THIRTY THIRD SCIENTISTS' MEET ON MILLETS AND FORAGES

Venue: **University Seminar Hall I**
Date and Time: **16.4.2015, 9.30 am**

Present status of millet and forage research	Dr. M. Maheswaran, Director of Research i/c
Action taken on the recommendations made during 32nd Scientists' Meet	
Crop Improvement	Dr. R. Ravikesavan, Professor and Head, Dept. of Millets Dr. A. Kalamani, Professor and Head, Dept. of Forages
Crop Management	Dr. Kalpana, Assistant Professor (Agronomy)
Crop Protection	Dr. P. Renuga devi, Assistant Professor (Pl. Pathology)
Research Highlights of 2014-15 and Action plan for 2015-16	
Crop Improvement	Dr. K. Ganesamurthy, Director i/c, Centre for Plant Breeding and Genetics
Crop Management	Dr.C. Jayanthi, Director i/c, Crop Management
Soil Health Management	Dr. V.P. Duraisamy, Special Officer i/c, Natural Resource Management
Crop Protection	Dr. D. Alice Professor and Head, Dept. of Plant Pathology
Wrap up	Vice-Chancellor, TNAU
Vote of Thanks	Dr. M. Maheswaran, Director of Research i/c

33rd CROP SCIENTISTS' MEET

MILLETS AND FORAGE CROPS

16th April, 2015

PROGRESS REPORT
2014-15

Department of Millets and Department of Forage crops
Centre for Plant Breeding and Genetics
Tamil Nadu Agricultural University
Coimbatore -641 003

CONTENTS

I. ACTION TAKEN ON THE RECOMMENDATIONS OF
32nd CROP SCIENTISTS' MEET

CROP IMPROVEMENT

S.No	Recommendation	Action Initiated
1	Assessing the lignin content in germplasm materials of kodo millet for establishing its role in culm strength	A total of 22 accessions of kodo millet were studied for lignin content. The content ranged from 0.78 mg/cm (TNPsc 106) to 6.98 mg/cm (Athipatti local). The other two accessions Adari and TNPsc 156 possessed high lignin content of 5.15 and 4.28 mg/cm with low degree of lodging respectively. The anatomical studies of thick culm genotypes with high degree of lodging *viz.* Adari and TNPsc 183 showed severe lignification around schlerenchyma arc and in the fiber cells around the vascular bundles whereas in Aamo 10, the weak culm type, the lignification not intense. The width of the sclerenchyma arc was higher in Adari and TNPsc 183 than Aamo 10. From this it evident that the intensity of liginification and thickness of sclerenchyma contributes to the culm strength in kodo millet.
2	Developing uniform and synchronized maturing varieties in small millets especially in finger millet to ease harvesting.	Among 858 finger millet accessions evaluated for synchronized maturity, the accessions *viz.* T545, T41, T691, T325, T554, T551, T554, T338 and T17 were found to be with synchronized maturity. These accessions will be tested for their agronomic superiority.
3	Breeding short duration little millet varieties which can be used as fodder as well	Among the seven entries evaluated in MLT under rainfed condition the entry TNPsu 170 recorded the maximum stover yield of 10.07 t/ha followed by PYR 11-05 (9.93t/ha) and TNPsu 167 (9.73t/ha) whereas the check CO 4 registered the stover yield of 8.94t/ha. The increased yield of the entries over the check is 12.64%, 11.07% and 8.84% respectively. Little millet entries TNPsu 176 and TNPsu 177 (80 days) were identified as short duration types with more plant height of 113.18 cm and 103.78 cm respectively when compared with CO 4 (91.8 cm)

<table>
<tr><td>4</td><td>Establishing nutritional values of all the minor millets and further improvement by value addition.</td><td>The nutrient contents in 27 finger millet genotypes were analyzed. Among the cultures TNEc 0601 recorded highest iron (8.6mg/100g) and Ca content (476mg/100g). TNEc 2179 registered high Ca (424.6g/100g) and highest Zn content (3.47mg/100g). Four cultures registered more than 8g/100g of iron content.

The analysis of protein content in 65 genotypes of barnyard millet resulted in the identification of ACM 161 (13.20 g/100g) with highest level of protein followed by ACM 110 (12.30 g/100g), ACM 145 (12.20 g/100g) and ACM 313 (12.10 g/100g). The culture ACM 161 recorded the highest crude fibre content of 10.80 g/100g followed by ACM 145 and ACM 110 (10.40 g/100g).

For iron ACM 145 registered the highest level of 18.4 mg/100 g followed by ACM 161 (17.8 mg/100 g), and the minimum amount of iron was observed in IEc.402 (10.1 mg/100g). The check CO (kv) 2 registered 16.5mg/100g.

Culture ACM 145 had highest zinc content of 5.6g/mg when compared to 5.2mg/100g observed in the check CO (kv) 2. Among the 65 cultures tested, ACM 161 recorded high value for protein, carbohydrate, crude fibre and iron in addition to yield. ACM 110 occupied second position for all the traits (except zinc).</td></tr>
<tr><td>5</td><td>Assessing Hydrogen Cyanide (HCN) content at various stages in multicut-sorghum varieties/cultures</td><td>The HCN content of multi-cut forage sorghum varieties viz., COFS 29 and COFS 31 was assessed at different stages 20 DAS, 45 DAS and after flowering. The results indicated that the initial HCN content was low at 20 DAS and increased at 45 DAS and declined after flowering

<table>
<tr><td colspan="4">HCN content (ppm) at various growth stages of multi-cut sorghum</td></tr>
<tr><td>Stage of crop</td><td>CoFS29</td><td>COFS31</td><td>Co 30</td></tr>
<tr><td>20 DAS</td><td>107.1</td><td>129.3</td><td>109.4</td></tr>
<tr><td>45 DAS</td><td>229.5</td><td>245.6</td><td>239.4</td></tr>
<tr><td>65 DAS</td><td>145.0</td><td>159.3</td><td>162.8</td></tr>
</table></td></tr>
</table>

6	Chettinad centre to focus on evaluation and evolution of improved cultures in varagu and kudhiraivali.	Barnyard millet AICSMIP trials were conducted and following promising entries *viz*., ACM 10-161 (1758kg/ha), ACM 10-082 (1952 kg/ha) and DHBMV 93-3 (1350 kg/ha) were identified for their superior performance in grain yield over check CO 2 (1292 kg/ha). Mutation breeding work was initiated in barnyard millet variety CO (kv) 2 with EMS at five concentration levels *viz*., 0.2%, 0.4%, 0.6%, 0.8%, 1.0%. LD 50 value was fixed as 0.51%.
7	Following the nomenclature of PYR instead of KRI/DPI for the cultures developed from RRS, Paiyur	All the cultures are renamed as PYR instead of DPI and KRI

<u>Themewise Action Taken</u>

S.No	Theme	Action initiated
1	Evolving dual/fodder purpose sorghum varieties/hybrids	A high yielding dual purpose sorghum culture TKSV 0809 has been released as K12 sorghum variety from Kovilpatti during 2015.It recorded an average grain yield of 3000 kg/ ha which was 16.9% and 24.7% increase over the checks K 8 and CSV 17, respectively. It also recorded dry fodder yield of 11.50 t/ha which is 34.2% increase over K8 sorghum variety. K 12 sorghum variety is shorter in duration which matures in 95 days. The crop is of tall plant type, tolerant to drought and non-lodging. Grains are with acceptable white colour, borne on medium cylindrical semi-compact ear heads. It is resistant to downy mildew and moderately resistant to shoot fly and stem borer. A dual purpose short duration culture TNS 623 is in second year of ART during 2014-15. It registered an average yield of 2749 kg/ha which is moderately resistant to shoot fly and stem borer. Two cultures *viz*., TNS 660 and TNS 661have been identified for testing in MLT with a grain yield of 4346 and 4336 kg/ha. It is 13 % increase over check CO 30 under station trials. Besides these cultures also recorded a stover yield of 10037 and 11654 kg/ha, respectively.

		Single cut forage sorghum culture TNFS 204 and the hybrid TNFSH 205 were evaluated in MLT for two years during 2013 and 2014. The hybrid TNFSH 205 recorded 24.43 t/ha of green fodder yield which is 8.58% increase over the check K11.
2	Identification of high yielding pearl millet varieties/hybrids for rainfed and summer irrigated conditions	Newly developed UCC 32 composite was tested under ART for two years. It performed well both under rainfed and irrigated situations in Tamil Nadu. This composite is medium in height (160-180cm) and matures with 85-90 days duration. It recorded a mean grain yield of 3474 kg/ ha under irrigated condition which is about 17.00 and 23.00 percent increase over the checks CO (Cu) 9 and ICMV 221 respectively. Under rainfed condition, it recorded 2916 kg/ha which is 15.00 and 24.00 percent increase over CO (Cu) 9 and ICMV 221,respectively.The protein content is high (12.07 %) and is resistant to the major disease downy mildew. This hybrid has been identifiedfor release during 2015-16. Among the two hybrids tested under ART, TNBH 08804 recorded an average yield of 2950 kg/ha which is 16.6 % increase over 86M52 and 7.9 % over TNAU cumbu hybrid CO 9.This hybrid possess compact ear head with bold grains. Another hybrid TNBH 10885 with an average yield of 2562 kg/ha over two years of testing under MLT had 13 per cent increased yield over the check TNAU Cumbu hybrid CO 9 and 17 per cent increased yield over private hybrid 86M52. This hybrid is having bold seed with compact earhead and resistant to downy mildew and rust.
3	Development of single cross maize hybrids suitable for irrigated and rainfed conditions	Four hybrids *viz*., CMH 08-381, CMH 09-464, CMH 08-282 and CMH 08-287 were identified by VIC of AICRP on Maize and released during 2014. Four maize hybrid cultures *viz,* CMH 08-617 (12215 Kg/ha), CMH11-582 (12072 kg/ha) CMH 11-614 (11916 Kg/ha) and CMH11-583 (11866 Kg/ha) with disease resistance were tested under station trial and were found to register 21.40 to 25.00, 17.70 to 21.20 and 19.00 to 22.50 percent increased yield over check hybrids *viz*.,Co6 (9772 kg/ha), 900M(G) (10079 kg/ha) and NK6240 (9974 Kg/ha) respectively under irrigated conditions both for Kharif and Rabi season. Under rainfed situation, the hybrid VMH 12013 was found to be promising with the percentage increase of 10.65% (6865 Kg/ha) over the TNAU MH CO 6.

4	Development of high yielding finger millet, little millet and proso millet varieties for rainfed conditions	Under AICRP trials, the culture TNPsu 171 ranked first under AVT over three location with grain yield of 2697 kg/ha which is 29% over all India check OLM 203 (2090 kg/ha). Similarly proso millet culture TNPm 230 ranked third in AVT with average grain yield of 2629 kg/ha which is 18.1% over all India check TNAU 145 (2317 kg/ha). The above cultures are under agronomy testing. Promising finger millet culturesTNEc1281 and TNEc1285 were tested under station trials and recorded 3050 and 2976 kg/ha of grain yield with an increase of 26.30 and 23.70 per cent over check Co 14 respectively.These cultures were promoted for MLT testing. In little millet, the entries TNPsu 176 and TNPsu 177 registered an average yield of 1859 and 1966 kg/ha with an increaseof 15.00 and 21.60 per cent, respectively under station trials and promoted for testing under MLT. In prosomillet , cultures TNPm 234 and TNPm 236 with an average yield of 1332 kg/ha and 1377 kg/ha with more than 20 per cent increase over check Co(PV)5 have been identified for MLT.
5	Evolving suitable varieties of barnyard millet, kodo millet and foxtail millet for water limiting environment	Drought related parameters *viz.*, relative water content, root dry weight, root: shoot ratio and root volume were analyzed for barnyard millet genotypes. The genotype P 17 recorded high relative water content of 108.33 per cent and P 19 had maximum root dry weight (10.77g) , root: shoot ratio of 0.20 and good root volume of 15.37 cm^3. These genotypes were found to be drought tolerant which may be utilized for breeding drought tolerant varieties in barnyard millet. A set of 28 entries in foxtail millet have been raised during summer 2015. Imposing drought stress in the treatment plots has been initiated during the reproductive phase to study its effect on grain yield and assess the variability among the genotypes. The work on drought will be continued.

CROP MANAGEMENT

1. Altering crop geometry to suit mechanical weeding in maize (only one season trial)

A field experiment was carried out at Maize Research Station, Vagarai during *Rabi* season of the year 2014-15 under irrigated condition with maize hybrid TNAU maize hybrid CO 6. The trial was laid out with the following treatments under randomised block design and replicated three times.

S. No.	First weeding	II weeding	Spacing (cm)
T_1	PE Atrazine at 0.25 kg /ha	Power weeder of 45 cm width on 45 DAS	60 x 25
T_2	PE Atrazine at 0.25 kg /ha	Power weeder of 45 cm width on 45 DAS	75 x 20
T_3	Power weeder of 45 cm width on 20 DAS	Power weeder of 45 cm width on 45 DAS	60 x 25
T_4	Power weeder of 45 cm width on 20 DAS	Power weeder of 45 cm width on 45 DAS	75 x 20
T_5	PE Atrazine at 0.25 kg /ha	Power weeder of 60 cm width on 45 DAS	75 x 20
T_6	Power weeder of 60 cm width on 20 DAS	Power weeder of 60 cm width on 45 DAS	75 x 20
T_7	PE Atrazine at 0.25 kg /ha	1 Hand weeding on 45 DAS	60 x 25
T_8	Unweeded check		

The results of the study revealed that significant difference between the treatments were observed for various growth and yield parameters and grain yield of the crop. As plant height is concerned, all the treatments (T_1 to T_7) produced taller plants in a range from 234 cm to 242 cm except the un-weeded check which produced smaller plants of 222.7 cm. Higher cob length was produced by the treatment T3 (17.9 cm) and was followed by treatments T_1, T_2, T_4, T_5, T_6 and T_7 whereas, the treatment T8 (un-weeded check) produced smaller cob length of 13.9 cm. Similar trend was observed among the treatments T_1, T_2, T_3, T_4, T_5, T_6 and T_7 for various yield parameters *viz*. No. of grain rows/cob, No. of grains/ row and No. of grains/cob and test grain weight. Higher cob and grain yields were recorded by the treatment T_5 (pre-emergence application of atrazine @ 0.25 Kg/ha followed by power weeder operation of 60 cm width on 45 DAS). However, the treatment was on par with the treatments T_3, T_4, and T_6, in which, power weeder was operated twice for the control of weeds. The treatment T_8 (un-weeded check) had recorded the lowest cob yield of 10113 Kg/ha and lowest grain yield of 7263 Kg/ha.

No significant differences between the treatment plots for the occurrence of weed flora *viz*., grasses, sedges and broad leaved weeds on 20, 40 and 60 DAS were found.

However, significant difference between the treatments was noted for the presence of grasses and broadleaved weeds on 60 DAS. Unweeded check (T8) did record higher number of grasses and broad leaved weeds per unit area whereas the presence of weeds in most of the other treatments was almost nil on 60 DAS.

No significant difference was noted among the treatments for density/sq. m of grasses, sedges and broad leaved weeds as counted on 20 and 40 DAS. However, significant difference between the treatments was noted for sedges and broad leaved weeds on 60 DAS.

Higher weed control efficiency was observed with treatments wherein pre-emergence application of atrazine herbicide was done (T_1, T_2, T_5 and T_7). However, the efficiency was higher for the treatments on 45 DAS wherein power weeder operation was done on 20 DAS (T_3, T_4 and T_6). The weed control efficiency was high (more than 90%) in all the treatments on 60 DAS.

Irrespective of plant spacing, usage of power weeder twice consumed more labour when compared to power weeder usage once. More area coverage per unit time was also higher for wider plant spacing of 75 x 20 cm than closer plant spacing of 60x25 cm.

Highest gross returns (Rs.124711/ha.), highest net returns (Rs. 72239/ha.) and highest BCR of 2.38 was recorded by the treatment T_5 *i.e.*, sowing of maize hybrid at 75x 20 cm plant spacing and pre-emergence atrazine herbicide application on 3rd DAS followed by power weeder operation on 45 DAS.

2. Nutrient Management for hybrid maize under rainfed vertisol (only one season trial)

Field trials were conducted at CRS, Veppanthattai and ARS, Kovilpatti to fix the optimum fertilizer application for rainfed maize with treatments *viz*. T_1 - Farmers Practice, T_2 - Recommended dose of fertilizer 40: 20: 0 kg NPK /ha) (As per CPG for vertisol), T_3 - 125: 37.5:37.50 NPK kg / ha, T_4 - 190:56:56 NPK kg / ha and T_5 - 250: 75: 75 NPK kg / ha involving two maize hybrids Co H (M) 6 and NK 6240

Application of higher level of fertilizer (T_5) recorded higher plant height (178.4 cm), cob length (17.57 cm), cob girth (14.90 cm), number of column/cob (31.05), number of grains /cob (407.45) and test weight (44.23 g) which was on par with farmer's practice (T_1). Higher level of fertilizer application (T_5) and farmer's practice (T_1) registered 24.57 and 15.14 per cent increased grain yield over RDF (T_2). In respect of economics, maximum net profit (Rs.50,760/ha) and BCR (2.77) was recorded in the treatment T_5 which received higher level of fertilizer application compared to other fertilizer levels (CRS, Veppanthattai)

Application of higher level of fertilizer (188: 56: 56 NPK kg/ha) recorded higher plant height (230.9 cm), cob length (17.24 cm), cob girth (13.72 cm), number of grains /row (19.14) and test weight (32.8 g). Lower yield parameters were recorded in recommended dose of fertilizer. Higher level of fertilizer application (T_5) and farmer's practice (T_1) registered 34.53 and 23.26 per cent increased grain yield over RDF (T_2) (ARS, Kovilpatti).

3. Performance evaluation of drip fertigation in Cumbu Napier hybrid grass

The experiment has been initiated only on 30.3.2015

4. Enhancing the productivity of small millets by dry farming techniques

Field experiments were planned to enhance productivity of small millets by adopting *in situ* soil moisture conservation practices at ARS, Vaigaidam (Proso millet - Panivaragu), DARS, Chettinad (Foxtail millet - Tenai), RRS, Paiyur (Little and Finger millet- Samai and Ragi) and RRS, Aruppukkottai (Barnyard millet and Kodo millet – Kuthiraivali and Varagu)

ARS,Vaigaidam (suggested crop was Panivargu; instead of Panivaragu Kuthiraivali was used)

Field experiment was conducted at during *Rabi* 2014-15, to find out the effect of different *in situ* moisture conservation practices for enhancing the productivity of Kudiraivali CO (Kv)2 under rainfed situation. The experiment consisted of the following treatments *viz*., T_1-Broad Bed and Furrow (BBF), T_2 - Compartmental Bunding (CB), T_3 - Ridges and Furrows (RF), T_4 -Tied Ridges (TR), T_5 - Basin Listing (BL), T_6 - Vertical Mulching (VM) and T_7 - Flat Bed (FB). The trial was laid out in a Randomized block design with three replications. Kudiravali variety CO (Kv) 2 taken for the experimentation.

In situ soil moisture conservation practices significantly influenced the growth and yield attributes of Kudiraivali (CO (Kv) 2). The results revealed that among the different *in situ* soil moisture conservation practices evaluated under rainfed condition, the highest growth parameters such as plant height (146.5 cm) and drymatter production (3420 kg/ha) were recorded with Tied Ridges (TR) followed by Ridges and Furrows (RF).

Among the *in situ* soil moisture conservation practices, tied ridges system recorded higher grain yield (1145 kg/ha) and straw yield of (2275kg/ha). Higher soil moisture content was recorded under this system at all stages of observation. However, it was on par with the ridges and furrows system. Regarding the economic returns higher benefit cost ratio (1.84) was obtained with ridges and furrows system due to its lower cost of cultivation.

Supplemental irrigation at primordial formation and flowering stage significantly increased the growth and yield attributes of kudiraivali. This treatment recorded higher grain yield (1036 kg/ha) and straw yield (2059 kg/ha) with higher economic returns (1.64) and higher moisture content at all stages of observation

DARS, Chettinad (Foxtail millet - Tenai)

The results revealed that among the different *in situ* soil moisture conservation practices evaluated under rainfed condition, the highest growth parameters such as no. of productive tillers per hill, ear head length (cm), grain yield (kg/ha), fodder yield (kg/ha) and test weight (1000 g wt.) were higher with Tied Ridges (TR) followed by Ridges and Furrows (RF). The lowest values of these parameters were observed under Broad Bed and Furrow (BBF) treatment. With respect to Days to 50% flowering and Days to maturity, the crop grown under treatment Tied Ridges (TR) and Ridges and Furrows (RF) attained 50 percent flowering at 45 DAS and matured 10 days earlier than rest of the treatments.

With respect to economics, though the treatments such as Tied Ridges (TR) and Ridges and Furrows (RF) recorded the highest gross return, both failed to produce higher benefit cost ratio of 2.90 and 2.70, respectively due to its higher cost of cultivation. Despite, the grain yield and gross return recorded under the treatment Compartmental Bunding (CB) as low as compared to Tied Ridges (TR) and Ridges and Furrows (RF), it could give higher benefit cost ratio of 3.05 owing to its lowest cost of cultivation (Rs 22750). From this study, it could be inferred that for higher productivity and yield in Tenai, either Tied Ridges (TR) or Ridges and Furrows (RF) may be followed and for higher BC ratio Compartmental Bunding (CB) is recommended.

RRS, Aruppukottai (Kuthiraivali and Varagu)

Significantly higher grain yield was recorded with the treatment of ridges and furrows in Kudiraivali (1682 kg/ha) and Varagu (1741 kg/ha). Higher net income was recorded with the treatment of ridges and furrows (Rs.14,995). However, higher B:C ratio was recorded with the treatment of Compartment bunding (1.85) since the treatment cost of forming compartment bunding was less than the cost of forming ridges and furrows. Higher net income was recorded with the treatment of ridges and furrows (Rs.16,275). However, higher B:C ratio was recorded with the treatment of Compartment bunding (1.88) and Ridges and furrows (1.88) since the treatment cost of forming compartment bunding was less than the cost of forming ridges and furrows. The rainfall use efficiency was also found higher with the treatment of ridges and furrows in Kudiraivali and Varagu. Soil moisture content was found to be more in the treatment of ridges and furrows at all growth stages of Kudiraivali and Varagu.

5. Enhancing partitioning efficiency in ragi using nutrients and plant growth regulators

Field experiments were conducted 1) to study the influence of nutrients and plant growth regulators on morphological traits and yield attributes and to find out the nutrient use efficiency (NUE) and translocation efficiency in relation to yielding potential of ragi (CO 15) at three different locations *viz*. ARS, Kovilpatti, RRS, Aruppukottai and TNAU, Coimbatore. The treatments followed were: T_1-Control, T_2-1% All 19:19:19, T_3-0.5% $MgSO_4$ + 0.5% Zn SO_4 + 0.2% Borax, T_4-200 ppm Chlormequat Chloride, T_5-0.1 ppm Brassinosteroids and T_6-Nutrient Consortia (0.5% All 19 :19 :19 + 0.25% $MgSO_4$ + 0.25% Zn SO_4 + 0.1% Borax + 0.1 ppm BRs).

ARS, Kovilpatti: In general, foliar application of nutrients and plant growth regulators in ragi crop considerably increased the plant height, plant biomass and yield and yield attributing traits compared to the control. But it was observed that the treatment with growth retardant chlormequat chloride @ 200 ppm (T_4) reduced plant height significantly. Among the treatments, application of nutrients and PGR consortia (T_6) significantly increased the plant height, dry weight of leaves and total biomass compared to other nutrients and PGR applied separately. There was no significant difference observed between treatments for number of tillers, shoot dry weight and number of ear heads per plant. Foliar spray of nutrient and PGR consortia recorded higher grain yield (2163 kg/ha) which was on par with foliar spray of 200 ppm chlormequat chloride (2152 kg/ha) with an yield increment of 15% and 14% respectively with control followed by foliar spray of All 19 which was on par with 0.1 ppm Brassinosteroids application.

RRS, Aruppukottai: Among the treatments the treatment T6 was recorded higher values in plant height (103.8 cm), number of tillers (3.3), leaf dryweight (4.5g/plant), stem dry weight (3g/plant), root dry weight (3.5g/plant) and total dry matter production (11g/plant) than other treatments. Among the treatments the treatment T6 registered higher values for number of ear heads/plant 7.5, ear head weight (42g/plant), harvest index (49.6 %) and grain yield (2850 kg/ha) than other treatments.

TNAU, Coimbatore: Foliar application of nutrients and PGRs significantly increased the plant height, dry weights of leaves, shoots and total biomass compared to control under irrigated condition. Among the treatments, nutrient & PGR consortia (T_6) recorded the maximum plant height, dry weights of leaves, shoots and total biomass followed by Brassinosteroids (T_5) and All 19 (T_2) which are on par with each other. Application of Chlormequat Chloride (T_4), being growth retardant significantly reduced the plant height. Experimental results revealed that the application of nutrients and PGR consortia (T_6) recorded the highest ear head weight and grain yield/plant followed by Brassinosteroids (T_5) and Chlormequat chloride (T_4) which were on par with each other.

Salient findings based on single season experiment over three locations: Application of nutrients and PGR consortia (T_6) recorded the highest grain yields under irrigated (3548 kg/ha) and rainfed (2507 kg/ha) conditions with an yield increment of 17.3 % and 15 % over control (1880 kg/ha), respectively.

6. **Rhizosphere Studies in Millets under Water Stress Condition (**Barnyard Millet - Kudiraivali)

Pot culture experiments were conducted to study the physiological and microbial mechanisms in the rhizosphere under different levels of soil moisture (T_1 - 25% Available soil moisture (ASM), T_2 - 50% ASM, T_3 - 75% ASM, T_4 - Control (100 % ASM) at Coimbatore and Aruppukottai involving CO 2 Kuthiraivali.

RRS, Aruppukottai: The treatment T_4 – 100% ASM recorded higher values in all the root characters at 30 days, 45 days and 60 days. (Root length 30 cm, 34 cm and 37 cm, Root volume 6.4 cc, 8.0 cc and 9.0 cc and root biomass 1.5 g/plant, 2.0 g/plant and 2.4 g/plant). Bacterial population was recorded at 30 days, 45 days and 60 days. Among the treatments the treatment T_4 – 100% ASM was recorded more bacterial growth 150 CFU X10^6 g^{-1} of Soil and 184.2 CFUX10^6 g^{-1} of Soil at 30 days and 45 days respectively.

TNAU, Coimbatore: Experimental results revealed that the different soil moisture regimes such as 25%, 50%, 75% and 100% ASM significantly influenced the morphological parameters of barnyard millet. Among the treatments, 25% and 50% ASM significantly reduced the growth parameters such as plant height, number of tillers, total biomass and root traits at all the stages of observation. The treatment, 75% ASM (T_3) significantly recorded higher values for growth parameters and root traits which are on par with the control which recorded the highest plant height, total biomass, number of tillers and root traits such as root length, root volume and root biomass.

Salient findings: Growth and development of barnyard millet was significantly reduced at 25% and 50% ASM conditions. There was significant variation observed in the populations of rhizosphere bacteria, fungi and actinomycetes under different moisture status of soil.

7. Demonstration of Nutriseed pack technology in irrigated hybrid maize

Experiments were conducted to differentiate the effectiveness of single time placement of Nutriseed Pack for growing maize to increase yield and fertilizer use efficiency over the surface application of fertilizers at three different locations *viz*. CRS, Veppanthattai, ARS, Bhavanisagar and TNAU, Coimbatore.

The effect of placement of Nutriseed Pack containing 75% NPK was compared with surface application of fertilizer at 100% NPK in 3 centres. Placement of Nutriseed Pack recorded greater plant height and high grain and stover yield at CRS, Veppanthattai and ARS, Bhavanisagar compared to surface application of fertilizers. However, at Coimbatore Centre (Eastern Block Farm) Nutriseed Pack placement recorded slightly lower yield than surface application. Overall, placement of Nutriseed Packs containing 75% NPK increased grain yield up to 8.44 percent over 100% NPK applied as surface broadcast. Reduced weed growth was observed under Nutriseed Pack placement when compared to surface application of fertilizers.

Effect of Nutriseed Pack on Plant height, Weed biomass and stover and grain yield

Location	Treatment	Plant height cm	Weed biomass kg ha^{-1}	Stover yield kg ha^{-1}	Grain yield kg ha^{-1}	Yield increase for Nutriseed Pack (%)
CRS, Veppanthattai	T_1 - Nutriseed Pack 75% NPK	228	666	10866	6350	23.5
	T_2 -Surface application 100%NPK	210	909	9675	5142	
ARS, Bhavanisagar	T_1 - Nutriseed Pack 75% NPK	205	232	8675	5980	8.2
	T_2 -Surface application 100%NPK	191	274	7855	5525	
TNAU Coimbatore	T_1 - Nutriseed Pack 75% NPK	196	162	10967	6740	-2.6
	T_2 -Surface application 100%NPK	216	215	11076	6920	
Mean Yield	T_1 - Nutriseed Pack 75% NPK				6357	8.44

8. Evaluation of maize genotypes for phosphorus acquisition

Field experiments have been conducted to evaluate the efficiency of the five maize genotypes at ARS, Bhavanisagar, Chinnamathampalayam, Coimbatore (Periyanaickenpalayam block); Maize Research Station, Vagarai and Cotton Research Station,Veppanthattai. The phosphorus levels imposed were 0, 50, 75 and 100 per cent of recommended P (75 kg P_2O_5 ha^{-1}). At harvest, grain yield, stover yield and yield parameters were recorded. Grain and stover P content was analysed and P uptake was estimated. Based on the data, Internal Phosphorus Utilisation Efficiency (PUE), Phosphorus Acquisition Efficiency (PAE) and Phosphorus Efficiency (PE) were derived.

In all the three centers, significant increase in grain yield was observed due to graded levels of phosphorous. At Coimbatore, grain yield under control (no P application) ranged from 3912-4952 kg ha^{-1}. Maize genotype COH(M) 8 recorded the highest grain yield of (4952 kg ha^{-1}) under no P application and was able to produce 88 per cent of grain yield (P_0) as under 100 per cent P application. At Vagari, among the different genotypes COH(M) 6 recorded the highest mean grain yield (8005 kg ha^{-1}) followed by COH(M) 8 (7812 kg ha^{-1}). Grain yield under control (no P application) ranged from 6668 (COH (M) 9) -7567 kg ha^{-1} (COH(M) 6). At Veppanthattai, at $P_{0,}$ COH(M) 6 and COH(M) 9 recoded significantly higher grain yield of 4950 kg ha^{-1} with PE of 75.9 and 77.3 per cent respectively. COH(M) 8 recorded the highest PE of 81.5 per cent. COH(M) 6 recorded the highest grain yield (6317 kg ha^{-1}) and was on par with COH(M) 8 (6284 kg ha^{-1}). These two genotypes recorded a higher grain yield than the mean under P_0 indicating their tolerance to P stress. All the genotypes responded to P application. Increasing the P application rate decreased the PUE in all the locations. Among the five genotypes COH(M) 8 recorded the highest mean PUE. When no P was applied, CMHO8 -156 was able to produce higher grain yield per unit of P absorbed (456 kg grain yield kg^{-1} P absorbed). Variation was observed between genotypes with respect to PE and PAE. When the mean data of all the locations was considered for PE, COH(M) 7 recorded the highest value of 88.2 and the lowest was by CMH08 -156 (84.7%) . COH(M) 8 recorded the highest mean PAE followed by COH(M) 7 . In all the three centres, lowest PAE was recorded by CMH08 -156.

Salient Findings: Variation was observed between genotypes and phosphorus levels with respect to grain yield, phosphorus uptake, PUE, PE, and PAE. The two genotypes COH(M) 6 and COH(M) 8 recorded a higher grain yield than the mean under P_o, indicating their tolerance to P stress. All the genotypes responded to P application. Increasing the P application rate decreased the PUE. Among the five genotypes COH(M) 8 recorded the highest mean PUE. When no P was applied, CMHO8 -156 was able to produce higher grain yield per unit of P absorbed. COH(M) 8 recorded the highest mean PAE (52.83%) followed by COH(M)7 (46.86 %.). Based on the grain yield and Internal Phosphorus Utilisation Efficiency, under no P application, the genotypes can be classified as

Tolerant, responsive with high Internal PUE	: COH(M) 6
Tolerant, responsive with low Internal PUE	: COH(M) 8
Non - Tolerant, responsive with high Internal PUE	: CMH08 - 156
Non - Tolerant, responsive with low Internal PUE	: COH(M) 7 and COH(M) 9

9. Yield enhancement of rainfed maize by STCR-IPNS approach on Inceptisols (red non calcareous soil)

Field experiments were conducted to validate the developed fertilizer prescription equations for rainfed maize through verification trials in Inceptisols (red non calcareous) at Coimbatore, MRS, Vagarai, ARS, Bhavanisagar and ARS, Kovilpatti. During the period under report four test verification trials were conducted in MRS -Vagarai, ARS- Kovilpatti, ARS- Bhavanisagar and a famer’s holding in Pethappampatti, Tiruppur District using TNAU Maize hybrid Co 6 as a test crop. The sowing was taken up on

29.6.2014, 30.09.2014, 10.10.2014, 17.10.2014 and harvested on 06.01.15, 04.02.2015, 20.01.2015 and 13.02.2015 respectively in MRS -Vagarai, ARS- Kovilpatti, ARS- Bhavanisagar and Pethappampatti, Tiruppur District. There were nine treatments *viz.*, blanket, STCR-NPK alone for 4 to 6 t ha^{-1}, STCR -IPNS for 4 to 6 t ha^{-1} and farmer's practice and control. Based on the initial soil test values of available N, P_2O_5, K_2O and yield targets aimed, fertilizer doses were calculated and applied for STCR treatments. For IPNS treatments, 12.5 tonnes of FYM were applied basally and fertilizer N, P_2O_5, K_2O doses were adjusted accordingly.

The mean values of the four test verification trials indicated that the highest grain yield of rainfed maize was recorded with STCR-IPNS-6 t ha^{-1} (5332 kg ha^{-1}) followed by STCR-IPNS-5 t ha^{-1} (5264 kg ha^{-1}). The per cent achievement of the targeted yield was more than 90 per cent proving the validity of the equations with STCR – IPNS - 5 t ha^{-1} (5264 kg ha^{-1}) and STCR-NPK- 5 t ha^{-1} (4943 kg ha^{-1}). The highest mean response ratio was recorded in STCR-IPNS-5 t ha^{-1} (21.7 kg kg^{-1}) followed by STCR-IPNS-4 t ha^{-1} (20.1 kg kg^{1}). The highest B: C ratio was also recorded in STCR-IPNS-5 t ha^{-1} (2.27). The farmer's practice recorded relatively lower yield and response ratio as compared to blanket and STCR treatments while the STCR - IPNS treatments recorded the higher per cent achievement and response ratio among all the treatments.Though the blanket fertiliser recommendation recorded relatively higher yield and response ratio over farmer's practice, it was lower when compared to STCR treatments. Thus, the results of the verification trials confirmed the validity of fertilizer prescription equations developed for rainfed maize on Irugur series (red non calcareous) for the yield targets of 5 t ha^{-1}.

Salient findings: The per cent achievement of the targeted yield was more than 90 per cent with STCR and STCR-IPNS treatment @ 5 t ha^{-1} for rainfed maize (TNAU maize hybrid CO6) proving the validity of the equations developed for rainfed maize on Irugur series (red non calcareous) (TypicUstropept). Application of FYM @ 12.5 t ha^{-1} along with inorganic fertilizers (34-71, 15-48 & 15-41 kg of N, P_2O_5 and K_2O ha^{-1}) for an initial soil test values in the range of 140-219,12.0 -23.3 and 284-547 kg ha^{-1} of available N, P and K respectively has recorded the highest mean response ratio of 21.7 kg grain per kg of nutrient applied for rainfed maize to get the mean grain yield of 5264 kg ha^{-1}.

10. Insight study about the benefit of nano application on seed quality improvement in maize

The maize hybrid COH (M) 6 seeds were treated with *Zinc Oxide* and Silver, packed in cloth bag and stored in ambient condition during January 2015. Initial germination seeds were 86%. Since, the initial germination is below the seed standard of 90% in the pre-review meeting it has been suggested to start the experiment with fresh seeds having the initial germination above the seed standard. Accordingly, the seeds were obtained for starting the storage experiment and synthesis of ZnO and Silver nano particles are in progress to impose seed treatment.

11. Influence of seed priming on productivity and storage of small millets

An experiment was conducted to standardize the priming technique (optimum concentration, duration and agent) for minor millets through laboratory evaluation and to evaluate the productivity of minor millets under irrigated/rainfed condition. The treatments followed for the priming were: T_1 – Control, T_2 - Seed Soaking with water, T_3 - Seed priming with 2% KH_2PO_4 and T_4 - Seed priming with 20% *Pseudomonas fluorescens* (liquid formulation). The minor millets involved in the study were: Tenai, Samai, Varagu, Panivaragu and Kuthiraivali. The parameters observed include: Germination %, Root length (cm), Vigour index, Speed of germination, Dehydrogenase activity, α- amylase content, Catalase activity and Peroxidase activity

Salient finding: Seeds primed with 20% liquid *P. fluorescens*followed by 2% KH_2PO_4 recorded the highest seed yield in tenai, varagu, panivaragu and kuthiraivali.

CROP PROTECTION

1. Development of Integrated management strategies for major pests and diseases of maize

The development of integrated management strategies for major pests and diseases was planned by including IPDM components such as soil amendments, biocontrol agents and newer molecule pesticides. However, attempts were made to manage Maydis Leaf Blight (MLB) of maize and Sorghum Downy Mildew (SDM) of maize.

Integrated management of Maydis Leaf Blight (MLB) of maize: Seed treatment (ST) with TNAU-Pf1 @ 10 g/kg seed + foliar spray of propiconazole (0.1%) or ST with TNAU-Pf1 @ 10 g/kg seed + foliar spray of tebuconazole (0.1%) at 40 DAS recorded the lowest PDI of leaf blight caused by *H. maydis* and maximum grain yield of 58.67 and 57.80 q/ha with highest BC ratio of 4.06 and 3.98, respectively (Veppanthattai)

Integrated management of Sorghum Downy Mildew (SDM) of maize: The experiment was conducted, but there was no incidence of sorghum downy mildew due to unfavourable relative humidity, temperature and rainfall during the cropping period (Coimbatore)

2. Development of IPM strategies for major pests and diseases of sorghum under rainfed conditions

For the management of shoot fly, stem borer and midge of sorghum under rainfed conditions seed treatment with Thiomethoxam 70 WS @ 3 g/kg of seed followed by spray of carbaryl 50WP @ 0.5 kg/ac at 45 days after emergence resulted with the lowest shoot fly, stem borer and midge incidence (3.37, 3.70 and 1-grade) and resulted with highest benefit cost ratio (1:2.11).

3. Management of blast in finger millet

Seed treatment with combination of P. *fluorescens*@ 10gand *T. virid*e @4g /kg of seed followed by foliar application of the new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf and neck blast disease incidence of 4.9% & 0.0% respectively as against the control(19.5 & 8.5 %) (RRS, Paiyur).

Seed treatment with combination of P. *fluorescens*@ 10gand *T. virid*e @4g /kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf, neck and finger blast disease incidence of 2.33 G, 8.83 & 9.0% respectively whereas in untreated control,theleaf, neck and finger blast disease incidence was of 4.83 (G), 18.43% & 19.23% respectively (TNAU, Coimbatore).

4. Variability of blast pathogens in millets and its management

Finger millet: Totally sixteen isolates of *Magnaporthegrisea* were collected for variability studies. The mean spore length and width were ranged from 16.72 to 21.72 and 6.7 to 8.5 µm, respectively**.** There was no cross infectivity among the isolates (TNAU, Coimbatore).

Pearl millet: There was no blast incidence on pearl millet during Kharif 2014 (TNAU, Coimbatore).

5. Identification and Mechanisms of pest and disease resistance in Promising millet entries

Maize: Totally 455 national entries were screened to identify the resistant and susceptible sources for sorghum downy mildew disease. The following nine resistant entries viz., CMH 12-667, DMRH 1413,CMH 11-586, CMH 12- 675, CMH 10 -527, CMH 10-547, CMH 11-617, CMH 11-579, CMH 11-626, and seven susceptible entries viz.,DMRH1308, IAHM2013-9,SAMH-221, CMH 11-658, CMH 11-659, CMH 11-582, NHM -1258,EH-2212 were identified and selected for reconfirmation under controlled environment.

Pearlmillet: Proteome analysis was carried out to determine the differentially expressed proteins involved in downy mildew resistance in susceptible (7042S) and resistant (TNAU CO9 hybrid) pearl millet cultivars. Fifteen new proteins, 20 up-regulated proteins and 11 down-regulated proteins were identified upon inoculation of *Sclerosporagraminicola* under glasshouse conditions. Further studies are in progress.

II. SALIENT FINDINGS

CROP IMPROVEMENT

Varieties/Hybrids released

State Release

Sorghum variety K12

A high yielding dual purpose sorghum culture TKSV 0809 was released as K12 sorghum variety from Kovilpatti during 2015. It has recorded an average grain yield of 3000 kg/ ha which was 16.90% and 24.70% increase over the checks K 8 and CSV 17, respectively. It also recorded dry fodder yield of 11.50 t/ha which is 34.20 % increase over K8 sorghum variety. K 12 sorghum variety is shorter in duration which matures in 95 days. The crop is of tall plant type, tolerant to drought and non-lodging. Grains are highly acceptable, white colour, borne on medium cylindrical semi-compact ear heads. It is resistant to downy mildew and moderately resistant to shoot fly and stem borer.

Central Release

Maize hybrid CMH 08-38

Hybrid culture CMH 08- 381 is a late maturity (105-110 days), single cross (UMI 1211 x UMI 1221, normal hybrid, bold grains, orange yellow colour with dent type.It has high shelling (81%), high test weight (40g/100 kernels) and stay green trait, which can fetch high price in the market for grain and fodder. It gave an average grain yield of 9359 kg/ha in Zone 3 and 4 over three years testing in Kharif season. It has consistentsuperiority in yield over qualifying national checks *viz*., PMH 1 (16.65%), PMH 3 (9.46 %), Seed Tech 2324 (18.06 %) and Bio 9681 (23.57%).

It exhibited multiple disease resistance *viz*.,Maydis leaf blight, Common rust, Turcicum leaf blight, Brown stripe downy mildew, Curvuleria leaf spot, Erwinia stalk rot and post flowering stalk rot under artificial conditions over qualifying check varieties. It also showed moderately resistant to stem borer *Chilopartellus*(3.50) against qualifying check hybrids*viz.*, PMH 1(3.91), PMH 3 (3.63), Seed tech 2324 (3.85) and Bio 9681 (4.13). It possesses special attributes such as high starch (76.42 %), high protein (10.57 %) and high beta-carotene (0.47 mg/100g) with moderate level of fat (4.56 %) and crude fibre (1.43%). It was identified by VIC for National release as CoH (M) 11 during 2014 for adoption in the states of **Bihar, Jharkhand, Odisha, Eastern Uttar Pradesh, Maharashtra, Karnataka, Andhra Pradesh and TamilNadu** for *Kharif* season.

Maize hybrid CMH 09-464

Hybrid culture CMH 09-464is a late maturity (105-125 days), modified single cross (UMI 1200 x UMI 1210') x UMI1223) normal hybrid, bold grains, orange yellow colour with dent type and stay green. It has high shelling (80%) and high test weight (41g/100 kernels)can fetch high price in the market. It gives an average grain yield of 8320 kg/ha in Zone-3 over three years in Kharif season. It has consistent superiority in yield over qualifying checks *viz*., PMH 1 (6.27%), PMH 3 (1.45 %), Seed tech 2324 (16.07 %) and Bio 9681 (14.92%).

It expressed multiple disease resistance *viz*., Maydis leaf blight, Curvuleria leaf spot, Common rust, Turcicum leaf blight, Downy mildew, Rajasthan downy mildew and Post flowering stalk rot under artificial screening conditions over qualifying check varieties. It exhibited moderately to stem borer *Chilopartellus*(4.84) against qualifying check varieties *viz.*, PMH 1(3.91), PMH 3 (3.63), Seed tech 2324 (3.85) and Bio 9681 (4.13). It possesses special attributes such as high starch (76.52 %), high protein (11.51 %) and high beta-carotene(0.48 mg/100g) with moderate level of fat (4.52 %) and crude fibre (1.44 %). For single cross hybrid seed production, the male parent UMI 1223 should be sown four days earlier than female parent (UMI 1200 x UMI 1210') in a ratio of 1:3 for flowering synchronization. For sister line crossing, the male parent UMI 1200 and female parent UMI 1210' can be sown simultaneously for flowering synchronization (1:4). It specifically identified by VIC for National release as CoH (M)12 during 2014 for adoption in the states of **Bihar, Jharkhand, Odisha and Eastern Uttar Pradesh** for *kharif* season**.**

Maize hybrid CMH 08-282

It is a late maturity (105-125 days) single cross (UMI 1200 x UMI 1230, normal hybrid, bold grains, orange yellow in colour with semi dent type. It has high shelling (80%), high test weight (41g/100 kernels) and stay green at maturity. It gives an average grain yield of 8951 kg/ha in zone-4 for mean yield of three years in *Rabi* season. It has consistent superiority in yield over qualifying checks *viz*., seed tech 2324 (10.70%), Buland (19.47 %) and Bio 9681 (9.48%) in breeding trials during *Rabi* season (Zone -4).

It is moderately resistant to Turcicum leaf blight, Sorghum downy mildew, Post flowering stalk rot and Common rust disease under artificial conditions over qualifying check varieties. It also showed moderately resistant to stem borer *Chilopartellus* against Qualifying check varieties *viz.*, Buland and Bio9681. It possesses special attributes such as high starch (75.30 %), high protein (11.25%) and high beta-carotene (0.46 mg/100g) with moderate level of fat (4.63 %) and crude fibre (1.28%).It recorded 4 t/ha of single cross hybrid seed yield, the male UMI 1200 and female UMI 1230 parents can be sown simultaneously for flowering synchronization in a ratio of 1:3 or 1:4. It specifically identified by VIC for Nationalrelease asCoH (M) 13 during 2014 for adoption in the states of **Tamil Nadu, Andhra Pradesh, Telangana**, **Karnataka** and **Maharashtra** for *Rabi* season under irrigated condition.

Maize hybrid CMH 08-287

It is a late maturity (115-128 days), single cross (UMI 1210 x UMI 1220), normal hybrid, bold grains, orange yellow in colourwith dent type. It has high shelling (80%) and high test weight (41g /100 kernels) can fetch high price in the market. Stay green at maturity become good fodder value after harvest. It gives an average grain yield of 9478 kg/ha in zone-4 for mean yield of three years in *Rabi* season. It has consistent superiority in yield over qualifying checks *viz*., seed tech 2324 (17.21%), Buland (26.51 %) and Bio 9681 (15.92%) in breeding trials during *Rabi* season (Zone-4)

It showed moderately resistant to Turcicum leaf blight, Post flowering stalk rot and Common rust disease under artificial conditions over qualifying check varieties. It also showed moderately resistant to stem borer *Chilopartellus* against Qualifying check varieties *viz.*, Buland and Bio9681. It possesses special attributes such as high starch (76.20 %), high beta-carotene (0.46 mg/100g) and crude fibre (1.42 %) with moderate level of fat (4.54 %) and protein (10.55 %). Single cross hybrid seed yield 4 t/ha, male parent should be sown four days earlier than female parent for flowering synchronization in a ratio of 1:3. It specifically identified by VIC for Nationalrelease asCoH (M) 14 during 2014 for adoption in the states of **Tamil Nadu**, **Andhra Pradesh, Telangana, Karnataka and Maharashtra** for **Rabi** season under irrigated condition.

Varieties/Hybrids identified for state release during 2015-16

Pearl Millet

A composite UCC 32 was developed and tested under different stages of testing. It performed well both under rainfed and irrigated situations in Tamil Nadu. This composite is medium in stature (160-180cm) with 85-90 days duration. It produces 4-6 productive tillers and recorded a mean grain yield of 3474 kg/ha under irrigated condition which is about 17 and 23 percent increase over the checks CO (Cu) 9 and ICMV 221 respectively. The mean grain yield under rainfed condition is 2916 kg/ha which is 15 and 24 percent increase over CO (Cu) 9 and ICMV 221, respectively.

Research Achievements

Sorghum

Coimbatore

- A dual purpose short duration culture TNS 623 is in second year of ART during 2014-15. It registered an average yield of 2749 kg/ha which is moderately resistant to shoot fly and stem borer.
- Two cultures *viz*., TNS 660 and TNS 661 were identified for testing in MLT with a grain yield of 4346 and 4336 kg/ha. It is 13 % increase over check CO 30 (3453 kg/ha) under station trials. Besides, these cultures also recorded a stover yield of 10037 and 11654 kg/ha, respectivelywith an increase of 12.6% and 30.4%over CO 30
- The promising entries viz., SPV2164, SPV2178, SPV2177 and SPV2175 identified from the AVT trials of AICRP were utilized in breeding programme**.**
- The single cut forage sorghum culture TNFS 204 and the hybrid TNFSH 205 were evaluated in MLT for two years during 2013 and 2014. The hybrid TNFSH 205 recorded 24.43 t/ha of green fodder yield which is 8.58% increase over the check K11.
- The promising entry SPV 2242 (TNFS 209) of IAVHT –multicut forage sorghum has been advanced to AVT –II year during kharif 2015.
- SSR markers namely Xtxp 1, Xtxp2, Xtxp 15, Xtxp 214, Xtxp 225 found associated with stay green/ drought tolerance and being confirmed in F2 generation of crosses CO 28 X IS 18551 and CO 28 X B35.
- One hundred and five sorghum accessionscollected from Japan through NIAS scheme were deposited in Dr. Ramaih Gene Bank, TNAU, Coimbatore. Among these lines twelve lines with early duration (80-90 days) were identified and utilized in the crossing programmes.

Kovilpatti

- A high yielding dual purpose sorghum culture TKSV 1036 with a duration of 95 days is proposed for MLT. It recorded an average grain yield of 3647kg/ha which is 26.6% increase over the check K8 (2879kg/ha).
- A forage sorghum culture TKFS 11109 with an average green fodder yield of 19.75t/ha with 40% increased yield over check K 11 (14.10t/ha) under rainfed condition is proposed for MLT.

Aruppukottai

- A high yielding sorghum culture, ASV 11-029 is proposed for MLT. This culture recorded an average grain yield of 2519 kg/ha, which is more than 30% increase over checks APK 1 and CO 30.

Pearlmillet

- Two promising hybrids, TNBH 08804 and TNBH 08813 were tested in ART for two years 2013-14 and 2014-15. The hybrid TNBH 08804 recorded an average grain yield of 2950kg/ha which is 8 and 17% increase over the checks TNAU cumbu hybrids CO 9 and private hybrid 86M52 respectively. This hybrid possess compact earhead with bold grains and resistant to downy mildew.
- Two hybrids *viz.*, TNBH 10885 and TNBH 10878 were tested for two years from 2013-14 and 2014-15 under MLT.Among the entries tested, the hybrid TNBH 10885 recorded an average yield of 2562 kg/ha which is 13 per cent increased yield over the check TNAU Cumbu hybrid CO 9 and 17 per cent increased yield over private hybrid 86M52. This hybrid is promoted to test under ART for the year 2015-16.
- Two hybrids*viz.*, TNBH 12 1255 and TNBH 12 1235 recorded an average yield of 5598 kg/ha and 5323kg/ha respectively under station trials which is 19 and 13% increased yield over TNAU cumbu hybrid CO 9 and 13 and 18% more yield over the private hybrid 86M52. These hybrids are promoted to test under MLT during the year 2015-16.
- Under male sterile line conversion programme uniform lines with 100 per cent sterility were identified which can be utilized for synthesis of new hybrid combinations. The lines were derived from five crosses ICMA 93111A X PT 6243 , ICMA 92333A X PT 5591, ICMA 99666A X PT 6272 ,ICMA 99666A X PT 4450, and ICMA 92333A X PT 6254
- A total of 200 recombinant inbred lines (RIL) was developed to identify agronomically superior inbred lines with rich beta carotene content by crossing PT 6129 (yellow parent) and PT 6029 (grey parent). The RIL *viz.* TNBG-06-45-5-5-2-2-10, TNBG-06-82-5-5-2-4-2, TNBG-06-67-5-5-3-4-7 and TNBG-06-194-5-5-2-1-1 performed better and recorded maximum grain yield per plant and showed desirable mean performance for most of the yield attributing traits. The other RIL *viz*. TNBG-06-132-5-5-3-2-10, TNBG-06-77-5-5-2-1-10, TNBG-06-53-5-5-3-2-5 and TNBG-06-81-5-5-3-3-1 possess higher levels of beta-carotene content.

Maize

Coimbatore

- Two single cross maize hybrid cultures *viz.*, CMH08-381 and CMH 09-464 were evaluated and studied under ART during 2014-15 and these two hybrids were identified by VIC during 2014 for central release as CoH(M) 11 and CoH(M)12 for Kharif season including Tamil Nadu state.
- Eleven hybrid cultures*viz.*, CMH 10 -531promoted for 3rd year testing in Zone 5, CMH10-547 for Zone 2 and 5, CMH10-582 for Zone 3, CMH11-617 for Zone-5 under medium maturity groups ; CMH11-595 and CMH11-611 for Zone 2, 5 and CMH11-579, CMH 11-626 and CMH11- 629 for Zone 2, 3, 5 under early maturity groups and baby corn hybrids CMH11-659 ,CMH11-658 were tested under AVT- 2nd year during Kharif 2014.

- Sixteen new single cross maize hybrid cultures *viz.*,CMH10-555,CMH11-618,CMH12-663,CMH12- 667, CMH12-671 for late maturity; CMH11- 584, CMH11- 586, CMH11-593, CMH11-615, CMH11- 619, CMH12- 665 for medium maturity and CMH10-527, CMH10-552, CMH12-675, CMH12-691 and CMH12-697 for early maturity were evaluated under All India trialsduringKharif 2014 .
- The average yield of maize hybrid CO 6 in 200 FLDs were 7888kg/ha during Rabi 13-14 and the difference between FLD average and state average was 4336 kg/ha
- A total of 326 selfed single plants (S 3- S7) were selected based on the high test weight, stay green, reduced Anthesis-SilkingInterval, good grain filling and resistance to SDM.
- In TSP- maize demonstrations, harvested green cobs ranged from 13.5 to 18.6 tones/ha and utilized as such for consumption in majority of the tribal farmers in Erode district.
- Two single cross sweet corn hybrids CSCH14003 (15597 kg/ha) and CSCH14012 (14167 kg/ha) were identified as better green cob yielders than best check Sugar 75 (13104 kg/ha)
- Sixteen hybrids were subjected to foreground selection for sugary genes by using the nearest markers *viz.*, umc 1303, umc 2061, bnlg 1937, umc 1969, umc 1142, umc 1896 and umc 1031 located at chromosome 4 (short arm)
- Two maize inbred sorghum downy mildew resistance introgressed lines *viz.*, 79/936-c1 -c7-c7- s7- s46 and 79/936-c1-c7-c7- s10- s80 withgenetical identity of 92.45% and 89.68% respectively to recurrent parent UMI 79 were developed.

Vagarai

- Under rainfed situation, the hybrid VMH 12013 was found to be promising with the percentage increase of 10.65% (6568 kg/ha) which is promoted to MLT under rainfed condition.
- Among the hybrids evaluated in IHT trials during Kharif 2013 and 2014, it was found that the hybrid VMH 12014 (UMI 1200 x VIM 357) has recorded the maximum grain yield of 9835 and 9978 kg/ha which is 10.50% and 10.70% higher than the check TNAU MH Co 6, respectively. Seed multiplication of the promising hybrid VMH 12014 is being done in order to nominate it for AICRP/State MLT during ensuing Kharif 2015 season.

Madurai

- Among the high beta carotene maize hybrids evaluated, ACM-M13-02 showed higher grain yield (11.28 t/ha) with a duration of 110 days suitable for late season, orange yellow color grain, flint type kernel and high beta carotene content of 4.0 µg/g. The hybrid showed increased yield over the checks CO6 (20.87%) with enhanced level of beta carotene. HPLC analysis also revealed a considerable improvement in the β-carotene of converted parental lines having the recurrent parent phenotype with enhanced beta carotene content of 3.5µg/g and 4.0 µg/g β-carotene respectively.
- The lpa2 homozygous BC_2F_2 lines showed high inorganic phosphorous (> 0.93 µgP) and reduced phytate with a range of 1.73 to 1.92 mg/g. The UMI285-lpa2 converted lines were crossed with CO6 parents UMI 1200 and UMI1230 among the hybrids the UMI 285-lpa2 x UMI1200 showed better performance and yield evaluation is in progress.
- Standardized medium for callus induction and regeneration in foxtail millet.

Small millets

Ragi

- Promising finger millet cultures TNEc1281 and TNEc1285 are proposed forMLT during 2015-16. These cultures recorded 3050 and 2976 kg/ha of grain yield with an increase of 26.30 and 23.70 per cent over check Co 14 respectively in the station trials.
- Twenty five entries along with one check were evaluated under Finger millet Initial Evaluation trial.Among these BR 70 recorded the grain yield of 3450 Kg/ha followed by VL 385 (3333 Kg/ha).
- Fourteen entries were evaluated Finger millet AVT I&II along with one check. VR 708 recorded the highest grain yield (4990Kg/ha) followed by GPU 45 (3928Kg/ha).
- Twenty entries along with one check were raised under AVT III among these BR 67 recorded the grain yield (4305 Kg/ha) and WWN 25 recorded the grain yield (3955 Kg/ha).

Samai

- In Samai, cultures TNPsu 176 and TNPsu 177 registered an average yield of 1859 and 1966 kg/ha with an increaseof 15.00 and 21.60 per cent, respectively under station trials and promoted for testing under MLT.
- Under AICRP trials, the culture TNPsu 171 ranked first under AVT over three locations with grain yield of 2697 kg/ha which is 29% over all India check OLM 203 (2090 kg/ha).

Panivaragu

- Panivargucultures TNPm 234 and TNPm 236 with an average yield of 1332 kg/ha and 1377 kg/ha with more than 20 per cent increase over check Co(PV)5. Both the cultures will be evaluated under MLT for second year.
- Prosomillet culture TNPm 230 ranked third in AVT with average grain yield of 2629 kg/ha which is 18.1% increased over all India check TNAU 145 (2317 kg/ha).
- DUS guide lines were standardized for Little millet and Proso millet based on the quantitative and qualitative descriptors**.**

Varagu

- TNAU 86 is under second year of ART testing(which was released as national variety during 2013).
- Among the 27 entries evaluated TNAU entries namely TNAU 103 and TNPsc 122 occupied second and third rank with a grain yield of 3364kg/ha and 3240kg/ha respectively. These entries were promoted for evaluationunder AICRIP agronomy trials.

Kudiraivali

Coimbatore

- TNAU 160 registered an overall mean yield of 2716 kg/ha with an increased yield of 12.7% over the check VL 207 (2411kg/ha) in the AICRP trials.

Madurai

- The culture ACM12-110 ranked first under BAVT trial with a yield of 2856kg/ha and ACM 10-010 recorded fifth rank with an yield of 2712kg/ha when compared to the check VL 207 (2411kg/ha).

Athiyandal

- Forced opening of the florets using water spray and covering the panicle with the polybag increased the humidity and thereby opening more number of flowers with protruded anthers in ragi which aided in easy removal of anther lobes before bursting. However, keeping the panicles enclosed inside the closed palms in the morning hours made the florets open, protruding the anthers out in samai and panivaraguto ease the removal of anthers in emasculation.

CROP MANAGEMENT

COIMBATORE

Agronomy

- Among the different kodo millet varieties, TNAU 111 has recorded higher grain yield, straw yield, net return and B:C ratio. Among the different little millet varieties, DhLTMV has recorded higher grain yield, straw yield, net return and B:C ratio. Among the different barnyard millet varieties, DhBmv 36-8 has recorded higher grain yield, straw yield, net return and B:C ratio.

- Application of 150% recommended dose of fertilizer (immediately after the alleviation of stress during early season drought) recorded higher finger millet grain yield of 2715 kg/ha and fodder yield of 5355 kg/ha. The above said treatment recorded 20.67 per cent and 28.67 per cent increase in grain yield and fodder yield over the control. Long season drought with top dressing of urea after alleviation of stress and giving two life irrigation recorded higher net return of Rs.37721/ha with B:C ratio of 1.95.

- Among the various small millet crops tried in alkaline soils, finger millet recorded higher grain yield, fodder yield, net monetary return and B:C ratio. Next to this, kodo millet recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

- Among the various weed control treatments tried in kodo millet, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by one intercultivation at 45 DAS recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

- Among the various weed control treatments tried in little millet, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by one intercultivation at 45 DAS (T10) recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

- Among the various intercropping systems, little millet + bhendi (8:2 ratio) recorded higher little millet equivalent grain yield, fodder yield, net monetary return and B:C ratio.

- Providing wider row spacing of 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between finger millet (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch along with integrated weed control method (Herbicide + 1IC) recorded higher finger millet grain yield, fodder yield, net monetary return and B:C ratio.

- The pearl millet entries responded for the application of N upto 90 Kg/ha. The entries MH 1901, MH1904 and MH 1889 yielded more than other entries.

- Time of sowing of pearl millet did not show any difference in the performance all the entries. The entries MH 1901, MH 1887, MH 1888, MH 1889 and MH1852 have shown an increasing trend over other types tried.

- Among the integrated weed management practices for pearl millet, Atrazine 0.5 Kg/ha or 0.25 Kg/ha followed by hand weeding 35 DAS were found to perform on parity with two hand weeding on 15 and 35 DAS.

- Study on nutrient management through organic and inorganic sources for major and trace elements in pearl millet showed that application of FYM 5.0 t/ha increased the yield over no manure application. The trace elements combined with FYM showed an increase over the control but did not differ among themselves significantly. The initial soil analysis and post analysis of the treatment means did not show marked difference except P which has little increase.

- Integrated nutrient management study on pearl millet hybrids under optimum management showed that among the three hybrids 86M66 followed by 86M84 performed better than GHB 558. The growth, yield parameters and yield were good with these hybrids. Among the four nutrient management tried 75% RDF + PSB+ 5.0 t of FYM has resulted in more growth and yield .his was closely followed by 50% RDF+PSB+7.5 t of FYM. The economics worked out also indicated a similar trend on gross returns, net returns and B/C ratio.

- The pearl millet entries in general has shown response to the applied nitrogen. The increase was from 30 Kg/ha to 60 Kg/ha. Further application increased the yield but not significantly.

- Application of 80 Kg/ha of N resulted in higher pearl millet yield which was significantly higher over 60 Kg/ha of N. The response was observed upto 100 Kg/ha but was not significant. Phosphorus response was observed up to 45 Kg/ha but did show significance over 30 Kg/ha. The economic analysis followed a similar trend. Higher doses above recommendations did not show marked difference and efficiency.

- In a study on the response of pre-released grain sorghum genotypes to different fertilizer doses showed that the genotypes tested SPH 1736, SPH 1737 and SPV 2165 responded to increasing fertilizer doses. But the performance of test genotypes was poor compared to the checks.

- In a study to evaluate the contribution of each management input towards yield and prioritize the importance it was found that application of all inputs excluding any one particular major management input viz., fertilizer or weeding or plant protection resulted in lower returns than control treatment without applying any input.

- Application of recommended dose of NPK (150:50:40 kg/ha) along with $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @ 25 kg/ha was found to be advantageous in enhancing the growth, yield and quality of CN hybrid grass CO (CN) 4 besides fetching higher economic returns.

- Conventional tillage for both maize and sunflower and PE atrazine at 0.5 kg/ha at 3 DAS + HW on 45 DAS for maize and PE pendimethalin1.0 kg/ha at 3 DAS and HW on 45 DAS for sunflower for better weed control, higher yield and economic returns

Soil Science

- The results of the test verification trial with hybrid maize confirmed the validity of the fertilizer prescription equations developed for Palaviduthi soil series (red non-calcareous soils). Soil test and yield target based fertiliser prescriptions under Integrated Plant Nutrition System (STCR-IPNS for 10 t ha^{-1}) *i.e.* application of N, P_2O_5 and K_2O @ 213:62:29 kg ha^{-1} along with FYM @12.5 t ha^{-1} can be recommended for achieving higher yields (10.50 t ha^{-1}) and response ratio (17.82 kg kg^{-1}) with hybrid maize on Palaviduthi soil series (red non-calcareous soils) for an initial soil test value of 230:38.6:410 kg ha^{-1} of available N, P and K respectively.

- The per cent achievement of the targeted yield was more than 90 per cent with STCR and STCR-IPNS treatment @ 5 t ha^{-1} for rainfed maize (TNAU maize hybrid CO6) proving the validity of the equations developed for rainfed maize on Irugur series (red non calcareous) (TypicUstropept). Application of FYM @ 12.5 t ha^{-1} along with inorganic fertilizers (71-77, 17-28 &15-41 kg of N, P_2O_5 and K_2O ha^{-1}) for an initial soil test values in the range of 149-164, 15.6-21.0 and 123-285 kg ha^{-1} of available N, P and K respectively has recorded the highest mean response ratio of 19.2 kg grain per kg of nutrient applied for rainfed maize to get the mean grain yield of 5026 kg ha^{-1}.

- Application of 90:45:17.5 and 250:75:75 kg N, P_2O_5 and K_2O as 100 per cent under integrated nutrient management practice (INM) along with FYM @ 10 t ha^{-1} for finger millet and maize hybrid respectively (T_8) significantly increased the grain and straw yield of both crops. The yield increase in INM recorded was 15.5% for finger millet and 15.7% for maize hybrid over 100% NPK. Non-inclusion of K in 100% NP also recorded the comparable yield with 100% NPK. Continuous addition of N alone resulted in decline in yield up to 22.8% for finger millet and 28.1% for maize hybrid when compared to 100% NPK.

- Application of 250:75:75 kg N, P_2O_5 and K_2O ha^{-1} as 100% NPK along with FYM @ 12.5 t ha^{-1} recorded the highest maize grain mean yield of 8480 kg ha^{-1} and mean straw yield of 11,287 kg ha^{-1}. The INM practice recorded 12.41% increase in the grain yield over 100% NPK. Continuous fertilization with urea had recorded 68.72% yield decline when compared to 100% NPK.

- Application of Phosphorus (SSP, DAP, enriched FYM with SSP, Nutriseed Pack (SSP), and Nutriseed Pack (DAP)) along with PB increased the per cent phosphorus derived from fertilizer (%Pdff), P uptake from fertilizer and PUE. The highest PUE of 25.38 was recorded in the treatment where enriched FYM with SSP was applied along with PB. Highest A value (9.2 mg P 100 g $^{-1}$ soil) was recorded in DAP applied treatment.

- Significant genotypic variation was observed in maize in a P deficient soil with regard to grain yield and stover yield at various levels of P application. Grain yield under control (no P application) ranged from 3912-6920 kg ha^{-1}. CMH08 -337 recorded the highest grain yield of 6290 kg ha^{-1} followed by COH(M) 8 (4952 kg ha^{-1}). CMH08 was able to produce 88 per cent of grain yield (P_0) as under 100 per cent P application.

- Application of B @ 1.0 kg ha^{-1} significantly recorded the highest dry grain 6.94 t ha^{-1} and stover yield (6.62 t ha^{-1}). Among the frequency of B application, application B to every year maize crop alone (F3) registered the highest amount of Grain and Stover yield. The interaction effect between the B level and frequency of B application was significant and revealed that application of 1.0 kg of B to every year (F3) registered the highest grain (8.05 t ha^{-1}) and stover yield (7.92 t ha^{-1}) respectively. Among the B levels, application of B @ 1.5 kg ha^{-1} registered the highest B uptake of 83.0 g ha^{-1} in grain while in stover, application of B @ 1.0 kg ha^{-1} registered the highest B uptake (234.1 g ha^{-1}). The application of B @ 2.0 kg ha^{-1} registered the highest available B in soil (1.13 mg kg^{-1})in soil after the harvest of third maize crop.

Microbiology

- Study on biodiversity and biofertilizers impact assessment of long-term nutrient management on microbial activities of soil revealed that the overall biological properties of Alfisol were controlled by the long-term nutrient management adoptions and to some extent by the growth stages of maize and their interactions. Microbial biomass, counts of observed microbial communities and hydrolytic enzymes were highest in organically managed and integrated nutrient management enforced soils at active vegetative stage of maize crop. The inorganic nutrient amendments and no fertilizer application had same magnitude on the biological and biochemical properties of soil throughout the maize crop growth. In general, the amplitude of interaction effect was higher order in OM and INM at vegetative stage than the mean values of the treatments at flowering, harvest and other samples. The respiration study indicates that metabolic quotient of the soil was significantly increased in early stage of maize due to agronomical disturbances and subsequently declined and stabilized during vegetative and flowering stages of maize. MBC, SIR, Actinobacterial and diazotrophic counts and activities of dehydrogenase, acid phosphatase and aryl sulphatase are the most sensitive soil biological indicators responded to both nutrient managements as well as the maize crop growth stages.

- Project on development of micro enterprise for ArbuscularMycorrhizalbiofertilizer production at villages through empowering rural women was conducted and totally 97 tons of AM Biofertilizer was produced in three different blocks and generated an income of Rs. 14, 55,000/- with net profit of Rs. 7, 76,000/- within the period of two years. In Thondamuthur block 14.4 % increase in yield was recorded with the AM inoculated Vegetable cowpea, and 20.3 % was recorded in Mary gold. Similarly in Karamadai block 11.5 % yield increase was reported in Brinjal and 39.8 % in Hybrid Cotton. Inoculation of AM in Onion, Bhendi and Chilli recorded 11.0 %, 18.1 %, 14.3 % yield increase in Periyanaickenpalayam block. Besides increasing the yield of different crops, AM inoculation saves 25 % of 'P' requirement.

Seed Science and Technology

- In maize hybrid COH (M) 5, seeds bioprimed with 8 % *Pseudomonas fluorescens*for 12 h / 20 % *Azospirillum*/ 20 % phophobacteria for 12 hrs / 80 % *Trichodermaviride*for 6 h enhanced the seed quality through increased seed germination, seedling growth and vigour. In maize hybrid COH (M) 5, the best performance under extreme salt stress and low moisture conditions was observed with 8% *Pseudomonas fluorescens* for 12h.
- *Trichodermaviride* 40 per cent recorded maximum germination (90 %), speed of germination (8.20) and minimum disease incidence of *Fusariummoniliforme* (26.26 PDI) compared to control. This result is on par with the treatment of *Pseudomonosfluorescens* at 40 per cent concentration which recorded germination of 89 %, speed of germination 8.33 and disease incidence 26.96 PDI.

VAGARAI

- The AICRP project on maize in evaluating the performance of pre release maize genotypes of various maturity groups revealed that the late maturity group maize genotypes exhibited their better performance when sown under higher plant density level of 50 x 20 cm and at higher nutrient dosage of 250-80-100 Kg NPK/ha. The pre-release maize genotypes*viz*., DMR 771, DMR 772, DMR 774 and DMR 775 of late maturity group could produce higher productivity with higher profitability than other genotypes and checks. Early maturity maize genotypes also exhibited their better performance when sown under higher plant density level of 50 x 20 cm and at higher nutrient dosage of 200-60-80 Kg NPK/ha. The pre-release maize genotype *viz*., DMR 811 of early maturity group could produce higher productivity with higher profitability followed by DMR 812 than checks.
- In a study on quantifying crop-weather relationship of selected food crops under current and future climate scenarios it was found that sowing of maize hybrids on October 5th of the year could be recommended for getting higher productivity under irrigated condition. TNAU maize hybrid CO 6 showed its significant superiority over other two maize hybrids in its growth and yield performance. Application of either 100% or 125% RDF could be recommended for getting higher grain yields of maize hybrids.

- In Permanent manurial experiment, the INM practice recorded the higher growth and yield parameters consequently the higher grain, stalk yield and nutrient uptakes of maize when compared to inorganic and organic treatment indicating the superiority of INM practice over other treatments. Slight increase in EC and organic carbon were observed due to different treatments. Available P and K content was slightly reduced while the reverse trend was observed in the case of available N status.

- Biofortification study of Zinc in Maize grain using Mycorrhizal Symbiosis showed that application of Zn 5 kg/ha and VAM recorded higher root volume, root CEC and grain and stalk yield followed by application of Zn 2.5 ka/ha and VAM.

KOVILPATTI

- Effect of micro environments on phenology, thermal requirements and grain yield of prominent rabi maize hybrids under rainfed condition was studied and it was found that maize hybrid COH (M) 6 sown during pre - monsoon season (39^{th} standard week – sep 24^{th}) was found to give higher yield and monetary return under rainfedvertisol condition.

- Performance evaluation of tractor operated air assisted seed drill for sowing minor millets revealed that line sowing of minor millets with air assisted seed drill resulted in 30 to 40 % saving in seed rate. Cost of sowing with air assisted seed drill was Rs. 750/ha which was 11.76 and 6.25 less than that of gorru sowing (Rs. 850/ha) and broadcasting (Rs. 800/ha). The time taken for sowing one hectare was 1.24, 2.81 and 3.00 hours with air assisted seed drill, tractor drawn gorru and broadcasting respectively. This implies that seed drill sowing can be 3 times faster than broadcasting resulting in high area of coverage which is essential under dryland conditions to make use of the soil moisture effectively. Plant population/m^2 was highest in broadcasting followed by gorru sowing and seed drill sowing owing to the high seed rate in all millets excepting little millet where the variation among the treatments was not significant. The number of tillers/plant was not significantly influenced by the method of sowing excepting kodo millet. In kodo millet, lesser plant population / m^2 in using seed drill resulted in profusedtillering compared to less no. of tillers in gorru sowing and broadcasting. The effect of treatments on yield was on par in barnyard millet, foxtail millet and little millet. Hence air assisted seed drill can be recommended for line sowing of minor millets in view of its less cost of sowing and high area of coverage/day. In kodo millet, sowing with air assisted seed drill registered 4.6 and 4.0 per cent higher yield than gorru sowing and broadcasting.

- Effect of fertilizer and moisture conservation practices on rainfedsorghum in vertisols was studied and itwasfoundthat among the land configuration methods tried BBF recorded higher plant height (140.6cm) and higher weight of panicle (46.1g) and panicle length (22.3cm) than ridges and furrow and flat bed. Among the fertilizer level, 20 kg N as a Urea+20 Kg P through EFYM + 10 kg K as a basal and `top dressing of 20 kg N as a Urea + 10 kg K recorded higher plant height (117.7cm) and higher weight of panicle (55.6g) and panicle length (22.7cm) than other treatments. There was 23 percent deficit of North east monsoon rainfall. Among the main plot treatments flat bed method of land configuration making results in highest B:C ration of 1.50 and in the subplot the treatment received 20 kg N as a Urea+20 Kg P through EFYM+10 kg K as a basal and top dressing of 20 kg N as a Urea + 10kg K registered highest B:C ration of 1.94. There was 23 percent deficit of North east monsoon rainfall.

- Permanent manurial experiments on Bt cotton and Maize rotation under dry farming in TypicHaplusterts and TypicHaplustalfs revealed that among the treatments higher plant height (145.0cm), grain yield (3438kg ha^{-1}) and straw yield (7823 kg ha^{-1}) were recorded in treatment received T8 - Urea (N 60)+DAP (P 40) + MOP (K 20) +25 kg $ZnSO_4$/ha followed 30 kg N (Urea) + 30 kg N (Crop residue) + 20 kg P + 10 kg K/ha and B:C ration of 2.27. There was 23 percent deficit of North east monsoon rainfall. Application of crop residues along with fertilizer, the treatment received (T_6) 40 kg N (urea) + 40 kg N (crop residue) +20 kg P+ 20 K/ha registered higher grain yield (3278 kg ha^{-1}), straw yield (7819 kg ha^{-1}).

ARUPPUKOTTAI

- Studies on agri-horti pastoral- animal based integrated farming system for rainfedvertisol The yield obtained from different annual intercrops were converted into grain yield of cholam or maize based on cost of the produce. It was found that higher profit was obtained by raising APK1 grain cholam or CoFS-29 fodder cholam in between sapota plantation. Application of recommended dose of inorganic fertilizers recorded higher income. Available nitrogen and phosphorus were found more in the sapota based grain cholam intercropping system. Available potash was found more in sapotabasedbhendi intercropping system. Application of full dose of recommended fertilizer recorded higher availabilty of major nutrients. The Ec level was ranging between 0.30 and 0.32 in sapota based annual intercropping systems and from 0.30 to 0.33 in fertilizer levels. The pH level was ranging between 8.1 and 8.3 in sapota based intercropping system and nutrient levels.

- Studies on the effect of Zinc in conjoint with organic manures on Hybrid Maize showed that The rate of release of zinc was highest while applying $ZnSO_4$inconjoint with organic manures than applying zinc alone. Application of zinc EDTA is on par with application of $ZnSO_4$ with FYM in releasing the zinc. Application of zinc in conjoint with organic manures performed better as compared to the application of zinc alone. The highest grain yield of 5940 $kgha^{-1}$ was recorded with the application of recommended dose of N, P_2O_5, K_2O along with $ZnSO_4$@ 37.5 $kgha^{-1}$ incubated with 375 kg of vermicompost for 30 days. A positive balance of Zn was observed while applying Zn inconjoint with vermicompost and FYM incubated for 30 days. A highest positive balance ofj 0.24 mg kg^{-1} was registered with application of $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with either vermicompost (or) FYM for 30 days. The highest B:C ratio of 2.98 was registered in the treatment receiving RDF + Application of 37.5 kg $ZnSO_4$ incubated with 375 kg of FYM for 30 days.

- Effect of *Methylobacterium* application on growth and yield of Kudiraivali – Var.Co(Kv) 2 was studied and it was found that It was found that seed imbibitions in 1.0 per cent PPFMfor 15 minutes and seed imbibitions in 2.0 per cent PPFMfor 15 minutes recorded higher germination and Vigour index. It was observed that seed imbibitions in 1.0 per cent PPFMfor 15 minutes and seed imbibitions in 2.0 per cent PPFMfor 15 minutes recorded higher population of bacteria (112.32 x 10^6cfu/g), fungi (52.14 x 10^3colonies /g) and actinomycetes (26.4 x 10^4cfu/g) compared to other treatments. Higher number of productive tillers and panicle length was observed with the treatments of seed imbibitions in 2.0 per cent PPFMfor 15 minutes and seed imbibitions in 1.0 per cent PPFMfor 15 minutes which in turn have established positive effect on grain yield.

PAIYUR

- Effect of continuous addition of organic, inorganic and combination of nutrients on soil fertility and productivity under Samai-Horsegram cropping system revealed that Application of fertilizer or organic manure either alone or in combination proved their efficiency in increasing the yield of samai over control. Adoption of integrated nutrient management (FYM @ 12.5 t/ha + Recommended dose of inorganic fertilizer 44-22-0 kg ha^{-1} N, P_2O_5 and K_2O + bio-fertilizers) rated to be more efficient by recording 924 kg ha^{-1}

with yield increase of 96.2 percent over control. Application of inorganic fertilizer rated next best by recording 695 kg ha^{-1} followed by organic manure alone (576 kg ha^{-1}).

- Physiological basis of screening samai varieties for drought tolerance under rainfed conditions was studied and it was found that among ten entries tested for drought tolerance, the variety MS -1236 performed better under rainfed conditions and was followed by KRI -11-05.
- Physiological and biochemical response study of ragi cultivars under rainfed conditions showed that the entries of KRI009-01 had highest value in morphological, growth attributes, physiological and biochemical parameters and were significantly differed between the other entries. Therefore, the entries of KRI 009-01 performed superior under rainfed conditions.

VEPPANTHATTAI

- Studies on conservation tillage crop residues and supplemental irrigation through drip irrigation for dryland crops in black soil showed that minimum tillage (BBF) with crop residue application @ 5 tones/ha and supplemental drip irrigation given at three times during the crop growing period had significant effect on soil moisture content , plant height, yield attributes and yield.
- Evaluation of *in-situ* water harvesting technologies and crop residue addition on soil moisture retention, growth and yield for dry land crops (Maize) showed that germination percentage of maize crop was not influenced by land configuration and crop residue addition. Higher soil moisture was observed at 0-15 cm, 15-30cm and 30-45 cm soil depth at 30,60 and 90 DAS in Broad Bed and Furrow system. It also recorded taller plants, higher yield attributes and yield. In case of sub plot soil mulching with crop residue @ 5tons/ha recorded higher soil moisture which was at par with coir pith and biochar application @5tons/ha. Coir pith addition registered higher yield attributes, yield and net profit of maize crop.

CROP PROTECTION

MAIZE

Plant Pathology, Coimbatore

- A total of 455 entries belong to different maturity groups were screened against sorghum downy mildew (SDM) caused by *Peronosclerosporasorghi*. Out of 455 entries, 174 entries showed the resistant reaction and 184 entries showed moderate resistant and 97 entries showed susceptible reaction. The infector row (CM500) and spreader rows were artificially inoculated with spraying of conidial suspension of Peronosclerosporasorghi by 3.00 am in the morning (Two sprays were given) . The susceptible check CM500 recorded 25- 60 % downy mildew incidence. The resistant check TNAU CoH-6 showed 100 percent resistance.
- In Trial no .61 Pathology, Nematology and Soil Science late Maturity Trial, among 120 IVT Late maturing entries screened, 42 entries were found to be resistant with < 10% SDM (JH 13183, MAH-974, K-25 Gold, SAMH-378, GYH-0652, CMH12-667, GOLD 1166, Srikar 3033, DMRH 1413, DAS-MH-107, HKH 422, REH 2013-2, JH 13244, JH 12063, JH13252, NT 8441, BH 412095, JKMH 4242, HT 51412373, JH 13230, GIN 02, BH 412140, CMH 10-555, VNR 31862, KF-110, GK-3118, DMRH 1415, KH-1408, SYN417750, IN 8603, JH 13044, GH-110204, MAH-957, GPS-02, GPMH-1111, Proline-2404, CMH 12-671, CMH11-618, KMH-3981, GH-110145, NT8711, GPS-03, HKH423, VEH 14-1, ADV 1190384, JH13023, IN8903, PRMH-189, DMRH 1411, SAMH-225) and 69 entries are moderately resistant with 10-25 % SDM incidence (PM 14105L, NMH 1605, JH 13197, ADV 0990293, CSM1, super 777, NT 6325, JH 130456, AH 7005, NMH-1247, JH 13094, CMH12-663, ADV 0990296, GIN 01, IN 8570, siri-4555, Bio-069, JH 13037, VNR4325, BH 412096, BH412141, REH2013-6, JH13278, PM14104L, PMSW4, JH13270, IN8569, HT 51412616, JH13249, GK-3124, 115-08-01, JH 13248, CP.555, DMH-7721, HT51412607, DMH-182, Sonam-27, IN8902, PM 14101L, REH2013-5, BH412131, JH12150, GPMH-1101, DKC9125, KH-2192, DMRH1409, IAHM 2013-12, PM14102L, RMH 726, PMH 3-C, Bio-9681-C, Seedtech 2324-C, HM11-C)and 9 entries were susceptible with >25% SDM incidence.(JH13041, JH13282, JH12010, NMH 1008, JKMH 4023, DAS-MH-106, Super6768, PM14101L, GPS-03).
- In Trial 62 Pathology, Nematology and Soil Science Medium Maturity Trial, among 129 IVT medium maturity entries, 51 entries showed resistance (LMH414, JH13172, DMRH1413, KH545,EH-2372, DH1411, TMMH801, UDMH-115, PM 14106M, DMRH1416, QMH-1034, DMRH1412, MMH5-13, HT51412616, JH13114, DAS-MH-306, NMH-3612, MMH2-13, JH13226, CMH11-619, GK-3120, DH1415, KF-105, AH-1322, GPS05, PM14108M, KMH-4811, HT51412182, CP.201, LMH114, HAH343, IAHM2013-11, NMH-3662, UDMH-114, JH13215,VEH14-2, IN8401, IAHM2013-26, KDMH100-3, CMH11-584, JH13224, CMH11-615, HKH344, DH1405, CMH11-586, DAS-MH-307, HM10(C))and 11 entries were susceptible with >25% SDM incidence (IAHM2013-9, JH 13164, GPS 01, Proline 786, Bio 719, MMH 3-13, RMH 796, JH13121, DH1401, Bio-9637(C)) and 67 were moderately resistant (QMH-1025, BH 412063, BH 412084, EH-2381, PMH 2277, JH 13246, JH 13139, EH-2235, IAHM 2013-97, ZMH-99 9, KDMH 100-8, HT 51412373, DH1413, DMRH1417, DH1403, JH 13164, GPS 01, BL897, MMH 4-13, REH2013-1, ZuariNandiri, CMH11-593, REH2013-4, Srikar 4689, LMH 314, KH-517 Gold, AWLH2, TI8261, IASH 11C022, JH 13142, JH13119, SHIATS MS2, IAHM 2013-33, AWLH1, MMH6-13, CMH12-665, DMRH1301, HT51412081, BH412066, JH 31605, JH13122, JH31607, JKMH4848,

REH2013-3, DMRH1302, DH1405, LMH 214, BH412044, BH412064, PM 14107M, BH412062, PMH 4(C), HM9(C)).

- In Trial 63 Pathology, Nematology and Soil Science Early Maturity trial, Among 51 IVT early maturing variety, 30 entries are found to be resistant (CMH12-675, FH 3704, KMH12-9, HKH 345, HKH347, CMH12-697, CMH10-527, DH286, BH412071, JKMH4025, PM14109E, AH-1318, AH-1320, DAS-MH-502, AH5021, DMRE1403, FH3695, DH283, KDMH100-1, AH-1319, CMH10-552, KMH12-8, K-26, GYH-0461, EH-2244, PM 14110E, FH 3703, Shalimaar maize com 6, Shalimaar maize com 5, Prakash (C)) and 19 entries are moderately resistant (EH-2371, LMH 614, BH 412093, LMH514, HKH346, GYH-0656, KMH12-18, AH-1321, AH 9001, CMH 12-691, AH7002, DAS-MH-502, AH 5012, KDMH 100-1, OMH-11, AH7001, GWH-0330, GWH-0503, Shalimaar maize hybrid2) and 3 entries (KF-95, SAMH-221, Shalimaar maize com 7) were found to be highly susceptible with 55% SDM incidence.
- In Trial 64 Pathology, Nematology and Soil Science Extra Early Maturity trial, Among 13 IVT Extra early maturity entries, 9 entries are found to be resistant (EH-2236, EH-2234, DH277, APH 27, DH 287, FH 3706, DH 285, AH -1317, Vivek Hybreds-43 (C)) and 3 entries are found to be moderately resistant (AH-1316, DH 288, Vivek Hybreds-21 (C)) and no entry was found to be susceptible.
- In Trial no .75 Pathology Entomology Trial (Late maturity), Among 27 AVT late maturity entries, 6 entries were resistant to SDM (VNR 31834, X35D601, DKC 9133(IM8539), HTMH 5108, HTMH 5202) and 7 entries were moderately resistant(HTMH 5404, KMH-2811, RMH-972, SUPER GA-105, VNR31355, SRI 4527, JH 12247) and 13 entries were found to be susceptible(IM 8562, CP.999, DAS- MH-105, IM 8556, JANAHIT, PRO-392, LTEH-22, NMH-1265, Geo PrimiumDiamon, PMH 1-C, PMH 3-C, Bio-9681-C, Seedtech 2324).
- In Trial 76 Pathology Entomology - Medium Maturity group, among 31 AVT medium entries screened,18 entries were found to be resistant (CMH 10-547, DKC 9144 (IM8478), DKC 9149 (IM8581), S-6750, JKMH 4545, TH-38, CMH 11-582, Kubershakthi, HTMH 5402, CMH 11-617, EH-2205, EH-2240, KMH-5951, PRMH-2177, KNMH 4010131, DKC 9145 (IJ8533), HM8-C,HM9-C) and 4 entries were found to be moderately resistant (FCH 11231, KDMH 2705, Rasi-3033, PMH 4(C)) and 8 entries (AQH 4, AQH 9, DKC 8144 (IM 8479), AQH 8, BH 41150, EHL 3412, Bio 9637(C), HM4-C) were found to be susceptible for SDM.
- In Trial 77 Pathology Entomology Trial - Early maturity group , among 26 AVT early maturing entries 11 entries were found to be resistant (DMH-63, FH 3664, JH-31610, LG 31.81, MEH 1-12-13, Bio 9720, Prakash (C), CMH 11-579, CMH 11-626, FH 3626)and 9 entries were found to be moderately resistant (AH 1261, FH 3669, GWH 0712, B-52, EH-2214, JH-31613, FH 3605, CMH10-531,Prakash (C)) and 7 were susceptible to SDM(CMH 11-595, CMH 11-611, NMH-1258, HKH314, EH-2233, EH-2212, KMH-7021).
- In Trial 78 Pathology Entomology Trial - Extra Early maturity group , among 10 Extra early maturing entries 6 were found to be resistant(KH-7502, Vivek Hybreds-21 (C), VIVEK QPM9-C, BIO 9681-F, PMH3-F, HM10-F) , one was moderately resistant(AH-1212) and three entries were susceptible for SDM (APQH 9, Vivek Hybreds-43 (C), PMH-1-F)

- In specialty corn Pathology, Nematology and Soil Science trial, among 48 specialty corn entries, 43 entries were found to be susceptible with 20 to 100 % SDM incidence(BAU QMH-17, BQPMH 18, LQPMH 114,KDPC-2 LQPMH 214, LQPMH 314, OQPMH 11-6, VEHQ 14-1, DMRQPM1401, MMH QPM-6-12-13, HQPM1-C, HQPM4-C, HQPM5-C, Vivek QPM-9-C, Pop corn (SCH), Bajoura Popcorn-2, BPC 3, DMRHP 1402, VL Pop corn -2, HPC 1, VL Pop corn-C, ADVSW-1, ADVSW-2, ASKH 1, Bajoura Sweet Corn, BiscoMadhu, BSCH 6, BSCH 63, FSCH 18, FSCH 41, FSCH 55, KSCH-333, QMHSC-1182, SWC 001, Madhuri-C, WOSC-C, ASKBH-1, BVM-2, CMH 11-658, CMH 11-659, NP 5004, NP 5040, Vivek Hybreds-27, HM4-C). Five entries were moderately resistant (BQPMH 36, KDQH-49, VEHQ 11-1, BPCH 27, NP 5040). Not even a single entry was found to be free from SDM.
- In evaluation of inbred lines for identification of resistant sources against major diseases of maize (SDM) trial, Among 104 inbreds in set I ,34 inbreds were found to susceptible (K2, K8, 16, 17, 20, 23, 24, 25, 26, 27, 28, 33, 34, 36, 40, 42, 49, 52, 63, 67, 73, 78, 79, 80, 81, 82, 89, 92, 93, 100, 101, 102), 37 were found to be moderately resistant (K1, 3, 5, 6, 7, 9, 10, 12, 13, 29, 35, 37, 39, 41, 45, 54, 55, 57, 58, 59, 61, 66, 68, 69, 70, 74, 75, 76, 77, 84, 85, 86, 87, 88, 90, 91, 104) and 36 entries were found to be resistant (K5, 6, 11, 14, 15, 18, 30, 31, 35, 38, 43, 46, 47, 48, 50, 51, 53, 60, 62, 64, 65, 71, 72, 83, 84, 85, 88, 90, 91, 94, 95, 96, 97, 98, 99, 100).
- Among Set II inbres, five inbreds were found to be susceptible(142355, 142356, 142371, 142382, 142383), 16 were moderately resistant 142351, 142352, 142353, 142354, 142357, 142363, 142367, 142368, 142369, 142374, 142375, 142384, 142388, 142390, 142391392) and 24 were found to be resistant (142358, 142359, 142360, 142361, 142362, 142364, 142365, 142366, 142370, 142372, 142373, 142375, 142376, 142377, 142379, 142380, 142381, 142384, 142385, 142386, 142387, 142389, 142393, 142394)

CRS, Veppanthattai

- Seed treatment (ST) with TNAU-Pf1 @ 10 g/kg seed + foliar spray of propiconazole (0.1%) or ST with TNAU-Pf1 @ 10 g/kg seed + foliar spray of tebuconazole (0.1%) at 40 DAS recorded the lowest PDI of leaf blight caused by *H. maydis* and maximum grain yield of 58.67 and 57.80 q/ha with highest BC ratio of 4.06 and 3.98, respectively .

AC&RI, Madurai

For information

- Among the entries are VIM 013, VIM-017, VIM-025, VIM-029, VIM-041, VIM-048(A), VIM-053, VIM-064, VIM-070, VIM-081, VIM-086, VIM-097(A), VIM 097 (B), VIM-111, VIM-131, VIM 134, VIM-162, VIM-176, VIM-203, VIM 204, VIM 205, VIM-212, VIM-228, VIM-232, VIM-246, VIM 247, VIM-253, VIM-259, VIM-262, VIM-271, VIM-275, VIM-276, VIM 279, VIM-283, VIM-298, VIM-296(w), VIM 304, VIM-308, VIM-312, VIM-315, VIM-317, VIM 319, VIM-328, VIM-376, VIM-377, VIM-380, VIM-385, VIM-392, were highly resistant to *Turcicum* Leaf blight (No symptoms)
- Among the entries are VIM 081, VIM 176, VIM 203, VIM 204, VIM 246, VIM 335 were resistant to *Turcicum*Leaf blight (Grade 1)
- Among the highly resistant inbreds tested in field conditions the inbreds*viz.*,**VIM 328**, VIM 279, **VIM 097(A)**, VIM 123, **VIM 293**, VIM 176, VIM 196, VIM 292, VIM 246, VIM 377, **VIM 247**, **VIM 377 (A)**, VIM 013, **VIM 029**, **VIM 228**, VIM 048, **VIM 131**, VIM 070, **VIM 298**, VIM 392, **VIM 259,** and **VIM 304** were finally selected for further crossing programme

4. Rice Research Station, Ambasamudram

- Among the different biocontrol agents tested under pot culture for the management of post flowering stalk rot, seed treatment + soil application of Pf 13 + Pf 16 + B 6 and carbendazim recorded lowest disease incidence of 33.33% against inoculated control (100%). Seed treatment + soil application of Pf 13 + Pf 16 + B 6 recorded highest cob yield of 242 g followed by carbendazim (240 g) against inoculated control 178.52.

PEARL MILLET

Plant Pathology

1. AC&RI, Madurai

- The initial pearlmillet entries *viz*., MH 2024, MH 2045 and RHB 177 had multiple resistance against downy mildew, rust and ergot
- The advanced pearlmillet entries *viz*., MH 1887, MH 1962, MH 1964, MH 1976, MH 1977 and MH 1979 had multiple resistance against downy mildew and rust
- The pearlmillet hybrids *viz*., HHB 234, RHB 177, GHB 538, HHB 67 Improved, RHB 173, RHB 121, GHB 558, KBH 108, MP 7792, Nandi 61, GHB 732, Proagro 9444 and B 2301 had maintained their stability of downy mildew resistance
- Seed treatment with *B. pumulis*(INR7) @ 10g + Chitosan @ 10g / Kg of seeds was found to be significantly reducing the downy mildew incidence in pearlmillet

SORGHUM

Agricultural Entomology

RRS, Kovilpatti

- In the pest surveillance study in Tuticorin District, during 2014-15, the shoot fly damage was 8.18 to 42.10 per cent and the stem borer damage was 14.12 to 49.34 per cent. The midge damage was upto 56.23 per cent and ear head bug/panicle damage rating ranged from 2 to 9.
- In kharif, 2014 among the entries provided by the Directorate of sorghum Research, Hyderabad the screening results at TNAU, Coimbatore showed that the dead hearts caused by stem borer on 45th day after emergence ranged from 0.00 to 50.00 per cent. The stem borer damage on the stem and peduncle based on tunneling were recorded at harvest and the damage was ranged from 0.00 to 100.00 per cent respectively. The best entries for major pests were recorded and reported for further screening programme. During the crop period severe outbreak of midge and mite was recorded with the damage rating of grade-9.
- In rabi, 2014-2015 among the entries provided by the Directorate of Sorghum Research, Hyderabad the screening results at ARS, Kovilpatti showed that the dead hearts caused by shoot fly on 28th day after emergence revealed that the damage level was high this year and it was ranged from 0.00 to 81.48 % respectively. The dead hearts caused by stem borer on 45th day after emergence revealed that the damage level ranged from 0.00 to 56.00 % respectively. The best entries for major pests were recorded and reported for further screening programme. During the crop period severe outbreak of midge and earhead bug recorded with the damage rating of grade-9.

- The deadhearts due to shoot fly and stem borer revealed that significantly minimum deadhearts were recorded in neem oil 3% (14.57 and 10.91) and Neem seed kernel extract 5% treated plots (18.11 and 12.34) as compared to control (41.08 and 44.54).
- The lowest spikelet damage was recorded in neem oil 3%,Neem seed kernel extract 5% and *Calotropisgigantea*10% leaf extract (3-grade) treated plots.
- The highest cost benefit ratio (1:1.90) was obtained in Neem seed kernel extract 5% treated plots followed by *Calotropisgigantea*10% leaf extract (1:1.83) and neem oil 3% treated plots (1:1.57)
- Lowest deadhearts due to shootfly recorded in sorghum + sesamum (12.47) and sorghum + bhendi (11.73) intercropped field as compared to control (48.64). The lowest deadhearts due to stem borer recorded in sorghum + cowpea (3.99) and sorghum + bhendi (7.83) intercropped field as compared to control (38.22).
- The lowest incidence of midge spikelet damage rating was recorded in Sorghum + sesamum (1-grade) followed by Sorghum + bhendi (1-grade) intercropped field. The highest cost benefit ratio (1:1.95) was also obtained in sorghum + sesamumfollowed by sorghum + bhendi(1:1.91) intercropped plots.
- Among the various modules tested, the insecticide applied module (12.76) recorded the lowest deadhearts due to shootfly followed by need based integrated module (14.97) as compared to control (62.08). The lowest deadhearts due to stem borer recorded in insecticide applied module (7.22) and eco-friendly module (7.30) as compared to control (42.19).
- The highest cost benefit ratio (1:1.63) was obtained in eco-friendly module followed by neem based module (1:1.31).

FINGER AND MINOR MILLET

Plant Pathology, Coimbatore

For information

- In the initial varietal trial, five entries *viz*., PPR 1053, KMR 502, KOPN 930, TNEC 1277 and PRSW 43 entries were free from all the blast diseases. Similarly, in the advance varietal trial I and II, entries namely GPU-45 and VR 708 were found to be resistant to leaf, neck and finger blast. In AVT III, entries *viz*., KMR 316, GPU 84, PR 202, KMR 344 and GK-2 were free from all the blast diseases
- Among the treatments tested, **s**eed treatment with combination of P. *fluorescens*@ 10gand *T. virid*i @4g /kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf, neck and finger blast disease incidence of 2.33 G, 8.83 % & 9.0 % respectively.

RRS, Paiyur

The confirmatory field trial results revealed that **s**eed treatment with*P. fluorescens* @ 10g/kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase was effective in increasing the plant growth and yield (3806 kg/ha) besides reducing blast diseases incidence under field conditions as against farmers practice in ragi (PDI, 17.4 &5.4%, and yield of 3143kg/ha).

III. PROJECT WISE REPORT

CROP IMPROVEMENT

SORGHUM

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SOR/2011/001**
2.	**Project Title**	**:**	**Development of sweet sorghum hybrids and varieties for high cane yield and improved sugar related traits**
3.	**Name of the Department/Station**		**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Latha,** **Assistant Professor (PB&G)**
5.	**Project duration**	**:**	**September 2011 to August 2016**

6. Objectives

- To develop hybrids and varieties for higher cane yield and juice yield
- To improve sucrose content in parental and breeding lines

7. Brief outline of the work carried out from the project initiation period

During 2010-11 about 50 sweet sorghum lines available in the germplasm were evaluated for cane yield, sugar content and sugar yield. A total of sixteen F1 hybrids developed by crossing the lines viz.,SS303, SPSSV6,SS179,SSV84, GR317, SS253, SS262, SS1094, SS253, SS192, SS172,SS917, SS449 and SS215 were evaluated for yield and quality attributes. From the F5 population 40 plants with high brix and thick stem were selected. The F6 population viz.,APK1xM35-1-2-2-2-1, SPV 1234xRS673-1-1-1-1 and IS18417xCo25-4-3-1-3 with high biomass yield and Brix of 20 were selected for further evaluation. During 2011-12, 92 plants were selected from the F2 population of 16 crosses. Six F6 population of the cross TNS 623xSPV881 with Brix of 18-21 and thick cane were advanced for further evaluation in replicated yield trials. During 2012-13, 22 emasculation crosses were done and the F1s were evaluated during 2013-14. A total of 12 hybrids were developed utilizing the CMS lines MS2219A, ICSA29014, PBT30377Ax7042 and ABT1006A and the hybrids were evaluated. Sixteen F1s and 17 F6 population were evaluated for biomass yield and brix. In the Advanced Yield Trial six entries were evaluated and two entries viz., TNSS 212 and TNSS 214 were selected for Multi location evaluation.

8. Work carried out during the review period

During summer 2014, a total of 23 F1 hybrids were evaluated and sixteen hybrids were selected based on biomass yield, Brix and grain yield. The F2 populations were raised for further evaluation and selection during summer 2015. The F3 population of 17 crosses were studied during summer 2014, and the F4 population were raised for further evaluation and selection during summer 2015. About 37, F6 population of various crosses involving the parents TNS603,Co26, Co25, SPV881, SPV462, IS3436, IS 18551 and Indore 12 were raised for studying the biomass yield and sugar related traits.

Cross combinations in F4 with high Brix and Biomass

SS 303 X SS 253 SS 303 X SS 262 SS 303 X SS 1094 SS 303 X SS 192 SPSSV 6 X SS 172 SPSSV 6 X SS 253	SS 1607 X SS 253 SS 179 X SS 449 SS 179 X SS 172 SS 179 X SS 917 SSV 84 X SS 262 SSV 84 X SS 192	SSV 84 X SS 917 SSV 84 X SS 172 GR 317 X SS 262 GR 317 X SS 172 GR 317 X SS 215

Preliminary Yield Trial

In the preliminary yield trial eight entries including the check were studied for yield and brix. The entry TNSS215 was found to be the best with total biomass yield of 39.11 t/ha and brix of 16.4 followed by TNSS220 with biomass yield of 38.14 t/ha and brix of 15.8.

Entry	DFF	Plant Height	Grain Yield (Kg/ha)	Total Biomass (t/ha)	Brix
TNSS 215 (Co26/IS 4646-3-1-1-2)	65	210	766.7	39.11	16.4
TNSS 216 (Co26/IS 4646-3-3-1-1)	66	159	866.7	36.31	16.8
TNSS 217 (Co26/IS18417-1-1-3-3)	63	153	777.8	29.66	16.2
TNSS 218 (Co26/IS18417-1-1-3-2)	63	168	988.9	28.39	16.0
TNSS 219 (Co26/IS4646-5-1-2-1)	63	154	666.7	27.28	16.4
TNSS 220 (APK1/M35-1-2-2-3)	66	190	788.9	38.14	15.8
TNSS 220 (APK1/M35-2-2-2-1)	63	175	633.3	32.31	16.0
SSV 84	65	155	722.22	25.36	16.0

9. Salient findings

The entry TNSS 212 was evaluated in AICSIP trial and MLT. It was selected from TNS 603/SPV881. It matures in 117 days. It has Brix of 16.3, Fresh biomass yield of 34.2t/ha and grain yield of 3042 Kg/ha. It was evaluated in MLT during 2013 and 2014. It recorded an average biomass yield of 25.35t/ha which is 4.88% increase over the check CSV24SS. It has Brix of 18.6.

The entry TNSS 214 selected from TNS 603/SPV 881 was also identified as promising with Biomass yield of 39.8t/ha which is 10.71% increase over CSV24SS and Brix of 20.1 which is 18.23% increase over CSV24SS.

10. Remarks of the Technical Director based on the pre-review:

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SOR/2013/002**
2.	**Project Title**	**:**	**Maintenance, evaluation and utilization of germplasm in sorghum**
3.	**Name of the Department/Station**		**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Latha** **Assistant Professor (PB&G)**
5.	**Project period**	**:**	**April 2013 to March 2018**

6. Objectives :

- Maintenance of available germplasm accessions, Periodical inclusions from NARS, International collections and land races
- Characterization, documentation and cataloguing
- Utilization and registration of lines in NBPGR

7. Brief outline of the work carried out from the project initiation period

A total of 4660 accessions were characterized and deposited in Ramaiah gene bank of Department of Plant Genetic Resources, CPBG, TNAU. All the morphological traits and yield attributes are being documented.

8. Work carried out during the review period:

A total of 250 germplasm accessions were characterized for all the morphological and yield attributes. Some of the accessions identified with desirable yield attributes are listed below.

Characters	**Accessions**
Days to 50% flowering Less than 65days	IL 416, AS 5160, AS 6697, SOR 577, SOR 1048, SO3 164, SPV 448, SPV 472, SOR 478, M 91747
Plant height above 200cm	SO3 203, SO3 281, GR 422, KO5 232, IS 4544, MR 5/4, AS 4660, GR 16, KO5 SS 202, VS 1565
Leaf length above 70cm	SPV 933, MS 8262, IS 1484, GR 477, IS 2238, AS 5162, MS 7611, IS 9889, AS 591, ICSV 233
Earhead length above 25cm	SO3 203, KO5 232, IL 416, M 91747, SOR 1048, SO3 127, GR 306, GR 285, AS 5218, SAR 38
Grain yield above 25gm	SSV 84, KO5 232, GR 422, GR 285, KO5 SS 650, GR 306, AS 7970, MS 8248, IS 9889, IS 1039

Some traditional sorghum varieties widely cultivated in different regions were collected and raised for characterization. A total of 50 R lines, 30 CMS lines and their respective maintainer lines were raised for characterization.

9. Salient findings

A total of 4660 accessions were characterized and deposited in Ramaiah gene bank of Department of Plant Genetic Resources, CPBG, TNAU.

10. Remarks of the Technical Director based on the pre-review: Nil

1. Project Number	**:**	**CPBG/CBE/PBG/SOR/2013/004**
2. Project Title		**Development of dual purpose varieties suitable for rainfed and irrigated eco system of Tamil Nadu with improved tolerance to shoot fly and stem borer**
3. Name of the Department/Station	**:**	**Department of Millets**
4. Name and designation of the Project Leader(s)	**:**	**Dr. B.Selvi** **Professor (PB&G)**
5. Period	**:**	**June 2013 to May 2018**

6. Objectives

- To develop early maturing dual purpose sorghum varieties with high grain and stover yield potential with improved resistance to shoot fly and stem borer .
- Evaluation of segregating materials generated from the previous project and identification promising families for further evaluation in yield trial

7. Brief outline of work carried out form the project initiation period

In UVT I(S) eight cultures were evaluated. The grain yield differences were insignificant. However, among the eight cultures tested only TNS 644 excelled the check variety CO 30 by recording grain yield of 2854 kg/ha with increased yield of 6.37 percent. For fodder yield potential also it was found to less yielding than the check variety.

In UVT II, Five cultures were tested along with checks viz., CO 30, APK1 and K8. Three entries viz., TNS 647, TNS 648 and TNS 649 were found to be superior with grain yield potential of 3457, 3604 and 3669 kg/ha with increased yield of 11, 14 and 16 % over the CO 30. The fodder yield potential of these cultures were 114750, 14014 and 14915 kg/ha. 12.2 and 13.2 percent respectively. The maturity duration recorded for these entries were 98-100 days. They possesed medium plant height of 190-200 cm.

Segregating materials of F2, F4 and F5 were evaluated. New crosses invoving elite lines from AICSIP trials were utilized for crossing programme.

Three cultures viz., TNS638, TNS647 and TNS 648 has been promoted to MLT and the culture TNS 623 has been promoted to second year ART evaluation

8. Work carried out during the review period

a. UVT-I(S)-2014

Sl. No.	Culture No	Parentage	Days to 50% flowering	Days to maturity	Plant height (cm)	Ear head length (cm)	Grain yield (kg/ha)	% inc. ove Co 30	Fodder yield (kg/ha)	% inc. over CO 30
1	TNS 658	CO 25 x Indore 12-3-4-2-2-1	62	93	138	20.6	4472	33.74	7741	-
2	TNS659	TNS 604 x EP 88-4-2-3-3-2	62	94	190	20.2	4129	23.47	10861	-
3	TNS660	TNS 603 x EP 60-4-3-1-1-1	61	91	189	19.4	3892	16.39	15037	27.4
4	TNS661	TNS 603 x IS 18551-3-1-2-1-1	61	92	155	19.5	3231	-3.37	16654	41.0
5	TNS 662	TNS 603 x SPV 462-3-1-2-1-1	61	94	230	20.2	3996	19.51	16367	38.6
6	TNS663	COS 28 x Indore 12-1-1-2-1-1	61	92	204	20.2	3344	0.00	11807	
7	Co 30		60	93	170	19.8	3066		12935	
8	APK 1		62	92	161	19.6	2657		14283	

Among six entries tested TNS 660 and TNS 662 recorded highest grain as well as fodder yield than the check Co 30. The grain and fodder yield potential of TNS 660 is 3892 kg and 15037 kg/ha with increased yield potential of 19.4 and 27.4 percent respectively with favorable plant height of 189 cm. The culture TNS 662 recorded 3996 and 16367 kg of grain and fodder yield with increase of 20.2 and 38.6 percent over the check CO 30. The same entries were raised in summer 2015 for evaluation.

b. RRYT-(K-2014)

Sl. No	Parentage	Days to 50 % flowering	Days to maturity	Plant Height	Grain yield (kg/ha)	Fodder yield (kg/ha)	Stem borer (Dead heart %)
1	Co26XIS4646 5-1-2-1	64	95	164	1419.75	11027	11.0
2	C026XIS4646 3-3-1-1	65	97	172	1438.27	15909	11.1
3	Co26XIS18417 1-1-3-1	63	96	156	1234.57	11395	8.9
4	Co26XIS18417 1-1-3-2	63	95	161	1425.93	11691	9.5
5	Co26XIS4646 3-1-1-3	66	96	168	1660.49	12284	11.5
6	Co26XIS 18417 1-1-3-3	66	93	155	1401.23	10106	9.1
7	Co26XIS4646 3-1-1-2	64	94	200	1450.62	17437	14.3
8	Co26XIS18417 1-1-3-3	64	98	166	1283.95	11689	10.7
9	Co26XIS18417 1-1-3-5	66	96	141	1314.81	9286	12.1
10	APK1XM35-1 2-2-2-1	63	95	176	1234.57	14995	7.7
11	APK1XM35-1 1-2-2-3	65	94	193	1456.79	16573	11.7
12	IS18417XCo25 4-3-1-3	66	93	119	1753.09	9635	9.2
13	IS18417XCo25 4-3-1-4	64	95	152	1487.65	10980	12.1
14	K 05 50	66	96	233	1271.6	10975	7.4
15	Co30	64	95	176	1574.07	10756	14.0
16	Cos28	65	98	172	1537.04	9472	12.8

A total of 14 entries were tested along with check variety Co 30 and Cos 28. The cross IS18417XCo25 4-3-1-3 recorded highest grain yield of 1753 kg/ha followed by Co26XIS4646 3-1-1-3 (1660 kg/ha.) Many entries surpassed the check in fodder yield potential. Continuous rain at the time of flowering affected crop growth and yield. All the entries resistant to stem borer.

c. UVT(S-2015)

The above entries were raised in UVT for further evaluation and selection.

d. MLT-K-2014

S. No.	Entry	Parentage	Days to maturity	Plant height (cm)	Grain Yield (kg/ha)	% inc over C030	Fodder yield (kg/ha)	% inc. over C030
1	TNS 638	KR 199 x PVK 809	94	192	2413	11.24	12444	6.76
2	TNS 647	APK 1 x M 35 -1-1-4-1-3	95	216	2407	10.97	12509	7.31
3	TNS 648	APK 1 x M 35 -1-2-2-2-2	95	207	2550	17.16	11707	0.43
4	TKSV1029		97	218	1787		11188	
5	ASV09007		98	241	2097		12978	11.34
6	Co 30		95	202	2308		11657	
7	K8		101	182	2154		11849	
8	CSV 17		79	116	2233		8664	
9	APK 1		93	170	2141		10812	

Among six entries tested in MLT at Coimbatore, TNS cultures viz., TNS 638 and TNS 647 recorded highest grain yield of 2413 and 2407 kg/ha in the kharif season with yield increase of 11.24 and 10.97 percent over the check vaiety Co 30. Besides these cultures also recorded higher fodder yield of 12 .4 and 12.5t/ha respectively by recoding 6.76 and 7.31 percent yield increase over the check variety Co 30. The plant height recorded for these cultures were 192 and 216 cm respectively. Both the cultures comes under short duration group (94-95 days).

e. MLT (S-2015)

The above entries were raised in summer for evaluation

f. NRRYT

Promising selection of the crosses Co 26 x EP58, Co 26 x EP 60, CO 28 x IS 2501, Co 28 x IS 18527 and Co 26 x IS 625 were raised for evaluation and selection.

g. Segregating materials evaluated

The following segregating materials raised for evaluation and selection

Generation	Trait	Crosses	Generation	Trait	Crosses
F4	**Yield**	TNS 627 x TNS640	**F3 & F4**	**Stay green**	CO 30 x B35
		TNS 629 x TNS624			CO 26x B35
		TNS 629 x TNS642		**Shoot fly**	CO 30 x IS18551
		TNS 629 x TNS636			K8 x IS18551
		TNS 629 x Co 26			CO 26 x IS 18551
		TNS 629 x TNS647	**F1 & F2**	**Shoot fly**	SPV 2164 X K 8
		TNS 630x TNS629			SPV 2164 X TNS 638
		TNS 630 x TNS642		**Early flow.**	CSV17 X TNS 30\
		TNS 630 x TNS636			CK 60 B X CSV – 17
		TNS 630 x Co 26			PBT 30377B X TNS 641
		TNS 630 x TNS647		**Head bug**	PBT30305Bx SPV2178
		TNS 630 x TNS626			ICS 29003 B xSPV2177
		TNS 630x TNS634		**Mite**	ABTA21002B x SPV2175
		TNS 631 x TNS 633			
		TNS 631 x TNS 636			
		TNS 631 x TNS 637			
		TNS 633 x TNS 636			
		TNS 633 x TNS 638			
		TNS 636 x TNS 630			
		TNS 636 x TNS 634			
		TNS 636 x TNS 637			

h. Seed production

Co 30 breeder seed plot is raised to produce indented quantity of 100 kg of breeder seed. Now the crop is in seedling stage.

i. Crossing Block

CO 26, C0 28, C0 30, APK 1 and K8 along with promising selections from AICSIP AVT trial were raised for effecting crosses.

9. Salient findings

In UVT,TNS 660 and TNS 662 recorded highest grain as well as fodder yield than the check Co 30. The grain and fodder yield potential of TNS 660 is 3892 kg and 15037 kg/ha with increased yield potential of 19.4 and 27.4 percent respectively with favorable plant height of 189 cm. The culture TNS 662 recorded 3996 and 16367 kg of grain and fodder yield with increase of 20.2 and 38.6 percent over the check CO 30.

In RRYT, the cross IS18417XCo25 4-3-1-3 recorded highest grain yield of 1753 kg/ha followed by Co26XIS4646 3-1-1-3 (1660 kg/ha.) Many entries surpassed the chck in fodder yield potential. Continues rain at the time of flowering affected crop growth and yield. The entries will be further in tested in UVT trial during summer 2014.

In MLT TNS cultures viz., TNS 638, TNS 647 and TNS648 recorded higher grain yield than the all the check entries. Higher fodder yield than the check was noted in TNS 638, TNS647 and ASV 09007.

10. Remarks of the Technical Director based on the pre-review -:

The culture TNS 623 has been recommended to third year ART and TNS648 and TNS660 has been recommended for MLT

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SOR/2013/003**
2.	**Project Title**	**:**	**Development of high yielding hybrids suitable for irrigated and rainfed ecosystem of Tamil Nadu with improved tolerance to shoot fly and stem borer**
3.	**Name of the Department/ Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist with Designation**	**:**	**Dr. B. Selvi,** **Professor (PBG)**
5.	**Project Period**	**:**	**June 2013 to May 2018**

6. Objectives

To develop early maturing dual purpose sorghum hybrids with high grain and optimum stover yield potential with improved resistance to shoot fly and stem borer.

7. Brief outline of the work carried out from the project initiation period

Two promising hybrids viz., ICS12A x ICSR 89020 and MS 70A x CO30 with grain yield of 2839 and 3332 kg ha has been identified and fifteen new crosses were synthesized

8. Work carried out during the project period

a. Hybrid evaluation

The following hybrids were evaluated for seed set on selfing.

ABT A1 1006 A x CO 26	PBT 30314 A x K 8	PBT 30377 A x IVT 4001
ABT A1 1006 A x SPV 2083	PBT 30377 A x CO 25	PBT 30377 A x IVT 4015
ABT A1 1006 A x IVT 4001	PBT 30377 A x TNS 30	ICS 88010 A x TNS 637
ICS 29004 A x TNS 645	PBT 30377 A x TKSV 0809	ICS 88010 A x TNS 640
ICS 29014 A x TNS 644	PBT 30377 A x TKSV 0902	ICS 88010 A x TNS 641

The seed set percent on selfing was very poor and none of the crosses were identified as promising one.

b. Multilplication of promising hybrids

ICS12A x ICSR 89020 and MS 70A x CO30 were raised for multiplication during Kharif. Sufficient seed could not be obtained due to rain and hence the parental seed were raised in summer 2015 for further multiplication.

c. A& B lines evaluation:

150 AB line pairs were raised for evaluation and maintenance. Among these the following lines were found to be true type and selected for further maintenance by paired crossing.

Sl.NO	Entries		Entries
1.	2219 AB	21.	ICS 501AB
2.	ICS 20AB	22.	ICS 501AB
3.	ICS70AB	23.	ICS 557AB
4.	ICS73AB	24.	ICS 670AB
5.	ICS 85 AB	25.	ICS 739AB
6.	ICS 95AB	26.	ICS 275AB
7.	TNAUMS 1AB	27.	ICS 371AB
8.	AKMS22AB	28.	ICS 400AB
9.	BJ 3AB	29.	ICS 422AB
10.	3660AB	30.	ICS 547AB
11.	5800AB	31.	ICS 691AB

12.	3040AB	32.	ICS 94AB
13.	SPA2 94002 AB	33.	ICS12 AB
14.	SPA2 94007 AB	34.	324 AB
15.	Spdm 9400221 b	35.	MS 70 AB
16.	TNS42 A2 AB		
17.	ICS 12 AB		
18.	ICS 51 AB		
19.	ICS 383 AB		
20.	ICS 384 AB		

9. Salient findings

Two promising hybrids viz., ICS12A x ICSR 89020 and MS 70A x CO30 with grain yield of 2839 and 3332 kg ha has been identified and raised for seed multiplication in summer 2015

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/KPT//PBG/SOR/001**
2.	**Project Title**	**:**	**Evaluation of high yielding sorghum varieties with resistance/ tolerance to earhead midge for late/ normal sowing conditions**
3.	**Name of the Department / Station**	**:**	**Agricultural Research Station, Kovilpatti**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. N. Malini** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**March 2015 to Feb 2018**

6. Objectives

1. To identify stable sources of resistance for midge resistance.
2. To utilize the identified lines/ families in hybridization programme and selection in $F_2/F_3/F_4$ segregating generations.
3. Screening the segregating progenies in the controlled condition / bombarded conditions and selections of resistant progenies.
4. Multilocation testing of developed lines for midge tolerance and yield under late and normal sowings.

7. Brief outline of the work carried out from the project initiation period

The high yielding varieties identified at ARS, Kovilpatti Viz., K 8, TKSV 0809, TKSV 0816, TKSV 0820, CSV 20, CSV 23, TNS 603 were crossed with midge resistant lines *viz* IS 1255, IS 2660, IS 2663, IS 7034, IS 9807, DJ 6514 and Swarna during rabi 2014.

8. Work carried out during the review period

F1 seeds were collected for further evaluation during 2015-16.

9. Salient findings – Nil

10. Remarks of the Technical Director based on the pre-review – Nil

1.	**Project Number**	**:**	**CPBG/APK/PBG/SOR/2009/001**
2.	**Project Title**	**:**	**Evolution of drought tolerant sorghum genotypes suited to rainfed tracts of southern districts of Tamil Nadu**
3.	**Name of the Department / Station**	**:**	**Regional Research station, Aruppukottai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. G. Anand** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**September 2009 to August 2014**

6. Objectives

To evolve drought tolerant sorghum genotypes suitable for the rainfed vertisol tracts of Tamil Nadu.

7. Brief outline of the work carried out from the project initiation period

Two cultures (ASV 09007 and ASV11029) have been proposed for MLT

8. Work carried out during the review period

The trails PYT I & PYT II and segregating materials F4 (CBE), F5 (KPT), F6 (KPT) – I set and F6 (KPT) – II set were raised during Rabi 2014 for evaluation of their performance.

SORGHUM – PRELIMINARY YIELD TRIAL I

Twelve entries were evaluated in Randomized block design replicate twice. Data on days to 50% flowering, plant height, ear head length and grain yield were recorded. Days to 50% flowering ranged from 47.5 to 62.0 days. The genotype ASV 11-029 recorded the highest grain yield of 3650 kg/ha. Their yield increase being 53 and 44 percentage over the check variety CO30 (2400 kg/ha) and APK -1 (2365 kg/ha).

SORGHUM – PRELIMINARY YIELD TRIAL II

Nine entries were evaluated in Randomized block design replicate twice. Data on days to 50% flowering, plant height, ear head length and grain yield were recorded in table. Days to 50% flowering ranged from 57.0 to 73.0 days. The genotype ASV 13-003 recorded the highest grain yield of 2457 kg/ha. The culture recorded yield increase of 24% over the local check APK-1.

9. Salient Findings

Culture Proposed for MLT 2015-16

Identified a high yielding sorghum culture, ASV 11-029 for MLT based on its performance over years. This culture recorded an average grain yield of 2519 kg/ha, which is 53% increase over APK-1 (1642 kg/ha) and 44% increase over COS30 (1739 kg/ha). This is promoted to MLT testing during 2015-16.

10. Remarks of the Technical Director based on the pre-review

- Closure proposal may be submitted
- The proposed Sorghum MLT culture ASV 09007 (tested in MLT 2013) has to be checked with the latest released sorghum variety K12.
- The cultures ASV 09007 and ASV 11029 may be given to AICRIP.
- Dry fodder yield has to be assessed and digestibility value has to be assessed along with the latest check K12.
- Performance of the cultures namely ASV 09007 and ASV 11029 may be evaluated in MLT Trials/ OFT during the ensuing season at ARS, Kovilpatti
- Periodical field visits at ARS, Kovilpatti may be performed for assessing the performance of the sorghum pre release cultures viz. ASV 09007 and ASV 11029.
- May be continued as new project

PEARL MILLET

1.	**Project Number**	**:**	**CPBG/CBE/PBG/PEM/2010/001**
2.	**Project Title**	**:**	**Maintenance of genetic purity and production of nucleus seeds of parental lines of hybrids and composites developed in pearl millet (*Pennisetum glaucum* L.)**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. Sumathi** **Professor (PB&G)**
5.	**Project Period**	**:**	**From: June 2010 - To: April 2015**

6. Objectives

- To identify the variability present in the available F_3 segregating population (PT 6029 x PT 6129) through phenotyping of morphological characters and for the Beta carotene content
- Development of agronomically desirable and elite pearl millet inbred with high beta carotene to produce beta carotene rich pearl millet variety/hybrid

7. Brief outline of the work carried out from the project initiation period

The nucleus and breeder seed production of pearl millet varieties ICMV 221 and Co(Cu) 9 and nucleus seeds of parents of the hybrid, TNAU cumbu hybrid Co 9 are being taken up periodically as per the indent placed by the Department of Agriculture and private seed companies.

A total quantity of 150 kgs of CO (Cu) 9 and 20 kgs of ICMV 221 breeder seeds were produced during the year 2013-14. Out of which 109 kgs of CO(Cu) 9 were despatched to different seed producing centres as per the despatch instructions received from the Director, CPBG, TNAU, Coimbatore -3.

8. Work carried out during the review period

The breeder seeds of Co(cu) 9 produced during 2013=14 was supplied during this year (2014 -15). A total of 109 kgs of Co(cu) 9 was supplied and the indented quantity of ICMV 221 was not lifted during this year.

Breeder seed produced during 2013 – 2014

Name of the variety / population	Production target (Kg)	Quantity produced (kg)	Quantity supplied (kg)
CO (Cu) 9	10	150	109
ICMV 221	13	20	Nil

The parental seeds of three kilograms of female lines and two kilograms of male lines of the hybrid, TNAU cumbu hybrid Co 9 were supplied to ORS, Tindivanam for taking up hybrid seed production.

The male and female lines of TNAU cumbu hybrid Co 9, *i.e.,* ICMA 93111 A and PT 6029-30 were sown in 4: 2 ratio in isolation at CBS farm. The crop was harvested and 200 kgs of hybrid seeds were produced and is being supplied.

Breeder seed production programme for the year 2014–15 (to be supplied during 2015-16)

Name of the variety/ population	Production target (Kg)	Remarks
CO (Cu) 9	56	The breeder seed crop was raised during January 2015. The crop is at flowering stage

Nucleus seed production

A total of 300 numbers of single plants of true to type of CO (Cu) 9 were selected from the breeder seed production plots. The observations were recorded and the data were analysed. Based on the analysis 150 plants from CO (Cu) 9 were selected. The selected individual plants were raised during *rabi* 2013-14 in progeny rows. The deviated progeny rows were rejected. The remnant seeds of the remaining progenies were bulked and this seeds were utilized to take up the breeder seed crop during rabi/summer 2015.

To produce the nucleus seeds of the female parent of the hybrid, TNAU cumbu hybrid Co 9, ICMA 93111 A and ICMB 93111B was raised in isolation in 4:2 ratio at CBS farm. Paired cross between A and B lines were carried out and the crop was harvested and processed. A total of five kgs of each 'A' and 'B' lines were produced and stored for further seed production programme.

The male and female lines of TNAU cumbu hybrid Co 9, *i.e.*, ICMA 93111 A and PT 6029-30 were sown in 4: 2 ratio in isolation and 200 kgs of hybrid seeds were produced and is being supplied.

9. Salient findings

A total quantity of 150 kgs of CO (Cu) 9 was produced during the year 2013-14. Out of which 109 kgs of CO(Cu) 9 were despatched to different seed producing centres as per the despatch instructions received from the Director, CPBG, TNAU, Coimbatore - 3. To achieve the breeder seed target of 56kgs of CO (Cu) 9, the crop was raised during *rabi/*summe*r* 2015. To produce the nucleus seeds of the female parent of the hybrid, TNAU cumbu hybrid Co 9, ICMA 93111 A and ICMB 93111B was raised in isolation and a total of five kgs of each 'A' and 'B' lines were produced and stored for further seed production programme.

10. Remarks of the Technical Director based on the pre-review

Seed production programme may be strengthened and the project may be continued.

1.	**Project Number**	**:**	**CPBG/CBE/PBG (New)**
2.	**Project Title**	**:**	**Evolution of high yielding single cross pearl millet hybrids with resistance to downy mildew and sent for approval.**
3.	**Name of the Department/Station**	**:**	**Department of millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. Sumathi, Professor**
5.	**Project Period**	**:**	**May 2010 to April 2015**

6. Objectives

A new Project is proposed with the project title of The materials developed in this project will be carried over to the new project.

- Synthesizing maximum number (400-500) of hybrid combinations with promising selected male sterile lines
- Evaluation of synthesized hybrids for its combining ability and fertility restoration
- Selection of promising hybrids and testing the potentiality of the selected hybrids for yield and downy mildew resistance (both under field and sick plot) in the advanced yield trials
- Identification of promising high yielding and downy mildew resistance hybrid suited for both rainfed and irrigated condition for release.

7. Brief outline of the work carried out from the project initiation period

The materials developed from the project CPBG/CBE/PBG/10/19 was carried over to this new project**.**

A high yielding and early maturing pearl millet hybrid, TNBH 0642 was developed from a cross between ICMA93111A (MS line from ICRISAT) and PT 6029-30 (Pollinator developed from germplasm lines). It has been tested extensively in Tamil Nadu and in other states under MLT, ART, OFT and All India Co ordinated programme. It performed well both under rainfed and irrigated situations in Tamil Nadu. This hybrid is medium in stature (160 -180 cm) and early in duration (Matures in 75-80 days). It produces 4-6 productive tillers with bold grain. It is highly resistant to downy mildew under both normal and sick plot conditions. This new hybrid recorded a mean grain yield of 3728 kg / ha under irrigated conditions, which are about 30 and 24 percent increase over the checks X7 and NH 07 respectively. The mean grain yield under rainfed condition is 2707 kg /ha which is 18 and 19 per cent increase over X7 and NH07 respectively. The Fe content is high (8 mg / 100 g). It has acceptable cooking quality and suited for consumption. This hybrid was released as TNAU cumbu hybrid Co 9 during 2011 for commercial cultivation in Tamil Nadu State.

New hybrids were synthesized; promising hybrids were identified and tested in different advanced trials. At present, two promising hybrids, TNBH 08804 and TNBH 08813 and two other promising hybrids, TNBH 10885 and TNBH 10878 are being tested under Adaptive research trial and multi location trials respectively.

8. Work carried out during the review period

Promising hybrids tested under adaptive Research Trial

Two promising hybrids, TNBH 08804 and TNBH 08813, are being tested for second year under Adaptive research trials during 2014-15. These hybrids recorded an average yield of 4076 kg/ha and 2867 kg/ha respectively under multi location trials. These hybrids are compact and bold grain and highly resistant to downy mildew. A total of 58 locations during *kharif* and 40 locations during *rabi* were conducted under ART and KVKs. The results are being received for compilation. The seeds were despatched to conduct ART at 52 locations during summer 2014.

Promising hybrids tested under Multilocation Trials

Two hybrids *viz.,* TNBH 10885 and TNBH 10878 are being tested for second year under multi location trials during the year 2014-15. These hybrids were tested at six locations during *kharif* 2014 season and four locations during *rabi* 2014-15 season. The result obtained during this year was compiled. Among the entries tested, the hybrid TNBH10885 recorded the average yield of 2562 kg/ha and it recorded around 13 per cent increased yield over the check TNAU Cumbu hybrid Co 9 and 17 per cent increased yield over private hybrid 86M52. This hybrid is having bold seed with compact earhead and resistant to downy mildew and rust.

Evaluation of new hybrids

Two set of hybrids were evaluated in station trials during *kharif* 2014 season. Set I includes 54 hybrids and Set II includes 148 hybrids. These hybrids were raised in replication along with the check TNAU cumbu hybrid Co 9. Selfing was carried out in all the hybrids to record the seed set percent. The crop was harvested and threshed. Based on the visual observation, vigour, seed set per cent, compactness, seed size and grain yield twenty five promising hybrids were identified. Evaluation of all these selected hybrids will be done during next season.

Synthesize of new hybrids

Crossing block was raised during *kharif* 2014 with 10 A lines (including A_1 and A_4 cytoplasm) and 15 newly developed restorer lines to synthesize new hybrids. One hundred and fourteen hybrids were synthesized and will be evaluated in the next season.

A lines involved **10 A lines were utilized** ICMA 91444, ICMA 91666, ICMA 92777, ICMA 93111, ICMA 94111, ICMA 94222, ICMA 94333, ICMA 98222, ICMA 99666 and ICMA 02777
Newly developed R lines TNBI 72, TNBI 77, TNBI 84, TNBI 90, TNB I98, TNBI 117, TNBI 124, TNBI 127 TNBI 133, TNBI 139, TNBI 150, TNBI 170, TNBI 178, TNBI 185, TNBI 188

A x B Seed multiplication

The ‘A’ and ‘B’ lines of the hybrid TNAU cumbu hybrid Co 9, *i.e* ICMA 93111A and B were raised in isolation at CBS farm during this summer 2014 season. Rouging was done regularly. Paired crosses were done. Selfed earheads in ‘B’ line was harvested separately. Paired crossed earheads were harvested separately and processed. The processed ‘A’ line seeds will be utilized for further maintenance and also for hybrid seed production.

Maintenance of ‘A’ ‘B’ lines and R lines

Seventy numbers of A and B lines were raised to maintain the sterility by paired crosses between them. The crop is raised during summer 2015. The crop is at vegetative stage.

9. Salient Findings

Two promising hybrids, TNBH 08804 and TNBH 08813, are being tested for second year under Adaptive research trials during 2014-15. These hybrids recorded an average yield of 4076 kg/ha and 2867 kg/ha respectively under multi location trials. These hybrids are compact and bold grain and highly resistant to downy mildew. Two hybrids *viz.*, TNBH 10885 and TNBH 10878 are being tested for second year under multi location trials during the year 2014-15. The hybrid, TNBH10885 recorded the average yield of 2562 kg/ha and it recorded around 13 per cent increased yield over the check TNAU Cumbu hybrid Co 9 and 17 per cent increased yield over private hybrid 86M52. This hybrid is having bold seed with compact earhead and resistant to downy mildew and rust. One hundred and fourteen new hybrids were synthesized for further evaluation.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/CBE/PBG/PEM /2010/002**
2.	**Project Title**	**:**	**Development of high yielding, pearl millet varieties / composites with desirable agronomic features and new inbred line development to utilize in the hybrid development programme**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.P.Veerabadhiran** **Professor (PB&G)**
5.	**Project Period**	**:**	**May 2010 to April 2015**

6. Objectives

- Screening and selection of elite inbreds from the germplasm for desirable grain traits
- Evaluation of selected inbreds for its combining ability (GCA& SCA)
- Development of composites by combining the inbreds with good combining ability
- Evaluation and identification of promising composites for release
- Synthesizing crosses between the selected inbreds for new inbred line development
- Selfing and evaluation of progenies in progeny row trials and isolation of homozygous lines
- Identification of inbred parents (R lines and B lines) with desirable grain quality traits for further use in hybrid breeding.

7. Brief outline of the work carried out from the project initiation period

The promising composite UCC 32 was developed and tested under different advanced testing trials, *viz.*, MLT, ART and Co - ordinated trials. It performed well both under rainfed and irrigated situations in Tamil Nadu. This variety is medium in stature (160-180cm) and in duration (mature in 85-90 days). It produces 4-6 productive tillers with mostly lanceolate shaped ears. The size of the grain is bold and is yellow in colour. The variety UCC 32 is highly resistant to downy mildew under both normal and sick plot condition. It recorded a mean grain yield of 3474 kg/ ha under irrigated conditions, which are about 17 and 23 percent increase over the checks CO (Cu) 9 and ICMV 221 respectively. The mean grain yield under rainfed conditions is 2916 kg/ha which is 15 and 24percent increase over CO (Cu) 9 and ICMV 221 respectively. The protein content is high (12.07%). It has acceptable cooking quality and suited for consumption. This composite was identified for release during the Crop Scientists' Meet 2014 -15.

One hundred and thirty two new restorer restorer lines were developed and are being maintained. These restorer lines are being utilized in the hybrid breeding programme.

8. Work carried out during the review period

Development of inbreds

F_2 generation (Restorer inbreds)

Six numbers of agronomically superior inbreds, PT 4007, PT 6304, PT 6308, PT 6311, PT 6318, PT 6326 were selected and crosses were effected (R x R) and twenty four cross combinations were made. The F_2 generation of 84 single plants was raised in the progeny rows during *kharif* 2014. Selfing was carried out in all the progeny rows. The selfed earheads were harvested and processed. Selfed single earheads will be forwarded to next generation.

F_4 generation (Set I) (Maintainer inbreds)

A total of 44 progenies of 'B x B' crosses of F_4 generation were raised during summer 2014. Selfing was carried out in all the progeny rows. The selfed earheads were harvested and are under processing. These progenies will be forwarded to F_5 generation during next season.

F_2 generation (Set II)

The promising twelve B lines were selected and were crossed with each other to develop a best 'B' line. Eighty four cross combination were made in all possible combinations. The F_2 generation of 350 single plants was raised in the progeny rows during *kharif* 2014. Selfing was carried out in all the progeny rows. The selfed earheads were harvested and processed. One hundred and forty four promising progenies were selected and these progenies will be forwarded to next generation.

Genetic Diversity and variability studies

To assess the diversity and variability present among the newly developed restorer lines, a total of 80 inbred lines including 50 restorer lines (newly developed restorer lines) and 30 maintainer lines were raised in three replications during *kharif* 14, to study the variability present in these lines. Selfing and sibmating was done in all the lines including all replications. Biometrical observations on post harvest traits and estimation of quality traits are under progress. The selfed earheads were harvested separately and processed. These seeds will be utilized for further maintenance.

Seed multiplication

The composite UCC 32 was raised in isolation for evaluation in large scale and seed multiplication during summer 2015. The crop is at flowering stage. Selections will be made for the single plants of the uniform types in open pollinated condition for further maintenance.

9. Salient findings

The promising composite UCC 32 was developed and tested under different advanced testing trials, *viz.*, MLT, ART and Co-Ordinated trials. It performed well both under rainfed and irrigated situations in Tamil Nadu. This variety is medium in stature (160-180cm) and in duration (mature in 85-90 days). It produces 4-6 productive tillers. This new variety recorded a mean grain yield of 3474 kg/ ha under irrigated conditions, which are about 17 and 23 percent increase over the checks CO (Cu) 9 and ICMV 221 respectively. The mean grain yield under rainfed conditions is 2916 kg/ha which is 15 and 24 percent increase over CO (Cu) 9 and ICMV 221 respectively. The progenies of restorer inbred line crosses and maintainer line inbred crosses of different generation will be forwarded to further generation to develop new restorer and maintainer lines.

10. Remarks of the Technical Director based on the pre-review

Enough quantity of seeds of promising composite UCC 32 may be produced and the release proposal may be submitted during the year 2015-16.

1.	**Project Number**	**:**	**CPBG/CBE/PBG/PEM /2011/003**
2.	**Project Title**	**:**	**Maintenance of germplasm accessions and collection, evaluation and utilization of genetic resources in pearlmillet (*Pennisetum glaucum* L.)**
3.	**Name of the Department/Station**	**:**	**Department of millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. Sumathi** **Professor (PB&G)**
5.	**Project Period**	**:**	**July 2011 to May 2016**

6. Objectives

- Collection and conservation of local and exotic germplasm lines with high genetic diversity
- Evaluation and maintenance of the genetic materials

- Utilization of useful genotypes in the breeding programmes as donors for economic traits and also as donors for disease resistance.

7. Brief outline of the work carried out from the project initiation period

A total of 2406 numbers of germplasm accessions, which includes inbreds, populations and local collections, are being maintained at the pearl millet unit of Department of Millets. Out of which 2200 accessions of pearl millet germplasms were packed and kept in the cold storage that is maintained at Plant Genetic Resources, CPBG, TNAU, and Coimbatore. Documentation and computerization of 1500 accessions were completed.

8. **Work carried out during the review period**

Germplasm maintenance

During this period around 148 accessions were collected from ICRISAT and AICPMIP trials. Including this new additions, a total of 2554 numbers of germplasm accessions, are being maintained at the pearl millet unit of Department of Millets.

***Kharif* 2014**

The working germplasm accessions of two hundred and thirty four lines were sown during *kharif* 14. Selfing and sibmating were carried out to maintain the genetic purity of the accessions and also for seed multiplication. Observations were recorded for the following nineteen characters as per the descriptor. Recording observation on post harvest characters are under progress. Wide variability was observed for these characters among these accessions. The variation observed among the accessions for important traits are furnished below

Characters	**Genotypes**
Days to 50% flowering	
Early types (35-40 days)	PT 6228, PT 6243, PT 6257, PT 6307, PT 6325, PT 6408,
Late (50 – 55 days)	PT 6234, PT 6263, PT 6293, PT 6335, PT 6364, PT 6395
Very late (>55days)	PT 6239, PT 6279, PT 6290, PT 6319, PT 6361, PT 6402,
Plant height (cm)	
Minimum (101-150cm)	PT 6231, PT 6245, PT 6292, PT 6307, PT 6341, PT 6415
Maximum (201 - 250cm)	PT 6226, PT 6253, PT 6281, PT 6319, PT 6435, PT 6402
No. of tillers	
Low (2-3nos)	PT 6231, PT 6273, PT 6307, PT 6341, PT 6390, PT 6413,
Medium (4-6)	PT 6226, PT 6292, PT 6321, PT 6363, PT 6407, PT 6436,

Leaf blade hairyness	
Hairy	PT 6246, PT 6305, PT 6385, PT 6430, PT 6452
Non hairy	PT 6236, PT 6251, PT 6298, PT 6370, PT 6401, PT 6437,
Hairyness of leaf sheath	
Hairy	PT 6235, PT 6276, PT 6299, PT 6342, PT 6411, PT 6441
Non hairy	PT 6227, PT 6251, PT 6288, PT 6329, PT 6390, PT 6414
Mid rib colour	
White	PT 6245, PT 6272, PT 6316, PT 6393, PT 6432, PT 6438
Dull white	PT 6240, PT 6260, PT 6296, PT 6339, PT 6387, PT 6431
Nodal hair	
Presence	PT 6234, PT 6270, PT 6302, PT 6421, PT 6434, PT 6446
Absence	PT 6240, PT 6265, PT 6310, PT 6372, PT 6399
Nodal colour	
Brown	PT 6247, PT 6280, PT 6403, PT 6433, PT 6457
Green	PT 6226, PT 6249, PT 6305, PT 6366, PT 6405, PT 6437,
Red	PT 6289, PT 6348, PT 6420
Internode colour	
Brown	PT 6280, PT 6355, PT 6403, PT 6435, PT 6457
Green	PT 6236, PT 6269, PT 6292, PT 6351, PT 6394, PT 6427,
Red	PT 6230, PT 6348, PT 6420
Bristle	
Presence	PT 6250, PT 6280, PT 6370, PT 6438
Absence	PT 6227, PT 6245, PT 6318, PT 6360, PT 6419, PT 6438,

Anther colour	
Light yellow	PT 6229, PT 6265, PT 6303, PT 6327, PT 6390, PT 6434
Yellow	PT 6331, PT 6251, PT 6292, PT 6329, PT 6385, PT 6430,
Purple	PT 6236, PT 6270, PT 6301, PT 6346, PT 6399, PT 6415
Spike exertion	
Partial	PT 6240, PT 6268, PT 6296, PT 6342, PT 6384, PT 6427,
Complete	PT 6228, PT 6260, PT 6299, PT 6355, PT 6388, PT 6414,
Spike shape	
Cylindrical	PT 6262, PT 6239, PT 6252, PT 6295, PT 6348, PT 6400,
Conical	PT 6232, PT 6256, PT 6281, PT 6317, PT 6397, PT 6429
Spindle	PT 6235, PT 6264, PT 6280, PT 6329, PT 6395, PT 6435,
Candle	PT 6244, PT 6278, PT 6312, PT 6417, PT 6450
Lanceolate	PT 6227, PT 6249, PT 6271, PT 6339, PT 6387, PT 6449
Dumbell	PT 6231, PT 6245, PT 6268, PT 6314, PT 6398, PT 6459
Tip sterility	
Presence	PT 6279, PT 6260, PT 6289, PT 6331, PT 6398, PT 6439,
Absence	PT 6226, PT 6255, PT 6293, PT 6335, PT 6402, PT 6435,
Days to maturity	
Early	PT 6228, PT 6255, PT 6257, PT 6325, PT 6394, PT 6408,
Medium	PT 6230, PT 6245, PT 6263, PT 6335, PT 6364, PT 6395,
Late	PT 6239, PT 6279, PT 6290, PT 6305, PT 6319, PT 6402,

Regarding documentation, among 2554 germplasm accessions, observations were recorded for 2200 accessions as per the pearl millet descriptors. Documentation and computerization of set I and set II was completed. The computerization of the data of documented traits of III and IV set for all the accessions is under progress.

One hundred and ten genotypes were selected at ICRISAT pearl millet nursery during the field day on pearl millet conducted at ICRISAT, Patancheru, Hyderabad. The seeds of ninety five genotypes were received. These accessions will be raised in the next season to assess its performance.

The following germplasm accessions were utilized for different research purpose.

Hybridization programme	PT2427, PT3778, PT4782, PT6027, PT6033, PT6037, PT6069, PT6237, PT6300, PT6304, PT6308, PT6310, PT6313, PT6313/1, PT6330, PT6345, PT6347, PT 6349 PT6354, PT6355, PT6470, PT6471, PT6472, PT6473, PT6474, PT6475, PT6476, PT6477 PT6478, PT6479
B line development programme	PT 6387, PT 6392, PT 6393, PT 6397, PT 6398, PT 6403, PT 6406, PT 6407, PT 6408
Genetic Diversity and variability study	Fifty accessions of Restorer lines and 30 accessions of maintainer lines.

9. Salient findings

A total of 2554 numbers of germplasm accessions, which includes inbreds, populations and local collections, are being maintained at the pearl millet unit of Department of Millets. Out of which 2200 accessions of pearl millet germplasms were packed and kept in the cold storage that is maintained at Plant Genetic Resources, CPBG, TNAU, and Coimbatore. The working germplasm accessions of two hundred and thirty four lines were sown. Selfing and sibmating were carried out to maintain the genetic purity of the accessions and also for seed multiplication. Wide variability was observed for the pre harvest traits.

10. Remarks of the Technical Director based on the pre-review

The viability of the seeds stored in the PGR may be checked periodically. The purity of the lines should be maintained properly.

1.	**Project Number**	**:**	**CPBG/CBE/PBG/10/009**
2.	**Project Title**	**:**	**“Development of new male sterile lines in Pearl Millet (*Pennisetumglaucum*(L.) R. Br.)”**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Ravikesavan, Prof & Head** **Dr. A. Subramanian,Asst Prof. (PB&G)**
5.	**Project Period**	**:**	**February 2010 to November 2014**

6. Objectives

- Selection of superior inbred lines based on *per se* performance and combining ability
- Crossing selected inbreds with proven male sterile lines
- Study of sterility of F_1 hybrids
- Back crossing of the male sterile hybrids with recurrent parents
- Assessment of stability of the newly developed male sterile lines

7. Brief outline of the work carried out from the project initiation period

A total of five promising “A” lines and 20 promising pollen parents were raised during Summer, 2009-10 in a crossing block and 71 successful hybrid combinations were generated. The F_1s were raised during *kharif*, 2010. Bagging of panicles was done in 10 primary tillers in each cross combination for assessment of seed set percentage. The bagged panicles were harvested upon maturity and percent seed set was worked out.

Among the hybrids generated, eight combinations *viz.*, ICMA 99666 x PT 6272, ICMA 99666 x PT 4450, ICMA 99666 x ICMB 05444, ICMA 92888 x PT 6066, ICMA 92888 x ICMB 05444, ICMA 02555 x ICMB 96555, 732 A x PT 6290 and 732 A x ICMB 93111 recorded very low seed set. Apart from the above eight hybrids, four new hybrids combinations *viz.*, ICMA 93111 x PT 6243, ICMA 92333 x PT 5591, ICMA 92333 x PT 6254 and ICMA 92333 x PT 6037 were identified to result in sterile F_1s in a separate study during 2010 and these were included in the study. Thus, a total of 12 hybrid combinations mentioned above were raised during summer, 2011 along with the corresponding pollen parents in back cross blocks for paired crossing. Pollen fertility was assessed microscopically and the combination 732A x ICMB 9311 was observed to produce fertile pollen and hence it was relegated from the conversion program. Other hybrids with complete pollen sterility were back crossed in paired fashion with the corresponding pollen parents . A total of 87 BC_1 F_1 paired crosses were obtained from 11 hybrids and the same were sown along with respective male parents for second generation back crossing during *kharif*, 2011 . Paired crossing of the BC_1 F_1s with respective pollen parents was carried out and this resulted in a total of 193 BC_2F_1 combinations.

A total of 38 lines were identified to be sterile based on pollen fertility analysis and bagging during summer, 2012 (Table 1) and these were raised in paired back crossing block along with the corresponding pollen parents in field no. NA 3C of MBS&NA farm during *Kharif*, 2012 and paired crossing was done. Among the combinations , three were found to be unstable and hence were not considered for further study and paired crossing was done between pollen and ovule parents of the remaining 35 lines which resulted in 125 paired crosses in BC_3 F_1 generation.

8. Work carried out during the review period

Summer'14

A total of 278 single plants of BC_5F_1 was raised in order to confirm their sterility expression behaviour under different seasons. The "A" lines were selfed to ensure the sterility status and pollen shedders were discarded. Among these lines only 120 lines did not set any seeds upon selfing. These lines along with the respective maintainer lines were harvested for further testing.

Apart from this another set of 60 BC_4F_1 lines which could not be raised for crossing during Kharif'13 were raised along with their pollen parents for further backcrossing and confirmation of sterility. Backcrossing was done and the fertile "A" lines were discarded and only sterile lines were selected for further evaluation.

Kharif'14

All the 150 BC_5F_1 showing complete sterility during summer'14 were raised along with their respective maintainers for backcrossing and crossing was effected. Selfing was done in the maintainer lines and also in 'A' line to observe for pollen shedders. Among these lines 65 lines found to shed pollen and hence only 85 lines were selected which were found to show uniformity both morphologically and for pollen sterility. These lines will be tested for pollen shedders for one more season to confirm their behavior during Summer'15.

The above chosen lines belong to the five crosses viz., ICMA 93111A X PT 6243, ICMA 92333A X PT 5591, ICMA 99666A X PT 6272 ,ICMA 99666A X PT 4450 and ICMA 92333A X PT 6254

Summer'15

Selected lines were sown to confirm the male sterility and also ascertain the influence of season in breakdown of male sterility.

9. Salient findings

Uniform lines with 100 per cent sterility were identified which can be utilized for synthesis of new hybrid combinations. The lines were derived from five crosses ICMA 93111A X PT 6243, ICMA 92333A X PT 5591, ICMA 99666A X PT 6272, ICMA 99666A X PT 4450, and ICMA 92333A X PT 6254.

10. Remarks of the Technical Director based on the pre-review

The project may be closed and the materials may be transferred to project no CPBG/CBE/PBG/10/19.

MAIZE

1.	**Project Number**	**:**	**CPBG/CBE/PBG/MAZ/2013/001**
2.	**Project Title**	**:**	**Evolution of single cross high yielding maize hybrid resistant to SDM with different maturity groups *viz.*,late (>95 d), medium (>85-95 d) and early (> 75-85 d) suitable for irrigated ecosystem**
3.	**Name of the Department/Station**	**:**	**Department of Millets, Coimbatore**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.G.Nallathambi** **Professor (PB&G)**
5.	**Project Period**	**:**	**June 2013 to May 2018**

6. Objectives

- Selection of maize inbreds for good agronomic traits tolerance to SDM
- Testing of inbreds for their combining ability with suitable testers.
- Single cross hybrid formation of desired seed and pollen parents.
- Identification of high yielding hybrids and testing its suitability for different agro climatic regions for state and National trials.
- Commercial exploitation of Identified stable high yielding hybrids of different maturity groups (late 95- 100, medium 85-95, early 75- 85d.)

7. Brief outline of the work carried out from the project initiation period

i. Maize Hybrids National release 2013 : 4 Nos.

Four maize hybrids *viz*., CoH(M)7 for Zone 3 & 4 ; CoH (M)8 for Zone 2, 3, 4 & 5; CoH (M) 9 for Zone 3 & 5 and CoH (M)10 for Zone 4 & 5 released national level for adoption in Kharif season.

ii. ARTs in farmer's field in Tamil Nadu

Two single cross maize hybrid cultures CMH 08-381 and CMH 09-464 studied under ARTs during 2013-14 .

iii. MLT-I&II

In MLT-I, maize hybrid culture CMH10-540 (105-110d) was identified as promising with grain yield of 8546 Kg/ha with 8.87, 9.86 and 16.16 % increased yield over Co6, NK6240 and 900M (G) respectively under irrigated condition during Kharif 2013. In MLT-II, the same hybrid culture also found promising under rainfed conditions with grain yield of 3769 Kg/ha with 11.7, 8.2 and 5.5 % increased yield over Co6, NK6240 and 900M (G) respectively.

iv. All India Trials:

Two late maturity hybrids *viz.*, CMH 10 - 477 for Zone 3 and CMH 10- 540 for Zone 5, one medium maturity hybrid CMH10-473 for Zone 2 and two early maturity hybrids CMH 08-484 for Zone 2 and CMH08-531 for zone 5 were identified as promising in AET 1st year under All India trials during Kharif 2013.

Sixteen hybrids of different maturity groups *viz.*, 6 late hybrids (CMH 10-548, 550, CMH11-583, 586, 591 & 660**) ,** 5 medium hybrids (CMH10-488, 547, CMH 11-582, 603 and 617), early hybrids (CMH 11-579, 595, 611, 626 and 629) and two baby corn hybrids CMH11-658, CMH-11 659) were nominated for testing in IETs under All India trials during Kharif 2013.

v. Advanced Varietal Trial- I & II (97+3):

Three hybrid culture CMH 08 -381b,CMH 08-381a, CMH 08-287 and CMH10-477 in AVT-II and fifteen single cross hybrids *viz.*, CMH10-538, CMH10-555, CMH11-614, CMH10-540, CMH11-627, CMH11-618, CMH10-548a, CMH11-603, CMH10-545,CMH11-608, CMH10-543, CMH10-548, CMH11-612, CMH11-629, and CMH 11-622 and four hybrids *viz.*, CMH12-669, CMH12-691, CMH12-661 and CMH12-665 IVT were identified as high yielding under irrigated conditions.

vi. Inbred purification and Seed increase

A total of 166 inbred lines were purified and maintained by selfing and sib pollinations.

vii. Parental seed production:

For popularization of hybrid Co6, 188 kg parental seeds Co6 was supplied to public sectors to undertake hybrid seed production 19 acres in Tamil Nadu.

For hybrid seed production, a total of 895 kg parental seeds of CMH 08-282 (Co6) , Co H (M) 7 and Co H (M) 8 were supplied to Gujarat seed corporation , Gujarat and Central state Farms, Raichur, Karnataka.

8. Work carried out during the review period

A.Rabi 2013-14:

a.Advanced Varietal trial –II (19+3):

Nineteen single cross hybrid cultures tested along with checks during Rabi2013-14, hybrid culture CMH 08-381b recorded the highest grain yield of 8419 kg/ha in 107 days followed by CMH08-287 (8229 Kg/ha,106 days), CMH08-381a (8129 Kg/ha, 106 days) and CMH09-464 (8125 kg/ha) which were 18, 16, 14**;** 15, 14, 12; 14, 12, 10 and 14, 12, 10 percent increased yield over hybrid checks *viz*., Co6 (7126 Kg/ha), 900M(G) (7266 Kg/ha) and NK6240 (7355 Kg/ha) respectively.

b.Advanced Varietal trial –I (65+3):

Among 65 hybrids with three checks studied during Rabi 2013-14, twenty single cross hybrids *viz.*,CMH11-617, CMH11-612, CMH11-614, CMH11-603,CMH11-618 ,CMH11-582, CMH11-608, CMH11-604,CMH11-629, CMH11-583, CMH11-611, CMH11-622 and CMH11-627 were identified as high yielding under irrigated conditions with yield range of 9326 (CMH11-627) to 9986 Kg/ha (CMH11-617) which were 14.8 to 22.9 %, 17.2 to 25.5 % and 11.9 to19.8% increased yield over check hybrids *viz.*,Co6 (8120 Kg/ha, 100d), 900 M (G)(7954 Kg/ha, 110d.) and NK6240 (8327 Kg/ha, 100d.).

c. Initial Varietal trial (19+3) :

Among the hybrids tested, 4 hybrids *viz.*, CMH12-662, CMH12-665, CMH12-667 and CMH12-672 were identified as high yielding (> 98-115 d.) with yield range of 7941(CMH12-672) to 8610 (CMH12-662) Kg/ha , which were 7.4 to 16.5 %, 11.1 to 20.5 % and 12.8 to 22.3 % increased yield over check hybrid Co6, 900M(G) and NK 6240 respectively.

d. Multilocation Trial - III (Dec –Jan – Irrigated):

In MLT-III, the hybrid cultue CMH10 -540 recorded the highest grain yield of 9845 Kg/ha in 104 days with 9.87 per cent over check hybrid Co6. The yield of private check hybrid 900M (G) and NK6240 were statically on par with high yielding hybrid culture CMH10 -540.

B. Kharif :2014

e. Advanced Varietal Trial-II (71+3):

Seventy one hybrid cultures tested, eight hybrid cultures *viz.*, CMH11-617, CMH11-582, CMH11-583, CMH11-591, CMH11- 614, CMH11-618, CMH11-620 and CMH11-619 were identified as high yielding with yield range of 13505 (CMH 11-619) to 14444 Kg/ha (CMH 11-617) which was 18.2 to 26.4 per cent increased yield over check co6 (11425 kg/ha). The top rank hybrid CMH 11-617 (98 days) have recorded the highest grain yield of 14444 kg/ha which was 18.3 and 24.3 per cent increased yield over private hybrids *viz.*, 900M (G) (12204 kg/ha; 108 days) and N K6240 (11621 Kg/ha; 100 days) respectively.

f. Advanced Varietal Trial-I (21+3):

Out of 24 single cross hybrids tested along with check hybrids *viz.*, Co6, 900M(G) and NK6240, the hybrid culture CMH12-667 recorded the highest grain yield of 14602 Kg/ha (100 days) followed by CMH12-661(13381Kg/ha, 100 days) and CMH12-672 (13146 kg/ha, 102 days), which were 31.2, 20.3, 18.2, and 21.8, 11.6, 9.7 per cent increased yield over best check Co6 (11125Kg/ha, 98 days) and 900 M(G)(11925 Kg/ha, 100 days) respectively.

g. Maize- Multilocation trial – I (4+ 3):

In MLT-I, hybrid culture CMH10-540 recorded the highest grain yield of 11458 Kg/ha in 105 days with 11.7, 6.4 and 13.2 per cent increased yield over check hybrid Co6 (10255 kg/ha), 900M(G) (10765 Kg/ha) and NK6240 (10125 Kg/ha) respectively.

h. Inbred purification and Seed increase:

Two hundred and ten inbred lines were purified and maintained by selfing and sib pollinations.

For strengthening the hybrid maize breeding programme, a total of 156 new germplasm accessions collected from Winter nursery centre (57nos) (DMR) and CIMMYT (99 nos), Hyderabad were maintained by selfing and sib pollination.

C. Rabi 2014:

i. Station trials:

For single cross hybrid evaluation, 75 entries in AVT-II, 17 entries in AVT- I and 8 entries in MLT-III raised Rabi '14 are in cob formation to maturity stages.

k. Inbred Purification and Seed Increase:

For Inbred purification and nucleus seed increase, 106 inbred lines raised during Janu.2015 are in cob formation to maturity stages. The lines were maintained by selfing and sib pollinations.

m. Hybrid seed production:

For supply of hybrid seeds for MLTs, ARTs, All India trials and station trials, a total of 62 parents of male and female Rabi 2014 are in maturity stage.

9. Salient findings

- Late maturity hybrid culture CMH 08-381(9359 Kg/ha) identified for National release during 2014 for adoption in the states of Bihar, Jharkhand, Odisha, Eastern Uttar Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu for Kharif season.
- Another late maturity modified single cross hybrid culture CMH 09-464 identified for National release during 2014 for adoption in the states of Bihar, Jharkhand, Odisha and Eastern Uttar Pradesh for Kharif season.
- Two hybrid culture CMH 08-282 (8951 Kg/ha) and CMH 08-287 (9478 kg/ha) were identified as National release during 2014 in the states of Tamil Nadu, Andhra Pradesh, Telangana, Karnataka and Maharashtra for Rabi season under irrigated condition.
- Two single cross maize hybrid cultures *viz.*, CMH08-381 and CMH 09-464 were evaluated and studied under ART during 2014-15 and these two hybrids were identified by VIC during 2014 for central release including Tamil Nadu state.
- Eleven promoted hybrid cultures *viz.*, CMH 10 -531 for 3rd year testing in Zone 5, CMH10-547 for Zone 2 and 5, CMH10-582 for Zone 3, CMH11-617 for Zone-5 under medium maturity groups ; CMH11-595 and CMH11-611 for Zone 2, 5 and CMH11-579, CMH 11-626 and CMH11- 629 for Zone 2, 3, 5 under early maturity groups and baby corn hybrids CMH11-659, CMH11-658 were tested under AVT- 2nd year in All India trials during Kharif 2004.
- Sixteen new single cross maize hybrid cultures *viz.*,CMH10-555,CMH11-618,CMH12-663, CMH12- 667, CMH12-671 for late maturity; CMH11- 584, CMH11- 586, CMH11- 593, CMH11-615, CMH11- 619, CMH12- 665 for medium maturity and CMH10-527, CMH10-552, CMH12-675, CMH12-691 and

CMH12-697 for early maturity were evaluated under All India trials during Kharif 2014 .

- In AHT-II, eight hybrids cultures *viz.,* CMH11-617, CMH11-582, CMH11-583, CMH11-591, CMH11- 614,CMH11-618, CMH11-620 and CMH11-619 were identified as high yielding with yield range of 13505 (CMH 11-619) to 14444 Kg/ha (CMH 11-617) which is 18.2 to 26.4 per cent increased yield over check Co6 (11425 kg/ha).

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/CBE/PBG/MAZ/2013/002**
2.	**Project Title**	**:**	**Development of for high yielding sweet corn hybrids suitable for Tamil Nadu**
3.	**Name of the Department/Station**	**:**	**Department of Millets** **CPBG, TNAU, Coimbatore**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Ravikesavan** **Professor and Head (PB&G)**
5.	**Project Period**	**:**	**Five Years** **June 2013- May 2018**

6. Objectives:

- Collection and evaluation of new sweet corn inbreds for their adaptability
- To develop high yielding sweet corn hybrids with high sugar content

7. Brief outline of the work carried out from the project initiation period

Under sweet corn development, a total of 17 sweet corn hybrids developed and evaluated. Green cobs were harvested on 70-75 DAS and the observations on cob length, cob girth, number of kernel rows, number of kernels and green cob yield per plant were recorded. Among the hybrids tested CSCH 11 -113 recorded a green cob yield of 14260 kg/ha followed by CSCH 11 -110 with 13973kg/ha yield. The check, madhuri registered7475kg/ha. Of all the hybrids observed for the green cob yield coupled with the cob appearance traits, during last two seasons the hybrid CSCH 92 has recorded a green cob yield of 15 t/ha with desirable taste and appearance.

Five new inbred lines were selected during the field day at DMR, winter nursery, Hyderabad (WNC 12039-1, 12084-1, 12012-2, 12068-2 and 12069-2) were raised and selfed. These lines were also crossed with the line SC -11-2 as male parent and the hybrid seeds collected. The hybrids along parents SC 11-2 and SC 1421-5-2-1 and check Sugar 75 were raised for evaluation.

Among the hybrids tested CSCH 13002 recorded the highest yield of 12281 kg/ha followed by the CSCH 92 (11214 kg/ha). The hybrid registered 7.6 % higher yield over the best check Sugar 75.

Apart from this new crosses were also made between the new winter nursery lines and the sweet corn lines of germplasm based on the time of tasselling/silking. A total of fifteen crosses were made and seeds collected. Simultaneously these lines are also being selfed for maintenance.

8. Work carried out during the review period

Kharif'15

Evaluation of single cross hybrids:

A total of 15 single cross hybrids along with three checks *viz*., Sugar 75, Madhuri and CSCH 92 were evaluated in randomized block design with three replications. Green cobs harvested on 20.10.2015. The performance of sweet corn hybrids are presented in the table 1.

The hybrid CSCH14003 has recorded the highest cob yield of 15597kg/ha which is 19.02% increase over the high yielding check Sugar 75 (13104 kg/ha). Two hybrids viz., CSCH14012 (14167kg/ha) and CSCH14001 (13424 kg/ha) were also found to record higher green cob yield than the best check.

Among the hybrids the hybrid CSCH 14010 registered high sugar content of 26.8mg/100g followed by CSCH 14005 and Sugar 75 (22.4mg/100g)

Crossing block and hybrids synthesized

Crossing block was raised in line x tester model with 11 lines and five testers with two staggered sowing on 26.07.2014 and 31.7.2014. Crossing was done in hand pollination method and 55 single cross hybrids were synthesized. The details of lines and testers used in provided below

Lines	Testers
USC 1-2-3-1 , USC 10-3, USC 1378-5-1, USC 1421 -5-2-2 , USC 7855-1-2 , USC 11 -2, WNC 12012 -2 , WNC 12069 - 2,WNC 12068 -2, WNC 12084 – 1 and USC 3324 – 3	SC 11 - 2 , SC 1421 -5- -2-1 , WNC 12039 -1 , SC 1107 and USC 1413 -6-2-2

Summer '15

Parental lines of six hybrids viz., CSCH 13001, CSCH 13002, CSCH 14003, CSCH 14012, CSCH 14001 and CSCH 92 which were found to perform well during 2013-14 and 2014-15 were raised for crossing and seed multiplication. Similarly the crossing block raised during Kharif'15 to have more seeds in order to evaluate the hybrids in larger plot size.

9. Salient findings

Two single cross hybrids CSCH14003 and CSCH14012 were identified as better green cob yielder than best check Sugar 75.

10. Remarks of the Technical Director based on the pre-review

High yielding hybrids are to be retested in larger plots and after assessing the performance they may be nominated for MLT.

Table.1 Performance of sweet corn hybrids in PYT

Sl.No	Hybrids	Plant Height (cm)	Cob placement height (cm)	Tassel length (cm)	No of tassel branches	Duration (days)	Green cob yield (kg/ha)	Total sugar content (%)	Special traits
1	CSCH 14003	161.37	67.58	36.17	15	85	15597	14.4	Lax tassel, tip filling and long cob
2	CSCH 14012	118.55	55.73	25.2	17	85	14167	16.4	Tip filling and long cob
3	CSCH 14001	165.47	68.17	37.48	22	84	13424	12.4	
4	Sugar 75 (c)	143.1	46.07	30.95	17	84	13104	22.4	
5	CSCH 14005	148.22	57.12	33.53	15	82	12875	22.4	Lax tassel, tip filling and long cob
6	CSCH 14014	115.6	48.43	27.63	11	84	11854	17.6	
7	CSCH 92	124.52	45.12	31.68	19	84	11000	16.4	
8	Madhuri (c)	117.97	46.53	30.3	18	85	9528	21.6	
9	CSCH 14007	145.23	58.8	30.65	21	85	9007	12.0	
10	CSCH 14011	120.28	52.68	28.82	17	82	8139	24.0	
11	CSCH 14006	156.52	60.33	35.13	23	81	7667	16.8	
12	CSCH 14008	114.53	51.1	29.17	18	84	6271	14.4	
13	CSCH 14010	117.57	54.45	27.2	19	84	5319	26.8	
14	CSCH 14009	129.53	50.98	28.52	17	84	4958	18.8	
15	CSCH 14004	138.77	53.17	32.07	17	83	3056	18.8	
16	CSCH 14002	132.1	48.27	34.07	17	83	2403	15.6	
17	CSCH 14015	102.45	38.82	25.38	11	85	1224	19.6	
18	CSCH 14013	103.17	34.47	23.75	12	82	847	26.0	
						SEd	**662.78**		
						CD (5%)	**1347.56**		
						CV	**9.71**		

1.	**Project Number**	:	**CPBG/CBE/PBG/MAZ/2013/003**
2.	**Project Title**	:	**Collection, maintenance and evaluation of genetic resources in maize gene bank and development of inbred lines**
3.	**Name of the Department/Station**	:	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	:	**Dr.A.Yuvaraja** **Assistant Professor (PB&G)**
5.	**Project Period**	:	**Five Years** **June 2013 to May 2018**

6. Objectives

- Collection of inbreds/genotypes from national / international sources
- Evaluation of gene bank inbred lines for yield traits, drought, pest and diseases
- Documents and cataloguing
- Developing new inbreds from heterotic pools

7. Brief outline of the work carried out from the project initiation period

Germplasms were collected from the sub project CPBG/CBE/PBG/08/004. These inbred lines were maintained through selfing and sibbing. It was evaluated for its suitability to further breeding programmes based on late maturity and pest (stem borer) and disease (downy mildew) resistance. The promising 47 lines were supplied to AC and RI, Trichy and AC and RI, Killikulam for crossing. A total of 664 maize entries were deposited in Dr.Ramaiah gene bank, deparment of PGR.

Inbred line development programme, 68 progenies in different generations were received from the sub project CPBG/CBE/PBG/08/004. A total of 33 progenies were selected based on the maturity, performance and grain colour.

8. Work carried out during the review period

Germplasm maintenance, evaluation and characterization

A total of 215 inbred lines including 112 normal yellow, 45 QPM, 13 pop corn, 43 sweet corn and two baby corn lines were raised in New Area Farm 2D on 26.07.2014. Rogueing was done in vegetative and flowering stages. The minimal descriptor traits on days to tasseling and days to silking, plant height, tassel length, tassel branches, cob length, cob circumbrance, number of rows, number of grains per row and days to maturity, colour and type of the grain were recorded. Manual selfing and sibbing carried out in stabilized lines to get uniformity and to utilize future breeding programmes. The consistent good performing lines are presented below.

Sweet corn: USC 1-2-3-1, USC 10-3-1, USC 11-2 (DO), USC 1207-6-2, USC 1378-5-1, USC 1413-6-2-1, USC 1413-6-2-2, USC 7853, USC 7855-1-2, USC 7855-3-1, USC 8324-3 and Tropical 3
Popcorn: Plot 1-4-1 and Basi local-2
QPM: DMR QPM 01-16, DMR QPM 09-3, DMR QPM 10-7 and QPM 10-4
Normal Yellow: V94-1-3 (NY), 678-1(Semi Dent) (NY), 1088-2-2(Stay Green) (NY), WNC 10443-1, WNC 10225-2, WNC 10313-1, WNC 12244, WNC 12234-2, WNC 12225-1, WNC 11516-3-2, NK-2, Tr. 1 1047-(37)-2 and B.NO 72173-3-1

Supply of inbred lines to breeding programmes:

The following inbred lines were supplied to the breeding projects operating at this department.

Sl.No.	**Project**	**No of inbred lines supplied**
1	Evolution of sweet corn hybrids project	16 SC Inbred lines
2	DBT project on Sweet corn	20 SC and 11 NY Inbred lines

Inbred lines development programme

A total of 33 progenies viz., S3-S4:3, S5-S6:12, S7-S8:1, S8-S9:4 and S9-S10:13 were raised on 26.07.2014 in New Area Farm 2D. The S8, S9 and S10 progenies raised in replicated thrice in larger plots along with check B. No. 1053-6-1 where as S4 and S6 are in non replicated rows for evaluation.

The individual plant progenies are selected based on late flowering group, narrow leaf, cob placement height, downy mildew and stem borer incidence.

S4 progenies (selection-3/3)

S6 progenies (selection-12/12)

S8 progenies (selection -1/1)

Performance of S9 and S10 progenies

S9 (4)	Entries	Grain character		Yield (kg/ha)	Pest and disease
49.	6208-7-3-1-4-3-2⊕	Orange	Flint	2223	Field tolerance to stem borer and downy mildew disease.
50.	7516-16-1-1-4-2-1⊕	Orange	Semi Dent	2302	
52.	7516-16-2-2-2-1-3 ⊕	Orange	Flint	1874	
54.	SUP 1-2-1-1-2-1 ⊕	Orange	Flint	1929	

S 10 (5)					
60.	Mon Par -3-4-6-4-2-2-1-6⊕	Deep orange	Flint	2486	
61.	Mon Par -4-1-2-7-3-1-6- ⊕	Orange	Flint	2513	
63.	6642-24-3-1-2-1-3-1 ⊕	Yellow	Dent	2403	
64.	6642-31-11-1-1-1-3-7 ⊕	Deep orange	Dent	2239	
65.	6642-31-11-2-2-2-2-1-3⊕	Orange	Semi dent	2551	
67.	5552-5-2-1-2-1-3-1 ⊕	Orange	Flint	2692	
68	B. No. 1053-6-1	Orange	Dent	2497	
	SEd:55.51, CD (5%)=115.13, CV=3.91				

The S9 and S 10 progenies are raised for synthesizing of hybrids to study the combining ability of new inbred lines.

Seed multiplication programme

Resynthesizing of drought tolerant hybrids viz.,CDMH 13023, CDMH 13070 and CDMH 13151 are being taken in filed no 3A. The crop is at flowering stage.

9. Salient findings

- Minimal descriptors of 215 germplasms were recorded.
- Stable lines in late maturing and good plant type were identified in normal yellow (14), sweet corn (12), QPM (4) and popcorn (2).
- Sweet corn inbred lines 36 and 11 normal yellow lines were supplied to breeding programmes.
- Better performing nine newly synthesized inbred lines were identified in S9 and S10 progenies.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/VGI/PBG/MAZ/2010/001**
2.	**Project Title**	**:**	**Collection and maintenance of maize germplasm**
3.	**Name of the Department/Station**	**:**	**Maize Research Station, Vagarai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.N.Kumari Vinodhana** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**April 2010 to March 2015**

6. Objectives

- Collection of inbreds/lines from different national and International institutes
- Evaluation of inbreds for yield traits, pest and disease reaction and drought tolerance

7. Brief outline of the work carried out from the project initiation period

During Kharif 2010, A total of 341 inbreds were sown in non replicated (6 m length) trial plot. Regular rouging was done in seedling stage, knee height stage, flowering stage, maturing stage & after harvesting to maintain genetic purity of inbred lines. Controlled selfing and sibbing was carried out to maintain genetic purity as well as seed increase. Among them, 323 germplasm lines have been successfully selfed and recovered pure seeds. In addition 143 inbreds were selected for use in our breeding programme during the field day held at DMR winter nursery, Hyderabad.

Evaluation of germplasm lines for drought

All the germplasm lines were subjected to evaluation under drought during 2010-11 season and the inbreds showing drought tolerance are listed below

Inbreds	**Reaction to drought**
VIM 92, VIM 140, VIM 144, VIM147, VIM 189, VIM 197, VIM 201, VIM 230, VIM 244, VIM 280, VIM 321	Highly tolerant to drought
VIM 80, VIM 86, VIM 97, VIM 258, VIM 262, VIM 276, VIM 281, VIM 284, VIM 302, VIM 310, VIM 339, VIM 340, VIM 353, VIM 358, VIM 379, VIM 383, VIM 392, VIM 393, VIM 399, VIM 407, VIM 410	Moderately tolerant to drought

Artificial Screening of germplasm lines for TLB

Through infector row method 100 lines were screened against *Turcicum* leaf blight. Sorghum grain inoculumswas used as inoculums through whorl placement. Among the inbreds screened, VIM 015, VIM 016, VIM 082, VIM 169, VIM 175, VIM 179, VIM 197, VIM 202, VIM 205, VIM 206, VIM 208, VIM 225, VIM 226, VIM 228, VIM 259, VIM 267, VIM 671, VIM 276, VIM 280, VIM 304, VIM 312, VIM 317, VIM 322, VIM 328, VIM 349, VIM 353, VIM VIM 357, VIM 398, VIM 309, VIM 28 and CM 282 were highly resistant to TLB. While the 11 inbreds *viz.*, VIM 134, VIM 147, VIM 155, VIM 176, VIM 235, VIM 256, VIM 274, VIM 282, VIM 303, VIM 346, VIM 348 were moderately resistant to TLB

A total of 494 numbers of maize inbreds were raised during 2013-14 rabi season and selfing was done to maintain the genetic purity of the lines. In addition, DUS charaterisation for a total of 50 inbreds for twenty seven traits were documented.

Two hundred germplasm lines were deposited in the ramiah gene bank, TNAU, Coimbatore.

8. Work carried out during the review period

Kharif 2014

About fifty inbred lines of the germplasm pool were characterized for the DUS traits *viz*., Ear length without husk, Ear diameter without husk, Ear shape, Ear number of rows, Ear type of grain, Ear colour of grain, Ear anthocyanin colouration of glumes, Kernel Arrangement Rows, Kernel shape and Kernel weight while the other 17 DUS traits have already been recorded. All the DUS traits recorded were documented. About 490 germplasm lines with viable healthy seeds were sorted, hand threshed and treated with insecticide to protect against storage pests and stored for further maintenance during Rabi 2014-15.

Some of the promising inbreds *viz*., VIM 015, VIM 017, VIM 023, VIM 053, VIM 57, VIM 081, VIM 061, VIM 108, VIM 136, VIM 153, VIM 197, VIM 244, VIM 11710, VIM 11529, VIM 11956 identified during Rabi 2013-14 were included in the crossing block during Kharif 2014 for synthesizing fresh crosses. A total of 23 fresh crosses were effected during Kharif 2014 season.

Rabi 2014-15

During Rabi 2014-15, the newly synthesized twenty three crosses (VMH 13001, VMH 13002, VMH 13003 …..VMH 13023) by involving selected inbred lines of the domestic germplasm and inbreds selected from winter nursery centre were raised under Initial hybrid trial-I for evaluation. The crop is in flowering stage.

About 490 inbred lines were raised during Rabi 2014-15 for seed multiplication. The crop is in vegetative stage. Selfing of each lines will be followed to maintain the genetic purity.

Maize germplasm field day was organized at Winter Nursery Centre, Hyderabad on 14.03.2015 and about 43 inbred lines was selected at winter nursery in order to utilize them for synthesizing the new crosses. Seeds will be received at the end of the season.

About thirty inbred lines that were found to be promising during Rabi 2013-14 were included in the crossing block to synthesize fresh crosses.

9. Salient findings

- The promising inbred lines identified during Rabi 2013-14 were utilized as the parents in crossing block and a total of 23 fresh crosses were effected during Kharif 2014 season.
- DUS characterization for a total of twenty seven traits were recorded and documented for 50 inbreds.
- About 490 inbred lines were raised during Rabi 2014-15 for seed multiplication
- About 43 inbred lines were selected from the Winter nursery, Hyderabad in the Maize germplasm field day in order to utilize them for synthesizing the new crosses

10. Remarks of the Technical Director based on the pre-review:

The project may be continued with the same objectives.

1.	**Project Number**	**:**	**CPBG/VGI/PBG/MAZ/2010/002**
2.	**Project Title**	**:**	**Development of high yielding single cross maize hybrids suitable for irrigated ecosystem**
3.	**Name of the Department/Station**	**:**	**Maize Research Station, Vagarai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. K.N. Ganesan,** **Professor (PB&G) and Head, MRS, Vagarai**
5.	**Project Period**	**:**	**April 2010 to March 2015**

6. Objectives

- Screening of available maize inbred lines to isolate productive lines.
- Development and evaluation of single cross hybrids, to identify superior hybrids suitable
  for irrigated conditions of Tamil Nadu.
- Study the tolerance level of superior hybrids to low nitrogen, downy mildew and stem borer.
- Hybrid and parental seed multiplication of the best hybrids.

7. Brief outline of the work carried out from the project initiation period

Under the advanced hybrid trial, two hybrids VMH 08013 and VMH 08014 registered significant yield increase over the high yielding check 900 M Gold which were nominated for the multi location testing during 2010-11. Among the two hybrids VMH 08014 was promoted to the AET 1st year trial for the Rabi'12 season. In addition the hybrid VMH 08014 was also promoted for ART 2012 and was tested at 100 locations throughout Tamil Nadu.

In Zone II of AICRP trial, the high yielding single cross hybid VMH 08014 recorded a grain yield of 8154 kg/ha in IET medium trial duing Rabi 2011 -12 season. It recorded a grain yield increase of 11.0 per cent over the check hybrid Bio 9637 (7343 kg/ha). In zone V, the hybrid VMH 08014 recorded an average grain yield of 7055 kg/ha, which is 35.1 per cent increased yield over Bio 9637 (5224 kg/ha). Hence, it was promoted to AET 1 and was evaluated in Zone II & V during Rabi 2012 -13 season. The new single cross hybrid VMH 08015 was nominated for evaluation during 2013-14 under IVT 2013 trial and results of the trials were discussed in Annual Maize Workshop. As per the results of ART trial conducted during 2013-14, the hybrid VMH 08014 has not out yielded the best check hybrid Co 6 and it has been withdrawn from ART.

The hybrid VMH 08015 (UMI 1038 x UMI 1065) recorded a grain yield of 9590 kg/ha in station trials and was proposed for MLT 2013 during *kharif* and *rabi* seasons.

The hybrid VMH 12001 (VIM 235 x VIM 321) which was found to be superior performing than the TNAU MH Co 6 during Rabi 2013-14 was included for evaluation under irrigated MLT during 2014-15.

The hybrids VMH 12006 (VIM 244 x VIM 419) and VMH 09020 (VIM 244 x VIM 058) has been included for evaluation under rainfed MLT during 2014-15.

8. Work carried out during the review period

I. Kharif 2014

a. Initial Hybrid Trial - I

Initial Hybrid trial (Irrigated) - I was conducted with maize single cross hybrids synthesized *viz*., VMH 12013, VMH 12014, VMH 12006, VMH 12001, VMH 08014, VMH 09020 and VMH 09025 including check TNAU maize hybrid Co 6 in two replications. The details of the hybrids evaluated, their pedigree and grain yield recorded are as furnished below.

Sl. No.	Hybrid	Pedigree	Grain yield (kg/ha)	% over TNAU MH Co 6
1.	VMH 12001	VIM 235 x VIM 321	4814	-
2.	VMH 12006	VIM 244 x VIM 419	**9075**	-
3.	VMH 08014	UMI 1037 X UMI 1065	6452	-
4.	VMH 09020	VIM 244 x VIM 058	8144	-
5.	VMH 09025	VIM 321 x VIM 015	5802	-
6.	VMH 12013	UMI 1200 x VIM 419	5726	-
7.	VMH 12014	UMI 1200 x VIM 357	**9978**	10.7
8.	TNAU MH Co 6	UMI 1200 x UMI 1230	**9012**	-

Among the hybrids evaluated, it was found that the hybrid VMH 12014 (UMI 1200 x VIM 357) has recorded the maximum grain yield of 9978 Kg/ha which is 10.7% higher than the check TNAU maize hybrid Co 6. It was closely followed by the hybrid VMH 12006. Seed multiplication of promising hybrid VMH12014 is being done in order to nominate it for AICRP/State MLT during ensuing Kharif 2015 season.

Special features of VMH 12014

- High yielding single cross maize hybrid (9978 kg/ha)
- Duration: 110 days

- Shelling percentage: 79%
- 100 gram weight: 39g
- Grain colour: Bold yellow dent.
- Suitable seasons: Irrigated (June – July), Rainfed (September – October)
- Moderate resistance to sorghum downy mildew

Performance of the single cross maize Hybrid VMH 12014

ENTRY	Days to 50% tassel	Days to 50% silk	Shelling %	Cob length (cm)	100 grain weight (g)	Grain yield kg/ha	% increase over Co 6
Kharif 2013 (Irrigated)							
VMH 12014	52	55	79.5	23.0	39	9835	10.5
Co 6	52	55	78.0	20.5	37	8900	
Kharif 2014 (Irrigated)							
VMH 12014	53	56	79	23.5	40	9978	10.7
Co 6	51	54	78	21.0	38	9012	
Over all increase over two seasons							**10.6**

b. Multi Location Trial (Irrigated)

During Kharif 2014, the irrigated MLT (MLT – I) was laid out with seven genotypes MH 14 (K) 001, 002, 003, 004, 005, 006, 007 on 13.08.2014 with the spacing of 60 x 25 cm and replicated thrice in randomized block design. Biometrical performance of the hybrids evaluated is furnished below.

Entry No	Days to 50% tassel	Days to 50% silk	Days to 75% dry usk	Plant height (cm)	Ear height (cm)	Shelling (%)	100 grain weight (g)	Grain Yield/ plant (kg/ha)
MH 14 (K) 001	50	53	100	187.0	93.0	78.1	37.0	8100
MH 14 (K) 002	48	52	96	174.0	82.5	78.0	37.0	7800
MH 14 (K) 003	52	55	102	181.5	83.7	70.3	36.5	7200
MH 14 (K) 004	51	54	101	173.0	87.5	75.6	37.0	8160
MH 14 (K) 005	52	54	103	171.0	82.4	78.0	39.0	10440
MH 14 (K) 006	54	56	102	171.5	91.7	72.7	32.0	5700
MH 14 (K) 007	54	57	100	179.0	87.2	73.8	34.5	6600

The results revealed that the entry MH14 (K) 005 recorded the highest grain yield of 10440kg/ha followed by the hybrid MH 14 (K) 004 with 8160kg/ha.

c. Multi location Trial (Rainfed)

The performance of the hybrid VMH 12006 in station trials was found to better during 2013-14 (grain yield of 5840 kg/ha with 11.5% increase over the check TNAU maize hybrid Co 6) and hence it was nominated for evaluation under rainfed MLT during 2014-15. Also, considering the performance of the single cross hybrid VMH 09020 in MLT during 2013-14, it was retained in MLT testing during 2014-15 under rainfed situation.

During Kharif 2014, the rainfed MLT (MLT-II) was sown with eight genotypes viz., MH 14 (K) 001, 002, 003, 004, 005, 006, 007, 008 on 06.10.2014 with the spacing of 60 x 25cm in three replications under the randomized block design. Biometrical performances of the hybrids evaluated are furnished below.

Entry No	Days to 50% tassel	Days to 50% silk	Days to 75% dry husk	Plant height (cm)	Ear height (cm)	Shelling (%)	100 grain weight (g)	Grain Yield/ plant (kg/ha)
MH 14 (KR) 001	54	56	103	242.3	143.8	78.7	38	6436
MH 14 (KR) 002	48	51	98	216.5	107.6	75.2	35	5142
MH 14 (KR) 003	51	54	101	231.3	123.8	77.4	35	5112
MH 14 (KR) 004	53	55	103	231.8	127.0	78.0	37	6006
MH 14 (KR) 005	52	55	102	238.6	135.0	79.5	39	7250
MH 14 (KR) 006	54	56	104	230.5	129.0	76.3	34	5033
MH 14 (KR) 007	53	55	101	244.0	137.4	77.0	35	6088
MH 14 (KR) 008	43	46	93	187.6	92.0	74.3	32	4677

The results revealed that the entry MH14 (KR) 005 recorded the highest grain yield of 7250kg/ha followed by the hybrid MH 14 (KR) 001 with 6436kg/ha under rainfed conditions.

II.Rabi 2014-15

a. Initial Hybrid Trial – I

During Rabi 2013-14, a total of fifteen inbreds identified in the germplasm were included in the crossing block during Kharif 2014 for synthesizing fresh crosses. About twenty three cross combinations (VMH 13001, VMH 13002, VMH 13003 …..VMH 13023) were synthesized and raised under Initial Hybrid Trial – I for evaluation during Rabi 2014-15. Now the crop is in flowering stage.

b. Initial Hybrid Trial – II

The maize single cross hybrids which were found to be promising during Kharif 2014 *viz*., VMH 12013, VMH 12014, VMH 12006, VMH 12001, VMH 09020 are being evaluated under Initial Hybrid Trial – II with two replications along with the check TNAU maize hybrid Co 6 during Rabi 2014-15 season. Now the crop is in flowering stage.

c. Multi location Trial (Rabi)

During Rabi 2014-15, The Multi location trial (MLT-III) comprising of eight entries was sown on 20.01.2015 with the spacing of 60 x 25cm in three replications under the randomized block design. Now the crop is in flowering stage.

III. Hybrid seed production

The hybrid seed production of TNAU maize hybrid CO 6 was undertaken during Kharif 2014. About 95 kgs of seeds were produced and distributed to the farmers and seeds were also used for raising three TSP off campus demonstrations in tribal farmers fields. Again during Rabi 2014-15, the hybrid seed production of TNAU maize hybrid CO 6 was undertaken which is currently in cob formation stage. Apart from the hybrid seed production, parental seed multiplication of the hybrids VMH 12014, VMH 12013 and TNAU maize hybrid CO 6 was also takenup during Kharif and Rabi 2014-15 seasons.

9. Salient findings

- The hybrid VMH 12014 (UMI 1200 x VIM 357) has recorded the maximum grain yield of 9978 Kg/ha under irrigated situation which is 8.9% higher than the check TNAU maize hybrid Co 6.
- Seed multiplication of VMH 12014 and VMH 12013 hybrid culture is being done in order to nominate it in AICRP/State MLT during the year 2015 -16.
- The results of MLT – I revealed that the entry MH14 (K) 005 recorded the highest grain yield of 10440kg/ha followed by the hybrid MH 14 (K) 004 8160kg/ha.
- The results of MLT-II revealed that the entry MH14 (KR) 005 recorded the highest grain yield of 7250kg/ha followed by the hybrid MH 14 (KR) 001 with 6436kg/ha under rainfed conditions.

10. Remarks of the Technical Director based on the pre-review:

The project may be continued with the same objectives.

1.	**Project Number**	**:**	**CPBG/VGI/PBG/MAZ/2014/003**
2.	**Project Title**	**:**	**Development of maize inbred lines from different heterotic gene pools to evolve single cross hybrids for rainfed condition**
3.	**Name of the Department/Station**	**:**	**Maize Research Station, Vagarai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.N.Kumari Vinodhana** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**October 2014 to September 2017**

6. Objectives

- To develop genetically diverse inbred lines of maize having superior *per se* performance as well as good general combining ability from different heterotic gene pools.
- Identification of best inbreds to evolve single cross hybrids suited for rainfed condition

7. Brief outline of the work carried out from the project initiation period

The project was propoed during October 2014. the project was initiated with the selection of Promising single cross hybrids *viz*., DMR 701, 702, 703,704, 705, 706, 707, 708, 709, 710, 711, 712, 801, 802, 803 from AICRP maize trials and was chosen as the base population (S_0) for the inbred development. The progress of work carried is briefed below

8. Work carried out during the review period

Seeds of the S_0 plants of the promising single cross hybrids selected were sown during September' 2014 and normal cultural operations were followed. Irrigation was withheld after giving life irrigation. Frequent rainy showers received during North East monsoon helped the crop growth period under rainfed. The single plants from the S_0 population of each promising hybrid were selected based on the plant vigour, earliness, standability, pest and disease resistance, narrow anthesis silking interval and selfing of the selected single plants was carried out to get the S_1 seeds. The selfed single plants were harvested and various morphological and biometrical characters *viz*., ear type, kernel shape, row arrangement, no of rows, plant height, ear height and cob weight are being recorded. S_1 seeds of the selected single plants of different cross combinations were raised in the progeny rows (ear to row) during February 2014 to generate S_2 population. The crop is in vegetative stage. Again imposing selection and selfing in a pedigree breeding fashion is to be practiced to generate S_2 population under managed water stress condition. The same procedure is to be repeated in the successive generations S_3 and S_4.

Rabi 2014-15

i. Initial Hybrid Trial (Rainfed):

It was conducted with maize single cross hybrids *viz*., VMH 12013, VMH 12014, VMH 12006, VMH 12001, VMH 08014, VMH 09020 and VMH 09025 including check TNAU maize hybrid Co 6 in two replications during September 2014. Among the hybrids evaluated, VMH 12013 (UMI 1200 X VIM 419) was found to be promising which yielded 6904kg/ha that was 12.3% increase over the check hybrid CO 6 under rainfed. The performance of the VMH 12013 for the last two seasons under rainfed is furnished below.

Performance of the single cross maize Hybrid VMH 12013

Entry	Days to 50% tassel	Days to 50% silk	Shelling %	Cob length (cm)	100 grain weight (g)	Grain yield kg/ha	% increase over Co 6
Kharif 2013 (Rainfed)							
VMH 12013	52	55	78	20.5	36	6826	9.0
Co 6	51	54	79	18	37	6262	
Kharif 2014 (Rainfed)							
VMH 12013	50	52	80	19	37	6904	12.3
Co 6	52	55	77.5	16.5	34	6148	-
Over all increase over two seasons							**10.6**

Special features of VMH 12013

- High yielding maize hybrid under rainfed (6865 kg/ha)
- Duration: 110 days
- Shelling percentage: 79%
- 100 gram weight: 36.5 g
- Grain colour: Bold yellow dent.
- Suitable seasons: Rainfed (September – October)

9. Salient findings

- Under rainfed situation, single cross maize hybrid VMH 12013 had recorded the highest grain yield during Kharif (rainfed) 2012-13 and 2013-14 seasons with average increase of 10.6% over TNAU maize Hybrid Co 6 and hence, the culture will be nominated for evaluation under State MLT during Kharif (rainfed) 2015-16 season.
- The S_1 seeds obtained from the selected selfed single plants of the promising hybrids of the S_0 population (derived from different heterotic panel) were raised to generate S_2 population.
- Among the hybrids evaluated during 2014 rainfed season, VMH 12013 (UMI 1200 X VIM 419) was found to be promising which yielded 6904kg/ha that was 12.3% increase over the check hybrid CO 6.

10. Remarks of the Technical Director based on the pre-review:

The project may be continued.

SMALL MILLETS

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SMM/2011/001**
2.	**Project Title**	**:**	**Evolution of climate resilient high yielding varieties of – fingermillet, littlemillet and prosomillet under rainfed condition**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**A.Thanga Hemavathy** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**Jun 2011 to May 2016**

6. Objectives

- ❖ To evolve high yielding, climate resilient and drought resistant varieties in fingermillet, littlemillet and prosomillet.
- ❖ To maintain the genetic purity of the released varieties through single plant selection.
- ❖ To produce quality nucleus and breeder seeds of the released varieties in fingermillet, littlemillet and prosomillet.
- ❖ To produce more quantity of quality seeds to popularize the varieties through FLD, OFT and mini-kit trials

7. Brief outline of the work carried out from the project initiation period

Progress made so far

Adaptive Research Trial

During 2013-2014, TNAU 1066 ragi culture along with three checks *viz.,* CO (Ra) 14, CO (Ra) 15, Paiyur (Ra) 2 and GPU 28 were evaluated in ART (50 trials) distributed to 10 districts (5 trials/District) and in 10 respective KVK (30 trials) centers in both *Kharif* and *Rabi* seasons. The grain yield for TNAU 1066 is 3212 kg/ hectare. When compared to CO1 5 TNAU 1066 yield 13.74% more yield.

In prosomillet one culture *viz.,* TNAU 151 along with a check *viz.,* CO (PV) 5, and TNAU 202 were evaluated in ART I (50 trials) distributed to 10 districts (5 trials/District) and in 10 respective KVK (30 trials) centers in both *Kharif* and *Rabi* seasons. The grain yield for TNAU 151 is 755 kg per hectare and this yield is 6.6% increased yield when compared with CO 5 check. The culture was forwarded to the Adaptive Research Trial II during *rabi*, 2013-14 in six locations. The grain yield is 995 kg/ha.

In Samai cultures *viz.*, TNAU 140, TNAU 142 and CO (Samai) 4 were laid out Adaptive Research Trial during *rabi*, 2013-14 in six locations. The grain yield of TNAU 140 was 857 kg/ha and TNAU 142 was 898 kg/ha, when compared to the check CO 4, TNAU 140 yield 5.4 % more yield.

Multi Location Trial

In fingermillet MLT, six entries *viz*., TNAU 1228, TNEc 1234, TNEc 1256, DPI 007 04, KRI 007 01, KRI 013 -11- 8 along with three checks CO 15, Paiyur 2 and GPU 28 were sown during Summer 2014 in RCBD with three replications. The entries TNAU 1234 and TNAU 1228 recorded the grain yield of 2650 and 2410 Kg per hectare respectively. The grain yield increased for TNAU 1234 and TNAU 1228 over CO 15 was 27.53 and 15.97 per cent respectively.

In littlemillet MLT, four entries *viz*., TNAU 167, TNAU 170 along with the checks OLM 203, JK 8 and CO 4 were sown during *Summer* 2014 in RCBD with three replications. Among the entries TNAU 167 recorded the highest grain yield of 2138 Kg/ha followed by TNAU 170 (2124 kg/ha)

In prosomillet MLT, three entries *viz*., TNPm 228, TNPm 230 along with check CO (PV) 5 were sown during *summer 2014* in RCBD with three replications. The entry TNPm 230 recorded the grain yield of 1278 Kg per hectare. The grain yield increased for TNPm 230 over CO (PV) 5 was 14.72.

Nucleus seed production

Nucleus seed was produced in CO (Samai) 4; Panivaragu - CO (PV) 5, Ragi - CO 9, CO 12, CO 13, CO (Ra) 14 varieties by plant to progeny rows and the nucleus seeds has been used for Breeder seed production

8. Work carried out during the review period

(i) Fingermillet

1. Preliminary Yield Trial (*Summer* 2014)

In fingermillet PYT, ten entries along with the checks CO 15, Paiyur 2 and GPU 28 were sown during *Summer* 2014 in RCBD with three replications. Among the entries TNAU 57 recorded the highest grain yield of 2510 Kg/ha which was 29.51 per cent increased over the check CO 15 followed by TNAU 54 with the grain yield of 2440 Kg/ha and that is 25.90 per cent higher than the check (Table 1).

2. Comparative Yield Trial (*Summer* 2014)

In fingermillet CYT, Fourteen entries along with the checks CO (Ra) 14, Paiyur 2 and GPU 28 were sown during *Summer 2014* in RCBD with three replications. Among the entries TNEc 1281 recorded the highest grain yield of 2400 Kg/ha which was 12.14 per cent increased over the best check CO 15 followed TNEC 1285 had 2380 kg/ha (Table 2).

3. Multi Location Trial (*Summer* 2014)

In fingermillet MLT, six entries *viz*., TNAU 1228, TNEc 1234, TNEc 1256, DPI 007 04, KRI 007 01, KRI 013 11 8 along with three checks CO 15, Paiyur 2 and GPU 28 were sown during Summer 2014 in RCBD with three replications. The entries TNAU 1234 and TNAU 1228 recorded the grain yield of 2650 and 2410 Kg per hectare respectively. The grain yield increased for TNAU 1234 and TNAU 1228 over CO 15 was 27.53 and 15.97 per cent respectively. (Table 3).

4. Advanced Yield trial (*Summer 20*14)

In fingermillet AYT, four entries *viz*., MS 2762, TNAU 879, TNAU 900, TNAU 1295 along with the checks CO 15 were sown during *Summer* 2014 in RCBD with three replications. TNAU 879 had kg/ha 2480 and TNAU 900 had 2224 kg/ha yield and it was 14.92 % and 3.05% more yield when compared with CO 15 (Table 4)

5. Multi Location Trial (*Rabi* 2014)

In fingermillet MLT, three entries *viz*., DPI 009-04, TNEc 1269, TNEc 1277 along with three check CO 15, Paiyur 2 and GPU 28 were sown during *Kharif* 2014 in RCBD with three replications. The entries TNAU 1269 and TNAU 1277 recorded the grain yield of 2780 and 2650 Kg per hectare respectively. The grain yield increased for TNAU 1269 and TNAU 1277 over CO 14 was 5.63 and 9.27 per cent respectively.

6. Germplasm Evaluation (Kharif 2014)

During Kharif 2014, fifty elite lines of finger millet along with two checks were raised and evaluated for all the biometrical traits. The entries were sown on 27.06.2014 in Augmented design. The quantitative observations were recorded based on the descriptors.

(ii) Littlemillet

1. Multi Location Trial (*Summer 2014*)

In littlemillet MLT, Four entries *viz*., TNAU 167, TNAU 170 along with the checks OLM 203, JK 8 and CO 4 were sown during *Summer* 2014 in RCBD with three replications. Among the entries TNAU 167 recorded the highest grain yield of 2138 Kg/ha followed by TNAU 170 (2124 kg/ha) (Table 5).

2. Advanced Yield Trial (*Summer 2014*)

In AYT, four entries TNAU PSU 174, TNAU PSU 176, TNAU PSU 177, TNAU PSU 178 and along with the check CO 4 were sown in RCBD with three replications. Among the four entries TNAU PSU 174 recorded highest yield of 2238 kg/ha (22.04% increase over check CO 4), followed by TNAU PSU 178 (2014 kg/ha). (Table 6).

3. Multi Location Trial (*Kharif 2014*)

In littlemillet MLT, two entries *viz*., TNAU 167, TNAU 170, KR 11-05, TNPsu 171 and TNPs along with the checks CO (Samai) 4, Paiyur 2, CO 2, OLM 203 and JK 8 were sown during *Rabi*, 2013-14 in RCBD with three replications. The data are being complied based on the different locations.

4. Germplasm Evaluation (Kharif 2014)

A total of 50 elite lines of little millet along with one check were evaluated for all the biometrical traits during Kharif 2014. The entries were sown on 03.07.2014 in Augmented design. The entries were sorted based on the quantitative and qualitative characters.

(iii) Prosomillet

1. Advanced Yield Trial (*Summer* 2014)

In prosomillet AYT, four entries viz., TNAU 231, TNAU 234, TNAU 236 and TNAU 238 along with the check were sown Co (PV) 5, during Summer 2014 in RCBD with three replications. Among the four entries TNAU 238 recorded highest yield of 1178 kg/ha (8.97% increased yield compare with check CO(PV) 5.(Table 7)

2. Multi Location Trial (*Summer* 2014)

In prosomillet MLT, three entries *viz*., TNPm 228, TNPm 230, TNPm 151 along with check CO (PV) 5 were sown during *summer 2014* in RCBD with three replications. The entry TNPm 151 recorded the grain yield of 1278 Kg per hectare. The grain yield increased for TNPm 151 over CO (PV) 5 was 14.72. (Table 8).

3. Multi Location Trial (*Kharif* 2014-15)

In prosomillet MLT, two entries *viz*., TNPm 228, TNPm 230 along with check CO (PV) 5 were sown during *Kharif 20*14 in RCBD with three replications. The entries are being evaluated and sorted based on the data from different locations.

9. Salient Findings

In ragi two entries Viz., TNEc 1281, TNEc 1285, two entries viz.,TNAU Psu 176, TNAU Psu 177, in Panivaragu TN Pm 238 has been proposed for MLT during 2015-16

The seed purity in fingermillet varieties *viz*., CO 9, CO 11, CO 12, CO 13 and CO (Ra) 14; Littlemillet varieties *viz*., CO 2, CO 3 and CO (Samai) 4 and Prosomillet varieties *viz.*, CO 4, CO (PV) 5, TNAU 145, TNAU 155 and TNAU 164 were maintained by following progeny row. The elite nucleus seeds were sown during *rabi*, 2013-14 for further multiplication.

Twenty FLD's viz., 10 ha of Ragi (CO15) and 10 ha of Samai (CO4) were conducted for popularizing the High yielding varieties in Dharmapuri district, Pennagaram taluk.

100 kg of Ragi CO 14, 55 kg of Ragi CO 14 and 22 kg of Samai CO 4 breeder seed were produced as per the indent.

10. Remarks of the Technical Director based on the pre-review: Project may be continued

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SMM/2011/002**
2.	**Project Title**	**:**	**To collect, maintain, evaluate, document, use and exchange of germplasm accessions in fingermillet, littlemillet and**
3.	**Name of the Department/Station**	**:**	**Departmetn of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**A.Thanga Hemavathy** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**June 2011 to May 2016**

6. Objectives

To collect, maintain, evaluate, document, use and exchange of germplasm accessions in fingermillet, littlemillet and prosomillet.

7. Brief outline of the work carried out from the project initiation period

A total of 3650 accessions of Ragi, 162 accessions of Samai and 539 accessions of Panivaragu are being maintained at Department of Millets, Tamil Nadu Agricultural University, Coimbatore Selected accessions with useful traits are being used in crossing. The germplasm materials have been given to other research stations and institutes on request for research purposes. All the germplasm accessions had been deposited in Dr.S. Ramaiah Gene Bank, TNAU, Coimbatore for cold storage. High yielding cultures were tested in RRYT, PYT, CYT and AYT to promote them for MLT, ART, OFT and All India Coordinated trials.

In Ragi 852 germplasm lines from NBPGR were raised on 22.09.2014 in Augmented design. All the accessions are being maintained and documented as per the NBPGR descriptors.

8. Work carried out during the review period

Elite germplasm for Ragi

During Kharif 2014, fifty elite lines of finger millet along with two checks were raised and evaluated for all the biometrical traits. The entries were sown on 27.06.2014 in augmented design. The observations were recorded based on the descriptors.

Elite germplasm for Samai

A total of 50 elite lines of little millet along with one check were sown during Kharif 2014 on 03.07.2014 in Augmented design. The observations were recorded based on the descriptors. Among the 50 entries 11 entries were selected based on the single plant yield and Test seed weight.

DUS characterization

For DUS characterization, 12 entries in prosomillet, 17 entries in littlemillet were received from the AICSMIP unit, Bangalore and were sown in the field CBS 4D on 27.06.2014. Visual assessment by single observation of group of plants or parts of plants (VG) and measurement of number of individual plants or parts of plants (MS) were recorded and documented. Among the 17 entries of little millet 8 entries were decumbent type and 6 entries were erect type. Three entries had pigmentation in the whole plant. None of the entries had pubescence. Inflorescence shape varied from diffused (5 entries), arched (9 entries) and globes elliptic (3 entries). Inflorescence type varied as very compact in 3 entries, intermediate type in 9 entries and open type for 5 entries. Among the 17 entries all were actively growing and senescence was not noticed. Among the 17 varieties OLM 217, OLM 208, OLM 203 were recorded as late types.

Among the 12 entries of prosomillet based on the growth habit 4 and 8 entries were recorded as Erect and decumbent type respectively. None of the lines are pigmentated. Sheath and ligule pubescence were recorded for 12 entries. Diffused type inflorescence was noticed in 8 entries and arched type of inflorescence was recorded in 4 entries.

Among the 12 entries seven entries were open type and 2 entries were intermediate compactness and 3 entries were compact type.

9. Salient Findings

Finger millet elite germplasm GE 3457 has longest finger length, and entries GE 2817 and GE 4600 were recorded as lodging tolerance. The entries like PCGL 33 and PCGL 35 were identified as non lodging types these entries may be utilized for the crossing programme and /or yield evaluation.

10. Remarks of the Technical Director based on the pre-review: Project may be continued.

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SMM/2011/003**
2.	**Project Title**	**:**	**Evolution of high yielding varieties in *Varagu, Kudiraivali and Tenai* suitable for different agroclimatic conditions**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. S.Geethanjali** **Assistant Professor (Small millets)**
5.	**Project Period**	**:**	**June 2011to May 2016**

6. Objectives

- To evolve high yielding varieties in *varagu, kudiraivali* and *tenai* suitable for different agroclimatic conditions and to maintain the genetic purity of the released varieties.
- To produce quality nucleus and breeder seeds of the released varieties.

7. Brief outline of the work carried out from the project initiation period

In this project, available variability in the germplasm has been explored, selections from germplasm collection have been done and forwarded for station trials such as RRYT, PYT, CYT, AYT, MLT and ART in foxtail millet, barnyard millet and kodo millet. In addition, mutation using gamma irradiation has also been taken up in kodo millet to create variability and promising entries have been forwarded for varietal trials. Based on these evaluations, in Kodo millet, two entries *viz.,* TNAU86 and TNAU128, and in barnyard millet, TNAU157 have been nominated for evaluation in ART.

8. Work carried out during the review period

Summer, 2014

***Varagu* :** In *Varagu*, six cultures were raised in CYT with two replications along with two checks. The trial was sown on 7.01.2014 in RBD. Among the entries, TNAU 256 was found to be early flowering. TNAU244 and TNAU248 recorded higher yield than the local check Co3 recording 4814 Kg/ha and 3456.79 Kg/ha respectively. These cultures will be once again evaluated in Summer, 2015 for further evaluation.

Tenai: In *Tenai*, nine cultures were raised in CYT with two replications along with checks CO(Te)7 and SiA326. The trial was laid on 23.01.2014 in RBD. Among the entries, TNSi339, TNSi332, TNSi327 and TNSi331 out yielded both the checks. In PYT *tenai*, a total of 29+2 cultures were sown on 23.01.2014 in RBD with three replications. Among the entries, TNAU396 and TNAU386 were observed to be early flowering. The entry TNAU371 recorded the maximum yield of 1979 kg/ha.

***Kudiraivali*:** In PYT, a total of 9 cultures were sown along with check, Co(Kv)2 in RBD with two replications on 23.1.2014. Among the test entries, TNAU197 and TNAU204 out yielded the check Co(Kv)2 by 28.5% and 26.2% respectively. In RRYT, 41 cultures were sown along with check Co(Kv)2 in RBD with two replications on 23.1.2014. Among the test entries evaluated, nine entries (IEC436, SI1, L1, EF97, EF101, TNAU97, IEC550, EF8, EF104) were observed to out yield the local check Co(Kv)2.

***Kharif*, 2014**

Varagu: Three cultures were sown along with one check in MLT in RBD with three replications on 24.07.14. None of the entries were superior to the local check Co3.

Tenai: Three cultures were sown along with one check in MLT in RBD with three replications on 24.07.14. None of the entries were superior to the local check Co(Te)7.

Kudiraivali: Four cultures were sown along with one check in MLT in RBD with three replications on 24.07.14. None of the entries were superior to the local check Co(Kv)2.

Breeder Seed Production The following quantity of breeder seeds was produced and supplied to the indenters.

Crop and variety	Quantity of breeder seed produced (Kg)	Quantity supplied (Kg)
Barnyard millet [CO(Kv)2]	30	4 (remaining to be supplied in 2015)
Kodo millet (CO3)	50	9 (remaining to be supplied in 2015)
Foxtail millet [CO(Te)7]	40	To be supplied in 2015

9. Salient Findings

In Kodo millet, TNAU 86 was also nominated in AICSMIP trials and released at the national level due to its high yield than the existing national checks.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/CBE/PBG/SMM/2011/004**
2.	**Project Title**	**:**	**Maintenance and evaluation of *Varagu, Kudiraivali* and *Tenai* germplasm**
3.	**Name of the Department/Station**	**:**	**Department of Millets** **Centre for Plant Breeding Genetics** **Tamil Nadu Agricultural University** **Coimbatore**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. S.Geethanjali** **Assistant Professor (Small millets)**
5.	**Project Period**	**:**	**June 2011 to May 2016**

6. Objectives

- To maintain, evaluate and document germplasm accessions in *Varagu*, *Kudiraivali* and *Tenai*
- To collect new germplasm and land races from places of endemic occurrence.

7. Brief outline of the work carried out from the project initiation period

In this project, germplasm collected from various places and those received from PC unit, AICSMIP, Bangalore, ICRISAT and NBPGR are being maintained and characterised for descriptor data. In kodo millet, 321 germplasm accessions have been characterised so far. In foxtail millet, a total of 252 lines received from PC unit, were characterized. Ninety five accessions received from ICRISAT, 34 accessions received from NBPGR and 322 germplasm accessions available in the Department of Millets have so far been characterised for 13 quantitative traits in barnyard millet.

8. Work carried out during the review period

Kharif, 2014

A total of 13 *kudiraivali* genotypes and 26 *varagu* genotypes were sown during 3.7.2014 for DUS characterization. Observations were recorded on DUS traits. Fifty elite germplasm lines each of *tenai* and *kudiraivali* supplied by the PC unit (Small millets) were sown along with two and three checks respectively for evaluation and characterization. The trials were sown in augumented design on 3.07.2014. Qualitative and quantitative descriptor data have been recorded. The variability for the quantitative traits recorded are presented in Table 1 and 2. In addition to these, 150 lines each of *tenai* and *kudiraivali* germplasm have been raised in Kharif 2014 for characterization and for selection of elite lines which can be carried forward for testing in row yield trials. The characterization is in progress.

Table 1:Variability in the Foxtail millet Elite Germplasm

S. No	Trait	Minimum	Genotype	Maximum	Genotype	Mean
1	Plant height (cm)	103.9	Ise779	176.2	Ise138	142.4
2	Tillers/ plant	3.0	Ise338K	6.2	Ise1	3.9
3	Flag leaf length (cm)	21.1	SiA2847	35.4	Ise144K	28.0
4	Flag leaf width (cm)	1.2	Ise1332	2.5	Ise1204	2.0
5	Peduncle length (cm)	16.2	Ise1	31.75	Ise144K	23.7
6	Inflorescence length (cm)	13.8	SiA805	23. 6	Ise43K	18.8
7	Days to 50% flowering	40.0	Ise1332	60.0	Ise144K	52.3
8	Test weight (g)	2.3	Ise1057	3.6	Ise54K	2.9
9	Grain yield /plant (g)	13.0	Ise138	34.0	SiA2854	20.5

Table 2: Variability in the Barnyard millet Elite Germplasm

S. No	Trait	Minimum	Genotype	Maximum	Genotype	Mean
1	Plant height (cm)	101.5	ACM332	154.0	TNEf202	132.42
2	Tillers/ plant	2.5	TNEf199	5.3	GECH746	3.62
3	Flag leaf length (cm)	16.3	ACM332	29.5	GECH27	23.87
4	Flag leaf width (cm)	1.4	ACM332	3.3	TNEf199	2.45
5	Peduncle length (cm)	6.0	TNEf199	33.9	ACM296	13.81
6	Inflorescence length (cm)	12.5	ACM332	28.3	TNEf202	19.48
7	Lower raceme length (cm)	1.5	ACM335	6.9	GECH1	2.73
8	Test weight (g)	2.3	ACM334	3.9	GECH351	2.82
9	Grain yield /plant (g)	6.3	GECH18	26.8	GECH758	13.46
10	Days to 50% flowering	40.0	GECH10	67.0	ACM331	49.66

9. Salient Findings: Nil

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**CPBG/PAI/PBG/SMM/2010/001**
2.	**Project Title**	**:**	**Development of high yielding short duration samai genotypes suitable to the rainfed areas of North Western Region of Tamil Nadu**
3.	**Name of the Department/Station**	**:**	**Regional Research Station, Paiyur**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. K.Geetha,** **Professor (PB&G)**
5.	**Project Period**	**:**	**June 2010 to June 2015**

6. Objectives

- To develop high yielding short duration samai genotypes suitable to the rainfed areas of North Western Region of Tamil Nadu.

7. Brief outline of the work carried out from the project initiation period

Germplasm accessions

Eighty three germplasm accessions of samai were raised and are being maintained every year.

Stations trials viz., PYT, AYT, and MLT were raised and evaluated.

AICRIP trials viz., LAVT were raised and evaluated.

8. Work carried out during the review period

a.Advanced cultures:

The promising samai culture KRI 11-05 (pureline selection from DLM 13) has been tested in ART during kharif 2013and its performance was obtained from forty locations in Krishnagiri and Dharmapuri districts. Promoted for 2nd year of testing in MLT during kharif 2015.

b.Germplasm accessions:

Sixty three germplasm accessions of samai available were raised for maintenance. Twenty new collections were added during August 2014.

c. Station trials:

Station trials *viz*., PYT, AYT, MLT & AICRIP trials in samai were evaluated during Kharif 2014.

i.PYT: Among eight entries, MS 1236 recorded the highest grain yield of 2235 kg/ha with the yield increase of 9.7 %.

ii.AYT: Among seven entries evaluated, OLM 203 recorded the highest grain yield.

iii.MLT: Among seven entries evaluated, the entry Samai 06 recorded the highest grain yield of 2095 kg/ha.

d.AICRIP trials

LAVT: Among twenty entries evaluated, LAVT 19 recorded the highest grain yield of 1989 kg/ha and the cultures found promising will be included for testing in station trials during Kharif 2015.

9. Salient Findings:

a.ART: The samai culture KRI 011-05 (pureline selection from DLM 13) was tested in ART under rainfed condition during kharif 2013. The results were obtained from forty locations each in Krishnagiri and Dharmapuri district.

b. MLT: The culture KRI 011-05 (pureline selection from DLM 13) was tested in MLT during kharif 2014. It is promoted for 2^{nd} year of testing in MLT during Kharif 2015.

10. Remarks of the Technical Director based on the pre-review

To test the promising samai culture KRI 011-05 (pureline selection from DLM 13) under ART in more locations and simultaneously to test in MLT (2^{nd} year of testing) during kharif 2015.

1.	**Project Number**	**:**	**CPBG/PAI/PBG/SMM/2011/002**
2.	**Project Title**	**:**	**Evolution of high yielding long duration ragi varieties with resistance to blast suitable for rainfed areas of North western region.**
3.	**Name of the Department/Station**	**:**	**Regional Research Station, Paiyur**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. K.Geetha,** **Professor (PB&G)**
5.	**Project Period**	**:**	**May 2011 to April 2016**

6. Objectives

- To develop high yielding short duration samai genotypes suitable to the rainfed areas of North Western Region of Tamil Nadu

7. Brief outline of the work carried out from the project initiation period

Germplasm accessions:

Twenty germplasm accessions of ragi were raised and are being maintained every year.

Stations trials viz., PYT, AYT, and MLT were raised and evaluated.

AICRIP trials viz., AVTe&m, AVTL &IVT were raised and evaluated.

8. Work carried out during the review period

a.Advanced cultures: The culture KRI 007-01 is proposed for testing in MLT during Kharif 2015. The culture DPI 009-04 is proposed for testing in ART during Kharif 2015 if found promising in MLT.

b.Stations trials *viz*., PYT, AYT, MLT & AICRIP trials viz., AVT e&m, AVT l, & IVT were evaluated during Kharif 2014.

i.PYT: Among five entries evaluated, the entry KRI 014-02 recorded the highest grain yield of 3951 kg/ha followed by KRI 014-03 (3837 kg/ha) and KRI 014-04 (3832 kg/ha), the yield increase being in the order of 5.3, 2.2 and 2.1 % respectively over the check Paiyur 2 which recorded 3753kg/ha.

ii.AYT: Among eight entries evaluated, the entry KRI 007-01 recorded the highest grain yield of 3995 kg/ha followed by KRI 009-04 (3916 kg/ha) and WN 259 (3891 kg/ha), the yield increase being in the order of 4.9, 2.9 and 2.2 % respectively over the check Paiyur 2 which recorded 3807 kg/ha.

iii.MLT: Among six entries evaluated, the entry Ragi 04 recorded the highest grain yield of 3921 kg/ha followed by Ragi 01 (3867 kg/ha) and Ragi 02 (3852 kg/ha).

c. AICRP:

i.AVT e&m: Among fifteen entries evaluated, the entry AVT e&m 7 recorded the highest grain yield of 3902 kg/ha followed by AVT e&m 4 (3799 kg/ha) and AVT e&m 1 (3780 kg/ha), the yield increase being in the order of 8.0, 5.1 and 4.5 % respectively over the check Co 7 which recorded 3614 kg/ha.

ii.AVT L: Among twenty one entries evaluated, the entry AVT L 15 recorded the highest grain yield of 3997 kg/ha followed by AVT L 16 (3991 kg/ha) and AVT L 12 (3972 kg/ha), the yield increase being in the order of 2.4, 2.3 and 1.8 % respectively over the check Paiyur 2 which recorded 3902 kg/ha.

iii.IVT: Among twenty six entries evaluated, the entry IVT 16 recorded the highest grain yield of 3991 kg/ha followed by IVT 17 (3972 kg/ha), IVT 19 (3946 kg/ha) and IVT 8 (3921 kg/ha), the yield increase being in the order of 6.7, 6.2, 5.5 and 4.8 % respectively over the check Paiyur 2 which recorded 3742 kg/ha.

9. Salient Findings:

Two ragi cultures viz., DPI 009-04 (Co 12 X TNAU 946) and KRI 007-01 (Co 12 X GPU 28) were tested in MLT and also in IVT & AVT under AICSMIP during kharif 2014. The ragi culture DPI 009-04 is nominated for testing in ART and KRI 007-01 in MLT during kharif 2015.

10. Remarks of the Technical Director based on the pre-review

To propose ragi cultures viz., DPI 009-04 and KRI 007-01 for testing in ART/MLT during kharif 2015.

1.	**Project Number**	:	**CPBG/PAI/PBG/SMM/2011/003**
2.	**Project Title**	:	**Maintenance and production of nucleus and breeder seeds of rice and millet varieties released from RRS, Paiyur.**
3.	**Name of the Department/Station**	:	**Regional Research Station, Paiyur**
4.	**Name(s) of the Scientist(s) with Designation**	:	**Dr. K.Geetha** **Professor (PB&G)**
5.	**Project Period**	:	**June 2011 to May 2016**

6. Objectives

- To produce nucleus and breeder seeds and supply breeder seeds as per indent without any shortfall.

7. Brief outline of the work carried out from the project initiation period

Produced nucleus and breeder seeds of Paiyur 1 rice, Paiyur 2 ragi and Paiyur 2 samai.

8. Work carried out during the review period

Breeder seed production:

Target for kharif 2014 is 50 kg for Ragi Paiyur 2 breeder seeds. Nursery was raised on 16.06.2014 and transplanted to main field on 07.07.2014 in G3. Monitoring team inspected the crop on 23.09.2014 and 09.10.2014 and certified the crop as true to type. The crop was harvested and threshing completed. A total of 100 kg of breeder seeds were produced and supplied 50 kg to ADA, Kaveripattinam on 25.02.2015.

Nucleus seed production:

Target for kharif 2014 is 2 kg for Ragi Paiyur 2 nucleus seeds. Nursery was raised on 19.06.2014 and transplanted to main field on 16.07.2014. The crop was harvested and threshing completed. A total of 50 kg of nucleus seeds were produced.

Breeder seed supply:

A total of 50 kg of Paiyur 1 paddy breeder seeds produced were supplied to ADA, Kaveripattinam on 03.06.2014.

9. Salient Findings:

Produced and supplied 50 kg of ragi Paiyur 2 breeder seeds to ADA, Kaveripattinam on 25.02.2015 as per indent without any short fall.

10. Remarks of the Technical Director based on the pre-review

To produce nucleus and breeder seeds without any shortfall and supply as per indent.

1.	**Project Number**	**:**	**CPBG/MDU/PBG/SMM/2009/001**
2.	**Project Title**	**:**	**Morphological characterization and identification of superior high yielding Barnyard millet, *Echinochloa frumentaceae* (Roxb.) Link genotypes suited to Southern districts of Tamil Nadu**
3.	**Name of the Department/Station**	**:**	**Plant Breeding and Genetics, AC & RI, Madurai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. C. Vanniarajan, Professor and Head (PB&G)**
5.	**Project Period**	**:**	**October 2009 to September 2012 (Extended up to March 2014). Closure report was sent during October 2014.**

6. Objectives

- Characterizing the germplasm of barnyard millet and cataloguing
- To identify superior high yielding barnyard millet geneotypes studied to Southern districts of Tamil Nadu

7. Brief outline of the work carried out from the project initiation period

Field Experiments

About seventy germplasm representing the collections of ICRISAT and Department of Millets, Tamil Nadu Agricultural University, Coimbatore was raised in unreplicated trail at AC&RI, Madurai on 14.07.2010 and observation was taken for both quantitative and qualitative characters. Studies on variability revealed that number of tillers, length of raceme, basal tillers, inflorescence weight, fodder yield and grain yield exhibited their major contribution to the variability and these characters could be exploited for successful isolation of desirable accessions for the characters concerned.

Clustering of the genotypes based on the quantitative characters was done using Wards method. All the genotypes were grouped into six clusters indicating wide diversity in the experimental material for majority of the characters.

Genetic diversity analysis on the basis of nine qualitative traits, grouped the genotypes into ten different clusters. The principal component analysis provides information on the key characters that contribute maximum to diversity. Among the eleven quantitative characters grain yield, inflorescence weight, number of racemes, basal tillers, fodder yield and days to flowering explained more variation in barnyard millet germplasm. In the present study, it is observed that TNAU 40 had high yielding as well as good in quality parameters *viz.,* fibre, calcium, carbohydrate and iron. This accession can be used for further crop improvement programme.

Forty high yielding accessions were sown in three locations at AC&RI, Madurai, Regional Research Station, Arupukkottai and Agricultural Research Station, Paramakudi on 09.07.11, 03.09.11 and 21.09.11 respectively. These accessions were tested for its stability for seed yield, fodder yield and nutritional components. The genotype ACM 145 exhibited superior mean performance for grain yield, fodder yield and inflorescence weight.

Based on AMMI analysis stable high grain yield per plant, fodder yield, inflorescence weight was recorded by the genotypes ACM 145 and ACM 146 in all the three locations. The high yielding genotypes for specific locations are ACM 10/035, ACM 125, ACM 161 and ACM 145 for AC & RI, Madurai (E1). The genotypes ACM 10/034, ACM 82 had specifically adapted for ARS, Paramakudi (E2) and genotypes ACM 125, ACM 10/035for RRS, Aruppukottai (E3).The genotype ACM 82 had the highest iron and zinc content in all the environments studied. Based on the four season experiments the following two cultures ACM 10-145 and ACM 10-82 were recommended for nomination to multi-location testing. A total of 95 barnyard millet germplasm was raised at Agricultural college and Research Institute, Madurai during January 2012. Among 95 germplasm, 52 germplasm were selected for its superior performance. These 52 germplasm were sown during Kharif and Rabi 2012 along with 13 local landraces in four different environments viz., Madurai, Vaigai Dam (D/S:28.09.2012), E3 – ARS, Paramakudi (D/S: 03.10.2012) and E4 – RRs, Aruppukottai in three replications. The crop was raised in RBD design. The cultures ACM10-082, ACM10-145, ACM10-161, ACM10-110 was raised along with the check Co1 and Co2 as comparative yield trial in a plot size of 2.25 x 3 m in four locations. Based on the four season experiments the following two cultures ACM 10-161 and ACM 10-110 were recommended for nomination to multi-location testing.

The National Elite Germplasm Trial was laid out on 10.07.13.About 53 genotypes were raised for characterization The genotype PCGB 6 recorded the highest grain yield of 36.25 g / plant followed by 31.3 g – PCGB 47

BAVT and ART Trials

During 2010, BAVT Trial has been conducted with 18 entries. In this trial, the entry BAVT 3 had showed better yield performance than the check CO (KV) 2.

The cultures ACM-10-145 and ACM 10-82 were nominated to All India Co-ordinated Small Millets Trial, 2013.

The BAVT genotypes numbering 21 received from AICSMIP, Banglaore were sown on 10.07.13. Biometrical characters were recorded and catalogued. In this experiment the entry BAVT – 20 showed better performance than check.

ART results 2013 - The culture ACM-10-145 will be repeated for one more year ART 2014.MLT results 2013 - The culture ACM-10-161 had recorded 16 % more yield than Co (KV) 2 and the culture ACM-10-082 recorded 9.0 % more yield than Co (KV) 2. The culture ACM-10-161 was retained for MLT –II year 2014-15.The culture ACM-10-082 had been nominated to ART –I year 2014-15.A new culture ACM-12-110 had been nominated for Multilocation trial 2014.

Tissue culture

A study was undertaken for *in vitro* culturing of barnyard millet from callus tissue for salt tolerance. Hypocotyls and leaf explants from surface sterilized seedlings of CO1 and CO2 were inoculated in callus induction medium containing 2,4-D and Kinetin. The genotype CO1 gave the best result in term of early callusing (15 days), callus induction of 80.33% and callus growth when cultured on MS medium supplemented with 2,4-D (0.1 mg/lit) in combination with Kinetin (0.5 mg/lit). The hypocotyls explants showed highest callus induction percent with yellow, brown coloured, smooth and highly friable calli. The results showed that the regeneration potential was more in CO1 than CO2 for 2% NaCl concentration.

Mutation

Seeds of CO1 and CO2 were subjected to ethyl methane sulphonate (20mM, 30mM, 40mM, 50mM, 60mM, 70mM and 80mM) and gamma rays irradiation (20,30,40,50,60 and 70 kr) were sown on 07.07.2010. The results showed that LD_{50} exceeds more than 70 kr for CO1 and CO2. The LD_{50} dose for germination is 70-80 mM for CO1 and CO2. Both the genotypes CO1 and CO2 responded same to both the mutagens used.

Crossing Programme

Crossing was made using CO 1, CO 2, ACM 082, ACM 110, ACM 145, ACM 161 as lines and ACM 11, ACM 12, PMK 331 and PMK as testers in a Line / Tester mating design.

The 10 parents and their 24 cross combinations were subjected to analysis to identify the potential parents and superior cross combinations to evolve breeding strategies for high yield in barnyard millet. Of the 24 cross combinations, Co2 x ACM12 had shown increased grain yield than Co2. The same combination also had shown increased mean for the characters single ear head weight and test weight. It has to be forwarded for further selection.

8. Work carried out during the review period

Project ended during March 2014.

- Two cultures ACM-10-145 and ACM-10-082 are in II year All India Coordinated Trials. Two cultures ACM-10-161 and ACM-12-110 are in I year All India Coordinated Trial.
- The culture ACM-10-145 is in II year ART and the culture ACM-10 082 is in I year ART.
- The culture ACM-10-161 is in II year MLT and the culture ACM-12-110 are in I year MLT.

9. Salient Findings

- Two cultures ACM-10-145 and ACM-10-082 are in II year All India Coordinated Trial. Two cultures ACM-10-161 and ACM-12-110 are in I year All India Coordinated Trial.

- The culture ACM-10-145 is in II year ART and the culture ACM-10 082 is in I year ART.
- The culture ACM-10-161 is in II year MLT and the culture ACM-12-110 are in I year MLT.

10. Remarks of the Technical Director based on the pre-review

The work may be continued by proposing a new project on barnyard millet

1.	**Project Number**	**:**	**CPBG/ADL/PBG/SMM/2014/001**
2.	**Project Title**	**:**	**Evaluation and selection of suitable small millet genotypes for North eastern zone in Tamil Nadu**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmalakumari** **Professor (PB&G)**
5.	**Project Period**	**:**	**July 2014 to June 2017**

6. Objectives

- Characterization and evaluation of ragi and other small millet genotypes for yield and yield attributes.
- Analyzing the suitability of the small millet genotypes for different cropping systems and cropping sequences under moist sub - humid climatic conditions of North eastern zone of Tamil Nadu for their sustained yield potential in the evaluation yield trials, multi location trials, on - farm trials, adaptive research trials and front line demonstrations
- Varietal selection using farmers participatory approach in the advanced yield trials giving due importance to the stake holders' preferences.
- Drawing relevant inferences during their different growth stages for their responses to varied biotic and abiotic stresses

7. Brief outline of the work carried out from the project initiation period:

During *kharif*, 2014 a total of eleven trials viz., five AICSMIP – IVT, AVT I&II, LAVT and PAVT and MLT – ragi, samai, panivaragu, kudiraivali, tenai, varagu and sorghum on were sown for evaluation and to assess their suitability for the North eastern zone in Tamil Nadu.

Farmers Participatory Varietal Selection

Farmers' Participatory Varietal Selection was carried out on 10.10.2014. A total of 41 farmers evaluated 20 advanced cultures of *samai* based on phenotypic performance of the genotypes. The scoring was done for the traits like, plant height, duration, panicle nature, grain type, lodging resistance and overall appearance.

8. Work carried out during the review period: Nil

9. Salient Findings

Among different genotypes collected and evaluated, one fingermillet, three littlemillet, two barnyardmillet and one kodomillet genotypes found to be agronomically good and high yielders. They have been purified and multiplied. These genotypes will be evaluated for their yield performance in comparison to the available high yielding checks.

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	**:**	**CPBG/ADL/PBG/SMM/2014/002**
2.	**Project Title**	**:**	**Genetic improvement of small millets for drought resistance and evolving high yielding varieties suitable for North eastern zone of Tamil Nadu**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmalakumari** **Professor (PB&G)**
5.	**Project Period**	**:**	**July 2014 to June 2017**

6. Objectives

- Elucidation and selection of ideal plant architecture to have maximum photosynthetic efficient canopy and maximum moisture extracting root system in small millets
- Creation of wide variability and multiple recombinant by hybridization utilizing trait specific genotypes
- Screening segregates for drought resistance and high yield and advancing selected genotypes for multi environment evaluation
- Understanding the genetic basis of drought resistance

7. Brief outline of the work carried out from the project initiation period:

Floral biology, time of flower opening, time of anther dehiscence, time of emasculation, time of pollen dusting and duration of pollen viability had been studied for North – eastern zone climatic conditions of Tamil Nadu during *kharif* season for ragi, samai, tenai, panivaragu and kudiraivali crops. In addition, manual emasculation through forced opening of florets by increasing the humidity through palm holding, water spraying and polybag method and removing of anthers using forceps was tried during previous day of crossing in the evening hours. Collection of pollen in the morning and immediately dusting the same on the emasculated flowers and contact method of crossing were followed for effecting pollination. Highly adaptive and good agronomic varieties as female and trait specific genotypes as male parents in ragi, samai and panivaragu the crossing programme was taken up during *kharif,* 2014.

8. Work carried out during the review period: Nil

9. Salient Findings

The rate of success of the crosses in different methods and crops were found to be encouraging. Hand emasculation followed by contact method of pollination had resulted in more number of seed set. Forced opening of the florets using water spray and covering the panicle with the polybag increased the humidity and thereby opening more number of flowers with protruded anthers in ragi which aided in easy removal of anther lobes before bursting. However, keeping the panicles enclosed inside the closed palms in the morning hours made the florets open, protruding the anthers out in samai and panivaragu to ease the removal of anthers in emasculation.

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	**:**	**CPBG/ADL/PBG/SMM/2014/003**
2.	**Project Title**	**:**	**Evaluation of germplasm and evolution of high yielding oat and wheat varieties as alternative crops for winter season**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmalakumari** **Professor (PB&G)**
5.	**Project Period**	**:**	**October 2014 to September 2017**

6. Objectives

- To evaluate the available winter cereal germplasm accessions
- To effect crossing for creating additional variability
- To assess heterosis, maternal effect and genetics of yield attributes
- To evolve suitable oat and wheat varieties for adoption and industrial utilization through value addition.
- To provide an alternate crop during winter to increase the income of the farmers

7. Brief outline of the work carried out from the project initiation period

Twenty wheat initial varietal trial (south zone) entries along with the infector row seeds were sown on 29.11.2015 for evaluation in RCBD with 4 replications. The crop stand is satisfactory and the crop is in maturity phase. The entries, IVT 16, IVT1 and

IVT3 (92 days) were early to mature. The team of scientist from RS, IARI, Wellington visited the trial plot. They also visited the front line demonstration in 3 farmers field at Tiruvannamalai district.

8. Work carried out during the review period: Nil

9. Salient Findings: Too early to report

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	**:**	**CPBG/CTN/PBG/SMM/2010/001**
2.	**Project Title**	**:**	**Barnyard millet Advanced varietal trial (BAVT)**
3.	**Name of the Department/Station**	**:**	**Dry land Agricultural Research Station, Chettinad-630102 Sivaganga District**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Sasikala** **Assistant Professor (PBG)**
5.	**Project Period**	**:**	**March 2010 to Till date**

6. Objectives

- Evaluation of advance breeding lines of barnyard millet suitable for red soils and rainfed condition.

7. Brief outline of the work carried out from the project initiation period

- AVT cultures were evaluated for its yield performance, pest and disease tolerance by comparing with a local check CO(KV)2.
- The cultures BAVT 14, BAVT 12 and BAVT 16 have been found promising and performed better than the check variety CO(KV)2.

8. Work carried out during the review period:

- For *Kharif* 2014, 24 entries were received from AICSMIP, Bangalore
- Field trial was performed in three replications and variety CO2 used as a local check.
- Yield attributing quantitative parameters (*viz*., Days to 50% flowering, days to maturity, plant height, panicle length, Total tillers, productive tillers, grain yield and fodder yield) were recorded.

9. Salient Findings

- The yield performance analysis indicated that three entries viz., BAVT1, BAVT 14 and BAVT 21 significantly performed better over check for grain yield
- Identified entries will be advanced for further evaluation.

10. Remarks of the Technical Director based on the pre-review: There is no remarks

1.	**Project Number**	**:**	**CPBG/CTN/PBG/SMM/2014/002**
2.	**Project Title**	**:**	**Development of Climate resilient Barnyard millet (*Echinochloa frumentaceae*) genotypes through Mutation Breeding**
3.	**Name of the Department/Station**	**:**	**Dry land Agricultural Research Station, Chettinad-630102 Sivaganga District**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.R.Sasikala** **Assistant Professor (PBG)**
5.	**Project Period**	**:**	**November 2014 to October 2017**

6. Objectives

- To develop a large mutant population in barnyard millet
- To identify extra early maturing, high yielding mutants of barnyard millet adapted to changing climatic conditions
- To identify and characterize barnyard millet mutant lines adapted to high temperature conditions

7. Brief outline of the work carried out from the project initiation period

- Barnyard millet CO (KV) 2 has been chosen for mutation treatment. Germination of CO2 seeds are around 98 percentage
- Seeds were treated with EMS @ 0.2%, 0.4%, 0.6%, 0.8%, 1.0% and control for fixing LD_{50} values.

8. Work carried out during the review period: This proposal was approved only during November 2014.

9. Salient Findings: LD_{50} value calculated for mutation treatment of barnyard millet (CO2) seed is 0.51% of EMS.

10. Remarks of the Technical Director based on the pre-review: There is no remarks

AICRP Projects

1.	**Project Number**	**:**	**AICRIP/PBG/CBE/SOR/006:**
2.	**Project Title**	**:**	**Evaluation of AICSIP entries.**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. B. Selvi, Professor (PBG)** **Dr.R.Latha, Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**June 2013 to May 2018**

6. Objectives

- Evaluation of sorghum trials on grain sorghum, forage sorghum, Sweet sorghum, pathology and agronomy as per the decision taken in the Annual meeting/Workshop conducted every year
- Raising entomology trials to facilitate entomologist from Kovipatti centre to evaluate

7. Brief outline of the work carried out from the project initiation period

It is a continoius and routine programme in which AICSIP trials allotted are evaluated and the data is uploaded

8. Work carried out during the review period

a. Evaluation of AICSIP trials

The following trials were evaluated during this kharif season and the data were uploaded.

Sl. No	Name of the Trial	No. of Entries	Replications	No. of Rows
Grain Sorghum				
1	IVT-GS	22	3	6
2	IHT-GS	26	3	6
3	AVT-GS	8	3	6
4	AHT-GS	9	3	6
5	IIHT	17	3	4
Forage Sorghum and Sweet Sorghum				
1	IAVHT- MC	12	3	10
2	IAVHT- SC	20	3	10
3	IAVHT- SS	18	3	6
4	SYT	8	3	6
Entomology				
1	IVT-GS	27	3	1
2	IHT-GS	31	3	1
3	AVT-GS	13	3	1
4	AHT-GS	14	3	1
5	IAVHT- MC	17	3	1
6	IAVHT- SC	25	3	1
7	IAVHT- SS	23	3	1
8	Elite DP –SF&SB	35	3	1
9	DSR F9-F10	45	3	1

Pathology				
1	IVT-GS	29	3	1
2	IHT-GS	33	3	1
3	AVT-GS	15	3	1
4	AHT-GS	16	3	1
5	IAVHT- MC	18	3	1
6	IAVHT- SC	27	3	1
Agronomy				
1	Trial1KD-Agron	7	3	6
2	Trial 3	2	3	6
3	Trial 4	1	3	6
4	Trial 5	1	3	6

9. Salient findings

The promising entries viz., SPV2164, SPV2178, SPV2177 and SPV2175 were utilized in breeding programme**.**

The promising entry SPV 2242 (TNFS 209) of IAVHT –multicut forage sorghum has been advanced to AVT –II year during kharif 2015.

10. Remarks of the Technical Director based on the pre-review : Nil

1.	**Project Number**	**:**	**AICRP/PBG/KPT/SOR/007**
2.	**Project Title**	**:**	**Evolution of high yielding, drought tolerant, dual purpose sorghum hybrids and varieties suitable for southern districts of Tamil Nadu and evaluation of All India Co ordinate trials.**
3.	**Name of the Department/Station**	**:**	**Agricultural Research Station, Kovilpatti**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. N. Malini** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**October 2012 to September 2015**

6. Objectives

- To test All India Co-ordinated materials for yield, fodder and other quantitative characters and the best genotypes will be isolated and test for their suitability to local agro climatic condition in different stages of the trials and to screen for drought tolerant and isolating them.

- The best one will be released as new variety/hybrids for general cultivation in southern districts of Tamil Nadu.
- To screen sorghum entries/ varieties/ hybrids for their resistance to shoot fly, stem borer, earhead bug and midge.
- Developing IPM modules for the control of sorghum pests.
- Conducting Front-Line Demonstrations in sorghum.

7. Brief outline of the work carried out from the project initiation period

Grain sorghum:

Elite lines identified during rabi 2013 were crossed with base parents viz., K 8, CSV 17 and TKSV 0809 and the F1 seeds were collected for further evaluation during rabi 2015.

SC Forage sorghum:

Elite lines of forage types identified during rabi 2013 crossed with base parents viz., K 11, CO (S) 29, CSV 21F during rabi 2014 and the F1 seeds were collected for further evaluation during rabi 2015.

Fifteen chencholam germplasm materials were collected from Dharmapuri, Madurai and Tuticorin districts during Jan 2015 and early will be evaluated during rabi 2015-16.

Early segregating generation viz., F2, F3, F4, F5 and F6 were evaluated and single plant selection were made based on grain yield and fodder quality traits evaluated.

8. Work carried out during the review period

The following trails and segregating materials were raised during Rabi 2014 and the details are as follows.

S. No.	Name of the trials	Entries	Checks used	Superior entries
I. Rainfed trials				
State Trials:				
1.	Station Trial - Grain Sorghum	21	5	TKSV 1042, TKSV 1036, TKSV 1045
2.	Station Trial – SC Forage Sorghum	11	4	TKFS 11109, TKFS 1199, TKFS 1047
3.	Preliminary yield Trial-I- Grain Sorghum	7	5	TKSV 1158 TKSV 1161 TKSV 1146 TKSV 1103

4.	Preliminary yield Trial-II- Grain Sorghum	15	5	TKSV 1310 TKSV 1311 TKSV 1306 TKSV 1308
5.	Preliminary yield Trial-I- SC Forage Sorghum	11	4	TKFS 1050 TKFS 11107 TKFS 11102
6.	Preliminary yield Trial-II - SC Forage Sorghum	4	3	TKFS 1302 TKFS 1301
7.	Multilocation Trial- Grain Sorghum – (Univ. Trial)	9	1	MLT-G-02-08-14, MLT-G-02-04-14, MLT-G-02-07-14
8.	Multilocation Trial-Sweet Sorghum (Univ. Trial)	4	2	SS-1414, SS-1415 and SS-1413
9.	Multilocation Trial-SC forage (Univ. Trial)	5	2	FS-1407 and FS-1404
10.	**Segregating Population:**			
	F_2	104		66
	F_3	108		40
	F_4	17		9
	F_5	8		4
	F_6	7		Bulk

AICSIP Trials (Late Kharif)

Sl. No.	Name of the Trial	No. of entries evaluated	Checks used	Superior entries
1.	IAVHT - Grain Sorghum	20	-	6052, 6102, 6062, 6012

9. Salient Findings

A high yielding dual purpose sorghum culture TKSV 0809 was developed from this station released as **K12 sorghum variety.** It has recorded an average grain yield of 3000 kg/ ha and registering 16.9% and 24.7% increase over the checks K 8 and CSV 17 respectively also recorded dry fodder yield of 11.5 tonne / ha which is 34.2 %increase yield over K8 sorghum variety.

A high yielding dual purpose sorghum culture TKSV 0902 identified from the Advanced yield trial is being tested in ART for the first year testing for the winter rainfed vertisol tracts of Tamil Nadu. The results are awaited.

A high yielding grain sorghum cultures TKSV 1029 is being proposed for MLT to test in the winter rainfed vertisol tracts of Tamil Nadu. The yield increase over the check is very low (10%)

10. Remarks of the Technical Director based on the pre-review

- The All India Co-ordinated Research Trial works carried out in the name of University Research Sub-Project may be merged and bringing under newly assigned AICRP number by the Directorate of Research.
- Efforts may be taken to develop chencholam with drought parameters.
- The two years MLT data in grain sorghum variety may be consolidated and proposed for ART.

1.	**Project Number**	**:**	**Voluntary centre- F7(9) 85 – Oilseed 30/1/87 of ICAR**
2.	**Project Title**	**:**	**AICSIP on Sorghum**
3.	**Name of the Department/Station**	**:**	**Agricultural Research Station** **Bhavanisagar – 638 451.**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. S. Devanand** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**From 2007- Till Date**

6. Objectives

Evaluation of sorghum genotypes sponsored by Directorate of Sorghum Research.

7. Brief outline of the work carried out from the project initiation period

Sorghum entries AHT and AVT were received during Kharif from 2007 to till date was evaluated as voluntary centre and the datas were submitted to Scientist in charge of Directorate of Sorghum Research, Hyderabad.

8. Work carried out during the review period

Two trials viz., AHT-GS and AVT-GS with seed materials received through Coimbatore centers was conducted and reported.

9. Salient Findings

- Kharif AHT 14 – 1007, 1051 and 1104 yielded more than 4 kg per plot.
- Kharif AVT 14 – 2056, 2102, 2103 and 22057 yielded more than 2 kg per plot.

10. Remarks of the Technical Director based on the pre-review: Nil

AICSIP-AHT-GS-KHARIF 2014													
ExpID	**Location**	**Year**	**Season**	**Block**	**Treat -ment**	**Plant stand after thinning (No.)**	**Days to 50% flowering (No.)**	**Plant Height (Cm)**	**Days to Maturity (No.)**	**Plant stand after harvest (No.)**	**Grain Yield/ Plot(Kg)**	**Dry Fodder Yield/ plot(Kg)**	**100 grain weight (Grams)**
292	Bhavanisagar	2014	Kharif	1	1007	128	71	131	101	118	4.92	10.85	3.5
292	Bhavanisagar	2014	Kharif	1	1006	112	72	110	95	102	3.45	8.15	3.6
292	Bhavanisagar	2014	Kharif	1	1002	98	67	105	89	102	3.68	8.12	3.6
292	Bhavanisagar	2014	Kharif	1	1005	132	73	135	118	112	3.5	10.12	3
292	Bhavanisagar	2014	Kharif	1	1004	115	72	162	96	101	3.25	9.5	3.5
292	Bhavanisagar	2014	Kharif	1	1001	128	74	124	102	112	3.84	10.42	3.6
292	Bhavanisagar	2014	Kharif	1	1009	seed not received							
292	Bhavanisagar	2014	Kharif	1	1003	116	71	142	108	116	3.54	9.1	3.2
292	Bhavanisagar	2014	Kharif	1	1008	102	72	175	102	98	3.12	8.06	3.8
292	Bhavanisagar	2014	Kharif	2	1054	114	70	142	102	104	3.65	9.23	3.85
292	Bhavanisagar	2014	Kharif	2	1051	118	71	131	108	104	4.54	11.65	3.6
292	Bhavanisagar	2014	Kharif	2	1056	108	62	86	95	100	3.12	10.3	3.8

292	Bhavanisagar	2014	Kharif	2	1057	95	72	115	100	92	3.75	8.1	3.6
292	Bhavanisagar	2014	Kharif	2	1058	124	75	173	101	110	5.1	7.1	4.2
292	Bhavanisagar	2014	Kharif	2	1055	119	73	112	105	106	3.45	8.15	3.8
292	Bhavanisagar	2014	Kharif	2	1053	125	74	102	101	112	3.85	11.55	4.1
292	Bhavanisagar	2014	Kharif	2	1059	seed not received							
292	Bhavanisagar	2014	Kharif	2	1052	118	71	131	106	107	3.95	10.63	3.4
292	Bhavanisagar	2014	Kharif	3	1107	135	92	99	98	112	3.41	10.5	3.5
292	Bhavanisagar	2014	Kharif	3	1106	112	73	128	107	100	3.58	10.1	3.7
292	Bhavanisagar	2014	Kharif	3	1108	102	72	175	102	92	3.17	8.6	3.8
292	Bhavanisagar	2014	Kharif	3	1101	128	74	124	102	112	3.84	10.42	3.6
292	Bhavanisagar	2014	Kharif	3	1104	128	71	126	97	117	4.65	7.42	3.7
292	Bhavanisagar	2014	Kharif	3	1109	seed not received							
292	Bhavanisagar	2014	Kharif	3	1105	110	72	128	95	99	3.85	8.1	4.1
292	Bhavanisagar	2014	Kharif	3	1102	112	74	163	102	98	3.45	7.86	3.7
292	Bhavanisagar	2014	Kharif	3	1103	118	70	146	100	98	3.62	9.4	3.2

AICSIP-AVT-GS-KHARIF 2014													
ExpID	**Location**	**Year**	**Season**	**Block**	**Treatment**	**Plant stand after thinning (No.)**	**Days to 50% flowering (No.)**	**Plant Height (Cm)**	**Days to Maturity (No.)**	**Plant stand after harvest (No.)**	**Grain Yield/Plot (Kg)**	**Dry Fodder Yield/plot (Kg)**	**100 grain weight (Grams)**
293	Bhavanisagar	2014	Kharif	1	2004	112	71	132	106	104	2.18	5.11	2.4
293	Bhavanisagar	2014	Kharif	1	2002	112	69	100	105	86	2.27	3.66	3
293	Bhavanisagar	2014	Kharif	1	2001	111	75	131	112	112	1.09	4.28	3.6
293	Bhavanisagar	2014	Kharif	1	2008	seed not received							
293	Bhavanisagar	2014	Kharif	1	2006	101	72	118	110	92	1.1	3.76	2.1
293	Bhavanisagar	2014	Kharif	1	2007	106	70	85	112	96	1.69	6.1	2.6
293	Bhavanisagar	2014	Kharif	1	2003	115	68	150	106	104	1.73	4.26	2.4
293	Bhavanisagar	2014	Kharif	2	2052	108	70	132	112	95	1.1	6.19	3
293	Bhavanisagar	2014	Kharif	2	2051	116	69	181	109	110	1.99	5.12	3.1
293	Bhavanisagar	2014	Kharif	2	2054	118	72	146	105	105	2.45	6.5	3
293	Bhavanisagar	2014	Kharif	2	2053	115	71	81	106	117	2	6.75	3.1
293	Bhavanisagar	2014	Kharif	2	2056	131	71	124	111	116	2.56	4.2	3.2
293	Bhavanisagar	2014	Kharif	2	2055	119	69	130	106	98	2.48	7.1	3.4

293	Bhavanisagar	2014	Kharif	2	2058	seed not received							
293	Bhavanisagar	2014	Kharif	3	2101	108	70	126	111	108	2.47	6.23	3.7
293	Bhavanisagar	2014	Kharif	3	2104	117	69	162	111	101	2.24	4.85	2.9
293	Bhavanisagar	2014	Kharif	3	2102	118	68	132	106	102	2.5	3.92	3.2
293	Bhavanisagar	2014	Kharif	3	2107	117	69	141	111	110	1.12	4.55	3.5
293	Bhavanisagar	2014	Kharif	3	2108	seed not received							
293	Bhavanisagar	2014	Kharif	3	2105	125	70	80	107	102	2.3	5.52	2.1
293	Bhavanisagar	2014	Kharif	3	2106	116	72	131	111	98	2.18	5.92	2.6
293	Bhavanisagar	2014	Kharif	3	2103	107	71	95	112	99	2.54	5.55	3.2
293	Bhavanisagar	2014	Kharif	3	2005	111	70	140	102	106	1.62	4.1	2.2
293	Bhavanisagar	2014	Kharif	3	2057	113	68	119	110	107	2.66	6.8	3.3

1.	**Project Number**	**:**	**AICRP /PBG/CBE/PEM/009**
2.	**Project Title**	**:**	**Evaluation of AICRP trials on pearl millet**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. Sumthi** **Professor (PB&G)**
5.	**Project Period**	**:**	**2012 to 2017**

6. Objectives

- Evaluation of advanced cultures received from AICRP on pearl millet under different advanced trials
- Selection of desirable male sterile and maintainer lines, restorer lines, trait specific inbred lines from the AICRP trials to utilize in the university breeding programme.

7. Brief outline of the work carried out from the project initiation period

Every year an average of 15 to 18 AICRP trials on pearl millet are being taken up regularly during both *kharif* and summer seasons. The observations were recorded as per the data sheets given and the filled in data sheets were sent to project Co-ordinator, AICRP on pearl Millet, ARS, Mandor, Jodhpur. Two promising hybrids in each year and two composites were proposed to test under AICRP trials using both *kharif* and summer trials in different zones.. The inbreds were selected from the trait specific inbred line trials *viz*., high tillering, compact earhead, thick panicle, stay green type inbred line trials. Around 120 trait specific lines were selected from the AICRP trials and utilized in the different university breeding programme.

8. Work carried out during the review period

AICPMIP TRIALS

Summer 2014

One summer hybrid trial and one high forage population trial was conductd during summer 2014. The trials were conducted successfully, the data were recorded in the given data sheets and the filled in data sheets were sent to the Project Coordinator, for compilation.

Summer hybrid trial

Sl.No	Name of the trial	No.of entries	Best performing entries	Grain yield (kg/ha)	Name of the Check	Percentage over the check
1.	SHT	24	NMH -82	4620	TNAU cumbu hybrid Co 9 (4535 Kg/ha)	2
			86M15	4521		-
			86M16	4106		-
			86M13	3997		-
			GHB1134	3654		-
			LG12.81	3132		-

High forage population trial

This trial was conducted with 23 entries and three replication. The observation on green fodder yield, dry fodder yield, plant height, stem weight and leaf weight were recorded. The cutting was done at three stages *i.e.*, 50^{th}, 80^{th} and 110^{th} days after sowing. Among the 23 genotypes tested, the genotype 6, gave higher green and dry fodder yield followed by 2, 17, 13 and 14.

***Kharif* 2014**

AICPMIP Trials

A total of seven AICPMIP trials were allotted to this centre. All the trials were raised during *kharif* 2014 season. Selfing of all the entries on AICPMIP trials were taken up for the assessment of seed set percentage on selfing. The observations were recorded as per the data sheets given. The filled in data sheets for all the seven trials were sent to the Project Co-ordinator, AICPMIP, Mandor, Jodhpur. The best performing entries in each trial was furnished below.

Sl. No.	Name of the trial	No. of entries	Best performing entries	Grain yield kg/ha	Name of check	Percentage over check
1.	IHT (M)	32	206	5620	TNAU cumbu Co 9 (5277kg/ha)	6
			208	5317		1
			221	5260		-
			229	5209		-
2.	IHT (L)	38	329	7203	TNAU cumbu Co 9 (5277kg/ha)	28
			321	7117		26
			317	6849		23
			303	6306		16

3.	AHT (M)	7	403 402 405	4239 4187 4111	TNAU cumbu Co 9 (4181kg/ha)	4 - -
4.	AHT (L)	18	515 507 503 505	5790 5661 5646 5633	TNAU cumbu Co 9 (4181kg/ha)	28 26 26 26
5.	PT	18	601 607 610 614	4387 4002 3347 3262	Co (Cu) 9 4255kg/ha	3 - - -
6.	RHVT	10	B2301 GHB Kaveri Super boss Pratap	4008 3711 3733 3498	-	-
7.	IHT (Fe & Zn)	21	719 712 710 704	4457 4249 3457 3493	-	-

ICAR -ICRISAT Partnership trial

A total of nine trials were conducted successfully. The filled in data sheets for all the nine trials were sent to the Project Co-ordinator, AICPMIP, Mandor, Jodhpur. The performance of the promising entries in all the nine trials is furnished below:

S.No.	Name of the trial	No. of entries	Promising entry		Agronomic score	Rust	No. of entries selected
			Pl. no	Tr.no			
1	Elite Inbred High Fe Joint Bio-fortification Trial	40	106 122 123 140	6 2 23 40	4 5 4 4	-	21

2	Early maturing Restorer Trial	50	125 132 133	25 32 33	4 4 4	-	23
3	High Fe Inbred Trial	40	101 114 137 134	33 26 8 14	4 4 4 4	-	20
4	Thick Panicle B line trial	24	112 120	12 20	4 4	-	13
5	Long panicle restorer trial	20	105 106 107 119	5 6 7 19	4 4 4 4	-	8
6.	Early maturing B line trial	22	106 107 109 111 121	6 7 9 11 21	4 4 4 4 4	-	10

SHT 2015

The summer hybrid trial was raised during the month of February 2015 with 22 entries in three replication in the field No. MBS 3B. The crop is at vegetative stage.

Performance of TNAU entries in AICPMIP trials 2013-2014

Entries	**AICPMIP code**	**Name of the trial**	**Grain yield(kg/ha)**		**Duration**		**Downy mildew**	
			A Zone	**B Zone**	**A zone**	**B zone**	**A zone**	**B Zone**
TNBH 08804	MH 1959	IHT(L)	2330	2238	82	85	2.6	4.1
TNBH 10885	MH 1960	IHT(L)	2260	2156	80	83	7.2	2.4
TNBH 10889	MSH 279	SHT	-	4627	-	87	-	-

Entries proposed and tested under SHT 2014

Entries	Parentage
TNBH 10885	ICMA 92777 x PT 6069

Entries proposed and tested under IHT (L) A and IHT (L) B 2014-15

Entries	Parentage
TNBH 12 -1255	ICMA 02777x PT 6303
TNBH 12-1235	ICMA 01666 x PT 6303

Entries to be proposed for IHT B during 2015-16

Entries	Parentage
TNBH 12 -1316	ICMA 99555 x PT 6300
TNBH 12-1214	ICMA 00444 x PT 6300

Entries proposed for SHT during 2015

Entries	Parentage
TNBH 12 -1255	ICMA 02777x PT 6303

Front Line demonstration

A total of 10 FLDs (10 hactares) were allotted to Coimbatore centre. Twenty five demonstrations on popularization of variety CO (cu) 9 and the hybrid TNAU cumbu hybrid Co 9 along with improved practices were conducted during *kharif* 2014 season at different locations from Coimbatore, Theni, Karur, Dharmapuri, Pudukkottai, Salem and Namakkal blocks. Each demonstration includes 0.4 ha. Out of twenty five demonstrations, 24 demonstrations were conducted successfully. The results revealed that the variety CO (cu) 9 with improved practices gave 27 % to 42% increased yield over the local variety with farmers practice and the hybrid TNAU cumbu hybrid Co 9 with improved crop management practices gave 42 % to 53% increased yield over the local variety with farmers practice. High net return of 33% was recorded by the hybrid TNAU cumbu hybrid Co 9. In general the hybrid TNAU cumbu hybrid Co 9 performed better than the variety CO (cu) 9.

9. Salient Findings

A total of seven AICPMIP trials and six ICAR – ICRISAT trials were raised during *kharif* 2014 season. One trial on summer hybrids and one trial on high forage population trial were raised during summer 2014. The observations were recorded as per the data sheets given. The filled in data sheets for all the trials were sent to the Project Co-ordinator, AICPMIP, Mandor, Jodhpur. One hybrid for SHT and two hybrids for IHT late and medium were proposed and tested under AICPMIP trials during this year.

A total of 10 FLDs (10 hactares) with twenty five demonstrations on popularization of variety CO (cu) 9 and the hybrid TNAU cumbu hybrid Co 9 along with improved practices were conducted during *kharif* 2014 season at different locations from Coimbatore, Theni, Karur, Dharmapuri, Pudukkottai, Salem and Namakkal blocks. The results revealed that the variety CO (cu) 9 with improved practices gave 27 % to 42%

increased yield over the local variety with farmers practice and the hybrid TNAU cumbu hybrid Co 9 with improved crop management practices gave 42 % to 53% increased yield over the local variety with farmers practice. High net return of 33% was recorded by the hybrid TNAU cumbu hybrid Co 9.

10. Remarks of the Technical Director based on the pre-review: Nil

The selected trait specific inbred lines may utilized in the inbred line development programme.

1.	**Project Number**	**:**	**AICRP/PBG/CBE/MAZ/004**
2.	**Project Title**	**:**	**Evaluation of hybrids and Composites from All India Co-ordinated Research Project on Maize and Development of new inbred lines.**
3.	**Name of the Department/Station**	**:**	**Department of Millets, Coimbatore**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.G.Nallathambi** **Professor (PB&G)**
5.	**Project Period**	**:**	**June 2013 to May 2018**

6. Objectives

- To evaluate maize hybrids and composites obtained through AICRP-Maize trials
- To develop new inbred lines from different heterotic populations
- To popularize National released hybrids *viz*., CMH 08-282 (Co6), CMH 08-287, CMH 08-292, CMH08-350 and CMH08-433 by increase of Nucleus seed, Breeder seed andTruthful labelled seed.
- To demonstrate promising technologies like cultivation of Single cross hybrids, Baby corn and QPM under FLD on maize (ICAR) in farmers holdings.

7. Brief outline of the work carried out from the project initiation period

In Kharif 2013, 275 entries in different maturity groups studied in 12 trials and a total of 24 best performing entries were identified as high yielding.

A total of 168 selfed progenies from S2 to S 6 were maintained by selfing and sibbing (kharif2013) and 468 selfed single plants were selected based on the high test weight, stay green, reduced ASI, good grain filling and resistance to SDM.

The grain yield of Co6 ranged from 7300 (Ariyalur) to 8250 kg/ha (Tiruchi) among 200 FLDs conducted in 13 districts of Tamil Nadu during kharif 2013. The average yield of Co6 in 200 FLDs were 7920 kg/ha and the difference between FLD average and state average was 1878 kg/ha**.**

For popularization of maize hybrid Co6, a total of 2440 Kg hybrid seeds of Co6 were produced and distributed to cover an area of 305 acres in Tamil Nadu under FLD programme and 32 acres (256 kg) for the states of Gujarat and Maharashtra during Kharif and Rabi '2013.

Fifty kg nucleus seeds of state and national released hybrids of parental lines *viz.,* UMI 1200, UMI 1230, UM1210, UMI 1220, UMI 1201, UMI 1205, and UMI 1230-1 were produced for Dus testing and breeder seed increase.

Ten 10 kg nucleus seeds of Co6 parents and 1.5 Kg of Co1 were supplied to ARS, Bavanisagar.

8. Work carried out during the review period

A.Rabi 2013-14:

a. Co-ordinated Breeding trials:

During Rabi 2013-14, a total of 118 entries in different maturity groups studied in 7 trials, 14 best performing high yielding entries *viz*., 15, 16 (T.1), 6, 7 (T.2), 2, 5 (T 3), 12, 15 (T.4), 7, 3 (T.5, 6), 4, 9 (T.7,8) and 2, 1 (QPM1-2) were identified in different maturity groups with yield range of 7218 to 11671 Kg/ha.for further breeding programme.

b.Segregating generation:

A total of 468 selfed progenies from S3 to S7 raised during Rabi 2013-14 were maintained by selfing and sibbing. A total of 326 selfed single plants were selected based on the high test weight, stay green, reduced ASI, good grain filling and resistance to SDM for further study of selections.

c. FLD Maize - Rabi 2013-14:

Two hundred FLDs were organized involving maize hybrid Co6 in 12 districts of Tamil Nadu. The grain yield ranged from 6645 (Erode) to 8925 Kg/ha (Coimbatore). The average yield of single cross maize hybrid Co6 in 200 FLDs were 7888 kg/ha during Rabi 2013-14 and the difference between FLD average and state average was 1846 kg/ha.

d. Hybrid Seed Production:

A total quantity of 1461 kg hybrid seeds of Co6 was produced from CBS farm and farmers holdings during summer '2014'.

B.Kharif 2014:

e. Co-ordinated Breeding trials:

In Kharif 2014, 400 entries in different maturity group's *viz.*, late, medium, early, extra early, sweet corn, Baby corn, Pop corn and QPM were evaluated and studied in 12 trials. Among the trial entries, 18 best performing entries (T.61 (85, 41), T.62 (102, 7), T.63 (4, 19), T.64 (10,12), T.65- 69 (4,3), T.66 (2, 4), T.67-71(6, 3), T.68 (3, 4) and QPM 1-2 (14,13) with yield range of 7909 to 13902 kg/ha were identified as high yielding in different maturity groups for further breeding programme.

f. Segregating generation:

A total of 326 selfed progenies from S4 to S8 raised during Kharif2014 were maintained by selfing and sibbing. Further a total of 248 selfed single plants including pure lines were selected based on high test weight, stay green, reduced ASI, good grain filling and resistance to SDM for further study of selections.

g. Front Line /TSP on Maize Demonstration:

During Kharif 2014, 10 ha of FLDs were organized involving 25 farmers under rainfed condition in Perambalur district. The single cross maize hybrid Co6 was used along with improved package of practices for demonstration. The inputs provided under the scheme were 8 Kg of Co6 maize hybrid and other field inputs *viz*., Atrazine and redomill limited to the grant amount per acre. The grain yield ranged from 5250 to 8125 Kg/ha and the average yield of 10 ha. demonstrations were found to be 6843 Kg/ha.

In TSP- maize demonstrations, 600 kg hybrid seeds of Co6 were distributed directly to 100 tribal farmers @ 6 Kg/ac for covering 100 acres in Thalavadi areas of Erode district. Further 5 tons of fertilizres @ 50 kg/farmers were also distributed to 100 tribal farmers. The harvested green cobs ranged from 13.5 to 18.6 tones/ha and utilized as such for consumption in majority of tribal farmers.

h.Nucleus and parental Seed production :

Seven kg nucleus seed of parental lines (10 Kg, UMI 1200 and 7 Kg, UMI 1230) of Co6 hybrid was supplied to ARS, Bhavanisagar for raising breeder seed production during 2014.

Eighty eight Kg Female parent UMI 1200 and 54 Kg male parent UMI 1230 of Co6 and 8 kg Female parent UMI 1201 and 10 Kg Male parent UMI 1230 of CoH(M) 8 hybrids were supplied to State Seed Farms, Pongalur, ARS, Vaigaidam and ARS, Virinjipuram for hybrid seed production of Co6 and CoH(M) 8. For hybrid seed production of Co6 and Co7, a total of 550 Kg parental seeds of female (350 Kg) and male (200 kg) parents (TFL seeds) were produced during Kharif 2014.

i. Hybrid seed production:

For popularization of maize hybrids at state and national level during 2014, a total of 2114 Kg hybrid seeds of Co6 (1951 Kg), Co7 (15 kg), Co8 (96 Kg), Co 9 (24 Kg), Co10 (19 kg) and CMH08-156 (9kg) were produced and distributed through FLD/TSP farmers, demonstrations and sales.

C.RABI 2014-15

j. Co-ordinate Breeding trials:

A total of 144 entries consisting of 8 trials in different maturity group's *viz*., late, medium, early and QPM raised during Dec. 2014 to Jan. 2015 are in milky to cob maturity stages.

k.Front line demonstration - Maize:

During Rabi 2014-15, 10 ha of FLDs were conducted involving 25 farmers under rainfed condition in Dindugal district. The single cross maize hybrid Co6 was used along with inproved package of practices for demonstration. The inputs provided under the scheme were 8 kg of Co6 maize hybrid and other field inputs *viz*., Atrazine and redomill limited to the grant amount per acre. The crop is in grain maturity stage.

l. Production of Nucleus seeds:

The parental lines of national released maize hybrids *viz*., Co6 (CMH08-282), Co H(M)7, CoH(M)8,CoH(M)9, CoH(M) 10 , Co H(M) 11 and Co H(M) 12 sown during Dec.2014 are in cob formation to maturity phases. Selfing and sib pollination were undertaken for maintenance of genetic purity.

m. Hybrid seed Production/ distribution:

A total quantity of 671 Kg processed hybrid seeds Co6 (351 kg) and Co8 (320 Kg) were obtained from one acre hybrid seed production undertaken in farmers holdings at Passur area . For CoH(M)7 hybrid seed production, 0.5 ac male (UMI 1210) and female (UMI1220) parents of CoH (M)7 sown in isolation on 8 and 12th January 2015 is in cob formation stage.

9. Salient Findings

i. In Rabi 13-14, 118 entries studied in 7 trials, 14 entries were identified as high yielding in different maturity groups with yield range of 7218 to 11671 Kg/ha.

ii. The average yield of maize hybrid Co6 in 200 FLDs were 7888 kg/ha during Rabi 13-14 and the difference between FLD average and state average was 1846 kg/ha.

iii. A total of 326 selfed single plants (S 3- S7) were selected based on the high test weight, stay green, reduced ASI, good grain filling and resistance to SDM.

iv. In Kharif 2014, 400 entries studied in 12 trials, 18 entries were identified as high yielding in different maturity groups with yield range of 7909 to 13902 kg/ha .

v. The grain yield of Co6 ranged from 5250 to 8125 Kg/ha in 10 ha FLDs organized at Perambalur district during Kharif 2014 and the average yield was 6843 Kg/ha.

vi. In TSP- maize demonstrations, harvested green cobs ranged from 13.5 to 18.6 tones/ha and utilized as such for consumption in majority of the tribal farmers in Erode district.

vii. For hybrid seed production of Co6 and Co7, 550 Kg parental seeds of female and male parents were produced during Kharif 2014

viii. For popularization of maize hybrids at state and national level (2014), 2114 Kg hybrid seeds of Co6 (1951 Kg), Co7 (15 kg), Co8 (96 Kg), Co 9 (24 Kg), Co10 (19 kg) and CMH 08-156 (9kg) were distributed during 2014-15 through FLD/TSP farmers, demonstrations and sales.

ix. Seventeen kg nucleus seed of parental lines of Co6 hybrid was supplied to ARS, Bhavanisagar for raising breeder seed production.

x. One hundred and forty two Kg parental seeds of Co6 hybrid and 18 kg parental seeds of CoH(M)8 hybrid were distributed to State Seed Farms, Pongalur, ARS, Vaigaidam and ARS, Virinjipuram for hybrid seed production during 2014-15.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**AICRP/PBG/ VGI/ MAZ/005**
2.	**Project Title**	**:**	**AICRP on Maize**
3.	**Name of the Department/Station**	**:**	**Maize Research Station, Vagarai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. K. N. Ganesan,** **Professor (PB&G) and Head**
5.	**Project Period**	**:**	**April 2010 to March 2015**

6. Objectives

- Strengthening of maize research activities on development of single cross hybrids suitable for irrigated and rainfed ecosystem.
- Testing of Co-ordinated materials under different maturity groups of extra early,early, medium and full season and special type of corn like baby corn, pop corn, sweet corn and QPM.
- Out sourcing of promising maize inbred lines from winter nursery workshop organized by Directorate of Maize Research.
- To study the adaptability of the other centre hybrids suitable for Tamil Nadu.
- To derive inbred lines from the AICRP materials

7. Brief outline of the work carried out from the project initiation period

A total of seven AICRP trials consisted of 118 hybrids were evaluated during Rabi 2013-14 season and datasheet was submitted to DMR, New Delhi. A total of eight AICRP trials consisted of 352 hybrids were allotted for evaluation during Kharif 2014. Observation on biometrical traits as specified by DMR is being continued. Under AICRP maize Tribal Sub-Plan (2014 -15), three off campus trainings on “Maize Production Technologies” was conducted for 50 tribal farmers (per training) at Pachalur, Dindigul district, Porupar settlement, Udumalpet Tk and Sempirankulam, kodaikanal Tk. A total of 150 ST farmers have been benefitted through this scheme.also three field days on “Awareness on single cross hybrid technology” were organized at the same places where the farmers shared their feedback of cultivating single cross maize hybrid CO 6.

8. Work carried out during the review period

I. Kharif 2014

During Kharif 2014, a total of eight trials comprising of 352 hybrids were evaluated under AICRP trials at this centre. Biometrical data recorded was documented, compiled and sent to the Project Director (Maize).

S. No.	Trial No.	Details of Trials	No. of Entries	Plot size	Superior performing entries
1	61	IVT (Late)	120	4m x 1.2m	41, 27, 37, 8, 100, 29, 23, 28, 102, 15, 5, 30, 117, 84, 55, 58
2	62	IVT (Medium)	130	4m x 1.2m	45, 50, 31, 87, 66, 85, 47, 19, 120, 102, 117, 8, 29, 90
3	63	IVT (Early)	47	4m x 1.2m	1, 4, 19, 43, 47,
4	64	IVT (Extra Early)	13	4m x 1.2m	12, 10
5	65	AVT (Late)	13	4m x 3.6m	13, 3, 1, 11, 9
6	66	AVT (Medium)	11	4m x 2.4m	3, 6, 2, 7
7	67	AVT (Early)	11	4m x 3.6m	1, 3, 4, 10
8	68	AVT (Extra Early)	7	4m x 2.4m	4, 5, 2

II.Rabi'14-15

During Rabi'14-15, following 8 trials comprising of 144 entries were laid out and the details of the trials are furnished below.

Sl. No	Details of Trial	No. of entries	Plot size
1	Trial I - IVT (Late)	40	4m x 1.2 m
2	Trial II - IVT (Medium)	33	4m x 1.2 m
3	Trial No 4 - AVT I - Late	23	4m x 2.4 m
4	Trial No 5 - AVT I Medium	12	4m x 2.4 m
5	Trial No 6&9, AVT I-II Early	5	4m x 3.6 m
6	Trial No 7 AVT II - Late	19	4m x 3.6 m
7	Trial No 8 AVT II – Medium	7	4m x 3.6 m
8	QPM Trial 1&2 Late/Medium/ Early	5	4m x 2.4 m

The entries in the above trials are in flowering stage

Tribal Sub Plan

Under AICRP Maize Tribal sub plan 2014-15 sponsored by DMR, New Delhi, three off campus trainings was conducted on "Maize Production Technologies" for 50 ST farmers (each training) for dissemination of single cross hybrid technology and popularization of maize hybrids.

1. TSP Off Campus training I was conducted at Pachalur, Vadakadu panchayat, Dindigul district on 25.08.2014
2. TSP Off Campus training II was conducted at Porupar settlement, Udumalpet Tk on 11.09.2014
3. TSP Off Campus training III was conducted at Sempirankulam, Kodaikanal Tk on 20.11.2014.

During these trainings, the farmers were taught about the “Maize production technologies” and about 8 Kg seeds of TNAU maize hybrid Co 6 and fertilizer for one acre was distributed to the tribal farmers to utilize them in the demonstration plot organised.

The TSP Monitoring team consisting of Sunil Neelam from Winter Nursery centre, IIMR, Hyderabad and Nrupama Singh from IIMR, New Delhi monitored the TSP demo plots at Pachalur and Poruppar on 04.12.14 and 05.12.14 and participated in field day on “Awareness on single cross hybrid technology” organized at Pachalur Village. The other field day was conducted at Porupar settlement Udumalpet Tk on 08.01.2015

9. Salient findings:

- A total of eight trials comprising of 352 hybrids were evaluated under AICRP trials during Kharif’14 season and the datasheet was compiled and submitted to DMR, New Delhi.
- A total of eight AICRP trials consisted of 144 hybrids were allotted for evaluation during Rabi 2014 –15 season. The crop is in flowering stage.
- Under AICRP maize Tribal Sub-Plan (2014 -15), three off campus trainings on “Maize Production Technologies” and field days was conducted for 50 tribal farmers (per training) at Pachalur, Dindigul district, Porupar settlement, Udumalpet Tk and Sempirankulam, Kodaikanal Tk. A total of 150 ST farmers have been benefitted through this scheme.

10. Remarks of the Technical Director based on the pre-review:

Work will be continued under AICRP project No. assigned by the Director of Research, TNAU, Coimbatore.

1.	**Project Number**	**:**	**AICRP/PBG/CBE/MIM/008**
2.	**Project Title**	**:**	**Evaluation of advance varieties of *Varagu, Kudiraivali* and *Tenai* received under AICSMIP trials**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. S.Geethanjali** **Assistant Professor (Small millets)**
5.	**Project Period**	**:**	**June 2011 to May 2016**

6. Objectives

- To evaluate advance varieties in *varagu, kudiraivali and tenai* under AICRP trials.
- To select superior cultures suitable for local agro climatic conditions and exploiting them for varietal evolution.

7. Brief outline of the work carried out from the project initiation period

Since 2011, advanced varietal trials (AVT) have been carried out in foxtail millet, barnyard millet and kodo millet during Kharif season. Entries nominated by TNAU and at the national level have been evaluated for their performance in terms of plant height, productive tillers, days to flowering, days to maturity, grain yield and fodder yield. Nomination of entries in AICSMIP trials for all the three crops has been based on their performance in terms of yield in the station trials. So far 6 entries in foxtail millet, 4 entries in barnyard millet, 6 entries in kodo millet have been nominated from this centre for evaluation under AICSMIP trials. One entry in Kodo millet, TNAU 86 which showed promising yield performance has been released at the national level during 2013.

8. Work carried out during the review period

During this year, advanced varietal trials were conducted in three crops *viz.*, Foxtail millet, Barnyard Millet and Kodo Millet. The entries for evaluation in Kharif season were received from AICSMIP unit, Bangalore, which also included entries nominated by TNAU. The crops were raised on 3.07.2014 in RBD with three replications under irrigated condition in plots of 10 rows each. For all these trials, the recommended spacing of 22.5cm between rows and 10cm between plants was followed. The recommended fertilizer dose of 40: 20:0 Kg NPK/ha was applied basally. Biometrical observations for plant height and number of tillers were based on 5 plants per entry in each replication. Days to 50% flowering and days to maturity were recorded based on visual observation of the whole plot. Grain yield and fodder yield were estimated based on net plot size.

Foxtail millet advanced varietal trial (FAVT)

In FAVT, a total of 24 entries including the local check Co(Te)7 were evaluated. Among the entries, SiA3159, SiA3222 and SiA3163 were found to be early flowering. Days to flowering in these entries was attained within 45 days of sowing. SiA3159 exhibited short stature in plant height compared to other entries recording 102.1 cm. TNSi267 recorded the maximum plant height of 161.2 cm. The mean number of productive tillers ranged from one to four per plant. Grain yield per plot (2.25m x 2.85m) ranged from 0.66 Kg (TNSi306) to 2.39 Kg (DhFtMV2-5). DhFtMV2-5, SiA3223 and DhFtMV333 ranked I, II and III respectively recording a plot yield of 2.39 Kg, 2.25 Kg and 1.86 Kg respectively while the check recorded 1.17 Kg. The overall estimated mean grain yield of the foxtail millet entries was found to be 22.3 q/ha. Most entries had straw white coloured seeds, two entries had orange seed coat and one entry had black seed coat colour. The overall estimated mean fodder yield was 4.29t/ha.

Barnyard millet advanced varietal trial (BAVT)

In BAVT, 25 advance cultures were evaluated including the local check Co(Kv)2. The mean plant height ranged from a minimum of 121.23cm (ACM 10-161) to a maximum of 155.6 cm (DHB 17-3). The mean number of productive tillers ranged from two to four tillers per plant. Days to fifty percent flowering commenced from 43 days after sowing in VL246 and reached upto a maximum of 61 days in ACM 12-110 and Co(Kv)2. Accordingly days to maturity ranged from 85-105 days. Grain yield per plot (2.25m x 2.85m) ranged from 0.71 Kg (VMBC 331) to 2.24 Kg (ACM 12-110). Two entries *viz.*, ACM 12-110 and VL239 recorded more than 2 Kg/plot. However 12 entries outyielded the local check. The overall estimated mean grain yield of the barnyard millet entries was 23.6 q/ha. The estimated fodder yield reached a maximum of 11.26t/ha in ACM 10-082.

Kodo millet advanced varietal trial (KAVT)

In KAVT, a total of 27 cultures along with one local check, CO3, were evaluated. There was a wide variation for plant height between the entries and ranged from 49.4cm (DPS110) to 102.1 cm (DHKM3). On an average, TNAU111 and TNAU86 (national check) produced 12 tillers per plant. While most entries attained 50 percent flowering phase within 60-70 days after sowing, late flowering entries were also observed *viz.*, TNPSc122, TNAU111, TNAU86, BK22, RK739, BK20 and RPS384. The crop duration ranged from 103 to 128 days. Grain yield per plot (2.25m x 2.85m) ranged from 0.56 Kg (DPS12) to 2.90 Kg (TNAU86). TNAU103 (2.25Kg/plot) ranked third among the 27 entries next to NDLK1 and TNAU86. The overall estimated mean grain yield of the kodo millet entries was 22.05q/ha. RK24 was the only entry with 4-5 multilayered irregular racemes per inflorescence. The estimated fodder yield ranged from 1.34t/ha (TNPSc144) to 4.1t/ha (TNAU103).

9. Salient findings

In Foxtail millet, DHFtMV2-5 recorded the highest grain yield (3733 Kg/ha) followed by SiA3223 (3513 Kg/ha).

In Barnyard millet, ACM12-110 recorded the highest grain yield (3497 Kg/ha) followed by VL239 (3358Kg/ha).

In Kodo millet, the national check TNAU86 recorded the highest grain yield of 4524 Kg/ha followed by NDLK1 (4204 Kg/ha) respectively.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**AICRP/PBG/CBE/MIM/008**
2.	**Project Title**	**:**	**Evaluation of high yielding genotypes in Fingermillet, Littlemillet and Prosomillet through AICSMIP trials**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Thanga Hemavathy** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**June 2011 to May 2016**

6. Objectives

- To evaluate the advanced entries from All India Co-ordinated Small Millets Improvement Project trials.

7. Brief outline of the work carried out from the project initiation period

All India Coordinated Trials (*kharif*, 2014)

(i) Finger millet Initial Varietal Trial (*kharif*, 2014)

A total of 25 entries along with the check CO (Ra) 14 were sown on 27.06.2014 in RCBD with three replications for evaluation of yield and yield attributes under IVT. Out of 25 entries, there are three entries *viz*., IVT 2,IVT 11 and IVT 21 were recorded as early flowering entries. The entry IVT 21 recorded a grain yield of 4425 kg/ha followed by IVT 6 and IVT 13 recorded the grain yield of 4400 Kg/ha and 4166 kg/ha respectively.

2. Finger millet Advanced Varietal Trial I and II (*kharif*, 2014)

In fingermillet AVT I & II, 15 entries including the local check, CO (Ra) 14 were sown on 27.06.2014 in RCBD with three replications. Among the 15 entries AVT I & II-8 and AVT I & II-11 recorded as early flowering types. The entry AVT E&M-11 recorded 4993 kg/ha of grain yield followed by AVT E&M-13 and AVT E&M-12 had 3928 kg/ha and 3492kg/ha of yield.

3. Finger millet Advanced Varietal Trial III (*kharif*, 2014)

Twenty entries including the local check, CO 15 were sown during *kharif*, 2014 on 27.06.2014 in RCBD with three replications for yield evaluation. The entry AVT L-20 recorded highest yield of 4305 kg/ha followed by AVT L-6 (3988 kg/ha.).

4. **Finger millet Elite germplasm evaluation (*kharif*, 2014)**

A total of 50 elite lines of finger millet along with two checks were evaluated for all the biometrical traits during Kharif 2014. The entries were sown on 27.06.2014 in Augmented design. The entries were evaluated based on quantitative and qualitative traits.

5. Littlemillet Advanced Varietal Trial (*kharif*, 2014)

A total of 19 entries along with the local check CO (Samai) 4 were sown during *kharif*, 2014 in RCBD with 3 replications on 27.06.2014. Among the entries, LAVT 11 recorded as early flowering entry and LAVT 4,8 and LAVT 17 were identified as late entries. The entry LAVT 10 was recorded as high yield as 3924kg/ha of grain yield followed by LAVT 1(3742 kg/ha) and LAVT-17 (3599 kg /ha).

6. Little Millet Elite germplasm evaluation

A total of 50 elite lines of little millet along with one check were evaluated for all the biometrical traits during Kharif 2014. The entries were sown on 03.07.2014 in Augmented design. The entries were evaluated based on quantitative and qualitative traits.

7. Prosomillet Advanced Varietal Trial (*kharif*, 2014)

In prosomillet, seventeen entries along with the check, CO (PV) 5 were sown on 27.06.2014 in RCBD with three replications. Out of 17 entries, PAVT 7 and PAVT 16 recorded as the early type. TH entry recorded 4080kg/ha of grain yield followed by PAVT-11 (3586 kg/ha).

8. Work carried out during the review period

AICSMIP advanced varietal trials were conducted in three crops *viz.,* Fingermillet, Little Millet and Proso Millet. The entries for evaluation in Kharif season were received from AICSMIP unit, Bangalore, which also included entries nominated by TNAU. The crops were raised on 26.02.2014 in RBD with three replications under irrigated condition in plots of 10 rows each. For all these trials, the recommended spacing of 22.5cm between rows and 10cm between plants was followed. The recommended fertilizer dose of 40: 20:0 Kg NPK/ha was applied basally. Biometrical traits were recorded based on 5 plants per entry in each replication. Days to 50% flowering and days to maturity were recorded based on visual observation of the whole plot. Grain yield and fodder yield were estimated based on net plot size.

9. Salient Findings

Finger millet Initial Evaluation trail: 25 entries along with one check were raised. Among these BR 70 recorded grain yield of 3450 Kg/ha followed by VL 385 (3333 Kg/ha) respectively. VL 385, VL 352 and DHFM were noted as early entries (49 days).

Finger millet AVT I and II: Fourteen entries were raised along with one check. VR 708 recorded the highest grain yield (4990Kg/ha) followed by GPU 45 (3928Kg/ha). GPU 92 and VR 708 were noted as early entries (53 days)

Finger millet AVT III: Twenty entries along with oen check were raised among these BR 67 recorded the grain yield (4305 Kg/ha) and WWN 25 recorded the grain yield (3955 Kg/ha).

JK 8 noted as early flowering (39 days)

Little Millet AVT: TNPSU 171 ranked first and recorded the highest grain yield (2924 Kg/ha) followed by DHLtMV 36-3 (2768Kg/ha).

Prosomillet AVT: TNPM 234 ranked second and recorded the grain yield (3996 Kg/ha) followed by TNPM 228(3684 Kg/ha) respectively.

10. Remarks of the Technical Director based on the pre-review: The Project may be continues

Externally Funded Projects

1.	**Project Number**	**:**	**UGC/CPBG/CBE/MIL/2013/R004**
2.	**Project Title**	**:**	**Identification of Quantitative Trait Loci (QTLs) for drought tolerance in sorghum**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.S.Sivakumar** **Professor (PBG)**
5.	**Project Period**	**:**	**2013 to 2016 (To be completed in 2015)**

6. **Objectives**

- To identify QTL and closely linked molecular marker associated with drought tolerance component traits in sorghum
- Employing marker assisted breeding programme using identified markers

7. Brief outline of the work carried out from the project initiation period

- Genotypes screened for pre flowering and post flowering drought tolerance, and drought tolerant genotypes viz., IS 18551, B35 selected.
- Crosses initiated among two selected genotypes as donors, IS 18551, B35 with varietal line CO 28 and F1 evaluated and forwarded.

8. Work carried out during the review period

- F2 plants from both crosses (stay green/drought tolerant and pre drying / susceptible plants, ~ 240 plants) evaluated under water limited condition.
- Genotyping was done with selected F2 plants using polymorhpic SSR markers including the previously reported SSR markers associated with stay green/ drought trait in sorghum
- Among the SSR markers tested, the markers namely Xtxp 1, Xtxp2, Xtxp 15, Xtxp 214, Xtxp 225 given positive results with stay green/ drought tolerance plants
- These primer employed for screening and ~50 plants (F3) from each cross combinations selected and forwarded to next generation, evaluation is in progress.

9. Salient Findings

SSR markers namely Xtxp 1, Xtxp2, Xtxp 15, Xtxp 214, Xtxp 225 found associated with stay green/ drought tolerance and being confirmed.

10. Remarks of the Technical Director based on the pre-review: Nil

1.	**Project Number**	**:**	**NIAS/CPBG/CBE/MIL/2013/R005**
2.	**Project Title**	**:**	**Evaluation of NIAS Gene Bank Sorghum Genetic Resources (mini core accessions)**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.S.Sivakumar** **Professor(PBG)**
5.	**Project Period**	**:**	**2013 to 2015**

6. Objectives

- To evaluate the tropical sorghum germplasm conserved in the NIAS gene bank, under the Coimbatore condition for adaptability in kharif/Rabi season
- To collect data on quantitative and qualitative traits and biometrical analysis
- To utilize the lines for breeding work in varietal/hybrid development and transfer of specific traits

7. Brief outline of the work carried out from the project initiation period

- 105 NIAS mini core accession were received from NBPGR, New Delhi sent by NIAS,Japan
- Seed multiplication taken up for all accessions to conduct evaluation

8. Work carried out during the review period

- The 105 accessions were evaluated for prescribed quantitative and qualitative characters for Rabi season (2013-2014) at ARS, kovilpatti
- The accessions were again evaluated for kharif season (2014) at Department of Millets, Coimbatore.
- Data has been complied for twelve qualitative, biometric traits and submitted to NIAS, Japan.
- Seed multiplication was taken up for utilization and conservation

9. Salient Findings

- Early duration lines 80-90 days (12 Nos) identified for utilization in our breeding programme.
- All accessions were deposited in Dr. Ramaih Gene Bank, TNAU, Coimbatore.

10. Remarks of the Technical Director based on the pre-review:Nil

1.	**Project Number**	**:**	**CPBG/CBE/PBG/12/S36**
2.	**Project Title**	**:**	**“Identification of high beta carotene Pearl millet lines (Golden millet) to enhance the nutritional security”**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. P. Sumathi** **Professor (PB&G)**
5.	**Project Period**	**:**	**July 2012 to June 2015**

6. Objectives

- To identify the variability present in the available F_3 segregating population (PT 6029 x PT 6129) through phenotyping of morphological characters and for the Beta carotene content.
- Development of agronomically desirable and elite pearl millet inbred with high beta carotene to produce beta carotene rich pearl millet variety/hybrid.

7. Brief outline of the work carried out from the project initiation period

The diverse pearl millet genotypes were taken to analyze the β carotene variability in order to biofortify the pearl millet for the enhanced nutritional value in the better adopted genotypes and segregating populations. The promising pearl millet inbred lines *viz*. PT 6131, PT 6130, PT 6129, PT 6128, PT 6029, PT 6017 showing a considerable variation in grain colour were screened for the β carotene variability using reverse phase High Performance Liquid Chromatography (HPLC). Among the genotypes screened, the inbred line PT 6129 which has a yellow grain colour, contains highest amount of β - carotene (2.417 μg/g) which was used as a donor for high beta carotene content in grains. The genotype PT 6029 which has a good agronomic value and is of grey grain colour showed a low β - carotene content of about 0.059 μg/g. The crosses were made between PT 6029 and PT 6129 and F_1 s were generated and forwarded to F_2 generation. On the basis of evaluation, progenies with high beta carotene content, good agronomic traits such as high single plant yield, lengthy ear head, high ear head weight, single ear head grain weight, single ear head weight were selected for raising F_3 and further generations (F_7). The variability study was carried out in F_3, F_4 and F_6 generations. Wide variation was observed for many of the traits that showed that there is a scope for selection from this population for crop improvement.

8. Work carried out during the review period

Characterization and evaluation of the 200 RILs (F_7) were done for 26 descriptors based on the standard pearl millet descriptors during *kharif* 2014. Based on *per se* performance, the lines, TNBG-06-45-5-5-2-2-10, TNBG-06-82-5-5-2-4-2, TNBG-06-67-5-5-3-4-7 and TNBG-06-194-5-5-2-1-1 recorded maximum grain yield per plant and showed desirable performance for most of the biometric traits. The RIL, TNBG-06-132-5-5-3-2-10 showed desirable *per se* performance for all the traits except number of nodes per plant. Besides, the RILs, TNBG-06-77-5-5-2-1-10 TNBG-06-53-5-5-3-2-5 and TNBG-06-81-5-5-3-3-1 also expressed favourable *per se* performance for most of the biometric traits. These lines will be exploited further to improve the productivity of pearl millet

Variability and heritability were also studied for the RIL populations. This revealed that selection for the traits, *viz.*, plant height, number of productive tillers per plant, number of nodes per plant, leaf blade length, leaf blade width, 1000 grain weight and grain yield per plant would be effective for further crop improvement programmes. Association analysis revealed that, for an effective breeding programme, selection based on the traits, plant height, number of productive tillers per plant, spike length, spike girth, 1000 grain weight and grain yield per plant will be helpful in improving the grain yield of the plant.

Total carotenoid and β carotene content were estimated using HPLC for the parents and selected progeny lines. The yellow parent PT 6129 showed highest total carotenoids (10.13µg/g) and β carotene content (1.78 µg/g) than the grey parent, PT 6029 which showed total carotenoid of 4.73 µg/g and β carotene content of 0.72 µg/g.. The RIL, TNBG-06-132-5-5-3-2-10 with yellow seed colour recorded high total carotenoid (15.77 µg/g) and high β carotene content (1.41 µg/g) followed by TNBG-06-77-5-5-2-1-10 (yellow seed colour ; 1.17 µg/g)), TNBG-06-53-5-5-3-2-5 (yellow seed colour; 1.07 µg/g)) and TNBG-06-81-5-5-3-3-1 (yellow brown seed colour; 0.92 µg/g)). These progenies could provide a valuable basis for increasing β carotene through conventional breeding.

High PCV and GCV estimates were recorded by total carotenoid, β-carotene content and grain yield per plant. The high heritability coupled with high genetic advance per cent of mean was recorded for the traits, *viz.*, total carotenoid and β-carotene content. Based on the mean performance and β-carotene content the RILs, TNBG-06-132-5-5-3-2-10, TNBG-06-77-5-5-2-1-10, TNBG-06-53-5-5-3-2-5 and TNBG-06-81-5-5-3-3-1 would be exploited further, to develop agronomically superior pearl millet variety / hybrid with rich beta carotene content.

9.Salient findings

The lines, TNBG-06-45-5-5-2-2-10, TNBG-06-82-5-5-2-4-2, TNBG-06-67-5-5-3-4-7 and TNBG-06-194-5-5-2-1-1 recorded maximum grain yield per plant and showed desirable mean performance for most of the biometric traits. The RIL, TNBG-06-132-5-5-3-2-10 showed desirable *per se* performance for all the traits except number of nodes per plant. Besides, the RILs, TNBG-06-77-5-5-2-1-10 TNBG-06-53-5-5-3-2-5 and TNBG-06-81-5-5-3-3-1 also expressed favourable *per se* performance for most of the biometric traits.

Total carotenoid and β carotene content were estimated using HPLC for the parents and selected progeny lines. The yellow parent PT 6129 showed highest total carotenoid and β carotene content than the grey parent, PT 6029. The RIL, TNBG-06-132-5-5-3-2-10 with yellow seed colour recorded high total carotenoid and high β carotene content followed by TNBG-06-77-5-5-2-1-10 (yellow seed colour), TNBG-06-53-5-5-3-2-5 (yellow seed colour) and TNBG-06-81-5-5-3-3-1 (yellow brown seed colour). These progenies could provide a valuable basis for increasing β carotene through conventional breeding.

10. Remarks of the Technical Director based on the pre-review

The promising inbreds with rich beta carotene may be utilized in hybrid development programme.

1.	**Project Number**	**:**	**DBT/CPBG/CBE/MIL/2013/005**
2.	**Project Title**	**:**	**“Marker Aided Back cross Breeding for introgression of sugar enhancer (se) gene from sweet corn to normal maize inbred lines for enhancing the sugar content”**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.A.Thanga Hemavathy** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**2013 to 2016**

6. Objectives

- To determine SSR polymorphisms for the se locus among selected sweet corn and normal maize lines
- To initiate a backcross scheme to introgress the *se* allele from sweet corn to normal maize inbreds tested in (1)
- To test the effectiveness of the polymorphic SSR marker(s) in (1) in discriminating between genotypes in BC_1F_1 progeny developed in (2)
- Identify a phenotypic marker system that could be employed to enhance background selection in the heterozygous BC_2F_2 progenies
- Biochemical estimation of quality parameters in the donor, recipient and converted lines.

7. Brief outline of the work carried out from the project initiation period

Sweet corn is a particular type of maize (*Zea mays* L., often referred to as corn in the United States). Sweet corn is harvested at an earlier maturity than field corn (before it is dry), for a different purpose (usually fresh produce, canning or freezing, for human consumption) and has been bred therefore to be qualitatively and quantitatively different from field corn in a number of respects. Sweet corn has several mutants, such as the sugar enhancer (se) gene, with a sugar content of up to about 18 %, the shrunken-2 (sh2) gene, also known as super sweets, with about 25 % sugars, and several others, some with even higher sugar contents. Sweet corn breeders have been extensively and successfully used 4 mutants, *sh2, bt, su 1* and se singly or in combinations in modern breeding to create new high sugar commercial sweet corn varieties. The breeding work has been centered on manipulation of these endosperm genes which control the level of sugar found in the corn kernel. As a result 4 groups of sweet corn, standard, super sweet, sugary enhanced and high sugar sweet corn, have been developed and successfully used for commercial production. The sugary varieties (su1) have a creamy texture and good germination and seedling vigour, but their kernels can lose their sucrose from 14.4 % to 5.7% (about 2.5 times) at room temperature (27^0C) for 24 hours after harvest due to rapid conversion of sucrose to starch (Garwood *et al.,* 1976). These losses greatly affect the eating quality. As a result, the harvest and storage periods for the su1 varieties are short. Super sweet corn cultivars contain the Sh2 gene. These cultivars do not convert sugar to starch readily and therefore stay their sweetness for a very long time after they reach harvestable maturity. But incase of super sweet corn types(sh2) need more isolation during cultivation and if they are pollinated by other genes types (*su1,se*, field corn) they will revert to field corn with high starch and low sugar.

The *se* type (sugar enhanced sweet corn) varieties have a sugar content twice as much as normal corn it have extremely tender kernels, creamy texture and good corn flavor. Sugar conversion occurs at the same rate as for the *su1* type since the kernels contain more sugar, their sweet taste retain longer after harvest. There are two distinct groups with in the varieties containing the se gene; homozygous and heterozygous. The homozygous varieties (*sese su1su1*) have higher sugar (20-35%) in 100% of their kernels. While the heterozygous varieties (*Sese su1su1*) have lower sugars (14-25%) and only 25% of the *se* type kernels and 75% of the *su1* type, therefore homozygous varieties are usually sweeter than heterozygous varieties (Tracy 1997). Hence quality commercial se (sugar enhanced sweet corn) hybrids have been developed and commercialized. Because of the importance of sweet corn, breeder have been devoted to the improvement of sweetness and other valuable characteristics, such as yield, disease and insect resistance and tolerance to environmental stresses.

Keeping this significance current study has been proposed to examine the feasibility of combining Sweet Enhancer *se* gene into early maturing normal maize inbreds through an integrated strategy Marker Assisted Selection for se1 recessive gene and phenotypic selection for modifier genes

8. Work carried out during the review period

Objective 1. To determine SSR polymorphisms for the *se gene* locus among selected sweet corn and normal maize lines

The research approached were made to investigate the development of high sugar content maize inbred lines through marker assisted selection and quality evaluation of introgressed high sugar line. Parents were selected based on the yield and other attributes. As per the list of Table 1 parents were evaluated for their agronomic response in the first season Kharif 2014 at Department of Millets, Tamil Nadu Agricultural University, Coimbatore. Based on the yield attributes best performing eight inbreds (Table 1 and 2) were selected under the normal corn group and fifteen sweet corn lines were subjected to the parental polymorphism (Plate 1) by using the sugary gene (su1) nearest (Table 4) primer. Although the best performer in the field (Table 3) condition have been selected for generation of F1 generation.

Parental polymorphism of sweet corn

Fifteen sweet corn mutant lines carrying sugary gene were subjected to the polymorphism level by using the following nearest primer located short arm of chromosome 4.

Objective 2. To initiate a backcross scheme to introgress the sugary gene/ sugar enhancer (se) gene from sweet corn to normal inbreds tested in (1)

Development of F_1 lines

The normal corn inbreds from Tamil Nadu Agricultural University and Winter Nursery Collection From DMR, New Delhi and elite sweet corn inbreds were raised during Kharif 2014 in two staggered sowing at 3 days interval in order to achieve programmed pollination at the Department of Millets, Tamil Nadu Agricultural University, Coimbatore. Al the cultural operations were carried out to similar to the normal maize crop. Tassel bag method was used for hybridization. Ear of maize emerging from leaf sheath was bagged with butter paper to protect the silk from wind pollination. Ear shoots were covered two days before silk emergence.

The brown bag cover was placed over the tassel of the male parent on the previous day of the pollination to collect pollen. The pollen collected in the tassel bag was dusted over the silk after removing the butter paper cover and replaces immediately to avoid contamination. A brown bag cover was tightly fastened over the pollinated ear for protection. Hand pollination was carried out between 9-11 AM. Simultaneously, selfing was also carried out in the parental lines by tassel bag method to acquire the parental seeds. At maturity the crossed seeds were harvested and dried up to 12% moisture content and preserved at room temperature.

Development of BC_1F_1 generation

Sixteen F_1 crosses should be subjected to the foreground selection by using twenty SSR markers markers located in the short arm of chromosome 4. Based on the selection best performing cross were forwarded to the back cross breeding programme. The latter generation progenies are being subjected to the following quality analysis viz. , total sugars and phytoglycogen (Hassid and Neufeld (1964), starch (Anthrone method), Crude protein (AOAC (1980)), ash determination (Pearson, 1973) Total CHO (Olaoye et al 2009), Sucrose and Reducing sugars (Nelson and Somogyi (1952), Crude protein are estimated by using gas liquid chromography.

Foreground selection

Sixteen F_1 crosses should be subjected to the foreground selection by using the following nearest markers located in the short arm of chromosome, markers also selected for foreground selection, viz., *umc 1071, umc 1636, umc 1736, umc 1506, umc 1582, umc 1383, umc 2080, umc 1446, umc 1590, umc 1241, umc 2343, umc 1169, umc 2116.*

Quality analysis of sugary gene/sugar enhancer gene introgressed lines

Following quality traits are being estimated to examine the quality traits in the introgressed lines of latter generation progenies. ($BC_3F_{1,}$ $BC_2F_{2,}$$BC_3F_{3)}$

The quality traits viz., total sugars and phytoglycogen (Hassid and Neufeld (1964), starch (Anthrone method), Crude protein (AOAC (1980)), ash determination (Pearson, 1973) Total CHO (Olaoye et al 2009), Sucrose and Reducing sugars (Nelson and Somogyi (1952), Crude protein are estimated by using gas liquid chromography.

9. Salient findings

The performance of the parental inbreds of a cross was predicted based on the yield traits in normal corn, sweet corn sugary mutant lines based on the su1 gene polymorphism by using SSR primers viz., UMC 2276 and UMC 2061. All the sweet corn lines were acquired good polymorphism for the two primers. Totally 16 crosses were made, the F_1 lines are being subjected to the foreground selection by using the nearest markers *viz*., umc 1303, umc 2061, bnlg 1937, umc 1969, umc 1142, umc 1896 and umc 1031 located at chromosome 4 (short arm) and if there may be a considerable variation in the sugary gene, the best cross will be forwarded to develop the back cross progenies and the whole marker screening *viz*., foreground and background and genome selection and the quality assessment has been done upto BC_2F_3 backcross progenies to attain the stability.

10. Remarks of the Technical Director based on the pre-review : Does not arise

1.	**Project Number**	**:**	**DBT/CPBG/CBE/MIL/2012/001**
2.	**Project Title**	**:**	**Developing guide lines for conduct of test for Distinctiveness, Uniformity and Stability in Small millets**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.A.Thanga Hemavathy** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**2012 to 2015**

6. Objectives

Standardization of DUS descriptors for Small Millets

7. Brief outline of the work carried out from the project initiation period

For DUS characterization, 12 entries in prosomillet, 17 entries in littlemillet were received from the AICSMIP unit, Bangalore and were sown in the field CBS 4D on 27.06.2014. Visual assessment by single observation of group of plants or parts of plants (VG) and measurement of number of individual plants or parts of plants (MS) were recorded and documented.

Among the 17 entries of little millet 8 entries were decumbent type and 6 entries were erect type. Three entries had pigmentation in the whole plant. None of the entries had pubescence. Inflorescence shape varied from diffused (5 entries), arched (9 entries) and globes elliptic (3 entries). Inflorescence type varied as very compact in 3 entries, intermediate type in 9 entries and open type for 5 entries. Among the 17 entries all were actively growing and senescence was not noticed. Among the 17 varieties OLM 217, OLM 208, OLM 203 were recorded as late types.

8. Work carried out during the review period

Among the 17 entries of little millet 8 entries were decumbent type and 6 entries were erect type. Three entries had pigmentation in the whole plant. None of the entries had pubescence. Inflorescence shape varied from diffused (5 entries), arched (9 entries) and globes elliptic (3 entries). Inflorescence type varied as very compact in 3 entries, intermediate type in 9 entries and open type for 5 entries. Among the 17 entries all were actively growing and senescence was not noticed. Among the 17 varieties OLM 217, OLM 208, OLM 203 were recorded as late types.

Among the 12 entries of prosomillet based on the growth habit 4 and 8 entries were recorded as Erect and decumbent type respectively. None of the lines are pigmentated. Sheath and ligule pubescence were recorded for 12 entries. Diffused type inflorescence was noticed in 8 entries and arched type of inflorescence was recorded in 4 entries. Among the 12 entries seven entries were open type and 2 entries were intermediate compactness and 3 entries were compact type.

9. Salient findings

DUS traits guide lines were standardized for Little millet and Proso millet based on the quantitative and qualitative descriptors**.**

10. Remarks of the Technical Director based on the pre-review : Does not arise

1.	**Project Number**	**:**	**DBT/CPBG/ATL/MIL/2013/R 002**
2.	**Project Title**	**:**	**DBT-GOI (3051-E28VF) - Development of waxy and non waxy foxtail millet genotypes suitable for Assam and Tamil Nadu and preparation of value added food products.**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmala Kumari** **Dr. N. Senthil** **Dr. A. Subramanian**
5.	**Project Period**	**:**	**2013 to 2016**

6. Objectives

- Identification of waxy and non waxy genotypes and amylase using markers.
- Effecting crosses among the genotypes with high amylose (non-waxy) into high yielding verities of Tamil Nadu and with low amylase waxy (waxy) into high yielding cultivars of Assam.
- Estimation of quality parameters in non-waxy lines such as cooked rice, extruded products and waxy lines such as flakes, extruded products in each backcrossed progenies.

7. Brief outline of the work carried out from the project initiation period

Evaluation of F_2 segregating materials of eighteen crosses have been sown and the crop is in reproductive phase. Nutritional analysis of parents and hybrids is in progress.

8. Work carried out during the review period : Nil

9. Salient findings: F_3 segregating materials are under evaluation.

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	**:**	**MARICO/CPBG/ATL/MIL/2012/R 001**
2.	**Project Title**	**:**	**Marico, Mumbai (3051-F37ZA) - Evaluation of high yielding and nutrient rich Oat variety suitable for value addition.**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmala Kumari** **Professor (PB&G)** **Dr. A. Subramanian** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**2012 to 2015**

6. Objectives

- To evaluate the available oat germplasm accessions
- To effect crossing for creating additional variability
- To assess heterosis, maternal effect and genetics of yield attributes
- To evolve suitable oat variety for adoption and industrial utilization through value addition for different regions of India

7. Brief outline of the work carried out from the project initiation period

The F1 and parental seeds were sown at Horticultural Research Station, Vijayanagaram, Ooty. New crossing block and hybrid evaluation activities are in progress at RS, IARI, Wellington. The crop is in the flowering phase and fresh crosses are being effected. Evaluation of eight high yielding advanced cultures of oats along with one check is in progress at six centres for assessing their stability. The crop is in harvesting phase. The crop had been harvested at KVK, Papparapatti and ARS, Virinjipuram.

8. Work carried out during the review period: Nil

9. Salient findings:

Four promising genotypes *viz*., TNAs 19, TNAs 20, TNAs 22, and TNAs 24 will be proposed for OFT and AICRP trials for evaluation.

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	**:**	**NRTT/CPBG/ATL/MIL/2011/R003**
2.	**Project Title**	**:**	**NRTT, Mumbai (3051-F37YY) - Upscaling popularization of little millet in Javadu Hills of Tiruvannamalai district, Tamil Nadu for enhancing the livelihood of tribal farmers**
3.	**Name of the Department/Station**	**:**	**Centre of Excellence in Millets, Athiyandal**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. A. Nirmala Kumari** **Professor (PB&G)** **Dr. A. Subramanian** **Assistant Professor (PB&G)**
5.	**Project Period**	**:**	**2011 to 2015**

6. Objectives

- Dissemination and demonstration of littlemillet production technologies in five clusters of Javadu hills in Thiruvannamalai district.
- Training the farmers to produce quality seeds and distribute among themselves
- Increasing the productivity and production with low cost inputs
- Improving the profitability of littlemillet and livelihood of tribal farmers
- Providing off-seasonal rural job opportunities through value addition
- Enhancing the soil health with the application of biofertilizers and reducing soil erosion in the cultivable area by contour bunding.

7. Brief outline of the work carried out from the project initiation period

The feedback of the farmers had been recorded. The team from NRTT, Mumbai came and visited the project site on 8.2.15. They have visited CEM, Athiyandal on 10.2.15 and interacted with the scientists and Dept. officials during the Zonal Meeting to know about the status of samai cultivation at Tiruvannamalai district.

8. Work carried out during the review period: Nil

9. Salient findings

High yielding variety CO (samai) 4 was adopted in large scale by the farmers at Javadhu Hills.

10. Remarks of the Technical Director based on the pre-review: Does not arise

1.	**Project Number**	:	**CPMB&B-PMB-11-002**
2.	**Project Title**	:	**Marker assisted introgression of *LycE /CrtRB1* gene for enhanced ProA in maize**
3.	**Name of the Department/Station**	:	**Department of Biotechnology, AC&RI, Madurai**
4.	**Name(s) of the Scientist(s) with Designation**	:	**Dr.N.Senthil, Dr. M. Raveendran, Mr.S. Vellaikumar, Dr.K. N. Ganesan, Dr.P.Veerabadiran, Dr.P.Nagarajan**
5.	**Project Period**	:	**December 2011 to June 2015**

6. Objectives

- Forwarding the selected backcross progenies, based on the phenotypic and genotypic selections, until BC_3F_1 and Genotyping with the validated markers.
- Developing beta carotene rich composites/single cross hybrids for the regions concerned.

7. Brief outline of the work carried out from the project initiation period

Screening the maize inbreds for the beta carotene content and PCR assay: PCR assay evaluation for *crtRB1* polymorphism using HYDB 3'TEprimer was done with 211 lines, the 543 bp allele of HYDB 3' TE; leading to higher β carotene concentrations, was detected only in the germplasm with higher β carotene but in lower frequency. The identified favorable and unfavorable genotypes were evaluated for whole kernel carotenoid content and seed β-carotene content. Genetic variability for kernel β -carotene studies revealed significant variation and it is ranging from 0.33 µg/g to 7.92 µg/g. Among the accessions UMI 176 (7.92 µg/g) was identified to have high β-carotene with yellow grain color. Comparisons between β-carotene with grain color revealed poor correlations with low R^2 values. This study shows that the selection of maize inbreds with enhanced seed beta carotene content is possible by selecting for *crtRB1* allele.

Effecting crosses between the popular inbred and the chosen inbred with higher levels of beta carotene: The PCR based marker assay and HPLC screening resulted in identification high beta carotene donor in the germplasm . Further the high beta carotene CIMMYT donor line obtained from the IARI, New Delhi is used for making crosses to transfer the beta carotene content to adopted inbred lines . Hence the HP467-15 was selected as donor parent based on high β-carotene content and elite popular inbreds of TNAU viz., UMI 1200 and UMI 1230 were used as recurrent parent for crossing programme . The crosses were made with HP467-15 during Kharif 2012 season. UMI 1200 × HP 467-15 new hybrid (F_1) combination was generated; The F1 were evaluated during the Rabi- summer 2013 for initiation of back cross programme. The favourable *crtRB1* allele introgressed from exotic donor line into popular inbred was backcrossed with recurrent parent (UMI 1200) as male and generated BC_1F_1 and BC1F2 generation.

8. Work carried out during the review period:

The back cross progenies of UMI 1200 (1.16 µg/g β-carotene and popular inbred) x HP467-15 (5.10 µg/g β-carotene and CIMMYT donor) were under evaluation. BC_2F_2 progeny F_{1-} c22-c7-c56-s5 were analyzed by foreground screening and a few plants having favorable allele from donor parent in homozygous condition (indicated by 543-bp banding pattern) were selected and selfed. Further phenotypic screenings were carried out for the identification of plants possessing agronomical characters that are almost similar to that of recurrent parent. As a result, F_{1-} c22-c7 –c56-s5and F_{1-} -c22-c7-s56 –s6 are the plants that are homozygous for the favorable allele selected as from F_{1-} -c22-c7-c56. These lines not only possess high β-carotene trait conferred by favorable allele in homozygous condition, but also posses almost all of superior agronomical traits of the recurrent parent. HPLC analysis also revealed a considerable improvement in the β-carotene of converted CO6 parental lines having the recurrent parent phenotype with enhanced beta carotene content of 3.5 µg/g and 4.0 µg/g β-carotene respectively.

Among the high beta carotene maize hybrids evaluated, ACM-M13-02 showed higher grain yield (11.28 t/ha) with a duration of 110 days suitable for late season, orange yellow color grain, flint type kernel and high beta carotene content of 4.0 µg/g. The hybrid showed increased yield over the checks CO6 (20.87%) with enhanced level of beta carotene.

9. Salient findings

Among the high beta carotene maize hybrids evaluated, ACM-M13-02 showed higher grain yield (11.28 t/ha) with a duration of 110 days suitable for late season, orange yellow color grain, flint type kernel and high beta carotene content of 4.0 µg/g. The hybrid showed increased yield over the checks CO6 (20.87%) with enhanced level of beta carotene. HPLC analysis also revealed a considerable improvement in the β-carotene of converted parental lines having the recurrent parent phenotype with enhanced beta carotene content of 3.5 µg/g and 4.0 µg/g β-carotene respectively.

10. Remarks of the Technical Director based on the pre-review

The promising cultures may be proposed for Multi Location Trail.

1.	**Project Number**	**:**	**CPMB&B-PMB-12-009**
2.	**Project Title**	**:**	**Development of low phytate maize hybrids using marker assisted back cross breeding programme**
3.	**Name of the Department/Station**	**:**	**Department of Biotechnology, AC&RI, Madurai**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr.N.Senthil, Dr. M. Raveendran, Dr.K. N. Ganesan, Mr.S. Vellaikumar, Dr.R.Balagobal**
5.	**Project Period**	**:**	**April 2012 to March 2015**

6. Objectives

- Continuation of back cross programme using available BCF1 progenies between lpa mutant lines and locally adopted UMI inbred lines
- Identification of lpa region in the back cross progenies using foreground SSR markers
- Screening of advanced back cross progenies using background SSR markers to identify & recover the recurrent parent genome
- Identification of effect of low phytate maize in poultry feeds by feeding trials using the low phytate and high phytate lines
- Synthesis of maize hybrids with the help of low phytate inbreds

7. Brief outline of the work carried out from the project initiation period

The experimental materials included well adapted, high phytate maize inbreds and mutant lines (EC 659418) with lpa2 locus obtained from Victor Robay , USDA, USA and the back cross progenies of UMI 285/ EC 659418.The low phytate F_1s (2.01mg/g) were crossed with recurrent parent UMI 285 to develop a back cross population upto BC_2F_1. In each generation marker assisted foreground analysis was done to identify *lpa2* locus introgressed lines and the selected lines with *lpa2* locus under study were selfed and forwarded to BC_2F_2 . The BC_2F_2 population *viz.*, S1-28-9, S1-28-44, S1-31-16 and S1-31-26 were identified with *lpa2* locus in homozygous condition and they were selfed and forwarded. Parental polymorphism survey was done using the SSR markers distributed throughout the genome of the maize lines for the background markers analysis. Out of 234 primers used 112 markers found to be polymorphic. In this 47 SSR markers were used for background analysis of the selected BC_2F_2 lines of UMI 285 x EC 659418. The BC_2F_2 individual S1-28-9 was having the highest recovery of recurrent parent genome (80.02 %) and a minimum recovery (73.41 %) was observed in the genotype S1-28-44.The study on phenotypic screening for low phytate revealed that in BC_2F_2 lines homozygous to EC 659418 for closely linked SSR showed high (> 0.46µgP) inorganic phosphorous content and reduced phytate content with the range of 1.73 to 1.92 mg/g. This data suggests that the effect of the *lpa2* locus in the reduction of the phytic acid content in the back cross lines.

8. Work carried out during the review period

The well adapted, high phytate maize inbreds UMI 1200 was crossed with lpa2 locus containing mutant lines EC 659418 and the back cross derived low phytate line UMI285- S1- 28-9.

The F1 progenies are under sown in the field during Rabi 2014. The estimation of phytate content in UMI285- S1-28-9 showed high (> 0.46µgP) inorganic phosphorous content and reduced phytate content with the range of 1.92 mg/g. Hence this converted low phytate maize lines can be used for the further maize inbred development for low phytate traits.

The UMI285-lpa2 converted lines were crossed with CO6 parents viz.,UMI 1200 and UMI1230.Among the hybrids evaluated the UMI 285-lpa2 x UMI1200 showed better performance compared other hybrids and further yield evaluation in progress.

Marker Assisted Backcross Breeding (MABB) for Conversion of UMI 395 white maize inbred lines as low phytate line also attempted and transferred the locus governing the low phytate trait (*lpa2* allele) from low phytate mutant line (EC659418) to UMI 395. The MABB, which involved three backcrosses with the recurrent parent, we used "foreground selection" [i.e., selecting backcross progenies with *lpa2* allele with the help of a Simple Sequence Repeat (SSR) marker "umc2230"] and "background selection" (i.e., selecting plants having genetic background similar to that of the recurrent parent UMI 395 using 50 SSR markers) for isolating backcross lines showing similarity to UMI 395 but with low phytate trait. The low phytate BC_3F_2 line "UMI 395/418-c8-c40-c44-s21-s36" showed the reduced phytate and high inorganic phosphorus level as similar to the low phytate parental line.

9. Salient findings

The lpa2 homozygous BC_2F_2 lines showed high inorganic phosphorous (> 0.93 µgP) and reduced phytate with a range of 1.73 to 1.92 mg/g. The UMI285-lpa2 converted lines were crossed with CO6 parents UMI 1200 and UMI1230 among the hybrids the UMI 285-lpa2 x UMI1200 showed better performance and yield evaluation is in progress.

10. Remarks of the Technical Director based on the pre-review

The yield potential of low phytate hybrid may be evaluated along with the check.

1.	**Project No**	**:**	**CPBG/CBE/PBG/11/S27**
2.	**Project Title**	**:**	**Marker assisted introgression of major QTLs conferring resistance to sorghum downy mildew in maize.**
3.	**Name of the Department/Station**	**:**	**Department of Millets**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**Dr. K.N.Ganesan** **Professor (PBG)**
5.	**Project Period**	**:**	**1.7.2011 to 31.12.2014**

6. Objectives

- To identify the downy mildew resistant QTLs regions in Chromosome 2 and Chromosome 6 using SSR marker in the segregating population.
- To introgress the downy mildew resistant QTL region into elite susceptible maize inbred through SSR marker assisted backcrossing.

7. Brief outline of the work carried out from the project initiation period

Hybridisation was made between the agronomically superior inbred UMI 79 with the sorghum downy mildew resistant donor UMI 936 to generate F_1 genration. In BC_3F_2 population, three progenies (7-2-3, 7-2-10, 7-7-7) were raised for phenotypic screening under sick plot conditions by spreader row technique. Artificial epiphytotic conditions were created by planting spreader rows of a susceptible maize genotype, CM 500.

After 30 days of spraying conidial spores in CM 500, test entries were sown and disease developed in one month. The conidial spray is also repeated after planting of test entries. Disease scoring was taken for individual plants to classify the plants as resistant or susceptible. Of the three progenies evaluated 7-7-7 has recorded more resistant plants and phenotypically superior for biometrical traits. Hence, the resistant plants of this population were selfed for further screening in lab. At lab, the DNA samples of resistant individuals are screened with identified sorghum downy mildew resistant QTL linked SSR markers *viz.,* BNLG 1154 and NC013 (chromosome 6) and Phi 053 and bnlg420 (chromosome 3).

8. Work carried out during the review period.

Background screening (i.e., selection of recurrent parent alleles using several molecular markers) was done to confirm the recovery of recurrent parent genome in the recombinant lines. This background screening will aid in reducing the number of generations to produce individuals with desired gene combinations but remains isogenic to recurrent parent. In our investigation, background screening was done in the selected two introgressed lines with major QTLs for resistance to sorghum downy mildew in order to estimate the recovery of the genome of the recurrent parent. A total of 51 polymorphic co-dominant markers were used to analyze 10 chromosomes in the maize genome. The background screening data for all the 10 chromosomes showing intervals in cM were graphically represented using the software, Graphical Genotypes (GGT) ver. 2.0.

From this project, the identified two introgressed lines *viz.,* 79/936-c1 -c7-c7- s7- s46 and 79/936-c1-c7-c7- s10- s80 are 92.45% and 89.68% genetically identical to the recipient/ recurrent parent respectively. Hence, these lines can be used in breeding programme to develop single cross hybrids with sorghum downy mildew resistance.

9. Salient findings:

Two sorghum downy mildew resistance introgressed lines *viz.,* 79/936-c1 -c7-c7- s7- s46 and 79/936-c1-c7-c7- s10- s80 with genetical identity of 92.45% and 89.68% respectively to recurrent parent UMI 79 were developed.

10. Remarks of the Technical Director : Nil

1.	**Project Number**	**:**	**Old number:CPMB&B-BTB-12-001**
2.	**Project Title**	**:**	**Optimization of *Agrobacterium* mediated transformation protocol for local elite cultivars of Foxtail millet (*Setaria italica*)**
3.	**Name of the Department/Station**	**:**	**Biotechnology**
4.	**Name(s) of the Scientist(s) with Designation**	**:**	**E.Kokiladevi, Assistant professor AC&RI, Madurai**
5.	**Project Period**	**:**	**2012-15**

6. Objectives

- To develop tissue culture regeneration protocol for high frequency shoot regeneration from mature and immature embryos through somatic embryogenesis.
- 2. To develop a stable gene transfer protocol through *Agrobacterium* mediated transformation
- Molecular analysis of transgenic *Setaria italica* lines at T_0 and T_1 generation.

7. Brief outline of the work carried out from the project initiation period

Fox tail Millet (*Setaria italica*) grains (Var. Co 6 and Co 7) grains were collected from Millet Breeding Station.

Seeds were inoculated in MS+2,4,D (1.0. 2.0, 2.5 mg/l) + Proline (0.8 mg/l) + Sucrose (3%) + Agar (0.8%) (pH5.8) for callus induction. Calli were transferred to shoot regeneration media (MS+BAP3.0mg/l+ Sucrose (3%) + Agar (0.8%) (pH5.8))

Immature inflorescence were inoculated in (MS+2,4, D (1.0. 2.0, 2.5 mg/l) + Sucrose (3%) + Agar (0.8%) (pH5.8) for callus induction.

To assess the regeneration potential, calli induced from immature inflorescence on MS medium containing 2, 4, D (2.5mg/L) were transferred to regeneration medium with different concentrations of BAP (1.0, 1.5, 2.0 &2.5 mg/l). The differentiation rate (percentage of differentiated calli among the total number of embryogenic calli) was varying. The calli induced from 2,4 D (2.5 mg/L) and cultured for 25 days in regeneration media containing BAP (1.5 mg/L) showed the highest differentiation frequency (82%). The shoots (about 1 cm long) were excised and transferred to rooting medium (1/2 MS + 1 mg/l L-Proline + 800 mg/l Casein Hydrolysate + 3 % (w/v) Sucrose + 0.3 % (w/v) Phytagel, pH 5.8) for two weeks until roots developed.

8. Work carried out during the review period

Immature inflorescence was co-cultivated using *Agrobacterium tumefaciens* harboring pCAMBIA 1305.1.The work is in progress.

9. Salient findings

Standardized medium for callus induction and Regeneration.

10. Remarks of the Technical Director based on the pre-review: Nil

CROP MANAGEMENT

AGRONOMY

1. Project No.	AICRP / PBG / CBE / SOR / 006
2. Project Title	AICRP on Sorghum Agronomy - Response of pre-released grain sorghum genotypes to different fertilizer levels
3. Name of the Department	Department of Mil3lets, TNAU, Coimbatore
4. Project Leader(s).	Dr. R.Kalpana, Assistant Professor (Agronomy)
5. Period	June 2014 – May 2015

6. **Objectives :** To evaluate the performance of grain sorghum genotypes for their yield potential and fertilizer response.
7. **Progress made so far:** This trial has been initiated this year with new set of varieties of sorghum.
8. **Progress made during the period under report**

Trial was conducted on grain sorghum during *kharif* 2014 at Millet Breeding Station, TNAU, Coimbatore. The trial included the following treatments: Main plot included 3 fertility levels viz., 50% RDF (45:22.5:22.5 kg NPK/ha), 75% RDF (67.5:33.75:33.75 kg NPK/ha), 100% RDF (90:45:45 kg NPK/ha), and subplot included 8 genotypes: test hybrids - SPH 1736, SPH 1737; test varieties – SPV 2165, check hybrids CSH 16, CSH 25 two check varieties CSV 20 and CSV 27. The trial was laid out in factorial randomized block design with three replications. Sowing was done on 02.7.2014.

Among the different genotypes tested highest plant height was recorded by the check variety CSV 27 which was significantly higher than the other genotypes. The plant height was recorded SPH 1737 was significantly lowest. Check hybrid CSH 16 was very early in flowering while the check variety CSV 27 took significantly highest number of days to flower. Lower dose of RDF recorded higher days to flower. Panicle length was significantly higher in the hybrids CSH 16 and SPH 1736. (Table1)

Test weight did not vary significantly among the genotypes though there were numerical differences, but varied with different fertility levels. Harvest index varied significantly among the genotypes and highest value was registered by check genotype CSH 16 which was statistically superior than other genotypes and the lowest by CSV 27. Highest grain yield was registered by check hybrid CSH 25 which was significantly superior than other genotypes. This genotype showed higher response to increasing levels of nutrient application. All the genotypes responded to increasing levels of fertilizer application. This was followed by CSH 16. None of the test genotypes were superior to these two checks. Highest stover yield was recorded by check variety CSV 27. Higher net return was recorded by CSH 25 with BCR of 2.48.

Table 1. Effect of treatments on growth and yield parameters:

Treatment	Plant height at harvest (cm)	Days to 50 % flowering	Panicle length (cm)	1000 seed weight (g)	HI (%)	Grain yield (kg/ha	Stover yield (kg/ha)	Net return (Rs/ ha)	BCR
Genotypes									
SPH 1736	157.9	60.4	32.62	32.2	13.67	1494	9713	6710	1.71
SPH 1737	144.7	63.7	29.12	30.4	11.13	1421	11449	7391	1.97
SPV 2165	168.9	67.0	25.69	28.5	10.91	1646	13236	9054	2.26
CSH 16	162.2	57.2	33.29	35.1	19.55	1873	7949	8615	2.02
CSH 25	150.1	61.9	30.47	31.6	17.54	2194	10708	11197	2.48
CSV 20	169.6	67.7	23.15	27.7	11.21	1690	13136	10129	2.29
CSV 27	192.6	73.7	25.4	26.2	7.81	1473	17171	9288	2.46
CD (5%)	5.1	1.5	2.39	2.3	1.13	128	771		
Fertility levels									
50% RDF	157.1	65.3	28.04	26	13.20	1214	9001	5935	1.93
75% RDF	162.3	64.4	28.44	30	13.30	2005	12153	9443	2.29
100% RDF	171.9	63.8	29.13	33	12.85	2088	14572	11358	2.36
CD (5%)	3.3	1.0	1.56	1.9	1.04	84	462		

9. **Salient findings**:

The genotypes tested SPH 1736, SPH 1737 and SPV 2165 responded to increasing fertilizer doses. But the performance of test genotypes was poor compared to the checks.

10. Remarks of the Technical Director based on the pre-review: Date of start and date of closure to be indicated. Findings to be given to CSM. Straw yield to be verified

1. **Project No.** AICRP / PBG / CBE / SOR / 006

2. **Project Title** AICRP on Sorghum Agronomy - Improving Nitrogen-use efficiency through method and time of N application

3. **Name of the Department** Department of Millets,TNAU, Coimbatore

4. **Project Leader(s).** Dr. R.Kalpana, Assistant Professor (Agronomy)

5. **Period** June 2013 – May 2015

6. **Objectives :** To evaluate the performance of grain sorghum genotypes for increasing split application of nitrogen.

7. **Progress made so far:** This trial has been initiated during June 2013 with the objective of improving nitrogen use efficiency by splitting application of N doses at different crop growth stages and including different methods of application including foliar sprays. Three cultivars were also studied and it was found that all the cultivars responded to split application of N and increasing the number of splits resulted in increased yield.

8. **Progress made during the period under report**: The trial was conducted to with the objective of improving nitrogen use efficiency by splitting application of N doses at different crop growth stages and including different methods of application including foliar sprays. The trial was laid out in Factorial RBD with three replications with the following treatments: Factor I included N application methods viz., N1-50% N at sowing and 50% at 30 DAS, N2-50% at sowing + 25% at 30 DAS +25% at boot-leaf stage (BLS), N3-25% at sowing + 50% at 30 DAS +25% at boot-leaf stage (BLS), N4- 25% at sowing + 50% at 30 DAS +15% at BLS +10% at grain filling stage (GFS) and N5- 25% at sowing+ 45% at 30 DAS+ 5%foliar spray at 45 DAS +15% at BLS+10%GFS. Factor II included Cultivars viz., V1 - CSH 16, V2 - CSV 20 and V3 – Co(S)30. The crop was sown on 02.07.2014 and harvested on 6.11.2014. Biometric observations yield and yield parameters were recorded and economics worked out.

Table 1. Effect of treatments on growth, yield parameters, yield and economics:

Treatment	**Plant height at harvest (cm)**	**Panicle length (cm)**	**100 seed weight (g)**	**HI (%)**	**Grain yield (kg/ha**	**Stover yield (kg/ha)**	**Net returns (Rs/ha)**	**BC ratio**
N application methods								
N1	174.0	26.51	2.97	15.41	1633	9027	6618	1.76
N2	183.5	26.24	3.07	16.43	1804	9257	7450	1.83
N3	176.7	27.67	3.03	15.26	1894	10581	8783	1.98
N4	177.6	26.14	3.15	16.04	2034	10773	9395	2.02
N5	174.6	27.49	3.15	14.45	1988	11795	9415	1.98
CD (5%)	5.1	2.15	0.21	1.24	196	1094		
Varieties								
CSH 16	161.8	29.14	3.19	17.22	1975	9552	8516	1.94
CSV 20	192.8	24.48	2.95	13.82	1767	11022	8154	1.89
Co S(30)	176.5	30.12	3.23	20.13	2184	10056	9452	2.01
CD (5%)	2.2	1.35	0.13	0.42	124	647		

Application of 50% N at sowing + 25% each at 30 DAS and BLS resulted in higher plant height which was significantly higher than the other treatments. CSV 20 recorded the highest plant height at harvest than CSH 16. 100 seed weight was not significantly affected by split application of N. Among the varieties statistically higher test weight was registered by Co S(30) than CSH 16 and CSV 20.

Harvest index was higher in N2 viz., application of N 50% at sowing + 25% at 30 DAS +25% at boot-leaf stage (BLS). Co S(30) recorded the highest HI. Grain yield was higher in N4- 25% at sowing + 50% at 30 DAS +15% at BLS +10% at grain filling stage (GFS), which was comparable with N5- 25% at sowing+ 45% at 30 DAS+ 5%foliar spray at 45 DAS +15% at BLS+10%GFS and N3-25% at sowing + 50% at 30 DAS +25% at boot-leaf stage (BLS). Co S(30) yielded significantly higher grain yield than CSH 16 and CSV 20. Treatment N5 recorded the highest stover yield which was statistically comparable with N4. Net returns and BC ratio were higher in N5 and BC ratio was higher in N4. Among the genotypes Co S(30) registered the highest net returns and BC ratio.

9. **Salient findings.** Increasing the number of split doses of N application improved the yield and economics of all the grain sorghum genotypes tested.

10. **Remarks of the Technical Director based on the pre-review:** Conducted under irrigated system. Treatments are to be refined during AICRP workshop. Findings to be given to CSM

1. **Project No.** AICRP / PBG / CBE / SOR / 006

2. **Project Title** AICRP on Sorghum Agronomy - Priority inputs in Kharif sorghum

3. **Name of the Department** Department of Millets,TNAU, Coimbatore

4. **Project Leader(s).** Dr. R.Kalpana, Assistant Professor (Agronomy)

5. **Period** June 2014 – May 2016

6. **Objectives :** To evaluate the contribution of each management input towards yield and prioritize the importance.

7. **Progress made so far:** This sub project was initiated only in 2014 and this is the first year of trial.

8. **Progress made during the period under report**:

Trial was conducted on grain sorghum to prioritize the input needed for higher yield during kharif 2014 at Millet Breeding Station, TNAU, Coimbatore. The trial included the following treatments: T1: Control , T2: Full package of practice (FPP)- Fertilizer + Weed control (Herbicide + hand weeding) + Plant protection + Seed treatment + Thinning + Hybrid, T3: FPP minus Fertilizer, T4: FPP minus Weed control, T5: FPP minus Plant protection, T6: FPP minus Seed treatment with PSB and

Azospirillum, T7: FPP minus Thinning, T8: FPP minus Improved hybrid. The Improved hybrid included was CSH 16 and in T8 treatment Co(S)30 was tried. The trial was laid out in Randomized block design with three replications. Sowing was done on 02.07.2014.

The plant stand was highest in T7 treatment in which all operations except thinning was carries out. Highest plant height was recorded in treatment T2 in which all the management inputs were applied and this was comparable with T5 in which plant protection alone was not followed. The plants in which all inputs were applied (T2) flowered earlier than the other treatments in which plants were under stress due to lack one input or other. Harvest index was significantly higher in the treatments T2 due to application of all inputs and this was comparable with T8 in which all inputs were applied with test variety instead of hybrid. Grain yield was significantly higher in T2 with all inputs and this was followed by T8 which was tested with variety with all inputs. Stover yield also followed a similar trend. Higher net returns and BCR were obtained in T2 followed by T7 and T8. Treatment T1 which was control without any input application registered higher economic returns than other treatments including all inputs minus fertilizer (T3), minus weed control (T4) and minus plant protection (T5).

Table 1. Effect of treatments on growth and yield parameters of sorghum:

Treatment	**Plant stand at thinning**	**Plant height @ harvest (cm)**	**Days to 50 % flowering**	**100 seed weight (g)**	**HI (%)**	**Grain yield (kg/ha)**	**Stover yield (Kg/ha)**	**Net returns (Rs/ha)**	**BC ratio**
T1- Control	197	160.0	60.3	2.56	11.37	803	6259	4575	2.14
T2- Full POP	199	173.4	57.7	3.01	21.82	2255	8079	7430	1.68
T3- FPP - Fertilizer	173	164.1	60.3	2.95	14.4	1058	6287	4061	1.67
T4 FPP - WC	194	161.0	59.7	2.87	11.74	1025	7708	1965	1.22
T5 FPP - PP	207	169.4	58.7	2.74	13.68	1222	7711	2015	1.20
T6 FPP – ST	195	167.3	58.3	2.69	17.33	1600	7632	3596	1.34
T7 FPP - Thinning	227	165.4	60.0	2.45	19.33	1831	7657	5461	1.54
T8 – FPP - hybrid	195	167.1	65.3	2.36	20.46	1970	7657	5219	1.47
CD (5%)	9	4.2	1.6	0.24	2.21	168	946		

9. **Salient findings:** Application of all inputs excluding any one particular major management input viz., fertilizer or weeding or plant protection results in lower returns than control treatment without applying any input.

10. **Remarks of the Technical Director based on the pre-review:** Combination of two inputs may be included and treatments are to be refined during AICRP workshop. Include the time of sowing and variety in the report. Treatment details are to be given.

1.Project No.

2.Project Title	Response of advanced genotype of small millets (Kodo millet, Little millet and Barnyard millet) to different levels of nitrogen under rain fed conditions.
3.Name of the Department	**Department of Millets,TNAU, Coimbatore**
4.Project Leader(s).	Dr.S.Manoharan
5.Period	July 2014 – June 2017

6. Objectives :

7. Progress made so far:

Kodo millet

Among the different varieties, TNAU 111 has recorded higher grain yield of 2496 Kg/ha with fodder production of 4473 Kg/ha followed by TNAU 103 and significantly superior to the rest of the varieties tried under this experiment. The local check Co.3 variety has recorded lower grain yield and fodder yield. Among the various fertilizers levels, application of 100 percent recommended dose of fertilizer recorded significantly higher grain yield of 2825 Kg/ha and fodder production of 5010 Kg/ha superior to the lower levels of fertilizer. The interaction effect was found to be significant. Among the different varieties, TNAU 111 has recorded higher net monetary return of Rs. 62363/ha with B:C ratio of 4.20. Among the fertilizers levels 100 percent recommended dose recorded higher monetary return of Rs 72257/ha with B: C ratio of 4.61. The culture TNAU 111 variety has recorded higher net monetary return of Rs. 79786/ha with B: C ratio of 4.99 at 100% RDF.

Little millet

Among the different varieties, DhLTMV culture has recorded higher grain yield of 1515 Kg/ha with fodder production of 2788 Kg/ha and significantly superior to other cultures tried. Next to this treatment, TNAU 160 has recorded higher grain yield (1445 Kg/ha) and fodder (2676 Kg/ha) which was on par with OLM 203 and local check Co.4. Among the various fertilizers levels, application of 100 percent recommended dose of fertilizer recorded significantly higher grain yield of 1661 Kg/ha with higher fodder production of 3077 Kg/ha and significantly superior to the lower levels of fertilizer.The interaction effect was found to be significant.Among the different cultures, DhLTMV culture has recorded higher net monetary return of Rs. 33913/ha with B:C ratio of 3.16. Among the fertilizers levels 100 percent recommended dose recorded higher net monetary return of Rs 38968/ha with B: C ratio of 3.52. The DhLTMV culture has recorded higher net monetary return of Rs. 45947/ha with B: C ratio of 3.97 at 100% RDF.

Barnyard millet

Among the different varieties, DhBmv 36-8 has recorded higher grain yield of 1654 Kg/ha with fodder production of 2940 Kg/ha and significantly superior to other cultures tried. Next to this treatment, TNAU 160 has recorded higher grain yield (1531 Kg/ha) and fodder production 2763 Kg/ha and followed by VL 239 variety are significantly superior to other cultures tried.

Fertilizers Levels

Among the various fertilizers levels, application of 100 percent recommended dose recorded significantly higher grain yield of 1775 Kg/ha and fodder production of 3197 Kg/ha and significantly superior to the lower levels of fertilizer. The interaction effect was found to be significant. Among the different cultures, DhBmv 36-8 has recorded higher net monetary return of Rs. 54030/ha with B:C ratio of 3.36. Among the fertilizers levels 100 percent recommended dose recorded higher net monetary return of Rs 42575/ha with B: C ratio of 3.75. The culture DhBmv 36-8 has recorded higher net monetary return of Rs. 52149/ha and B:C ratio of 4.37 at 100% RDF.

8. Progress made during the period under report:

9. Salient findings:.

Among the different Kodo millet varieties, TNAU 111 has recorded higher grain yield, straw yield, net return and B:C ratio. Among the different Little millet varieties, DhLTMV has recorded higher grain yield, straw yield, net return and B:C ratio. Among the different Barnyard millet varieties, DhBmv 36-8 has recorded higher grain yield, straw yield, net return and B:C ratio

10.Remarks of the Technical Director based on the pre-review: It has to be continued

1.Project No.	DCM – CBE – AGR – 13 - 009
2.Project Title	Evolving drought management practices in rainfed finger millet to mitigate climate change
3.Name of the Department	Department of Millets,TNAU, Coimbatore
4.Project Leader(s).	Dr.S.Manoharan
5.Period	July 2013 – June 2016

6.Objectives :

7.Progress made so far:

Droughts:

Among the various kinds of drought, mid season drought has recorded higher grain yield of 2807 kg/ha with higher fodder production of 5015 kg/ha. The above said treatment was on par with late season drought.

Drought Management Practices:

Among the various drought management practices, reducing weed menance by spraying post emergence herbicide and potash spraying (0.1 per cent) has recorded higher grain yield of 2863 kg/ha and fodder yield of 5064 kg/ha, which is on par with other practices.

Control plot recorded a grain yield of 2250 kg/ha with fodder production of 4162 kg/ha.

Interaction:

Application of 150% recommended dose of fertilizer (immediately after the alleviation of stress during early season drought) recorded higher grain yield of 2715 kg/ha and fodder yield of 5355 kg/ha. The above said treatment recorded 20.67 per cent and 28.67 per cent increase in grain yield and fodder yield over the control.

Economics:

Among the various kinds of drought, mid season drought recorded higher net monetary return of Rs.32810/ha and with higher B:C ratio of 1.73. Among the various drought management practices, reducing weed menance by spraying post emergence herbicide and potash spraying (0.1 percent) recorded higher net monetary return of Rs.37761/ha and with higher B:C ratio of 1.90. The interaction effect showed that long season drought with top dressing of urea after alleviation of stressand giving two life irrigation recorded higher net return of Rs.37721/ha with B:C ratio of 1.95.

8. Progress made during the period under report:

9. Salient findings:. The interaction effect showed that long season drought with top dressing of urea after alleviation of stress and giving two life irrigation recorded higher net return of Rs.37721/ha with B:C ratio of 1.95.

10. Remarks of the Technical Director based on the pre-review: It has to be continued

1.Project No.	DCM – CBE – AGR – 13 - 008
2.Project Title	Screening of small millets for problematic soils
3.Name of the Department	Department of Millets,TNAU, Coimbatore
4.Project Leader(s).	Dr.S.Manoharan
5.Period	July 2013 – June 2016

6.Objectives :

7.Progress made so far:

Small Millet Crops

Among the various small millet crops tried in alkaline soils, finger millet recorded higher grain yield of 2123 Kg/ha with higher fodder production of 3994 Kg/ha and significantly superior to other small millet crops. Next to this crop, Kodo millet recorded higher grain yield (1820 Kg/ha) with higher fodder production (3270 Kg/ha). The lowest grain and fodder yields were recorded by little millet.

Varieties

Finger millet: Trichy 1 variety recorded higher grain yield of 2415 kg/ha with higher fodder production of 4522 kg/ha.

Barnyard millet: The variety CO.2 recorded higher grain yield of 2130 kg/ha with higher fodder production of 4061 kg/ha.

Kodo millet: The variety GPUK3 recorded higher grain yield of 2218 kg/ha with higher fodder production of 4099 kg/ha.

Little millet; The variety CO.4 recorded higher grain yield of 1138 kg/ha with higher fodder production of 3430 kg/ha.

Foxtail millet: The variety CO.7 recorded higher grain yield of 1762 kg/ha with higher fodder production of 3335 kg/ha.

Proso millet: The variety CO.5 recorded higher grain yield of 1697 kg/ha with higher fodder production of 3135 kg/ha.

Crop x Varieties: The interaction effect was found to be significant between the crops and varieties.

Economics

Among the various small millet crops tried in alkaline soils, finger millet recorded higher net monetary return of Rs.35861/ha with B:C ratio of 2.54. Next to this, kodo millet recorded higher net monetary return of Rs. 27184/ha with B: C ratio of 2.19. The interaction effect showed that the variety Trichy 1 in finger millet, has recorded higher net monetary return of Rs.43236/ha with higher B:C ratio of 2.81.

8. Progress made during the period under report:

9. Salient findings:. Among the various small millet crops tried in alkaline soils, finger millet recorded higher grain yield, fodder yield, net monetary return and B:C ratio. Next to this, kodo millet recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

10. Remarks of the Technical Director based on the pre-review: It has to be continued

1. Project No.

2. Project Title Chemical weed control studies in kodo millet

3. Name of the Department Department of Millets,TNAU, Coimbatore

4. Project Leader(s). Dr.S.Manoharan

5. Period July 2014 – June 2017

6. Objectives :

7. Progress made so far:

Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher grain yield of 2522 kg/ha with the fodder production of 4438 kg/ha. The above said treatment was on par with the pre-emergence application of pendimethalin @ 0.5 kg a.i / ha followed by 1 IC at 45 DAS (T6) and Pre emergence application of Bensulfuron ethyl + Petilachlor @ 2.0 kg a.i /ha followed by 1 IC at 45 DAS (T8) and significantly superior to other treatments. The lowest grain and fodder yields were recorded by the unweeded check (T12).

Economics

Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher net monetary return of Rs.64417/ha with B:C ratio of 4.60. Next to this treatment, pre-emergence application of pendimethalin @ 0.5 kg a.i / ha followed by 1 IC at 45 DAS (T6) and Pre emergence application of Bensulfuron ethyl + Pretilachlor @ 2.0 kg a.i /ha followed by 1 IC at 45 DAS (T8) has recorded higher net income and B:C ratio.

8. Progress made during the period under report:

9. Salient findings:. Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

10. Remarks of the Technical Director based on the pre-review: Nil

1. Project No.

2. Project Title Chemical weed control studies in little millet

3. Name of the Department Department of Millets,TNAU, Coimbatore

4. Project Leader(s). Dr.S.Manoharan

5. Period July 2014 – June 2017

6. Objectives :

7. Progress made so far:

Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher grain yield of 1520 kg/ha with the fodder production of 2660 kg/ha. The above said treatment was on par with the pre-emergence application of pendimethalin @ 0.5 kg a.i / ha followed by 1 IC at 45 DAS (T6) and significantly superior to other treatments. Next to the above said treatments, pre emergence application of Bensulfuron ethyl + Petilachlor @ 2.0 kg /ha followed by 1 IC at 45 DAS (T8) after sowing has recorded higher grain yield of 1406 kg/ha with the fodder production of 2503 kg/ha. The lowest grain and fodder yields were recorded by the unweeded check (T12).

Economics

Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher net monetary return of Rs.32690/ha with B:C ratio of 2.93. Next to this treatment, pre-emergence application of pendimethalin @ 0.5 kg a.i / ha followed by 1 IC at 45 DAS (T6) has recorded higher net income of Rs.30818/ha and B:C ratio of 2.82.

8. Progress made during the period under report:

9. Salient findings:

Among the various weed control treatments, pre-emergence application of Isoproturon @ 0.5 kg a. I /ha followed by 1 IC at 45 DAS (T10) recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

10. Remarks of the Technical Director based on the pre-review: Nil

1.Project No.

2.Project Title	Intercropping studies in little millet
3.Name of the Department	Department of Millets,TNAU, Coimbatore
4.Project Leader(s).	Dr.S.Manoharan
5.Period	July 2014 – June 2017

6. Objectives :

7. Progress made so far:

All the intercrops grown with little millet crop have been converted into little millet equivalent grain yield. Among the various intercropping systems, little millet + bhendi (8:2) ratio recorded higher little millet equivalent grain yield of 1708 kg/ha with fodder production of 3176 kg/ha and it was followed by intercropping of little millet with green gram at 8:2 ratio which recorded higher little millet equivalent grain yield of 1623 kg/ha and fodder production of 3002 kg/ha and significantly superior to other treatments.

The lowest little millet equivalent grain yield and fodder yield was recorded by the little millet + guar (8:2).

Economics

Among the various intercropping systems, little millet + bhendi (8:2 ratio) recorded net monetary return of Rs. 38154/ha with B:C ratio of 3.14. Next to this, intercropping of little millet with green gram at 8:2 ratio which recorded higher net monetary return of Rs. 35393/ha with B:C ratio of 2.99. The lowest net return and B:C ratio were recorded by intercropping of little millet with guar (8:2).

8. Progress made during the period under report:

9. Salient findings:

Among the various intercropping systems, little millet + bhendi (8:2 ratio) recorded higher little millet equivalent grain yield, fodder yield, net monetary return and B:C ratio.

10. Remarks of the Technical Director based on the pre-review: Nil

1.Project No.

2.Project Title	Effect of different methods of crop establishment and weed control measures on growth and yield of Finger millet
3.Name of the Department	Department of Millets,TNAU, Coimbatore
4.Project Leader(s).	Dr.S.Manoharan
5.Period	July 2014 – June 2017

6.Objectives :

7.Progress made so far:

Method of establishment

Among the various methods of establishment, providing row spacing 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between ragi (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch (M_2) recorded higher grain yield of 2736 kg/ha and with higher fodder production of 5234 kg/ha. The above said method of establishment was found to be significantly superior to other methods of establishment.

Weed Management Practices

Among the various weed management practices, integrated weed control method (application of pre-emergence herbicide @ 0.5 kg a.i/ha with one intercultivation) recorded higher grain yield of 2432 kg/ha with higher fodder production of 4721 kg/ha and it is significantly superior to other weed management practices.

Interaction

The interaction effect was found to be significant. Providing row spacing 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between ragi (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch (M_2) along with integrated weed control method (Herbicide + 1 IC) recorded higher grain yield of 3536 kg/ha and higher fodder production of 6701 kg/ha. The above said treatment combination was found to be significantly superior to other treatmental combinations.

Economics

Among the various methods of establishment, providing row spacing 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between ragi (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch (M_2) recorded higher net monetary return of Rs.37291 /ha and with higher B:C ratio of 1.89. Among the various weed control methods, integrated weed control method (Herbicide + 1IC) registered higher net monetary return of Rs.43935/ha with higher B:C ratio of 1.99. The interaction effect showed that providing wider row spacing of 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between ragi (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch (M_2) along with integrated weed control method (Herbicide + 1IC) recorded higher net monetary return of Rs.54160 along with higher B:C ratio of 2.22.

8. Progress made during the period under report:

9. Salient findings:

The interaction effect showed that providing wider row spacing of 45cm and plant to plant spacing of 7.5cm and raising sunnhemp green manure in between ragi (22.5 cm) rows and harvesting sunnhemp at 40 DAS and using as mulch (M_2) along with integrated weed control method (Herbicide + 1IC) recorded higher grain yield, fodder yield, net monetary return and B:C ratio.

10.Remarks of the Technical Director based on the pre-review: Nil

1. **Project no.**	:	AICRP / PBG / CBE / PEM /009
2.Project title	:	Response of Pearl Millet Advance, Medium and Late hybrid and varietal entries to N levels
3.Name of the department	:	Department of Millets, TNAU
4. Name of the project leaders	:	N.Meyyazhagan,
5. Period	:	Continuous
6. **Objectives**	:	To study the response of advance hybrids and nitrogen application

7. Progress made so far :

This is the continuous experiment under AICPMIP. Every year new entries are allotted for evaluating for their response for N application. These entries were treated for their response to N levels of 30, 60 and 90kg/ha. The experiment was laid out in a split splot design with N levels in Main plot and entries in subplot. The treatments were replicated three times.

Table.1.Response of pearl millet hybrids to N levels

<table>
<tr><th>Nitrogen Levels/ Entries</th><th colspan="2">Plant population ‘000/ha</th><th colspan="2">Plant height (cm)</th><th colspan="2">Days to 50% flowering</th><th colspan="2">Total tillers (No./Plant)</th><th colspan="2">Productive tillers (No./Plant)</th><th colspan="2">Earhead length (cm)</th><th colspan="2">Earhead girth (cm)</th></tr>
<tr><td colspan="13">N levels(Kg/ha)</td><td colspan="2"></td></tr>
<tr><td>30</td><td colspan="2">136.0</td><td colspan="2">163.7</td><td colspan="2">46.4</td><td colspan="2">3.3</td><td colspan="2">2.6</td><td colspan="2">21.9</td><td colspan="2">8.1</td></tr>
<tr><td>60</td><td colspan="2">133.2</td><td colspan="2">159.0</td><td colspan="2">47.5</td><td colspan="2">3.5</td><td colspan="2">2.9</td><td colspan="2">22.6</td><td colspan="2">8.6</td></tr>
<tr><td>90</td><td colspan="2">132.8</td><td colspan="2">163.5</td><td colspan="2">47.5</td><td colspan="2">3.8</td><td colspan="2">3.1</td><td colspan="2">23.8</td><td colspan="2">8.9</td></tr>
<tr><td>Entries</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td></tr>
<tr><td>MH1852</td><td colspan="2">132.3</td><td colspan="2">162.0</td><td colspan="2">45.1</td><td colspan="2">3.4</td><td colspan="2">2.7</td><td colspan="2">20.1</td><td colspan="2">9.7</td></tr>
<tr><td>MH1889</td><td colspan="2">133.1</td><td colspan="2">167.5</td><td colspan="2">50.3</td><td colspan="2">3.1</td><td colspan="2">2.4</td><td colspan="2">26.7</td><td colspan="2">9.0</td></tr>
<tr><td>MH1888</td><td colspan="2">132.3</td><td colspan="2">164.0</td><td colspan="2">47.4</td><td colspan="2">3.5</td><td colspan="2">2.8</td><td colspan="2">27.0</td><td colspan="2">9.2</td></tr>
<tr><td>MH 1887</td><td colspan="2">138.7</td><td colspan="2">166.2</td><td colspan="2">48.6</td><td colspan="2">3.7</td><td colspan="2">3.0</td><td colspan="2">18.6</td><td colspan="2">9.4</td></tr>
<tr><td>MH1904</td><td colspan="2">132.5</td><td colspan="2">161.7</td><td colspan="2">47.6</td><td colspan="2">3.4</td><td colspan="2">3.0</td><td colspan="2">24.0</td><td colspan="2">9.3</td></tr>
<tr><td>MH1901</td><td colspan="2">135.2</td><td colspan="2">157.5</td><td colspan="2">49.0</td><td colspan="2">3.5</td><td colspan="2">3.1</td><td colspan="2">18.9</td><td colspan="2">9.8</td></tr>
<tr><td>MP533</td><td colspan="2">131.9</td><td colspan="2">164.4</td><td colspan="2">45.1</td><td colspan="2">3.7</td><td colspan="2">2.8</td><td colspan="2">22.0</td><td colspan="2">6.5</td></tr>
<tr><td>MP534</td><td colspan="2">135.5</td><td colspan="2">164.2</td><td colspan="2">45.4</td><td colspan="2">4.4</td><td colspan="2">3.0</td><td colspan="2">23.1</td><td colspan="2">8.0</td></tr>
<tr><td>MP535</td><td colspan="2">136.8</td><td colspan="2">162.7</td><td colspan="2">44.8</td><td colspan="2">3.2</td><td colspan="2">2.5</td><td colspan="2">24.9</td><td colspan="2">6.2</td></tr>
<tr><td>Pratap</td><td colspan="2">135.3</td><td colspan="2">147.4</td><td colspan="2">48.3</td><td colspan="2">3.5</td><td colspan="2">3.1</td><td colspan="2">22.2</td><td colspan="2">8.6</td></tr>
<tr><td>86M64</td><td colspan="2">132.2</td><td colspan="2">167.4</td><td colspan="2">49.0</td><td colspan="2">3.5</td><td colspan="2">2.8</td><td colspan="2">21.9</td><td colspan="2">8.1</td></tr>
<tr><td>Raj 171</td><td colspan="2">132.5</td><td colspan="2">159.8</td><td colspan="2">45.0</td><td colspan="2">3.7</td><td colspan="2">3.0</td><td colspan="2">22.6</td><td colspan="2">8.6</td></tr>
<tr><td></td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td></tr>
<tr><td>N Levels</td><td>1.99</td><td>NS</td><td>3.2</td><td>8.87</td><td>0.3</td><td>0.83</td><td>0.13</td><td>0.36</td><td>0.08</td><td>0.22</td><td>0.86</td><td>2.38</td><td>0.1</td><td>0.27</td></tr>
<tr><td>Entries</td><td>2.4</td><td>NS</td><td>4.2</td><td>8.4</td><td>0.6</td><td>1.2</td><td>0.11</td><td>0.22</td><td>0.13</td><td>0.26</td><td>1.09</td><td>2.18</td><td>0.84</td><td>1.68</td></tr>
<tr><td>NxE</td><td>4.16</td><td>NS</td><td>7.2</td><td>NS</td><td>1.0</td><td>NS</td><td>0.19</td><td>NS</td><td>0.22</td><td>NS</td><td>1.89</td><td>NS</td><td>1.46</td><td>NS</td></tr>
</table>

Table.2.Response of pearlmillet hybrids to N levels

Nitrogen Levels/ Entries	Test weight (g)		Grain Yield (Kg/ha)		Straw yield (Kg/ha)		Gross returns (Rs/ha)	Net returns (Rs/ha)	B/C ratio
N levels Kg/ha									
30	11.1		1776		3496		23056	7706	1.50
60	11.8		2019		3756		26101	10401	1.66
90	12.1		2399		4022		30793	14743	1.92
Entries									
MH1852	12.9		2228		3849		28663	13138	1.85
MH1889	12.9		2315		4013		29789	14264	1.92
MH1888	12.3		2195		3737		28214	12689	1.82
MH 1887	12.2		2188		3779		28140	12615	1.81
MH1904	11.9		2377		3826		30437	14912	1.96
MH1901	11.5		2395		4046		30758	15233	1.98
MP533	11.0		1741		3639		22715	7190	1.46
MP534	10.9		1798		3752		23450	7925	1.51
MP535	10.8		1635		3307		21269	5744	1.37
Pratap	12.9		2118		4183		27503	11978	1.77
86M64	11.3		2016		3444		25917	10392	1.67
Raj 171	9.3		1765		3518		22943	7418	1.48
	SED	CD	SED	CD	SED	CD	NA	NA	NA
N Levels	0.24	0.67	85..0	235.8	107	297			
Entries	0.28	0.56	89.9	179.5	184	367			
NxE	0.49	NS	155.8	NS	318	NS			

8. Progress made during the period under report:

The experiment was conducted during Kharif,2014. The experiment was laid out with new entries MH 1852, MH 1889, MH 1888, MH 1887, MH 1904, MH 1901, MP 533, MP534, MP 535 and zonal checks Pratap, 86M64, and Raj 171.

The results indicated that application of Nitrogen influenced upon the growth and yield of the Pearl millet hybrids. Application of 30 kg/ha influenced the yield and there was a further increase in the application of N up to 90 Kg/ha. The yield was the highest with the application of N at higher level. A similar trend was observed with the straw yield of the Pearl millet.

The entries MH 1901, MH1904, MH1889 and MH 1852 were found performing well over other entries. In general millet hybrids showed higher performance over millet population. The interaction effect was not observed.

Since the entries allotted for N response studies varied every year there was no scope for combined analysis. The results are analyzed and interpreted for every year of study separately.

9. Salient findings :

The entries responded for the application of N upto 90 Kg/ha. The entries MH 1901, MH1904 and MH 1889 yielded more than other entries.

11. Remarks of the Technical Director based on the pre-review: Kharif results may be presented

1. **Project no.**	**:**	AICRP / PBG / CBE / PEM /009
2.Project title	**:**	Performance of Pearl Millet Advance Hybrid and population entries to different sowing dates.
3.Name of the department	**:**	Department of Millets, TNAU, Coimbatore
4. Name of the project leaders	**:**	N.Meyyazhagan,
5. Period	**:**	Continuous
6. **Objectives**	**:**	To study the response of advance hybrids and different sowing date.
7.Progress made so far	**:**	This is continuing experiment

8. Progress made during the period under report

The experiment was laid out with new entries MH 1852, MH 1889, MH 1888, MH 1887, MH 1904, MH 1901, MP 535 and zonal checks Pratap, 86M64, and Raj 171. These entries were sown in three different dates,i.e. July last week, August second week and August fourth week. The experiment was laid out in a split splot design with sowing dates in Main plot and entries in subplot. The treatments were replicated three times.The experiment was conducted during Kharif,2014.

9.Salint findings

Sowing time did not show any difference in the performance all the entries. The entries MH 1901, MH 1887, MH 1888, MH 1889 and MH1852 have shown an increasing trend over other types tried. The millet population has shown a lesser performance.

10. Remarks of the Technical Director based on the pre-review:

PMAT 11c: The entries are tested for their performance under different sowing dates during the Kharif season

Sowing time/ Entries	Plant population '000/ha		Plant height (cm)		Days to 50% flowering		Total tillers (No./Plant)		Productive tillers (No./Plant)		Earhead length (cm)		Earhead girth (cm)	
Sowing time														
S1	133.2		157.1		46.6		3.5		2.9		22.0		8.0	
S2	134.9		161.9		47.6		3.6		3.0		20.9		8.2	
S3	131.5		158.3		47.4		3.6		3.1		21.4		8.0	
MH1852	133.4		157.6		45.3		3.6		3.2		19.8		8.8	
MH1889	133.5		162.2		46.0		3.6		2.7		25.3		8.4	
MH1888	134.8		164.3		49.0		3.4		2.8		25.2		8.2	
MH 1887	135.0		161.7		49.2		4.0		3.5		18.4		8.3	
MH1904	132.8		158.8		48.2		3.3		3.1		21.7		8.5	
MH1901	134.4		153.8		48.2		3.4		3.1		21.0		8.4	
MP535	131.0		152.4		44.3		3.4		2.9		22.4		7.0	
Pratap	130.4		142.8		48.7		3.4		2.8		18.4		8.2	
86M64	130.9		159.7		48.4		3.1		2.9		21.3		8.4	
Raj 171	135.9		177.8		44.3		4.3		2.8		21.2		6.4	
	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
N Levels	2.21	NS	2.4	NS	0.49	NS	0.09	NS	0.12	NS	0.7	NS	0.16	NS
Entries	2.95	NS	3.6	7.4	0.68	1.39	0.16	0.33	0.2	0.42	0.9	1.9	0.28	0.57
NxE	5.11	NS	6.2	NS	1.17	NS	0.28	NS	0.72	NS	1.6	NS	0.48	NS

PMAT 11c: The entries are tested for their performance under different sowing dates during the Kharif season

<table>
<tr><th>Sowing time / Entries</th><th colspan="2">Test weight (g)</th><th colspan="2">Grain Yield (Kg/ha)</th><th colspan="2">Straw yield (Kg/ha)</th><th>Gross returns (Rs/ha)</th><th>Net returns (Rs/ha)</th><th>B/C ratio</th></tr>
<tr><td colspan="10">Sowing time</td></tr>
<tr><td>S1</td><td colspan="2">11.6</td><td colspan="2">1898</td><td colspan="2">3575</td><td>24567</td><td>9017</td><td>1.58</td></tr>
<tr><td>S2</td><td colspan="2">11.6</td><td colspan="2">1923</td><td colspan="2">3668</td><td>24910</td><td>9360</td><td>1.60</td></tr>
<tr><td>S3</td><td colspan="2">11.9</td><td colspan="2">1902</td><td colspan="2">3644</td><td>24642</td><td>9092</td><td>1.58</td></tr>
<tr><td>Entries</td><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td></td><td></td><td></td></tr>
<tr><td>MH1852</td><td colspan="2">12.1</td><td colspan="2">1910</td><td colspan="2">3668</td><td>24754</td><td>9204</td><td>1.59</td></tr>
<tr><td>MH1889</td><td colspan="2">12.2</td><td colspan="2">1973</td><td colspan="2">3738</td><td>25549</td><td>9999</td><td>1.64</td></tr>
<tr><td>MH1888</td><td colspan="2">12.9</td><td colspan="2">2077</td><td colspan="2">4055</td><td>26948</td><td>11398</td><td>1.73</td></tr>
<tr><td>MH 1887</td><td colspan="2">12.9</td><td colspan="2">1987</td><td colspan="2">4175</td><td>25928</td><td>10378</td><td>1.67</td></tr>
<tr><td>MH1904</td><td colspan="2">11.8</td><td colspan="2">1930</td><td colspan="2">4013</td><td>25166</td><td>9616</td><td>1.62</td></tr>
<tr><td>MH1901</td><td colspan="2">12.8</td><td colspan="2">2063</td><td colspan="2">4208</td><td>26864</td><td>11314</td><td>1.73</td></tr>
<tr><td>MP535</td><td colspan="2">8.6</td><td colspan="2">1633</td><td colspan="2">2650</td><td>20925</td><td>5375</td><td>1.35</td></tr>
<tr><td>Pratap</td><td colspan="2">12.4</td><td colspan="2">1853</td><td colspan="2">3053</td><td>23766</td><td>8216</td><td>1.53</td></tr>
<tr><td>86M64</td><td colspan="2">10.5</td><td colspan="2">1893</td><td colspan="2">3055</td><td>24248</td><td>8698</td><td>1.56</td></tr>
<tr><td>Raj 171</td><td colspan="2">10.5</td><td colspan="2">1757</td><td colspan="2">3675</td><td>22918</td><td>7368</td><td>1.47</td></tr>
<tr><td></td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>SED</td><td>CD</td><td>NA</td><td>NA</td><td>NA</td></tr>
<tr><td>N Levels</td><td>0.08</td><td>NS</td><td>59.9</td><td>NS</td><td>148.4</td><td>NS</td><td></td><td></td><td></td></tr>
<tr><td>Entries</td><td>0.25</td><td>0.5</td><td>67.5</td><td>138.4</td><td>416.1</td><td>337.9</td><td></td><td></td><td></td></tr>
<tr><td>NxE</td><td>0.42</td><td>NS</td><td>116.9</td><td>NS</td><td>109.1</td><td>NS</td><td></td><td></td><td></td></tr>
</table>

1. **Project no.**	**:**	DCM-CBE-AGR-12-009
2.Project title	**:**	Integrated weed management in Pearl millet (PMAT-9)
3.Name of the department	**:**	Department of Millets, TNAU, Coimbatore
4. Name of the project leaders	**:**	N.Meyyazhagan,
5. Period	**:**	July, 2012 – June, 2015
6. **Objectives**	**:**	To find out the possibility of using chemical method as an alternate to manual weeding in Pearlmillet and To work out the economics of weed control methods

7. Progress made so far

The experiment was under All India Coordinated Project and conducted for two years. The experiment consisted of nine treatments i.e. Unweeded check(T_1), Weed free check(T_2), Atrazine applied at 0.5 Kg a.i./ha as pre-emergence fb H.W.(T_3), Atrazine at 0.1,0.2,0.3,0.4 Kg a.i./ha as post emergence fb H.W 35 DAS (T_4, T_5,T_6,T_7)and two hand weeding15 and 30-35 days after sowing (T_8). The experiment was conducted in RBD replicated three times. It was compared with the recommendation for our region i.e. Atrazine 0.25 Kg a.i./ha fb hand weeding on 35 DAS(T_9).

8. Progress made during the period under report

This is the third year of experimentation.The weed flora of the experiment were *panicumrepens, trianthemaportulacastrum, Cynodondactylon, Digeraarvensis, Partheniumhysterophorus.*

The results indicated that grain yield was more with two hand, weed free check, atrazine 0.25 and 0.5 Kg a.i./ha as pre-emergence followed hand weeding, weed free checkand were significantly superior overweedingunweeded check. Application of atrazine at 0.1,0.2,0.3 and 0.4 Kg a.i./ha as post-emergence followed by a hand weeding at 35 DAS though increased the yield over unweeded check but were not significant.

A similar trend was observed with straw yield. Grain yield was more with two hand weeding weed free check and atrazine0.25 and 0.5 Kg a.i./ha as pre-emergence followed hand weeding, and were significantly superior over unweeded check. No pytotoxic symptom was observed.

Gross returns were more with atrazine at 0.25 and 0.5 Kg a.i./ha as pre-emergence followed a hand weeding 45 DAS . The next in the line were weed free check and two hand weeding. It was the lowest with the unweeded check.

Net returns were more with the application of atrazine at 0.25 and 0.5 Kg a.i. /ha as pre-emergence followed a hand weeding 45 DAS , weed free check and two hand weeding. It was the lowest with the unweeded check. (Table 1&2)

9. Salient findings : Atrazine 0.5 Kg/ha or 0.25 Kg/ha fb hand weeding 35 DAS were found to perform on parity with two hand weeding on 15 and 35 DAS.

10. Project wise remarks: weed flora, intensity, WCE,days of HW, growth characters, pooled data are to be given.Phytotoxicity ratings may be provided.

Table1.Effedct of different weed management practices on Pearl millet yield

Treat-ment	**Population/ ha**		**Plant height (cm)**		**Days to 50% flowering**		**Total tillers (No./Plant)**		**Productive tillers (No./Plant)**		**Earhead length (cm)**		**Earhead Girth (cm)**	
T1	130.3		142		45.3		2.6		1.8		21.1		7.3	
T2	132.0		171		46.3		4.0		3.6		23.4		8.7	
T3	131.3		171		45.7		4.1		3.8		24.0		8.5	
T4	131.7		155		49.0		3.9		3.0		19.9		7.8	
T5	138.7		156		49.7		3.7		2.9		22.9		7.8	
T6	128.3		156		50.0		3.6		3.1		22.0		7.7	
T7	125.3		160		47.3		3.5		3.0		22.0		8.1	
T8	135.7		166		46.3		3.7		3.5		23.9		8.1	
T9	130.0		166		46.7		3.9		3.6		23.2		8.2	
	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
	6.7	NS	18.2	1.7	3.6	0.32	8.4	18.2	1.7	3.6	1.24	2.69	0.28	0.61

Table2.Effedct of different weed management practices on Pearl millet yield

Treatment	**Test Weight (g)**		**Grain Yield (Kg/ha)**		**Straw yield (Q/ha)**		**Gross returns (Rs/ha)**		**Net returns (Rs/ha)**		**B/C ratio**	
T1	11.1		1560		27.2		20078		8378		1.7	
T2	12.9		2080		36.5		26785		12085		1.8	
T3	12.6		1960		35.4		25288		12088		1.9	
T4	12.3		1310		23.5		16895		3995		1.3	
T5	12.3		1450		27.4		18771		5771		1.4	
T6	11.5		1590		30.1		20585		7385		1.6	
T7	11.1		1180		22.1		15267		1867		1.1	
T8	12.9		2090		35.6		26860		12660		1.9	
T9	12.2		1890		34.8		24420		11420		1.9	
	SED	CD	SED	CD	SED	CD	SED	CD	NA		SED	CD
	0.38	0.82	137.0	295.9	3.6	7.8	1811	3911			0.72	1.56

Table 3.Effect of different weed management practices on Pearl millet yield

	30 DAS			At harvest		
Treatment	**Weed intensity (no./m^2)**	**Weed dry weight (g/m^2)**	**Weed control efficiency (%)**	**Weed intensity (no./m^2)**	**Weed dry weight (g/m^2)**	**Weed control efficiency(%)**
T1	192.0	195.0	0.0	189.3	226.7	0
T2	58.7	79.8	58.2	62.0	75.0	66.6
T3	83.0	101.2	48.6	111.7	124.0	45.9
T4	135.3	134.7	30.7	143.3	174.8	22.7
T5	134.0	125.0	36.2	143.7	174.8	23.1
T6	138.0	120.6	38.9	147.3	167.5	26.7
T7	130.7	126.4	34.9	141.3	178.5	21.1
T8	101.7	119.7	38.8	110.7	134.8	39.2
T9	67.0	100.8	47.8	72.0	134.2	41.4

Table 4. Effedct of different weed management practices on Pearl millet yield (Combined analysis)

Treatment	**Grain yield (Kg/ha)**	**Straw yield (Kg/ha)**	**Gross returns (Rs/ha)**	**Net returns (Rs/ha)**	**B/C ratio**
T1	1377	2717	20078	8378	1.7
T2	2106	3649	26785	12085	1.8
T3	2089	3536	25288	12088	1.9
T4	1496	2349	16895	3995	1.3
T5	1534	2741	18771	5771	1.4
T6	1646	3009	20585	7385	1.6
T7	1555	2215	15267	1867	1.1
T8	2088	3561	26860	12660	1.9
T9	2088	3480	24420	11420	1.9
	SED119361.2 361.2 361.2	 780.1 780.1	NA		
	CD 257780.1		NA		

1. **Project no.** : DCM-CBE-AGR-12-010

2.Project title : Nutrient management through organic and inorganic sources for major and trace elements in Pearl millet (PMAT-10)

3.Name of the department : Department of Millets, TNAU, Coimbatore

4. Name of the project leaders : N.Meyyazhagan

5. Period : July,2012 – June,2015

6. **Objectives** : To study the organic and inorganic sources on Pear and yield

7. Progress made so far :

The experiment was conducted for two years. The experiment consisted of two factors, FYM at two levels (No application and 5.0 t/ha application) and inorganic fertilizers to supply major and trace elements i.e. No fertilizer application, Recommended Dose of NPK (RDF 80:40:40 Kg/ha)), RDF+Zincsulphate at 20 Kg/ha, Ferrous sulphate 20 Kg/ha, Boron 10 Kg/ha and Gypsum 250 Kg/ha. The experiment was conducted in Factorial RBD and replicated thrice.

8. Progress made during the period under report:

This is the third year of experimentation. FYM application of 5.0 t/ha increased the growth and yield of Pearl millet. Application of RDF alone or in combination with Zinc as Zinc sulphate, Iron as iron sulphate, Boron as borax or Gypsum increased the plant height, total and productive tillers, earhead length and girth and finally the yield of grain and straw. The applied fertilizers to supply trace elements in combination with RDF improved the growth and yield but were not significant over RDF alone.

Gross return worked out for the FYM application has shown an increased amount than no FYM application. Gross return was more with RDF +Boron, RDF+Zn, RDF+Fe, Gypsum and RDF alone.(Table 1 &2).Net return was more with no FYM application. It was higher with RDF in the combination of Gypsum, Fe, Zn, B and RDF alone. The lowest return was obtained with control(No manure or fertilizer applied)

9. Salient findings :

Application of FYM 5.0 t/ha increased the yield over no manure application. The trace elements combined with FYM showed an increase over the control but did not differ among themselves significantly. The initial soil analysis and post analysis of the treatment means did not show marked difference except P which has little increase

10. Project wise remarks: Dose of FYM, Growth characters, yield parameters, soil analysis data are to be given

Initial soil available nutrients

Nutrients	**Available (kg/ha)**	**Status (high/ medium/ low)**
N	246	Low
P	9.0	Low
K	639	High
ZN	1.3	Sufficient
Fe	20.2	Sufficient

Post harvest soil analysis

Nutrients	Available (kg/ha)	Status (high/ medium/ low)
N	223.93	Low
P	12.27	Medium
K	530.40	High
ZN	2.92	Sufficient
Fe	18.34	sufficient

The experiment was conducted for the second year. The experiment consisted of two factors, FYM at two levels (No application and 5.0 t/ha application) and inorganic fertilizers to supply major and trace elements i.e. No fertilizer application, Recommended Dose of NPK(RDF 80:40:40 Kg/ha)), RDF+Zincsulphate at 20 Kg/ha, Ferrous sulphate 20 Kg/ha, Boron 10 Kg/ha and Gypsum 250 Kg/ha. The experiment was conducted in Factorial RBD and replicated thrice.FYM & Fertilizers

Table.1.Effect of organic and inorganic sources of nutrients on Pearl millet

	Population/ ha (in thousands)		Plant height (cm)		Days to 50% flowering		Total tillers no/Plant		Productive tillers (no./Plant)		Earhead length (cm)		Earhead girth (cm)	
No FYM application	136		155.8		46.6		2.7		2.3		23.0		5.6	
FYM Application	135		159.3		47.8		2.9		2.5		24.0		6.1	
RDF	133		157.3		47.5		2.71		2.1		24.3		5.7	
Zn SO4	135		160.5		47.5		2.80		2.5		23.0		5.8	
Fe SO4	138		156.8		47.7		3.05		2.6		24.3		5.9	
Boron	136		159.8		46.5		2.89		2.5		23.6		5.8	
Gypsum	135		157.0		48.2		2.72		2.4		25.3		5.7	
Control	136		153.6		45.8		2.53		2.4		20.8		5.6	
	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
Tech-FYM	1.13	NS	0.94	1.95	0.33	0.68	0.07	0.15	0.07	0.14	0.39	0.80	0.34	0.34
Fert	1.96	NS	1.63	NS	0.57	NS	0.12	NS	0.12	NS	0.67	NS	0.59	NS
FYMxFert	1.60	NS	1.33	NS	0.46	NS	0.10	NS	0.09	NS	0.55	NS	0.48	NS

Table.2.Effect of organic and inorganic sources of nutrients on Pearl millet

FYM & Fertilizers	Test weight (g)		Grain Yield (Kg/ha)		Straw yield (Kg/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		B/C ratio	
No FYM application	11.3		2002		38.1		24158		8366		1.53	
FYM Application	11.8		2237		43.1		26862		6070		1.29	
RDF	11.4		2167		39.8		26369		8319		1.48	
Zn SO4	11.8		2272		41.3		27279		7979		1.43	
Fe SO4	11.8		2211		43.2		26554		7504		1.41	
Boron	11.4		2167		41.2		26025		7175		1.40	
Gypsum	11.6		2046		41.4		24573		6273		1.35	
Control	11.2		1854		36.7		22260		6060		1.39	
	SED	CD	SED	CD	SED	CD	NA	CD	NA		NA	
Tech-FYM	0.09	0.19	58.0	120.3	1.2	2.5						
Fert	0.15	NS	100.4	NS	2.0	NS						
FYMxFert	0.13	NS	82.0	NS	1.7	NS						

Table.3. Effect of organic and inorganic sources of nutrients on Pearl millet (combined analysis)

FYM & Fertilizers	Grain yield (Kg/ha)		Sraw yield (Kg/ha)		Gross return (Rs/ha)		Net return (Rs/ha)		B/C ratio	
No FYM application	2006		4094		26116		10325		1.66	
FYM Application	2274		4653		29615		8823		1.42	
RDF	1976		4007		25710		7660		1.44	
Zn SO4	2188		4450		28486		9186		1.49	
Fe SO4	2276		4656		29635		10585		1.57	
Boron	2205		4404		28661		9811		1.53	
Gypsum	2203		4499		28682		10382		1.59	
Control	1992		4224		26019		9819		1.63	
	SED	CD	SED	CD	NA		NA		NA	
Tech-FYM	38.2	79.3	92.9	192.6						
Fert	66.2	NS	160.8	NS						
NS	93.7	NS	131.3	NS						

1. **Project no.** : AICRP / PBG / CBE / PEM /009

2.Project title : Integrated nutrient management for Pearl millet hybrids under optimum management

3.Name of the department : Department of Millets, TNAU, and Coimbatore

4. Name of the project leaders : N.Meyyazhagan

5. Period : Three years-2014-2017

6. **Objectives** : To study the effect of INM on growth, yield and quality of Pearl millet hybrids

7. Progress made so far :

The experiment was initiated during year 2014 based on the group meet discussions. The experiment consists of hybrids viz., three hybrids and four management techniques, which are RDF(M1),,RDF+PSB+Azospirillum(M2), 50%RDF+PSB+Azospirillum+7.5tFYM(M3) and 75% RDF+PSB+Azospirillum+5.0 t FYM(M4). The experiment was conducted in a split plot design keeping hybrids in the main plot and management techniques in the sub plot. The treatments were replicated three times.

8. Progress made during the period under report:

Three hybrids viz., 86M64, 86M86 and GHB 558 were allotted and were studied for their performance with RDF, RDF+PSB and Azospirillum, 50% RDF+PSB+Azospirillum+7.5tFYM and 75% RDF+PSB+Azospirillum+5.0 t FYM. The hybrids were allotted to main plot and management to sub-plot. The treatments were replicated three times.

9. Salient findings:

Integrated nutrient management for Pearl millet hybrids under optimum management Among the three hybrids 86M66 followed by 86M84 performed better than GHB 558. The growth, yield parameters and yield were good with these hybrids. Among the four nutrient management tried 75% RDF + PSB+ 5.0 t of FYM has resulted in more growth and yield .his was closely followed by 50% RDF+PSB+7.5 t of FYM.The economics worked out also indicated a similar trend on gross returns, net returns and B/C ratio.

10. Project wise remarks: experimental details like design, replication etc., are to be given. Statistical analysis is not necessary for economics. The project may be continued

Table.1.Performance of Pearl millet hybrids under different management

Hybrid/ Management	Plant population '000/ha		Plant height(cm)		Days to 50% lowering		Total tillers (No./Plant)		Productive tillers (No./Plant)		Earhead Length (cm)		Earhead Girth (cm)	
Hybrids														
86M64	135.6		170		48.7		3.7		3.1		23.4		9.0	
86M86	134.7		164		48.2		3.8		3.2		21.7		8.1	
GHB558	136.4		146		47.9		3.6		3.0		16.0		7.3	
Management														
M1	134.2		154		48.7		3.2		2.8		20.5		7.8	
M2	136.4		157		47.8		3.4		2.9		21.3		8.0	
M3	136.3		164		48.4		4.0		3.3		19.3		8.6	
M4	135.5		166		48.1		4.0		3.4		20.2		8.1	
	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
H	1.48	NS	1.94	5.37	0.45	1.25	0.23	0.64	0.19	0.52	0.99	2.75	0.31	0.86
M	2.63	NS	2.50	6.92	0.69	1.91	0.24	0.66	0.15	0.34	0.89	2.45	0.39	1.07
HxM	4.55	NS	4.33	NS	1.20	NS	0.41	NS	0.26	NS	1.54	NS	0.68	NS

Table.1. Performance of Pearl millet hybrids under different management

Hybrid/ Manage-ment	Test weight (g)		Grain Yield (Kg/ha)		Straw yield (Kg/ha)		Gross returns (Rs/ha)		Net returns (Rs/ha)		B/C ratio	
Hybrids												
86M64	11.9		2054		40.6		26678		8121		1.45	
86M86	12.2		2294		45.1		29777		11219		1.64	
GHB558	10.8		1829		36.5		23769		5212		1.30	
M1	11.1		1874		38.7		24419		8869		1.57	
M2	11.3		1939		40.0		25273		9423		1.59	
M3	11.9		2189		41.8		28357		7957		1.39	
M4	12.2		2233		42.4		28916		6486		1.29	
	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD	SED	CD
H	0.17	0.47	127.8	355.2	1.9	5.3	NA		NA		NA	
M	0.30	0.83	134.5	369.9	1.2	3.3						
HxM	0.52	NS	233.0	NS	2.1	NS						

1.	**Project No. Title**	**:**	DCM - CBE - AGR - 12 - 018
2	**Project Title**	**:**	Long term trial on tillage and weed management in maize - sunflower cropping system.
3	**Name of the Department/ station**	**:**	AICRP-WM, Department of Agronomy
4	**Name(s) of the scientist(s) with designation**	**:**	Dr. N. Sakthivel, Assistant Professor (Agronomy)
5	**Project Period**	**:**	July, 2012 - September, 2015
6	**Objectives**	**:**	➢ To find out the effect of tillage on weed diversity in different cropping system. ➢ To evaluate different tillage and weed management methods on the productivity of different cropping system.

7 Brief outline of the work carried out from the project initiation period:

Field experiments were conducted at Eastern Block, Tamil Nadu Agricultural University, Coimbatore to evaluate the effect of long term tillage and weed management in maize-sunflower cropping system. Two year experiments viz., *kharif*, 2012 & 2013 (maize) and *rabi*, 2012-13 & 2013-14 (sunflower) were completed.

8 Work carried out during the review period:

During third year experiment *kharif*, 2014 (maize) and *rabi*, 2014-15 were completed. Weed parameters yield and economics of both the seasons are presented.

Treatment details

Main plot (Tillage methods)

Maize (I crop)	**Sunflower (II crop)**
T_1 - Zero tillage	Zero tillage
T_2 - Zero tillage	Conventional tillage
T_3 - Conventional tillage	Zero tillage
T_4 - Conventional tillage	Conventional tillage

Sub plot (Weed management practices)

Maize (I crop)	**Sunflower (II crop)**
W_1 - Hand weeding (HW) on 25 and 45 DAS	HW on 25 and 45 DAS
W_2- Atrazine 0.5 kg a.i./ha + HW on 45 DAS	Pendimethalin 1.0 kg a.i./ha + HW on 45 DAS
W_3 - Unweeded control	Unweeded control

9 Salient Findings

Maize (*kharif,* 2014)

Trianthema portulacastrum, Digera arvensis, Amaranthus viridis, Cleome gynandra, Parthenium hysterophorus and *Datura metal* under broad leaf, *Dactyloctenium aegyptium, Echinochloa colonum, Setaria verticillata* and *Dinebra retroflexa.under* grass and *Cyperus rotundus* under sedgewer the predominant weeds

At 60 DAS, conventional tillage and PE application of PE atrazine at 0.5 kg/ha + HW on 45 DAS recorded significantly lower weed density (16.8 &19.48 No./m^2), dry weight (11.44 & 17.46 g/ha) and higher weed control efficiency (77.02 & 62.13%).

Conventional tillage (CT-CT) and application of PE atrazine at 0.5 kg a.i./ha at 3 DAS + HW on 45 DAS recorded significantly higher grain yield (5098 & 5187 kg/ha) and net return (Rs.35546 & 34974/ha) and benefit cost ratio (2.39 & 2.28).

Sunflower (*Rabi* 2014-15)

Trianthema portulacastrum, Digera arvensis, Amaranthus viridis, Portulaca oleracea, Corchorus olitorius and *Parthenium hysterophorus* under broad leaf. weeds were *Dactyloctenium aegyptium* and *Echinochloa colonum.* under grass and *Cyperus rotundusunder sedge were the predominant weeds.*

Conventional tillage (CT-CT) with application of PE pendimethalin1.0 kg a.i./ha at 3 DAS and HW on 45 DAS recorded significantly lower total weed density (27.6 & 20.32 No./m^2), dry weight (14.26 & 12.12 g/m^2) and higher weed control efficiency (76.38 & 77.62%)

Conventional tillage (CT-CT) with application of PE pendimethalin1.0 kg a.i./ha at 3 DAS and HW on 45 DAS recorded significantly higher seed yield (2275 & 2096 kg/ha), net return (Rs. 23860 & 18250/ha) and benefit cost ratio (2.16 & 1.82).

Conventional tillage for both maize and sunflower and PE atrazine at 0.5 kg/ha at 3 DAS + HW on 45 DAS for maize and PE pendimethalin1.0 kg/ha at 3 DAS and HW on 45 DAS for sunflower for better weed control, higher yield and economic returns

10 • **Remarks of the Technical Director based on the pre-review:** Title to be changed as maize-sunflower cropping system instead of different cropping system

• Zero till seeder may be used for sowing instead of manual sowing with labour under ZT condition

Table 1. Effect of tillage and weed management practices on total weed density, dry weight, WCE at 60 DAS and yield and economics in maize (*Kharif* 2014)

Treatment	Total weed density (No/m^2)	Total weed dry weight (g/ha)	WCE (%)	Yield (kg/ha)	Net returns (`/ha)	B:C ratio
T_1 (ZT-ZT)	6.14 (35.65)	4.73 (20.36)	59.10	4113	25151	2.04
T_2 (ZT-CT)	5.75 (31.06)	4.57 (18.85)	62.13	4315	27940	2.17
T_3 (CT-ZT)	5.15 (24.57)	3.91 (13.25)	73.38	4875	32630	2.26
T_4 (CT-CT)	4.34 (16.8)	3.67 (11.44)	77.02	5098	35546	2.39
SEd	0.14	0.18	-	**217**	**-**	**-**
CD	0.29	0.35	-	**496**	**-**	**-**
W_1 (HWT)	5.10 (24.03)	4.73 (20.38)	59.10	5013	28536	1.90
W_2 (Herbicide)	4.63 (19.48)	4.41 (17.46)	62.13	5187	34974	2.28
W_3 (UWC)	5.85 (32.25)	7.20 (49.78)	-	3050	13180	1.56
SEd	**0.17**	**0.19**	**-**	**232**	**-**	**-**
CD	**0.36**	**0.42**	**-**	**516**	**-**	**-**

Table 2. Effect of tillage and weed management practices on total weed density, dry weight, WCE at 60 DAS and yield and economics in sunflower (*Rabi* 2014-15)

Treatment	Total weed density (No/m^2)	Total weed dry weight (g/ha)	WCE (%)	Yield (kg/ha)	Net returns (`/ha)	B:C ratio
T_1 (ZT-ZT)	8.09 (63.45)	5.67 (30.25)	46.12	1739	16205	1.81
T_2 (ZT-CT)	6.49 (40.12)	4.40 (17.35)	68.25	2078	19150	1.92
T_3 (CT-ZT)	7.10 (48.37)	4.82 (21.22)	63.85	1845	16640	1.88
T_4 (CT-CT)	5.44 (27.6)	4.03 (14.26)	76.38	2275	23860	2.16
SEd	**0.16**	**0.15**	**-**	**108**		**-**
CD	**0.39**	**0.29**	**-**	**285**		**-**
W_1 (HWT)	7.31 (51.42)	(4.17) 15.36	71.65	1987	11950	1.59
W_2 (Herbicide)	4.72 (20.32)	3.76 (12.12)	77.62	2096	18250	1.82
W_3 (UWC)	13.77 (187.69)	7.64 (56.38)		993	5020	1.15
SEd	**0.21**	**0.18**		**132**		
CD	**0.52**	**0.38**	**-**	**176**	**-**	**-**

1.	Project Number	:	**DCM-CBE-AGR-12-005**
2.	Project Title	:	**Performance of Cumbu Napier hybrid grass CO (CN) 4 as influenced by micro nutrients under irrigated conditions**
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**Dr. A. Velayutham** Professor (Agronomy)
5.	Project Period	:	June 2012 to September 2014

6. Objectives

- To study the effect of conjoint application of inorganic fertilizers and micronutrients on green fodder yield and quality of CN hybrid grass (CO(CN) 4
- To find out the economics of green fodder production under above system

7. Brief outline of the work carried out from the project initiation period

Field experiment had been initialed in field No.F2, New Area farm, Department of Forage Crops on 29.06.2012 as per the technical programme. Mechanical composition of soil and initial fertility status had been analyzed. The crop culture had been carried out as per the recommendation of Crop Production Guide. The data on growth and yield have been recorded. The forage crop CN hybrid grass CO (CN) 4 has been maintained by crop management practices. The data on growth, yield and quality parameters were subjected to statistical scrutiny.

8. Work carried out during the review period

The experiment on CN hybrid grass CO (CN) 4 was laid out with nine treatments *viz*., application of recommended dose of NPK (T1), NPK+$FeSO_4$ @ 50 kg/ha (T2), NPK+$FeSO_4$ @ 100 kg/ha (T3), NPK+$ZnSO_4$ @ 25 kg/ha (T4), NPK+$ZnSO_4$ @ 50 kg/ha (T5), NPK+$FeSO_4$ @ 50 kg/ha+$ZnSO_4$ @ 25 kg/ha (T6), NPK+$FeSO_4$ @ 100 kg/ha+$ZnSO_4$ @ 25 kg/ha (T7), NPK+$FeSO_4$ @ 50 kg/ha+$ZnSO_4$ @ 50 kg/ha (T8) and NPK+$FeSO_4$ @ 100 kg/ha+$ZnSO_4$ @ 50 kg/ha (T9) in RBD with three replications. The treatments were imposed as per schedule. Green fodder harvest was carried out as and when the fodder crop was ready for harvest. Fourteen harvests were made during the project period. The data collected on growth, yield and quality parameters were statistically analyzed. The results on pooled analysis are furnished in Table 10. The pooled analysis of data on green fodder yield over fourteen cuts revealed that application of recommended dose of NPK along with micronutrients *viz*., $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @25 kg/ha significantly improved the green fodder yield 2917 q/ha to 3696 q/ha which was 26 % higher than RDF. It also gave higher net return and B:C ratio (2.10).

Table 1. Pooled analysis of yield, quality and economics of BN hybrids as influenced by micronutrients under irrigated conditions (1-14 cuts) - 2012-13 to 2014-15

T.No	Plant height (cm)	LS ratio	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Crude protein (%)	Cost of Cultivation (Rs.)	Net return (Rs.)	BCR
T_1	171.92	0.30	2917	423	34.6	8.06	253688	183860	1.72
T_2	178.33	0.34	3187	499	45.2	8.88	260688	217318	1.83
T_3	174.37	0.32	3095	476	42.3	8.71	267688	196517	1.73
T_4	183.42	0.36	3234	544	52.2	9.51	256288	228820	1.89
T_5	180.68	0.35	3191	517	47.8	9.13	258888	219763	1.85
T_6	200.35	0.44	3695	724	79.5	10.95	263288	290609	2.10
T_7	190.83	0.39	3480	631	63.9	10.11	270288	251684	1.93
T_8	193.90	0.41	3594	681	71.2	10.44	265888	273217	2.03
T_9	187.25	0.38	3458	609	60.3	9.81	272888	245761	1.90
SEd	4.18	0.01	27	9	1.15	0.20			
CD(0.05)	8.90	0.02	81	26	3.44	0.42			

T_1 -NPK alone T_2 -NPK+$FeSO_4$ @ 50 kg/ha T_3 - NPK+ $FeSO_4$ @ 100 kg/ha

T_4 - NPK+$ZnSO_4$ @ 25 kg/ha, T_5 - NPK+ $ZnSO_4$ @ 50 kg/ha

T_6 - NPK+ $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha

T_7 - NPK+ $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha

T_8 - NPK+ $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 50 kg/ha

T_9 - NPK+ $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 50 kg/ha

9. Salient Findings:

Application of recommended dose of NPK (150:50:40 kg/ha) along with $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @ 25 kg/ha was found to be advantageous in enhancing the growth, yield and quality of CN hybrid grass CO (CN) 4 besides fetching higher economic returns.

10. Remarks of the Technical Director based on the pre-review

- Pooled data (yield) to be given
- Salient findings to be given to CSM
- OFT to be conducted on the technology for adoption

SOIL SCIENCE

1.	**Project Number**	:	AICRP/NRM/CBE/SAC/002
2.	**Project Title**	:	Test verification of fertiliser prescription under IPNS for maize-tomato sequence
3.	**Name of the Department/Station**	:	Department of Soil Science and Agricultural Chemistry, TNAU, Coimbatore-641 003.
4.	**Name(s) of the Scientist(s) with Designation**	:	Dr. R. Santhi, Professor (SS & AC)
5.	**Project Period**	:	D/S: October 2012 D/C: September 2015
6.	**Objectives**	:	To test verify the validity of the fertilizer prescription equations for maize and tomato under IPNS in maize-tomato sequence.

7. Brief outline of the work carried out from the project initiation period:

To test verify the validity of the fertiliser prescription equations for maize and tomato under IPNS in maize-tomato sequence, since the project initiation, four verification trials were conducted at farmer's holding of Dindigul district (Kasthurinaickenpatti, Thoppupatti, Kendayagoundanur and Thogamalaikottai) on Palaviduthi series. There were seven treatments *viz*., blanket, STCR-NPK alone-10 t ha^{-1}, STCR-NPK alone - 11 t ha^{-1}, STCR-IPNS -10 t ha^{-1}, STCR-IPNS-11 t ha^{-1}, farmer's practice and control for hybrid maize. For hybrid tomato, the treatments were blanket, STCR-NPK alone - 80 t ha^{-1}, STCR-NPK alone - 90 t ha^{-1}, STCR-IPNS - 80 t ha^{-1}, STCR-IPNS-90 t ha^{-1}, farmer's practice and control. In all the trials, based on the initial soil test values of available N, P and K and yield targets aimed, fertilizer doses were calculated using the fertilizer prescription equations for maize and tomato and applied for STCR treatments. For IPNS treatments, FYM @12.5 t ha^{-1} was applied basally. For tomato, initial soil test values were predicted using the post-harvest soil test values prediction equations of maize. Routine agronomic practices were carried out periodically for maize and tomato. At harvest, the grain yield of maize and fruit yield of tomato were recorded. Post-harvest soil samples were collected and analysed for available NPK status. Using the experimental data, per cent achievement, response ratio and BCR were computed.

The results of the verification trials conducted during 2012 - 14 proved the validity of the fertiliser prescription equations for maize and tomato and the post-harvest soil test values prediction equations on Palaviduthi soil series (red non-calcareous soils). Based on the outcome of the four trials of maize – tomato, it could be inferred that targeting 10 t ha^{-1} of hybrid maize in the first season and 90 t ha^{-1} of hybrid tomato in the second season would be ideal in terms of yield, response ratio, BCR and soil fertility.

8. Work carried out during the review period:

To validate the fertiliser prescription equations under IPNS for maize and tomato in maize - tomato sequence on Palaviduthi series (Typic Rhodustalf - red non-calcareous soils), during the period under report, one test verification trial (fifth trial) has been conducted with maize (TNAU Maize hybrid Co 6) at farmer's holding of Viralipatti, Dindigul Dt. and the verification trial with tomato is in progress.

(i) <u>Verification trial on hybrid maize</u>

Fertiliser Prescription equations

FN = 3.96 T - 0.62 SN - 0.69 ON

FP_2O_5 = 1.56 T – 1.93 SP – 0.60 OP

FK_2O = 1.66 T - 0.27 SK – 0.49 OK

where, FN, FP_2O_5 and FK_2O are fertilizer N, P_2O_5 and K_2O in kg ha^{-1} respectively; T is the yield target in q ha^{-1} ; SN, SP and SK respectively are alkaline $KMnO_4$-N,Olsen-P and NH_4OAc-K in kg ha^{-1} and ON, OP and OK are the quantities of N, P and K supplied through FYM in kg ha^{-1}.

There were seven treatments *viz.,* blanket, STCR-NPK alone-10 t ha^{-1}, STCR-NPK alone - 11 t ha^{-1}, STCR-IPNS -10 t ha^{-1}, STCR-IPNS-11 t ha^{-1}, farmer's practice and control. Based on the initial soil test values of available N, P and K and yield targets aimed, fertilizer doses were calculated using the above fertilizer prescription equations and applied for STCR treatments. For IPNS treatments, FYM @12.5 t ha^{-1} was applied basally. 25% N and full P_2O_5 and K_2O were applied basally and hybrid maize was sown on 19.08.14. The remaining 50% N was top dressed at 25 DAS (12.09.14) and 25% of N at 45 DAS (4.10.14) and routine agronomic practices was carried out periodically. The crop was harvested on 19.12.14 and grain yield was recorded. Post-harvest soil samples were collected and analysed for available NPK status. The details of fertiliser doses applied, yield, response ratio and BCR are furnished in Table 1.

The results of the verification trial (Table 1) revealed that the targeted yield was achieved within +/- 10 per cent variation proving the validity of the fertiliser prescription equations. The grain yield of maize ranged from 3.55 t ha^{-1} in absolute control to 10.65 t ha^{-1} in STCR-IPNS-11 t ha^{-1}. Among the treatments, STCR-IPNS-11 t ha^{-1} had recorded relatively higher grain yield (10.65 t ha^{-1}) followed by STCR-IPNS-10 t ha^{-1} which had also recorded comparable yields (10.50 t ha^{-1}). However, relatively higher response ratio was recorded in STCR-IPNS-10 t ha^{-1} (17.82 kg kg^{-1}) followed by STCR-NPK alone - 10 t ha^{-1} (16.79 kg kg^{-1}) as compared to STCR-IPNS-11 t ha^{-1} and STCR-NPK alone-11 t ha^{-1} treatments. In blanket and farmer's practice, the grain yield was 8.70 and 6.80 t ha^{-1} respectively and RR was 12.88 and 10.48 kg kg^{-1} respectively. The per cent increase in yield due to STCR-IPNS-10 t ha^{-1} over blanket and farmer's practice was 20.7 and 54.4, respectively proving the superiority of STCR-IPNS.

(ii) <u>Verification trial on hybrid tomato</u>

After the harvest of maize, verification trial on hybrid tomato has been initiated in the same plots for validating the fertiliser prescription equations as furnished below:

Fertiliser Prescription Equations

FN = 0.45 T - 0.63 SN - 0.72 ON

FP_2O_5 = 0.42 T – 4.18 SP – 0.73 OP

FK_2O = 0.40 T - 0.48 SK – 0.66 OK

There are seven treatments *viz.*, blanket, STCR-NPK alone - 80 t ha^{-1}, STCR-NPK alone - 90 t ha^{-1}, STCR-IPNS - 80 t ha^{-1}, STCR-IPNS-90 t ha^{-1}, farmer's practice and control and were imposed in the respective treatments of previous maize crop.

Using the post-harvest soil test values prediction equations for hybrid maize, initial soil test values of available N, P and K for tomato were predicted. Making use of the predicted soil test values and yield targets aimed, fertilizer doses were calculated for tomato using the above fertiliser prescription equations and applied for STCR treatments (Table 2). For IPNS treatments, FYM @12.5 t ha^{-1} was applied basally. For blanket and STCR treatments, 25% N, 100% P_2O_5 and 40 % K_2O were applied basally and hybrid tomato (Sivam) has been transplanted on 17.2.15. Routine agronomic practices are being carried out periodically and the trial is in progress.

9. Salient Findings:

The results of the test verification trials with hybrid maize confirmed the validity of the fertiliser prescription equations developed for Palaviduthi soil series (red non-calcareous soils). Soil test and yield target based fertiliser prescriptions under Integrated Plant Nutrition System (STCR-IPNS for 10 t ha^{-1}) *i.e.* application of N, P_2O_5 and K_2O @ 213:62:29 kg ha^{-1} along with FYM @12.5 t ha^{-1} can be recommended for achieving higher yields (10.50 t ha^{-1}), response ratio (17.82 kg kg^{-1}) and BCR (2.38) with hybrid maize on Palaviduthi soil series (red non-calcareous soils) for an initial soil test value of 230:38.6:410 kg ha^{-1} of available N, P and K respectively.

10. Remarks of the Technical Director based on the pre-review:

Tomato trial to be taken up.

Table 1. Results of test verification trial on hybrid maize

Location: Viralipatti,Dindigul Dt. Soil: Palaviduthi series (Typic Rhodustalf) (red non- calcareous)

Hybrid : TNAU Maize hybrid Co 6 D/S: 19.08.14; D/H: 19.12.14

S. No.	Treatments	Fertiliser doses (kg ha^{-1})			Grain yield (t ha^{-1})	Percent achieve-ment	RR (kg kg^{-1})	BCR
		FN	FP_2O_5	FK_2O				
1.	Blanket	250	75	75	8.70	-	12.88	2.02
2.	STCR- NPK alone 10 t ha^{-1}	253	82	55	10.10	101.0	16.79	2.35
3.	STCR - NPK alone 11 t ha^{-1}	293	97	72	10.45	95.0	14.94	2.32

4.	STCR-IPNS - 10 t ha^{-1}	213	62	29	10.50	105.0	17.82	2.38
5.	STCR-IPNS- 11 t ha^{-1}	253	77	46	10.65	96.8	15.37	2.34
6.	Farmer's practice	145	65	100	6.80	-	10.48	1.63
7.	Control	0	0	0	3.55	-	-	1.09

STCR-IPNS: NPK+FYM @ 12.5 t ha^{-1}.

Initial Soil Test values

Majornutrients (kg ha^{-1})			**Micronutrients (mg kg^{-1})**		
$KMnO_4$-N	:	230	DTPA-Zn	:	0.95
Olsen-P	:	38.6	DTPA-Fe	:	5.90
NH_4OAc-K	:	410	DTPA-Mn	:	8.74
			DTPA-Cu	:	1.30

Fertiliser Prescription Equations

$$FN = 3.96\ T - 0.62\ SN - 0.69\ ON$$

$$FP_2O_5 = 1.56\ T - 1.93\ SP - 0.60\ OP$$

$$FK_2O = 1.66\ T - 0.27\ SK - 0.49\ OK$$

Table 2. Prediction of post-harvest soil test values of available N, P and K in maize-tomato cropping sequence (Location: Viralipatti, Dindigul Dt.)

Treatments (Maize)	**First crop (maize)**						**Treatments (Tomato)**	**Second crop (tomato)**		
	Fertiliser doses (kg ha^{-1})			**Predicted PHSTVs (kg ha^{-1})**				**Fertiliser doses (kg ha^{-1})**		
	FN	**FP_2O_5**	**FK_2O**	**SN**	**SP**	**SK**		**FN**	**FP_2O_5**	**FK_2O**
Blanket	250	75	75	226	25.2	320*	Blanket	200	250	250
STCR- NPK alone -10tha^{-1}	253	82	55	232	26.4	319	STCR-NPK alone- 80tha^{-1}	214	226	167
STCR - NPK alone-11t ha^{-1}	293	97	72	238	28.1	323	STCR-NPK alone- 90tha^{-1}	255	260	205
STCR-IPNS - 10 t ha^{-1}	213	62	29	236	31.6	344	STCR - IPNS 80 t ha^{-1}	171	182	120

STCR-IPNS-11 t ha^{-1}	253	77	46	244	34.3	353	STCR - IPNS 90 t ha^{-1}	211	213	156
Farmer's practice	180	65	65	205	22.1	310*	Farmer's practice	180	150	150
Control	0	0	0	185	18.2	290*	Control	0	0	0

PHSTVs: Post-Harvest soil test values;*observed soil test values; IPNS: NPK + FYM@12.5 t ha^{-1}.

Prediction equations for post - harvest soil test values of available N, P and K (After Maize)

Treatments	R^2
NPK alone	
YPHN= 5.2038 + 0.7636^{**} SN + 0.0455 FN + 0.004 grain yield	0.9042^{**}
YPHP= -2.5334 + 0.4442^{**} SP + 0.0826^{**} FP + 0.0005 grain yield	0.8465^{**}
YPHK= 100.85 + 0.476^{**} SK + 0.165^{*} FK + 0.0014 grain yield	0.8232^{**}
NPK+ FYM @12.5 t ha^{-1}	
YPHN= -7.6933 + 0.7333^{**} SN + 0.0376 FN + 0.0067^{*} grain yield	0.9855^{**}
YPHP= -9.3804 + 0.5594^{**} SP + 0.0861^{**} FP + 0.0014^{*} grain yield	0.9154^{**}
YPHK= 42.801 + 0.6347^{**} SK + 0.2871^{**} FK + 0.0033^{**} grain yield	0.9408^{**}
*Significant at P = 0.05; ** Significant at P = 0.01; PH = post-harvest; SN, SP and SK are soil available N,P and K respectively; FN,FP and FK = doses of fertilizer N, P_2O_5 and K_2O respectively.	

Project 2

1	**Project Number**	:	AICRP/NRM/CBE/SAC/002
2	**Project Title**	:	Soil Test Crop Response Correlation Studies through IPNS for Rainfed maize
3	**Name of the Department/Station**	:	Department of Soil Science and Agricultural Chemistry, TNAU, Coimbatore-641 003
4	**Name(s) of the Scientist(s) with Designation**	:	Dr. K.M. Sellamuthu Assistant Professor (SS&AC)
5	**Project Period**	:	From October 2012 — To September 2015

6 **Objectives:**

1. To develop fertilizer prescription equations (FPE's) for rainfed maize through refinement of FPE's for irrigated maize
2. To validate the FPE's for rainfed maize through verification trials

7 **Brief outline of the work carried out from the project initiation period :**

A field experiment was conducted with TNAU maize Hybrid C6 at Maize Research Station, Vagarai under rainfed conditions to develop fertiliser prescription equations (FPEs) for rainfed maize through the refinement of the existing fertilizer prescription equations for irrigated hybrid maize. The experimental soil is coming under Irugur soil series (Fine loamy, mixed, isohyperthermic, non calcareous, Typic Ustropept) with a pH value of 6.97 and EC value of 0.39 dS m^{-1} and available N, P and K were 176.0, 12.3 and 276 kg ha^{-1} respectively. The design of experiment was RBD with three replications and nine treatments viz., STCR-NPK alone-4 t ha^{-1}, STCR-NPK alone-5 t ha^{-1}, STCR-NPK alone-6 t ha^{-1}, STCR-IPNS-4 t ha^{-1}, STCR-IPNS-5 t ha^{-1}, STCR-IPNS-6 t ha^{-1}, FYM @ 6.25 ha^{-1} alone, FYM @ 12.5 ha^{-1} alone and absolute control. Pre-sowing soil samples were collected plotwise (27 plots) and analysed for available N, P and K. The treatments were imposed and maize crop was sown on 16.10.2012. Routine agronomic practices were carried out periodically as per the Crop Production Guide and the crop was harvested on 20.2.2013. Plot wise grain and straw yields were recorded and grain and straw samples were collected, processed and analysed for their N, P and K contents. Making use of dry matter yield and nutrient content, total N, P and K uptake were computed. Using the pre-sowing soil available N, P and K, fertilizer doses applied, grain yield and total N,P and K uptake, the basic parameters viz., Nutrient requirement (NR), contribution of nutrients from soil (Cs), contribution of nutrients from fertiliser (Cf) and contribution of nutrients from organic manure (Co) were computed and FPEs for rainfed maize was developed. Nomograms were formulated for desired yield targets of rainfed maize.

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively; T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

To validate the fertilizer prescription equations developed for rainfed maize under IPNS on Irugur series (red non calcareous soils), test verification trial was conducted at Kasthurinaickenpatti in Dindigul District during 2013-14. There were nine treatments *viz.*, blanket, STCR-NPK alone for 4 to 6 t ha^{-1}, STCR -IPNS for 4 to 6 t ha^{-1} and farmer's practice and control. Based on the initial soil test values of available N, P_2O_5, K_2O and yield targets aimed, fertilizer doses were calculated and applied for STCR treatments. For IPNS treatments, 12.5 tonnes of FYM were applied basally and fertilizer N, P_2O_5, K_2O doses were adjusted accordingly. The results indicated that, the highest grain yield of rainfed maize was recorded with STCR-IPNS-6 t ha^{-1} (4080 kg ha^{-1}) followed by STCR-IPNS-5 t ha^{-1} (4032 kg ha^{-1}). The per cent achievement of the targeted yield was more than 90 per cent proving the validity of the equations with STCR-IPNS-4 t ha^{-1} (3899 kg ha^{-1}) and STCR-NPK-4 t ha^{-1} (3788 kg ha^{-1}). Thus, the results of the verification trial at

Kasthurinaickenpatti Dindigul district confirmed the validity of fertilizer prescription equations developed for rainfed maize on Irugur series (red non calcareous) for an yield target of 4 t ha^{-1}.

8 Work carried out during the review period:

To validate the fertilizer prescription equations developed for rainfed maize under IPNS on Irugur series (red non calcareous soils), test verification trials were conducted in five locations (Kendyakgoundanur, Nalroadu, Viralipatti I & II and Asaripudur) in Dindigul District. There were nine treatments *viz.*, blanket, STCR-NPK alone for 4 to 6 t ha^{-1}, STCR -IPNS for 4 to 6 t ha^{-1} and farmer's practice and control. Based on the initial soil test values of available N, P_2O_5, K_2O and yield targets aimed, fertilizer doses were calculated and applied for STCR treatments. For IPNS treatments, 12.5 tonnes of FYM were applied basally and fertilizer N, P_2O_5, K_2O doses were adjusted accordingly. The details of fertilizer doses applied, grain yield, percentage achievement and response ratio are furnished in Tables 1 to 6.

The mean values of the five test verification trials indicated that the highest grain yield of rainfed maize was recorded with STCR-IPNS-6 t ha^{-1} (5200 kg ha^{-1}) followed by STCR-IPNS-5 t ha^{-1} (5026 kg ha^{-1}). The per cent achievement of the targeted yield was more than 90 per cent proving the validity of the equations with STCR-IPNS-5 t ha^{-1} (5026 kg ha^{-1}) and STCR-NPK-4 t ha^{-1} (3736 kg ha^{-1}). The highest mean response ratio was recorded in STCR-IPNS-5 t ha^{-1} (19.2 kg kg^{-1}) followed by STCR-NPK-4 t ha^{-1}(18.3 kg kg^{-1}). The highest B: C ratio was also recorded in STCR-IPNS-5 t ha^{-1} (2.34). The farmer’s practice recorded relatively lower yield and response ratio as compared to blanket and STCR treatments while the STCR - IPNS treatments recorded the higher per cent achievement and response ratio among all the treatments. Though the blanket fertiliser recommendation recorded relatively higher yield and response ratio over farmer's practice, it was lower when compared to STCR treatments.

Thus, the results of the verification trials in Dindigul district confirmed the validity of fertilizer prescription equations developed for rainfed maize on Irugur series (red non calcareous) for an yield target of 5 t ha^{-1}.

9 Salient Findings:

The per cent achievement of the targeted yield was more than 90 per cent with STCR and STCR-IPNS treatment @ 5 t ha^{-1} for rainfed maize (TNAU maize hybrid CO6) proving the validity of the equations developed for rainfed maize on Irugur series (red non calcareous) (Typic Ustropept). Application of FYM @ 12.5 t ha^{-1} along with inorganic fertilizers (71-77, 17-28 &15-41 kg of N, P_2O_5 and K_2O ha^{-1}) for an initial soil test values in the range of 149-164, 15.6-21.0 and 123-285 kg ha^{-1} of available N, P and K respectively has recorded the highest mean response ratio of 19.2 kg grain per kg of nutrient applied for rainfed maize to get the mean grain yield of 5026 kg ha^{-1}.

10. Remarks of the Technical Director based on the pre-review

- Rainfall distribution days during experimentation to be recorded
- TNAU hybrid maize performed well
- Trial is in progress

Table 1. Results of the test verification trial on rainfed maize

Location	:	Kendayagoundannur, Reddiyarchathiram Block Dindigul Dt	Soil	: Red non calcareous (Irugur series)
Variety	:	TNAU maize hybrid Co6	D/S	: 23.09.2014
Season	:	Rabi	D/H	: 21.01.2015

S. No.	Treatments	Fertiliser doses (kg ha^{-1})			Grain yield (kg ha^{-1})	Percent Achieve-ment	RR (kg kg^{-1})	B:C ratio
		N	P_2O_5	K_2O				
1.	Blanket	60	30	30	3460	-	15.3	1.75
2.	STCR-NPK alone 4 t ha^{-1}	61	19	43	3590	89.8	16.0	1.83
3.	STCR-NPK alone 5 t ha^{-1}	93	34	60**	4765	95.3	16.8	2.27
4.	STCR-NPK alone 6 t ha^{-1}	120**	49	60**	4896	81.6	14.3	2.28
5.	STCR-IPNS-4 t ha^{-1}	39	15*	23	3750	93.8	17.3	1.86
6.	STCR-IPNS-5 t ha^{-1}	71	17	41	4996	99.9	18.0	2.31
7.	STCR-IPNS-6 t ha^{-1}	104	32	58	5140	85.7	15.4	2.28
8.	Farmers practice	32	23	23	2590	-	12.5	1.37
9.	Control	0	0	0	1620	-	-	0.94

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ; * Maintenance dose **Maximum dose

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha-1)			Micronutrients (mg kg-1)		
$KMnO_4$ - N	:	162	DTPA-Zn	:	0.55
Olsen - P	:	21.0	DTPA-Fe	:	4.63
NH_4OAc- K	:	123	DTPA-Mn	:	9.31
			DTPA-Cu	:	0.28

Table 2. Results of the test verification trial on rainfed maize

Location	:	Nalroadu, Reddiyarchathiram Block Dindigul Dt	Soil	:	Red non calcareous (Irugur series)
Variety	:	TNAU maize hybrid Co6	D/S	:	23.09.2014
Season	:	Rabi	D/H	:	21.01.2015

S. No.	Treatments	Fertiliser doses (kg ha^{-1})			Grain yield (kg ha^{-1})	Percent Achieve-ment	RR (kg kg^{-1})	B:C ratio
		N	P_2O_5	K_2O				
1.	Blanket	60	30	30	3420	-	14.3	1.73
2.	STCR-NPK alone 4 t ha^{-1}	67	21	35	3580	89.5	15.3	1.83
3.	STCR-NPK alone 5 t ha^{-1}	99	36	53	4896	97.9	17.0	2.34
4.	STCR-NPK alone 6 t ha^{-1}	120**	51	60**	5012	83.5	14.3	2.33
5.	STCR-IPNS-4 t ha^{-1}	45	15*	15*	3810	95.3	17.1	1.90
6.	STCR-IPNS-5 t ha^{-1}	77	19	33	5110	102.2	18.2	2.38
7.	STCR-IPNS-6 t ha^{-1}	109	34	50	5285	88.1	15.5	2.35
8.	Farmers practice	32	23	23	2650	-	12.1	1.40
9.	Control	0	0	0	1706	-	-	0.98

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ; * Maintenance dose **Maximum dose

<u>Fertiliser Prescription Equations</u>

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha^{-1})			**Micronutrients (mg kg^{-1})**		
$KMnO_4$ - N	:	149	DTPA-Zn	:	0.44
Olsen - P	:	20.0	DTPA-Fe	:	3.28
NH_4OAc- K	:	161	DTPA-Mn	:	4.42
			DTPA-Cu	:	0.37

Table 3. Results of the test verification trial on rainfed maize

Location	:	Viralipatti I Dindigul Block Dindigul Dt	Soil	:	Red non calcareous (Irugur series)
Variety	:	TNAU maize hybrid Co6	D/S	:	24.09.2014
Season	:	Rabi	D/H	:	04 .02.2015

S. No.	**Treatments**	**Fertiliser doses (kg ha^{-1})**			**Grain yield (kg ha^{-1})**	**Percent Achieve-ment**	**RR (kg kg^{-1})**	**B:C ratio**
		N	**P_2O_5**	**K_2O**				
1.	Blanket	60	30	30	3026	-	11.1	1.55
2.	STCR-NPK alone 4 t ha^{-1}	62	28	15*	3250	81.3	14.7	1.73
3.	STCR-NPK alone 5 t ha^{-1}	95	43	27	4747	94.9	18.5	2.35
4.	STCR-NPK alone 6 t ha^{-1}	120**	59	44	4950	82.5	14.6	2.34
5.	STCR-IPNS-4 t ha^{-1}	40	15*	15*	3680	92.0	18.8	1.85
6.	STCR-IPNS-5 t ha^{-1}	73	26	15*	4970	99.4	19.9	2.37
7.	STCR-IPNS-6 t ha^{-1}	105	42	24	5122	85.4	15.4	2.36
8.	Farmers practice	38	23	30	2586	-	9.8	1.35
9.	Control	0	0	0	1695	-	-	0.98

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ;

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha^{-1})			**Micronutrients (mg kg^{-1})**		
$KMnO_4$ - N	:	159	DTPA-Zn	:	1.28
Olsen - P	:	16.2	DTPA-Fe	:	4.28
NH_4OAc- K	:	285	DTPA-Mn	:	4.85
			DTPA-Cu	:	0.87

Table 4. Results of the test verification trial on rainfed maize

Location	:	Aasaripudur, Reddiyarchathiram Block Dindigul Dt	Soil	:	Red non calcareous (Irugur series)
Variety	:	TNAU maize hybrid Co6	D/S	:	24.09.2014
Season	:	Rabi	D/H	:	04 .02.2015

S. No.	**Treatments**	**Fertiliser doses (kg ha^{-1})**			**Grain yield (kg ha^{-1})**	**Percent Achieve-ment**	**RR (kg kg^{-1})**	**B:C ratio**
		N	**P_2O_5**	**K_2O**				
1.	Blanket	60	30	30	3296	-	13.5	1.61
2.	STCR-NPK alone 4 t ha^{-1}	60	28	15*	3365	84.1	16.4	1.73
3.	STCR-NPK alone 5 t ha^{-1}	93	43	27	4820	96.4	19.4	2.30
4.	STCR-NPK alone 6 t ha^{-1}	120*	58	44	5010	83.5	15.0	2.29

5.	STCR-IPNS-4 t ha^{-1}	38	15*	15*	3660	91.5	19.3	1.78
6.	STCR-IPNS-5 t ha^{-1}	71	26	15*	4960	99.2	20.3	2.28
7.	STCR-IPNS-6 t ha^{-1}	103	41	24	5196	86.6	15.9	2.31
8.	Farmers practice	35	20	15	2630	-	13.7	1.36
9.	Control	0	0	0	1679	-	-	0.94

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ; * Maintenance dose **Maximum dose

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha^{-1})			**Micronutrients (mg kg^{-1})**		
$KMnO_4$ - N	:	164	DTPA-Zn	:	0.68
Olsen - P	:	16.6	DTPA-Fe	:	4.26
NH_4OAc- K	:	285	DTPA-Mn	:	4.58
			DTPA-Cu	:	0.50

Table 5. Results of the test verification trial on rainfed maize

Location	:	Viralipatti II Reddiyarchathiram Block Dindigul Dt	Soil	:	Red non calcareous (Irugur series)
Variety	:	TNAU maize hybrid Co6	D/S	:	26.09.2014
Season	:	Rabi	D/H	:	04 .02.2015

S. No.	Treatments	Fertiliser doses (kg ha^{-1})			Grain yield (kg ha^{-1})	Percent Achieve-ment	RR (kg kg^{-1})	B:C ratio
		N	P_2O_5	K_2O				
1.	Blanket	60	30	30	3416	-	14.7	1.67
2.	STCR-NPK alone 4 t ha^{-1}	64	30	17	3586	89.7	17.5	1.81
3.	STCR-NPK alone 5 t ha^{-1}	96	45	35	4755	95.1	17.7	2.24
4.	STCR-NPK alone 6 t ha^{-1}	120**	60**	52	4995	83.3	14.4	2.25
5.	STCR-IPNS-4 t ha^{-1}	42	15*	15*	3780	94.5	19.3	1.83
6.	STCR-IPNS-5 t ha^{-1}	74	28	15*	5096	101.9	19.7	2.33
7.	STCR-IPNS-6 t ha^{-1}	106	43	32	5255	87.6	15.6	2.30
8.	Farmers practice	38	23	30	2680	-	11.3	1.35
9.	Control	0	0	0	1652	-	-	0.92

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ; * Maintenance dose

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha^{-1})			Micronutrients (mg kg^{-1})		
$KMnO_4$ - N	:	156	DTPA-Zn	:	1.04
Olsen - P	:	15.6	DTPA-Fe	:	3.58
NH_4OAc- K	:	247	DTPA-Mn	:	4.24
			DTPA-Cu	:	1.09

Table 6. Range and mean values of results of the test verification trial on rainfed maize

Soil : Red non calcareous (Irugur series)

Variety : TNAU maize hybrid Co6

Season : Rabi 2014

S. No.	Treatments	Fertiliser doses (kg ha^{-1})			Mean Grain yield (kg ha^{-1})	Mean Percent Achieve-ment	Mean RR (kg kg^{-1})	Mean B:C ratio
		N	P_2O_5	K_2O				
1.	Blanket	60	30	30	3324	-	13.8	1.66
2.	STCR-NPK alone 4 t ha^{-1}	60*-67	19-30	15-43	3474	86.9	16.0	1.79
3.	STCR-NPK alone 5 t ha^{-1}	93-99	34-45	27-60**	4797	95.9	17.9	2.30
4.	STCR-NPK alone 6 t ha^{-1}	120**	49-60**	44-60**	4973	82.9	14.5	2.30
5.	STCR-IPNS-4 t ha^{-1}	38-45	15*	15*-23	3736	93.4	18.3	1.84
6.	STCR-IPNS-5 t ha^{-1}	71-77	17-28	15*-41	5026	100.5	19.2	2.34
7.	STCR-IPNS-6 t ha^{-1}	103-109	32-43	24-58	5200	86.7	15.5	2.32
8.	Farmers practice	32-38	20-23	15-30	2627	-	11.9	1.36
9.	Control	0	0	0	1670	-	-	0.95

STCR-IPNS : NPK+12.5 t FYM ha^{-1} ; * Maintenance dose

Fertiliser Prescription Equations

FN = 3.23 T- 0.42 SN - 0.52 ON

FP_2O_5 = 1.51 T -1.98 SP - 0.94 OP

FK_2O = 1.73 T -0.21 SK - 0.48 OK

where, FN, FP_2O_5 and FK_2O are fertiliser N, P_2O_5 and K_2O in kg ha^{-1} respectively;

T = Grain yield target in q ha^{-1}; SN, SP and SK are available N, P and K in kg ha^{-1} respectively; ON, OP and OK are N, P and K supplied through FYM in kg ha^{-1}

Initial Soil Test values

Major nutrients (kg ha^{-1})			Micronutrients (mg kg^{-1})		
$KMnO_4$ - N	:	149-164	DTPA-Zn	:	0.44-1.28
Olsen - P	:	15.6-21.0	DTPA-Fe	:	3.28-4.63
NH_4OAc- K	:	123-285	DTPA-Mn	:	4.24-9.31
			DTPA-Cu	:	0.28-1.09

Project: 3

1.	Project number	:	**AICRP/NRM/CBE/SAC/003**
2.	Project Title		AICRP on Long Term Fertilizer Experiment – Studies on the content and uptake of nutrients and nutrient availability in finger millet- maize cropping system.
3.	Name of the Department		Soil Science and Agricultural Chemistry
4.	Name and designation of the project leader	:	**Dr. K. Arulmozhiselvan** Professor (SS & AC) Dept. of Soil Science and Agrl. Chemistry Tamil Nadu Agricultural University Coimbatore 641 003
5.	Period (Month and years)	:	5 years (April 2012-March 2017)

6. Objectives

- To study the effect of continuous application of plant nutrients on the yield of finger millet–maize cropping system.
- To study the effect of various treatments on the content of major nutrients in crop.
- To study the uptake of nutrients and monitor the changes in nutrient balance over a period of time.
- To record the changes in available secondary and micronutrients in soil.
- To bring out 40 years of LTFE Research as bulletin.

7. Progress made so far :

All India Co-ordinated Research Project on Long Term Fertilizer Experiment (LTFE) was initiated in 1972 and being maintained at Tamil Nadu Agricultural University, Coimbatore. The soil of LTFE of TNAU, Coimbatore is calcareous in nature and belongs to Inceptisol having *vertic* properties with clay >30 per cent. At the time of start in 1972 the soil was low in available N and P and high in available K. In the last 40 years 99 crops were raised. Earlier finger millet-cowpea-maize sequence was followed. From 2000 onwards finger millet-maize cropping sequence is adopted.

From the beginning improved varieties and hybrids of maize are being tested in LTFE. From 2010 onwards revised rate of 250:75:75 kg N, P_2O_5 and K_2O ha^{-1} is followed for hybrid maize. There are 10 regular treatments replicated 4 times in randomized block design with plot size of 200 m^2. In the LTFE trial, so far 99 crops (37 cropping cycles) were raised.

8. Work carried out during the review period

During 2014-15, finger millet – maize crops were raised (100^{th} and 101^{st} crops; 38 cropping cycle) were raised. Grain and straw yields were recorded. Nutrient status was estimated. Mean values for 5 years are presented in Tables with overall mean for grouped years and treatments for the period from 2011 to 2014.

9. Salient findings from the project

- ✓ Application of 90:45:17.5 and 250:75:75 kg N, P_2O_5 and K_2O as 100 per cent under integrated nutrient management practice (INM) along with FYM @ 10 t ha^{-1} for finger millet and maize hybrid respectively (T_8) significantly increased the grain and straw yield of both crops. The yield increase in INM recorded was 15.5% for finger millet and 15.7% for maize hybrid over 100% NPK. Non-inclusion of K in 100% NP also recorded the comparable yield with 100% NPK. Continuous addition of N alone resulted in decline in yield up to 22.8% for finger millet and 28.1% for maize hybrid when compared to 100% NPK.

- ✓ The available nutrient status was found to be high in INM practice. Next in order, the yield and available nutrients were high under 150% NPK which was significantly higher than 100% NPK. Non-inclusion of K in 100% NP, and P and K in 100% N treatment significantly reduced available P and K when compared to 100% NPK.

- ✓ Regarding nutrients balance, negative balance in available N, P and K was noticed under continuous cropping with finger millet whereas in maize hybrid build up was noticed for N and P and depletion was found in K. Besides continuous non addition of fertilizer in control and 100% N alone, depletion of N and P was also recorded under maize crop.

10. Remarks of the Technical Director based on the pre-review:

101 crops (38 cropping cycle) is completed. The yield of crops during the past five years was found to decline, the reasons for which have to be examined. Sowing in different months had variation on yield over the years. So uniform sowing in every season has to be maintained to see the impact of the treatments on the performance of the crop. There was 15% increase in yield with 100% NPK plus FYM over 100% NPK alone. K uptake by the crops was found to be higher. K supply to crops has to be investigated by taking up clay mineralogy study. FLD trials conducted in the farmers field was not explained to HOD and in future, it shall be popularized by showing the crop performance to the Department Officials and HOD.

Findings on crop performance due to skipping of K in the sequential cropping system may be considered for giving it as information. Continuation proposal to be sent/ new research project to be proposed.

Table 1. Grain yield of maize (kg ha^{-1}) from 2011 to 2014

Treatments	2011 (95^{th})	2012 (97^{th})	2013 (99^{th})	2014 (101^{st})	Mean
T_1 - 50 % NPK	6351	6388	5974	5132	5961
T_2 -100 % NPK	7662	7324	6693	5378	6764
T_3 -150 % NPK	8569	8020	6955	5492	7259
T_4 -100 % NPK + HW	7257	7115	6476	5311	6540
T_5 -100 % NPK + Zn	8209	7733	6836	5432	7053
T_6 -100 % NP	7077	7217	6557	5213	6516
T_7 -100 % N	5009	5225	4973	4256	4866
T_8 -100 % NPK + FYM	9263	8558	7422	6057	7825
T_9 -100 % NPK (-S)	6664	6839	6646	5349	6375
T_{10} -control	3261	4133	3223	3012	3407
SEd	161	152	154	137	
CD (P = 0.05)	273	259	262	233	

Table 2. Stover yield of maize (kg ha^{-1}) from 2011 to 2014

Treatment Structure	2011 (95^{th})	2012 (97^{th})	2013 (99^{th})	2014 (101^{st})	Mean
T_1 - 50 % NPK	11380	8987	8902	7029	9075
T_2 -100 % NPK	13141	10642	9616	8271	10418
T_3 -150 % NPK	14714	11442	9856	8514	11132
T_4 -100 % NPK + HW	12680	10393	9403	8149	10156
T_5 -100 % NPK + Zn	13821	11118	9780	8458	10794
T_6 -100 % NP	12437	10515	9606	8134	10173
T_7 -100 % N	9508	7912	7824	6933	8044
T_8 -100 % NPK + FYM	15461	11629	10150	9379	11655
T_9 -100 % NPK (-S)	11778	10056	9534	8221	9897
T_{10} -control	6896	6965	5996	5242	6275
SEd	260	231	266	165	
CD (P = 0.05)	443	394	453	281	

Table 3. Available nutrient status (kg ha^{-1}) in post-harvest soil of maize

Treatment Structure	Available Nitrogen (kg ha^{-1})			Available phosphorus (kg ha^{-1})			Available potassium (kg ha^{-1})		
	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)
T_1 - 50 % NPK	165	171	+6	16.50	17.51	+1.01	592	521	-71
T_2 -100 % NPK	184	194	+10	19.80	21.06	+1.26	673	555	-118
T_3 -150 % NPK	194	222	+28	22.98	24.82	+1.84	717	584	-133
T_4 -100 % NPK + HW	183	196	+13	19.01	19.92	+0.91	655	550	-105
T_5 -100 % NPK + Zn	186	201	+15	19.29	20.47	+1.18	660	542	-118
T_6 -100 % NP	179	195	+16	17.80	18.66	+0.86	545	403	-142
T_7 -100 % N	173	195	+22	11.96	10.48	-1.48	552	499	-53
T_8 -100 % NPK + FYM	207	225	+18	24.95	26.61	+1.66	765	635	-130
T_9 -100 % NPK (-S)	181	189	+8	20.07	21.23	+1.16	652	546	-106
T_{10} -control	150	148	-2	6.59	6.45	-0.14	497	471	-26
SEd		3.89			0.44			12.83	
CD (p=0.05)		6.62			0.75			21.84	

Previous value 1972 Available N: 178 Available P: 11.0 Available K: 810 kg ha^{-1}

Table 4. Grain yield of finger millet (kg ha^{-1}) from 2010-14

Treatments	2011 (96th)	2012 (98th)	2013 (100th)	2014 (102nd)	Mean
T_1 - 50 % NPK	2169	2425	2084	1968	2162
T_2 -100 % NPK	2324	2700	2623	2276	2481
T_3 -150 % NPK	2445	2850	2917	2466	2670
T_4 -100 % NPK + HW	2289	2625	2476	2156	2387
T_5 -100 % NPK + Zn	2383	2890	2870	2306	2612
T_6 -100 % NP	2311	2650	2525	2215	2425
T_7 -100 % N	2032	2250	1742	1638	1916
T_8 -100 % NPK + FYM	2571	3125	3071	2698	2866
T_9 -100 % NPK (-S)	2285	2685	2594	2218	2446
T_{10} -control	1874	1915	1413	1325	1632
SEd	51	68	124	32	
CD (P = 0.05)	86	116	211	55	

Table 5. Straw yield of finger millet (kg ha^{-1}) from 2010-14

Treatments	2011 (96^{th})	2012 (98^{th})	2013 (100^{th})	2014 (102^{nd})	Mean
T_1 - 50 % NPK	4545	3516	3233	3934	3807
T_2 -100 % NPK	4746	4147	4142	4792	4457
T_3 -150 % NPK	4958	4492	4637	5398	4871
T_4 -100 % NPK + HW	4664	3975	3893	4636	4292
T_5 -100 % NPK + Zn	4988	4583	4557	5160	4822
T_6 -100 % NP	4875	4032	3977	4431	4329
T_7 -100 % N	4133	3114	2655	3123	3256
T_8 -100 % NPK + FYM	5237	5123	4956	5968	5321
T_9 -100 % NPK (-S)	4807	4113	4092	4590	4401
T_{10} -control	4035	2345	2101	2156	2659
SEd	112	64	87	87	
CD (P = 0.05)	191	109	148	147	

Table 6. Available nutrient status (kg ha^{-1}) in post-harvest soil of finger millet

Treatments	Available Nitrogen (kg ha^{-1})			Available phosphorus (kg ha^{-1})			Available potassium (kg ha^{-1})		
	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)
T_1 - 50 % NPK	166	161	-5	17.58	16.67	-0.91	616	598	-18
T_2 -100 % NPK	185	172	-13	20.65	19.44	-1.21	661	639	-22
T_3 -150 % NPK	196	180	-16	22.77	21.31	-1.46	694	664	-30
T_4 -100 % NPK + HW	183	169	-14	19.10	18.26	-0.84	633	609	-24
T_5 -100 % NPK + Zn	189	177	-12	20.02	18.98	-1.04	652	628	-24
T_6 -100 % NP	184	172	-12	18.45	17.49	-0.96	599	570	-29
T_7 -100 % N	178	175	-3	11.95	10.13	-1.82	591	581	-10
T_8 -100 % NPK + FYM	205	209	+4	24.83	24.41	-0.42	743	739	-4
T_9 -100 % NPK (-S)	182	169	-13	20.70	19.62	-1.08	638	616	-22
T_{10} -control	148	141	-7	6.86	6.62	-0.24	527	521	-6
SEd		4.44			0.40			14.80	
CD (p=0.05)		7.57			0.68			25.20	

Previous value 1972 Available N: 178 Available P: 11.0 Available K: 810 kg ha^{-1}

Project 4

1.	Project Number	:	**NRM/CBE/SAC/13/004**
2.	Project Title	:	**Permanent Manurial Experiment of Coimbatore under irrigated Tropical Agro Ecosystem**
3.	Name of the Department	:	Soil Science and Agrl. Chemistry
4	Name and designation of the project leader	:	**Dr. M. Elayarajan** Assistant Professor (SS & AC) Dept. of Soil Science and Agrl. Chemistry Tamil Nadu Agricultural University Coimbatore 641 003
5.	Period (Month and years)		5 years (November 2013 to October 2018)

6. Objectives

- To evaluate the effect of various plant nutrient supply system on soil available nutrients.
- To assess the response of crops to various input supply system in terms of crop yields and nutrients uptake.
- To monitor soil biology in terms of microbial population and organic carbon biomass carbon once in two years.
- To monitor the nutrient balance in terms of total nutrients and changes the physical properties once in five years.

7. Progress made so far

The Permanent Manurial Experiment (PME) was started in the year 1909 and being maintained at Tamil Nadu Agricultural University, Coimbatore. It is the oldest one having historical importance in India as it has crossed 104 years of continuous experimentation. This experiment was conducted to study the continuous application of nutrients on yield and available nutrients status of soil. It has eighteen treatments which comprises of control, either nutrients alone or in combination, organic manures alone and INM etc. are being tested as non-replicated trial.

From 2008 onwards the treatments of PME was revised to suit the high yielding crops that are being released and recommended currently. The approaches of nutrient addition through FYM/ Poultry Manure, Integrated Nutrient Management, STCR-IPNS, and residue incorporation, etc were introduced in the middle strip of PME. Instead of fixed dose of fertilizer nutrients followed earlier, the blanket dose of fertilizer recommended for each crop variety/ hybrid is being adopted at present in maize-sunflower cropping system under irrigated conditions. In the PME trial, so far 158 crops were cultivated and reported.

8. Work carried out during the review period

During 2014-15, Maize – sunflower crops were raised (159^{th} and 160^{th} crops) were raised. Grain and stover yields of maize and grain and haulm yield of sunflower were recorded. Nutrient status was estimated. Mean values for 5 years are presented in Tables with overall mean for grouped years and treatments for the period from 2011 to 2014.

9. Salient findings

Application of 250:75:75 kg N, P_2O_5 and K_2O ha^{-1} as 100% NPK along with FYM @ 12.5 t ha^{-1} (T_{10}) recorded the highest maize grain mean yield of 8480 kg ha^{-1} and mean straw yield of 11,287 kg ha^{-1}. The INM practice recorded 12.41% increase in the grain yield over 100% NPK. Continuous fertilization with urea had recorded 68.72% yield decline when compared to 100% NPK.

- ✓ The available nitrogen and potassium status were found to be high INM treatment. In case of available phosphorus, application of poultry manure on nitrogen equivalent basis recorded the highest available P followed by INM and STCR-IPNS.
- ✓ Regarding nutrient balance, balanced NPK fertilization and INM practice showed the positive balance in available NPK while continuous skipping of fertilizer nutrients resulted in negative balance.

10. Remarks of the Technical Director based on the pre-review:

159^{th} maize crop was harvested. Application of 100% NPK plus FYM registered higher grain yield over STCR –IPNS. Micronutrients status of post-harvest soils to be checked up as iron and other micronutrients content are found to be very low. Treatment details indicating NPK dose may be given while presenting the data. Residue mulch added and nutrient contribution to the soil to be quantified. The MNS unit is requested to analyse the soil samples for micronutrient status and verify the values

Table 1. Effect of Continuous fertilization on grain yield of maize during 2011-14

Treatments		2011 (153^{th})	2012 (155^{th})	2013 (157^{th})	2014 (159^{th})	Mean
T_1	Control	1087	1860	952	854	1188
T_2	N alone	3140	3782	1339	1179	2360
T_3	NK alone	5918	5941	3124	2460	4361
T_4	NP alone	6522	8356	8171	5286	7084

T_5	NPK	7729	8971	8088	5389	7544
T_6	PK alone	2174	3951	2343	1900	2592
T_7	K alone	1812	3142	2583	2072	2402
T_8	P alone	1691	2657	2865	2274	2372
T_9	NPK blanket	7488	8845	7321	5473	7282
T_{10}	100 % NPK + FYM	9179	9906	8808	6025	8480
T_{11}	Farmer's practice	6643	8715	5016	3819	6048
T_{12}	No manure no crop	-				
T_{13}	STCR – IPNS	6522	9757	8133	5135	7387
T_{14}	FYM NEB	6280	5428	6235	4694	5659
T_{15}	PM NEB	7246	7828	5139	3907	6030
T_{16}	Residue mulching	2415	3090	2786	2218	2627
T_{17}	FYM Every Year (2 crops)	2959	3832	3463	2704	3240
T_{18}	FYM Even Year (2 crops)	2234	3651	1686	1428	2250

Table 2. Continuous manuring and fertilization on straw yield of maize from 2011-14

Treatments		2011 (153th)	2012 (155th)	2013 (157th)	2014 (159th)	Mean
T_1	Control	5918	2889	1154	1021	2746
T_2	N alone	7609	5072	1758	1668	4027
T_3	NK alone	7246	7246	3944	3698	5534
T_4	NP alone	6401	10628	9136	8759	8731
T_5	NPK	12560	11473	9177	8860	10518
T_6	PK alone	7005	6039	3609	3555	5052
T_7	K alone	4831	5435	3655	3600	4380
T_8	P alone	5435	5072	3771	3724	4501
T_9	NPK blanket	13647	11111	8603	7654	10254
T_{10}	100 % NPK + FYM	12802	12681	10210	9456	11287
T_{11}	Farmer's practice	8333	10386	6022	5435	7544
T_{12}	No manure no crop	-	-	-	-	-
T_{13}	STCR – IPNS	12560	12319	9538	7225	10411
T_{14}	FYM NEB	16546	9058	7619	7387	10153
T_{15}	PM NEB	14614	11111	6103	6036	9466
T_{16}	Residue mulching	9541	5435	3328	3301	5401
T_{17}	FYM Every Year (2 crops)	6039	5918	4905	4754	5404
T_{18}	FYM Even Year (2 crops)	3925	5737	3027	2954	3911

Table 3. Available nutrient status (kg ha^{-1}) in post-harvest soil of maize hybrid

Treatments		Available Nitrogen (kg ha^{-1})			Available phosphorus (kg ha^{-1})			Available potassium (kg ha^{-1})		
		Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)	Mean of 5 years 2009-2013	Current year 2014	Balance (+ or -)
T_1	Control	154	143	-11	11.04	9.94	-1.10	403	408	5
T_2	N alone	178	206	28	14.03	12.53	-1.50	429	414	-15
T_3	NK alone	187	205	18	14.40	12.20	-2.20	508	530	22
T_4	NP alone	186	200	14	17.98	15.85	-2.13	433	418	-15
T_5	NPK	203	215	12	20.79	21.94	1.15	535	530	-5
T_6	PK alone	159	151	-8	18.19	19.52	1.33	521	542	21
T_7	K alone	158	148	-10	13.99	12.43	-1.56	545	569	24
T_8	P alone	155	148	-7	18.84	20.45	1.61	464	449	-15
T_9	NPK blanket	196	207	11	20.42	21.54	1.12	550	562	12
T_{10}	100 % NPK + FYM	221	243	22	25.76	27.92	2.16	627	645	18
T_{11}	Farmer's practice	174	182	8	14.66	15.50	0.84	461	465	4
T_{12}	No manure no crop	164	169	5	12.40	12.90	0.50	444	450	6
T_{13}	STCR – IPNS	214	235	21	23.50	25.33	1.83	590	577	-13
T_{14}	FYM NEB	185	200	15	21.47	24.26	2.79	548	564	16
T_{15}	PM NEB	198	215	17	26.55	29.76	3.21	576	579	3
T_{16}	Residue mulching	170	175	5	16.88	17.44	0.56	465	459	-6
T_{17}	FYM Every Year (2 crops)	189	183	-6	18.45	16.50	-1.95	474	483	9
T_{18}	FYM Even Year (2 crops)	178	168	-10	17.25	16.03	-1.22	474	485	11

Previous value in 1984 - for Available N: 144, Available P: 3.40 and Available K: 448 kg ha^{-1}

Project 5

1	**Project Number**	:	NRM - CBE - SAC - 14 – 001
2	**Project Title**	:	Phosphorus acquisition and phosphorus use efficiency as influenced by various P sources in maize – groundnut sequence - An investigation using ^{32}P
3	**Name of the Department/Station**	:	Soil Science & Agricultural . Chemistry Tamil Nadu Agricultural University Coimbatore – 641 003
4	**Name(s) of the Scientist (s) with Designation**	:	S.Meena Professor (SS&AC)
5	**Project Period**	:	June, 2014 to May, 2016
6	**Objectives**	:	(i) To study the phosphorus acquisition and phosphorus use efficiency of added sources in maize using ^{32}P (ii) To determine the residual effect of added sources on the succeeding crops (groundnut) using ^{32}P (iii) To study the mechanism of P mobilization in soil as influenced by sources and crops (iv) To determine the PUE in maize – groundnut cropping system using radiotracer technique (v) Test verification of the selected source and level under field conditions
7	**Brief outline of the work carried out from the project initiation period**	:	The project work has been initiated only during 2014 - 15.

8 Work carried out during the review period

Bulk soil sample for conducting the pot culture experiment was collected from a farmer's holding in Thondamuthur. The samples were processed and filled in polythene lined pots @ 10 kg pot $^{-1}$ Initial analysis of the soil revealed that the soil is alkaline in reaction (pH: 8.20), low in nitrogen (151 kg ha^{-1}), medium in phosphorus (21.26 kg ha^{-1}) and high in potassium (556 kg ha^{-1}). The inorganic P fractions were saloid – P (25 ppm), Iron – P (40.50 ppm), aluminium P (40.25 ppm) and Ca-P (132.5 ppm) respectively.

Sowing of maize (COH(M) 6) was taken up on 24.10.2014. Totally there were ten treatments replicated four times. The treatments were P as Single Superphosphate, Enriched FYM with Single Superphosphate (EFYM), DAP, Nutriseed pack (SSP), Nutriseed pack (DAP), Single Superphosphate + Phosphobacteria (PB), EFYM (SSP) + PB, DAP + PB, Nutriseed pack (SSP) + PB and Nutriseed pack (DAP) + PB. Phosphorus sources were tagged with ^{32}P (obtained as ^{32}P in orthophosphoric medium from the Board of Radiation and Isotope Technology) and applied as per the treatments.

On harvest, the grain and stover dry weight was recorded. Phosphorus content by grain and stover were analysed. Also, the radioactive ^{32}P in the grain and stover sample was determined using Liquid Scintillation Counter (Perkin Elmer Tricarb 2810 R). Using the data, phosphorus uptake by grain and stover, per cent phosphorus derived from fertilizer (%Pdff), per cent phosphorus derived from soil (%Pdfs), Phosphorus Use Efficiency (PUE) and A value were determined.

Irrespective of the P source, application of P along with phosphobacteria recorded significantly higher grain yield than application of P alone. Application of Nutriseeed pack (SSP) + PB recorded the highest maize grain yield (71.57 g pot^{-1}) and was on par with Nutriseeed pack (DAP) + PB (69.60 g pot^{-1}), enriched FYM with SSP + PB (69.53 g pot^{-1}). Also, Nutriseeed pack (SSP) + PB recorded the highest maize stover yield (117.66 g pot^{-1}) and was on par with Nutriseeed pack (DAP) + PB (111.49 g pot^{-1}) (Table 1).

Application of P along with PB increased the per cent Pdff, P uptake from fertilizer and PUE. Per cent Pdff ranged from 11.18 per cent (DAP) to 23.23 in EFYM with SSP in grain and in stover from 19.08 per cent (DAP) to 31.43 in EFYM with SSP. The highest per cent Pdfs was due to DAP (84.87 %) (Table 2).

The highest mean PUE of 25.38 was recorded in the treatment where enriched FYM with SSP was applied along with PB. Highest A value (9.2 mg P 100 g^{-1} soil) was recorded in DAP applied treatment (Table 3).

9 Salient Findings :

Application of Phosphorus (SSP, DAP, enriched FYM with SSP, Nutriseed pack (SSP), and Nutriseed pack (DAP)) along with PB increased the per cent phosphorus derived from fertiliser (% Pdff) , P uptake from fertilizer and PUE. The highest PUE of 25.38 was recorded in the treatment where enriched FYM with SSP was applied along with PB. Highest A value (9.2 mg P 100 g^{-1} soil) was recorded in DAP applied treatment.

10 Remarks of the Technical Director based on the pre-review : To be continued

Table 1. Grain yield, stover yield and P uptake as influenced by various phosphorus treatments

Treatments	Yield (g pot $^{-1}$)		Phosphorus uptake (mg pot $^{-1}$)		
	Grain	Stover	Grain	Stover	Total
Single Superphosphate (SSP)	58.18	81.42	134.27	120.76	255.03
Enriched FYM with SSP (ESSP)	64.32	99.39	174.98	121.74	296.72
DAP	45.02	76.54	184.60	101.07	285.67
Nutriseed pack (SSP)	64.64	105.56	193.27	137.24	330.51
Nutriseed pack (DAP)	62.80	95.36	155.91	129.81	285.71
Single Superphosphate +PB	65.37	106.78	173.39	130.18	303.58
Enriched FYM with SSP (ESSP) + PB	69.53	108.23	184.24	129.12	313.36
DAP + PB	63.13	95.20	156.09	118.85	274.94
Nutriseed pack (SSP) + PB	71.57	117.66	196.82	156.40	353.22
Nutriseed pack (DAP) + PB	69.60	111.49	189.66	144.15	333.81
SEd	2.40	3.80	8.73	10.51	13.62
CD (0.05)	4.91	7.75	17.82	21.47	27.94

Table 2. Per cent phosphorus derived from fertilizer (%Pdff), Per cent phosphorus derived from soil (%Pdfs) as influenced by various phosphorus treatments

Treatments	% Pdff			% Pdfs		
	Grain	Stover	Mean	Grain	Stover	Mean
Single Superphosphate	15.78	24.70	20.24	84.22	75.30	79.76
Enriched FYM with SSP (EFYM)	19.28	28.13	23.70	80.72	71.87	76.30
DAP	11.18	19.08	15.13	88.82	80.92	84.87
Nutriseed pack (SSP)	12.56	20.42	16.49	87.44	79.58	83.51
Nutriseed pack (DAP)	16.97	22.47	19.72	83.03	77.53	80.28
Single Superphosphate +PB	16.71	28.75	22.73	83.29	71.25	77.27
Enriched FYM with SSP (EFYM) + PB	23.23	31.43	27.33	76.77	68.57	72.67
DAP + PB	19.27	26.87	23.07	80.73	73.13	76.93
Nutriseed pack (SSP) + PB	15.17	21.90	18.54	84.83	78.10	81.46
Nutriseed pack (DAP) + PB	16.57	24.56	20.57	83.43	75.44	79.43
SEd	1.35	3.01	1.56	1.35	3.01	1.56
CD (0.05)	2.76	6.16	3.18	2.76	6.16	3.18

Table 3. Phosphorus Use Efficiency (PUE) and A value (mg P 100 g $^{-1}$ soil) as influenced by various phosphorus treatments

Treatments	PUE			A value		
	Grain	Stover	Mean	Grain	Stover	Mean
Single Superphosphate	12.90	18.22	15.56	8.7	5.0	6.4
Enriched FYM with SSP (EFYM)	20.63	21.03	20.83	6.8	4.2	5.3
DAP	12.52	11.69	12.11	13.0	6.9	9.2
Nutriseed pack (SSP)	14.86	17.04	15.95	11.4	6.4	8.3
Nutriseed pack (DAP)	16.21	17.63	16.92	8.0	5.6	6.7
Single Superphosphate +PB	17.69	22.07	19.88	8.1	4.1	5.6
Enriched FYM with SSP (EFYM) + PB	26.05	24.70	25.38	5.4	3.6	4.3
DAP + PB	18.41	19.54	18.98	6.8	4.4	5.5
Nutriseed pack (SSP) + PB	18.14	20.77	19.45	9.1	5.8	7.2
Nutriseed pack (DAP) + PB	19.21	21.63	20.42	8.2	5.0	6.3
SEd	1.38	2.21	1.04	0.8	0.8	0.7
CD (0.05)	2.82	4.51	2.12	1.6	1.7	1.3

Project 6

1	Project Number	:	DST/NRM/ CBE/ SAC/2012/001
2	Project Title	:	Crop and Genotypic Variation - A Tool to Enhance phosphorus Use Efficiency for Sustainable Cropping in Low Phosphorus Soils (Externally Funded Project)
3	Name of the Department/Station	:	Soil Science & Agricultural Chemistry Tamil Nadu Agricultural University Coimbatore – 641 003

4	Name(s) of the Scientist (s) with Designation	:	S.Meena Professor (SS&AC) P.Malarvizhi Professor (SS&AC)
5	Project Period	:	March, 2012 – February, 2015.
6	Objectives	:	▪ To study the phosphorus (P) acquisition characteristics of maize and cotton under P deficient conditions and to select efficient crop using ^{32}P radiotracer technique. ▪ To study the relationship between root traits, organic acid root exudates and phosphatase on Phosphorus Use Efficiency of different genotypes of the selected crop. ▪ To test verify the efficiency of the selected cultivars (with varying P acquisition) for their P efficiency under field condition in P deficient soil.

7 Brief outline of the work carried out from the project initiation period:

Experiment I - Selecting efficient P acquisition crop - ^{32}P radiotracer experiment

Maize and cotton as test crops was studied for their efficiency with regard to Phosphorus (P) acquisition. Cotton recorded higher root – shoot ratio at P_0 and $P_{3.75}$ mg kg^{-1}. Increased available P content was noticed in rhizosphere soil and the increase was higher in the case of maize. Rhizosphere pH after 60 days of growth was slightly acidic irrespective of the crop. Enhanced activity of acid phosphatase by cotton roots conferred a potential advantage for cotton to acquire P from organic pools. The depletion of inorganic P fractions (Fe-P and Ca-P) by cotton was smallest when compared to maize. The higher efficiency of maize over cotton in inorganic P fraction acquisition might be related to root morphological traits e.g. root hair development. At all levels of P application, maize recorded significantly lower specific radioactivity and higher IEP. Malic acid was recorded in the rhizosphere soil of maize while in cotton no organic acids were detected. Under P deficiency condition maize recorded lower Phosphorus Stress Factor (PSF) values, high Phosphorus Utilisation Efficiency (PUE), Phosphorus Efficiency (PE) and Phosphorus Acquisition Efficiency (PAE).

Maize having depicting high PUE, PE and low PSF values is a better choice for P deficient condition. A higher PAE efficiency of maize can be related to the ability of maize to take up P from insoluble inorganic P forms.

Experiment II - Phosphorus Use Efficiency in maize - Genotypic variation

Greenhouse experiment was initiated with eleven genotypes of maize in a P deficient soil with two phosphorus treatments (-P and +P) and the experiment was replicated three times. Three sets were maintained for 30 DAS, 45 DAS and harvest. The experimental soil was sandy loam in texture with pH of 7.95 and EC of 0.20 dSm^{-1}. The soil was low in nitrogen (255 kg ha^{-1}), phosphorus (7.42 kg ha^{-1}) and medium in potassium (266 kg ha^{-1}). Eleven maize genotypes COH(M) 6, CMH08 - 156 , CMH08 – 287, CMH08 – 292, CMH08 – 337, CMH08 – 350, CMH08 - 381 (a), CMH08 - 381 (b), CMH08 – 433, CMH08 – 464 and NK 6240 were used in the experiment.

Significant genotypic variation was observed in maize in a P deficient soil with regard to grain yield and stover yield with and without P application. Genotypes CMH08 - 337, CMH08-381 (a) and CMH08 -381(b) recorded significantly higher grain yield under P stress (no P application) and were able to produce 72-73 per cent of the yield as P applied treatment.

In the soil, magnitude of pH reduction was high under –P than under +P. Variation in pH among the genotypes indicates the ability of the genotypes to induce variation in soil reaction. Irrespective of the genotypes acid phosphatase and malic acid exudation recorded in no P treatment was significantly higher than that in the P applied treatment and variation exist among genotypes also. Acid phosphatase and malic acid exerted a significant positive effect on PE and PUE.

Range of PUE (grain) (17.2- 30.5 g^2GY mg $^{-1}$P) and PUE (stover) (40.9 – 67.80 g^2SY mg $^{-1}$P) gave a clue of genotypic variability for P-utilization. Maize genotypes CMH08 - 337, CMH08 - 381 (a) and CMH08 - 381 (g) recorded PSF values of less than 30 per cent.

Based on various parameters, genotypes were grouped as P efficient, inefficient and moderately efficient.

Experiment III: During the third year of the experiment, test verification of the efficiency of the selected cultivars (with varying P acquisition) for their P efficiency under field condition in P deficient soil.

8 Work carried out during the review period

Test verification of the efficiency of the selected cultivars (with varying P acquisition) for their P efficiency under field condition in P deficient soil. A field experiment has been taken up in a farmer's field at Chinnamathampalyam village of Periyanaickanpalayam block of Coimbatore district (11°.21'14" N ; 76°97'78" E). The experimental soil was low in nitrogen (176 kg ha^{-1}) and phosphorus (8.48 kg ha^{-1}) and high in potassium (281 kg ha^{-1}).

Sowing of six genotypes of maize (CMH08- 156, CMH08- 287 [CO (H) M 7], CMH08- 292 [CO (H) M 8], CMH 08- 337, CMH08 – 350 [CO (H) M 9] and [CO (H) M 6] was taken up on 04.09.2014. The phosphorus levels imposed were 0, 50, 75 and 100 per cent of RDF-P (i.e., 75 kg P_2O_5 ha^{-1}). One soil and plant sampling was carried out on 45 DAS to understand the early stage variation. Soil and plant samples were collected at post- harvest stage. In soil, pH, available phosphorus content and phosphorus fractions were studied. In plant, grain and stover yield, root dry matter was recorded and phosphorus content was analyzed. Using the data, phosphorus uptake, Phosphorus Efficiency (PE) , Internal Phosphorus Utilisation Efficiency (PUE) and Phosphorus Acquisition Efficiency (PAE) were calculated.

Increase in P levels resulted to increased pH of the soil. A decrease in Ca-P content over the initial values was observed in control (no P application).

Significant genotypic variation was observed in maize in a P deficient soil with regard to grain yield and stover yield at various levels of P application (Table 1). Grain yield under control (no P application) ranged from 3912 - 6290 kg ha^{-1}. CMH08 -337 recorded the highest grain yield of 6290 kg ha^{-1} followed by COH(M) 8 (4952 kg ha^{-1}) . CMH08-337 was able to produce 88 per cent of grain yield as under 100 per cent P application.

Genotypes, phosphorus levels and their interaction exerted a significant effect on phosphorus uptake of grain, stover and total P uptake. Increasing P levels increased the grain and stover P uptake. Total P uptake under control ranged from 9.62 kg ha^{-1} for CMH08 -156 to 17.81 kg ha^{-1} (CMH08 -337) and in P_{100} ranged from 24.42 kg ha^{-1} for COH(M) 7 to 30.40 (CMH08 -337 and COH(M) 9).

Internal P Utilization Efficiency (grain) ranged from 324 (COH(M) 7) – 406 (CMH08 156) kg grain kg^{-1} P absorbed exhibiting a 1.25 fold increase. Increasing the P application rate decreased the Internal P Utilization Efficiency (Table3).

Increase in B:C ratio was observed with increase in P application. CMH08 337 recorded the highest B:C ratio under P_0 and P_{100}.

The genotypes are categorized based on grain yield and PUE.

1. <u>Tolerant, responsive with high PUE</u> : COH(M) 8 produced grain yield more than the mean of the six genotypes at P_0 , responded significantly to P application with the internal PUE higher than the average

2. <u>Tolerant, responsive with low PUE</u> : CMH08 337 produced higher grain yield than the genotypic mean at Po, responded significantly to P application , but PUE was lower than the genotypic mean at P_0.

3. <u>Non -Tolerant, responsive with high PUE</u> : CMH08 156 produced grain yield lesser than the mean of the six genotypes at P_0 , responded significantly to P application with the internal PUE higher than the average

4. <u>Non -Tolerant, responsive with low PUE</u> : COH(M) 7, COH(M) 9 and COH(M) 6 produced grain yield lesser than the mean of the six genotypes at P_0 , responded significantly to P application with the internal PUE lower than the average

The genotype identified as tolerant, responsive with high PUE [COH(M) 8] can perform well under low P soil without P application and also it can respond well with P application.

9 Salient Findings :

Significant genotypic variation was observed in maize in a P deficient soil with regard to grain yield and stover yield at various levels of P application. Grain yield under control (no P application) ranged from 3912-6920 kg ha^{-1}. CMH08 -337 recorded the highest grain yield of 6290 kg ha^{-1} followed by COH(M) 8 (4952 kg ha^{-1}). CMH08 was able to produce 88 per cent of grain yield (P_0) as under 100 per cent P application.

Genotypes, phosphorus levels and their interaction exerted a significant effect on phosphorus uptake of grain, stover and total P uptake. Increasing P levels increased the grain and stover P uptake. Grain P uptake under control ranged from 4.38 kg ha^{-1} for CMH08 -156 to 7.31 kg ha^{-1} (CMH08 -337) and in P_{100} ranged from 11.98 kg ha^{-1} for CMH08 -156 to 13.81 kg ha^{-1} (CMH08 -337).

The genotypes are categorized based on grain yield and PUE.

1. Tolerant, responsive with high PUE : COH(M) 8 produced grain yield more than the mean of the six genotypes at P_0, responded significantly to P application with the internal PUE higher than the average.
2. Tolerant, responsive with low PUE : CMH08 337 produced higher grain yield than the genotypic mean at P_0, responded significantly to P application, but PUE was lower than the genotypic mean at P_0.
3. Non -Tolerant, responsive with high PUE : CMH08 156 produced grain yield lesser than the mean of the six genotypes at P_0, responded significantly to P application with the internal PUE higher than the average.
4. Non -Tolerant, responsive with low PUE : COH(M) 7, COH(M) 9 and COH(M) 6 produced grain yield lesser than the mean of the six genotypes at P_0, responded significantly to P application with the internal PUE lower than the average.

The genotype identified as tolerant, responsive with high PUE [COH(M) 8] can perform well under low P soil without P application and also it can respond well with P application.

10	Remarks of the Technical Director based on the pre-review	:	To be continued

Table 1. Grain and Stover Yield of maize as influenced by genotypes and phosphorus levels

Genotype P levels	Grain yield (kg ha^{-1})					Stover yield (kg ha^{-1})				
	P_0	P_{50}	P_{75}	P_{100}	Mean	P_0	P_{50}	P_{75}	P_{100}	Mean
CMH08 – 156	3912	4783	5929	6427	5263	5281	8163	9507	9354	8076
COH (M) 7	4012	4298	4778	5229	4579	6088	8148	9105	8950	8073
COH(M) 8	4952	5312	5675	6689	5657	6049	7091	7523	8925	7397
CMH08 337	6290	6583	6945	7152	6743	7353	7751	7866	8391	7840
COH (M) 9	4381	4627	5198	5806	5003	5635	7172	7770	8402	7244
COH (M) 6	4190	4646	5467	6376	5170	5062	7744	8600	9199	7651
Mean	4623	5042	5665	6280	5402	5911	7678	8395	8870	7714

Source	Grain yield		Stover yield	
	SEd	CD (0.05)	SEd	CD (0.05)
Genotype (G)	223	449	237	477
Phosphorus (P)	182	366	193	389
G x P	446	898	474	953

Table 2. Total Phosphorus uptake as influenced by genotypes and phosphorus levels

Genotype P levels	Total P uptake (kg ha^{-1})				
	P_0	P_{50}	P_{75}	P_{100}	Mean
CMH08 – 156	9.62	18.24	24.86	29.81	20.63
COH (M) 7	12.39	19.42	23.20	24.42	19.86
COH(M) 8	13.31	20.01	22.25	28.56	21.03
CMH08 337	17.81	25.76	27.94	30.40	25.48
COH (M) 9	17.52	25.76	27.84	30.40	20.74
COH (M) 6	12.65	19.75	23.74	26.83	20.73
Mean	12.36	19.50	23.44	27.60	20.60

Source	SEd	CD (0.05)
Genotype (G)	1.55	3.11
Phosphorus (P)	1.26	2.54
G x P	3.09	6.23

Table 3. Internal P Utilisation Efficiency and Phosphorus Efficiency (PE) as influenced by genotypes and phosphorus levels.

Genotype P levels	**Internal P Utilization Efficiency (kg grain yield kg $^{-1}$ P absorbed)**					**PE (%)**	
	P_0	**P_{50}**	**P_{75}**	**P_{100}**	**Mean**	**Grain**	**Stover**
CMH08 – 156	406	262	239	216	281	61	56
COH (M) 7	324	216	206	214	240	77	68
COH(M) 8	372	253	253	234	278	74	68
CMH08 337	353	247	240	235	269	88	88
COH (M) 9	354	234	219	216	256	75	67
COH (M) 6	342	238	233	231	261	66	55
Mean	359	242	232	224	264	74	67

Genotype P levels	**Benefit – Cost Ratio**				
	P_0	**P_{50}**	**P_{75}**	**P_{100}**	**Mean**
CMH08 – 156	1.35	1.56	1.88	1.98	1.69
COH (M) 7	1.38	1.40	1.51	1.61	1.48
COH(M) 8	1.71	1.73	1.80	2.06	1.83
CMH08 337	2.17	2.14	2.20	2.21	2.18
COH (M) 9	1.51	1.51	1.65	1.79	1.62
COH (M) 6	1.44	1.51	1.73	1.97	1.66
Mean	1.59	1.64	1.80	1.94	1.74

Table 4. Benefit – cost ratio as influenced by genotypes and phosphorus levels

1.	Project Number	:	NRM-CBE-SAC- 12- 005 **(AICRP / NRM / CBE / SAC / 004)**
2.	Project Title	:	Long term effect of different levels and frequency of B application on the fate of B pools in soils of maize - sunflower cropping system
3.	Name of the Department	:	Soil Science and Agricultural Chemistry
4	Name and designation of the project leader	:	Dr. D.Muthumanickam , Professor
5.	Period (Month and years)		6 years (August, 2012 to July 2018)

6. Objectives

- ❖ To assess the frequency and level of B application for maize - sunflower cropping system for increasing crop yield
- ❖ To study the effect of frequency of B application on fate of B pools in soils of maize - sunflower cropping system
- ❖ To monitor the changes in soil fertility and productivity due to different levels and frequency of B application under continuous maize - sunflower cropping system

7. Progress made sofar

Field experiment was conducted in B deficient soil (0.37 mg kg^{-1}) in maize crop during August 2012 with varied B levels (0, 0.5, 1.0, 1.5 and 2.0 kg B ha^{-1}) and different application times (one in 6 years (F1), alternate years - I^{st}, 3^{rd} , 5^{th} year – maize crop alone (F2), Yearly once -maize crop alone (F3) and all crops (F4). Totally twenty treatment combinations were replicated thrice in a split plot design using main treatment as frequency of B application and levels of B as sub plots. The results revealed that the application of B @ 1.0 kg ha^{-1} significantly recorded the highest dry grain (8.85 t ha^{-1}) and stover yield (8.15 t ha^{-1}) and the yield increase was 39.5 and 29.7 per cent over control respectively for grain and stover, however the frequency of B application was non-significant.

After the harvest of maize crop, the second crop in cropping sequence- sunflower was raised with application of B to F4 frequency (application of B to all crops) at different levels. The results of sunflower experiment revealed that the application of B @ 1.5 kg ha^{-1} significantly recorded the highest dry seed (2471 kg ha^{-1}) and stalk yield (3727 kg ha^{-1}) and the yield increase was 34.2 per cent over control for seed. Among the frequency levels, application of B to all the crops (F4) registered the maximum seed (2323 kg ha^{-1})and straw yield (3229 kg ha^{-1}) as compared to others.

The second maize crop (third crop in sequence) was raised after the harvest of I sunflower crop (2^{nd} crop in sequence) with application of B fertilizer to F3 (Every year-maize crop alone) and F4 (application of B to all crops at different levels) frequencies. The results showed that application of B @ 1.0 kg ha^{-1} significantly recorded the highest dry grain (7.55 t ha^{-1}) and stover yield (7.00 t ha^{-1}). Among the frequency of B application, application B to all crops (F4) registered the highest amount of grain and straw yield.

The second sunflower crop (fourth crop in sequence) was raised after the harvest of II maize crop (3^{rd} crop in sequence) with application of B fertilizer to F4 (application of B to all crops at different levels) frequencies. The results showed that application of B @ 2.0 kg ha^{-1} significantly recorded the highest dry seed (2334 kg ha^{-1}) and stalk yield (2560 kg ha^{-1}) respectively. Among the frequency levels, F3, registered maximum seed (2368 kg ha^{-1}) and stalk yield (2562 kg ha^{-1}) as compared to others. The interaction effect between the B level and frequency of B application were significant and revealed that application of 0.5 kg of B to every crops (F4) registered the highest dry seed (2790 kg ha^{-1}) and stalk yield (2968 kg ha^{-1}) respectively. Among the B fractions the order was residual B >oxide bound B> organically bound> readily soluble > specifically adsorbed >nonspecifically adsorbed B.

After the harvest of 2^{rd} sunflower crop(4^{th}crop), the third maize crop (fifth crop in sequence) was raised with application of B fertilizer to F2, F3 and F4 frequencies with required quantity of NPK fertilizers.

8. Progress made during the period

Results of Third Maize Crop Experiment (Fifth crop in sequence)

a. Grain and stover yield

The grain yield of maize crop varied from 4.96 – 8.05 (Table 1) and significantly differed with rate of B application. Among the B levels application of B @ 0.5 kg ha^{-1} registered the maximum grainyield of 6.90 t ha^{-1}, followed by application of 1.0 kg ha^{-1}, however they were on par with each other. Among the frequency of B application, yearly one time application of B for maize crop alone (F3) registered the highest grain yield, however it was onpar with application of B to alternate years - I^{st}, 3^{rd} , 5^{th} year – maize crop (F2). The interaction effect revealed that yearly one time application of B for maize crop (F3) alone @ 1.0 kg ha^{-1} toregistered the highest grain yiled of maize followed by application of B to alternate years - I^{st}, 3^{rd} , 5^{th} year – maize crop @ 0.5 kg ha^{-1}(F2).

Table 1. Effect of frequency and rate of B application on maize grain yield

Frequency of B applied	Dry grain yield (t ha^{-1})					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	5.04	5.54	5.89	6.42	6.65	5.91
F2	4.99	7.02	7.56	7.37	7.01	6.79
F3	4.96	7.11	8.05	7.62	6.46	6.84
F4	4.97	7.83	6.08	5.85	5.14	5.96
Mean	4.99	6.90	6.86	6.80	6.32	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.03	0.08		F at T	0.09	0.18
T	0.05	0.09		T at F	0.09	0.19

b. Stover yield

The stoveryield of maize crop varied from 4.77 to 7.92 t ha^{-1} respectively (Table 2) and significantly differed with rate of B application. The applicaton of B @ 1.0kg ha^{-1}registered the highest stover yield of maize (6.62 t ha^{-1}), followed by application of 1.5 kg ha^{-1}. Among the frequency of B application, yearly one time application of B for maize crop alone (F3) registered the highest stover yield, however it was onpar with application of B to alternate years - Ist, 3rd , 5th year – maize crop (F2). The interaction effect revealed that yearly one time application of B for maize crop (F3) alone @ 1.0 kg ha^{-1} toregistered the highest stover yield of maize (7.92 t ha^{-1}).

Table 2. Effect of frequency and rate of B application on maize stover yield.

Frequency of B applied	Dry stover yield (t ha^{-1})					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	4.59	5.08	5.64	6.11	6.57	5.60
F2	4.69	6.44	7.06	6.75	6.48	6.28
F3	4.62	6.51	7.92	7.40	5.91	6.47
F4	4.60	6.67	5.87	5.43	4.77	5.44
Mean	4.63	6.18	6.62	6.42	5.93	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.06	0.16		F at T	0.18	0.25
T	0.06	0.11		T at F	0.11	0.23

c. B content in grain and stover

The B content in grain was varied from 8.60 to 13.50 mg kg^{-1} while it was 18.7 to 48.2 mg kg^{-1} in stover (Table 3 and 4). Among the varied B levels of application, application of B @ 2.0 kg ha^{-1} registered the highest B content of 12.42 and 36.7 mg kg^{-1} in grain and stover respectively.. Among the frequencies, application B to all crops (F4) registered the highest B content both in grain and stover.

Table 3. Effect of frequency and rate of B application on B content in maize grain.

Frequency of B applied	B content in grain (mg kg^{-1})					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	8.70	9.20	9.80	10.27	10.50	9.69
F2	8.60	10.80	12.07	12.40	12.57	11.29
F3	8.60	11.83	12.47	12.83	13.10	11.77
F4	8.70	12.17	12.83	13.17	13.50	12.07
Mean	8.65	11.00	11.79	12.17	12.42	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.10	0.24		F at T	0.15	0.33
T	0.06	0.13		T at F	0.13	0.26

Table 4. Effect of frequency and rate of B application on B content in maize stover.

Frequency of B applied	B content in stover (mg kg^{-1})					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	18.7	21.7	29.5	27.6	27.6	25.0
F2	18.8	24.7	33.7	29.6	31.2	27.6
F3	18.8	30.4	35.6	36.6	39.6	32.2
F4	18.8	39.6	42.6	44.2	48.2	38.7
Mean	18.8	29.1	35.4	34.5	36.7	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.193	0.473		F at T	0.499	1.048
T	0.257	0.524		T at F	0514	1.048

d. B uptake in grain and stover

The B uptake in grain was varied from 42.7 to 100.4 g ha^{-1} while it was 85.8 to 282.0 g ha^{-1} in stover (Table 5 and 6). Among the B levels, application of B @ 1.5 kg ha^{-1}

registered the highest B uptake of 83.0 g ha^{-1} in grain. In the case of stover , application of B @ 1.0 kg ha^{-1} registered the highest B uptake (234.1 g ha^{-1}). Among the frequencies, yearly one time application of B for maize crop alone (F3) registered the highest B uptake in grain (81.9 g ha^{-1}) followed by application of B to alternate years - I^{st}, 3^{rd} , 5^{th} year – maize crop (F2). The application of B to all the crops (F4) registered the lowest B uptake (77.9 g ha^{-1}) as compared to other frequiencies. In stover, yearly one time application of B (F3) registered the highest B uptake (214.3 g ha^{-1}).

Table 5. Effect of frequency and rate of B application on B uptake in maize grain

Frequency of B applied	**B uptake in grain (g ha^{-1})**					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	43.8	51.0	57.7	65.9	69.8	57.7
F2	42.9	75.8	91.2	91.4	88.1	77.9
F3	42.7	84.1	100.4	97.8	84.6	81.9
F4	43.2	95.3	78.0	77.0	69.4	72.6
Mean	43.2	76.5	81.8	83.0	78.0	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.90	2.20		F at T	1.64	4.96
T	0.76	1.56		T at F	1.53	4.19

Table 6. Effect of frequency and rate of B application on B uptake in maize stover

Frequency of B applied	**B uptake in stover (g ha^{-1})**					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	85.8	110.2	166.4	168.6	181.3	142.5
F2	88.2	159.1	237.9	199.8	202.2	177.4
F3	86.9	197.9	282.0	270.8	234.0	214.3
F4	86.5	264.1	250.1	240.0	229.9	214.1
Mean	86.8	182.8	234.1	219.8	211.9	
	SEd	CD(0.05)			SEd	CD(0.05)
F	1.48	3.62		F at T	3.43	7.24
T	1.73	3.52		T at F	3.45	7.03

e. Available B status in soil

The available B status in soil after the harvest of third maize crop was significantly differed with rate of B application and varied from 0.26 to 2.43 mg kg^{-1} (Table 7). Among the varied B levels of application, application of B @ 2.0 kg ha^{-1} registered the highest available B in soil (1.13 mg kg^{-1}). Among the frequencies of B application, application of B to all the crops (F4) significantly registered the highest available B status in soil.

Table 7. Effect of frequency and rate of B application on available B status in soil

Frequency of B applied	Available B (mg kg^{-1}) I					
	B levels (kg ha^{-1})					
	Bo	**B0.5**	**B1.0**	**B1.5**	**B2.0**	**Mean**
F1	0.26	0.33	0.41	0.45	0.52	0.39
F2	0.26	0.44	0.53	0.59	0.65	0.49
F3	0.26	0.64	0.71	0.79	0.91	0.66
F4	0.26	0.90	1.13	1.85	2.43	1.31
Mean	0.26	0.58	0.69	0.92	1.13	
	SEd	CD(0.05)			SEd	CD(0.05)
F	0.02	0.05		F at T	0.04	0.08
T	0.017	0.03		T at F	0.03	0.07

9. Salient findings of Third maize crop (2015):

- Application of B @ 1.0 kg ha^{-1} significantly recorded the highest dry grain 6.94 t ha^{-1} and stover yield (6.62 t ha^{-1}).
- Among the frequency of B application, application B to every year maize crop alone (F3) registered the highest amount of Grain and Stover yield.
- The interaction effect between the B level and frequency of B application was significant and revealed that application of 1.0 kg of B to every year (F3) registered the highest grain (8.05 t ha^{-1}) and stover yield (7.92 t ha^{-1}) respectively.
- Among the B levels, application of B @ 1.5 kg ha^{-1} registered the highest B uptake of 83.0 g ha^{-1} in grain while in stover, application of B @ 1.0 kg ha^{-1} registered the highest B uptake (234.1 g ha^{-1}).
- The application of B @ 2.0 kg ha^{-1} registered the highest available B in soil (1.13 mg kg^{-1})in soil after the harvest of third maize crop.

10. Remarks of the Technical Director based on the pre-review :

- Sixth crop –sunflower to be taken up.
- Application of boron @ 1 kg / ha to maize crop in the sequence recorded higher yield. While application of boron @ 0.5 kg /ha to all the crops recorded comparable yield.
- Application of boron at higher levels (1.5 & 2.0 kg/ha) showed decline in yield. Cause for the decline in yield may be examined by checking up soil boron recorded in the previous crop and plant B (maize) content.

1.	Project Number	:	
2.	Project Title	:	Permanent manurial experiment on maize - greengram cropping system in red sandy loam soil of Vagarai under irrigated condition
3.	Name of the Department	:	MRS,Vagarai
4	Name and designation of the project leader	:	Dr. C. Bharathi Assistant Professor (Soil Science&Agrl. Chemistry)
5.	Period (Month and years)		October 2014 to September 2019

6. Objectives:

- To study the Initial and post harvest analysis of pH, EC, organic carbon, available N, P, K content of soil.
- To study the changes in soil biological properties *viz*., microbial population, dehydrogenase, phosphatase activity.
- To study the effect of continuous addition of organics, inorganics and its integrated effect on yield attributes, yield and uptake of maize.

7. Progress made so far:

Field experiment was conducted using COHM 6 Maize hybrid as a test crop at MRS, Vagarai. The sowing was taken up on 3.10.14. The spacing used was 60 x 25 cm. The experiment was a non replicated trial. Treatments were imposed as per schedule. Treatments consisted of control, organic, inorganic and integrated nutrient management. In the inorganic treatment NPK was applied based on STCR. Organic plot received the application of farm yard manure @12.5t/ha, while INM plot received 12.5t FYM/ha and NPK based on STCR- IPNS along with biofertilizer. Pre emergence herbicide atrazine was sprayed on 3 DAS to control weeds. The experimental soil is a sandy loam.

Table. 1. Effect of different nutrient management practices on growth yield and yield parameters of maize

Treatments	Plant height (cm)	Cob Length (cm)	Cob girth (cm)	Cob Weight (g)	100 Grain weight	Grain Yield (kg/ha)	Straw Yield (kg/ha)
T1-Control	180.5	14.5	12.1	114.8	32.01	5967	8543
T2-Organic	213.1	16.8	13.5	130.4	34.25	7544	10865
T3-Inorganic	224.4	18.0	14.2	172.3	36.08	8003	11456
T4-INM	231.5	18.5	15.0	179.7	36.76	8317	11982
SD	23.2	1.8	1.2	31.6	2.1	1043	1515

The result indicated that the plant height ranged from 180.5 to 231.5 cm due to different treatment effects (table 1). The INM practice showed the highest plant height followed by inorganic and organic which were on par with each other. The yield parameters such as cob length, girth, weight and 100 grain weight were the highest in INM practice followed by inorganic and organic. The grain yield varied significantly due to various treatments and ranged from 3978 to 8317 kg/ha. The highest grain yield was observed in INM practice which significantly differed from other treatments. The control recorded the lowest grain yield. The highest straw yield was recorded in INM (11982 kg/ha) followed by inorganic, organic treaments.

Treatments	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw
Control	40.31	23.59	14.77	9.13	39.41	93.89
Organic	50.49	33.72	22.05	12.85	54.30	110.49
Inorganic	61.23	36.36	28.66	15.53	57.72	121.02
INM	66.30	40.18	32.87	19.24	60.94	133.57
SD	11.6	7.1	7.9	4.3	9.5	16.8

The nutrient uptake by the crop at harvest registered significant difference due to different treatments. The N and P uptakes were highest in grain when compared to stalk. Whereas K uptake was highest in stalk rather than grain. Among the treatments, INM practice recorded the highest uptake followed by inorganic, organic, while the control recorded lowest uptake (Table 2).

Table.3 Effect of different nutrient management practices on post harvest soil chemical properties

Treatments	pH			EC (dSm^{-1})			OC (g/kg)		
	Mean of previous years	Current year 2014-15	Change	Mean of previous years	Current year 2014-15	Change	Mean of previous years	Current year 2014-15	Change
Control	7.50	7.55	0.05	0.26	0.37	0.11	0.29	0.31	0.02
Organic	7.49	7.42	0.07	0.25	0.29	0.04	0.36	0.44	0.08
Inorganic	7.52	7.66	0.14	0.26	0.35	0.09	0.31	0.35	0.04
INM	7.55	7.6	0.05	0.26	0.31	0.05	0.34	0.45	0.11
SD		0.10			0.04			0.07	

Table.4 Effect of different nutrient management practices on post harvest soil nutrient status

Treatments	Av. N(kg/ha)			Av. P(kg/ha)			Av. K(kg/ha)		
	Mean of previous years	Current year 2014-15	Change	Mean of previous years	Current year 2014-15	Change	Mean of previous years	Current year 2014-15	Change
T1	153	146	7.0	14	12.6	-1.4	597	575	-22
T2	184	190	6.0	21.0	20	-1.0	685	674	-11
T3	177	184	7.0	19.7	17.5	-2.2	680	661	-19
T4	196	205	9.0	21.6	18.6	-3.0	693	678	-15
SD		25			3			49	

The results showed that there was a slight decrease in pH in the organic plot while the reverse was in the case of inorganic, INM and control. However all the treatments were responded uniformly in the case of EC of the soil. With respect to organic carbon buildup, organics applied plot was statistically comparable with INM plot. The change in available N showed increasing trend in all the treatments except control. In the case of available P, K there was a decline in all the treatments however the rate of decrease was lowest in the case of organic (Tables 3&4).

8. Progress made during the period

9. Salient findings :

The INM practice recorded the higher growth and yield parameters consequently the higher grain, stalk yield and nutrient uptakes of maize when compared to inorganic and organic treatment indicating the superiority of INM practice over other treatments. Slight increase in EC and organic carbon were observed due to different treatments. Available P and K content was slightly reduced while the reverse trend was observed in the case of available N status.

10. Remarks of the Technical Director based on the pre-review :

New continuation proposal was submitted and field experiment on maize was conducted.

1.	Project Number	:	
2.	Project Title	:	Biofortification of Zinc in Maize grain using Mycorrhizal Symbiosis
3.	Name of the Department	:	MRS,Vagarai
4	Name and designation of the project leader	:	Dr. C. Bharathi Assistant Professor (Soil Science&Agrl. Chemistry)
5.	Period (Month and years)		1.7.2012 to 31.06.2015

6. Objectives:

- To examine the growth, nutritional and yield responses of maize and soil biochemical changes under mycorrhizal symbiosis with Zn fertilization.
- To study the effect of Zn fertilization with mycorrhizal symbiosis on Zn partitioning in maize grain.

7. Progress made so far:

Field experiment was conducted using hybrid maize (COHM 6) with graded levels of Zn (Zn 0, Zn 2.5 and Zn 5 kg/ha) and AM inoculam (*Glomus intraradice*) at MRS, Vagarai. In all the treatments NPK was applied as per crop production guide. The design of the experiment was RBD with 4 replication. Pre emergence herbicide atrazine was sprayed on 3 DAS to control weeds. The experimental soil is a sandy loam. Mycorrhizal colonization was assessed. Biometric observations were taken at 45 and 75 DAS. The crop was harvested and the results are given below. Root, shoot and soil samples are being analyzed for its nutrients concentrations.

Table 1. Effect of mycorrhiza and zinc on root architecture of maize

Treatment No	Treatments (kg/ha)	Root length (cm)		Root volume(cm^3)	
		45 DAS	75 DAS	45 DAS	75 DAS
T1	Control	25.4	24.1	85.6	92.3
T2	Zn2.5	26.7	26.0	92.7	101.2
T3	Zn5	27.0	27.4	95.7	105.0
T4	AMF alone	27.3	28.9	94.3	103.5
T5	Zn2.5 + AMF	28.9	29.3	100.3	114.3
T6	Zn5 + AMF	28.5	31.6	110.6	119.7
SED		2.6	3.01	7.01	7.77
CD (p=0.05)		NS	NS	14.9	16.5

The root length of maize due to application of Zn and VAM showed non significant effect. At 45 DAS the root length was the highest in treatment T5 which received Zn 2.5 kg/ha and VAM whereas at 75 DAS the root length was highest in T6. However the root volume showed significant difference due to application of Zn and VAM and the highest being recoreded in treatment T6 which received Zn 5 kg/ha and VAM in both the stages of observation followed by Zn 2.5 kg/ha+VAM (Table1).

Table 2. Effect of mycorrhiza and zinc on plant height and root CEC of maize

Treatment No	Treatments (kg/ha)	Plant height(cm)		Root CEC (C mol(P+) kg^{-1})	
		45 DAS	75 DAS	45 DAS	75 DAS
T1	Control	165	232	2.21	2.32
T2	Zn2.5	160	215	2.56	3.16
T3	Zn5	148	223	2.60	3.20
T4	AMF alone	156	228	3.44	3.87
T5	Zn2.5 + AMF	170	243	2.92	3.95
T6	Zn5 + AMF	163	235	3.86	4.12
SED		6.9	8.4	0.13	0.16
CD (p=0.05)		NS	NS	0.29	0.36

There was no significant difference in plant height due to different treatments both at 45 and 75 DAS. Regarding root CEC, significant difference was observed in both the stages. The highest root CEC was noticed in treatment T6 and the lowest being recorded in the control (Table2).

Table 3. Effect of mycorrhiza and zinc on yield of maize

Treatment No	Treatments (kg/ha)	Yield (kg/ha)	
		Grain	Stover
T1	Control	7431	9985
T2	Zn2.5	7713	10412
T3	Zn5	7927	10976
T4	AMF alone	7625	11205
T5	Zn2.5 + AMF	8012	11687
T6	Zn5 + AMF	8265	11903
SED		228	253
CD (p=0.05)		486	539

The grain yield varied significantly due to various treatments and the yield ranged from 7431 to 8265 kg/ha.The highest grain yield of 8265 kg/ha was observed in treatment T6 which received the application of Zn 5 kg/ha and VAM followed by treatment T5 which received Zn 2.5 kg/ha and VAM. The lowest grain yield was observed in control. Similar results were observed with regard to stalk yield wherein the highest stalk yield of 11903 kg/ha was recorded in treatment T6 which received Zn 5 kg/ha and VAM (Table3).

9. Salient findings :

Application of Zn 5 kg/ha and VAM recorded higher root volume, root CEC and grain and stalk yield followed by application of Zn 2.5 ka/ha and VAM.

10. Remarks of the Technical Director based on the pre-review : -

MICROBIOLOGY

1.Project No.	AICRP/NRM/CBE/AGM/001 ICAR-AINP
2.Project Title	Soil Biodiversity & Biofertilizers Impact assessment of long-term nutrient management on microbial activities of soil
3.Name of the Department	Dept.of Agrl.Microbiology
4.Project Leader(s).	D Balachandar Professor (Ag. Micro)
5.Period	April 2013 to March 2016

6. Objectives :

7. Progress made so far:

Effect of long-term nutrient managements on biological and biochemical properties of semi-arid tropical Alfisol during maize crop development stages

Understanding the influence of organic or inorganic nutrient management on soil biology and biochemistry during crop growth may help to develop more sustainable fertilization strategies. Hence, the biological variables including soil organic carbon (SOC), microbial biomass carbon (MBC), six cultivable microbial communities, five hydrolytic enzymes activity and soil respiratory indices from a long-term fertility experiment field (>100 years) were assessed at different growth stages of maize. The samples were taken from four long-term treatments *viz*., Control (no fertilization), balanced inorganic fertilizers (IC), organic amendments (OM) and integrated nutrient management (INM, organic manure plus chemical fertilizers) at five different stages of maize cropping (S1, pre-cropping; S2, five days after sowing; S3, vegetative; S4, flowering; S5, after harvesting). Responses of most of the assessed parameters to organic fertilization (OM and INM) were significantly higher than those from inorganically managed and control soils. There was significant difference in SOC due to long-term nutrient managements (OM>INM>IC>control) but not due to growth stages of maize (Table 1). MBC was also higher in OM and INM compared to IC and Control and found significantly different at growth stages of maize (Table 1 and Figure 1). Values of microbial counts and assessed enzyme activities were highest at vegetative stage of maize following a declined trend at later stages. The respiration studies indicate a difference between the responses of substrate induced respiration rate (SIR) and metabolic quotient (qCO_2) (Figure 2). SIR was more significantly influenced by long-term nutrient managements than crop stages, while qCO_2 was by early stage of maize growth (S2) alone. The principal component analysis (PCA) identifies MBC, qCO_2, SIR, dehydrogenase, phosphatase and aryl sulphatase and counts of Actinobacteria and diazotrophs as major drivers for the variability among the samples. PCA discriminated OM and INM samples from IC and control and vegetative stage of maize from other stages. The interaction effects of long-term nutrient managements and maize growth stages were found significant to MBC, counts of Actinobacteria and diazotrophs and activities of dehydrogenase, acid phosphatase and aryl sulphatase (Figure 3). However, the resilience of semi-arid tropical soil, independent of long-term nutrient management adoptions, was not affected due to maize growth. The present study thus provides some reliable biological indicators to monitor the semi-arid tropical soils, those influenced by nutrient managements.

Table 1 Two ways ANOVA analysis of variables assessed from soils as affected by long-term nutrient managements and physiological stages of maize crop

Soil variables	F value		
	Nutrient management	Crop stage	Nutrient management x Crop Stage
Soil organic C	19.28**	NS	NS
Available N	21.43**	5.54*	NS
Available P	14.49**	NS	NS
Available K	41.12**	5.21*	NS
Microbial biomass-C	49.42**	215.92**	6.23**
Metabolic quotient	NS	5.77*	NS
Substrate induced respiration	22.18**	19.45*	6.10**
Total culturable bacteria	3.53*	3.25*	NS
Total culturable fungi	NS	30.93**	NS
Actinobacteria	12.85**	16.13**	3.06*
Azotobacter	8.01**	13.47**	NS
Arthrobacter	NS	6.39*	NS
Total diazotrophs	70.91**	5.46*	4.63*
Dehydrogenase	25.47**	16.32*	13.17*
Urease	3.14*	NS	NS
Acid phosphatase	126.08*	602.02**	103.49*
Alkaline phosphatase	19.16*	208.47**	NS
Aryl sulphatase	268.69**	1076.08**	15.87**

* $p < 0.05$; ** $p < 0.001$; NS – Non-significant

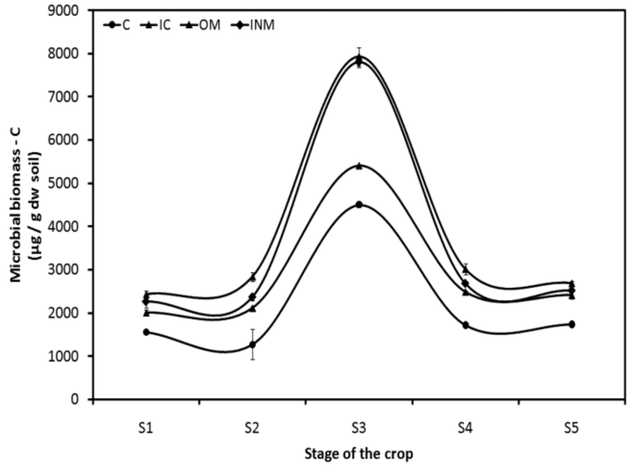

Figure 1 Dynamics of microbial biomass-C in semi-arid tropical Alfisol at different growth stages of maize crop planted under different long-term nutrient managements. Means of six replicate values plotted and errors bars indicate the standard error. C – Unfertilized control soil (●) ; IC – Inorganic chemical fertilizer amended soil (▲); OM – Organic manures amended soil (■); INM – Integrated nutrient management adopted soil. Growth stages: S1 - Pre-cropping; S2 - Five days after sowing; S3 - Vegetative; S4 -Flowering; S5 - After harvesting.

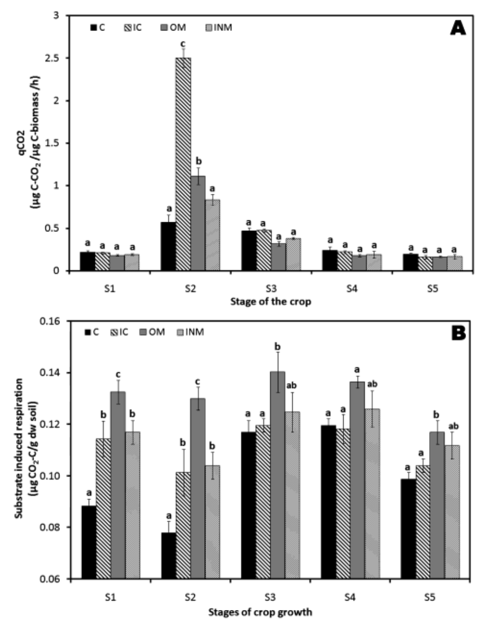

Figure 2 Metabolic quotient (A) and substrate induced respiration rate (B) of semi-arid tropical Alfisol at different growth stages of maize crop planted under different long-term nutrient managements. Means of six replicate values plotted and errors bars indicate the standard errors. For each panel, different letters indicate significantly different within the sampling stage of the crop at *p*<0.05 according to DMRT. C – Unfertilized control soil (●) ; IC – Inorganic chemical fertilizer amended soil (▲); OM – Organic manures amended soil (■); INM – Integrated nutrient management adopted soil. Growth stages: S1 - Pre-cropping; S2 - 5 days after sowing; S3 - Vegetative; S4 -Flowering; S5 - After harvesting.

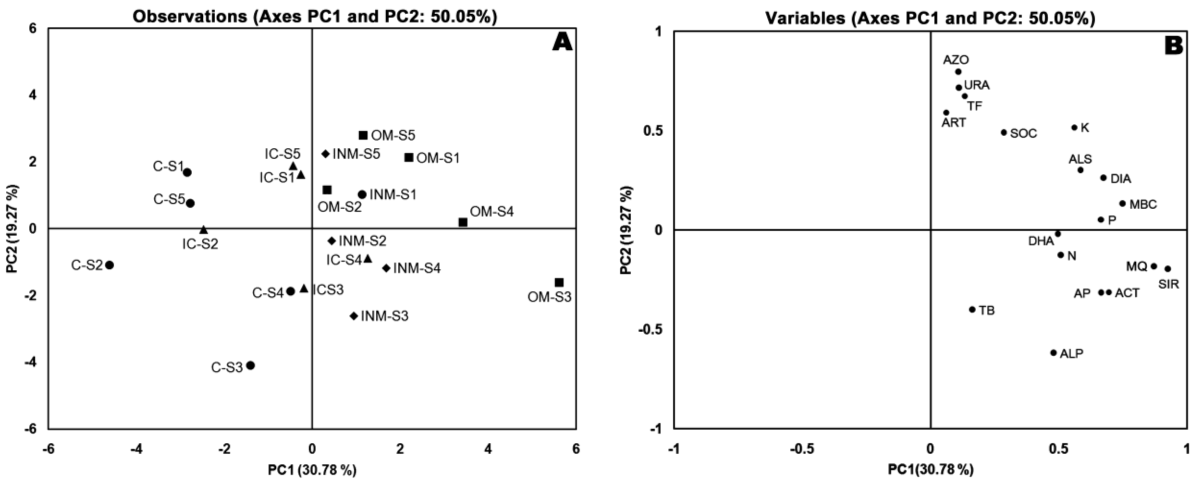

Figure 3 Scoring plot of samples (A) and loading plot of variables (B) ordinated in PCA. Abbreviations of variables are explained in materials and method. The % variance explained by each component is given in parenthesis. C – Unfertilized control soil (●) ; IC – Inorganic chemical fertilizer amended soil (▲); OM – Organic manures amended soil (■); INM – Integrated nutrient management adopted soil (♦). Growth stages: S1 - Pre-cropping; S2 - 5 days after sowing; S3 - Vegetative; S4 -Flowering; S5 - After harvesting.

8. Progress made during the period under report:

9. Salient findings:

- This study has revealed that the overall biological properties of Alfisol were controlled by the long-term nutrient management adoptions and to some extent by the growth stages of maize and their interactions.
- Microbial biomass, counts of observed microbial communities and hydrolytic enzymes were highest in organically managed and integrated nutrient management enforced soils at active vegetative stage of maize crop.
- The inorganic nutrient amendments and no fertilizer application had same magnitude on the biological and biochemical properties of soil throughout the maize crop growth. In general, the amplitude of interaction effect was higher order in OM and INM at vegetative stage than the mean values of the treatments at flowering, harvest and other samples.
- The respiration study indicates that metabolic quotient of the soil was significantly increased in early stage of maize due to agronomical disturbances and subsequently declined and stabilized during vegetative and flowering stages of maize.
- MBC, SIR, Actinobacterial and diazotrophic counts and activities of dehydrogenase, acid phosphatase and aryl sulphatase are the most sensitive soil biological indicators responded to both nutrient managements as well as the maize crop growth stages.

10. Remarks of the Technical Director based on the pre-review: -

1.Project No.	NRM/CBE/AGM/ 11 / S.05
2.Project Title	Development of micro enterprise for Arbuscular Mycorrhizalbiofertilizer production at villages through empowering rural women
3.Name of the Department	Dept.of Agrl.Microbiology
4.Project Leader(s).	Dr.K.Kumutha, Professor (Ag. Micro)
5.Period	July 2011- September 2014

6.Objectives:

7.Progress made so far:

- Training on AM production was given to 15 women groups in 3 Blocks of Coimbatore viz., Thondamuthur, Karamadai and Periyanaickenpalayam block. 225 women were benefited.
- Women trained in Thondamuthur and Karamadai Block was involved in continuous production of AM Biofertilizer on large scale.
- Totally 56 tons was produced in Thondamuthur block, 30 tons in Karamadai and 7.5 tons in Periyanaickenpalayam block
- The Quality analysis of the produced AM inoculum has been done regularly and it was found satisfactory.
- Marketing of the produced AM inoculum was done through Iswaryam Organics, Sulur.
- Totally nine field trials were conducted on different crops to demonstrate the influence of AM inoculation on growth and yield parameters. Generally ,in all the crops 5-60 % yield increase was recorded with inoculation of AM application.
- Totally 3 Bioferlizer field days were conducted to create awareness and confidence on production and application of AM Biofertilizers, About 300 farmers were benefitted
- Women groups from all the 3 blocks were taken for exposure visit to the well established AM Bioferilizer unit of this department as well as to the private units that created interest to start up the own production unit
- Motivational meetings were conducted to continue the production of AM Biofertilizers after completion of the Scheme.

8. Progress made during the period under report:

9. Salient findings:

- Totally 97 tons of AM Biofertilizer was produced in three different blocks and generated an income of Rs. 14, 55,000/- with net profit of Rs. 7, 76,000/- within the period of two years.
- In Thondamuthur block 14.4 % increase in yield was recorded with the AM inoculated Vegetable cowpea, and 20.3 % was recorded in Mary gold. Similarly in Karamadai block 11.5 % yield increase was reported in Brinjal and 39.8 % in Hybrid Cotton.
- Inoculation of AM in Onion, Bhendi and Chilli recorded 11.0 %, 18.1 %, 14.3 % yield increase in Periyanaickenpalayam block.
- Besides increasing the yield of different crops, AM inoculation saves 25 % of ‘P’ requirement

10. Remarks as per project wise recommendations.: -

1.Project No.	NRM/CBE/AGM/14/002
2.Project Title	Studies on the nutritional / anti-nutritional changes in finger millet food(s) fermented with thermo tolerant *Pediococcuspentosaceus*
3.Name of the Department	Dept.of Agrl.Microbiology
4.Project Leader(s).	Dr. R.Subhashini, Assistant Professor (Ag. Micro)
5.Period	

6.Objectives:

7.Progress made so far:

- The lactic acid bacterial culture was observed to be Gram positive rods.
- The culture was tested for amylase production by inoculating on medium with and without starch.
  - <u>Starch agar medium</u> (g/l)
  - Beef Extract - 3.0
  - Soluble Starch - 10.0
  - Agar - 15.0
  - pH - 7.5

- The organism was able to grow on Starch agar medium, but there was no formation of clear zone upon addition of Iodine.

- The culture was tested for production of protease by inoculating on medium with and without gelatin and also on medium with and without casein.
  - Casein agar medium (g/l) Gelatin agar medium (g/l)
  - Glucose - 1.0 Dipotassium hydrogen phosphate – 2.0
  - Casein - 15.0 Glucose - 1.0
  - Agar - 15.0 Peptone - 5.0
    - Gelatin - 15.0
    - Agar - 15.0
    - The organism was able to grow on Gelatin agar medium, but there was no formation of clear zone upon addition of mercuric chloride. The organism grew on casein agar medium.
- The culture was tested for lipase production by inoculating on medium with and without Tween 20, with the following composition (g/l):
  - Peptone - 5.0
  - Yeast Extract - 3.0
  - Tween 20 - 10.0 ml
  - Agar - 15.0
    - Within 24h, the organism was able to grow on medium without Tween 20, while no growth was observed in medium supplemented with Tween 20.
- DNA was extracted from the culture using standard protocol and quantified using Nano Drop 2000C Spectrophotometer. The DNA as seen from the agarose gel was sheared with more of RNA contamination. Absorbance value (A260/A280) was recorded as 1.71 and 1.93, and the concentration was observed to be 115.5 ng/µl and 221.0 ng/µl for the two replicates respectively.

8. Progress made during the period under report:

9. Salient findings: The biochemical and molecular characterization of LAB isolates have been initiated

10. Remarks as per project wise recommendations. -

SEED SCIENCE AND TECHNOLOGY

1	Project Number	:	**UGC/SC/CBE/SST/2012/R002**
2	Project Title	:	Physiological, biochemical and molecular basis of seed biopriming with biocontrol agents and liquid biofertilizers in rice and maize

3	Name of the Department / Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.M.Bhaskaran, Special Officer (Seeds) Dr.P.Selvaraju, Prof. (SST)
5	Project Period	:	2012 to 2015
6	Objectives	:	To standardize an optimum concentration and duration of bio-priming using bio-control agents and liquid bio-fertilizers for rice and maize. To determine the storability of bio-primed seeds including seed health. To study the pre-germinative and post-germinative physiological, biochemical and molecular changes of bio-primed seeds during germination. To evaluate the performance of bio-primed seeds under stress conditions.
7	Brief outline of the work carried out from the project initiation period	:	Completed
8	Work carried out during the review period	:	Completed
9	Salient findings	:	In maize hybrid COH (M) 5, seeds bioprimed with 8 % *Pseudomonas fluorescens* for 12 h / 20 % *Azospirillum* / 20 % phophobacteria for 12 hrs / 80 % *Trichoderma viride* for 6 h enhanced the seed quality through increased seed germination, seedling growth and vigour. In maize hybrid COH (M) 5, the best performance under extreme salt stress and low moisture conditions was observed with 8% *Pseudomonas fluorescens* for 12h.
10	Remarks of the Technical Director based on the pre-review	:	Completed

SCHEME - 2

1	Project Number	:	-
2	Project Title	:	**DST -** Marker assisted introgression of LCYE gene for enhanced ProA in development of maize hybrid and evaluation of their seed quality characters
3	Name of the Department/ Station	:	Department of Seed Science and Technology, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr. D.Thirusendura Selvi
5	Project Period	:	2011 to 2014
6	Objectives	:	Screening of maize germplasm for β- carotene with the inbreds of TNAU gene pool using molecular method and HPLC analysis. Effecting crosses between the popular adapted inbred and the chosen inbred from the pool with higher β- carotene. Effecting backcrosses between the hybrid and recurrent parent. Genotyping of the backcross progenies with the validated marker. Evaluation of the seed vigour, production techniques and storability of selected back cross progenies.
7	Brief outline of the work carried out from the project initiation period	:	The ***crtRB1*** 3'TE polymorphism assay in 17 inbreds revealed that only 3 inbreds *viz*., UMI 176, UMI 936 (W) and HP 467-15 had the favourable allele. Genetic Variation of kernel beta-carotene accumulationAmong the 17 elite maize inbreds revealed that total carotenoids content in maize inrbeds vary from 2.05 µg/g to 38.29 µg/g while the β-carotene content from 0.16 µg/g to 7.92 µg/g. The high β-carotene inbreds identified were UMI 176 (7.92 µg/g) and HP 467-15 (5.1 µg/g).

In Marker assisted Introgression of favourable *crtRB1* allele study first, the F_1s of the cross between 'UMI 285' and 'HP467-15'were raised. The F_1s thus confirmed as heterozygous through foreground screening were used as female parents to backcross with recurrent male parent UMI 285 and forwarded to BC_3F_1 generation. BC_3F_1 progenies were analyzed by foreground screening and ten heterozygous plants (i.e., having alleles from both the parents (as indicated by a 296-bp/543-bp banding pattern) were selected and selfed for the development of BC_3F_2 progenies.

The same procedure is followed in the cross between 'UMI 61' and 'HP467-15. The BC_2F_1 generation was completed and the seeds harvested from BC_2F_1 plants #61 (i.e. F_1-c15-c2-61) and #62 (i.e. F_1-c15-c2-62) were used for raising BC_3F_1 progenies. The seed quality evaluation study for the high, medium and low β-carotene inbreds was completed.

8	Work carried out during the review period	:	Project completed.
9	Salient findings	:	The ***crtRB1*** 3'TE polymorphism assay in 17 inbreds revealed that only 23 inbreds *viz.*, UMI 176, UMI 936(W) and HP 467-15 had the favourable allele. High β-carotene inbreds *viz.*, UMI 176 (7.92 µg/g) and HP 467-15 (5.1 µg/g) were identified in the Genetic Variation of kernel beta-carotene accumulation study. Marker assisted Introgression of favourable *crtRB1* allele from exotic donor line into popular inbreds *viz.*, UMI 285 and UMI 61 and development of an elite inbred of maize with high beta carotene. In which, UMI 285 BC_3F_1 generation was completed and selfed for the development of BC_3F_2 progenies is completed selfed for the development of BC_3F_2 progenies.

			The homozygous donor type progeny will be raised to get the derived line of high beta carotene UMI 285 type plants. The 'UMI 61' and 'HP467-15 cross BC_2 F_1 generation was completed and were used for raising BC_3F_1 progenies. Seed quality variation among the high, medium and low β- carotene genotypes were evaluated. Further, the seed quality evaluation studies to be conducted for the selected backcross progenies after selfing the selected progenies and seed multiplication.
10	Remarks of the Technical Director based on the pre-review	:	Project completed

1	Project Number	:	AICRP / STR / CBE / SEP / 001
2	Project Title	:	AICRP on NSP (Crops) Seed Technology Research Standardization of biopriming (biological seed treatment) for management of seed borne pathogens
3	Name of the Department / Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.N.Indra, Asst. Prof. (Pl.Path)
5	Project Period	:	2014 - 2015
6	Objectives	:	To determine the efficacy of biological agents for the management of seed borne inoculum
7	Brief outline of the work carried out from the project initiation period	:	The experiment was laid out at TNAU during July 2014 - October 2014 with seven treatments and three replications.
8	Work carried out during the review period	:	The seeds were bioprimed with the biocontrol agents of respective concentrations and sown in the field. The observations on the incidences of *Fusarium moniliforme* and *Aspergillus flavus* were recorded at the time of harvest.

9	Salient findings	:	*Trichoderma viride* 40 per cent recorded maximum germination (90 %), speed of germination (8.20) and minimum disease incidence of *Fusariumn moniliforme* (26.26 PDI) compared to control. This result is on par with the treatment of *Pseudomonos fluorescens* at 40 per cent concentration which recorded germination of 89 %, speed of germination 8.33 and disease incidence 26.96 PDI.
10	Remarks of the Technical Director based on the pre-review	:	-

SCHEME - 3.2.

1	Project Number	:	AICRP/STR/CBE/SEP/001
2	Project Title	:	Studies on the Effect of insecticidal seed treatment on seed viability during storage under ambient condition (Maize)
3	Name of the Department / Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.L.Allwin, Asst. Prof. (SST)
5	Project Period	:	2014-15
6	Objectives	:	To evaluate newer molecules against major storage insect pests damaging seeds. Study of storability of treated seeds.
7	Brief outline of the work carried out from the project initiation period	:	Newer molecules of insecticides were treated with maize and blackgram seeds and stored. Observations were recorded at three months interval. Experiment is in progress.
8	Work carried out during the review period	:	
9	Salient findings	:	The results of the experiment on the efficacy of newer insecticides on insect infestation in maize showed that twelve months after the start of the experiment (03.06.13), insect infestation in all the

			insecticide treated seeds was below 1.0% (IMSCS) while untreated control recorded 7.7%. The per cent seed germination was on par in all the insecticides and in control (83.0 to 86.3). Seed moisture content ranged between 8.9 and 9.3 per cent. After twelve months of storage the per cent mortality of released *Sitophilus oryzae*, 3,7 and 15 days after release was higher (100%) in all the insecticides but lower in Novaluron and chlorfenopyr (96.7%).
10	Remarks of the Technical Director based on the pre-review	:	Close monitoring of the experiments at every stage and documentation needs to be strengthened.

SCHEME - 3.3

1	Project Number	:	AICRP/STR/CBE/SEP/001
2	Project Title	:	AICRP – NSP(CROPS) - Seed Entomology Effect of new packaging material on storability of seeds under ambient conditions (Maize)
3	Name of the Department/ Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.L.Allwin, Asst. Prof. (SST)
5	Project Period	:	2014-15
6	Objectives	:	• To study the effect of new packaging material on storability of seed. • To evaluate the effectiveness of new packaging material against major storage insect pests damaging seeds.
7	Brief outline of the work carried out from the project initiation period	:	Maize seeds were packed in new packaging materials. Stored seeds were observed for insect infestation.
8	Work carried out during the review period	:	Experiment is in progress.

9	Salient findings	:	The results showed that twelve months after the start of the experiment, infestation level of *Sitophillus oryzae* in all the treatments were below 2 % irrespective of the packaging material but it was much lower in treated bag, treated lamination, treated liner with Emamectin benzoate @ 2ppm. Untreated control recorded significantly higher damage of 1.7 to 2.7%. The seed germination ranged between 83.7 to 87.7 per cent. The per cent moisture content ranged between 8.5 and 10.4.
10	Remarks of the Technical Director based on the pre-review	:	-

SCHEME - 3.4.

1	Project Number	:	AICRP/STR/CBE/SEP/001
2	Project Title	:	AICRP – NSP(CROPS) - Seed Entomology Efficacy of insecticides and botanicals against storage insects of seeds and their influence on seed viability during storage under ambient condition (Maize and Blackgram)
3	Name of the Department / Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.L.Allwin, Asst. Prof. (SST)
5	Project Period	:	2014-15
6	Objectives	:	To evaluate insecticides/botanicals against major storage insect-pests damaging seeds. Study of the storability of treated seeds
7	Brief outline of the work carried out from the project initiation period	:	*Acorus calamus* oil was extracted using soxhlet apparatus. Sweet flag 6 EC formulation was prepared.
8	Work carried out during the review period	:	Efficacy of botanicals is being recorded against pulse beetles and rice weevils.

			Experiment is in progress.
9	Salient findings	:	The results of the experiment on the efficacy of newer insecticides on insect infestation in maize showed that three months after the start of the experiment (11.09.14), insect infestation in all the treated seeds were above 1.0% and was much lower in Emamectin benzoate, Deltamethrin and *Acorus calamus* formulation (0.1%) while untreated control recorded 4.7 %. The per cent seed germination was on par in all the treatments and its ranged between (91.3 to 93.7) and moisture content ranged between 10.1 and 10.5 per cent. After three months of storage the per cent mortality of released *Sitophillus oryzae*, 3,7 and 15 days after release was higher (100%) Emamectin benzoate, Deltamethrin and *Acorus calamus* formulation.
10	Remarks of the Technical Director based on the pre-review	:	-

II. UNIVERSITY SUB PROJECT

1	Project Number	:	SC / CBE / SST / 2013 / 008
2	Project Title	:	Influence of seed moisture content and Containers under controlled and modified atmospheric conditions on storability of maize and blackgram seeds
3	Name of the Department/ Station	:	Seed Centre, TNAU, Coimbatore
4	Name(s) of the Scientists(s) with Designation	:	Dr.K.Nelson Navamaniraj Asst. Prof. (SST)
5	Project Period	:	December 2013 to November 2015
6	Objectives	:	Influence of different levels of seed moisture content on seed viability under controlled/ ambient storage condition. Effect of seed storage container on longevity of seeds stored in controlled / cold storage conditions. Effect of different levels of CO_2 and

			oxygen under controlled storage conditions.
7	Brief outline of the work carried out from the project initiation period	:	Initial evaluation has completed and the storage experiment is in progress
8	Work carried out during the review period	:	Initial evaluation for maize COH (M) 6 and storage evaluation is under progress.
9	Salient findings	:	Too early to report.
10	Remarks of the Technical Director based on the pre-review	:	Similar studies being carried out by Dr.S.Lakshmi, Asst. Prof. (SST) and Dr.L.Allwin, Asst. Prof. (Ag.Ento) may be compared and accordingly the objectives may be revised or closed. If the works on going / completed are in different methodologies, all the works outcome compiled and given as holistic approach for adoption. Close monitoring needs to be strengthened.

MRS,VAGARAI

1.	Project Number	:	AICRP/PBG/VGI/MAZ/005 (Agronomy)
2.	Project Title	:	Evaluation of different agronomic management practices for production of single cross maize hybrids, inbreds and composites under All India Coordinated Research Project on maize.
3.	Name of the Department/ Station	:	MRS, VAGARAI
4.	Name(s) of the Scientist(s) with Designation	:	Dr. R. Karthikeyan Assistant Professor (Agronomy)
5.	Project Period	:	April, 2014 to March, 2017

6. Objectives:

- To study the response of pre-release genotypes of different maturity (late/ medium/ early/ extra early) group to different plant density and nutrient levels and their interactions under irrigated condition.

- To identify the optimum plant density and nutrient dose for the pre-release genotypes of different maturity groups for attaining higher productivity and profitability.
- To evaluate the performance of maize hybrids to site-specific nutrient management and targeted yield approach under varied plant densities.

7. Progress made so far:

***Kharif*, 2014:**

Under this project, two field experiments were carried out during *Kharif* season of the year 2014 to evaluate the performance of pre-release genotypes of different maturity groups under different nutrient levels and plant densities.

Trial 1: Performance of pre-release genotypes of late maturity group under varying plant density and nutrient levels (AVT II)

The pre-release maize germplasm of 07 Nos. of late maturity group received from IIMR, New Delhi were evaluated at two different nutrient levels and two plant densities. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 07.07.2014 and harvested on 27.10.2014. The biometric observations on growth and yield parameters were recorded during vegetative and maturity phases of the crop. The treatment details are furnished below.

Main plots – Nutrient levels	Subplots – Plant density	Sub-sub plots - Pre-released maize genotypes
N_1: 200-65-80 kg NPK/ha	P_1: Normal (60x20 cm)	07 Nos. of late maturity group
N_2: 250-80-100 kg NPK/ha	P_2: High (50x20 cm)	received from IIMR, New Delhi

The data on various growth, yield parameters and grain and stover yields of the pre-released maize genotypes of late maturity group at various nutrient levels and plant densities are presented in Tables 1& 2.

The results of the experiment revealed that among the two nutrient levels tested, it was observed that no significant difference between the treatments for growth parameters *viz*., plant stand at harvest, number of cobs per ha, days to flowering and maturity and shelling percentage. However, significant difference between the treatments was observed for plant height at harvest, cob weight, grain and stover yields of the maize genotypes. Taller plants of 201.5 cm, higher cob yield of 12922 Kg/ha, higher grain yield of 10465 Kg/ha and stover yield of 8967 Kg/ha was recorded under the nutrient level of 250-80-100 Kg NPK/ha (N_2) indicating its significant superiority over the nutrient level 200-65-80 Kg NPK/ha (N_1).

Among the two plant densities evaluated, the performance of all the pre-release maize genotypes was significantly superior under higher plant density (D2) for most of the growth and yield parameters than at normal plant density of 60x20 cm (D1). High plant height, more number of plants per ha and their cobs, higher cob weight (13247 Kg/ha), higher grain yield (10717 Kg/ha) and stover yield (9188 Kg/ha) were recorded under higher plant density level of 50x20 cm.

Table 1: Influence of nutrient levels and plant density on the growth parameters of pre-release maize genotypes of late maturity group

Treatments	Plant height at harvest (cm)	Plant stand at harvest (000/ha)	Cobs (000/ ha)	Days to tasseling	Days to silking	Days to maturity
Main factor – Nutrient levels						
N_1- 200-65-80 Kg NPK/ha	194.5	84.2	83.1	52.0	54.6	104.5
N_2- 250-80-100 Kg NPK/ha	201.5	84.9	83.8	51.8	54.6	104.4
SEd.	0.82	0.26	0.37	0.77	0.23	0.19
CD (p=0.05)	1.87	NS	NS	NS	NS	NS
Sub factor –Plant density						
D_1- Normal (60x20 cm)	196.3	76.9	76.0	51.6	54.3	104.2
D_2- High (50x20 cm)	199.7	92.2	90.8	52.2	54.9	104.7
SEd.	0.73	0.23	0.22	0.31	0.11	0.21
CD (p=0.05)	2.03	0.63	0.61	NS	0.31	NS
Sub-sub factor- Genotypes						
DMR 771	206.5	87.7	86.8	51.6	55.5	105.3
DMR 772	198.2	85.3	84.3	53.4	55.6	107.7
DMR 773	185.3	77.4	76.2	51.2	53.5	102.3
DMR 774	203.8	88.5	86.9	53.1	55.2	105.4
DMR 775	204.2	87.6	86.3	53.6	56.2	106.2
DMR 776	190.9	77.0	76.0	48.0	50.8	98.9
DMR 777	197.3	88.5	87.3	52.9	55.6	105.6
SEd.	0.82	0.94	0.88	0.29	0.26	0.28
CD (p=0.05)	1.65	1.89	1.77	0.60	0.53	0.57

The results of the experiment revealed that among the two nutrient levels tested, it was observed that no significant difference between the treatments for growth parameters *viz*., plant stand at harvest, number of cobs per ha, days to flowering and maturity and shelling percentage. However, significant difference between the treatments was observed for plant height at harvest, cob weight, grain and stover yields of the maize genotypes. Taller plants of 201.5 cm, higher cob yield of 12922 Kg/ha, higher grain yield of 10465 Kg/ha and stover yield of 8967 Kg/ha was recorded under the nutrient level of 250-80-100 Kg NPK/ha (N_2) indicating its significant superiority over the nutrient level 200-65-80 Kg NPK/ha (N_1).

Among the two plant densities evaluated, the performance of all the pre-release maize genotypes was significantly superior under higher plant density (D2) for most of the growth and yield parameters than at normal plant density of 60x20 cm (D1). High plant height, more number of plants per ha and their cobs, higher cob weight (13247 Kg/ha), higher grain yield (10717 Kg/ha) and stover yield (9188 Kg/ha) were recorded under higher plant density level of 50x20 cm.

Table 2: Influence of nutrient levels and plant density on the yield parameters and yield of pre- release maize genotypes of late maturity group.

Treatments	Cob weight (Kg/ha)	Shelling percentage	Grain yield (Kg/ha)	Stover yield (Kg/ha)
Main factor – Nutrient levels				
N_1- 200-65-80 Kg NPK/ha	12089	80.4	9730	8459
N_2- 250-80-100 Kg NPK/ha	12922	80.9	10465	8967
SEd.	98.1	0.34	103.3	128.3
CD (p=0.05)	207.4	NS	213.4	294.0
Sub factor –Plant density				
D_1- Normal (60x20 cm)	11764	80.5	9478	8238
D_2- High (50x20 cm)	13247	80.9	10717	9188
SEd.	106.3	0.19	92.8	167.6
CD (p=0.05)	295.1	NS	207.7	325.4
Sub-sub factor- Genotypes				
DMR 771	13443	81.4	10947	9273
DMR 772	13212	81.0	10712	9102
DMR 773	11603	80.4	9334	8065
DMR 774	13038	80.6	10518	8970
DMR 775	13248	79.8	10585	9222
DMR 776	11085	81.3	9010	8097
DMR 777	11910	80.4	9577	8264
SEd.	124.5	0.57	119.1	184.2
CD (p=0.05)	250.3	NS	239.5	370.3

Among the different pre-release genotypes evaluated, irrespective of the nutrient level and plant density, the genotype DMR 771 did produce taller plants of 206.5 cm and significantly superior over others. The genotypes DMR 774 and DMR 775 were significantly on par in producing plants of 203.8 cm and 204.2 cm. The genotype DMR 776 produced shorter plants of 190.9 cm height. With respect to plant stand and production of cobs per ha., the genotypes DMR 777, DMR 775 and DMR 771 were on par with each other in producing higher plant stand and higher number of cobs per ha. when compared to other maize genotypes. The genotypes DMR 776 and DMR 773 did record lower plant population and produced lower number of cobs per ha. In case of their phenology, the maize genotype DMR 776 expressed its earliness to attain flowering (tasseling and silking) and maturity as compared to other maize genotypes which exhibited almost similar phenophase duration in general.

The maize genotypes DMR 771, DMR 772, DMR 774 and DMR 775 were on par with each other, however, significantly superior over other maize genotypes in producing higher cob yield and grain yield. The highest grain yield of 10947 Kg/ha was recorded by the genotype DMR 771 and it was on par with DMR 772 (10712 Kg/ha). The maize genotype DMR 776 did produce the lowest grain yield of 9010 Kg/ha. With regard to stover yield, the maize genotypes DMR 771, DMR 772, DMR 774 and DMR 775 were on par and significantly superior over DMR 773, DMR 776 and DMR 777 which were on par with each other.

The data on the performance of different maize genotypes in terms of economics is presented in Table 3. Based on the economics, the pre-release maize genotype DMR 775 did exhibit the highest BCR of 2.29 under higher plant density level (50x20 cm) with a nutrient dose of 250-80-100 Kg NPK/ha. It was followed by the genotypes DMR 771 and DMR 774 in producing higher BCR of 2.27 under higher plant density (D_2) with higher nutrient dose (N_2). The least BCR of 1.60 was recorded by the maize genotype DMR 776 under normal plant density of 60x20 cm and at lower nutrient dose of 200-65-80 Kg NPK/ha.

From the experiment, it can be concluded that the pre-release maize genotypes DMR 771, DMR 772, DMR 774 and DMR 775 could produce higher productivity with higher profitability under higher plant density of 50 x 20 cm at higher nutrient level of 250-80-100 Kg NPK/ha than other maize genotypes. The maize genotype DMR 776 showed its poorest performance in producing grain yield.

Table 3. Performance of maize genotypes of late maturity group in terms of economics

Nutrient levels	Plant density	Genotypes	Mean grain yield (Kg/ha)	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	BCR
N_1	D_1	DMR 771	10270	133512	65215	68297	2.05
		DMR 772	9919	128944	65215	63729	1.98
		DMR 773	8833	114824	65215	49609	1.76

Nutrient levels	Plant density	Genotypes	Mean grain yield (Kg/ha)	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	BCR
		DMR 774	9204	119651	65215	54436	1.83
		DMR 775	9226	119934	65215	54719	1.84
		DMR 776	9018	104231	65215	39016	1.60
		DMR 777	8443	109764	65215	44549	1.68
	D_2	DMR 771	10994	142917	65455	77462	2.18
		DMR 772	10673	138752	65455	73297	2.12
		DMR 773	9166	119545	65455	54090	1.83
		DMR 774	10904	141747	65455	76292	2.17
		DMR 775	10934	142141	65455	76686	2.17
		DMR 776	9523	123803	65455	58348	1.89
		DMR 777	10085	131101	65455	65646	2.00
N_2	D_1	DMR 771	10715	139299	67073	72226	2.08
		DMR 772	10650	138456	67073	71383	2.06
		DMR 773	9326	121233	67073	54160	1.81
		DMR 774	10127	131653	67073	64580	1.96
		DMR 775	10274	133557	67073	66484	1.99
		DMR 776	8571	111424	67073	44351	1.66
		DMR 777	9123	118603	67073	51531	1.77
	D_2	DMR 771	11810	153531	67713	85818	2.27
		DMR 772	11608	150904	67713	83191	2.23
		DMR 773	9984	129794	67713	62081	1.92
		DMR 774	11837	153884	67713	86171	2.27
		DMR 775	11908	154808	67713	87095	2.29
		DMR 776	9928	129065	67713	61352	1.91
		DMR 777	10658	138558	67713	70845	2.05

Trial 2: Performance of pre-release genotypes of early maturity group under varying plant density and nutrient levels (AVT II)

In this trial, the pre-release maize genotypes of 04 Nos. of early maturity group received from IIMR, New Delhi were evaluated at two different nutrient levels and two plant densities. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 30.07.2014 and harvested on 05.11.2014. The biometric observations on growth and yield parameters were recorded during vegetative and maturity phases of the crop. The treatment details are furnished below.

Main plots – Nutrient levels	Subplots – Plant density	Sub-sub plots - Pre-released maize genotypes
N_1: 150-50-60 kg NPK/ha	P_1: Normal (60x20 cm)	04 Nos. of early maturity group
N_2: 200-60-80 kg NPK/ha	P_2: High (50x20 cm)	received from IIMR, New Delhi

The data on various growth, yield parameters, grain and stover yields of the pre-released maize genotypes at various nutrient levels and plant densities are presented in Tables 4 & 5.

Table 4: Influence of nutrient levels and plant density on the growth parameters of pre- release maize genotypes of early maturity group

Treatments	Plant height at harvest (cm)	Plant stand at harvest (000/ha)	Cobs (000/ ha)	Days to tasseling	Days to silking	Days to maturity
Main factor – Nutrient levels						
N_1-150-50-60 Kg NPK/ha	161.2	88.4	87.7	48.0	51.3	91.5
N_2-200-60-80 Kg NPK/ha	165.7	87.8	86.5	49.4	52.5	94.0
SEd.	1.87	0.57	1.04	0.26	0.33	0.51
CD (p=0.05)	3.77	NS	NS	0.71	NS	1.19
Sub factor –Plant density						
D_1- Normal (60x20 cm)	160.8	80.6	80.6	48.6	51.7	92.9
D_2- High (50x20 cm)	166.0	95.4	93.5	48.8	52.1	92.6
SEd.	0.51	0.52	0.40	0.25	0.39	0.30
CD (p=0.05)	1.42	1.43	1.13	NS	NS	NS

Treatments	Plant height at harvest (cm)	Plant stand at harvest (000/ha)	Cobs (000/ ha)	Days to tasseling	Days to silking	Days to maturity
Sub-sub factor- Genotypes						
DMR 811	157.7	87.4	88.0	46.7	50.0	91.1
DMR 812	166.1	87.7	86.9	47.6	50.8	91.6
DMR 813	163.8	88.4	87.0	49.4	52.5	93.4
DMR 814	166.2	88.6	86.5	51.0	54.3	95.0
SEd.	1.03	0.50	0.53	0.30	0.30	0.27
CD (p=0.05)	2.12	NS	NS	0.62	0.61	0.55

The results of the experiment revealed that among the two nutrient levels tested, it was observed that significant difference between treatments was noted for plant height, days to tasseling and maturity, grain yield and stover yield of the maize genotypes. The nutrient level of 200-60-80 Kg NPK/ha did produce taller plants of 165.7 cm, delayed tasseling and maturity, higher grain yield (7449 Kg/ha) and higher stover yield (6346 Kg/ha) which inturn exhibited its significant superiority when compared to the nutrient level of 150-50-60 Kg NPK/ha (N_1).

Among the two plant densities tested, sowing of maize genotypes under higher plant density of 50 x 20 cm (D_2) recorded taller plants, more plant population and production of higher number of cobs per ha., higher cob yield, grain and stover yields irrespective of the maize genotypes evaluated. It depicted the significant superiority of higher plant density over normal plant density in producing the plant growth and yield parameters and ultimately the grain yield of maize genotypes.

Table 5. Influence of nutrient levels and plant density on the yield parameters, grain yield and stover yield of pre- release maize genotypes of early maturity group.

Treatments	Cob yield (Kg/ha)	Shelling percentage	Test grain weight (g)	Grain yield (Kg/ha)	Stover yield (Kg/ha)
Main factor – Nutrient levels					
N_1-150-50-60 Kg NPK/ha	8731	80.8	33.3	7054	5740
N_2-200-60-80 Kg NPK/ha	9185	81.1	33.5	7449	6346
SEd.	103.5	0.47	0.24	83.3	70.5
CD (p=0.05)	NS	NS	NS	168.1	155.3

Treatments	Cob yield (Kg/ha)	Shelling percentage	Test grain weight (g)	Grain yield (Kg/ha)	Stover yield (Kg/ha)
Sub factor –Plant density					
D1- Normal (60x20 cm)	8386	80.7	33.2	6775	5591
D2- High (50x20 cm)	9530	81.3	33.6	7729	6495
SEd.	98.3	0.54	0.23	64.3	53.2
CD (p=0.05)	206.3	NS	NS	148.5	127.7
Sub-sub factor- Genotypes					
DMR 811	9353	80.3	35.0	7506	6255
DMR 812	8995	81.7	33.5	7353	6128
DMR 813	8732	80.7	30.4	7047	5871
DMR 814	8751	81.1	34.5	7101	5917
SEd.	98.6	0.73	0.58	95.3	90.1
CD (p=0.05)	197.8	NS	1.20	196.8	165.3

Among the four maize genotypes tested, significant difference between them was noticed for plant height, days to flowering and maturity, cob yield, test grain weight, grain yield and stover yield, while no significant difference was observed for plant population, cobs production per ha. and shelling percentage. The performance of the genotypes DMR 814 and DMR 812 was significantly superior in producing taller plants over the genotypes DMR 811 and DMR 813. The genotype DMR 811 exhibited its earliness in its growth duration, attaining early shift in its phenophases as compared to other maize genotypes. In case of grain and stover yields, the maize genotype DMR 811 did produce higher grain yield (7506 Kg/ha) and stover yield (6255 Kg/ha) and however, it was on par with the genotype DMR 812 and significantly superior over DMR 813 and DMR 814, which served as control checks.

The data on the performance of different maize genotypes in terms of economics is presented in Table 6.Based on the economics, the pre-release maize genotype DMR 811 did exhibit the highest BCR of 1.72 under higher plant density level (50x20 cm) with a nutrient dose of 200-60-80 Kg NPK/ha. It was followed by the genotype DMR 812 in producing higher BCR of 1.67 under higher plant density (D_2) with higher nutrient dose (N_2). The least BCR of 1.37 was recorded by the maize genotypes DMR 813 and DMR 814 under normal plant density of 60x20 cm and at lower nutrient dose of 150-50-60 Kg NPK/ha.

From the study, it could be inferred that in the early maturity group, the pre-release maize genotype DMR 811 did perform superior in producing higher productivity and profitability under higher plant density level (50x20 cm) with higher nutrient dose of 200-60-80 Kg NPK/ha. it was followed by the maize genotype DMR 812 for its better performance over the genotypes DMR 813 and DMR 814 (control checks).

Table 6. Performance of maize genotypes of early maturity group in terms of economics

Nutrient levels	Plant density	Genotypes	Mean grain yield (Kg/ha)	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	BCR
N_1	D_1	DMR 811	6843	88963	61073	27890	1.46
		DMR 812	6571	85425	61073	24352	1.40
		DMR 813	6434	83640	61073	22567	1.37
		DMR 814	6420	83464	61073	22391	1.37
	D_2	DMR 811	7749	100732	61673	39059	1.63
		DMR 812	7656	99527	61673	37854	1.61
		DMR 813	7391	96084	61673	34411	1.56
		DMR 814	7375	95878	61673	34205	1.55
N_2	D_1	DMR 811	7184	93389	61918	31471	1.51
		DMR 812	7152	92970	61918	31052	1.50
		DMR 813	6726	87439	61918	25521	1.41
		DMR 814	6874	89363	61918	27445	1.44
	D_2	DMR 811	8251	107268	62518	44750	1.72
		DMR 812	8034	104444	62518	41926	1.67
		DMR 813	7639	99308	62518	36790	1.59
		DMR 814	7738	100595	62518	38077	1.61

***Rabi*, 2014-15:**

Main plots – Nutrient levels	Subplots – Plant density	Sub-sub plots - Pre-released maize genotypes
N_1: 200-65-80 kg NPK/ha	P_1: Normal (60x20 cm)	06 Nos. of medium maturity group
N_2: 250-80-100 kg NPK/ha	P_2: High (50x20 cm)	received from IIMR, New Delhi

During *Rabi*, 2014-15 season, four field experiments are being carried out, under irrigated condition. The progress made in the trials during the season are detailed hereunder.

Trial 1. Performance of pre-release genotypes of medium maturity group under varying plant density and nutrient levels (AVT II)

The pre-release maize genotypes 06 Nos. of medium maturity group received from IIMR, New Delhi were evaluated at two different nutrient levels and two plant densities. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 07.01.2015. The treatment details are furnished below.

Basal and top dressing of fertilizers were applied to the crop as per the treatments. Plant protection measures for the control of *spodoptera* and stem borer were attempted during early stage of the crop. Biometric observations such as plant stand during crop establishment stage was recorded. The crop is in reproductive stage and the trial is in progress.

Trial 2. Performance of pre-release genotypes of early maturity group under varying plant density and nutrient levels (AVT II)

The pre-release maize genotypes 04 Nos. of early maturity group received from IIMR, New Delhi were evaluated at two different nutrient levels and two plant densities. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 20.01.2015. The treatment details are furnished below.

Main plots – Nutrient levels	Subplots – Plant density	Sub-sub plots - Pre-released maize genotypes
N_1: 150-50-60 kg NPK/ha	P_1: Normal (60x20 cm)	04 Nos. of early maturity group
N_2: 200-60-80 kg NPK/ha	P_2: High (50x20 cm)	received from IIMR, New Delhi

Basal and first top dressing of fertilizers were applied to the crop as per the treatments. Plant protection measures for the control of armyworm and stem borer were attempted during early stage of the crop. Biometric observations such as plant stand during crop establishment stage was recorded. The crop is in vegetative stage and the trial is in progress.

Trial 3. Performance of pre-release genotypes of late maturity group under varying plant density and nutrient levels (AVT II)

The pre-release maize genotypes 14 Nos. of late maturity group received from IIMR, New Delhi were evaluated at two different nutrient levels and two plant densities. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 30.01.2015. The treatment details are furnished below.

Main plots – Maize hybrids	Subplots – Plant density	Sub-sub plots – Nutrient levels
H_1: TNAU maize hybrid CO6	P_1: Normal (60x20 cm)	N_1: RDF
H_2: NK 6240	P_2: High (50x20 cm)	N_2: STCR approach
		N_3: SSNM approach

Basal and first top dressing of fertilizers were applied to the crop as per the treatments. Plant protection measures for the control of *spodoptera* and stem borer were attempted during early stage of the crop. Biometric observations such as plant stand during crop establishment stage was recorded. The crop is in vegetative stage and the trial is in progress.

Trial 4. Performance of maize hybrids under varying plant density and nutrient levels during Rabi season

The predominant maize hybrids (TNAU maize hybrid CO 6 and NK 6240) were evaluated at three different nutrient levels and two plant densities under irrigated condition during *Rabi* season of the year 2014-15. The experiment was laid out under split-split plot design, replicated thrice. The sowing of the experiment was made on 21.01.2015. The treatment details are furnished below.

The recommended dose of fertilizers (250-75-75 Kg NPK/ha) was followed for the treatment N_1 while fertilizer dose was calculated for the treatment N_2 considering the soil test values analysed and targeted grain yield of 11.0 tonnes/ha and using the STCR equations. The Nutrient Expert software was run for calculation of fertilizer dose for the treatment N_3 under SSNM approach. Basal and first top dressing of fertilizers were applied to the crop as per the treatments. Plant protection measures for the control of *spodoptera* and stem borer were attempted during early stage of the crop. Biometric observations such as plant stand during crop establishment stage was recorded. The crop is in vegetative stage and the trial is in progress.

8.Progress made during the period under report:

9.Salient findings:

Among the various intercropping systems, little millet + bhendi (8:2 ratio) recorded higher little millet equivalent grain yield, fodder yield, net monetary return and B:C ratio.

10.Remarks of the Technical Director based on the pre-review: Nil

1.	Project Number	:	
2.	Project Title	:	Quantifying crop-weather relationship of selected food crops under current and future climate scenarios
3.	Name of the Department/ Station	:	MRS, VAGARAI
4.	Name(s) of the Scientist(s) with Designation	:	Dr. R. Karthikeyan Assistant Professor (Agronomy)
5.	Project Period	:	Two years (2014-15 to 2015-16)

6. Objectives:

To develop genetic coefficients for the ruling maize hybrids in the study area.

To perform weather sensitivity analysis using DSSAT/ APSIM models for assessing the change in phenology, physiology and partitioning efficiency.

To suggest management options for reducing the impact of climate change.

7. Progress made so far:

A field experiment was carried out at Maize Research Station, Vagarai during late *Kharif*/ early *Rabi* season of the year 2014-15 under irrigated condition. The trial was laid out under Randomised block design and replicated three times. The treatment details of the experiment are as follows.

Treatment details		
A.	Dates of sowing	i). September 25th ii). October 5th iii). October 15th
B.	Maize Hybrids	i). TNAU Maize Hybrid CO 6 ii). NK 6240 iii). Pioneer 30B11
C.	Fertilizer dose	i). Lesser than Normal (75% RDF) ii). Normal (100% RDF) iii). Higher than Normal (125% RDF)

Three maize hybrids were sown under three different dates of sowing to evaluate their performance under irrigated condition at different nutrient levels. The maize hybrids predominantly cultivated in the region were selected for experimentation. Normal package of practices recommended for irrigated maize cultivation was followed in the study. Biometric observations on growth and yield of maize hybrids were recorded during the period of experimentation and presented in the following tables (Table 1 and 2).

Table 1. Growth performance of maize hybrids under varied sowing dates and at different fertilizer levels

Treatments	Plant Ht (cm)	Plant stand (000/ha)	No. of cobs (000/ha)	Days to tasseling	Days to silking	Days to maturity
Factor 1: Sowing dates						
D_1: Sowing on 25 th Sep	212.3	64.1	62.7	55.7	57.9	106.9
D_2: Sowing on Oct 5th	221.6	63.5	62.8	55.9	58.1	106.2
D_3: Sowing on Oct 15th	205.5	63.0	61.9	54.4	56.6	105.3
SEd.	2.37	0.50	0.32	0.12	0.24	0.23
CD (p=0.05)	4.75	NS	NS	0.28	0.49	0.47
Factor 2: Maize Hybrids						
H_1: TNAU maize hybrid CO 6	235.4	64.9	64.0	54.0	56.2	105.8
H_2: NK 6240	200.6	63.6	62.6	55.1	57.5	103.1
H_3: Pioneer 30B11	203.5	62.2	60.9	57.0	59.0	109.5
SEd.	4.36	0.62	0.61	0.38	0.39	0.26
CD (p=0.05)	8.92	1.32	1.33	0.87	0.85	0.54
Factor 3: Fertilizer levels						
F_1: 75% RDF	206.8	63.7	62.6	55.7	57.7	105.5
F_2: RDF	212.6	63.5	62.4	55.5	57.6	106.2
F_3: 125% RDF	220.1	63.6	62.5	54.9	57.3	106.7
SEd.	0.97	0.41	0.47	0.13	0.20	0.25
CD (p=0.05)	1.99	NS	NS	0.27	NS	0.52

The results of the study revealed that among the three sowing dates tested, there existed significant difference between them for growth parameters of maize hybrids such as plant height and its phenophases*viz.*, days to tasseling, silking and maturity and no such significant difference was observed for plant population and number of cobs per hectare. Taller plants of maize hybrids were produced when sown during October 5th and was followed by September 25th. The sowing date of October 15th did produce smaller plants comparatively. Sowing of maize hybrids on October 5th took more days for tasseling, silking and maturity. However, it was on par with the sowing date of September 25th and significantly more over October 15th sowing.

Table 2. Yield performance of maize hybrids under varied sowing dates and at different fertilizer levels

Treatments	Cob yield (Kg/ha)	Shelling percentage	Grain yield (Kg/ha)	Stover yield (Kg/ha)
Factor 1: Sowing dates				
D_1: Sowing on 25 th Sep	12546	80.9	10156	10114
D_2: Sowing on Oct 5th	13167	80.0	10547	10773
D_3: Sowing on Oct 15th	12207	79.6	9721	9322
SEd.	170.8	0.35	174.6	224.5
CD (p=0.05)	354.7	0.74	355.0	453.7
Factor 2: Maize Hybrids				
H_1: TNAU maize hybrid CO 6	13268	80.9	10746	10140
H_2: NK 6240	12630	79.5	10042	10011
H_3: Pioneer 30B11	12023	80.1	9637	10058
SEd.	175.6	0.21	134.6	163.3
CD (p=0.05)	362.8	0.45	283.1	NS
Factor 3: Fertilizer levels				
F_1: 75% RDF	11737	79.8	9373	9430
F_2: RDF	12783	80.2	10261	10101
F_3: 125% RDF	13400	80.5	10791	10648
SEd.	148.5	0.20	106.4	133.1
CD (p=0.05)	300.9	0.42	215.7	270.2

Yield parameters *viz*., cob weight, shelling percentage, grain and stover yield of maize hybrids were also influenced by the sowing dates. Sowing of maize hybrids on October 5th recorded higher cob weight of 13167 Kg/ha, higher grain yield of 10547 Kg/ha and higher stover yield of 10773 Kg/ha. It was significantly superior over other two sowing dates. However, September 25th sown maize hybrids recorded higher shelling percentage as compared to other two sowings.

Among the three maize hybrids, significant difference was observed for all the growth and yield parameters, and grain yield. TNAU maize hybrid CO 6 produced taller plants (235.4 cm), higher plant population (64900 plants/ha), higher number of cobs (64000/ha), earliness in its phenopasic duration, higher cob weight (13268 Kg/ha), higher shelling percentage (80.9%) and higher grain yield (10746 Kg/ha).The maize hybrid was significantly superior over other two maize hybrids tested. It was followed by the maize hybrid NK 6240 in producing comparatively higher growth and yield. The maize hybrid Pioneer 30B11 exhibited its inferior performance over others.

Among the three fertilizer levels tested, application of 125% RDF did produce taller plants of 220.1 cm, and resulted in earliness for tasseling whereas delayed maturity period. No significant difference was observed for growth parameters like plant population, number of cobs/ha. and days to silking. Application of 125% RDF also resulted in producing higher cob weight (13400 Kg/ha), higher shelling percentage (80.9 %), higher grain yield (10791 Kg/ha) and higher stover yield (10648 Kg/ha). The treatment was significantly superior over the other fertilizer levels. Application of 75% RDF did recorded lesser growth and yield of maize hybrids naturally.

8. Work carried out during the review period

9. Salient Findings:

From the study, it could be inferred that sowing of maize hybrids on October 5th of the year could be recommended for getting higher productivity under irrigated condition. TNAU maize hybrid CO 6 showed its significant superiority over other two maize hybrids in its growth and yield performance. Application of either 100% or 125% RDF could be recommended for getting higher grain yields of maize hybrids.

10. Remarks of the Technical Director based on the pre-review: -

ARS, Kovilpatti

1.	Project Number	:	**DRES/KPT/AGR/012/002.**
2.	Project Title		Effect of micro environments on phenology, thermal requirements and grain yield of prominent rabi maize hybrids under rainfed condition.
3.	Name of the Project Leaders and Designation	:	Dr. A.Solaimalai, Assistant Professor (Agron)
4.	Name of the Dept/Stations		*ARS,Kovilpatti*

5. Project duration (Date of start and Date of closure) : September 2012 to March 2015

6. Objectives : To study the response of prominent maize hybrids to differential microenvironments

To study phenologicalbehavior vis-à-vis thermal requirements

To work out the heat use efficiency of hybrids of the crop and to develop appropriate sowing window.

7. Progress made :

Field trial was conducted in Field No. 16 during the north-east monsoon period under rainfed situation with the following treatments.

Design : Spilt plot design

Replication : Three

Spacing : 45 x 20 cm

Plot size : 5.4 x 4.0 m

Treatments

Main plot: Date of sowing

D_1: 39 standard week (Sep 24th – 30th)

D_2: 40th standard week (1 to 7 'Oct)

D_3: 41st standard week (8 to 14 ‘Oct)

D_4: 42nd standard week (15 to 21' Oct)

Subplot: Hybrids

H1: 900(M) Gold

H2: NK6240

H3: Prabal

H4: Hishell

H5: 30R 77

H6: NK21

H7: COH (M) 6

Table 1. Weather parameters at different phenophases of maize crop

Weather parameters	Treatments			
	39th std week	40th std. week	41st std. week	42nd std week
Seedling stage				
Maximum Temp (°C)	35.3	35.5	37.1	31.3
Minimum Temp (°C)	24.5	24.3	24.2	25.0
Relative humidity (%)	92.7	86.9	83.1	94.7
Sunshine (Hours/day)	4.7	6.5	7.2	2.7
Evaporation (mm/day)	4.3	3.7	5.3	3.1
Rainfall (mm)	49	13.4	7.4	76.8
Knee high stage				
Maximum Temp (°C)	35.9	33.0	31.4	32.5
Minimum Temp (°C)	24.3	24.5	24.0	23.1
Relative humidity (%)	86.1	90.1	94.0	93.3
Sunshine (Hours/day)	6.5	4.0	3.7	5.2
Evaporation (mm/day)	4.6	4.2	2.9	3.2
Rainfall (mm)	51.6	89.4	142.8	72.6
Tasseling stage				
Maximum Temp (°C)	32.0	32.5	30.7	29.7
Minimum Temp (°C)	23.6	23.3	22.8	22.3
Relative humidity (%)	93.4	92.2	91.3	90.8
Sunshine (Hours/day)	4.6	5.3	3.5	3.1
Evaporation (mm/day)	3.1	3.4	3.0	2.7
Rainfall (mm)	114.0	94.8	74.4	75.4
Silking stage				
Maximum Temp (°C)	31.3	28.5	28.7	29.1
Minimum Temp (°C)	23.3	22.5	21.2	22.8
Relative humidity (%)	90.7	92.7	90.4	92.9
Sunshine (Hours/day)	4.3	0.7	5.7	3.8
Evaporation (mm/day)	3.7	2.1	3.0	2.2

Weather parameters	Treatments			
	39th std week	40th std. week	41st std. week	42nd std week
Rainfall (mm)	12.0	46.0	1.2	11.6
Milking stage				
Maximum Temp (°C)	28.3	29.0	30.3	31.0
Minimum Temp (°C)	21.9	22.0	22.1	22.1
Relative humidity (%)	90.7	91.2	90.9	91.1
Sunshine (Hours/day)	2.6	3.6	3.4	4.4
Evaporation (mm/day)	2.3	2.2	2.5	2.8
Rainfall (mm)	68.6	42.0	24.8	31.6
Dough stage				
Maximum Temp (°C)	30.7	30.7	32.6	33.2
Minimum Temp (°C)	23.3	22.5	22.7	20.8
Relative humidity (%)	92.0	92.3	96.5	91.3
Sunshine (Hours/day)	2.5	4.1	5.9	8.3
Evaporation (mm/day)	2.5	2.3	2.4	3.9
Rainfall (mm)	6.2	3.8	30.2	0.0
Maturity stage				
Maximum Temp (°C)	31.4	30.3	32.7	32.5
Minimum Temp (°C)	22.4	21.9	20.4	20.6
Relative humidity (%)	94.8	90.0	90.5	88.5
Sunshine (Hours/day)	5.1	4.2	7.8	8.3
Evaporation (mm/day)	2.7	2.5	4.0	4.5
Rainfall (mm)	13.2	1.6	0.0	0.0

D1, D2, D3 and D4 were sown on 24.09.2014, 01.10.2014, 08.10.2014 and 15.10.2014 respectively. D_1, D_2, D_3 and D_4 recorded a total rainfall of 314.6, 291.0, 280.8 and 268.0 mm during the cropping season (Table 1). D_4 sowings received higher rainfall during seedling. D_3 sowing recorded higher rainfall during knee high and dough stage. D1 sowing window received higher rainfall during tasseling, milking and maturity stages.

Table 2. Influence of date of sowing on growth, yield parameters and yield of maize hybrids under rainfed condition during 2014-15

Treatments	Plant height (cm)	LAI at tasseling	DMP (kg/ha)	Cob length (cm)	Cob girth (cm)	Grain rows/ cob	Grains / row	100 seed weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)
Date of sowing										
39^{th} standard week (Sep 24^{th})	204.5	5.73	10524	16.31	12.82	12.95	22.94	21.98	3692	6615
40^{th} standard week (Oct 1)	193.7	5.67	10101	15.49	12.17	12.29	21.73	21.58	3497	6388
41^{st} standard week (Oct 8)	189.5	5.31	9858	15.11	11.84	11.97	21.22	21.30	3420	6221
42^{nd} standard week (Oct 15)	185.8	5.20	9711	14.81	11.61	11.79	20.79	21.30	3354	6140
CD (5 %)	4.2	0.16	183	0.30	0.23	0.26	0.36	NS	72	142
Hybrids										
900(M) Gold	211.2	5.11	9382	14.29	11.22	11.33	20.07	19.71	3233	5932
NK6240	197.5	6.02	10892	16.86	13.23	13.37	23.67	22.20	3813	6862
Prabal	187.0	4.97	9549	13.91	10.92	11.11	19.54	21.36	3148	6184
Hishell	179.0	5.37	9701	15.04	11.80	11.93	21.12	22.45	3402	6082
30R 77	188.5	5.63	10247	15.76	12.37	12.52	22.14	19.73	3566	6464
NK21	174.5	5.33	9589	14.92	11.71	11.84	20.96	20.77	3376	5996
COH (M) 6	215.9	6.07	10981	17.23	13.52	13.66	24.20	24.55	3896	6868
CD (5%)	4.7	0.18	206	0.46	0.37	0.39	0.45	0.61	85	155

Growth parameters, yield attributes and yield of maize hybrids was significantly affected by date of sowings except 100 grain weight (Table 2). Higher plant height (204.5 cm), leaf area index (LAI) (5.73), dry matter production (10524 kg/ha), cob length (16.31 cm), cob girth (12.82 cm), grain rows / cob (12.95), grains /row (22.94), grain yield (3692 kg/ha) and stover yield (6615 kg/ha) were recorded by 39th standard week sown crop. This treatment was followed by 40th standard week crops. This might be due to occurence of rainfall during 39st standard week. Lower values of growth characters, yield components and yields were obtained with crop sown during 42nd standard week.

With regard to maize hybrids, COH (M) 6 recorded higher plant height (215.9 cm), LAI (6.07), dry matter production (10981 kg/ha), cob length (17.23 cm), cob girth (13.52 cm), grain rows / cob (13.66), grains /row (24.20), 100 grain weight (24.55 g) grain yield (3896 kg/ha) and stover yield (6868 kg/ha). This was followed by NK 6240 hybrid. Maize hybrid Prabal gave lower values of growth parameters, yield characters and yields under rainfed condition.

Table 3. Influence of sowing dates on helio thermal unit and growing degree days of Maize at different phenophases

Treatments	Seedling		Knee high		Tasseling		Silking		Milking		Dough		Maturity		Total	
	HTU	GDD	HTU	GDD	HTU	GDD	HTU	GDD	HTU	GDD	HTU	GDD	HTU	GDD	AHTU	AGDD
39th std. week	94.2	19.9	132.2	20.1	82.5	17.8	77.2	17.3	38.2	15.1	43.4	17.0	88.9	16.9	6973.7	1504.9
40th std. week	129.2	19.9	80.5	18.7	95.5	17.9	11.1	15.5	53.9	15.5	72.0	16.6	71.9	16.1	6709.6	1477.0
41st std. week	147.7	20.7	66.2	17.7	63.1	16.7	82.0	15.0	57.4	16.2	103.1	17.6	128.4	16.5	7723.4	1652.8
42nd std. week	50.9	18.1	93.7	17.8	50.5	16.0	58.7	16.0	76.8	16.5	139.8	17.0	136.9	16.5	7697.2	1625.9

With regard to accumulated helio thermal unit and growing degree days, 41st standard week sown crop recorded higher accumulated helio thermal unit(AHTU) and accumulated growing degree day (AGDD) (Table 3). Lower values of AHTU and AGDD were registered with crop sown during 40th standard week. HTU values were decreasing from seedling to milking stage and thereafter it again increased dough to maturity phase. GDD also followed a similar trend in different growth phases.

The soil moisture content was estimated by gravimetric method. With regard to date of sowing, D_1 sowing recorded higher soil moisture contents at 30, 60 and 90 DAS respectively over other sowing windows (Table 4). Among the maize hybrids, H_7 recorded higher soil moisture status at all the growth stages whereas H_3 registered lower values of soil moisture content at different phenophases of crop.

Table 4.Effect of date of sowing and hybrids on soil moisture content (%)

Treat ments	30 DAS					60 DAS					90 DAS				
	D_1	**D_2**	**D_3**	**D_4**	**Mean**	**D_1**	**D_2**	**D_3**	**D_4**	**Mean**	**D_1**	**D_2**	**D_3**	**D_4**	**Mean**
0 -15 cm															
H_1	36.36	34.28	32.72	30.24	**33.40**	35.93	33.55	31.07	30.79	**32.84**	28.02	29.87	26.33	24.32	**27.14**
H_2	37.47	35.39	33.83	31.31	**34.50**	37.01	34.66	32.18	31.92	**33.94**	29.12	30.97	27.43	25.42	**28.24**
H_3	35.54	33.46	31.91	29.38	**32.57**	35.08	32.73	30.25	29.97	**32.01**	27.2	29.05	25.51	23.5	**26.32**
H_4	36.88	34.8	33.24	30.72	**33.91**	36.42	34.07	31.59	31.31	**33.35**	28.54	30.39	26.85	24.84	**27.66**
H_5	37.18	35.13	33.54	31.02	**34.22**	36.72	34.37	31.89	31.63	**33.65**	28.84	30.69	27.15	25.14	**27.96**
H_6	36.84	34.76	33.22	30.68	**33.88**	36.38	34.03	31.55	31.27	**33.31**	28.49	30.34	26.82	24.79	**27.61**
H_7	38.35	36.27	34.71	32.19	**35.38**	37.87	35.52	33.04	32.76	**34.80**	30.03	31.88	28.34	26.33	**29.15**
Mean	**36.95**	**34.87**	**33.31**	**30.79**		**36.49**	**34.13**	**31.65**	**31.38**		**28.61**	**30.46**	**26.92**	**24.91**	
15-30 cm															
H_1	37.98	36.57	34.52	32.66	**35.43**	32.68	35.98	33.23	32.24	**33.53**	30.45	31.42	28.27	26.62	**29.19**
H_2	39.21	37.68	35.63	33.77	**36.57**	33.79	37.09	34.35	33.31	**34.64**	31.56	32.53	29.38	27.73	**30.30**
H_3	37.29	35.76	33.71	31.85	**34.65**	31.87	35.17	32.42	31.43	**32.72**	29.63	30.6	27.45	25.8	**28.37**
H_4	38.63	37.13	35.05	33.19	**36.00**	33.21	36.51	33.76	32.77	**34.06**	30.97	31.94	28.79	27.14	**29.71**
H_5	38.91	37.38	35.33	33.47	**36.27**	33.49	36.79	34.04	33.05	**34.34**	31.26	32.23	29.08	27.43	**30.00**
H_6	38.59	37.06	35.01	33.15	**35.95**	33.17	36.47	33.72	32.73	**34.02**	30.92	31.89	28.74	27.09	**29.66**
H_7	40.02	38.49	36.44	34.58	**37.38**	39.92	37.88	35.13	34.16	**36.77**	32.39	33.36	30.21	28.56	**31.13**
Mean	**38.66**	**37.15**	**35.10**	**33.24**		**34.02**	**36.56**	**33.81**	**32.81**		**31.03**	**32.00**	**28.85**	**27.20**	

With regard economic analysis, 39^{th} standard week sown crop gave higher gross return (Rs. 51689/ha), net return (Rs. 51689/ha) and B:C ratio (2.52) whereas lower monetary benefit was obtained from 42^{nd} standard week sown crop (Table 5). Higher heat use efficiency was recorded under 39^{th} standard week sown crop. Among the maize hybrids, COH (M) 6 registered higher gross return (Rs. 54548/ha), net return (Rs. 33798/ha) and B:C ratio (2.63). Lower net return was recorded with prabal hybrid whereas 900 (M) gold gave lower B:C ratio.

Table 5. Effect of date of sowing on economics and heat use efficiency of hybrid maize under rainfed situation

Treatments	Gross return (Rs/ha)	Net return (Rs/ha)	B:C ratio	Heat use efficiency (kg/ha/°C day)
Date of sowing				
39^{th} standard week (Sep 24^{th} – 30^{th})	51689	31196	2.52	2.45
40^{th} standard week (1 to 7 'Oct)	48954	28461	2.39	2.37
41^{st} standard week (8 to 14 'Oct)	47876	27383	2.34	2.07
42^{nd} standard week (15 to 21' Oct)	46960	26467	2.29	2.06
Hybrids				
900(M) Gold	45266	24516	2.18	-
NK6240	53386	32536	2.56	-
Prabal	44070	24020	2.20	-
Hishell	47632	27582	2.38	-
30R 77	49920	29670	2.47	-
NK21	47268	26518	2.28	-
COH(M) 6	54548	33798	2.63	

8. Work carried out during the review period

9. Salient Findings:

Maize hybrid COH (M) 6 sown during pre - monsoon season (39^{th} standard week – sep 24^{th}) was found to give higher yield and monetary return under rainfedvertisol condition.

10. Remarks of the Technical Director based on the pre-review: -

1	Project Number	:	**AICRP/DCM/KPT/AGR/004**
2	Project Title	:	Performance evaluation of tractor operated air assisted seed drill for sowing minor millets

3	Name of the Department/Station	:	Agricultural Research Station, Kovilpatti
4	Name(s) of the Scientist(s) with Designation	:	Dr. M. Rajeswari Professor (SWC)
5	Project Period	:	2014 - 2017
6	Objectives	:	To evaluate the performance of tractor operated air assisted seed drill for sowing minor millets

7. Brief outline of the work carried out from the project initiation period :

This is the first year of the experiment.

8. Work carried out during the review period

The experiment was conducted to evaluate the performance of tractor operated air assisted seed drill for sowing minor millet in comparison with the traditional practice of broadcasting and gorru sowing. Four minor millet crops viz., barnyard millet (CO2), Foxtail millet (CO7), little millet and kodomillet were tested. Sowing of the test crops was done on 30.10.2014 and the soil moisture content was 33.90 per cent at 0-15 cm depth of soil. The rainfall received during the cropping period was 150.4 mm in 12 rainy days. The crops were sown at a row spacing of 30 cm. The air assisted drill consisted of nine furrow openers and the tractor drawn gorru consisted of 5 furrow openers at a spacing of 30 cm. In the tractor drawn gorru two persons were engaged for metering the seeds in to the seed funnel. The seeds were mixed with sand for gorru sowing and broadcasting.

The results of the experiment are furnished below

S. No.	Crops	Air assisted seed drill	Tractor drawn gorru	Broad casting	
Seed rate kg/ha					
1.	Barnyard millet	7.0	8.5	10	
2.	Foxtail millet	6.5	8.0	10	
3.	Little millet	5.0	8.0	10	
4.	Kodo millet	5.0	8.0	10	

Plant population/m^2					SEd	CD
1.	Barnyard millet	31.86	39.29	44.57	3.62	7.88
2.	Foxtail millet	32.14	41.71	39.71	2.23	4.86
3.	Little millet	29.29	28.00	35.29	NS	NS
4.	Kodo millet	19.86	38.14	42.14	1.92	4.18
No. of tillers						
1.	Barnyard millet	3.29	2.57	3.43	NS	NS
2.	Foxtail millet	4.57	4.71	5.86	NS	NS
3.	Little millet	4.86	5.14	5.43	NS	NS
4.	Kodo millet	16.66	9.90	10.50	1.92	4.80
Yield (kg/ha)					**SEd**	**CD**
1.	Barnyard millet	1013	1232	1326	NS	NS
2.	Foxtail millet	1053	1158	1231	NS	NS
3.	Little millet	191	277	325	NS	NS
4.	Kodo millet	1807	1727	1737	33	75
BC ratio						
1.	Barnyard millet	1.23	1.48	1.41		
2.	Foxtail millet	1.28	1.39	1.31		
3.	Little millet	0.23	0.33	0.34		
4.	Kodo millet	2.19	2.07	1.86		

9. Salient Findings

- ❖ Line sowing of minor millets with air assisted seed drill resulted in 30 to 40 % saving in seed rate
- ❖ Cost of sowing with air assisted seed drill was Rs. 750/ha which was 11.76 and 6.25 less than that of gorru sowing (Rs. 850/ha) and broadcasting (Rs. 800/ha)
- ❖ The time taken for sowing one hectare was 1.24, 2.81 and 3.00 hours with air assisted seed drill, tractor drawn gorru and broadcasting respectively. This implies that seed drill sowing can be 3 times faster than broadcasting resulting in high area of coverage which is essential under dryland conditions to make use of the soil moisture effectively.
- ❖ Plant population/m^2 was highest in broadcasting followed by gorru sowing and seed drill sowing owing to the high seed rate in all millets excepting little millet where the variation among the treatments was not significant.
- ❖ The number of tillers/plant was not significantly influenced by the method of sowing excepting kodo millet. In kodo millet, lesser plant population / m^2 in using seed drill resulted in profusedtillering compared to less no. of tillers in gorru sowing and broadcasting.
- ❖ The effect of treatments on yield were on par in barnyard millet, foxtail millet and little millet. Hence air assisted seed drill can be recommended for line sowing of minor millets in view of its less cost of sowing and high area of coverage/day. In kodo millet, sowing with air assisted seed drill registered 4.6 and 4.0 per cent higher yield than gorru sowing and broadcasting.

Constraints

The seed tube in air assisted seed drill gets clogged while sowing in wet soil.

Refinement

The seed tubes are to be placed 10 to 15 cm above the furrow openers.

10. Remarks of the Technical Director based on the pre-review

- Economics to be worked out
- Good quality photos to be included for constraints
- May be continued with modified seed tube *i.e.*, placed 5-10 cm above the furrow openers

1.	Project Number	:	AICRP/DCM/KPT/AGR/004
2.	Project Title	:	Effect of fertilizerand moisture conservation practices on rainfedsorghum in vertisols
3.	Name of the Department/	:	Agricultural Research Station

	Station		Kovilpatti-628501.
4.	Name(s) of the scientist(s) with Designation	:	PI : Dr. V. Sanjivkumar, Assistant Professor (SS&AC). Co-PI : Dr. D. Jawahar, Professor and Head.
5.	Project period	:	October 2011 to September 2015
6.	Objectives	:	

To study the effect of fertilizer and moisture conservation practices on productivity and profitability of sorghum.

To assess the changes in soil physical and chemical properties of soil.

7. Brief outline of the work carried from the project initiation period :

The experiment was conducted in split plot design replicated twice under rainfed situation. Biometric observation was recorded periodically.

The soil samples was collected and determined for the soil moisture content.

Among the land configuration methods tried Broad bed furrow (BBF) recorded taller plants and higher weight of panicle, test weight and grain yield then ridges & furrow and flat bed.

Ridges & furrow and broad bed furrow recorded higher grain yield than flat bed. However there is no significant difference in grain yield among land configuration methods.

Among the fertilizer level, 20 kg N as a Urea+20 Kg P through EFYM+10 kg K as a basal and top dressing of 20 kg N as a Urea + 10kg K as top dressing recorded higher weight of grains/panicle and grain yield and stover yield followed by FYM 5t/ha+ NPK 4:10:0 as a basal and NPK 16:0:0 as top dressing which was significant superior to other treatments.

Among the interaction effect studied between fertilizer level and land configuration methods, BBF with 20kg N as a urea+20 kg P through EFYM +10 kg K as a basal and 20kg N+10kg K as top dressing recorded higher weight of grains/panicle and grain and stover yield. There is no significant differences in available soil moisture among the land configuration methods. However higher soil moisture maintained in BBF.

There is build up of organic carbon and available nitrogen is noticed in FYM application treatments and decreases in soil pH and EC was observed. However in control plot the native nutrient pool is being exhausted and negative nutrient status is observed.

8. Work carried out during the review period:

After harvest of the crop, soil samples was collected and analysed for the available nutrients.

9. Salient findings:

Among the land configuration methods tried BBF recorded higher plant height (140.6cm) and higher weight of panicle (46.1g) and panicle length (22.3cm) than ridges and furrow and flat bed.

Among the fertilizer level, 20 kg N as a Urea+20 Kg P through EFYM +10 kg K as a basal and `top dressing of 20 kg N as a Urea + 10 kg K recorded higher plant height (117.7cm) and higher weight of panicle (55.6g) and panicle length (22.7cm) than other treatments. There was 23 percent deficit of North east monsoon rainfall.

Among the main plot treatments flat bed method of land configuration making results in highest B:C ration of 1.50 and in the subplot the treatment received 20 kg N as a Urea+20 Kg P through EFYM+10 kg K as a basal and top dressing of 20 kg N as a Urea + 10kg K registered highest B:C ration of 1.94.

There was 23 percent deficit of North east monsoon rainfall.

10. Remarks of the Technical Director based on the pre-review:

Soil analysis was carried out and incorporated in the report.

Project to be continued.

1.	Project Number	:	AICRP/DCM/KPT/AGR/004
2.	Project Title	:	Permanent manurial experiments on Bt cotton and Maize rotation under dry farming in Typic Haplusterts and Typic Haplustalfs.
3.	Name of the Department/ Station	:	Agricultural Research Station Kovilpatti-628501.
4.	Name(s) of the scientist(s) with Designation	:	PI : Dr. V. Sanjivkumar, Assistant Professor (SS&AC). Co-PI : Dr. D. Jawahar, Professor and Head.
5.	Project period	:	October 2011 – September 2016

6. Objectives:

To find out the combined effect of organic and inorganic nitrogen on Cotton - Maize rotation

To evaluate the long-term effect of nutrient on crop yield and soil fertility

To assess the temporal effect of nutrient treatments on soil physical and chemical properties

To choose the most appropriate fertilizer treatment to sustain the crop yields and soil fertility

To find out the effect of micronutrient $ZnSO_4$ on the yield and quality of cotton and maize crops.

7. Brief outline of the work carried from the project initiation period:

The experiment was conducted in randomized block design replicated thrice under rainfed situation. Biometric observation was recorded periodically.

Plants samples are collected and estimated for the total plant nutrient content.

Taller plants, higher no. Of sympodial branches,, No. Of bolls and boll weight were recorded in received T8 - Urea (N 60)+DAP (P 40) + MOP (K 20) +25 kg $ZnSO_4$/ha followed by Urea (N80)+ DAP (P40)+ MOP (K40) in both locations.

Higher seed cotton yield was recorded in T8 - Urea (N 60)+DAP (P 40) + MOP (K 20) +25 kg $ZnSO_4$/ha in both vertisols and Alfisols condition. Due to failure of monsoon B:C ratio was recorded less than one in all the treatments in both location.

There is build up of organic carbon and available nitrogen is noticed in FYM application treatments and decreases in soil pH and EC was observed. However in control plot the native nutrient pool is being exhausted and negative nutrient status is observed.

8. Work carried out during the review period:

After harvest of the crop, soil samples was collected and analysed for the available nutrients.

9. Salient findings:

Among the treatments higher plant height (145.0cm), grain yield (3438kg ha^{-1}) and straw yield (7823 kg ha^{-1}) were recorded in treatment received T8 - Urea (N 60)+DAP (P 40) + MOP (K 20) +25 kg $ZnSO_4$/ha followed 30 kg N (Urea) + 30 kg N (Crop residue) + 20 kg P + 10 kg K/ha and B:C ration of 2.27. There was 23 percent deficit of North east monsoon rainfall.

Application of crop residues along with fertilizer, the treatment received (T_6) 40 kg N (urea) + 40 kg N (crop residue) +20 kg P+ 20 K/ha registered higher grain yield (3278 kg ha^{-1}), straw yield (7819 kg ha^{-1}).

10. Remarks of the Technical Director based on the pre-review:

Soil analysis was carried out and incorporated in the report.

Project to be continued.

ARS, Aruppukkottai

1.	Project Number	**DRES/APK/SAC/013/002**
2.	Project title	Studies on agri-horti pastoral- animal based integrated farming system for rainfedvertisol
3.	Name of the Department/ station	Regional Research Station, Aruppukottai
4.	Name(s) of the scientist(s) with designation	1. S.Senthivel, Professor (Agronomy) 2.P.Saravanapandian, Professor (SS&AC)
5.	Project period	January, 2013 to August, 2016

6. Objectives

a. To increase the total productivity of the land under the horticultural land use system by including annual intercrops in rainfedvertisol

b. To popularize goat rearing along with horticultural and agricultural crops inrainfedvertisol

7. Brief outline of the work carried out from the project initiation period

2013-14- During the first year of the study the annual intercrops were sown on 30-10-2013 in sapota plantation and the trial was conducted with the following set of treatments

Main plot

Sapota based intercropping system-6 Nos.

M1- Sapota without intercrop

M_2- Sapota + Grain maize – CoHM6

M_3- Sapota + Fodder maize – African Tall

M_4- Sapota + Grain cholam- APK 1

M_5- Sapota + Fodder cholam–Co.FS 29

M_6- Sapota + Hybrid bhendi

Sub-plot- Nutrient management- 4 levels

S_1- No fertilizer application to intercrops

S_2- 50 % of fertilizer dose of intercrops

S_3- 75 % of fertilizer dose of intercrops

S_4- 100 % of fertilizer dose of intercrops

Recommended dose of fertilizers were applied to different annual intercrops as per treatment schedule.

The annual intercrops were failed due to poor rainfall distribution during the crop period. A total rainfall of 125.4 mm was received during the crop period which was 43.5 per cent less than the normal rainfall of the months from November, 2013 to February, 2014 (i.e. 222.1 mm).Sapota fruits were harvested from different treatments and the income generated from sapota fruits were taken in to consideration and it was converted into grain / fodder equivalent of the annual intercrops. Accordingly the treatment of sapota raised without annual intercrops (T1) alone registered net income and other treatments of sapota based intercropping system and nutrient management practices recorded no income since no yield was obtained from annual intercrops and the cost of cultivation exceeded gross income.

Two set of tellicherry goats each of four numbers were included in the study. One set will be fed with concentrate prepared with maize and sorghum grain and allowed for grazing and another set will be allowed for grazing alone. The live weight of the goats is to be measured periodically after 6 months. Since the annual intercrops were failed the goats were not fed with concentrate and the live weight could not be measured and recorded.

8. Work carried out during the review period-2014-15

Intercultural operations were carried out during off season in sapota plantation with the receipt of summer rains. Fruit bearing in sapota was affected due to poor rainfall distribution during off season. Even during the crop season very few fruits were formed in the experimental area. Hence, no harvest was done during the crop season in sapota.

The annual intercrops were sown 19.9-2014 in sapota plantation as per treatment schedule. The annual intercrops received a total rainfall of 310.7 mm during the crop period in 24 rainy days. In total 25.2 % deficit rainfall was received during the crop period than the normal. A total of 16.8 % deficit rainfall was received during the year 2014. A deficit rainfall of 25.7 % was received during North-East monsoon season.

The annual intercrops were harvested on 29-01-2015 and the data on grain and fodder yield were recorded. The grain produce of cholam and maize were converted in to concentrate feed and are being fed to four Tellicherry goats maintained in the farm which will be compared with the other four goats which are not fed with concentrate feed. The comparative growth of the identified goats will be measured in terms of live weight at the end of sixth month. Few trees in sapota plantation are in bearing stage.

Post harvest soil samples were analysed for observing available major nutrients, pH and Ec

9. Salient findings

The yield obtained from different annual intercrops were converted into grain yield of cholam or maize based on cost of the produce. It was found that higher profit was obtained by raising APK1 grain cholam or CoFS-29 fodder cholam in between sapota plantation. Application of recommended dose of inorganic fertilizers recorded higher income.

No yield could be recorded in the treatment of sapota rasied without intercrops since no harvest was done in sapota so far.

Available nitrogen and phosphorus were found more in the sapota based grain cholam intercropping system. Available potash was found more in sapota based bhendi intercropping system

Application of full dose of recommended fertilizer recorded higher availabilty of major nutrients

The Ec level was ranging between 0.30 and 0.32 in sapota based annual intercropping systems and from 0.30 to 0.33 in fertilizer levels.

The pH level was ranging between 8.1 and 8.3 in sapota based intercropping system and nutrient levels.

10 Remarks of the Technical Director based on the pre-review

Component wise productivity are to be given

Soil fertility status and recycling of inputs are to be mentioned

Objective wise outcome are to be given with data

All the objectives to be refined (Mid term correction) and approval to be obtained

Nutrient content of crop residue to be provided.

To be continued for another year.

Salient findings to be given to CSM with pooled data

REPORT ON THE SUB PROJECT

1	Project Number	:	**DRES/APK/SAC/01/013**
2	Project Title	:	Studies on the effect of Zinc inconjoint with organic manures on Hybrid Maize.

3	Name of the Department/ Station	:	Regional Research Station, Aruppukottai
4	Name(s) of the Scientist(s) with Designation	:	Dr.P. Saravana Pandian, Professor (SS&AC)
5	Project Period	:	May 2013 to April 2016

6. Objectives:

To evaluate the effect of zinc alone and inconjoint with organic manures onyield, uptake of nutrients and available nutrient status.

To study the releasing pattern of zinc inconjoint with organic manres over a period of time.

7. Brief outline of the work carried out from the project initiation period

To study the releasing pattern of zinc inconjoint with organic manures, a laboratory incubation study was conducted with following treatments.

T_1 - $ZnSO_4$ @ 37.5 kg ha^{-1}.

T_2 - Zn EDTA @5 kg ha^{-1}.

T_3 - Zinc solubilising bacteria @ 2 kg ha^{-1}

T_4 - $ZnSO_4$ @ 37.5 kg ha^{-1} + Zinc solubilising bacteria @ 2 kg ha^{-1}.

T_5 -$ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg vermicompost for 30 days. (1;10 ratio)

T_6 - $ZnSO_4$ @ 25 kg ha^{-1} incubated with 250 kg vermicompost for 30 days. (1;10 ratio)

T_7 - $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg FYM for 30 days. (1;10 ratio)

T_8 - $ZnSO_4$ @ 25 kg ha^{-1} incubated with 250 kg FYM for 30 days. (1;10 ratio)

Two hundred grams of soils were taken in plastic containers and treatment from T_1 to T_8 were added and allowed to incubate for 10 weeks. Soil samples were drawn once in a week and the Zn contents were analysed by DTPA extract and the releasing pattern of zinc over a period of time was arrived.

The rate of release of zinc was found to be higher while incubating $ZnSO_4$ either with Vermicompost (or) FYM rather than applying zinc alone as $ZnSO_4$ (or) Zn EDTA. The mean value ranged from 0.8 to 7.7 mg kg^{-1} and the highest rate of release of zinc (7.7 mg kg^{-1}) was noticed in the treatment receiving $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg vermicompost for 30 days. A constant increase in the rate of release of Zn (4.3 to 10.2 mg kg^{-1}) was registered in the particular treatment. On the other hand, the rate of release of zinc was lowered over a period of time in the treatment receiving $ZnSO_4$ @37.5 kg ha^{-1}.

To study the effect of zinc alone and inconjoint with organic manures on yield, uptake of nutrients and available nutrient status a field experiment was conducted with Hybrid Maize (Adventa) as test crop. The treatment structure is as follows,

T_1 - Farmer's fertilizer practice (Application of complex fertilizer 25 kg ha^{-1} as basal)

T_2 - Recommended NPK @ 40:20:0 kg ha^{-1}.

T_3 - T_2+ Basal application of $ZnSO_4$ @ 37.5 kg ha^{-1}.

T_4 - T_2+ Basal application of Zn EDTA @ 5 kg ha^{-1}.

T_5 - T_2 + Inoculation of Zinc solubilising bacteria @ 2 kg ha^{-1}.

T_6 - T_2+$ZnSO_4$ @ 37.5 kg ha^{-1} +Zinc solubilising bacteria @ 2 kg ha^{-1}.

T_7 - T_2 + $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg vermicompost for 30 days. (1;10 ratio)

T_8 - T_2 + $ZnSO_4$ @ 25 kg ha^{-1} incubated with 250 kg vermicompost for 30 days. (1;10 ratio)

T_9 - T_2 + $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg FYM for 30 days. (1;10 ratio)

T_{10} - T_2 + $ZnSO_4$ @ 25 kg ha^{-1} incubated with 250 kg FYM for 30 days. (1;10 ratio)

T_{11} - T_2 + Foliar spray of $ZnSO_4$ @ 0.5 % 3 times at knee high stage, tasseling and cob initiation stage.

T_{12} - T_2 + Foliar spray of Zn EDTA @ 0.2 % 3 times at knee high stage, tasseling and cob initiation stage.

The result revealed that the higher grain yield of 1300 kg ha^{-1} was registered with application of recommended dose of N, P_2O_5 and K_2O ha^{-1} along with 37.5 kg $ZnSO_4$incubated with 375 kg of vermicompost for 30 days. Regarding the nutrient status, a positive balance of N and P were registered with application of recommended dose of N, P_2O_5 and K_2O ha^{-1}incombination with 375 kg $ZnSO_4$ incubated with either vermicompost (or) FYM for 30 days. Similarly, a positive balance of Zn was recorded with the same treatment.

8. Work carried out during the review period

During the year 2014-15, second field experiment was conducted with Maize hybrid (CO_6) after imposing the treatments. The crop was sown on 16.09.2014 and harvested on 08.01.2015

Bulk soil samples were collected and analysed for basic physical and chemical properties. Treatment wise soil samples were collected on 30^{th}, 60^{th} days after sowing of the crop and analysed for available N,P,K,S, Organic Carbon, available Zn, Mn, Cu and Fe. Similarly plant samples were collected on 30^{th} , 60^{th} and at harvest stage. The plant samples collected on 30^{th} and 60^{th} DAS were analysed for N,P,K,S, Zn,Cu, Mn and Fe contents and their uptake were computed.

Effect of treatments of grain yield of maize

The grain yield of maize was statistically significant due to the application of nutrients. The grain yield ranged from 3250 to 5940 kg ha^{-1} (Table 1). The highest grain yield of 5940 kg ha^{-1} was registered with the application of recommended dose of N, P_2O_5 and K_2O along with $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with 375 kg of vermicompost for 30 days followed by application of 25 kg $ZnSO_4$ incubated with 250 kg vermicompost for 30 days. However, this treatment was statistically on par with the application of 37.5 kg $ZnSO_4$ and 25 kg $ZnSO_4$ incubated with 375 kg FYM and 250 kg FYM for 30 days.

Influence of treatments on uptake of Zn

The uptake of Zn registered at three stages were statistically influenced by the treatments. Among the three stages, the highest uptake was recorded at the harvest stage. (Table 2) Application of $ZnSO_4$ incubated with either vermicompost (or) FYM registered higher Zn uptake as compared to application of recommended dose of N,P_2O_5 and K_2O alone (or) application of recommended dose of N,P_2O_5 and K_2O along with $ZnSO_4$ @ 37.5 kg ha^{-1}. The highest Zn uptake of 70.4, 82.0 and 90.0 ha^{-1} at 30 DAS, 60 DAS and harvest stages respectively were registered with application of recommended dose of N, P_2O_5 and K_2O along with 37.5 kg $ZnSO_4$ incubated with 375 kg vermicompost incubated for 30 days.

Influence of treatments on available micro nutrient status of post harvest soil

The available micronutrient status of post harvest soil were statistically influenced by the application of nutrients (Table 3). It ranged from 0.40 to 0.88, 3.40 to 5.32, 5.50 to 6.10 and 0.40 to 0.54 mg kg^{-1} of Zn, Fe, Mn and Cu respectively. While comparing with the initial status both positive and negative balance were recorded. In the case of Zn, a positive balance were registered with the application of either $ZnSO_4$ @ 37.5 kg ha^{-1} in combination recommended dose of N,P_2O_5 and K_2O (or) application of $ZnSO_4$ incubated with either vermicompost (or) FYM for 30 days. Regarding available Fe, a positive balance was registered while applying $ZnSO_4$incombination either with vermicompost (or) FYM incubated for 30 days. While a negative balance have been registered with Mn and Cu.

9.Salient Findings

The rate of release of zinc was highest while applying $ZnSO_4$inconjoint with organic manures than applying zinc alone. Application of zinc EDTA is on par with application of $ZnSO_4$ with FYM in releasing the zinc.

Application of zinc inconjoint with organic manures performed better as compare to the application of zinc alone. The highest grain yield of 5940 $kgha^{-1}$ was recorded with the application of recommended dose of N, P_2O_5, K_2O along with $ZnSO_4$@ 37.5 $kgha^{-1}$ incubated with 375 kg of vermicompost for 30 days.

A positive balance of Zn was observed while applying Zn inconjoint with vermicompost and FYM incubated for 30 days. A highest positive balance ofj 0.24 mg kg^{-1} was registered with application of $ZnSO_4$ @ 37.5 kg ha^{-1} incubated with either vermicompost (or) FYM for 30 days.

The highest B:C ratio of 2.98 was registered in the treatment receiving RDF + Application of 37.5 kg $ZnSO_4$ incubated with 375 kg of FYM for 30 days.

10	Remarks of the Technical Director based on the pre-review	:	Rain fall data and distribution during crop growth to be indicated. Data on grains/cob to be given as whole number

Zn uptake is given as kilogram per ha which is incorrect and should be gram per ha.

Treatment details in the table to be modified.

Stover/grain price to be indicated while working out the B:C ratio.

Table 1. Influence of treatments on grain yield of maize and uptake of nutrients (kg ha $^{-1}$)

Treatments	Grain yield	N uptake	P uptake	K uptake
FFP	3250	36.8	11.4	19.8
RDF	4600	52.5	16.8	28.8
RDF +$ZnSO_4$ 37.5 kgha^{-1}	5350	61.8	14.0	34.0
RDF + Zn EDTA 5 kg ha^{-1}	5700	65.4	22.0	36.4
RDF + ZSB	4700	54.0	16.8	29.0
RDF + $ZnSO_4$ + ZSB	5500	63.0	14.4	35.0
RDF + $ZnSO_4$ 37.5 kg enriched withVC 375 kg	5940	71.5	24.6	41.4
RDF + $ZnSO_4$ 25 kg enriched with VC 250 kg	5600	64.5	23.6	38.6
RDF + $ZnSO_4$ 37.5 kg enriched with FYM 375 kg	5750	66.2	24.0	40.0
RDF + $ZnSO_4$ 25 kg enriched with FYM 250 kg	5600	65.0	23.0	38.0
RDF + FS of $ZnSO_4$ 0.5 %	4850	56.5	16.8	29.4
RDF + FS of Zn EDTA 0.2 %	5060	58.2	17.2	30.0
SEd	114	4.6	1.7	2.6
CD (P=0.05)	232	9.3	3.4	5.3

Table 2.Influence of treatments on Zn uptake (gha^{-1})

Treatments	30 DAS	60 DAS	At harvest
FFP	26.4	30.0	31.8
RDF	34.8	39.8	41.4
RDF +$ZnSO_4$ 37.5 kgha^{-1}	48.4	59.2	64.8

RDF + Zn EDTA 5 kg ha^{-1}	57.0	69.8	74.6
RDF + ZSB	36.8	46.4	50.0
RDF + $ZnSO_4$ + ZSB	51.4	62.0	66.4
RDF + $ZnSO_4$ 37.5 kg enriched with VC 375 kg	70.4	82.0	90.0
RDF + $ZnSO_4$ 25 kg enriched withVC 250 kg	65.0	72.8	80.4
RDF + $ZnSO_4$ 37.5 kg enriched with FYM 375 kg	70.0	76.8	88.0
RDF + $ZnSO_4$ 25 kg enriched with FYM 250 kg	64.2	70.2	81.4
RDF + FS of $ZnSO_4$ 0.5 %	40.0	50.0	52.4
RDF + FS of Zn EDTA 0.2 %	43.8	51.4	54.0
SEd	4.2	3.6	3.4
CD (P=0.05)	8.5	7.4	7.0

Table 3. Available micronutrient status of post harvest soil ($mgkg^{-1}$)

Treatments	Zn	Fe	Mn	Cu
FFP	0.48	3.85	6.24	0.52
RDF	0.40	3.40	5.82	0.46
RDF +$ZnSO_4$ 37.5 $kgha^{-1}$	0.74	3.20	5.60	0.42
RDF + Zn EDTA 5 kg ha^{-1}	0.80	4.35	5.50	0.46
RDF + ZSB	0.55	3.40	5.75	0.50
RDF + $ZnSO_4$ + ZSB	0.76	3.40	5.60	0.40
RDF + $ZnSO_4$ 37.5 kg enriched with VC 375 kg	0.88	5.32	6.10	0.54
RDF + $ZnSO_4$ 25 kg enriched with VC 250 kg	0.82	4.90	6.04	0.48
RDF + $ZnSO_4$ 37.5 kg enriched with FYM 375 kg	0.88	5.25	6.10	0.54
RDF + $ZnSO_4$ 25 kg enriched with FYM 250 kg	0.84	5.00	6.00	0.50
RDF + FS of $ZnSO_4$ 0.5 %	0.40	3.52	5.52	0.46
RDF + FS of Zn EDTA 0.2 %	0.42	3.64	5.64	0.46
SEd	0.03	0.36	0.24	0.03
CD (P=0.05)	0.07	0.71	0.46	0.07

1	Project Number	:	**DRES/APK/AGM/014/001**
2	Project Title	:	**Effect of *Methylobacterium* application on growth and yield of Kudiraivali – Var.Co(Kv) 2**
3	Name of the Department/ Station	:	Regional Research Station Aruppukottai
4	Name(s) of the Scientist(s) with Designation	:	Dr. R. Poorniammal, Asst. Prof. (Agrl. Micro.)
5	Project Period	:	October, 2014 – September, 2017

6 Objectives:

1. To study the interaction effect on the application of *Methylobacterium* on seed germination of Kudiraivali.
2. To optimize the time of application of *Methylobacterium* as foliar bioinoculant (concentration optimized from first objective) through *In vivo* experiments.
3. To study the effect of *Methylobacterium* on growth and yield of kudiraivali Co(kv) 2

7 Brief outline of the work carried out from the project initiation period:

This is the first year of the study. The experimental crop Co (Kv) 2 Kudiraivali was sown on 01-10-2014 with the following set of treatments

T_{1}- Un inoculated Control

T_{2}-Phosphobacteria +Azospirllum (Seed Treatment 600g/ha of seeds)

T_{3}- Seed imbibitions in water for 15 minutes

T_{4} -Seed imbibitions in 1% PPFMfor 15 minutes

T_{5} -Seed imbibitions in 2% PPFMfor 15 minutes

The trial was conducted in a Randomised block design replicated thrice. A total of 273.1 mm of rainfall was received in 21 rainy days. A deficit rainfall of 25.7 per cent was recorded over normal (273.1 mm). However the growth and establishment of the crop was found normal. Observations on germination percentage and vigour index, Microbial population in rhizosphere, Plant biometricparametersand Yield attributing parameters were recorded. The data on different observations were statistically analyzed.

8 Work carried out during the review period:

The details furnished in Serial number 7 holds good for the serial number 8 since this is the first of the study.

9 Salient Findings:

1. Effect of seed treatment with Methylobacterium on seed germination and Vigour index

It was found that seed imbibitions in 1.0 per cent PPFMfor 15 minutes and seed imbibitions in 2.0 per cent PPFMfor 15 minutes recorded higher germination and Vigour index. (Table.1)

2. Effect of seed treatment with Methylobacterium inoculation on microbial population in the rhizosphere on periodical interval

It was observed that seed imbibitions in 1.0 per cent PPFMfor 15 minutes and seed imbibitions in 2.0 per cent PPFMfor 15 minutes recorded higher population of bacteria (112.32 x 10^6cfu/g), fungi (52.14 x 10^3colonies /g) and actinomycetes (26.4 x 10^4cfu/g) compared to other treatments.(Table.2)

3. Effect of seed treatment of Methylobacteriumon growth and yield parameters of Kudiraivali- Co(Kv) 2

Higher number of productive tillers and panicle length was observed with the treatments of seed imbibitions in2.0 per cent PPFMfor 15 minutes and seed imbibitions in 1.0 per cent PPFMfor 15 minutes which in turn have established positive effect on grain yield. (Table.3)

10	Remarks of the Technical Director based on the pre-review	:	- Application of methylo bacterium @1 and 2% recorded high germination percentage and root length and higher grain yield of 2400 kgha^{-1} (100%) as compared to control - SEd and CD values to be worked out and included based on which conclusions to be drawn - Seed treatment and foliar spray to be included in the revised project proposal

Table 1. Effect of seed treatment with Methylobacterium on seed germination of Kudiraivali Co(kv) 2

Treatments	Root length	Shoot length	Germination percentage	Vigor index
T_{1-} Un inoculated Control	3.75	14.2	62	1085
T_{2-} Phosphobacteria +Azospirllum (ST 600g/ha)	4.50	17.2	78	1696
T_{3-} Seed imbibitions in water for 15 minutes	4.50	16.3	65	1478
T_{4-} Seed imbibitions in 1% PPFMfor 15 minutes	7.00	21.1	95	2670
T_5 -Seed imbibitions in 2% PPFMfor 15 minutes	8.50	21.6	97	2832
SEd	**0.21**	**0.73**	**-**	**-**
CD (0.05%)	**0.42**	**1.47**	**-**	**-**

Table 2. Effect of seed treatment with Methylobacterium inoculation on microbial population in the rhizosphere of KudiraivaliCo(kv) 2

Treatments	30 DAS			60 DAS			90 DAS		
	Bacteria CFU x $10^6 g^{-1}$	Fungi Colonies x $10^3 g^{-1}$	Actino- mycetes CFU x $10^4 g^{-1}$	Bacteria CFU x $10^6 g^{-1}$	Fungi Colonies x $10^3 g^{-1}$	Actino- mycetes CFU x $10^4 g^{-1}$	Bacteria CFU x $10^6 g^{-1}$	Fungi Colonies x $10^3 g^{-1}$	Actino- mycetes CFU x $10^4 g^{-1}$
T_{1-} Un inoculated Control	32.5	20.50	10.47	48.70	25.97	14.78	26.25	11.35	3.75
T_{2-} Phosphobacteria+ Azospirllum (600g/ha)	44.2	21.14	12.48	78.35	23.35	20.14	45.12	12.34	10.15
T_{3-} Seed imbibitions in water for 15 minutes	31.5	28.47	9.47	53.78	26.47	12.47	38.56	12.9	6.78

T_4 -Seed imbibitions in 1% PPFMfor 15 minutes	65.7	34.21	15.36	105.73	47.50	23.0	59.64	28.14	12.78
T_5 -Seed imbibitions in 2% PPFMfor 15 minutes	68.4	36.0	14.78	112.32	52.14	26.41	52.64	23.47	13.62
SEd	2.602	2.712	1.817	4.7	3.195	2.22	2.87	2.45	1.65
CD (0.05%)	5.466	5.69	3.818	10.01	6.714	4.672	6.04	5.16	3.48

Table 3. Effect of seed treatment of Methylobacteriumon plant biometric and yield parameters of Kudiraivali Co(kv) 2

Treatments	**Days to 50% flowering**	**Days to maturity**	**Plant height (cm)**	**Number of productive tillers**	**Panicle length (cm)**	**Grain yield Kg/ha**	**Straw yield Kg/ha**	**Percentage yield increase**
T_{1-} Un inoculated Control	56	35	174.3	5.0	17.3	1300	3750	--
T_{2-} Phosphobacteria + Azospirllum (600g/ha)	55	36	177.7	6.0	21.0	2000	4230	53.8
T_{3-} Seed imbibitions in water for 15 minutes	56	35	157.7	4.0	18.0	1400	3500	7.7
T_4 -Seed imbibitions in 1% PPFMfor 15 minutes	54	34	186.0	7.0	22.0	2400	4300	84.6
T_5 -Seed imbibitions in 2% PPFMfor 15 minutes	54	33	185.3	7.0	22.7	2400	4450	86.0
SEd	**--**	**--**	**2.70**	**0.23**	**0.85**	**31.44**	**156.7**	**--**
CD (0.05%)	**--**	**--**	**5.41**	**0.47**	**1.70**	**62.88**	**313.4**	**-**

RRS, PAIYUR

1	Project Number	:	DRES/PAI/SAC/011/001:
2	Project Title	:	Effect of continuous addition of organic, inorganic and combination of nutrients on soil fertility and productivity under Samai- Horse gram cropping system
3	Name of the Department/Station	:	RRS,Paiyur
4	Name(s) of the Scientist(s) with Designation	:	Dr. M.VIJAYAKUMAR Asst. Professor (SS&AC)
5	Project Period	:	June 2012 - July 2015
6	Objectives	:	

7. Progress made so far :

The experiment consists of four treatments *viz*., T_1-Control, T_2-organic manuring, T_3-Inorganic fertilization (Recommended NPK 44:22:0 kg ha^{-1}), T_4-Integrated nutrient management (FYM @ 12.5 t ha^{-1} + Recommended NPK 44:22:0 kg ha^{-1} + bio-fertilizers).

The experiment was laid out in randomized block design with five replications. The initial soil sample was collected and analyzed for physico-chemical and chemical properties and results are presented in table 1.

Table 1 Initial soil properties of experimental site

Field number	: F3b
Bulk Density	: 1.22 Mg m^{-3}
Particle Density	: 2.16 Mg m^{-3}
Total porosity	: 43.5 %
AWC : 32.5 %	
Organic Carbon	: 4.3 g kg^{-1}
Texture	: sl
pH	: 7.38
EC	: 0.24 dS m^{-1}

Treatment	Av. N (kg ha^{-1})	Av. P (kg ha^{-1})	Av. K(kg ha^{-1})
T_1- Control	162	11.8	230
T_2- Organic manure	166	13.4	245
T_3- Inorganic fertilization	205	14.1	268
T_4- INM	228	15.2	254

The soil of the experimental site was sandy loam in texture; low in organic carbon (4.3 g kg^{-1}); WHC (32.5%); free from salts; neutral in pH; low in available N and medium in available P and K.

The kharif season crop samai var. Paiyur 2 was sown on 25.09.2014. The spacing adopted was 22.5 x 0 cm. The manures and fertilizers were applied as per the treatment schedule. Data on biometric characters *viz.,* plant height, No. of panicles and panicle length and grain and straw yield were recorded and presented in Table 2.

Table: 2 Effect of continuous addition of organic, inorganic and combination of nutrients on biometric characters and yield of Samai

Treatment	Plant height (cm)	No. of panicles/ plant	Panicle length (cm)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})
T_1- Control	69.1	5.8	20.7	471	1093
T_2-Organic manuring	88.3	7.8	21.9	576	1303
T_3- Inorganic fertilization	91.0	9.1	22.7	695	1544
T_4- INM	94.4	10.1	24.1	924	2150
SEd	2.81	0.351	0.983	25.0	67.7
CD (p=0.05)	6.13	0.765	2.143	54.5	148

The samai crop was harvested during 16th December, 2014 and data were recorded on biometric characters and post harvest soil samples were collected for processing and analysis of physico-chemical, biological properties and nutrient status of soils.The plant heights were ranged from 69.1 cm to 94.4 cm. Though, the treatment that received INM (T_4) practices recorded higher plant height, there was no significant difference among organic manure (T_2) and chemical fertilizer alone (T_3) however, T_4 significantly different from control (T_1). Similar trend was observed in length of panicles. The number of panicles was favourably influenced by the application of INM recorded more number of panicles (10.1) rather than organic, inorganic fertilizers alone or control. The work will be continued as per the technical programme.

The grain yield ranged from 471 kg to 924 kg ha^{-1} among the treatments. Adoption of integrated nutrient management rated to be more efficient by recording 924 kg ha^{-1} with per cent increase of yield over control (96.2%), organic manuring alone (60.4%) and inorganic fertilization alone (32.9%). Application of FYM alone was associated with 576 kg ha^{-1} and inorganic fertilizer recorded 695 kg ha^{-1}. The above results clearly indicated the more beneficial nature of integrated nutrient management in increasing the yield of samai. Similar trends were also observed in straw yield.The analysis of post-harvest soil samples for physico-chemical properties and nutrient status of soils is in progress and data will be presented during crop scientist meet, 2015.

8. Work carried out during the review period

9. Salient Findings

Application of fertilizer or organic manure either alone or in combination proved their efficiency in increasing the yield of samai over control. Adoption of integrated nutrient management (FYM @ 12.5 t/ha + Recommended dose of inorganic fertilizer 44-22-0 kg ha^{-1} N, P_2O_5 and K_2O + bio-fertilizers) rated to be more efficient by recording 924 kg ha^{-1} with yield increase of 96.2 percent over control. Application of inorganic fertilizer rated next best by recording 695 kg ha^{-1} followed by organic manure alone (576 kg ha^{-1}).

10. Remarks of the Technical Director based on the pre-review: Nil

1	**Project Number**	:	DRES/PAI/CRP/014/001
2	**Project Title**	:	Physiological basis of screening samai varieties for drought tolerance under rainfed conditions.
3	**Name of the Department/ Station**	:	RRS,Paiyur
4	**Name(s) of the Scientist(s) with Designation**	:	Dr.A.Anderson Amalan Kumar Assistant Professor (Crop Physiology)
5	**Project Period**	:	September, 2014 to May, 2016
6	**Objectives**	:	

7. Progress made so far :

A field experiment was conducted at the RRS main farm with the varieties *viz.*,Paiyur 2, PM 29, KRI-11-05, MS- 110, MS- 509, MS-1211, MS-1236, MS-4700, MS-4784 and CO 4 to screen for drought tolerance under rainfed conditions. Sowing was done after receiving a rainfall of 61.2 mm on 24.09.2014 Morphological observations was recorded on 24.10.2014(30 DAS) and 24.11.2014 (60 DAS). Significant difference between the varieties was observed for the characters studied. Maximum plant height and number of leaves was observed in KRI 11-05. Root length was more in PM 29 and was closely followed by KRI 11-05. The variety MS -1211 recorded the minimum plant height, root length and number of leaves. On 60 DAS, maximum plant height and root length was observed in PM 29. Paiyur 2 recorded maximum number of leaves.

Morphology at 30 DAS and 60 DAS and yield per hectare

Variety	30 DAS			60 DAS			Yield per hectare (t/ha)
	Plant height (cm)	Root length (cm)	No. of leaves	Plant height (cm)	Root length (cm)	No. of leaves	
Paiyur 2	38.7	8.3	5.3	38.7	4.3	8.3	1.57
PM 29	34.2	12.0	4.0	65.3	7.7	8.0	1.53
KRI -11-05	44.5	13.5	7.0	53.0	4.7	8.3	1.71
MS - 110	44.0	10.8	5.0	59.0	5.3	6.7	1.65
MS - 509	33.5	9.3	5.0	38.3	4.7	6.0	1.48
MS - 1211	29.5	7.3	3.3	64.0	3.7	6.7	1.54
MS - 1236	34.7	8.2	5.0	48.0	2.5	6.7	1.73
MS - 4700	39.8	10.2	5.0	55.0	5.0	9.0	1.57
MS - 4784	31.3	8.8	4.3	40.7	4.0	5.7	1.52
CO - 4	34.8	8.2	3.3	66.3	7.0	7.3	1.57
SE(d)	2.74	0.46	0.15	4.31	0.28	0.45	0.11
CD 0.05	5.78	0.96	0.32	9.06	0.58	0.95	0.22

Bio-chemical attributes at 60 DAS and physiological parameters.

At 60 DAS				0-30 DAS		31-60 DAS	
Variety	RWC (%)	Proline (mg/g)	Protein (mg/g)	CGR ($g/m^2/day$)	RGR (g/g/day)	CGR ($g/m^2/day$)	RGR (g/g/day)
Paiyur 2	67.10	0.74	9.09	0.506	0.084	0.755	0.013
PM 29	67.67	0.67	9.18	0.599	0.087	0.898	0.013
KRI -11-05	71.25	0.77	10.67	0.508	0.084	0.872	0.014
MS - 110	70.52	0.76	10.88	0.320	0.077	1.040	0.018
MS - 509	67.29	0.67	9.32	0.398	0.081	0.243	0.007
MS - 1211	69.13	0.68	9.29	0.335	0.078	0.793	0.018
MS - 1236	71.87	0.81	10.35	0.607	0.087	1.074	0.021
MS - 4700	70.55	0.54	10.02	0.428	0.082	0.466	0.011
MS - 4784	68.28	0.44	8.55	0.256	0.074	0.314	0.012
CO - 4	67.15	0.78	10.35	0.321	0.078	0.861	0.019
SE (d)	1.94	0.04	0.46	0.02	0.003	0.045	0.001
CD 0.05	4.06	0.09	0.97	0.041	0.006	0.094	0.003

Significant differences were observed for the bio chemical attributes. Leaf proline content was high in the variety MS 1236 (0.81 mg/g) and was par with all the varieties except MS 4700 and MS 4784. The variety MS 110 recorded the maximum protein content of 10.88 mg/g and was followed by KRI - 11-05, CO- 4 and MS-1236. Relative water content of the leaf was high in the variety MS 1236 (71.87 %) and was on par with KRI -11-05, MS 1236 and MS -110 . The variety MS- 1236 recorded the maximum crop growth rate (g/m^2/day) of 0.607 and 1.074 at 0- 30 DAS and 30-60 DAS respectively. Similar trend was observed in the relative growth rate also.

Significant difference was observed for grain yield among the 10 varieties tested for drought tolerance. MS -1236 recorded the maximum yield of 1.73 tonnes per hectare and was on par with all the varieties except MS - 509, which recorded the lowest yield of 1.48 t/ha. The culture KRI -11-05 closely followed MS 1236 with the mean grain yield of 1.71 t/ha.

8. Work carried out during the review period

9. Salient Findings:

Among ten entries tested for drought tolerance, the variety MS -1236 performed better under rainfed conditions and was followed by KRI -11-05.

10. Remarks of the Technical Director based on the pre-review:

As per the remarks of the Director, Crop Management, this project is closed. (Ref. No. DCM/RRS/PAI/ Pre review 2014-15 dt.31.01.2015).

1	**Project Number**	:	DRES/PAI/CRP/14/002
2	**Project Title**	:	“Physiological and biochemical responses of ragi cultivars under rain-fed conditions”
3	**Name of the Department/Station**	:	RRS,Paiyur
4	**Name(s) of the Scientist(s) with Designation**	:	Dr. K. Krishna Surendar Asst. Professor (CRP)
5	**Project Period**	:	August, 2014 to June, 2016
6	**Objectives**	:	

7. Progress made so far:

The sub project was proposed and submitted for approval by RPAC as per the ref.no. P&H/RRS/PYR/sub projects/CRP/2014 dt. 07.08.2014. the remarks was received vide ref.no. DCM/New/RRS/Paiyur/CRP/Remarks/2014 dt 19.09.2014 and the revised subproject was submitted for approval of RPAC vide ref.no. P&H/RRS/PYR/New research sub projects/CRP/2014 dt. 26.09.2014 and it was approved vide ref. no DR/P3/DRVI/New Proj/2014 dt 15.10.2014.

The field investigation were undertaken to study the physiological and biochemical responses of ragi cultivars under rain-fed conditions. Seven ragi entries were chosen for this experiment *viz.*, (V_1) Paiyur 2, (V_2) CO7, (V_3) CO 15, (V_4) L 5, (V_5) GPU 28, (V_6) KRI 007-01 and (V_7) KRI 009-01 with three replications and data were analyzed using Randomized Block Design. Two field experiments were considered to meet these objectives from August, 2014 to April, 2015 (Ist field experiment) and July, 2015 to June, 2016 (IInd experiment). The seeds were sown in the field with the spacing of 22.5 x 10 cm and sowing was done on 19.08.2014 after receiving the rainfall of 37.4mm. The total amount of rainfall during August, September, October and November is 37.4 mm, 106.2 mm, 248.7mm and 35.8mm**.** The morphological observations were recorded during 45th DAS, 60th DAS, 75th DAS (Days to 50% flowering) and at Harvest stage. The physiological and biochemical analysis were recorded at 50 per cent flowering stage. The results are as follows:

Amount of rainfall received during cropping period

Cropping Period	Rain fall (mm)	Rainy Days
Sowing to 45th DAS	143.6	4
46th DAS to 60th DAS	63.1	4
61th DAS to 75th DAS	185.6	7
76th DAS to Harvest	35.8	3
Total	428.1	18

The amount of water required for cultivation of ragi under rainfed condition is 450mm to 500 mm. In this experiment; it was observed that, totally 428.1mm of rainfall received with 18 rainy days. Even though, there is a deficit of rainfall (71.9mm), the changes of morphological characters and physiological and biochemical parameters of seven cultivars were observed and presented in table 1, 2, 3 and 4.

Table 1. Responses of ragi cultivars under rain-fed conditions on plant height, root length and root volume at different growth stages.

Cultivars	Plant height (cm)				Root length (cm)				Root volume (mL)			
	45th DAS	60th DAS	75th DAS	Harvest	45th DAS	60th DAS	75th DAS	Harvest	45th DAS	60th DAS	75th DAS	Harvest
Paiyur 2	44.3	73.7	93.0	93.0	13.3	19.5	19.8	23.1	8.5	10.6	10.6	13.5
CO7	48.4	62.0	83.0	82.9	13.9	17.1	17.2	18.7	8.5	10.0	10.0	13.4
CO15	52.4	66.1	82.9	82.8	13.4	21.6	21.6	21.7	7.0	9.0	9.0	12.3
L5	51.9	65.0	84.0	84.0	14.9	18.2	18.6	18.8	6.5	10.0	10.0	13.3
GPU 28	51.4	68.6	86.6	86.6	18.4	18.8	19.1	19.9	8.5	8.3	8.3	11.9
KRI007-01	56.4	63.5	81.4	81.4	13.9	15.6	16.8	18.3	6.5	8.3	8.3	11.9
KRI009-01	57.4	75.4	96.1	96.1	16.4	16.9	19.8	21.9	9.5	11.3	11.3	14.2
Mean	51.75	67.77	86.72	86.67	14.90	18.25	18.99	20.34	7.9	9.6	9.6	12.92
SEd	0.93	1.27	1.63	1.73	0.57	0.72	0.88	0.84	0.42	0.68	1.10	0.85
CD=P(0.05)	1.98	2.70	3.47	3.67	1.20	1.53	1.88	1.79	0.91	1.45	2.33	1.81

Table 2. Responses of ragi cultivars under rain-fed conditions on Leaf Area, Leaf Area Index and Leaf Area Duration at different growth stages.

Cultivars	Leaf Area (cm^2)				LAI				LAD (days)		
	45^{th} DAS	60^{th} DAS	75^{th} DAS	Harvest	45^{th} DAS	60^{th} DAS	75^{th} DAS	Harvest	45-60^{th} DAS	60- 75^{th} DAS	75^{th} DAS – Harvest
Paiyur 2	443.8	1061.9	955.8	917.6	1.97	4.72	4.25	4.08	50.2	67.3	62.4
CO7	654.6	751.7	697.1	658.8	2.91	3.34	3.10	2.93	46.9	48.3	45.2
CO15	737.1	875.7	853.8	815.5	3.28	3.89	3.79	3.62	53.8	57.6	55.6
L5	594.0	779.0	742.0	703.8	2.64	3.46	3.30	3.13	45.8	50.7	48.2
GPU 28	403.3	960.4	917.8	879.6	1.79	4.27	4.08	3.91	45.5	62.6	59.9
KRI007-01	571.5	658.3	720.5	682.3	2.54	2.93	3.20	3.03	41.0	46.0	46.8
KRI009-01	983.0	1105.5	1181.9	1143.7	4.37	4.91	5.25	5.08	69.6	76.2	77.5
Mean	**626.77**	**884.65**	**867.00**	**828.75**	**2.79**	**3.93**	**3.85**	**3.68**	**50.38**	**58.39**	**56.52**
SEd	3.97	8.94	20.90	18.25	0.01	0.02	0.06	0.06	0.32	0.74	0.97
CD=P(0.05)	8.42	18.96	44.32	38.69	0.03	0.06	0.14	0.12	0.69	1.58	2.07

Table 3. Responses of ragi cultivars under rain-fed conditions on Specific Leaf Weight, Crop Growth Rate and TDMP at different growth stages.

Cultivars	SLW (mg cm^{-2})				CGR (mg m^{-2} d^{-1})			TDMP (g)			
	45^{th} DAS	60^{th} DAS	75^{th} DAS	Harvest	45^{th} DAS	60^{th} DAS	75^{th} DAS	45^{th} DAS	60^{th} DAS	75^{th} DAS	Harvest
Paiyur 2	4.00	11.30	11.79	10.14	2.16	0.53	0.56	8.1	15.4	17.2	19.1
CO7	4.73	11.33	11.85	11.64	0.71	0.53	0.50	9.3	11.7	13.5	15.2
CO15	4.89	11.27	11.92	10.55	2.07	0.65	0.53	6.0	13.0	15.2	17.0
L5	4.94	11.94	12.29	11.95	1.57	0.86	0.53	6.6	11.9	14.8	16.6
GPU 28	4.91	11.28	11.93	11.77	1.01	0.53	0.53	9.5	12.9	14.7	16.5
KRI007-01	5.25	12.76	12.92	12.32	0.15	0.41	0.53	11.6	12.1	13.5	15.3
KRI009-01	5.23	12.70	12.89	12.02	1.87	0.59	0.53	9.5	15.8	17.8	19.6
Mean	**4.85**	**11.79**	**12.22**	**11.48**	**1.36**	**0.59**	**0.53**	**8.67**	**13.24**	**15.25**	**17.04**
SEd	0.23	0.52	NS	0.50	0.02	0.06	0.04	0.08	0.17	0.41	0.64
CD=P (0.05)	0.49	1.12	NS	1.07	0.05	0.13	0.98	0.17	0.37	0.87	1.36

The result on morphological characters viz., plant height, root length, root volume, Leaf Area, LAI, LAD, SLW, CGR and TDMP was recorded at 45^{th}, 60^{th}, 75^{th} DAS and at harvest stages. Among the seven cultivars, the highest morphological and growth attributes characters were noticed in KRI 009-01 at all the growth stages, which was followed by Paiyur 2 and both are n par with each other. The lowest performance was noticed in CO 15 and GPU 28.

Table 4. Physiological and biochemical responses of ragi cultivars under rain-fed conditions @at75th DAS (50 % flowering stage) and yield (Q ha^{-1}) at harvest stage.

Cultivars	Chl 'a' (mg g^{-1})	Chl 'b' (mg g^{-1})	Total chlorophyll (mg g^{-1})	Soluble protein (mg g^{-1})	Proline (mg g^{-1})	CSI (%)	MSI (%)	RWC (%)	Yield (Q ha^{-1})
Paiyur 2	0.93	0.62	1.55	12.0	0.86	85.5	81.2	76.2	38.07
CO7	0.87	0.39	1.27	11.5	0.70	81.9	77.6	70.9	37.68
CO15	0.93	0.50	1.43	11.6	0.69	84.1	79.8	74.7	37.53
L5	0.86	0.19	1.05	9.5	0.59	79.0	74.7	72.2	37.47
GPU 28	0.91	0.47	1.38	11.5	0.72	84.0	79.7	73.9	37.23
KRI007-01	0.90	0.44	1.33	9.0	0.58	84.1	79.8	72.1	39.16
KRI009-01	0.95	0.62	1.57	22.0	1.18	85.2	80.9	77.2	39.95
Mean	**0.91**	**0.46**	**1.37**	**12.44**	**0.76**	**83.39**	**79.12**	**73.90**	**38.16**
SEd	0.014	0.015	0.029	1.965	0.018	0.194	0.218	0.235	0.101
CD=P(0.05)	0.022	0.033	0.050	4.282	0.020	0.378	0.420	0.513	0.203

The data on physiological and biochemical parameters were significantly differed between the entries and was recorded at 50% flowering stage. Comparing the entries, KRI009-01 showed its superiority over the other entries. The entries of KRI009-01 had highest value in total chlorophyll content, soluble protein, stress imino acid of proline, chlorophyll stability index, membrane stability index and relative water content (1.57 mg g^{-1}, 22.0 mg g^{-1}, 1.18 mg g^{-1}, 85.2%, 80.9%, 77.2%). However, the lowest value was observed in CO 15 and GPU 28.

The yield was recorded at harvest stage. Plot yield and yield ha^{-1} were recorded after threshing. Comparing the seven entries, KRI 009-01 had highest plot yield of (2.69 kg and kg $plot^{-1}$) and hectare yield of (39.95 Q ha^{-1}). Therefore, the entries of KRI 009-01 performed superior and were identified suitable entries for grown under rainfed conditions.

8. Work carried out during the review period

9. Salient Findings:

The entries of KRI009-01 had highest value in morphological, growth attributes, physiological and biochemical parameters and were significantly differed between the other entries. Therefore, the entries of KRI 009-01 performed superior under rainfed conditions

10. Remarks of the Technical Director based on the pre-review:

As per the remarks of the Director, Crop Management, this project is closed.

(Ref. No. DCM/RRS/PAI/ Pre review 2014-15 dt.31.01.2015).

CRS,Veppanthattai

1	Project Number	:	**TRRI/VPT/AGR/12/001**
2	Project Title	:	Studies on conservation tillage crop residues and supplemental irrigation through drip irrigation for dryland crops in black soil
3	Name of the Department/Station	:	CRS,Veppanthattai
4	Name(s) of the Scientist(s) with Designation	:	Dr. R. Baskaran Assistant Professor (Agronomy)
5	Project Period	:	October 2012 to September 2015 (Three years)
6	Objectives	:	

7. Progress made so far:

Treatments

Main plot

M_1 – Conventional tillage

M_2 – Minimal tillage – BBF without crop residue

M_3 – Minimal tillage – BBF with crop residue @ 2.5 tons ha-^{1}

M_4 – Minimal tillage – BBF with crop residue @ 5 tons ha-^{1}

Sub plot

S_1- Supplemental drip irrigation one time

S_2- Supplemental drip irrigation two times

S_3- Supplemental drip irrigation three times

S_4- Control

Results

The experiment was laid out as per the treatment schedule and the maize hybrid NK 6240 was sown on 25.08.2014 and harvested on 08.01.2015 The soil moisture was measured by using theta probe moisture meter and plant height was recorded at 30, 60 and 90 DAS. Results revealed that there was no variation in germination percentage of maize. Crop residue application and supplemental drip irrigation influenced the soil moisture, plant height, yield attributes and yield of maize.

Among the main plot treatment minimum tillage (BBF) with crop residue application @ 5 tons/ha recorded higher plant height of 53.2, 147.5, 197.2 and 221.6 cm at 25 DAS, 40 DAS, 55 DAS and harvest, respectively.

Similarly yield attributes like, cob length, (19.7 cm),cob girth (15.8 cm), cob weight (136.7 g), test weight (306 g) , no of grain/cob (412.9) and yield of 6,150 kg/ha This was followed by minimum tillage (BBF) with crop residue application @ 2.5 tons/ha. Lower plant height, yield attributes and yield were recorded in the conventional tillage method.

In the sub plot treatment supplemental drip irrigation given at three times during the crop growing period, recorded higher plant height of 53.6 , 146.8, 192.2 and 206.5 cm at 25 DAS, 40 DAS , 55 DAS and harvest respectively. Similarly yield attributes like, cob length, (19.5 cm). cob girth (16.2 cm), cob weight (141.1 g), test weight (307 g), no. of grain/cob (405.3) and yield of 6460 kg/ha. This was followed by supplemental drip irrigation given two times during the crop growing period. Lower plant height and yield attributes and yield were recorded in no supplemental drip irrigation methods (Table 1 and 2)

Nutrient uptake and Economics:

Minimum tillage (BBF) with crop residue application @ 5 tons/ha (M_4) registered higher plant nutrient uptake of N (108.2 kg/ha), P (23.8 kg/ha), K (107.5 kg/ha) (Table. 3) and higher net return (Rs. 46,000/ha) and cost benefit ratio (2.7) (Table 4).This was followed by minimum tillage (BBF) with crop residue application @ 2.5 tons/ha and comparable to the conventional tillage method of treatment.

Similarly in the sub plot treatment supplemental drip irrigation given three times (S_3) during the crop growing period registered higher nutrient uptake of N (107.1 kg/ha), P (21.5 kg/ha), K (103.8. kg/ha) and higher net return (Rs**.** 50.120/ ha), cost benefit ratio (2.8).This was followed by supplemental drip irrigation given two times.

Soil moisture content:

Minimum tillage (BBF) with crop residue application @ 5 tons/ha recorded the maximum soil moisture at 30 and 60 DAS at 0-15cm, 15-30cm, 30-45cm depth and the treatment had no effect on soil moisture at 90 DAS.

Supplemental drip irrigation given three times during the crop growing period had significant effect on soil moisture content during the crop growth stages. This treatment recorded higher soil moisture content at 30 and 60 DAS at the soil depth of 0-15, 15-30 and 30-45 cm and the treatment had no effect on soil moisture at 90 DAS.

Interaction effect between main and subplot treatments had no influence on soil moisture, growth, yield attributes and yield of maize crop (Table 5).

Table 1. Conservation tillage, crop residue application and supplemental irrigation on germination and plant height (cm) of maize

Treatment	Germination (%)	Plant height (cm)			
		25 DAS	40 DAS	55 DAS	Harvest
Main plot					
M_1	**92.8**	37.6	128.4	175.2	204.1
M_2	**94.3**	42.7	134.6	187.4	21238
M_3	**96.7**	48.8	142.2	192.1	216.4
M_4	**97.2**	53.2	147.5	197.2	221.6
S.Ed	**1.6**	0.9	1.9	1.8	2.2
C.D (P=0.05)	**NS**	1.1	4.1	3.8	4.8
Sub Plot					
S_1	**95.6**	45.4	138.3	181.9	192.6
S_2	**97.5**	51.2	142.0	184.8	199.2
S_3	**98.0**	53.6	146.8	192.2	206.5
S_4	**94.2**	43.4	133.4	165.4	180.6
S.Ed	**1.8**	0.7	1.6	2.8	3.0
C.D (P=0.05)	NS	1.5	3.5	6.0	6.4
M at S					
S.Ed	2.2	0.7	1.9	2.0	2.2
C.D (P=0.05)	NS	NS	NS	NS	NS
S at M					
S.Ed	3.8	0.73	0.90	2.2	2.4
C.D (P=0.05)	NS	NS	NS	NS	NS

Table 2.Conservation tillage, crop residue application and supplemental irrigation on yield attributes and yield of maize

Treatment	Cob length (cm)	Cob girth (cm)	Cob Weight (g)	Test weight (g)	No of grain /cob	Yield (Kg/ha)
Main plot						
M_1	15.9	13.3	113.8	288	348.6	4430
M_2	16.2	14.6	129.4	290	388.4	5150
M_3	17.3	15.2	131.4	293	396.8	5550
M_4	19.7	15.8	136.7	306	412.9	6150
S.Ed	0.6	0.08	8.1	0.95	6.4	86.7
C.D **(P=0.05)**	1.3	0.17	17.5	NS	13.8	187
Sub Plot						
S_1	16.4	14.2	119.5	306	361.3	5280
S_2	17.5	15.6	127.8	294	382.5	5795
S_3	19.5	16.2	141.1	307	405.3	6460
S_4	15.3	14.2	110.9	292	310.7	4750
S.Ed	0.5	0.7	9.5	0.60	9.04	90.4
C.D **(P=0.05)**	1.1	1.5	20.52	NS	19.4	195
M at S						
S.Ed	3.3	5.8	11.7	0.70	80.0	86.5
C.D (P=0.05)	NS	NS	NS	NS	NS	NS
S at M						
S.Ed	4.2	6.6	13.2	0.82	73.5	94.3
C.D (P=0.05)	NS	NS	NS	NS	NS	NS

Table 3. Effect of different conservation, crop residue application and supplemental irrigation on economics of maize.

Treatment	Gross return (Rs/ha)	Cost of cultivation (Rs/ha)	Net Return (Rs/ha)	Benefit cost ratio
Main plot				
M_1	53,160	24,360	28,800	2.2
M_2	61,800	25,780	36,020	2.4
M_3	66,600	26,900	39,700	2.5
M_4	73,800	27,800	46,000	2.7
Sub plot				
S_1	63,360	25,100	38,260	2.5
S_2	69,540	26,300	43,240	2.6
S_3	77,520	27,400	50,120	2.8
S_4	57,000	24,350	32,650	2.3

Table 4. Effect of different conservation, crop residue application and supplemental irrigation onnutrient uptake of maize

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)
Main plot			
M_1	94.3	16.2	88.6
M_2	88.5	17.9	92.1
M_3	102.3	21.5	93.5
M_4	108.2	23.8	107.5
S.Ed	3.5	1.2	3.9
C.D**(P=0.05)**	7.5	2.6	7.6

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)
Sub Plot			
S_1	91.2	19.6	80.2
S_2	103.6	20.6	96.3
S_3	107.1	21.5	103.8
S_4	82.2	14.6	70.2
S.Ed	3.7	1.4	3.2
C.D**(P=0.05)**	8.0	3.0	8.4
M at S			
S.Ed	3.2	1.5	4.9
C.D (**P=0.05)**	. NS	NS	NS
S at M			
S.Ed	4.1	1.8	4.5
C.D (P=0.05)	. NS	NS	NS

Table 5. Effect of different conservation, crop residue application and supplemental irrigation on Soil moisture content

Treatment	Soil moisture content (%)								
	30 DAS			60 DAS			90 DAS		
	0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 Cm	0-15 cm	15-30 cm	30-45 cm
Main plot									
M_1	30.6	32.3	35.8	33.2	34.6	34.5	35.0	36.8	35.2
M_2	31.9	35.6	37.3	36.2	35.5	35.9	36.8	37.2	37.5
M_3	33.4	36.9	38.1	37.4	36.2	36.5	38.7	38.6	38.9
M_4	35.2	38.5	38.8	39.5	38.8	38.8	39.8	39.2	39.4
S.Ed	0.5	0.6	0.8	1.3	0.9	1.0	0.9	1.4	1.7
C.D**(P=0.05)**	1.08	1.3	NS	2.8	1.9	2.2	NS	S	NS

Sub Plot									
S_1	33.4	33.6	35.8	35.0	32.1	31.2	33.5	35.2	35.9
S_2	34.6	35.4	36.2	36.6	34.1	34.8	36.8	37.2	36.6
S_3	36.**0**	38.2	38.5	38.5	39.5	37.2	39.2	39.5	38.6
S_4	31.2	31.9	34.6	34.5	31.9	31.0	34.6	33.1	31.2
S.Ed	0.7	0.8	0.9	0.8	0.8	1.1	1.1	1.3	1.8
C.D**(P=0.05)**	1.5	1.7	NS	NS	NS	NS	NS	NS	NS
M at S									
S.Ed	1.6	1.7	1.1	0.8	1.5	1.7	1.4	1.5	1.8
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
S at M									
S.Ed	1.4	1.9	1.3	0.7	1.2	1.9	1.9	2.4	2.0
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

8. Work carried out during the review period

9. Salient Findings:

Minimum tillage (BBF) with crop residue application @ 5 tones/ha and supplemental drip irrigation given at three times during the crop growing period had significant effect on soil moisture content , plant height, yield attributes and yield.

10. Remarks of the Technical Director based on the pre-review:

i. Economics to be worked out.

As per the suggestion, economic is worked out and incorporated in the report.

ii.To be continued

Experiment was also conducted during the year 2014 – 2015 after obtaining proper approval.

1	Project Number	:	TRRI/VPT/AGR/12/002
2	Project Title	:	Evaluation of *in-situ* water harvesting technologies and crop residue addition on soil moisture retention, growth and yield for dry land crops (Maize).
3	Name of the Department/Station	:	CRS,Veppanthattai

4	Name(s) of the Scientist(s) with Designation	:	Dr. R. Kavimani Professor and Head (Agronomy)
5	Project Period	:	September 2012 to August 2015 (Three years)
6	Objectives	:	

7. Progress made so far:

Maize hybrid COHM6 was sown on 12.08.2014 and harvested on 10.12.2014. Data on soil moisture, plant height, yield and yield attributes were recorded and analyzed statistically. Initial soil sample was collected and analyzed for its physical and chemical properties. The total rainfall during the cropping period was 482.0 mm received in 42 rainy days as against the normal rainfall of 699.0 mm in 31 rainy days.

Analysis revealed that there was no variation in germination percentage of maize. Soil moisture, plant height, yield attributes and yield were significantly influenced by both main plot and subplot treatments. Broad Bed and Furrow system(M_2) recorded maximum soil moisture content at 0-15cm, 15-30cm and 30-45cm depth at 30, 60 and 90 DAS which was on par with M_3(Table:1). Soil mulching with crop residue @5tons/ ha (S_2) favored higher soil moisture content at 0-15cm, 15-30cm, 30-45 cm soil depth at 30, 60 and 90 DAS, which was at par with coirpith incorporation @5tons/ ha (S_3) and biochar application @ 5 tons/ha (S_4).

Maize crop raised in Broad Bed and Furrow system (M_2) recorded higher plant height at 30, 60 and 90DAS and higher yield attributes viz, no. of grains/cob which was at par with the treatment M_3. Coir pith incorporation @ 5tons/ha (S_3) registered higher plant height at different growth stages and yield attributes i.e. no. of grains/cob which was on par with S_4 andS_2 (Table 2). Broad Bed and Furrow system (M_2) recorded higher grain yield of 5926 kg/ha which was at par with the treatment M_3. Incorporation of coir pith @ 5tons/ha (S_3) recorded an increased grain yield of 13 % over no crop residue addition (S_1). Different treatments had no effect on yield attributes such as cob length, cob girth, no. of rows/cob, no. of column /cob and 100 grain weight.

Interaction effect between main and subplot treatments had no influence on soil moisture, growth, yield attributes and yield of maize crop.

8. Work carried out during the review period

9. Salient Findings:

Germination percentage of maize crop was not influenced by land configuration and crop residue addition.

Higher soil moisture was observed at 0-15 cm, 15-30cm and 30-45 cm soil depth at 30,60 and 90 DAS in Broad Bed and Furrow system. It also recorded taller plants, higher yield attributes and yield. In case of sub plot soil mulching with crop residue @ 5tons/ha recorded higher soil moisture which was at par with coir pith and biochar application @5tons/ha. Coir pith addition registered higher yield attributes, yield and net profit of maize crop.

10. Remarks of the Technical Director based on the pre-review:

i. Economics to be worked out.

As per the suggestion, economic is worked out and incorporated in the report.

ii.To be continued

Experiment was also conducted during the year 2014 – 2015 after obtaining proper approval. (Extension proposal approval No. DR/TRRI/ADT/RPAC/VPT – AGR/2014 dt. 27.11.2014)

Table 1. Effect of land configuration and crop residue addition on germination and soil moisture in rainfed maize

Treatments	Germination percentage	Soil moisture (%) 30 DAS			Soil moisture (%) 60 DAS			Soil moisture (%) 90 DAS		
		0-15cm	15-30cm	30-45cm	0-15cm	15-30cm	30-45cm	0-15cm	15-30cm	30-45cm
M_1 - Compartmental bunding	96.74	29.16	30.33	30.88	29.25	29.93	31.98	37.65	38.88	40.68
M_2 – Broad Bed and Furrow	97.85	30.54	32.46	34.08	31.05	31.60	32.95	40.20	41.15	42.65
M_3 –Ridges and Furrow	97.43	30.49	32.02	32.35	29.28	31.18	32.15	38.85	40.15	41.93
M SEd CD (P= 0.05)	0.58 NS	0.50 1.02	0.90 1.85	1.45 2.96	0.61 1.25	0.52 1.06	0.73 NS	0.75 1.53	0.73 1.50	0.63 1.29
S_1 – No crop residue addition	97.21	29.46	29.93	30.06	28.43	29.64	31.40	37.47	38.73	40.77
S_2 – Crop residue mulch @ 5tons/ha	97.04	32.14	32.56	33.29	30.80	32.03	32.87	40.03	40.93	42.13
S_3 – Coirpith incorporation @ 5tons/ha	97.44	31.26	32.36	32.93	30.20	31.20	32.70	39.13	40.40	42.10
S_4–Biochar application@ 5tons/ha	97.66	30.89	31.92	32.52	30.00	31.10	32.47	38.97	40.02	42.00
S SEd CD (P= 0.05)	0.67 NS	0.58 1.18	0.95 1.94	1.52 3.12	0.70 1.44	0.60 1.23	0.84 NS	0.86 1.77	0.85 1.74	0.72 NS
M at S SEd CD (P= 0.05)	1.16 NS	1.04 NS	1.56 NS	2.51 NS	1.22 NS	1.04 NS	1.38 NS	1.42 NS	1.40 NS	1.19 NS
S at M SEd CD (P= 0.05)	1.46 NS	1.15 NS	2.03 NS	3.27 NS	1.54 NS	1.29 NS	1.80 NS	1.85 NS	1.82 NS	1.55 NS

Table 2. Plant height, yield attributes and grain yield of maize as influenced by various treatments

Treatments	Plant height cm			Yield attributes						
	30 DAS	60 DAS	90 DAS	Cob length cm	Cob girth cm	No. of column/cob	No. of rows/ cob	No. of grains/cob	100 grain weight g	Grain yield kg/ha
M_1 -Compartmental bunding	100.95	253.48	256.13	19.42	15.63	32.05	14.6	471	44.65	5508
M_2 – Broad Bed and Furrow	106.30	262.90	260.70	20.15	16.06	32.53	14.8	487	45.64	5926
M_3 –Ridges and Furrow	105.28	257.20	259.83	19.76	16.04	32.48	14.8	482	44.75	5779
M SEd CD (P= 0.05)	1.21 2.49	3.14 6.42	1.75 3.57	0.52 NS	0.33 NS	0.48 NS	0.3 NS	3 6	0.83 NS	114 234
S_1 – No crop residue addition	101.40	251.70	247.47	19.02	15.56	31.63	14.1	460	46.48	5494
S_2 – Crop residue mulch @ 5tons/ha	103.54	260.33	259.23	19.78	15.73	32.17	14.4	479	43.12	5673
S_3 – Coirpith incorporation @ 5tons/ha	106.82	270.87	265.60	20.31	16.52	33.13	15.0	485	45.32	6036
S_4–Biochar application@ 5tons/ha	104.93	264.93	263.23	20.03	15.81	32.47	14.6	482	45.14	5778
S SEd CD (P= 0.05)	1.40 2.87	3.96 8.11	2.02 4.18	0.67 NS	0.42 NS	0.61 NS	0.3 NS	3 7	0.95 NS	132 270
M at S SEd CD (P= 0.05)	2.17 NS	6.14 NS	3.13 NS	1.04 NS	0.67 NS	0.85 NS	0.5 NS	6 NS	1.65 NS	229 NS
S at M SEd CD (P= 0.05)	2.98 NS	7.91 NS	4.02 NS	1.34 NS	1.36 NS	1.13 NS	0.6 NS	7 NS	2.15 NS	297 NS

Table 3. Economics

Treatments	Gross Income Rs/ha	Cost of Cultivation Rs/ha	Net Profit Rs/ha	B:C Ratio
M_1S_1	59,517	29,620	29,897	2.01
M_1S_2	61,201	31,710	29,491	1.93
M_1S_3	66,817	33,128	33,689	2.02
M_1S_4	61,429	34,680	26,747	1.77
M_2S_1	64,365	29,120	35,245	2.21
M_2S_2	65,823	32,210	34,613	2.11
M_2S_3	69,574	32,628	36,946	2.13
M_2S_4	68,083	34,180	33,903	1.99
M_3S_1	62,353	29,120	33,233	2.14
M_3S_2	64,263	32,210	32,053	2.00
M_3S_3	68,218	32,628	35,590	2.09
M_3S_4	66,365	34,180	32,185	1.94

Grain Rate: Rs. 11.30/kg

1	Project Number	:	
2	Project Title	:	Evaluation of System of Finger millet (*Elusinecoracana*) Intensification (SFI) in Tamil Nadu''
3	Name of the Department/Station	:	Centre of Excellence in Millets, Athiyandal – 606 603
4	Name(s) of the Scientist(s) with Designation	:	Dr. M. Jayachandran, Professor & Head
5	Project Period	:	February 2015- June 2018

6 Objectives:

To find out suitable nursery management techniques and age of the seedling for SFI

To find out suitable spacing and plant density to enhance productivity under system of finger millet intensification (SFI)

To assess the performance of seedling density on tiller production with SFI system of finger millet cultivation

To evaluate the performance of system of finger millet intensification (SFI) under varied levels of N management with leaf colour chart

To evaluate suitable weed management practices with mechanized power weeding in SFITo work out water requirement and water management techniques for SFI

To assess the economic benefits of SFI with conventional method of finger millet cultivation

7 Brief outline of the work carried out from the project initiation period:

Project proposal has been submitted to the Director (TRRI) for the approval of RPAC

8 Work carried out during the review period:-

9 Salient Findings:Too early to report

10 Remarks of the Technical Director based on the pre-review:Does not arise

1	Project Number	:	
2	Project Title	:	Effect of organic foliar spray on growth and yield of finger millet
3	Name of the Department/Station	:	Centre of Excellence in Millets, Athiyandal – 606 603
4	Name(s) of the Scientist(s) with Designation	:	Dr. K. Sivagamy Assistant Professor (Agronomy)
5	Project Period	:	March 2015 to July 2017

6 Objectives:

To evolve the suitable foliar nutrition through organic sources for ragi.

To study the effect of foliar nutrition through organic sources on growth and yield of ragi

To analyze the economics of ragi

7 Brief outline of the work carried out from the project initiation period:

Project proposal has been submitted to the Director (TRRI) for the approval of RPAC

8 Work carried out during the review period:-

9 Salient Findings: Too early to report

10 Remarks of the Technical Director based on the pre-review: Does not arise

1	Project Number	:	
2	Project Title	:	Effect of date of sowing on seed yield and quality in Samai
3	Name of the Department/Station	:	Centre of Excellence in Millets, Athiyandal – 606 603
4	Name(s) of the Scientist(s) with Designation	:	Dr. V. Paramasivam, Professor (SST)
5	Project Period	:	December, 2014 - November, 2017
6	Objectives: To study the effect of date of sowing on seed yield. To study the influence of date of sowing on resultant seed quality.		
7	Brief outline of the work carried out from the project initiation period	:	Project proposal has been submitted to the Director (TRRI) for the approval of RPAC
8	Work carried out during the review period	:	-
9	Salient Findings	:	Too early to report
10	Remarks of the Technical Director based on the pre-review	:	Does not arise

1	Project Number	:	
2	Project Title	:	Effect of seed priming techniques on seed germination and yield in Ragi (Finger millet: *Eleusinecoracana*)
3	Name of the Department/Station	:	Centre of Excellence in Millets, Athiyandal – 606 603
4	Name(s) of the Scientist(s) with Designation	:	Dr. J. Yogalakshmi Assistant Professor (SST)
5	Project Period	:	September 2014 - September 2016

6 Objectives:

To assess the effect of various seed priming techniques on germination in Finger millet (Ragi- *Eleusinecoracana*).

To assess the seed yield using different seed priming techniques

7 Brief outline of the work carried out from the project initiation period:

Project proposal has been submitted to the Director (TRRI) for the approval of RPAC

8 Work carried out during the review period: -

9 Salient Findings: Too early to report

10 Remarks of the Technical Director based on the pre-review: Does not arise

CROP PROTECTION

I. MAIZE

A. Plant Pathology

1. AC&RI, Coimbatore

1	Project Number	:	**“AICRP/PBG/CBE/MAZ/004”**
2	Project Title	:	**AICRP on Maize Improvement**
3	Name of the Department/Station	:	Department of Millets Tamil Nadu Agricultural University Coimbatore-641003
4	Name(s) of the Scientist(s) with Designation	:	Dr. P. Renukadevi Assistant Professor (Plant Pathology)
5	Project Period	:	Continuous scheme
6	Objectives	:	Screening of maize entries against sorghum downy mildew under artificial condition and documenting other disease
7	Brief outline of the work carried out from the project initiation period	:	Regular screening of the national entries for sorghum downy mildew disease to identify the multiple disease resistant source.S Survey and surveillance of seasonal occurrence of various diseases and recording outbreak of new diseases of maize and documenting.

8. Work carried out during the review period:

1. Maintenance of Sorghum Downy Mildew Inoculum Nursery:

SDM inoculum nursery has been established at glass house of Department of Plant Pathology using SDM susceptible check CM500. The plants were sprayed with SDM conidial suspension collected from ZARS. Mandiya, Karnataka at two leaves stage continuously for five days by 3.00 am in the morning for the establishment of disease. The infection could not be established because of low Relative Humidity (< 80%) and high temperature.

2. Survey and Surveillance

Survey was conducted during Kharif 2014. In Kharif Thiruchencode,Udumalpet, Dindugal, Pongaliyur and thondamuthur locations were surveyed. But only in Thondamuthur and Pongaliyur the sorghum downy mildew incidence was found to be 70 and 100 % where sowing was done only in October. The rainfall during that month was

352 mm. The ear rot incidence was recorded in Anthiyur block. The pathogen identification and confirmation is in progress through pathogenicity tes.

3. Screening of National entries for sorghum downy mildew resistance

Four Intial Varietal Trials (IVT) and nine Advanced Varietal Trials(AVT) and two sets of inbreds were screened for SDM incidence

(A). Evaluation of maize entries against sorghum downy mildew (SDM) caused by *Pernosclerospora sorghi*

A total of 455 entries belong to different maturity groups were screened against sorghum downy mildew (SDM) caused by *Peronosclerospora sorghi*. Out of 455 entries, 174 entries showed the resistant reaction and 184 entries showed moderate resistant and 97 entries showed susceptible reaction. The susceptible check CM500 recorded 25- 80 % downy mildew incidence. The resistant check TNAU CoH-6 showed 100 percent resistance. The grade scale for screening downy mildew- Incidence <10%- Resistant; 10-25 %- Moderately resistant; >25% Susceptible to highly susceptible.

(B). Evaluation of inbred lines (146 entries) for identification of resistant sources agains Sorghum downy mildew during Kharif 2014.

146 inbred lines were screened for their reactions to Sorghum downy mildew. Out of 146 inbreds, 60 inbreds showed resistant reaction, 53inbreds showed moderately resistant and 39 inbreds showed susceptible reaction against sorghum downy mildew of maize. The resistant check TNAU CoH-6 showed 100 percent resistance. The susceptible check CM 500 recorded 80-100 % SDM incidence.

(C). Trap Nursery

Twelve inbreds were sown for checking natural occurrence of various diseases. All the inbreds except SC 24-1-2-6 recorded 6.00 to 100 % of Sorghum downy mildew. Polysora rust was found upto grade 3 and Turcicum Leaf Blight was found upto grade 1 only.

(D). Development of integrated disease management for major diseases of maize

Experiment was conducted for the management of Sorghum Downy Mildew at Coimbatore centre with the following ten treatments with susceptible Inbred – CM500with three replications.

Treatments:

T_1 *ST-Bacillus amyloliquefaciens* @10g/kg ; SA (1:50) + FA @ 1.0% @15th& 35th DAS

T_2 ST -TV-3 *Trichoderma viride* @ 0.5% +SA (1:50) + FS @ 0.5% @15th& 35th DAS

T_3 ST-TH-3 (*Trichoderma harzianum*) @ 0.5% SA-(1:50) + FS @ 0.5% @15th& 35th DAS

T_4 ST-*Trichoderma asperellum* @ 0.5% +SA- (1:50) FS@ 0.5% @15th& 35th DAS

T_5 ST-*Trichoderma harzianum* @ 0.5% +SA-(1:50) +FS @ 0.5% @15th& 35th DAS

T_6 ST-Fosetyl-al @ 0.2% +FS- @ 0.2% FS @15th& 35th DAS

T_7 ST-Azoxystrobin @ 0.2%+ FS @ 0.15% @15th& 35th DAS

T_8 ST-Metalaxyl+Mancozeb @ 0.25% +FS @ 0.25% @15th& 35th DAS

T_9 ST -Metalaxyl @ 0.25% FS @ 0.25% @15th& 35th DAS

T_{10} Untreated check (water spray) @15th& 35th DAS

The experiment was conducted, but there was no incidence of sorghum downy mildew due to unfavourable relative humidity, temperature and rainfall during the cropping period.

9. Salient Findings:

For Information:

- A total of 455 entries belong to different maturity groups were screened against sorghum downy mildew (SDM) caused by *Peronosclerospora sorghi*. Out of 455 entries, 174 entries showed the resistant reaction and 184 entries showed moderate resistant and 97 entries showed susceptible reaction. The infector row (CM500) and spreader rows were artificially inoculated with spraying of conidial suspension of Peronosclerospora sorghi by 3.00 am in the morning (Two sprays were given) . The susceptible check CM500 recorded 25- 60 % downy mildew incidence. The resistant check TNAU CoH-6 showed 100 percent resistance.
- In Trial no .61 Pathology, Nematology and Soil Science late Maturity Trial, among 120 IVT Late maturing entries screened, 42 entries were found to be resistant with < 10% SDM (JH 13183, MAH-974, K-25 Gold, SAMH-378, GYH-0652, CMH12-667, GOLD 1166, Srikar 3033, DMRH 1413, DAS-MH-107, HKH 422, REH 2013-2, JH 13244, JH 12063, JH13252, NT 8441, BH 412095, JKMH 4242, HT 51412373, JH 13230, GIN 02, BH 412140, CMH 10-555, VNR 31862, KF-110, GK-3118, DMRH 1415, KH-1408, SYN417750, IN 8603, JH 13044, GH-110204, MAH-957, GPS-02, GPMH-1111, Proline-2404, CMH 12-671, CMH11-618, KMH-3981, GH-110145, NT8711, GPS-03, HKH423, VEH 14-1, ADV 1190384, JH13023, IN8903, PRMH-189, DMRH 1411, SAMH-225) and 69 entries are moderately resistant with 10-25 % SDM incidence (PM 14105L, NMH 1605, JH 13197, ADV 0990293, CSM1, super 777, NT 6325, JH 130456, AH 7005, NMH-1247, JH 13094, CMH12-663, ADV 0990296, GIN 01, IN 8570, siri-4555, Bio-069, JH 13037, VNR4325, BH 412096, BH412141, REH2013-6, JH13278, PM14104L, PMSW4, JH13270, IN8569, HT 51412616, JH13249, GK-3124, 115-08-01, JH 13248,

CP.555, DMH-7721, HT51412607, DMH-182, Sonam-27, IN8902, PM 14101L, REH2013-5, BH412131, JH12150, GPMH-1101, DKC9125, KH-2192, DMRH1409, IAHM 2013-12, PM14102L, RMH 726, PMH 3-C, Bio-9681-C, Seedtech 2324-C, HM11-C)and 9 entries were susceptible with >25% SDM incidence.(JH13041, JH13282, JH12010, NMH 1008, JKMH 4023, DAS-MH-106, Super6768, PM14101L, GPS-03).

- In Trial 62 Pathology, Nematology and Soil Science Medium Maturity Trial, among 129 IVT medium maturity entries, 51 entries showed resistance (LMH414, JH13172, DMRH1413, KH545,EH-2372, DH1411, TMMH801, UDMH-115, PM 14106M, DMRH1416, QMH-1034, DMRH1412, MMH5-13, HT51412616, JH13114, DAS-MH-306, NMH-3612, MMH2-13, JH13226, CMH11-619, GK-3120, DH1415, KF-105, AH-1322, GPS05, PM14108M, KMH-4811, HT51412182, CP.201, LMH114, HAH343, IAHM2013-11, NMH-3662, UDMH-114, JH13215,VEH14-2, IN8401, IAHM2013-26, KDMH100-3, CMH11-584, JH13224, CMH11-615, HKH344, DH1405, CMH11-586, DAS-MH-307, HM10(C))and 11 entries were susceptible with >25% SDM incidence (IAHM2013-9, JH 13164, GPS 01, Proline 786, Bio 719, MMH 3-13, RMH 796, JH13121, DH1401, Bio-9637(C)) and 67 were moderately resistant (QMH-1025, BH 412063, BH 412084, EH-2381, PMH 2277, JH 13246, JH 13139, EH-2235, IAHM 2013-97, ZMH-99 9, KDMH 100-8, HT 51412373, DH1413, DMRH1417, DH1403, JH 13164, GPS 01, BL897, MMH 4-13, REH2013-1, Zuari Nandiri, CMH11-593, REH2013-4, Srikar 4689, LMH 314, KH-517 Gold, AWLH2, TI8261, IASH 11C022, JH 13142, JH13119, SHIATS MS2, IAHM 2013-33, AWLH1, MMH6-13, CMH12-665, DMRH1301, HT51412081, BH412066, JH 31605, JH13122, JH31607, JKMH4848, REH2013-3, DMRH1302, DH1405, LMH 214, BH412044, BH412064, PM 14107M, BH412062, PMH 4(C), HM9(C)).
- In Trial 63 Pathology, Nematology and Soil Science Early Maturity trial, Among 51 IVT early maturing variety, 30 entries are found to be resistant (CMH12-675, FH 3704, KMH12-9, HKH 345, HKH347, CMH12-697, CMH10-527, DH286, BH412071, JKMH4025, PM14109E, AH-1318, AH-1320, DAS-MH-502, AH5021, DMRE1403, FH3695, DH283, KDMH100-1, AH-1319, CMH10-552, KMH12-8, K-26, GYH-0461, EH-2244, PM 14110E, FH 3703, Shalimaar maize com 6, Shalimaar maize com 5, Prakash (C)) and 19 entries are moderately resistant (EH-2371, LMH 614, BH 412093, LMH514, HKH346, GYH-0656, KMH12-18, AH-1321, AH 9001, CMH 12-691, AH7002, DAS-MH-502, AH 5012, KDMH 100-1, OMH-11, AH7001, GWH-0330, GWH-0503, Shalimaar maize hybrid2) and 3 entries (KF-95, SAMH-221, Shalimaar maize com 7) were found to be highly susceptible with 55% SDM incidence.
- In Trial 64 Pathology, Nematology and Soil Science Extra Early Maturity trial, Among 13 IVT Extra early maturity entries, 9 entries are found to be resistant (EH-2236, EH-2234, DH277, APH 27, DH 287, FH 3706, DH 285, AH -1317, Vivek Hybreds-43 (C)) and 3 entries are found to be moderately resistant (AH-1316, DH 288, Vivek Hybreds-21 (C)) and no entry was found to be susceptible.
- In Trial no .75 Pathology Entomology Trial (Late maturity), Among 27 AVT late maturity entries, 6 entries were resistant to SDM (VNR 31834, X35D601, DKC

9133(IM8539), HTMH 5108, HTMH 5202) and 7 entries were moderately resistant(HTMH 5404, KMH-2811, RMH-972, SUPER GA-105, VNR31355, SRI 4527, JH 12247) and 13 entries were found to be susceptible(IM 8562, CP.999, DAS- MH-105, IM 8556, JANAHIT, PRO-392, LTEH-22, NMH-1265, Geo Primium Diamon, PMH 1-C, PMH 3-C, Bio-9681-C, Seedtech 2324).

- In Trial 76 Pathology Entomology - Medium Maturity group, among 31 AVT medium entries screened,18 entries were found to be resistant (CMH 10-547, DKC 9144 (IM8478), DKC 9149 (IM8581), S-6750, JKMH 4545, TH-38, CMH 11-582, Kuber shakthi, HTMH 5402, CMH 11-617, EH-2205, EH-2240, KMH-5951, PRMH-2177, KNMH 4010131, DKC 9145 (IJ8533), HM8-C,HM9-C) and 4 entries were found to be moderately resistant (FCH 11231, KDMH 2705, Rasi-3033, PMH 4(C)) and 8 entries (AQH 4, AQH 9, DKC 8144 (IM 8479), AQH 8, BH 41150, EHL 3412, Bio 9637(C), HM4-C) were found to be susceptible for SDM.

- In Trial 77 Pathology Entomology Trial - Early maturity group , among 26 AVT early maturing entries 11 entries were found to be resistant (DMH-63, FH 3664, JH-31610, LG 31.81, MEH 1-12-13, Bio 9720, Prakash (C), CMH 11-579, CMH 11-626, FH 3626)and 9 entries were found to be moderately resistant (AH 1261, FH 3669, GWH 0712, B-52, EH-2214, JH-31613, FH 3605, CMH10-531,Prakash (C)) and 7 were susceptible to SDM(CMH 11-595, CMH 11-611, NMH-1258, HKH314, EH-2233, EH-2212, KMH-7021).

- In Trial 78 Pathology Entomology Trial - Extra Early maturity group , among 10 Extra early maturing entries 6 were found to be resistant(KH-7502, Vivek Hybreds-21 (C), VIVEK QPM9-C, BIO 9681-F, PMH3-F, HM10-F) , one was moderately resistant(AH-1212) and three entries were susceptible for SDM (APQH 9, Vivek Hybreds-43 (C), PMH-1-F)

- In specialty corn Pathology, Nematology and Soil Science trial, among 48 specialty corn entries, 43 entries were found to be susceptible with 20 to 100 % SDM incidence(BAU QMH-17, BQPMH 18, LQPMH 114,KDPC-2 LQPMH 214, LQPMH 314, OQPMH 11-6, VEHQ 14-1, DMRQPM1401, MMH QPM-6-12-13, HQPM1-C, HQPM4-C, HQPM5-C, Vivek QPM-9-C, Pop corn (SCH), Bajoura Popcorn-2, BPC 3, DMRHP 1402, VL Pop corn -2, HPC 1, VL Pop corn-C, ADVSW-1, ADVSW-2, ASKH 1, Bajoura Sweet Corn, Bisco Madhu, BSCH 6, BSCH 63, FSCH 18, FSCH 41, FSCH 55, KSCH-333, QMHSC-1182, SWC 001, Madhuri-C, WOSC-C, ASKBH-1, BVM-2, CMH 11-658, CMH 11-659, NP 5004, NP 5040, Vivek Hybreds-27, HM4-C). Five entries were moderately resistant (BQPMH 36, KDQH-49, VEHQ 11-1, BPCH 27, NP 5040). Not even a single entry was found to be free from SDM.

- In evaluation of inbred lines for identification of resistant sources against major diseases of maize (SDM) trial, Among 104 inbreds in set I ,34 inbreds were found to susceptible (K2, K8, 16, 17, 20, 23, 24, 25, 26, 27, 28, 33, 34, 36, 40, 42, 49, 52, 63, 67, 73, 78, 79, 80, 81, 82, 89, 92, 93, 100, 101, 102), 37 were found to be moderately resistant (K1, 3, 5, 6, 7, 9, 10, 12, 13, 29, 35, 37, 39, 41, 45, 54, 55, 57, 58, 59, 61, 66, 68, 69, 70, 74, 75, 76, 77, 84, 85, 86, 87, 88, 90, 91, 104) and 36 entries were found to be resistant (K5, 6, 11, 14, 15, 18, 30, 31, 35, 38, 43, 46, 47, 48, 50, 51, 53, 60, 62, 64, 65, 71, 72, 83, 84, 85, 88, 90, 91, 94, 95, 96, 97, 98, 99, 100).

- Among Set II inbres, five inbreds were found to be susceptible(142355, 142356, 142371, 142382, 142383), 16 were moderately resistant 142351, 142352, 142353, 142354, 142357, 142363, 142367, 142368, 142369, 142374, 142375, 142384, 142388, 142390, 142391392) and 24 were found to be resistant (142358, 142359, 142360, 142361, 142362, 142364, 142365, 142366, 142370, 142372, 142373, 142375, 142376, 142377, 142379, 142380, 142381, 142384, 142385, 142386, 142387, 142389, 142393, 142394)

10	Remarks of the Technical Director based on the pre-review	:	Artificial screening may be standardized for sorghum downy mildew of maize in the controlled environment. Pathogenicity of ear rot of maize may be confirmed

2. CRS, Veppanthattai

1	Project Number	:	TRRI/VPT/PAT/13/001
2	Project Title	:	Integrated Management of leaf blight in maize
3	Name of the Department/Station	:	Cotton Research Station, Veppanthattai
4	Name(s) of the Scientist(s) with Designation	:	Dr. T. Anand Assistant Professor (Plant Pathology)
5	Project Period	:	June 2013- May 2015 (Two years)
6	Objectives	:	To evaluate the efficacy of different IDM module against leaf blight under field conditions.
7	Brief outline of the work carried out from the project initiation period	:	The results of the first season field experiment revealed that the seed treatment with TNAU-Pf1 @ 10 g/kg seed + foliar spray of propiconazole (0.1%) was found to be effective for the management of leaf blight disease in maize.
8	Work carried out during the review period	:	

a. In vitro* screening of different fungicides against *Helminthosporium maydis

Required quantity of individual fungicides was added separately into molten and cooled potato dextrose agar. Later 20 ml of the poisoned medium was poured into sterile Petri plates. Mycelial discs of 5 mm size from actively growing culture of the fungus were cut out by a sterile cork borer and one such disc was placed at the centre of each agar plate. Control was maintained without adding any fungicides to the medium. Each treatment was replicated thrice. Then such plates were incubated at room temperature for seven days and radial colony growth was measured. The efficacy of a fungicide was expressed as per cent inhibition of mycelial growth over control.

Results

Data for systemetic and non-systemetic fungicides for inhibition of mycelial growth are presented in Table 1. There was significant difference among the systemic fungicides in inhibiting the growth of *Helminthosporium maydis*. The triazoles like propiconazole, tebuconazole and hexaconazole were best (100%) and significantly superior in inhibiting the mycelial growth of the fungus at 0.1 per cent concentration. The effect of non-systemic fungicides on the growth of *H. maydis* was also significant. Mancozeb (0.2%) was recorded 92.78 per cent inhibition over control and was followed by propineb at 0.2 per cent (93.33%) and coppper oxychloride at 0.25 per cent (62.22%).

Table 1. Effect of different fungicide molecules against the mycelial growth of *Helminthosporium maydis*

S. No.	Fungicide	Radial mycelial growth (cm)	Per cent inhibition over control
1.	Propiconazole (0.1%)	0.00[a]	100.0
2.	Propineb (0.2%)	0.60[b]	93.33
3.	Hexaconazole (0.1%)	0.00[a]	100.0
4.	Tebuconazole (0.1%)	0.00[a]	100.0
5.	Carbendazim (0.1%)	8.05[e]	10.56
6.	Chlorothalonil (0.1%)	5.90[d]	34.44
7.	Mancozeb (0.2%)	0.65[b]	92.78
8.	Copper oxychloride (0.25%)	3.40[c]	62.22
9.	Azoxystrobin	7.95[e]	11.67
10.	Azadirachtin (0.1%)	7.90[e]	12.22
11.	Untreated control	9.00[f]	-

Values are means of three replications. In a column, means followed by a common letter are not significantly different at 5% level by DMRTs.

Integrated management of leaf blight under field conditions

b. Field experiment

A field experiment was conducted to assess the possibility of managing the leaf blight disease by combining different management measures during August 2014-January 2015. The treatments of the experiment were

T1. Seed treatment (ST) with *P. fluorescens* (TNAU-Pf1) + Foliar spray (FS) with Mancozeb (0.2%)
T2. ST with TNAU-Pf1 + FS with Propiconazole (0.1%)
T3. ST with TNAU-Pf1 + FS with Propineb (0.2%)
T4. ST with TNAU-Pf1 + FS with Tebuconazole (0.1%)
T5. ST with TNAU-Pf1 + FS with Carbendazim (0.1%)
T6. ST with TNAU-Pf1 + FS with Copper oxychloride (0.25%)
T7. ST with TNAU-Pf1 + FS with Hexaconazole (0.1%)
T8. ST with TNAU-Pf1 + FS with Chlorothalonil (0.1%)
T9. ST with TNAU-Pf1 + FS with Azadirachtin (0.1%)
T10. ST with TNAU Pf1 alone
T11. Untreated control

The incidence of leaf blight was recorded in terms of PDI (Percent Disease Index). The grain yield was also recorded in each treatment and expressed as quintal/ha.

Among different treatments, seed treatment (ST) with TNAU-Pf1 @ 10g/kg seed + foliar spray of propiconazole (0.1%) at 40 days after sowing (DAS) recorded only 2.95 PDI of leaf blight followed by ST with TNAU-Pf1 + foliar spray of tebuconazole (0.1%) (3.25 PDI) and were on par with each other. Whereas untreated control plots recorded 22.64 PDI of leaf blight (Table 2). Further, the treatments ST with TNAU-Pf1 + foliar spray of propiconazole and ST with TNAU-Pf1 + foliar spray of tebuconazole were recorded the maximum grain yield of 58.67 and 57.80 q/ha with highest BC ratio of 4.06 and 3.98, respectively (Table 3).

Table 2. Integrated management of leaf blight under field conditions

S. No.	Treatments	Leaf blight (PDI)	
		Before spray	After spray
1.	ST with TNAU-Pf + FS with Mancozeb (0.2%)	2.15[a]	5.67[b]
2.	ST with TNAU-Pf1 + FS with Propiconazole (0.1%)	1.84[a]	2.95[a]
3.	ST with TNAU-Pf1 + FS with Propineb (0.2%)	2.22[a]	5.80[b]
4.	ST with TNAU-Pf1 + FS with Tebuconazole (0.1%)	2.06[a]	3.25[a]
5.	ST with TNAU-Pf1 + FS with Carbendazim (0.1%)	2.10[a]	11.67[d]
6.	ST with TNAU-Pf1 + FS with Copper oxychloride (0.25%)	1.05[a]	6.90[bc]
7.	ST with TNAU-Pf1 + FS with Hexaconazole (0.1%)	1.90[a]	5.12[b]
8.	ST with TNAU-Pf1 + FS with Chlorothalonil (0.1%)	1.26[a]	7.44[c]
9.	ST with TNAU-Pf1 + FS with Azadirachtin (0.1%)	2.40[a]	12.05[de]
10.	ST with TNAU - *P. fluorescens*	1.98[a]	13.66[e]
11.	Untreated control	1.87[a]	22.64[f]

ST - Seed treatment; FS - Foliar spray; DAS - days after sowing

Values are means of three replications. In a column, means followed by a common letter are not significantly different at 5% level by DMRTs

Table 3. Effect of different IDM on grain yield of maize under field conditions			
S. No.	**Treatments**	**Grain yield (Q/ha)**	**BCR**
1.	ST with TNAU-Pf + FS with Mancozeb (0.2%)	55.85[c]	3.70
2.	ST with TNAU-Pf1 + FS with Propiconazole (0.1%)	58.67[a]	4.06
3.	ST with TNAU-Pf1 + FS with Propineb (0.2%)	55.90[bc]	3.64
4.	ST with TNAU-Pf1 + FS with Tebuconazole (0.1%)	57.80[a]	3.98
5.	ST with TNAU-Pf1 + FS with Carbendazim (0.1%)	48.87[f]	2.11
6.	ST with TNAU-Pf1 + FS with Copper oxychloride (0.25%)	52.45[d]	2.98
7.	ST with TNAU-Pf1 + FS with Hexaconazole (0.1%)	56.28[b]	3.71
8.	ST with TNAU-Pf1 + FS with Chlorothalonil (0.1%)	51.80[d]	2.88
9.	ST with TNAU-Pf1 + FS with Azadirachtin (0.1%)	47.20[e]	2.44
10.	ST with TNAU-Pf1	43.76[f]	1.92
11.	Untreated control	39.94[g]	-

ST - Seed treatment; FS - Foliar spray; DAS - days after sowing

Values are means of three replications. In a column, means followed by a common letter are not significantly different at 5% level by DMRTs

9. Salient findings

Seed treatment (ST) with TNAU-Pf1 @ 10 g/kg seed + foliar spray of propiconazole (0.1%) or ST with TNAU-Pf1 @ 10 g/kg seed + foliar spray of tebuconazole (0.1%) at 40 DAS recorded the lowest PDI of leaf blight caused by *H. maydis* and maximum grain yield of 58.67 and 57.80 q/ha with highest BC ratio of 4.06 and 3.98, respectively .

10. Remarks of the Technical Director based on the pre-review:	**: Nil**

3. AC&RI, Madurai

1	Project Number	:	DRES/VGI/PAT/013/001
2	Project Title	:	Exploiting genetic variability of Maize genotypes resistance to turcicum leaf blight disease under artificial epiphytotic conditions”
3	Name of the Department/Station	:	Department of Plant Pathology, AC&RI, Madurai
4	Name(s) of the Scientist(s) with Designation	:	Project Leader: **Dr. K. Sethuraman,** Professor (Pl. Path.)
5	Project Period	:	April 2013– March 2016 **(Three Years)**

6. Objectives

- Survey and collection of different isolates of *H. turcicum* in maize growing areas of Tamil nadu.
- Isolation and selection of most virulent isolates based on growth and infective nature under lab and glass house conditions.
- Screening of germplasm lines with inoculations of sorghum grain inoculums of the most virulent isolate artificially for studying the symptom expression in the glass house and field conditions (artificial epiphytotoic conditions).
- Identification of resistant genotypes based on the disease symptom expressions with better yield and will be used for further utilization in the breeding/crossing programmes.

7. Brief outline of the work carried out from the project initiation period :

- The survey was conducted in maize growing areas of eight districts of Tamil Nadu (Dindigul, Tiruppur, Trichy, Madurai, Virudhunagar, Thoothukkudi, Theni and Perambalur) and the turcicum leaf blight infected leaf samples were collected and the pathogens were isolated. The most virulent isolate (from Dindigul samples) has been identified based on the symptom expression on artificial inoculation on plants which has been used for further inoculation studies.
- Whorl Drop method of inoculation was followed for artificial inoculation. The same inbreds are also sown in the Pot culture experiments. The symptoms development were periodically observed and recorded and based on the symptoms development in the different inbreds, the scoring was given. The Plant height, cob height, lesion length and lesion width were also recorded.
- A total of 291 germplasm has been sown in the field No. B5 (part) on 18.09.13. Among the inbreds sown 191 obtained from the Plant Breeding unit and the remaining obtained from the Directorate of Maize Research, New Delhi. The inbreds were raised in two meter rows and for each ten inbreds susceptible (CM 202) and resistant checks were sown (infector row method) and all around the field the susceptible check was sown. The CO 6 was used as resistant check. The spray of insecticide (Monocrotophos) was given on 12 th day after sowing to control to prevent stem borer infection. The sorghum grain inoculum of *Turcicum* was prepared and used for inoculation purpose. For this, the sorghum grain was soaked, autoclaved and the turcicum culture disc was inoculated and kept for obtaining full growth of culture.
- Among the Leaf samples collected from different maize growing areas in 8 districts the isolate of Dindigul was effective in inducing the disease symptoms which has been used for further inoculation of the inbreds of maize.
- Among the inbreds screened, the inbreds *viz*., VIM-005, VIM-013, VIM-017, VIM-025, VIM-029, VIM-032, VIM-041, VIM-048(A), VIM-053, VIM-058(A),

VIM-064, VIM-065, VIM-070, VIM-081, VIM-085, VIM-086, VIM-094, VIM-097(A), VIM-097(B), VIM-100, VIM-111, VIM-131, VIM-134, VIM-162, VIM-176, VIM-178, VIM-203, VIM-204, VIM-205, VIM-212, VIM-228, VIM-232, VIM-239, VIM-246, VIM-247, VIM-253, VIM-259, VIM-262, VIM-275,VIM-276, VIM-279, VIM-282, VIM-283, VIM-290, VIM-293, VIM-298, VIM-296(w), VIM-304, VIM-308, VIM-309, VIM-312, VIM-315, VIM-317, VIM-319, VIM-328, VIM-335, VIM-352, VIM-365, VIM-376, VIM-377, VIM-380, VIM-392, were highly resistant to *Turcicum* Leaf blight (Grade 0).

- The inbreds *viz*., VIM-003, VIM-015, VIM-046, VIM-071,VIM-103, VIM-179, VIM-197(0), VIM-208, VIM-214, VIM-215, VIM-222, VIM-225, VIM-277, VIM-291, VIM-297, VIM-313, VIM-353, VIM-360, VIM-364, VIM-368, VIM-379, VIM-391, were highly resistant to *Turcicum* Leaf blight (Grade 1).
- The inbreds *viz*., VIM-007, VIM-050(A), VIM-050(B), VIM-062, VIM-163, VIM-202, VIM-211, VIM-213, VIM-216, VIM-220, VIM-230, VIM-233, VIM-235, VIM-248, VIM-267, VIM-272(0), VIM-278, VIM-280, VIM-294, VIM-351, VIM-374, were resistant to *Turcicum* Leaf blight (Grade 2).

8. Work carried out during the review period

A total of 105 inbreds (out of 291 inbreds) which were promising against turcicum leaf blight disease were again sown in the pots and fields for confirmation studies.

These inbreds were raised in two meter rows and for each ten inbreds susceptible (CM 202) and resistant checks were sown and all around the field the susceptible check was sown. The CO 6 has been used as resistant check. The spray of insecticide (Monocrotophos) was given on 12th day after sowing to control. The sorghum grain inoculum of *Turcicum* was prepared and used for inoculation purpose. For this, the sorghum grain was soaked, autoclaved and the turcicum culture disc was inoculated and kept for obtaining full growth of culture. Whorl Drop method of inoculation was followed for artificial inoculation. The same inbreds are also sown in the Pot culture experiments. The symptoms development were periodically observed and recorded and based on the symptoms development in the different inbreds the scoring was given. The Plant height, cob height, lesion length and lesion width were also recorded. Based on the scores the inbreds were classified in different categories and presented in the tables.

9. Salient findings

For information:

❖ Among the entries are VIM 013, VIM-017, VIM-025, VIM-029, VIM-041, VIM-048(A), VIM-053, VIM-064, VIM-070, VIM-081, VIM-086, VIM-097(A), VIM 097 (B), VIM-111, VIM-131, VIM 134, VIM-162, VIM-176, VIM-203, VIM 204, VIM 205, VIM-212, VIM-228, VIM-232, VIM-246, VIM 247, VIM-253, VIM-259, VIM-262, VIM-271, VIM-275, VIM-276, VIM 279, VIM-283, VIM-298, VIM-296(w), VIM 304, VIM-308, VIM-312, VIM-315, VIM-317, VIM 319, VIM-328, VIM-376, VIM-377, VIM-380, VIM-385, VIM-392, were highly resistant to *Turcicum* Leaf blight (No symptoms)

- Among the entries are VIM 081, VIM 176, VIM 203, VIM 204, VIM 246, VIM 335 were resistant to *Turcicum* Leaf blight(Grade 1)
- Among the highly resistant inbreds tested in field conditions the inbreds *viz.*,**VIM 328**, VIM 279, **VIM 097(A)**, VIM 123, **VIM 293**, VIM 176, VIM 196, VIM 292, VIM 246, VIM 377, **VIM 247**, **VIM 377 (A)**, VIM 013, **VIM 029**, **VIM 228**, VIM 048, **VIM 131**, VIM 070, **VIM 298**, VIM 392, **VIM 259,** and **VIM 304** were finally selected for further crossing programme

10. Remarks of the Technical Director based on the pre-review:	**: Nil**

4. AC&RI, Madurai

1	Project Number	:	DR/P3/DRVI/MRS-VGI/GOI
2	Project Title	:	Viscosinamide-producing *Pseudomonas fluorescens* strain for managing major fungal diseases of maize
3	Name of the Department/Station	:	AC&RI, Madurai
4	Name(s) of the Scientist(s) with Designation	:	Dr.R.Radhajeyalakshmi Assistant Professor (Plant Pathology)
5	Project Period	:	23.04.2014 – 23.04.2017
6	Objectives	:	

- Isolation and enumeration of Viscosinamide-producing *Pseudomonas fluorescens* strain from maize rhizosphere.
- Analyzing antifungal properties of the strain against major soil and foliar pathogens of maize.
- *In vitro* and *in vivo* evaluation of the strain upon disease control and yield on maize.
- Mass multiplication, genetic improvement with increased glycosyl hydrolase activities against oomycetes (Downy mildews)

7. Brief outline of the work carried out from the project initiation period:- -

8. Work carried out during the review period:

Identification and enumeration of Viscosinamide-producing *Pseudomonas fluorescens* strains from maize rhizosphere soil grown in sugarbeet intercropping in sandy loam soil ecosystem has been initiated.

Analyzing antifungal properties of VMD strains against major soil and foliar pathogens of maize is under progress under *in vitro* conditions.

9. Salient Findings:

For Information:

VMD *Pf* strains were screened in MGS1 selective media and their growth characters were analyzed. The strain having highest CFU/g in selective media was tested against Turcicum Leaf Blight, Maydis Leaf Blight and Post Flowering Stalk Rot.

10.	Remarks of the Technical Director based on the pre-review	:	Nil

5. Rice Research Station, Ambasamudram

1	Project Number	:	**UGC/CPPS/ASD/PAT/2012/R001**
2	Project Title	:	**UGC Sponsored scheme "Eco Friendly management of Post Flowering Stalk Rot (PFSR) of maize (*Zea mays*.L) by using biocontrol agents".**
3	Name of the Department/Station	:	**Rice Research Station, Ambasamudram**
4	Name(s) of the Scientist(s) with Designation	:	**Dr. N. Rajinimala, Asst. Prof. (Plant Pathology)**
5	Project Period	:	**July 2012 - June 2015**
6	Objectives	:	Survey for the incidence of PFSR disease in major maize growing areas of Tamil Nadu Isolation and selection of potential antagonistic organism from maize field available in local area Bio chemical characterization and mode of action of effective antagonistic organism Comparison of efficiency between potential antagonistic organism and already available known antagonistic organism viz., *Trichoderma viride, Pseudomonasflouresence* and *Bacillus. sp* against PFSR disease Development of bioformulation of effective antagonistic organism and evaluation of its efficacy against PFSR disease in pot culture experiment Study of defense related enzymes induced in the plant system, due to the application of biocontrol agents Evaluation of bioformulation against PFSR disease under field condition

7.Brief outline of the work carried out from the project initiation period :

❖ Fiftyisolates of bacteria were isolated from 280 number of rhizosphere soil samples collected from major maizegrowing districts of Tamil Nadu. Among the fifty isolates, 35 were *Pseudomonas* and 15 were *bacillus.*

❖ Among the fifty isolates screened, ten *Pseudomonas* sp. and five *Bacillus* sp. isolates showed inhibitory action against *M. phaseolina* of maize whereas the other strains were found ineffective. It was found that *Pseudomonas* isolates 16, 13, 11 and 19 exhibited maximum inhibition against the PFSR pathogen. The isolate Pf 16 recorded maximum per cent inhibition of *M. phaseolina* mycelial growth over control (55.56).

❖ Among the collected isolates of *Bacillus* sp. screened, the isolate B6 significantly reduced the linear mycelial growth of *M. phaseolina* to an extent of 46.67 per cent over control.

8.Work carried out during the review period:

a.Effect of crude antibiotics of antagonistic bacteria against *M. phaseolina*

The crude antibiotics of five isolates of *P. fluorescens* (Pf 10, Pf 11, Pf 13, Pf 16 and Pf 93) and five isolates of *Bacillus* (B 3, B5, B6, B10 and B15) were tested for their antifungal activity against *M. phaseolina.* The crude antibiotic isolated from Pf 16 recorded the maximum percent inhibition of *M. phaseolina* mycelia growth of (37.43%) over untreated control. It was followed by Pf 13, Pf 11, Pf 19 and Pf 10. In case of *Bacillus* isolates, the isolate B6 recorded maximum per cent inhibition of *M. phaseolina* mycelia growth of (28.53 %) over untreated control followed by B3 (18.31 %).

b. Effect of phenazine and 2, 4 DAPG from antagonistic bacteria on the growth of

M. phaseolina

The phenazine and 2, 4 DAPG antibiotics were extracted from effectiveisolates of *Pseudomonas* and *Bacillus* respectively tested for their antifungal activity. The phenazine isolated from Pf16 isolate recorded 22.00 per cent inhibition of *M. phaseolina* mycelia growth over control and it was followed by Pf13 isolate (16.11%). However the phenazine isolated from other isolates was not effective in inhibiting the mycelial growth of *M. phaseolina*. DAPG isolated from Pf 16 recorded 26.84 per cent inhibition of *M. phaseolina* mycelia growth over control. It was followed by B6, Pf 13 Pf 11, B3 and Pf 19**.** The 2, 4 DAPG from other isolates were not effective

c. Production of siderophores by antagonistic bacteria

The bacterial isolates of *Pseudomonas fluorescens* were found to produce siderophore in chromeazurol S (CAS) plate assay method. But the isolates of *Bacillus subtilis* failed to produce siderophores in the same media. All isolates of *P. fluorescens* were able to produced yellow, green yellow-to-yellow fluorescent pigmentation in blue colored media. The isolates Pf 11 and Pf 10 produced deep red colour instantly by the addition of tetrazolium salt to siderophores sample where as the isolate Pf 16, Pf 19 and Pf 13 produced red colour slowly, indicating that the nature of the siderophore is hydroxymate type **.** Carboxymate type of siderophore was determined by the disappearance of pink colour on the addition of phenolphthalein to siderophores sample. The isolate Pf 11, Pf 10, Pf 16 and Pf 13 were also producing carboxymate type of siderophore

d. Salicylic acid Production

Different antagonistic bacterial isolates were tested for salicylic acid production. Among the isolates Pf 16 was recorded the maximum salicylic acid production (60.58 µg/ml) followed by isolate Pf 13 (58.35µg/ml) and the isolate Pf 10 recorded the minimum salicylic acid production (15.00 µg/ml) compared to other isolates.

e. Production of Indole acetic acid

Indole acetic acid production by different antagonistic bacterial isolates was quantified. Among the isolates, Pf 16 was recorded the maximum IAA production of (18.60 µg/ml) which followed by Pf 13 isolate (10.32 µg/ml) and the minimum IAA production (1.60 µg/ml) was recorded by B10 isolate.

f. Lytic enzyme Production

Production of β 1, 3 glucanase

The isolate Pf16 was recorded the higher β 1,3 glucanase activity (33.80 µg of glucose/min/ml) followed by isolate pf 13 (30.00 µg of glucose/min/ml) and the isolate Pf 10 was recorded minimum β 1,3 glucanase activity (9.00 µg of glucose/min/ml) when compared with all isolates.

g. Pot culture studies

Among the different biocontrol agents tested under potculture, seed treatment + soil application of Pf 13 + Pf 16 + B 6 recorded highest plant height of 170.23 cm, followed by carbendazim (167.52 cm) against inoculated control (123.15 cm).

seed treatment@ 10g/kg + soil application of Pf 13 + Pf 16 + B 6 recordedhighest cob length (23.00 cm),cob height (64.00 cm) followed by carbendazim recorded cob length of 21.75 cm and cob height of 62.43 cm against inoculated control (11.00 cm and 44.53 cm).

As for the disease incidence is concerned, seed treatment + soil application of Pf 13 + Pf 16 + B 6 and carbendazim recorded lowest disease incidence of 33.33% against inoculated control (100%). Seed treatment + soil application of Pf 13 + Pf 16 + B 6 recorded highest cob yield of 242 g followed by carbendazim (240 g) against inoculated control (178.52 g).

h. Inducing systemic resistance in maize plants

1. Peroxidase (PO)

Peroxidase activity was measured in leaves and roots of cotton plants treated with effective biocontrol agents and challenged with the pathogens *M. phaseolina.* The activity of peroxidase was induced in the plants treated with biocontrol agents, chemicals and also in the challenged inoculation with the respective pathogen. In general, no significant difference of the PO activity observed in the uninoculated plants throughout the period of observation. The results revealed that the activity of PO enzyme was significantly higher in maize root pretreated with consortial formulation T7 (Pf 13, Pf 16 and B 6) at 4 days after challenge inoculation with *M. phaseolina*. The PO activity declined after in all the treatments.

2. Polyphenol oxidase (PPO)

The trend of increasing PPO activity was similar to that of PO in all treatments.The PPO activity reached maximum on four days after inoculation with effective biocontrol agents followed by challenge inoculation with *M. phaseolina*. The treatment T7 (Pf 13, Pf 16 and B6) was recorded the maximum level of PPO activity compared to other treatments.

3. Phenylalanine ammonia lyase (PAL)

Activity of PAL was induced in maize plant (roots) treated with effective biocontrol agents after challenge inoculation with *M. phaseolina* and the enzyme activity reached maximum at four days after inoculation with the pathogen. Consortial formulation of biocontrol agents T7 treatment (Pf 13, Pf 16 and B6) recorded higher activity of PAL enzyme.

9. Salient Findings :

Among the different biocontrol agents tested under potculture, seed treatment + soil application of Pf 13 + Pf 16 + B 6 and carbendazim recorded lowest disease incidence of 33.33% against inoculated control (100%).seed treatment + soil application of Pf 13 + Pf 16 + B 6 recorded highest cob yield of 242 g followed by carbendazim (240 g) against inoculated control 178.52 .

10. Remarks of the Technical Director based on the pre-review : Nil

B. Agricultural Entomology

1. MRS, Vagarai

1	Project Number	:	DRES/VGI/AEN/014/001
2	Project Title	:	Studies on the pests of maize and their natural enemies
3	Name of the Department/Station	:	Maize Research Station , Vagarai
4	Name(s) of the Scientist(s) with Designation	:	Dr.N.M.Arivudainambi, Assistant Professor (Agricultural Entomology)
5	Project Period	:	December 2013- December 2017

6. Objectives :

To assess the stemborer incidence in pure/mixed crop stand under rainfed/irrigated condition

To explore the natural enemies including pathogens on egg, larva and pupa

To correlate the weather factors and natural enemy complex on the host population

To formulate an IPM strategy based on the natural enemy complex

7. **Brief outline of the work carried out from the project initiation period :**

   The experiment was started during July 2014.Maize hybrid CO 6 was utilized in Pure and mixed crop stand (cow pea as intercrop 2:1 ratio) under rainfed and irrigated condition

8 **Work carried out during the review period :**

Trial was undertaken during July 9th 2014. Maize hybrid Co6 was used for the study and 5 rows of maize each having 5m length at 60cmX25cm spacing. Four treatments including pure and mixed crop stand under rainfed and irrigated condition were undertaken with five replications.

T1-Purecrop (Maize) Irrigated T2-Maize with intercrop cowpea Irrigated

T3-Maize with intercrop cowpea Raifed T4- Pure crop (Maize) Rainfed

Both irrigated and rainfed crops were affected by Green caterpillar. Under irrigated condition, pure crop was affected more. In the rainfed crop pure crop and intercropped maize were almost equally got affected.

Both in irrigated and rainfed conditions Ash weevil *Myllocerus* sp and Flea beetle *Chaetocnema* sp were present. *Pyrilla* and pumpkin beetle were present in the irrigated condition. With regard to natural enemies *Brumus sp* was present in irrigated condition. The species *Menochilus* sp was present in both irrigated and rainfed conditions. Long horned grass hopper was present in irrigated condition. Stink bugs were present in both irrigated and rainfed condition. Aphid colony (*Rhopalosipum maidis*) was present in rainfed condition. Shot holes by stem borer were more in irrigated condition. Stem borer larvae were collected and reared in polythene bags and there were no emergence of *Apanteles* parasitoids.

9. Salient findings

The natural enemy *Brumus sp* was found in irrigated condition. Aphid colony was found in rainfed condition.

10. Remarks of the Technical Director based on the pre-review:	No progress was made in the project for the past two years Research work was not carried out properly No insect pest was identified and no data was documented properly. No inference can be made from existing data.

Project II:

1	Project Number	:	DRES/VGI/AEN/014/002
2	Project Title	:	Evaluation of certain insecticides and bio control agent *Trichogramma chilonis* against stem borer *Chilo partellus* in maize
3	Name of the Department/Station	:	Maize Research Station , Vagarai
4	Name(s) of the Scientist(s) with Designation	:	Dr.N.M.Arivudainambi, Assistant Professor(Agricultural Entomology)
5	Project Period	:	May 2014 to April 2017
6	Objectives: To validate the biocontrol agent *Trichogramma chilonis* alone and alongwith certain insecticides against stem borer Chilo partellus in maize. To find out the bio efficacy of newer meolecules of insecticides against stem borer *Chilo partellus* in maize		
7	Brief outline of the work carried out from the project initiation period	:	--

8. Work carried out during the review period :

Fourteen treatments were undertaken with three replications.

No	Treatments	No	Treatments
T1	Indoxacarb 15.8EC100ml/ha	T8	T2 + T6
T2	Chlorantraniliprole 20SC 200ml/ha	T9	T3 + T6
T3	Cartap hydrochloride 50SP 1kg/ha	T10	T4 + T6
T4	*Bacillus thuringiensis* 500ml/ha	T11	T5 + T6
T5	NSKE 5% 25kg/ha	T12	Seed treatment of Imidacloprid @70WS 10g/kg of seeds
T6	*Trichogramma chilonis* @2,50,000/ha	T13	Leaf Whorl application of Carbofuran 3G@ 0.3kg ai/ha at 20^{th} day after sowing
T7	T1 + T6	T14	Untreated control

Experiment was conducted at Maize Research Station, Vagarai with maize hybrid Co6 for the study and the following insecticides were evaluated for their efficacy against Maize Stem Borer.

During the first round of spray, shot holes were recorded in cartaphydrochloride treated plots (0.561%) similar results were recorded in the treatments with imdacloprid, neem seed kernel extract with *Trichogramma*. Dead hearts were recorded (0.561%) in chlorantraniliprole with Trichogramma treated plot and neem seed kernel extract with Trichogramma treated plot.

During the second round of spray, highest number of shot holes were recorded in untreated check(8.5%) followed by imidacloprid treated plot(6.8%) followed by *Trichogramma* treated plot(5.1%). No dead heart is observed.

During third round of spray, untreated check recorded higher percentage of shot holes (3.4%) followed by*Trichogramma* with indoxacarb treated plot(2.21%). Dead hearts were recorded in the treatments with indoxacarb and the treatment with neem seed kernel extract and *Trichogramma* (0.561%).

9. Salient findings

Dead hearts were recorded in the treatments with indoxacarb and the treatment with neem seed kernel extract and *Trichogramma*(0.561%).

10. Remarks of the Technical Director based on the pre-review:	No progress was made in the project for the past two years Research work was not carried out properly No insect pest was identified and no data was documented properly. No inference can be made from existing data.

II. PEARL MILLET

1	Project Number	:	**AICRP/PBG/CBE/PEM/009**
2	Project Title	:	Performance of pearlmillet entries against major diseases under downy mildew sick plot conditions and management of pearlmillet downy mildew
3	Name of the Department/Station	:	Department of Millets, TNAU, Coimbatore
4	Name(s) of the Scientist(s) with Designation	:	G. Karthikeyan, Professor (Plant Pathology)
5	Project Period	:	October 2012 to September 2015

6. Objectives:

- To evaluate the pearlmillet entries obtained from Project Co-ordinator (AICPMIP), ICRISAT and the entries of TNAU for resistance to downy mildew and other important diseases
- To develop disease management package for downy mildew of pearlmillet
- To survey on the incidence and occurrence of pearlmillet diseases in farmers field

7. Brief outline of the work carried out from the project initiation period

The following lines were identified as resistant donors / lines under downy mildew sick plot conditions during 2011 -2013.

Initial pearlmillet hybrids and varieties

The initial pearlmillet entries *viz*., MH 1854, MH 1855, MH 1856, MH 1860, MH 1879, MH 1883, MH 1887, MH 1888, MH 1890, MH 1893, MP 539, MP 540, ICMH 356 and GHB 732 had multiple resistances against downy mildew and rust. MH1922, MH1928, MH1930, MH1931, MH1949, MH1950, MH1954, MH1967, MH1968, MH1969, MH1970, MH1985, MH1987 and GHB732 were found to be resistant for downy mildew under downy mildew sick plot conditions.

Advanced pearlmillet hybrids and varieties

The advanced pearlmillet entries *viz*., MH 1747, MH 1751, MH 1759, MH 1766, MH 1790, MP 732 and B 2301 were found to possess multiple resistances against downy mildew and rust. The entries *viz*., MH1792, MH1816, MH1887, MH1888, MH1889, MH1890, MH1894, MH1904, 86M64, B2301, MH1771, MH1815, MH1828, MH1831, MH1855, MH1864, MH1869, MH1884, MH1886, MH1899, MH1900, MH1901, MH1905, MP520, MP533, MP534, MP535, RHB177, ICMH356, RHB173, VBBH3040, GHB558, Nandi 61, RAJ171, Pusa Composite 383 and ICTP8203 were found to be resistant for downy mildew.

Disease resistance stability of released popular hybrids / varieties and A, B and R lines

The entries *viz*., GHB 538, GHB 719, GHB 744, GHB 732 and ICTP 8203 were found to have multiple resistances against downy mildew and rust. The hybrids / varities *viz*., HHB234, GHB732, B2301 HHB226, GHB538, ICMH356, SHRADA, RHB173, RHB121, HHB197, GHB558, GHB744, Pratap (MH1642), 86M86, Kaveri Super Boss, Nandi 61, 86M64, Saburi, MBC2, ICTP8203, RAJ171, JBV2, ICMV221 and ICMV155 were showed their stability in their resistance against downy mildew.

Downy Mildew Virulence Nursery

The pearlmillet entries *viz*., P310-17, 852 B, IP 11428, IP 18293, IP 18294, 7042-1-4-4, HHB67-1 Improved, HHB67-2 Improved, J-2548, 203-SB-12, 279-SB-12, ICMR-09111, ICMR 09666, ICMR 09777, DHLB 16, DHLB 17, RHRB 13, DHLBI 967 P310-17, 852B, IP18293, HHB67-1 Improved, HHB-2 Improved, JMSB20091, PIB994, PIB998, PB543B, 834B, IP18292, IP18294, IP18298, 7042-1-4-4, ICMB11444, ICMB12444, ICMR010007, H/77/833-2-202, H/77/833-2, 843B-22B, 843B, DHLBI846, DHLBI731, J-2480, 92-SB-13, JMSB-101, JMSB-9904, JMSB-20071, Comp. sum 622-660, Pusa 2013-1, Pusa 2013-2, Pusa 2013-3, PIB1234, PIB626, PIB 654, PIB957 and PB214B were found to be resistant to downy mildew.

Summer hybrids

The summer pearlmillet entries *viz*., MSH257, MSH276, MSH279, MSH282, MSH283, MSH287, MSH289, MSH290, MSH292, MSH294 and 86M64 were found to be highly resistant to downy mildew. The summer entries *viz*., SHPT 102, SHPT 104, SHPT 106, SHPT 109, SHPT 110, SHPT 114, SHPT 116, SHPT 117, SHPT 119, SHPT 121 and SHPT 123 were also found to be highly resistant to downy mildew.

Evaluation of Integrated disease management module for pearlmillet downy mildew

The field trials were conducted during Kharif 2013 and 2014 with the pearlmillet cultivar B 2302 for the evaluation of Integrated disease management module (IDM) using host plant resistance, biocontrol agents *viz*., *Bacillus pumilus* - INR7, *Pseudomonas fluorescens* - Pf1 and chitosan for the management of pearl millet downy mildew under downy mildew sick plot conditions. The results of the trials revealed that the seed treatment with Apron 35 SD @ 6g / Kg of seeds recorded a significantly lower downy mildew incidence followed by seed treatment with *Bacillus pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg of seed. Similarly, seed treatment with *Pseudomonas fluorescens* (Pf1) alone @ 10g / Kg of seeds and seed treatment with *Bacillus pumulis* (INR7) alone @ 10g / Kg seeds were on par with seed treatment with *Bacillus pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg of seed. Seed treatment with Apron 35 SD@ 6g/ Kg of seeds recorded a significantly higher grain and straw yield followed by seed treatment with *Bacillus pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg and seed treatment with *Pseudomonas fluorescens* (Pf1) alone @ 10g / Kg of seed.

8. Work carried out during the review period:

The following field trials were conducted during the Kharif season of the year 2014 under downy mildew sick plot conditions of TNAU, Coimbatore using infector-indicator row system / method of screening. Similarly, the field trial of PMPT VII was conducted during the Summer season of the year 2014 under downy mildew sick plot conditions using infector-indicator row system / method of screening. The entry 7042S was used as infector row in both the seasons. The incidence of downy mildew in the infector row ranged from 24.7 to 55 per cent and 80.9 to 100 per cent during Summer and Kharif 2014 seasons respectively. The downy mildew incidence in the indicator row (Bhavanisagar Local) ranged from 9.1 to 37 per cent during Kharif 2014 season.

Disease screening of initial pearl millet hybrids and varieties

Among one hundred and twenty four initial pearlmillet entries screened under this trial, twenty entries *viz.*, MH1992, MH 1994, MH 2005, MH 2007, MH 2024, MH 2025, MH 2026, MH 2032, MH 2033, MH 2034, MH 2040, MH 2045, MH 2049, MP 553, 557, RHB177, GHB744, KHB108 and 86M86 were found to be completely free from downy mildew disease even after 60 days of sowing. The entries *viz*., MH1989, MH 1990, MH 1991, MH 1995, MH 1996, MH 1997, MH 1998, MH 1999, MH 2001, MH 2002, MH 2003, MH 2009, MH 2010, MH 2011, MH 2012, MH 2014, MH 2015, MH 2016, MH 2017, MH 2018, MH 2019, MH 2020, MH 2022, MH 2027, MH 2028, MH 2029, MH 2030, MH 2031, MH 2035, MH 2036, MH 2037, MH 2038, MH 2039, MH 2041, MH 2044, MH 2046, MH 2047, MH 2050, MH 2051, MH 2053, MH 2054, MH 2055, MH 2056, MH 2058, MH 2060, MH 2061, MH 2062, MH 2064, MH 2066, MH 2069, MH

2070, MH 2071, MH 2072, MH 2073, MH 2074, MH 2075, MH 2077, MH 2078, MH 2079, MH 2080, MP 552, MP 556, MP 559, MP 560, MPMH17, RHB173, Pratap (MH1642), PAC909, GHB558, MP7792, 86M84, RAJ171, Pusa Composite 383, MBC2, ICMV155, and Dhanshakti showed highly resistant reaction with an incidence of below five per cent downy mildew under downy mildew sick plot conditions. The entries *viz*., MH 1993, MH 2004, MH 2008, MH 2013, MH 2021, MH 2023, MH 2042, MH 2048, MH 2052, MH 2057, MH 2059, MH 2063, MH 2065, MH 2068, MP 554, MP 555, MP 558, HHB67 Improved, ICMH 356, Kaveri Super Boss, JBV 2 and ICMV 221 recorded a downy mildew incidence between five and ten per cent. The entries *viz*., MH 1994, MH 1995, MH 1997, MH 1998, MH 1999, MH 2003, MH 2005, MH 2006, MH 2007, MH 2008, MH 2012, MH 2013, MH 2019, MH 2029, MH 2031, MH 2032, MH 2035, MH 2036, MH 2044, MH 2049, MH 2050, MH 2051, MH 2053, MH 2055, MH 2074, MH 2075, MH 2077, MH 2079, MP 555, MP556, MP 557 and RHB 177 were totally free from rust disease. The entries *viz*., MH 1989, MH 2024, MH 2028, MH 2045 and RHB 177 were found to be totally free from ergot infection, while the incidence in the other entries ranged from 0.5 to 6.5 per cent. The entries *viz*., MH 2024, MH 2045 and RHB 177 had multiple resistances against downy mildew, rust and ergot diseases. There were no incidences of smut during the season.

Disease screening of advanced pearl millet hybrids and varieties

Totally fifty five advanced pearlmillet entries were screened under this trial. Among them, twenty three entries *viz.*, MH1771, MH 1777, MH 1887, MH 1888, MH 1889, MH 1913, MH 1962, MH 1964, MH 1970, MH 1974, MH 1976, MH 1977, MH 1979, RHB 173, RHB 121, GHB 744, Pratap, Kaveri Super Boss, GHB 558, 86M86, NANDI 61, GHB 732 and B2301 were completely free from downy mildew disease at 60 days after sowing. The entries *viz*., MH 1828, MH 1831, MH 1837, MH 1901, MH 1904, MH 1910, MH 1915, MH 1928, MH 1930, MH 1939, MH 1957, MH 1969, MP 533, MP 535, MP 545, MP 546, HHB67 Improved, ICMH356, 86M64, RAJ 171, Pusa Composite 383 and ICMV 155 were recorded an incidence of below five per cent downy mildew. The advanced entries *viz*., MH 1852, MH 1875, MH 1890, MH 1975, MH 1984, MP 534, RHB 177, JBV 2 and ICMV 221 recorded a downy mildew incidence between five and ten per cent. The entries *viz*., MH 1887, MH 1962, MH 1964, MH 1969, MH 1970, MH 1974, MH 1975, MH 1976, MH 1977 and MH 1979 were totally free from rust incidence. The entry MH1915 was found to be totally free from ergot infection, while the incidence of ergot in the other entries ranged from 1.0 to 5.0 per cent. There was no smut incidence in the trial. The entries *viz*., MH 1887, MH 1962, MH 1964, MH 1976, MH 1977 and MH 1979 were found to posses multiple resistances against downy mildew and rust. There were no incidences of smut during the season.

Monitoring disease resistance stability of released popular hybrids / varieties and A, B and R lines

Among the thirty popular hybrids / varieties and A, B and R lines screened, HHB 234, RHB 177, GHB 538, HHB 67 Improved, RHB 173, RHB 121, GHB 558, KBH 108, MP 7792, Nandi 61, GHB 732, Proagro 9444 and B 2301 were showed their stability in their resistance against downy mildew without any downy mildew infection even at sixty days after sowing under downy mildew sick plot conditions. The entries *viz*., HHB 226, GHB 905, MPMH 17, HHB 197, GHB 744, HHB 223, 86M86, Kaveri Super Boss, Pratap (MH 1642), PAC 909, Dhansakti, RAJ 171, Pusa Composite 383, JBV 2, ICMV 221 and ICMV 155 were also maintained their stability in downy mildew resistance by recording an incidence of below five per cent downy mildew. None of the entry was free from rust disease and the rust severity ranged from 1.0 to 7.0 per cent in different entries. The entries *viz*., HHB 234, HHB 226, MP7792, NANDI 61, GHB 732, PRATAP (MH 1642), PAC 909 and B2301 were found to be totally free from ergot infection, while the incidence of ergot in the other entries ranged from 1.0 to 5.0 per cent. The entries *viz*., HHB234, MP7792, NANDI 61, GHB 732 and B2301 were found to have multiple resistances against downy mildew and ergot diseases. Again there were no incidences of blast and smut diseases during the year in this trial also.

Disease screening of summer pearl millet hybrids

Totally twenty four summer pearlmillet entries were screened under this trial. All twenty four entries recorded a downy mildew incidence of below five per cent. The incidence of downy mildew in infector row (7042S) ranged from 16.33 to 55.07. Though all the twenty four summer pearlmillet entries were found to be resistant to downy mildew by registering a downy mildew incidence of less than five per cent under downy mildew sick plot conditions, the five entries *viz.,* SHT 104, SHT 110, SHT 111, SHT 116 and SHT 118 were found to be completely free from downy mildew disease even at 60 days after sowing. None of the entries was free from rust disease. The rust severity ranged from 3.0 to 14.5 per cent. There were no incidences of blast, smut, ergot and grain mold in the trial during the summer season.

Pearl Millet Downy Mildew Virulence Nursery (PMDMVN) – 2014

Totally sixty five pearlmillet entries were maintained in the Downy Mildew Virulence Nursery – 2014 under downy mildew sick plot conditions. The incidence of downy mildew in the infector row (7042S) was found to be up to 100 per cent. Among sixty five entries maintained, seven entries *viz.,* 852B, IP18293, IP18294, HHB67- 2 Improved, J2578, J2538 and JMSB20101 were completely free from downy mildew infection even at sixty days after sowing. The entries *viz.,* P310-17, 700651, 7042R, IP18292, ICMB10444, ICMB11555, ICMB81, ICMB14001, ICMB14003, ICMB14004, ICMR08555, ICMR14001, ICMR01007, H/77/833-2-202, H/77/833-2, P1449-P2, AIMP92901-P3, AIMP92901-P8, ICMB9011-P6, PIB226, PIB957, PIB1234, PIB654, PIB626, PIB686, 214B, BIBsum456-462, ARL1, ARL2, J2480, J2500, J2495, J2523, 92-SB-13, JMSB9904, JMSB20071, JMSB20091, JMSB20111, J2510, JMSB20082 and JMSB20042 also showed resistant reaction by recording an incidence of below five per cent downy mildew.

Pearl Millet Blast Virulence Nursery (PMBVN) – 2014

Totally fifty five pearlmillet entries were maintained in the Pearlmillet Blast Virulence Nursery – 2014 under field conditions. The incidence of blast ranged from 1 to 1.25 per cent in all the entries maintained in the nursery. Among fifty five entries maintained, fifteen entries *viz.,* IP11010, ICMB92666, ICMB92777, ICMB02111, 863B-P2, HHB146 Improved, ICMR11019, ICMB95222-672, PUSA2014-3, J2500, J2495, 96-SB-13, IMSB9904, JMSB20101 and JMSB20082 were completely free from downy mildew infection even at sixty days after sowing. None of the entry was free from rust disease and the rust severity ranged from 0.75 to 5.0 per cent in different entries.

Evaluation of Integrated Disease Management Module for pearlmillet downy mildew

A field trail was conducted during Kharif season of 2014 with the pearlmillet cultivar B 2302 for the evaluation of Integrated Disease Management Module (IDM) using host plant resistance, biocontrol agents *viz*., *Bacillus pumilus* - INR7, *Pseudomonas fluorescens* - Pf1 and chitosan formulation for the management of pearl millet downy mildew under downy mildew sick plot conditions.

The results revealed that the seed treatment with Metalaxyl 35 SD @ 6g / Kg of seeds recorded a significantly lower downy mildew incidence of 3.7 per cent as against 11.9 per cent in control plot at 60 days after sowing under downy mildew sick plot conditions, which was followed by seed treatment with *Bacillus pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg of seed with a downy mildew disease incidence of 6.9 per cent. Seed treatment with *Pseudomonas fluorescens* (Pf1) alone @ 10g / Kg of seeds and seed treatment with *Bacillus pumulis* (INR7) alone @ 10g / Kg seeds were on par. Seed treatment with Metalaxyl 35 SD@ 6g/ Kg of seeds recorded a significantly higher grain and straw yield of 1444 Kg/ha and 2986 Kg/ha respectively, which was followed by seed treatment with *Bacillus pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg (with a grain and straw yield of 1364 and 2952 Kg/ha respectively) and seed treatment with *Pseudomonas fluorescens* (Pf1) alone @ 10g / Kg of seed (with a grain and straw yield of 1262 and 2898 Kg/ha respectively).

Monitoring of pearl millet diseases in farmers' field

Field surveys conducted in Coimbatore, Krishnagiri, Salem and Cuddalore districts of Tamil Nadu revealed that there was no downy mildew incidence on TNAU Cumbu Hybrid CO 9 in Coimbatore district. Traces of downy mildew incidence were observed in the cultivar CO (Cu) 9 in Coimbatore. Similarly, the incidence of downy mildew in the cultivar ICMV 221 was ranged from 1.0 to 2.1% in different districts. A higher range of downy mildew incidence (0.5 to 3.8%) was observed on the local pearmillet cultivars in Coimbatore, Salem, Cuddalore and Krishnagiri districts. The incidence of rust disease was observed in all the above districts surveyed irrespective of cultivars. The rust severity ranged from 9.5 to 15.5%. The incidence of ergot was also observed in the districts *viz*., Coimbatore and Krishnagiri and the incidence ranged from 2.1 to 4.5 per cent in these districts. The smut incidence was observed in a little extent of 0.5 per cent in Coimbatore.

9. Salient Findings:

- The initial pearlmillet entries *viz*., MH 2024, MH 2045 and RHB 177 had multiple resistance against downy mildew, rust and ergot
- The advanced pearlmillet entries *viz*., MH 1887, MH 1962, MH 1964, MH 1976, MH 1977 and MH 1979 had multiple resistance against downy mildew and rust
- The pearlmillet hybrids *viz*., HHB 234, RHB 177, GHB 538, HHB 67 Improved, RHB 173, RHB 121, GHB 558, KBH 108, MP 7792, Nandi 61, GHB 732, Proagro 9444 and B 2301 had maintained their stability of downy mildew resistance

- Seed treatment with *B. pumulis* (INR7) @ 10g + Chitosan @ 10g / Kg of seeds was found to be significantly reducing the downy mildew incidence in pearlmillet

10. Remarks of the Technical Director based on the pre-review:	*P. fluorescens* along with chitosan may be tried for the management of downy mildew of pearl millet. Proper care should be taken to avoid the spread of pathogen from sick plot to other areas. Pre release cultures showing resistance to major diseases may be documented and forwarded for breeding use Artificial screening and mechanisms of resistance may be done for promising entries.

III. SORGHUM

Agricultural Entomology

1.	Project Number	:	**DRES/KPT/AEN/013/002 (AICRP/PBG/KPT/SOR/007)**
2.	Project Title	:	Evaluation of sorghum cultures for their resistance to major insect pests
3.	Name of the Department/ Station	:	Agrl. Research Station, Kovilpatti
4.	Name(s) of the Scientist(s) with Designation	:	Dr. P. ANANDHI, Asst. Professor (Agrl. Entomology)
5.	Project Period	:	Aug. 2013 - July 2016
6.	Objectives	:	Conducting the pest surveillance to study the seasonal abundance and population dynamics of sporadic and unusual out breaks at major sorghum growing areas of Coimbatore and Tuticorin Districts. Screening the materials received from the Project Co-ordinator, AICSIP, Hyderabad at TNAU, Coimbatore during kharif season and ARS, Kovilpatti during rabi season.

7. Brief outline of the work carried out from the project initiation period:

- **Based on the survey and pest surveillance the incidences of the major pests were identified.**
- The resistant breeding materials was isolated by screening against major sorghum pests and it was utilized for further breeding programme.

8. Work carried out during the review period :

Seasonal abundance and population dynamics of sporadic and unusual out breaks of pests at major sorghum growing areas.

In the pest surveillance study, the fields from North Thittankulam, K. Duraisamypuram, Thoppureddiapatti, Surangudi and Kovilpatti region were selected. The crop was sown with K8, PAC 501 and K 4 sorghum during the second fortnight of October 2014 with receipt of rainfall in these areas. The observation showed that the shoot fly damage was 8.18 to 42.10 per cent and the stem borer damage was 14.12 to 49.34 per cent respectively. The midge damage percentage ranged from 9.19 to 49.34 and the head bug damage rating ranged from 2 to 9. Earhead bug severe outbreak was recorded during this year and the damage rating ranged upto grade 9. It may be due to late sowing taken at Agricultural Research Station, Kovilpatti during this period.

National entries received from the Project Co-ordinator, AICSIP, Hyderabad were screened at TNAU, Coimbatore during kharif and ARS, Kovilpatti during rabi season.

Kharif trial at TNAU, Coimbatore

The following trials were conducted at Tamil Nadu Agricultural University, Coimbatore during 2014 kharif season to evaluate their resistance against the major sorghum pests. Resistant entries for stem borer are reported below.

S.No.	**Trial Name**	**Entries x 3 replications**
	brid Trial -GS	19
	rietal Trial -GS	26
	Initial Hybrid Trial -GS	13
	l Trial -GS	25
	ted Varietal and Hybrid Trial - MC	22
	ted Varietal and Hybrid Trial - SC	15
	ted Varietal and Hybrid Trial - SS	21
		25
		40

Entries identified for stem borer resistance during kharif 2014

		Entries with stem borer resistance Dead heart on 45 DAE (%)
	AHT- GS	CSH 23(10.53),SPH 1724 (10.81), SPH 1748 (5.41),CSH 30 (5.26), 1109 (5.41), CSH 25 (4.08)
	AVT - GS	CSV 27 (8.33), SPV2165 (5.26), CSV 23 (6.67), CSV 17 (0) , CSV 20 (5.0), SPV 2242 (10.87)
	IHT - GS	SPH 1780 (4.0),CSH16 (4.8),CSH 30 (0.0),SPH 1791(0.0), SPH 1788 (0.0), SPH1777 (0.0), SPH 1779 (0.0), SPH1793, SPH 1784(4.9), CSH25 (3.2), SPH 1786 (2.7)
	IVT - GS	CSV 27(5), SPV 2294 (9.3), SPV 2293 (7.5), SPV 2299 (7.7) , SPV 2298(5.8), SPV 2303 (7.0), SPV 2301 (8.6), SPV2297(7), CSV 17(5.1)
	IAVHT-MC	SPH1770(7), SPH 1769 (6.5), SPH 1768 (8.3), SSG 59-3(7.4), CSH 20MF(4.2), SPH 1700(7.7), SPH 1772(6.3), SPH 1769(6.3), SPV 2292(6.9)
	AVT - SC	SPH 1797(4),SPV 2185(3.6),SPV 2315(3.6),SPV 2314(2.3), CSV 30F(3.6),SPV2316(5),SPH 1796(2.2),CSH 13(0), SPH 1752(4.4),SPV 2313(4),CSV 13(4.8),SPV 2315(4)
	IVT - SC	CSV 19 SS(7.9),SPV 2196(4),SPH 1755(7.1) CSH 22 SS(9.1),SPV 2321(11.9),SPV 2324(11.1),SPV 2319(11.5), CSV 24 SS(11.6), SPV 2323 (10),SPV 2322(9.1),SPV 2320(7.5)
	IAVHT SS	DP –SF-kh 12 (5.56), ISIPRSN- 14 (0), DP- SF KH12(5.88), DP- SF KH12 (5.13), SIPRSN- 13(0.0), ISIPRSN- 8(0.0), ISIPRSN- 16(0.0) IASFN-KH12-1(7.14), ISIPRSN-17(4.17), ISIPRN-7(0.0)
	AICSIP - SPN	NRCS ENT R 07-24-3-1-4 (2.94), EC 15(5.00), PGN 30 (2.38), ICSV 705(6.67), NRCS ENT R 07-48-1-1-2 (2.86), NRCS ENT R 07-24-3-1-2(2.94), ENT R 07-48-1-1-3(4.65), ICSV 700(4.44)

Rabi Trials at ARS, Kovilpatti

The following trials were conducted at Agricultural Research Station, Kovilpatti during 2014-15 rabi season to evaluate their resistance against the major sorghum pests under rainfed condition. Resistant entries for shoot fly and stem borer are reported below.

S.No.	Trial Name	Entries x 3 replications
1.	Advanced Varietal and Hybrid Trial – DS	20
2.	Initial Varietal and Hybrid Trial – DS	30
3.	Initial Varietal and Hybrid Trial – SS	20
4.	AICSIP-SPN (DS & SS)	30

Entries identified for Shoot fly resistance during Rabi 2014-15

Sl. No.	Trial Name	Entries resistant for shoot fly
1.	AVHT-DS	1006(0), 1012(5.56), 1013(3.33), 1063(3.33), 1055 (6.67), 1060(5.88), 1108(0), 1103(6.06), 1109(0)
2.	IVHT-DS	2016(5.41), 2003(3.57), 2013(3.45), 2061(0), 2063(8.0), 2064(5.0), 2108(5.0), 2109(7.41), 2107(6.25).
3.	IVHT-SS	3003(6.25), 3057(2.94), 3059(6.45), 3115(3.13), 3111(11.11), 3113(3.13)
4.	AICSIP (DS-SPN)	413(3.33), 422(7.69), 423(7.14), 427(0), 445(6.25), 450(8.82), 453(0), 473(11.11), 477(7.41), 479(11.11), 484 (9.38)

Entries identified for Stem borerresistance during Rabi 2014-15

Sl. No.	Trial Name	Range	Entries for stem borer resistance
1	AVHT-DS	3.03 to 21.74	1005(4), 1012(5.56), 1063(3.33), 1061(3.57), 1055(3.33), 1103(3.03), 1112(3.23), 1104(3.23)
2.	IVHT-DS	0 to 56.00	2008 (4.17), 2057 (3.13), 2051 (2.78), 2055(3.70), 2103(3.23)
3.	IVHT-SS	0 to 53.33	3004(7.90), 3006(4.44), 3066(0), 3062(4.0), 3060(3.45), 3101(8.8)
4.	AICSIP (DS-SPN)	0-42.85	414(3.70), 421(4.76), 445(3.13), 470(5.0), 485(3.85), 489(0)

9.Salient Findings:

a. For Information:

1. In the pest surveillance study in Tuticorin District, during 2014-15, the shoot fly damage was 8.18 to 42.10 per cent and the stem borer damage was 14.12 to 49.34 per cent. The midge damage was upto 56.23 per cent and ear head bug/panicle damage rating ranged from 2 to 9.

2. In kharif, 2014 among the entries provided by the Directorate of sorghum Research, Hyderabad the screening results at TNAU, Coimbatore showed that the dead hearts caused by stem borer on 45th day after emergence ranged from 0.00 to 50.00 per cent. The stem borer damage on the stem and peduncle based on tunneling were recorded at harvest and the damage was ranged from 0.00 to 100.00 per cent respectively. The best entries for major pests were recorded and reported for further screening programme. During the crop period severe outbreak of midge and mite was recorded with the damage rating of grade-9.
3. In rabi, 2014-2015 among the entries provided by the Directorate of Sorghum Research, Hyderabad the screening results at ARS, Kovilpatti showed that the dead hearts caused by shoot fly on 28th day after emergence revealed that the damage level was high this year and it was ranged from 0.00 to 81.48 % respectively. The dead hearts caused by stem borer on 45th day after emergence revealed that the damage level ranged from 0.00 to 56.00 % respectively. The best entries for major pests were recorded and reported for further screening programme. During the crop period severe outbreak of midge and earhead bug recorded with the damage rating of grade-9.

10.	Remarks of the Technical Director based on the pre-review	:	Mechanisms of resistance may be studied for the promising entries

Project-II

1.	Project Number	:	**DRES/KPT/AEN/015/NEW**
2.	Project Title	:	Eco-friendly approaches for the management of important pests of sorghum
3.	Name of the Department/ Station	:	Agrl. Research Station, Kovilpatti
4.	Name(s) of the Scientist(s) with Designation	:	Dr. P. ANANDHI, Asst. Professor (Agrl. Entomology)
5.	Project Period	:	October 2014- September 2017
6.	Objectives	:	To evaluate the plant products against the important pests of sorghum To evolve the suitable intercrop for the management of important pests of sorghum. To validate the IPM modules against major pests of sorghum
7.	Brief outline of the work carried out from the project initiation period	:	

8. Work carried out during the review period:

I. Evaluation of plant products against the important pests of sorghum

To evaluate the different plant products for the management of shoot fly, stem borer and midge a field experiment was laid out in a Randomized Block Design during *rabi* 2014-15. The deadhearts due to shoot fly and stem borer recorded in different treatments at 28 DAE and 45 DAE revealed that significantly minimum deadhearts were recorded in neem oil 3% (14.57 and 10.91) and Neem seed kernel extract 5% treated plots (18.11 and 12.34) as compared to control (41.08 and 44.54). The highest incidence of midge spikelet damage rating was recorded in control (9-grade) followed by Notchi (*Vitex negundo*) 10% leaf extract (7-grade). The lowest spikelet damage was recorded in neem oil 3%, Neem seed kernel extract 5% and *Calotropis gigantea* 10% leaf extract (3-grade) treated plots

Grain yield

The experimental data indicated that the highest grain yield was recorded by Neem seed kernel extract 5% (1985.00 kg/ha),neem oil 3% (1878.33 kg/ha) and *Calotropis gigantea* 10% leaf extract (1822.00 kg/ha) treated plots. However, the highest cost benefit ratio (1:1.90) was obtained in Neem seed kernel extract 5% treated plots followed by *Calotropis gigantea* 10% leaf extract (1:1.83) and neem oil 3% treated plots (1:1.57)

II.Evolving the suitable intercrop for the management of important pests of sorghum.

To evlove the suitable intercrop for the management of shoot fly, stem borer and midge another field experiment was laid out in a Randomized Block Design during *rabi* 2014-15. The experiment consisted of seven treatments including an untreated check with three replications. The deadhearts due to shoot fly and stem borer recorded in different treatments at 28 DAE and 45 DAE revealed that significantly lowest deadhearts due to shootfly recorded in sorghum + sesamum (12.47) and sorghum + Bhendi (11.73) intercropped field as compared to control (48.64). The lowest deadhearts due to stem borer recorded in sorghum + cowpea (3.99) and sorghum + Bhendi (7.83) intercropped field as compared to control (38.22).The lowest incidence of midge spikelet damage rating was recorded in Sorghum + sesamum (1-grade) followed by Sorghum + Bhendi (1-grade) intercropped field

Grain yield

The experimental data indicated that the highest grain yield was recorded from sorghum + sesamum (1885.00 kg/ha) followed by sorghum + bhendi (1846.33) intercropped plots. Samewhile, the highest cost benefit ratio (1:1.95) was also obtained in sorghum + sesamum followed by sorghum + bhendi (1:1.91) intercropped plots.

III.Validation of the IPM modules against major pests of sorghum

To validate the IPM modules for the management of shoot fly, stem borer and midge another field experiment was laid out in a Randomized Block Design during *rabi* 2014-15. The experiment consisted of five treatments including an untreated check with four replications. The details of the treatments imposed are given below.

T1- Insecticide module with only insecticide application.

(1.Seed treatment with Imidacloprid 70 WS @ 3 g/kg seed

2. Spraying of Carbaryl 50WP @ 1kg/ha at 28 DAE for shoot fly

3. Dusting of Carbaryl 10D @25 kg/ha at 60 DAE for stem borer and midge)

T2- Ecofriendly module

(1. Intercropping sorghum + cowpea (4:1)

2. Installing fish meal trap upto 30 DAE

3. Releasing of egg parasitoid, *T. chilonis* at 45 DAE for stem borer

4. Spraying of Spinosad 45 % SC @ 75 g ai/ha at 50DAE for stem borer

5. Spraying Neem oil 3% at 60 DAE for midge)

T3- Need based integrated module consists of insecticides, botanicals and natural enemies

T4- Neem based module with application of only neem products

1. Incorporation of neem cake 150 kg/ha

2. Neem seed kernel extract (5%) at 28 DAE

3. Neem seed kernel extract (5%) at 45 DAE

4. Spraying of neem oil 3% at 60 DAE)

T5-untreated control.

The dead hearts due to shoot fly and stem borer recorded in different treatments at 28 DAE and 45 DAE revealed that significantly minimum deadhearts due to shootfly recorded in insecticide applied module (12.76) followed by need based integrated module (14.97) as compared to control (62.08). The lowest deadhearts due to stem borer recorded in insecticide applied module (7.22) and eco-friendly module (7.30) as compared to control (42.19). The lowest incidence of midge spikelet damage rating was recorded in need based integrated module and insecticide applied module (3-grade).

Grain yield

The experimental data indicated that the highest grain yield was recorded from Insecticide module with only insecticide application (2396.25 kg/ha) followed by Need based integrated module consisting of insecticides, botanicals and natural enemies (2115.75). However, the highest cost benefit ratio (1:1.63) was obtained in eco-friendly module followed by neem based module (1:1.31).

9. Salient findings

a. For Information :

1. The deadhearts due to shoot fly and stem borer revealed that significantly minimum deadhearts were recorded in neem oil 3% (14.57 and 10.91) and Neem seed kernel extract 5% treated plots (18.11 and 12.34) as compared to control (41.08 and 44.54).
2. The lowest spikelet damage was recorded in neem oil 3%, Neem seed kernel extract 5% and *Calotropis gigantea* 10% leaf extract (3-grade) treated plots.

3. The highest cost benefit ratio (1:1.90) was obtained in Neem seed kernel extract 5% treated plots followed by *Calotropis gigantea* 10% leaf extract (1:1.83) and neem oil 3% treated plots (1:1.57)
4. Lowest deadhearts due to shootfly recorded in sorghum + sesamum (12.47) and sorghum + bhendi (11.73) intercropped field as compared to control (48.64). The lowest deadhearts due to stem borer recorded in sorghum + cowpea (3.99) and sorghum + bhendi (7.83) intercropped field as compared to control (38.22).
5. The lowest incidence of midge spikelet damage rating was recorded in Sorghum + sesamum (1-grade) followed by Sorghum + bhendi (1-grade) intercropped field. The highest cost benefit ratio (1:1.95) was also obtained in sorghum + sesamum followed by sorghum + bhendi (1:1.91) intercropped plots.
6. Insecticide applied module (12.76) recorded the lowest deadhearts due to shootfly followed by need based integrated module (14.97) as compared to control (62.08). The lowest deadhearts due to stem borer recorded in insecticide applied module (7.22) and eco-friendly module (7.30) as compared to control (42.19).
7. The highest cost benefit ratio (1:1.63) was obtained in eco-friendly module followed by neem based module (1:1.31).

10.	Remarks of the Technical Director based on the pre-review	:	Natural enemies population should be recorded Reason for the reduction of pests in the inter cropping system of sorghum may be studied.

II. FINGER AND MINOR MILLET

A. Plant Pathology

1.	Project Number	:	AICRP/PBG/CBE/MIM/008
2.	Project Title	:	Evaluation of finger millet and small millets against major diseases and management of seed blackening in ragi
3.	Name of the Department/ Station	:	Department of Millets, CPBG, TNAU, Coimbatore -3
4.	Name(s) of the Scientist(s) with Designation	:	Dr. T. Raguchander Professor (Plant Pathology)
5.	Project Period	:	October 2013 to September 2016
6.	Objectives	:	Screening of finger millet entries for important diseases Phenotyping of finger millet mapping populations for blast resistance Management of seed blackening in ragi Evaluation of advanced entries of small millets for their reaction to important diseases
7.	Brief outline of the work carried out from the project initiation period	:	

1. **Work carried out during the review period:**

1. Screening of entries against major diseases of ragi

The following field trials were conducted as per the technical programme of small millets pathology for 2014-2015.

Initial Varietal Trial

Twenty five entries were screened under Initial Varietal Trial (IVT) against major diseases of ragi. Leaf blast incidence of grade ranged from 0.00 to 3.00 was observed. Neck blast and finger blast ranged from 0.0 to 22.53 per cent and 0.0 to 18.06 per cent respectively were observed. Five entries *viz*., PPR 1053, KMR 502, KOPN 930, TNEC 1277, and PRSW 43 entries were free from all the blast diseases. Check KM 252 showed disease grade for leaf blast (3.3 Grade), neck blast (23.6 per cent) and finger blast (25.87 per cent) respectively.

Advanced Varietal Trials (AVT) -I and II

Fourteen entries were screened for major diseases of ragi. Leaf blast incidence of grade upto 3.3 was observed among the entries screened. Neck blast ranging from 0.0 to 18.67 per cent and Finger blast ranging from 1.27 to 24.33 per cent was recorded in the entries. Entries viz., GPU-45 and VR 708 were resistant to all the blast diseases. Check KM 252 recorded incidences of leaf blast (3.67 Grade), neck (20.43 per cent) and finger blast (23.67 per cent).

Advanced Varietal Trials (AVT) -III

Twenty entries were screened under AVT III against important diseases. Leaf blast incidence ranged from 0.0 to 3.6 grade, neck blast ranged from 0.0 to 18.23 per cent and finger blast ranged from 0.0 to 31.5 per cent were observed. Five entries *viz*., KMR 316, GPU 84, PR 202, KMR 344 and GK-2 were found to be resistant to leaf, neck and finger blast diseases.

Other small millets:

Evaluation of germplasm and breeding entries of small millets for their reaction to important diseases.

A. Foxtail millet

FAVT: Twenty three entries were screened for brown spot, rust and smut diseases. All entries free smut and trace amount of leaf blast and rust were observed up to less than 1.0 G.

B. Little millet

LAVT: Advanced Varietal trial: A total of nineteen entries were screened for Grain smut and rust disease. All entries recorded less than 1% grain smut except DLM 89 (up to 1%) and trace amount of rust in GPUL 2 (Upto 1.0 G).

C. Proso millet

PAVT: Advanced Varietal trial: Seventeen entries were screened for *Helminthosporium* and rust diseases. All entries showed less than 1.0 G for *Helminthosporium* leaf spot and rust.

SM (PP) 302: Evaluation of donor screening nursery (DSN)

1. Little millet

Totally twelve entries were screened for grain smut and rust disease. Among the entries, only one entry JK 8 showed higher incidence of brown spot (1.67 G) and rust (2.33 G).

2. **Proso Millet**

Fourteen entries were screened for leaf spot and other disease (rust). Among the entries TNAU 183, TNAU 217 and GPU-21 recorded more than 1.0 G for leaf spot and rust.

3. Managment of ragi blast with newer fungicides and bioagents

A field experiment was conducted at MBS, Coimbatore-2014 using the ragi variety KM 252 with 11 treatments replicated thrice in Randomized Block Design. Bio-control agent *P. fluorescens*, *T. viride* and new fungicide molecule Tricyclazole + Mancozeb were used in this experiment. Treatment details were furnished below

T_1	Seed treatment with *P. fluorescens Fp7* @ 10g/kg of seed
T_2	Foliar application of *P. fluorescens Fp7*@ 5g/lit during maximum tillering and heading stage
T_3	Seed treatment + foliar application of *P. fluorescens* (T_1+T_2)
T_4	Seed treatment with *Trichoderma viride* @ 4g/kg of seed
T_5	Foliar application of *T. viridi* @ 4g/lit during maximum tillering and heading phase
T_6	Seed treatment + foliar application *T. viride* (T_4+T_5)
T_7	Seed treatment with Tricylazole + Mancozeb @ 2g/kg
T_8	Foliar application of Tricylazole + Mancozeb @ 2g/ lit during maximum tillering and heading phase
T_9	Seed treatment + foliar application Tricylazole + Mancozeb (T_7+T_8)
T_{10}	Seed treatment with combination of *P. fluorescens* 10g/kg + *T. viride* @ 4g/kg + Foliar application of Tricylazole + Mancozeb @ 2g/ lit during maximum tillering and heading phase
T_{11}	Untreated control

Treatments were imposed as per the technical schedule. Observation on blast incidence and growth characteristics and yield parameters were recorded.

Results:

Among the treatments tested, **s**eed treatment with combination of P. *fluorescens* @ 10gand *T. virid*i @4g /kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf, neck and finger blast disease incidence of 2.33 G, 8.83 % & 9.0 % respectively. Untreated control recorded maximum disease incidence of 4.83 (G), 18.43% & 19.23% respectively.

The result of the growth parameters showed that, seed treeatment with*P. fluorescens* @ 10g /kg of seed followed by foliar application new fungicide molecule Tricyclazole +Mancozeb @ 2g/lit at maximum tillering and heading phase) recorded more no of tillers of 6.0/plant, plant height of 98.5 cm, finger length of the 8.6 cm and no of fingers of 8.0/ earhead respectively. The same recorded higher yield of 2968 kg/ha where as untreated control recorded lowest yield of 1872 kg/ha.

9. Salient findings

For information

- In the initial varietal trial, five entries *viz*., PPR 1053, KMR 502, KOPN 930, TNEC 1277 and PRSW 43 entries were free from all the blast diseases. Similarly, in the advance varietal trial I and II, entries namely GPU-45 and VR 708 were found to be resistant to leaf, neck and finger blast. In AVT III, entries *viz*., KMR 316, GPU 84, PR 202, KMR 344 and GK-2 were free from all the blast diseases
- Among the treatments tested, **s**eed treatment with combination of P. *fluorescens* @ 10gand *T. virid*i @4g /kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf, neck and finger blast disease incidence of 2.33 G, 8.83 % & 9.0 % respectively.

10.	Remarks of the Technical Director based on the pre-review	:	Pathogen cultures are to deposited in the department Pathotyping of *P. grisea* may be initiated Artificial screening and mechanisms of resistance may be studied for promising entries.

2. RRS, Paiyur

1	Project Number	:	DRES/PAI/PAT/013/001
2	Project Title	:	Biological control of blast disease in finger millet in the North Western agro climatic zone of Tamil Nadu
3	Name of the Department/Station	:	Regional Research Station, Paiyur
4	Name(s) of the Scientist(s) with Designation	:	Dr. K. Kalpana Assistant Professor (Pl.Pathol)
5	Project Period	:	June 2013 to March 2015
6	Objectives: To study the biocontrol activity of *Psuedomonas fluorescens and Trichoderma viride* against blast of ragi under field condition To evaluate the plant growth promotional activity of bioagents in ragi against blast		

7. Brief outline of the work carried out from the project initiation period :

Field experiments season I &II were conducted at Regional Research Station Paiyur to study the effect of biocontrol agents and new fungicide molecule on blast incidence using the ragi variety Paiyur 2 with 11 treatments replicated thrice in the randomized block design. Observations on blast incidence growth and yield parameters were recorded and statistically analyzed.

8. Work carried out during the review period:

Season I

The second year first season experiment was conducted at Research Station, Paiyur during December 2014 using the ragi variety Paiyur2 with 11 treatments replicated thrice in Randomized Block Design. Bio-control agent *P. fluorescens, T. viride* and new fungicide molecule Tricyclazole + Mancozeb were used in this experiment. Treatment details were furnished below

T_1	Seed treatment with *P. fluorescens Fp7* @ 10g/kg of seed
T_2	Foliar application of *P. fluorescens Fp7*@ 5g/lit during maximum tillering and heading stage
T_3	Seed treatment + foliar application of *P. fluorescens* (T_1+T_2)
T_4	Seed treatment with *Trichoderma viride* @ 4g/kg of seed
T_5	Foliar application of *T. viridi* @ 4g/lit during maximum tillering and heading phase
T_6	Seed treatment + foliar application *T. viride* (T_4+T_5)
T_7	Seed treatment with Tricyclazole + Mancozeb @ 2g/kg
T_8	Foliar application of Tricyclazole + Mancozeb @ 2g/ lit during maximum tillering and heading phase
T_9	Seed treatment + foliar application Tricyclazole + Mancozeb (T_7+T_8)
T_{10}	Seed treatment with combination of *P. fluorescens* 10g/kg + *T. viride* @ 4g/kg + Foliar application of Tricyclazole + Mancozeb @ 2g/ lit during maximum tillering and heading phase
T_{11}	Untreated control

Treatments were imposed as per the technical schedule. Observation on blast incidence and growth characteristics (No. of tillers, Tiller height, No. of leaves/ tiller and leaf length etc) and yield parameters were recorded and statistical analysis was done.

Results :(Season I)

1. Effect of bioagent and fungicide on blast disease incidence and yield in finger millet:

Among the treatments **s**eed treatment with combination of P. *fluorescens* @ 10gand *T. viridi* @4g /kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase recorded minimum leaf and neck blast disease incidence of 4.9% & 0.0% respectively this was followed by seed treatment and foliar application of P. *fluorescens* @10g/kg& 5g/lit (7.9 and 2.5 %). Untreated control recorded maximum disease incidence of 19.5 & 8.5% respectively.

2. Growth and yield parameters

Growth promotion was observed in all the treatments tested except control. Among the treatments Seed treatment with*P. fluorescens* @ 10g /kg of seed followed by foliar application new fungicide molecule Tricyclazole +Mancozeb @2g/lit at maximum tillering and heading phase) recorded more no. of tillers of 3.1/plant, plant height of 119.1 cm, no. of leaves of 16.8/tiller, leaf length of 39.2cm, finger length of the 8.5cm and no of fingers of 9.1/ earhead respectively, this was followed by the treatment seed treatment with *P. fluorescens* @10g/kg + foliar application of *P. fluorescens*@5g/litat maximum tillering and heading stage), whereas untreated control recorded minimum no of tillers of 2.9/hill, plant height of 93.6cm , no of leaves of 10.6/tiller, leaf length of 26.3cm, finger length of the 6cm and no of fingers of 5.7 / earhead respectively.

3. Yield

All the treatments tested were effective in increasing the grain yield of ragi except control. Among the treatment tested the significantly highest yield of 3809kg/ha with B: C ratio of 3.56 was recorded in seed treatment with P. *fluorescens* @ 10g/kg of seed & foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase and seed treatment with *P. fluorescens* @10g/kg and its two application at maximum tillering (3619kg/ha, B: C ratio of 3.66). The lowest yield of 2953kg/ha was recorded in the untreated control.

Season II

The second year season II confirmatory experiment was conducted during November2014. Nursery was raised on using the Paiyur2 ragi. Transplanting was taken up on 05.12.2014.Treatments were imposed as per the technical programme. Observations on blast disease incidence growth and yield parameters were recorded and statistical analysis was carried out.

Results:

1. Effect of bioagent and fungicide on blast disease incidence and yield in finger millet:

The results of second season experiment confirmed the first season experiment. Here also the significant difference in the leaf blast and neck blast incidence was observed in seed treatment with of P. *fluorescens* @ 10g/kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase) minimum per cent disease incidence of 1.5% & 0.0% followed by seed treatment + foliar application of P. *fluorescens* @ 10g/kg& 5g/lit). Untreated control recorded maximum disease incidence of 17.43%. &5.4 respectively.

2. Growth and yield parameters

The confirmatory field trial results on growth and yield parameters recorded at maturity stage showed that the significant difference with respect to plant height, no. of tillers, no. of fingers and finger length was observed in seed treatment with of *P.*

fluorescens @ 10g/kg and its foliar application (2g/lit) at maximum tillering and heading phase (Plant height of 75.2cm, no.. of tillers of 9.2, no of leaves of 7.3 cm, no. of fingers of 6.9 and finger length of 6.0 cm) followed by seed treatment with of *P. fluorescens* @ 10g/kg, seed treatment with*P. fluorescens* @ 10g/kg & foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase respectively. Untreated control recorded minimum plant height of 59cm, no. of tillers of 5.4, no. of leaves of 5.3 cm, no. of fingers of 5.0 and finger length of 4.7 cm respectively.

3. Yield

The results on grain yield revealed that the maximum yield of 3887kg/ha was recorded in seed treatment with*P. fluorescens* @ 10g/kg & foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase. Untreated control recorded minimum yield of 3143kg/ha.

9. Salient Findings

The confirmatory field trial results revealed that **s**eed treatment with*P. fluorescens* @ 10g/kg of seed followed by foliar application new fungicide molecule Tricyclazole + Mancozeb @2g/lit at maximum tillering and heading phase was effective in increasing the plant growth and yield (3806 kg/ha) besides reducing blast diseases incidence under field conditions as against farmers practice in ragi (PDI, 17.4 &5.4%, and yield of 3143kg/ha).

10.	Remarks of the Technical Director based on the pre-review	:	Pathogen cultures are to deposited in the department Pathotyping of *P. grisea* may be initiated Artificial screening and mechanisms of resistance may be studied for promising entries.

IV. LIST OF ONGOING PROJECTS
CROP IMPROVEMENT

1. UNIVERSITY RESEARCH SUB-PROJECTS

S. No	Project No	Project Title	Period	Investigators
A.	**SORGHUM**			
1	CPBG/CBE/PBG/SOR/2011/001	Development of sweet sorghum hybrids and varieties for high cane yield and improved sugar related traits	Sep 2011 to Aug 2016	Dr.R.Latha Assistant Professor (PB&G)
2	CPBG/CBE/PBG/SOR/2013/002	Maintenance, evaluation and utilization of germplasm in Sorghum	Apr 2013 to Mar 2018	Dr.R.Latha Assistant Professor (PB&G)
3	CPBG/CBE/PBG/SOR/2013/003	Development of high yielding hybrids suitable for irrigated and rainfed ecosystem of Tamil Nadu with improved tolerance to shoot fly and stem borer	Jun 2013 to May 2018	Dr.B.Selvi Professor (PB&G)
4	CPBG/CBE/PBG/SOR/2013/004	Development of high yielding dual purpose sorghum varieties suitable for irrigated and rainfed ecosystem of Tamil nadu with improved tolerance to shoot fly and stem borer	Jun 2013 to May 2018	Dr.B.Selvi Professor (PB&G)
5	CPBG/APK/PBG/SOR/2009/001	Evolution of drought tolerant sorghum genotypes suited to rainfed tracts of southern districts of Tamil Nadu.	Sep 2009 to Aug 2014	Dr.G.Anand Assistant Professor (PB&G)
6	CPBG/KPT/PBG/SOR/2015/001	Evaluation of high yielding sorghum varieties with resistance/ tolerance to earhead midge for late/ normal sowing conditions	March 2015 to Feb 2018	Dr. N. Malini Assistant Professor (PB&G)

B.	**PEARL MILLET**			
7	CPBG/CBE/PBG/PEM/2010/001	Maintenance of genetic purity and production of nucleus seeds of parental lines of hybrids and composites developed in pearl millet (*Pennisetum glaucum* L.)	June 2010 to Apr 2015	Dr.P.Sumathi Professor (PB&G)
8	CPBG/CBE/PBG/PEM /2010/002	Development of high yielding, pearl millet varieties / composites with desirable agronomic features and new inbred line development to utilize in the hybrid development programme	May 2010 to Apr 2015	Dr.P.Veerabadhiran Professor (PB&G)
9	CPBG/CBE/PBG/PEM /2011/003	Maintenance of germplasm accessions and collection, evaluation and utilization of genetic resources in pearlmillet (*Pennisetumglaucum*L.)	Jul 2011 to Jun 2016	Dr.P.Sumathi Professor (PB&G)
10	CPBG/CBE/PBG/10/009	"Development of new male sterile lines in Pearl Millet (*Pennisetumglaucum*(L.) R. Br.)"	February 2010 to November 2014	Dr. A. Subramanian, Asst Prof. (PB&G) Dr.R.Ravikesavan, Prof & Head (PB&G)
C.	**MAIZE**			
11	CPBG/CBE/PBG/MAZ/2013/001	Evolution of Single cross high yielding maize hybrid resistant to Sorghum downy mildew disease with different maturity groups *viz*., late (>95d) , medium (>85-95 d) and early (>75-85 d) suitable for irrigated ecosystem.	Jun 2013 to May 2018	Dr.G.Nallathambi Professor (PB&G)

12	CPBG/CBE/PBG/MAZ/2013/002	Development of high yielding sweet corn hybrids suitable for Tamil Nadu	Jun 2013 to May 2018	Dr. R. Ravikesavan Professor & Head (PB&G)
13	CPBG/CBE/PBG/MAZ/2013/003	Collection, maintenance and evaluation of genetic resources in maize and development of new inbred lines	Jun 2013 to May 2018	Dr. A. Yuvaraja Assistant Professor (PB&G)
14	CPBG/VGI/PBG/MAZ/2010/001	Collection and maintenance of maize germplasm	Apr 2010 to Mar 2015	Dr. N. Kumari Vinothana Assistant Professor (PB&G)
15	CPBG/VGI/PBG/MAZ/2010/002	Development of high yielding single cross maize hybrids suitable for irrigated ecosystem.	Apr 2010 to Mar 2015	Dr. K. N. Ganesan Professor & Head (PB&G)
16	CPBG/VGI/PBG/MAZ/2014/003	Development of maize inbred lines from different heterotic gene pools to evolve single cross hybrids for rainfed condition	Oct 2014 to Sep 2017	Dr. N. Kumari Vinothana Assistant Professor (PB&G)
D.	**SMALL MILLETS**			
17	CPBG/CBE/PBG/SMM/2011/001	Evolution of climate resilient high yielding varieties of – fingermillet, littlemillet and prosomillet under rainfed condition	Jun 2011 to May 2016	Dr. A. Thanga Hemavathy Assistant Professor (PB&G)
18	CPBG/CBE/PBG/SMM/2011/002	Maintenance, evaluation, utilization and distribution of fingermillet, littlemillet and prosomillet Germplasm Resources	Jun 2011 to May 2016	Dr. A. Thanga Hemavathy Assistant Professor (PB&G)

19	CPBG/CBE/PBG/SMM/2011/003	Evolution of high yielding varieties in *Varagu*, *Kudiraivali* and *Tenai*suitable for different agro climatic conditions	Jun 2011 to May 2016	Dr. S. Geethanjali Assistant Professor (PB&G)
20	CPBG/CBE/PBG/SMM/2011/004	Maintenance and evaluation of *Varagu*, *Tenai*and*Kudiraivali*germplasm	Jun 2011 to May 2016	Dr. S. Geethanjali Assistant Professor (PB&G)
21	CPBG/PAI/PBG/SMM/2010/001	Development of high yielding short duration samai genotypes suitable to the rainfed areas of North Western Region of Tamil Nadu	Jun 2010 to Jun 2015	Dr. K. Geetha Professor (PB&G)
22	CPBG/PAI/PBG/SMM/2011/002	Evolution of high yielding long duration ra varieties with in- built resistance to bla suitable for rainfed areas of Nor western region.	May 2011 to April 2016	Dr.K.Geetha Professor (PB&G)
23	CPBG/PAI/PBG/SMM/2011/003	Maintenance and production of nucleus and breeder seeds of rice and millet varieties released from RRS, Paiyur.	June 2011 to May 2016	Dr.K.Geetha Professor (PB&G)
24	CPBG/MDU/PBG/SMM/2009/001	Morphological characterization and identification of superior high yielding barnyard millet genotypes suited to Southern districts of Tamil Nadu	Oct 2009 to Mar 2014	Dr. C. Vanniarajan Professor & Head Dept. of Plant Breeding & Genetics
25	CPBG/ADL/PBG/SMM/2014/001	Evaluation and selection of suitable small millet genotypes for North eastern zone in Tamil Nadu	Jul 2014 to Jun 2017	Dr. A. Nirmalakumari Professor (PB&G)

26	CPBG/ADL/PBG/SMM/2014/002	Genetic improvement of small millets for drought resistance and evolving high yielding varieties suitable for North eastern zone of Tamil Nadu	Jul 2014 to Jun 2017	Dr. A. Nirmalakumari Professor (PB&G)
27	CPBG/ADL/PBG/SMM/2014/003	Evaluation of germplasm and evolution of high yielding oat and wheat varieties as an alternative crop for winter season	October 2014 to September 2017	Dr. A. Nirmalakumari Professor (PB&G)
28	CPBG/CTN/PBG/SMM/2010/001	Barnyard millet Advanced varietal trial (BAVT)	March 2010 to Till date	Dr.R.Sasikala Assistant Professor (PBG)
29	CPBG/CTN/PBG/SMM/2014/002	Development of Climate resilient Barnyard millet (*Echinochloa frumentaceae*) genotypes through Mutation Breeding	November 2014 to October 2017	Dr.R.Sasikala Assistant Professor (PBG)

II. AICRP Projects

S. No	Project No	Project Title	Period	Investigators
A.	**SORGHUM**			
1	AICRP/PBG/CBE/SOR/006	AICRP on Sorghum	June 2013 to May 2018	Dr. B. Selvi Professor (PB&G) Dr.R.Latha Assistant Professor (PB&G) Dr.R.Kalpana Assistant Professor (Agronomy)
2	AICRP/PBG/KPT/SOR/007	AICRP on Sorghum	October 2012 to September 2015	Dr. N. Malini Assistant Professor (PB&G) Dr. P. Anandhi Assistant Professor (Agrl. Entomology)
B.	**PEARL MILLET**			
3	AICRP/PBG/CBE/PEM/009	AICRP on Pearl Millet		Dr.P.Sumathi Professor (PB&G) Dr.G.Karthikeyan Professor (Pl. Pathology) Dr.N.Meyyzahagan Professor (Agronomy)

C.	**MAIZE**			
4	AICRP/PBG/CBE/MAZ/004	AICRP on Maize	June 2013 to May 2018	Dr.G.Nallathambi Professor (PB&G) Dr.P.Renukadevi Assistant Professor (PB&G)
5	AICRP/PBG/ VGI/ MAZ/005	AICRP on Maize	April 2010 to March 2015	Dr. K. N. Ganesan Professor & Head (PB&G)
D.	**SMALL MILLETS**			
6	AICRP/PBG/CBE/MIM/008	AICRP on Small Millets		Dr. A. Thanga Hemavathy Assistant Professor (PB&G) Dr.S.Geethanjali Assistant Professor (PB&G) Dr.S.Manoharan Professor (Agronomy) Dr.T.Raguchandar Professor (Pl. Pathology)

Voluntary Centres

S. No	Crop	Centres	Period	Investigators
1	Sorghum	ARS, Bhavanisagar	From 2007 to Till Date	Dr.P.S. Devanand Assistant Professor (PB&G)
2	Small Millets	CEM, Adhiyanthal	2014	Dr. A. Nirmalakumari Professor (PB&G)

III. Externally Funded Projects

Department of Millets

S. No.	Project No	Project Title	Funding Agency	Project period	Budget (Lakh Rs.)	Project Leader (S) (PI/Co-PI)
1	PPV/CPBG/CBE/MIL/2012/R001	Developing guide lines for conduct of test for Distinctiveness, Uniformity and Stability (DUS) in small millets	PPV&FRA	2012 to 2015	15.65	Dr.A.ThangaHemavathy Dr.S.Geethanjali
2	UGC/CPBG/CBE/MIL/2012/R002	Development of high culm strength , bold seeded and compact plant type genotypes in kodo millet suitable for mechanical harvesting	UGC	2012 to 2015	9.63	Dr.A.Subramanian Dr.A.Nirmalakumari

3	UGC/CPBG/CBE/MIL/2012/R003	Identification of high beta carotene pearl millet lines (Golden Millet) to enhance the nutritional security	UGC	2012 to 2015	10.13	Dr.P.Sumathi Dr.P.Veerabadhiran Dr.N.Senthil
4	UGC/CPBG/CBE/MIL/2013/R004	Identification of Quantitative Trait Loci (QTLs) for drought tolerance in sorghum	UGC	2013 to 2016	11.21	Dr.S.Sivakumar
5	NIAS/CPBG/CBE/MIL/2013/R005	Evaluation of NIAS Gene Bank Sorghum Genetic Resources (mini core accessions)	NIAS, Japan	2012 to 2015	11.00	Dr. S. Sivakumar
6	DBT/CPBG/CBE/MIL/2013/R006	Marker aided back cross breeding for introgression of sugar enhancer (se) gene from sweet corn to normal maize inbred lines for enhancing the sugar content	DBT Biocare	2013 to 2016	22.86	Dr. A.Thanga Hemavathy
7	DBT/CPBG/CBE/MIL/2014/R008	Mapping of QTL for betacarotene [*Pennisetum glaucum* (L)] in pearl millet	DBT	2015 to 2017	34.63	Dr.P.Sumathi Dr.N.Senthil Mr.S. Vellaikumar

Centre of Excellence of Millets, Athiyandal

S. No.	Project No	Project Title	Funding Agency	Project period	Budget (Lakh Rs.)	Project Leader (S) (PI/Co-PI)
1	DBT/CPBG/ATL/MIL/2013/R 002	Development of waxy and non waxy foxtail millet genotypes suitable for Assam and Tamil Nadu and preparation of value added food products.	DBT	2013-2016		Dr. A. Nirmala Kumari Dr. N. Senthil Dr. A. Subramanian
2	MARICO/CPBG/ATL/MIL/2012/ R 001	Evolution of high yielding and nutrient rich Oat variety suitable for value addition.	MARICO	2012-2015		Dr. A. Nirmala Kumari Dr.A. Subramanian
3	NRTT/CPBG/ATL/MIL/2011/R003	Productivity enhancement in little millet and net profit uplifting of Javadhu hill tribal and small farmers of Tamil Nadu.	NRTT	2011-2015		Dr. A. Nirmala Kumari Dr.A. Subramanian

Department of Biotechnology

S. No.	Project No	Project Title	Funding Agency	Project period	Budget (Lakh Rs.)	Project Leader (S) (PI/Co-PI)
1	CPMB&B-PMB-11-002	Marker assisted introgression of *LycE /CrtRB1* gene for enhanced ProA in maize		December 2011 to June 2015		Dr.N.Senthil Dr. M. Raveendran Mr.S. Vellaikumar Dr.K. N. Ganesan Dr.P.Veerabadiran Dr.P.Nagarajan
2	CPMB&B-PMB-12-009	Development of low phytate maize hybrids using marker assisted back cross breeding programme		April 2012 to March 2015		Dr.N.Senthil Dr. M. Raveendran Dr.K. N. Ganesan Mr.S. Vellaikumar Dr.R.Balagobal
3.	Old number:CPMB&B-BTB-12-001	Optimization of *Agrobacterium* mediated transformation protocol for local elite cultivars of Foxtail millet (*Setaria italica*)		2012-15		E.Kokiladevi

ABSTRACT

CROPS and CENTRES	University Sub-Projects	AICRP Projects	Externally funded projects	Total
SORGHUM				
Coimbatore	4	1	2	7
Kovilpatti	1	1	-	2
Arupukottai	1	-	-	1
Bhavanisagar	-	1*	-	1
Sub total	**6**	**3**	**2**	**11**
PEARL MILLET				
Coimbatore	4	1	2	7
Sub total	**4**	**1**	**2**	**7**
MAIZE				
Coimbatore	3	1	1	5
Vagarai	3	1	-	4
Sub total	**6**	**2**	**1**	**9**
SMALL MILLETS				
Coimbatore	4	1	2	7
Paiyur	3	-	-	3
Madurai	1	-	-	1
Athiyandal	3	1*	3	7
Chettinad	2	-	-	2
Sub total	**13**	**2**	**5**	**20**
Biotechnology	**-**	**-**	**3**	**3**
Total Projects	**29**	**8**	**13**	**50**

(*AICRP-Voluntary Centres)

CROP MANAGEMENT

Department of Agronomy, TNAU, Coimbatore

S.No	Title of the Project	Period	Project Leader
1.	AICRP / PBG / CBE / SOR / 006 Response of pre-released grain sorghum genotypes to different fertility	June 2014 – May 2016	Dr. R. Kalpana
2.	AICRP / PBG / CBE / SOR / 006 Improving Nitrogen-use efficiency through method and time of N application	June 2013 – May 2015	Dr. R. Kalpana
3.	AICRP / PBG / CBE / SOR / 006 Priority inputs in *kharif* sorghum	June 2014 – May 2016	Dr. R. Kalpana
4.	DCM-CBE-AGR-12-009 Integrated Weed Management in Pearl Millet	July 2012 - June 2015	Dr. N. Meyyazhagan
5.	DCM-CBE-AGR-12-010 Nutrient Management through organic and inorganic sources for major and trace elements in Pearl Millet	July 2012 - June 2015	Dr. N. Meyyazhagan
6.	AICRP / PBG / CBE / PEM /009 Response of pearl millet advance, medium and late hybrid and varietal entries to levels of N	June 2014 – May 2016	Dr. N. Meyyazhagan
7.	AICRP / PBG / CBE / PEM /009 Performance of medium and late advance hybrid and population entries to different dates of sowing in Zone B.	June 2014 – May 2016	Dr. N. Meyyazhagan
8.	AICRP / PBG / CBE / PEM /009 Integrated nutrient management for Pearl millet hybrids under optimum management in zone B	June 2014 – May 2016	Dr. N. Meyyazhagan

9.	DCM - CBE- AGR- 11- 016 Response of advanced genotypes of small millets to different levels of nitrogen under rainfed condition	July 2011 - June 2014	Dr.S. Manoharan
10.	DCM-CBE-AGR-13-007 Effect of crop geometry and weed management practices on rainfed finger millet	July 2013 - June 2016	Dr.S. Manoharan
11.	DCM-CBE-AGR-13-008 Screening of Small millets for problematic soils	July 2013 - June 2016	Dr.S. Manoharan
12.	DCM-CBE-AGR-13-009 Evolving drought management practices in rainfed finger millet to mitigate climate change	July 2013 - June 2016	Dr.S. Manoharan
13.	DCM-CBE-AGR-12-005 Performance of Cumbu Napier hybrid grass CO(CN)4 as influenced by micronutrients under irrigated conditions	June 2012 - Sep.2014	Dr. A.Velayutham
14.	DCM - CBE - AGR - 12 – 018 Long term trial on tillage and weed management in maize - sunflower cropping system.	July 2012 - Sept 15	Dr. N. Sakthivel

Department of Soil Science & Agricultural Chemistry

S. No.	Project no. and title	Period	Project Leader(s)
1.	AICRP/NRM/CBE/SAC/002 Test verification of fertilizer prescription under IPNS for maize-tomato sequence	Oct 2012 - Sept 2015	Dr. R. Santhi
2.	AICRP/NRM/CBE/SAC/002 Soil Test Crop Response Correlation Studies through IPNS for Rainfed maize	Oct 2012 - Sept 2015	Dr. K. M. Sellamuthu
3.	AICRP/NRM/CBE/SAC/003 AICRP on Long Term Fertilizer Experiment - Studies on the content and uptake of nutrients and nutrient availability in finger millet- maize cropping system.	April 2012- March 2017	Dr.K. Arulmozhiselvan
4.	NRM - CBE - SAC - 13 - 004 Permanent Manurial Experiment of Coimbatore under irrigated Tropical Agro Ecosystem	Nov 2013 to Oct 2018	Dr. M. Elayarajan
5.	NRM - CBE - SAC - 14 - 001 Phosphorus acquisition and phosphorus use efficiency as influenced by various P sources in maize – groundnut sequence - An investigation using ^{32}P	June, 2014 - May, 2016	Dr. S. Meena
6.	Crop and Genotypic Variation - A Tool to Enhance phosphorus Use Efficiency for Sustainable Cropping in Low Phosphorus Soils	Mar 2012 – Feb 2015	S.Meena P.Malarvizhi
7.	AICRP/NRM/CBE/SAC/004 Long term effect of different levels and frequency of B application on the fate of B pools in soils of maize - sunflower cropping system	Aug 2012 - July 2018	Dr. D. Muthumanickam

Department of Microbiology

S. No.	Project no. and title	Period	Project Leader
1	AICRP/NRM/CBE/AGM/001 ICAR-AINP Soil Biodiversity & Biofertilizers Impact assessment of long-term nutrient management on microbial activities of soil	April 2013 - March 2016	D Balachandar
2	NRM/CBE/AGM/ 11 / S.05 Development of micro enterprise for Arbuscular Mycorrhizal biofertilizer production at villages through empowering rural women	July 2011- Sept 2014	Dr.K.Kumutha,
3	NRM/CBE/AGM/14/002 Studies on the nutritional / anti- nutritional changes in finger millet food(s) fermented with thermo tolerant *Pediococcus pentosaceus*	June 2014 – May 2016	Dr.R.Subhashini

Maize Research Station, Vagarai

S. No	Project No. & title	Period	Project leader
1.	AICRP/PBG/VGI/MAZ/005 Evaluation of different agronomic management practices for production of single cross maize hybrids, inbreds and composites under All India Coordinated Research Project on maize.	Apr, 2014 – Mar, 2017	Dr. R. Karthikeyan
2.	Permanent manurial experiment on maize - greengram cropping system in red sandy loam soil of Vagarai under irrigated condition	Oct, 2014 - Sep, 2019	Dr. C. Bharathi
3.	Biofortification of Zinc in Maize grain using Mycorrhizal Symbiosis (UGC)	Jul, 2012 - Jun, 2015	Dr. C. Bharathi

Agricultural Research Station, Kovilpatti

S. No.	Project No. and title	Period	Project Leader
1.	AICRP/DCM/KPT/AGR/ 004 Effect of fertilizer and moisture conservation practices on rainfed sorghum in Vertisols	Oct, 2011 - Sept 2015	Dr.V.Sanjivkumar
2.	AICRP/DCM/KPT/AGR/ 004 PME on Bt cotton and maize rotation under dry farming in Typic Haplusterts	Oct, 2011 - Sept 2016	Dr.V.Sanjivkumar
3.	AICRP/ DCM/ KPT/ AGR/ 1988/ 003 (DRES/KPT/AGR/012/002) Effect of micro environments on phenology, thermal requirements and grain yield of prominent *rabi* maize hybrids under rainfed condition	Sept 2012 – March 2015	Dr. A. Solaimalai Dr. S. Subbulakshmi
4.	AICRP/DCM/KPT/AGR/004 Performance evaluation of tractor operated air assisted seed drill for sowing minor millets	June 2014- May 2017	Dr. M. Rajeswari

Cotton Research Station, Veppanthattai

Sl. No	Project No. and title	Period	Project leader
1.	TRRI/VPT/AGR/12/002 Evaluation of *insitu* water harvesting technologies and crop residue addition on soil moisture retention, growth and yield for dry land crops (Cotton, Maize).	Sept 2012 - Aug 2015	Dr. R.Kavimani
2	TRRI/VPT/AGR/12/001 Studies on conservation tillage crop residues and supplemental irrigation through drip irrigation for dryland crops in black soil	Oct 2012 – Sept 2015	Dr.R.Baskaran

Regional Research Station, Paiyur

S. No	Title of the Project	Period	Project Leader
1	DRES/PAICRP/014/001. Physiological basis of screening samai varieties for drought tolerance under rainfed conditions.	Sept. 2014 - March 2016	Dr. A. Anderson Amalan Kumar
2	DRES/PAI/CRP/014/002 Physiological and biochemical responses of ragi cultivars under rainfed conditions	Aug.2014 - June 2016	Dr. K. Krishna Surendar
3	DRES/PAI/SAC/011/001 Effect of continuous addition of organic, inorganic and combination of nutrients on soil fertility and productivity under Samai - Horsegram cropping system	June 2012 - July 2015	Dr.M.Vijayakumar,

Regional Research Station, Aruppukottai

S. No.	Project No. and title	Period	Project leader
1	DRES/APK/SAC/01/013 Studies on the effect of zinc inconjoint with organic manures on Hybrid Maize.	May 2013 -Apr, 2016	Dr.P. Saravana Pandian,
2	DRES/APK/AGM/014/001 Effect of *Methylo bacterium* application on growth and yield of Kudiraivali – var.CO KV 2	Oct, 2014 - Sep,2017	Dr.R. Poorniammal

Centre of Excellence in Millets, Tiruvannamalai

S. No	Project No. & title	Period	Project leader
1.	DCM/ ADL / AGR / SMM / 2015/ 001 Evaluation of System of Finger millet (*Eleusine coracana*) Intensification (SFI) in Tamil Nadu (Irrigated)	Feb, 2015- June 2018	Dr. M.Jayachandran
2.	DCM/ ADL / AGR / SMM / 2015/ 002 Effect of organic foliar spray on growth and yield of ragi in Tiruvannamalai Dt	Dec, 2014 - Mar, 2017	Dr.K.Sivagamy
3.	Effect of date of sowing on seed yield and quality in Samai	Dec, 2014 - Nov, 2017	Dr. V.Paramasivam

Abstract of Projects

Department / Station	Agronomy	SS&AC	Microbiology	Crop Physiology	Seed Science
TNAU, Coimbatore	14	7	3	-	-
MRS, Vagarai	1	2	-	-	-
ARS, Kovilpatti	4	-	-	-	-
CRS, Veppanthattai	2	-	-	-	-
RRS, Paiyur	-	1	-	2	-
ARS, Aruppukottai	-	1	1	-	1
CEM, Athiyendhal	2	-	-	-	-

CROP PROTECTION

List of Projects			
S. No.	**Project No. & Title**	**Duration**	**Name of the Project Leader**
I.Sorghum			
Integrated Pest Management (Agrl.Entomology)			
1.	**DRES/KPT/AEN/015/NEW** Eco-friendly approaches for the management of important pests of sorghum	October 2014-September 2017	Dr. P. Anandhi Asst. Prof. (Agrl. Ent.), ARS, Kovilpatti
2	**DRES /KPT/ AEN /013/ 002.** Evaluation of sorghum cultures for their resistance to major pests. **(AICRP/PBG/KPT/SOR/007)**	Aug.2013-July 2016	Dr. P. Anandhi Asst. Prof. (Agrl. Ent.), ARS, Kovilpatti
II.Maize			
A.(Plant Pathology) **Host Plant Resistance**			
3.	**DRES/VGI/PAT/013/001.** Exploiting genetic variability of Maize genotypes resistance to turcicum leaf blight disease under artificial epiphytotic conditions”**- UGC- Externally project**	April 2013–March 2016	Dr. K. Sethuraman Professor (Pl. Pathology) Maize Research Station, Vagarai
4.	**DR/P3/DRVI/MRS-VGI/GOI** Viscosinamide-producing *Pseudomonas fluorescens* strain for managing major fungal diseases of maize	23.04.2014 – 23.04.2017	Dr.R.Radhajeyalakshmi Assistant Professor (Plant Pathology) AC&RI, Madurai
Integrated Pest Management			
5.	**TRRI/VPT/PAT/13/001.** Integrated Management of leaf blight in maize.	June 2013-May 2015	Dr. T. Anand Asst. Prof. (Pl. Path.), CRS, Veppanthattai

AICRIP projects			
6.	"**AICRP/PBG/CBE/MAZ/004"** Screening of maize entries against sorghum downy mildew under artificial condition and documenting other disease	AICRP	Dr. P. Renukadevi Asst. Prof. (Pl. Pathology) Dept. of Millets, Coimbatore
7.	**UGC/CPPS/ASD/PAT/2012/R001UGC** Eco Friendly management of Post Flowering Stalk Rot (PFSR) of maize (*Zea mays*.L) by using biocontrol agents".	July 2012 - June 2015	Dr. N. Rajinimala, Asst. Prof. (Plant Pathology) RRS,, Ambasamudram
B. Agrl.Entomology			
8.	**DRES/VGI/AEN/014/001** Studies on the pests of maize and their natural enemies	Dec 2013-Dec-2017	Dr.N.M.Arivudainambi, Asst. Professor (Agrl. Entomology)
9.	DRES/VGI/AEN/014/002 Evaluation of certain insecticides and bio control agent *Trichogramma chilonis* against stem borer *Chilo partellus* in maize	May 2014-April 2017	Dr.N.M.Arivudainambi, Asst. Professor (Agrl. Entomology)
III.Pearl Millet			
AICRIP project			
10.	**AICRP/PBG/CBE/PEM/009** Performance of pearlmillet entries against major diseases under downy mildew sick plot conditions and management of pearlmillet downy mildew	**AICRP**	Dr. G. Karthikeyan Professor (Pl. Pathology Dept. of Millets, Coimbatore
IV. Ragi and Small millet			
AICRIP project			
11.	AICRP/PBG/CBE/MIM/008 Evaluation of finger millet and small millets against major diseases and management of seed blackening in ragi	AICRP	Dr. T. Raguchander Professor (Pl. Pathology) Dept. of Millets, Coimbatore

Integrated Pest Management			
12	**DRES /PAI/ PAT /013/ 001.** Biological control of blast disease of finger millet in the north western agro climatic zones of Tamil Nadu	June 2013- Mar.2015	Dr. K. Kalpana Asst. Prof. (Pl. Path.), RRS, Paiyur
13	**SC/ADL/PAT/SMM/2015/002 (New)** An investigation into the epidemiology and ecofriendly management of blast disease in finger millet	Jan 2015 - Dec 2017	Dr. G. Senthilraja Assistant Professor (Plant Pathology)

Total Number of Projects in Crop Protection

S.No	Crop	No. of projects	
		Entomology	Pathology
1.	Sorghum	2	-
2.	Pearl Millet	-	1
3.	Maize	2	5
4.	Small Millets	-	3
	Total	4	9
	Grand total	**13**	

ART RESULTS

Sorghum

Performance of Sorghum entries for grain yield in ART

Trial		Centres	No.of Locations	TNS 623	TKSV0902	CO 30	TKSV0809
ART I	1	**Cuddalore**	**2**	1180	1298	1340	1228
	2			1345	1425	1245	1320
	3	**Dharmapuri**		2450	2300	2250	2375
	4	**Krishnagiri**	**2**	2050	1925	1950	2050
	5			2150	2125	2250	2150
	6	**Coimbatore**		1321	1236	1016	976
	7	**Pudukkottai**	**2**	2000	2100	2100	1850
	8			4100	4150	4400	4300
	9	**Madurai**	**2**	2160	2172	2060	1975
	10			2172	2060	1975	2160
	11	**Virudhunagar**	**4**	2750	2700	2800	2725
	12			2700	2900	2475	3025
	13			2850	2725	2775	2700
	14			1000	950	1025	625
			Mean	2159.143	2147.571	2118.643	2104.214
ART II							
	1	**Cuddalore**	2	1207	1287	1028	1072
	2			1106	1075	988	1039
	3	**Krishnagiri**	2	2125	2350	1950	2050
	4			2325	2150	2250	2150
	5	**Pudukkottai**	2	5100	5150	5250	5250
	6			5300	5750	5500	5600
	7	**Madurai**	1	2275	2460	2225	2218
	8	**Virudhunagar**	4	2675	2375	2275	2350
	9			2800	2725	2750	2700
	10			2850	2725	2775	2700
	11			2625	2375	2250	2300
				2762.545	2765.636	2658.273	2675.364

Pearl Millet

Performance of pearl millet hybrids under ART and OFT

Sl.No	Season	No.of locations	TNBH 08804	TNBH 08813	Co 9 hybrid	86M52
1	ART 1/2013-14	10	2795	2518	2760	2448
2.	ART 2/2013-14	9	2116	2089	2424	2063
3.	ART 3/2013-14	7	1986	1918	2138	1764
4.	ART 1/2014-15	5	2456	2350	2309	2592
5.	ART 2/2014-15	2	2503	2400	2457	2515
6.	OFT 3/13-14	6	4102	4053	3305	3050
7.	OFT 1/14-15	8	3929	3950	3235	2988
8.	OFT 2/14-15	7	3714	3703	3249	2824
	Mean		2950	2872	2735	2531
	% Increase over Co 9		7.9	5		
	% Increase over 86 M 52		16.6	13.4		

MLT RESULTS

Grain sorghum 2014-15

S.No	Entry	Coimbatore	Aruppukottai	Bhavani sagar	Kovilpatti	Paiyur
1	TNS 638(R)	2413	1722	2074	400	3570
2	TNS 647	2407	2222	2167	550	3873
3	TNS 648	2550	1944	1972	2500	3687
4	TKSV1029 ®	1787	1657	1926	3400	3707
5	ASV 09 007	2097	2648	2435	1067	3600
6	Co 30	2308	2352	2241	600	3787
7	K8	2154	1620	1824	3200	3803
8	CSV 17	2233	1343	1593	4717	3773
9	APK 1	2141	1463	1694	2833	3533

Forage sorghum
MLT 2013-14

Centres	TNFS 204		TNFSH 205		TKFS 06111		K11	
	DFF	GFY (t/ha)	DFF	GFY (t/ha)	DFF	GFY (t/ha)	DFF	GFY (t/ha)
Coimbatore	68	35.21	64	41.35	65	29.06	68	25.52
Aruppukottai	-	17.21	-	11.14	-	9.20	-	9.06
Vaigai dam	58	38.75	63	20.83	60	36.04	66	32.71
Paiyur	-	34.07	-	34.56	-	33.63	-	34.78
Kovilpatti	-	16.98	-	22.50	-	15.21	-	17.81
Bhavanisagar	-	24.58	-	27.5	-	26.04	-	23.44
Mean	**63**	**27.80**	**63.5**	**26.31**	**62.5**	**24.86**	**67**	**23.89**

MLT 2014-15

Centres	TNFS 204		TNFSH 205		TNFS 213		TKFS 1051		K11	
	DFF	GFY (t/ha)	DFF	GFY (t/ha)	DFF	GFY (t/ha)	DFF	GFY (t/ha)	DFF	GFY (t/ha)
Coimbatore	67	17.48	65	**25.77**	65	20.01	67	20.02	67	16.88
Aruppu-kottai	53	12.69	54	10.21	52	8.98	51	**18.15**	52	15.58
Paiyur	-	30.28	-	30.64	-	31.03	-	**31.21**	-	30.44
Kovilpatti*	54	3.90	60	8.17	55	2.30	54	2.70	57	3.10
Yethapur	60	16.44	66	22	64	**20.89**	63	14.89	64	19.91
Veppan-thattai	60	18.36	68	**24.09**	67	23.56	66	16.87	66	22.73
Bhavani Sagar*	55	13.07	53	**4.95**	53	9.46	51	7.22	51	5.65
Mean	**60.00**	**19.05**	**63.2**	**22.54**	**62.00**	**20.89**	**61.75**	**20.23**	**62.25**	**21.11**
Pooled Mean	**61.50**	**23.43**	**63.38**	**24.43**					**64.63**	**22.50**
% increase over check	-	**4.12**	-	**8.58**	-	-	-	-		

DFF-Days to 50% flowering; GFY-Green Fodder Yield

Sweet sorghum
MLT 2013-14

Centres	TNSS 212			CSV24SS			CSV 19SS			SSV84		
	DFF	Brix	Total Bio mass (t/ha)	DFF	Brix	Total Bio mass (t/ha)	DFF	Brix	Total Bio mass (t/ha)	DFF	Brix	Total Bio mass (t/ha)
Coimbatore	66	19.8	41.30	67	17.8	36.60	66	17.3	35.2	68	17.2	35.3
Paiyur			32.49			34.30			34.26			32.93
Kovilpatti	68	18.5	19.78	64	15.5	11.00	63	17.8	16.56	63	14.4	13.65
Vaigai Dam	74	-	17.45	72		22.14	58		19.28	61		21.09
Bhavani sagar			34.38			32.92			30.73			28.23
Mean	**69**	**19.2**	**29.08**	**68**	**16.7**	**27.39**	**62**	**17.6**	**27.21**	**64**	**15.8**	**26.24**

MLT 2014-15

Centres	TNSS 212			CSV24SS			CSV 19SS			SSV84		
	DFF	Brix	Total Biomass (t/ha)	DFF	Brix	Total Biomass (t/ha)	DFF	Brix	Total Biomass (t/ha)	DFF	Brix	Total Biomass (t/ha)
Coimbatore	67	18.6	26.00	65	16.8	25.64	63	17.0	23.67	67	16.2	24.43
Aruppukottai	51	-	11.85	52	-	13.15	53	-	9.81	51	-	10.37
Paiyur	-	-	40.03	-	-	40.74	-	-	39.51	-	-	37.07
Kovilpatti	66	17.5	11.14	63	13.5	8.12	56	16.8	13.09	56	11.4	12.87
Veppanthattai	66	-	21.36	69	-	20.04	64	-	19.56	63	-	18.56
Yethapur	65	-	19.33	69	-	18.00	63	-	17.78	64	-	16.78
Bhavanisagar	51	-	12.56	52	-	14.0	53	-	10.42	51	-	11.57
Mean	**63**	**18.1**	**21.62**	**64**	**15.2**	**20.95**	**60**	**16.9**	**20.57**	**60**	**13.8**	**20.01**
Pooled Mean	66	18.6	25.35	**66**	15.9	24.17	**61**	17.2	23.89	**62**	14.8	23.13
% increase over check			**4.88**									

PEARL MILLET

Performance of Advanced Pearl millet cultures under MLT – *Kharif*, 2014

Location	Grain Yield Kg/ha			
	TNBH 10878	TNBH 10885	Co 9 hybrid	86M52
Vridhachalam	3185	4099	2322	3135
Bhavanisagar	1088	1528	1458	1273
Vaigaidam	-	-	-	-
Paiyur	4513	4624	4460	4497
Yethapur	4365	4125	4150	3850
Coimbatore	3168	3591	3120	2727
Mean	**3264**	**3593**	**3102**	**3096**
% Increase over Co 9	5.2	15.8		
% Increase over 86 M 52	5.4	16.0		

Performance of Advanced Pearl millet cultures under MLT – *Rabi*, 2014-15

Location	Grain Yield Kg/ha			
	TNBH 10878	TNBH 10885	Co 9 hybrid	86M52
Aruppukottai	648	768	1222	426
Kovilpatti	554	600	778	954
Coimbatore	2782	3230	2260	2525
Mean	**1328**	**1533**	**1420**	**1302**
% Increase over Co 9	-	8.0		
% Increase over 86 M 52	2.0	17.7		
Overall Mean	**2296**	**2562**	**2261**	**2199**
% Increase over Co 9	1.6	13.3		
% Increase over 86 M 52	4.4	16.6		

MAIZE

MLT-III Rabi 2013-14 *(Dec - Jan*: Irrigated) Yield (kg/ha)

S. No.	Centre's	CMH 10-473	CMH 10-477	CMH 10-540	VMH 08-015	Co6	NK6240	900M (G)
1	Bhavanisagar	4167	3519	3981	3889	3796	3981	3889
2	Coimbatore	8283	9343	9845	8568	8961	9925	9642
3	Vagarai	6960	7590	7730	8090	7730	8510	7910
	Mean	6470	6817	**7185**	**6849**	6829	7472	7147
% Co6		**-**	**-**	**5.19**	**0.27**	**#**	**-**	**-**
% over NK6240		-	-	**-**	-	-	**#**	**-**
% over 900 M(G)		-	-	**-**	-	-	-	**#**

MLT - I Kharif 2014 (Early)(June-July **:Irrigated)** **Yield (kg/ha)**

S. No.	Centre's	CMH 10-473	CMH 10-477	CMH 10-540	CMBH 12-1	Co6 (C)	NK6240 (C)	900M (G) (C)
1	Coimbatore	9025	10325	11458	9125	10255	10125	10765
2	Bhavanisagar	2417	1833	2861	2806	4833	4972	3028
3	Paiyur	8469	8197	9108	8589	9006	8081	8672
4	Vagarai	5700	6600	7200	7800	8100	8160	10440
	Mean	6402	6739	**7657**	7080	8048	7834	8226
% Co6		-	-	-	-	#	-	-
% over NK6240		-	-	-	-	-	#	-
% over 900 M(G)		-	-	-	-	-	-	#

MLT- II Kharif 2014 (Late) (Sept -October: **Rainfed)** **Yield (kg/ha)**

S. No.	Centre's	CMH 10-473	CMH 10-477	CMH 10-540	VMH 12-006	VMH 9020	Co6 (C)	NK6240 (C)	900M (G (C)
1	Veppanthattai	7409	8261	7909	7306	7759	7559	9468	8185
2	Aruppukottai	1367	1900	1872	2644	2661	2383	1728	3072
3	Yethapur	7444	8344	7900	7233	7667	7756	9362	8222
4	Kovilpatti	8049	8999	8466	7316	8083	7649	7833	8266
5	Vagarai	4894	3832	5842	4833	5010	4638	5413	4652
	Mean	5833	**6267**	**6398**	5866	**6236**	5997	6761	6479
% Co6		-	**4.50**	**6.69**	-	**3.98**	#	-	-
% over NK6240		-	-	-	-	-	-	#	-
% over 900 M(G)		-	-	-	-	-	-	-	#

Overall performance of maize hybrids under MLT-I and III during **2013 & 2014** (Kharif and Rabi**)** under **irrigated** conditions **(2 years yield data)**

S.No	Location	Year	Yield (Kg/ha)						
			CMH 10-473	CMH 10- 477	CMH 10-540	CMB H12-1	Co6	NK 6240	900M (G)
MLT-I Kharif									
1	Vagarai	2013	6656	9081	10062	-	8635	8629	9185
2	,,	2014	5700	6600	7200	7800	8100	8160	10440
3	Coimbatore	2013	10617	10644	11484	-	10255	10247	10424
4	,,	2014	9025	10325	11458	9125	10425	10125	10765
5	Paiyur	2014	8469	8197	9108	8589	9006	8081	8672
6	Bhavanisagar	2013	4056	4296	4815	-	4315	5204	4426
7	,,	2014	2417	1833	2861	2806	4833	4972	3028
8	Vriddhachala	2013	6795	6406	5937	-	7046	5102	4082
9	Madurai	2013	6142	6883	8210	-	7809	8117	7006
10	Pattukkottai	2013	10476	8000	10770	-	9042	9375	9021
	Mean ((10)		7035 (10)	7227 (10)	**8191 (10)**	7080 (3)	7947 (10)	7801 (10)	7705 (10)
% Co6			-	-	**3.07**	-	#	-	-
% over NK6240			-	-	**5.00**	-	-	#	-
% over 900 M(G)			-	-	**6.31**	-	-	-	#

	MLT-III Rabi	Rabi							
1	Bhavanisagar	2013	4167	3519	3981	-	3796	3981	3889
2	Coimbatore	2013	8283	9343	9845	-	8961	9925	9642
3	Vagarai	2013	6960	7590	7730	-	7730	8510	7910
	Mean (3)		6470	6817	**7185**	-	**6829**	**7472**	**7147**
% Co6			-	-	**5.19**	-	**#**	-	-
% over NK6240			-	-	-	-	-	**#**	-
% over 900 M(G)			-	-	-	-	-	-	**#**
Overall pooled yield data of Kharif and Rabi (Irrigated)									
Grand mean (13)			6905	7132	**7958**	-	7688	7725	7576
% Co6			-	-	**3.51**		**#**	-	-
% over NK6240			-	-	**3.02**		-	**#**	-
% over 900 M(G)			-	-	**5.04**		-	-	**#**

Overall performance of maize hybrids under MLT-II during Kharif 2013 & 2014 under rainfedconditions ((2 years Yield data).

S. No.	**Location**	**Year**	**Yield (Kg/ha)**						
			CMH 10-473	**CMH 10- 477**	**CMH 10-540**	**VMH 9020**	**Co6 (C)**	**NK 6240**	**900M (G) -C**
	MLT-II	**Kharif**							
1	Veppanthattai	2013	4688	5147	4798	4405	4232	4758	5320
2	,,	2014	7409	8261	7909	7759	7559	9468	8185
3	Aruppukottai	2013	1513	892	1722	1004	1717	976	1302
4	,,	2014	1367	1900	1872	2661	2383	1728	3072
5	Yethapur	2013	3140	3294	3360	2116	3264	2870	2560
6	,,	2014	7444	8344	7900	7667	7756	9362	8222
7	Kovilpatti	2013	3603	3214	3553	3128	3040	2970	3673
8	,,	2014	8049	8999	8466	8083	7649	7833	8266
9	Vagarai	2013	4894	4833	5413	4652	4638	5842	5010
10	,,	2014	4894	3832	5842	5010	4638	5413	4652
		Mean (10)	4700	4872	**5084**	4649	4688	5122	5026
% Co6			-	**3.92**	**8.45**	-	**#**	-	-
% over NK6240			-	-	-	-	-	**#**	-
% over 900 M(G)			-	-	**1.15**	-	-	-	**#**

Ragi

S. No.	Varieties	Grain yield (kg/ha)						% increase over best check		
		Coimbatore	Bhavanisagar	Paiyur	Kovilpatti	Aruppukottai	Mean	CO 14	Paiyur 2	GPU 28
1	DPI 009-04	2364	3080	3867	Not germinated	3293	3156	28.65	3.91	40.20
2	TNEc 1269	2780	2400	3852	346	2667	2409	-	-	7.01
3	TNEc 1277	2650	1933	3753	114	1960	2082	-	-	-
4	Co(Ra) 14 (C)	2733	2173	3921	864	2573	2453			
5	Paiyur (Ra) 2 (C)	2080	2693	3773	Not germinated	3600	3037			
6	GPU 28 (C)	2306	2413	3842	518	2173	2251			
	Mean	2486	2449	3834	1842	2711				

Samai

S.No.	Varieties	Grain yield (kg/ha)					% increase Over Best check	
		Coimbatore	Paiyur	Aruppukottai	Kovilpatti	Mean	CO 4	Paiyur 2
1	TNPsu 167	2179	2178	787	Grain yield not reported	1715	-	3.3
2	TNPsu 170	2145	2082	600		1609	-	-
3	KR 11-05	1988	2011	560		1520	-	-
4	TNPsu 171	2078	2133	640		1617		
5	TNPsu 174	2114	2063	787		1655		
6	CO 4	2087	2095	1267		1816		
7	Paiyur 2	1978	2018	986		1661		
	Mean	2081	2082	804				

Panivaragu

S.NO	Varieties	Grain yield (kg/ha)					% increase Over check
		Coimbatore	Paiyur	Kovilpatti	Aruppukottai	Mean	CO (PV)5
1	TNPm234	2153	2583	57	533	1332	22.87
2	TNPm 236	2210	2390	121	547	1317	21.49
3	CO (PV)5	2378	2435	72	533	1084	
	Mean	2247	2469	83.3	538		

Barnyard Millet

Locations	TNAU153	TNAU185	ACM12-110	ACM10-161	Co(Kv)2
Bhavanisagar	2489.0	2015.0	2578.0	2163.0	3259.0
Coimbatore	1399.4	1521.9	1852.5	1051.1	2037.8
Aruppukottai	2977.6	1866.6	2488.8	2948.0	2429.5
Madurai	2519.0	2816.0	3112.0	3409.0	2075.0
Kovilpatti	996.0	724.0	773.0	824.0	1025.0
Athiyandal	3428.2	3247.5	3563.7	3645.6	3883.4
Paramkudi	-	-	-	-	-
Chettinad	-	-	-	-	-
Mean	2301.5	2031.8	2394.7	2340.1	**2451.6**
% increase over check	-	-	-	-	

Kodo millet

Locations	TNAU142	TNAU144	CO3	APK1
Vridhachalam	3588.0	4334.0	4413.0	4525.0
Coimbatore	1146.7	1645.3	2073.9	1729.4
Paiyur	3472.0	3536.0	3402.0	3378.0
Aruppukottai	2711.0	2281.4	2696.1	2251.7
Kovilpatti	744.0	587.0	544.0	444.0
Athiyandal	4320.5	4661.4	4127.4	4462.2
Vamban	1068.0	1087.0	1123.0	1158.0
Tindivanam	-	-	-	-
Mean	2435.7	2590.3	**2625.6**	2564.0
% increase over Co3	-	-		

Foxtail millet

Locations	TNSi306	TNSi309	TNSi267	Co(Te)7
Vridhachalam	2763.0	1904.0	2544.0	3140.0
Coimbatore	2453.6	2326.7	2405.3	2637.2
Paiyur	2612.0	2449.0	2647.0	2696.0
Veppanthattai	2014.8	2136.3	1668.1	1869.6
Aruppukottai	2207.3	2296.2	2162.8	2222.1
Kovilpatti	243.0	290.0	166.0	255.0
Athiyandal	2564.9	2626.6	2183.0	2449.0
Vamban	1360.0	1290.0	1120.0	1110.0
Mean	2027.3	1914.8	1862.0	**2047.4**
% increase over check	-	-	-	

Seed Production and supply in Millets during 2014-15

S.No.	Crop	Variety	Qty (Kg)
1.	Maize	CO 6	2214
2.	Sorghum	CO 30	1100
3.	Cumbu	Co(cu)9	749.25
4.	Ragi	CO 15	662.75
5.	Samai	CO 4	689.25
6.	Varagu	CO 3	952.25
7.	Kudiraivali	CO(Kv) 2	640.5
8.	Panivaragu	CO (Pv)5	48.5
9.	Tenai	CO 6	237
		CO 7	1070.75
	Total		**8364.5**

Forage Crops

33rd CROP SCIENTISTS' MEET ON FORAGE CROPS - 2015

1. Action taken on / Thrust area / General Recommendation THRUST AREA

S. No.	Thrust area	Action taken
I	**CROP IMPROVEMENT**	
1.	Development of drought tolerant *Cenchrus* suited for pasture lands	• A promising *Cenchrus* culture **FDC 265** was identified and subjected for conducting OFT (2012-13 and 2013-14) and MLT during 2014-15. • Results of OFTs showed that FDC 265 executed a mean GFY of 52.0 t/ha /yr as against 43.5 t/ha /yr in CO 1. The per cent increase in GFY over CO 1 was 19.5. • The results of MLT obtained from 12 centres revealed that, it had registered a mean GFY of 52.68 t/ha/yr as against CO 1 (42.37 t/ha/yr). The per cent increase in GFY over CO 1 was 24.33. • Being perennial, the culture FDC 265 need to be evaluated for one more year under MLT during 2015-16 to ascertain its perenniality.
2.	Evolution of high biomass yielding legume fodders with improved fodder quality	**Fodder cowpea** • A promising fodder cowpea culture **TNFC 0924** (CO 5 x Bundel lobia 2) superior to CO (FC) 8 for GFY has been identified and proposed for OFT (2013 and 2014) and MLT during 2014. • The results revealed that the culture TNFC 0924 had registered remarkably higher mean GFY of 25.22 t/ha against the check CO (FC) 8 (21.34 t/ha). The per cent increase in green fodder yield over the check was 18.25. The protein content of TNFC 0924 was recorded to be 22.3 % as against CO (FC) 8 (21.8%). ***Desmanthus*** • A promising mutant **TND 1308** (450 Gy) superior to the introduced variety for fodder yield has been identified and will be proposed for conducting MLT from 2015 onwards for two years. **Lucerne** • Superior Lucerne culture **TNLC 14** identified from poly-cross breeding programme (2003 – 2010) will be proposed for conducting MLT from *rabi* 2015-16 onwards.
II	**CROP MANAGEMENT**	
1.	Performance evaluation of drip fertigation in Cumbu Napier hybrid grass	• An experiment on the performance evaluation of drip fertigation in Cumbu Napier hybrid grass CO (BN) 5 was taken up on 30.03.2015.

Number of ongoing Research Sub Projects

Department of Forage Crops, TNAU, Coimbatore

I. CROP IMPROVEMENT

1. Breeding	-	7

II. CROP MANAGEMENT

1. Agronomy	-	1
Total		**8**

SALIENT FINDINGS OF RESEARCH, 2014-15

A. CROP IMPROVEMENT

a. CROP VARIETIES RELEASED

S. No.	Crop/ Variety	Year of release	Special features
1.	Fodder sorghum CO 31	2014	Higher green fodder yield (192 t/ha/year); Enhanced seed yield due to intact seeds; Low HCN (172 ppm) and crude fibre (19.80 %). High dry matter yield (49.73 t/ha/yr).

b. IDENTIFIED FOR RELEASE DURING 2016

Fodder cowpea culture TNFC 0924

It is a cross derivative of CO 5 x Bundel lobia 2. Earlier variety CO (FC) 8 was released during 2004. This entry was subjected to evaluation as against CO (FC) 8 from 2010 to 2012 at Forage Research Farm, Coimbatore. Based on recommendations of ARW on Millets and Forage Crops, 2013, it has been proposed for conducting OFTs during 2013 and 2014. As per recommendations of ARW on Millets and Forage Crops, 2014, it was proposed for conducting MLT during 2014.

In the station trials, TNFC 0924 had accomplished a green fodder yield of 24.25 t/ha as compared to check CO (FC) 8 (20.80 t/ha) while the results obtained from On Farm Trials revealed that it had executed a mean GFY of 29.02 t/ha as against 24.73 t/ha in CO (FC) 8. The per cent increase in GFY over CO (FC) 8 was 16.6 and 17.35 respectively (Table 1).

The results of MLT conducted at 14 centres revealed that, TNFC 0924 had recorded a green fodder yield of 22.39 t/ha as against the check (18.53 t/ha). The per cent increase in GFY over CO (FC) 8 was 20.83.

The overall results revealed that the culture TNFC 0924 had registered remarkably higher mean green fodder yield of 25.22 t/ha against the check CO (FC) 8 (21.35 t/ha). The per cent increase in green fodder yield over the check was 18.13. The protein content of TNFC 0924 was recorded to be 22.3 % as against CO (FC) 8 (21.8%). Similarly, it also registered a lesser fibre content of 16% as compared to the check (18.5%).

Further, TNLC 0924 ranked first at National level in IVT (*kharif* 2012) and AVT I (*kharif* 2013) consecutively for GFY and DMY in the AICRP trials. In AVT I (*kharif* 2013), TNLC 0924 had recorded a higher dry matter yield of 2.9 t/ha with a per cent superiority of 3.9 over all the National checks at all India level. It had also ranked first for crude protein content (17.6 %) and crude protein yield (0.53 t/ha) at All India level.

Considering the supremacy of the fodder cowpea culture TNLC 0924 in OFT (*kharif* 2013 & 2014), MLT (*kharif* 2014) and AICRP trials (*kharif* 2012 & 2013), it will be proposed for release during 2016.

Table 1. Mean green fodder yield of fodder cowpea culture TNFC 0924

S. No.	Trials	No. of trials	Green fodder yield (t/ha)		% increase over CO (FC) 8
			TNFC 0924	CO (FC) 8	
1.	Research Station Trial (2010 - 2012)	3	24.25	20.80	16.60
2.	OFT (2013 and 2014)	60	29.02	24.73	17.35
3.	MLT (2014)	14	22.39	18.53	20.83
	Over all mean		**25.22**	**21.35**	**18.13**

c. IDENTIFIED FOR MLT 2015

1. Hedge Lucerne culture TND 1308

A promising mutant TND 1308 (450 Gy) superior to the introduced variety for fodder yield has been identified from Mutation breeding programme commenced during 2010. It was subjected for continuous evaluation against the introduced variety for two years (2013-14 and 2014-15).

The results revealed that the mutant TND 1308 had registered a mean green fodder yield of 81.9 t/ha /yr as compared to check (70.45 t/ha /yr). It will be proposed for conducting MLT from *rabi* 2015-16 onwards for two years.

2. Lucerne culture TNLC 14

The promising Lucerne culture *viz*., TNLC 14 identified from completed poly-cross breeding programme (2003 – 2010**)** has been subjected for evaluation against the recently released Lucerne variety CO 2 for two successive years (2013-14 and 2014-15).

The results revealed that the entry TNLC 14 accomplished a mean green fodder yield of 136.5 t/ha /yr as compared to check CO 2 (121.5 t/ha /yr). The per cent increase in green fodder yield over the check CO 2 was 12.3.

Based on its superior performance, it has been proposed for AICRP perennial trial from *rabi* 2013-14 onwards and now it is in the second year of perennial trial. It will be proposed for conducting MLT from *rabi* 2015-16 onwards for two years.

3. *Cenchrus* (Continued)

The *Cenchrus* culture FDC 265 has been evaluated under MLT against CO 1 during 2014-15 in 14 centres. Being perennial, it has to be tested for one more year under MLT in the same centres during 2015-16 to ascertain its consistency in performance.

d. Entries nominated for AICRP trials (2014-15)

A total of four entries two in CN hybrid grass, one each in Fodder cowpea and Lucerne was nominated for conducting All India coordinated varietal trials during the period from 2014-15 (Table 2).

Table 2. Entries nominated for AICRP trials

S. No.	Crop/ Culture	Season sponsored	Destiny/ Research findings
1.	**BN hybrid grass (2)** TNCN 1076 TNCN 1078	*Kharif* 2013	Ongoing
2.	**Fodder cowpea** TNFC 0926	*Kharif* 2014	**Ranked first at National level** in IVT (*kharif* 2013) and AVT I (*kharif* 2014) consecutively for GFY Will be promoted to AVI II (*kharif* 2015)
3.	**Lucerne** TNLC 14	*Rabi* 2013-14	Ongoing

B. CROP MANAGEMENT

Agronomy

Performance of Cumbu Napier hybrid grass CO (CN) 4 as influenced by micro nutrients under irrigated conditions

It could be inferred that, out of the 12 harvests made application of recommended dose of NPK (150:50:40 kg N, P_2O_5 and K_2O) along with $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @ 25 kg/ha was found to have significant effect on green fodder yield and quality traits of Cumbu Napier hybrid grass.

PROJECT WISE PROGRESS OF RESEARCH

A. CROP IMPROVEMENT

1. Project Number : **CPBG / CBE / PBG / NEW**

2. Project Title : **Collection, evaluation, documentation and selection of *Cenchrus, Deenanath and Bracharia* species**

3. Name of the Department/Station : Department of Forage Crops, TNAU, CBE-3

4. Name(s) of the Scientist(s) with Designation : **Dr. A. Kalamani** Professor and Head

5. Project Period : (June 2014 to May 2017)

6. **Objectives :**

- Collection of new germplasm lines
- To evaluate genotypes for their fodder production potential and quality aspects.
- Selection of the best genotypes than the existing varieties.
- Documentation of selected genotypes

7. Brief outline of the work carried out from the project initiation period

To evaluate genotypes in forage grasses *Cenchrus* for their fodder production potential and quality aspects. Utilization of the best genotypes in Breeding programme to improve the existing varieties, new collections of *Cenchrus* were added to the existing accessions. The new accessions were evaluated on the basis of morphological characters. High morphological variation was observed for plant height, number of tillers, leaf length and leaf breadth.

8. Work carried out during the review period

A total of 210 accessions collected from Tiruppur, Erode and Coimbatore Districts are being maintained for evaluation and utilization.

The new promising entries was observed with more number of tillers/ plant, leaves and with high biomass compared to the check CO1. One accession was drought tolerance with pink stem and another two accessions were early with high vigour and exhibits high biomass. These cultures will be forwarded to PYT during *kharif,* 2015.

Performance of *Cenchrus* culture FDC 265 in MLT

FDC 265 had registered exceedingly higher green fodder yield of 47.6 t/ha/yr against the check CO 1 (39.3 t/ha/yr). The per cent increase in green fodder yield over the check CO 1 was 20.8 (Table 3). In the station trials, it had accomplished a mean green fodder yield of 38.0 t/ha /yr as compared to check CO 1 (32.0 t/ha /yr) while the results obtained from On Farm Trials showed that FDC 265 executed a mean GFY of 52.0 t/ha /yr as against 43.5 t/ha /yr in CO 1. The per cent increase in GFY over CO 1 was 18.7 and 19.5 respectively.

The results obtained from MLT showed that FDC 265 had executed a mean green fodder yield of 52.7 t/ha/yr as against the check (42.4 t/ha/yr). The per cent increase in GFY over CO 1 was 24.3.

Being perennial, the culture FDC 265 needs to be evaluated for one more year under MLT during 2015-16 to ascertain its consistency in performance.

Table 3. Mean green fodder yield of *Cenchrus* culture FDC 265

S. No.	Trials	No. of trials	GFY (t/ha/year)		% increase over CO 1
			FDC 265	CO 1	
1.	Research Station Trial (2009-2011)	3	38.0	32.0	18.7
2.	On Farm Trial (2012-13 & 2013-14)	60	52.0	43.5	19.5
3.	MLT (2014-15)	12	52.7	42.4	24.3
	Over all mean		**47.6**	**39.3**	**20.8**

New entries studied during 2015-16

One drought tolerance accession with pink stem, two early high vigour accessions with high biomass and late flowering with high biomass in *C. glaucus* and few other cultures exhibits good vigour. These cultures will be forwarded to PYT along with the check CO 1 for further evaluation.

II. *Bracharia*

Seven collections were made from Tamil Nadu and Kerala and were evaluated (Table 4). These collections have recorded significantly higher green fodder yield. *Bracharia mutica* recorded the highest green fodder yield of 17.92 t/ha.

Table 4. Performance of *Bracharia* spp.

S. No.	Entry	Plant height (cm)	No. of tillers	No. of leaves	Leaf length (cm)	Leaf breadth (cm)	GFY (t/ha)
1.	*Bracharia mutica*	82.60	23.50	8.40	24.00	1.80	17.92
2.	*B. ruziziensis*	69.30	32.30	8.20	22.00	1.80	13.33
3.	*B. decumben*	74.40	31.20	6.00	29.00	1.70	12.50
4.	*B. brizantha*	63.90	30.00	6.50	30.00	1.30	11.67
5.	*B. decumbens/1*	81.50	25.60	5.80	28.00	1.10	11.67
6.	*B. ruziziensis/1*	86.00	29.50	6.50	31.00	1.00	10.00
7.	*B. mutica/1*	85.20	28.00	7.00	28.00	1.30	16.67

9. Salient Findings:

- The new best *Cenchrus* cultures will be forwarded to Preliminary Yield Trial along with check variety CO 1 for further evaluation.
- The culture FDC 265 needs to be evaluated for one more year under MLT during 2015-16 to ascertain its consistency in performance.

10. Remarks of the Technical Director based on the pre-review:

- The *Cenchrus* culture FDC 265 may be evaluated under MLT for one more year (2015-16)

1.	Project Number	:	**CPBG / CBE / PBG / NEW**
2.	Project Title	:	**Evolving high biomass yielding genotypes in *Desmanthus* and *Stylosanthus***
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**Dr. A. Kalamani** Professor and Head
5.	Project Period	:	(June 2014 to May 2017)

6. Objectives :

- Collection of new germplasm lines
- To evolve high biomass yielding types in *Stylosanthus* and *Desmanthus*
- Documentation of selected genotypes
- To create variation through mutation

7. Brief outline of the work carried out from the project initiation period

Desmanthus known as hedge Lucerne was identified as a valuable and highly nutritious legume fodder. It is suitable for cultivation in all types of soils and seasons. Work was done to increase the variability and targeting higher green fodder yield coupled with good quality in *Desmanthus virgatus* through mutagenesis.

High biomass yielding mutant was identified and this trait will be utilized in further crop improvement programme after the required field assessment

8. Work carried out during the review period

Superior plants were selected from M_5 generation in each treatment based on high biomass, high green fodder yield and high protein content. The selected mutants have been evaluated for their green fodder yield in M_5 generation. The recorded data on the green fodder yield were subjected to statistical analysis and pooled analysis has been worked out.

I. *Desmanthus*

A gamma ray mutant of introduced *Desmanthus viz*., TNDS 1308 superior to the former for GFY has been identified from M_5 population TNDS 1308 was sown on 07.07.2014 by ear to row method. Critical observation of progenies for fodder yield traits is in progress.

IDENTIFIED FOR MLT 2015

1. Hedge Lucerne culture TND 1308

A promising mutant TND 1308 (450 Gy) superior to the introduced variety for fodder yield and quality as detailed in Table 5 has been identified and proposed for conducting MLT/ OFT from 2015 onwards for two years.

Table 5. Mean green fodder yield of Hedge Lucerne culture TND 1308

S. No.	Trials	No. of trials	GFY (t/ ha/yr)	
			TND 1308	***Desmanthus***
1.	Research Station trials, 2013-14	1	83.20	72.50
2.	2014-15	1	80.60	68.40
	Over all mean		**81.90**	**70.45**
	% increase over the check *Desmanthus*		**16.25**	

II. *Stylosanthus*

A total of 13 accessions collected from Kerala are being maintained for evaluation and utilization. These above collections have recorded significantly higher green fodder yield. The entry SLC 17 recorded the highest green fodder yield of 37.2 t/ha in four cuts (V to VIII cuts) over the check *S. scabra* (33.5 t/ha) and the per cent increase over check was 11.04.

Stylosanthus new collection 2014

Five numbers of *Stylosanthus* were collected from Coimbatore district and evaluated during *Kharif*, 2014 (Table 6).

Table 6. Performance of *Stylosanthus* collections

S. No.	Entry	Plant height (cm)	No. of branches/ clump	Leaf length (cm)	Leaf breadth (cm)	GFY (t/ha)
1.	Local collection 1	79.37	9.73	1.55	0.40	7.08
2.	Local collection 2	73.37	9.57	2.57	0.30	8.00
3.	Local collection 3	93.77	5.34	1.81	0.72	9.00
4.	Local collection 4	76.57	9.17	1.61	0.42	7.25
5.	Local collection 5	59.63	6.07	1.91	0.28	8.33
6.	*S. scabra* (control)	65.00	7.50	1.73	0.43	7.80

The Local collection-3 recorded the highest green fodder yield of 9.0 t/ha in first cut over the check *S. scabra* (7.8 t/ha) and the per cent increase over check was 15.38.

9. Salient Findings

A promising mutant TND 1308 (450 Gy) superior to the introduced variety in *Desmanthus* for fodder yield and quality as detailed below has been identified and proposed for conducting MLT/ OFT from 2015 onwards for two years.

10. Remarks of the Technical Director based on the pre-review:

- The hedge lucerne culture TND 1308 may be proposed for conducting MLT from *kharif* 2015 onwards for two years.

1.	Project Number	:	**CPBG / CBE / PBG / 13 /09**
2.	Project Title	:	**Evolution of leguminous forage crops and evaluation of nominated entries of leguminous forage crops for yield and quality under AICRP on forage crops.**
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**C. Babu** Professor (PBG)
5.	Project Period	:	(October 2013 to September 2016)

6. Objectives

i) Hybridization and selection in Lucerne and fodder cowpea for yield and quality

ii) Evaluation of genotypes in leguminous forage crops for their fodder production potential and quality aspects under AICRP on FC.

7. Brief outline of the work carried out from the project initiation period

- Conducted University advanced varietal perennial trial in Lucerne during 2013-14.
- Proposed a promising Lucerne culture TNLC 14 (ALP 3-1) to AICRP on FC for evaluation in the AICRP varietal perennial trials (*Rabi* 2013-14).
- Conducting National Poly-cross breeding programme on Lucerne commenced during *rabi* 2011-12 as per technical programme.
- Lucerne variety CO 2 was released during 2013 for general cultivation in Tamil Nadu and got notified during January 2015.

- A total 80 nos. of accessions of fodder cowpea have been characterized.
- Conducted University advanced varietal trial in fodder cowpea during *kharif* 2013 and identified two promising entries better than CO (FC) 8.
- Proposed a promising fodder cowpea culture TNFC 0926 to AICRP on FC for evaluation in the AICRP varietal trials (*Kharif* 2013).
- Conducting Co-ordinated perennial trial in Lucerne and fodder cowpea genotypes as per technical programme allotted by AICRP on FC, IGFRI, Jhansi.

8. Work carried out during the review period

I. LUCERNE

1. National Poly -cross breeding programme

Poly-cross breeding programme in Lucerne has been initiated at this centre during *rabi* 2011-12. This programme is being conducted as per technical programme finalized during the NGM *rabi* 2011-12.

From the selected progenies, most promising individual plants (41) were identified, tagged and numbered and allowed for seed production during summer 2014. The OP seed of selected promising plants (41) were harvested individually and were sown on 09.02.2015 in a single row of 3 m length spaced at 30 cm for progeny test.

2. University advanced varietal perennial trial in Lucerne

The promising Lucerne culture *viz*., TNLC 14 identified from completed poly-cross breeding programme (2003 – 2010**)** has been subjected for evaluation against the recently released Lucerne variety CO 2 for two successive years (2013-14 and 2014-15).

The results revealed that the entry TNLC 14 accomplished a mean green fodder yield of 136.5 t/ha /yr as compared to check CO 2 (121.5 t/ha /yr). The per cent increase in green fodder yield over the check CO 2 was 12.3 (Table 7).

Based on its superior performance, it has been proposed for inclusion in the AICRP perennial trial from *rabi* 2013-14 onwards. It will be proposed for conducting MLT from *rabi* 2015-16 onwards.

Table 7. Mean green fodder yield of Lucerne culture TNLC 14 (2013-14 and 2014-15)

S. No.	Trials	No. of trials	GFY (t/ ha/yr)	
			TNLC 14	**CO 2**
1.	Research Station trials, 2013-14	1	134.0	118.0
2.	2014-15	1	139.0	125.0
	Over all mean		**136.5**	**121.5**
	% increase over the check CO 1		**12.3**	

3. Promising Lucerne culture proposed for AICRP trials

S. No.	Culture	Season sponsored	Destiny/ Research findings
1.	TNLC 14	*Rabi* 2013-14	Ongoing being perennial trial

4. Germplasm collection and maintenance

A total of 36 germplasm accessions collected from Tirupur Dt., Kutch Dt. Gujarat and promising material generated from poly-cross breeding is being maintained and utilized in crop improvement programme.

5. AICRP trials

Varietal Trial in Lucerne (Perennial) 2013-16

Seven entries nominated from AICRP on FC, Jhansi were sown on 28.10.2013 in RBD, replicated three times. Among them, three entries *viz*., VTLU 3 and VTLU 4 have recorded significantly higher green fodder and dry matter yield in 15 cuts over CO 1.

II. FODDER COWPEA

1. Germplasm collection and maintenance

A total of 110 germplasm accessions of fodder cowpea are being maintained for utilization in hybridization programme. A new crossing programme will be initiated during *kharif* 2015.

2. University advanced varietal trial

Two promising fodder cowpea cultures *viz*., TNFC 01 (TNFC 0924) and TNFC 02 (TNFC 0926) were evaluated during *kharif* 2013 for GFY potential against the check CO (FC) 8 and found that both entries performed better than the check. Considering the supremacy of these two cultures, they have been promoted for conducting MLT and OFT during *kharif* 2014.

3. Performance of fodder cowpea cultures in MLT (*Kharif* 2014)

MLTs on fodder cowpea cultures *viz.*, TNFC 01 (TNFC 0924) and TNFC 02 (TNFC 0926) were conducted during *kharif* 2014 at RRS, Paiyur, ARS, Virinjipuram, KVK, Papparapatti, NPRC, Vamban, SRS, Sirugamani, DARS, Chettinadu, ORS, Tindivanam, VRS, Palur, RRS, Viridhachalam, CRS, Vepanthattai, TCRS, Yethapur, ARS, Bhavanisagar ARS, Vaigaidam and Coimbatore.

The results revealed that the culture TNFC 01 (TNFC 0924) had recorded higher green fodder yield of 22.39 t/ha as against the check CO (FC) 8 (18.3 t/ha) followed by TNFC 02 (TNFC 0926). The percentage increase over the check was 20.83

4. Identified for release during 2016

Considering the supremacy of the fodder cowpea culture TNLC 0924 in OFT (*kharif* 2013 & 2014), MLT (*kharif* 2014) and AICRP trials (*kharif* 2012 & 2013), it will be proposed for release during 2016.

5. Promising fodder cowpea culture proposed for AICRP trials

A promising fodder cowpea culture *viz*., TNFC 0926 (CO 5 x KBG 2) superior to the released variety CO (FC) 8 for fodder yield and quality has been nominated for inclusion in the AICRP trials as detailed below.

S. No.	Culture	Special features	Season sponsored	Status
1.	TNFC 0926 (CO 5 x KBG 2)	Higher GFY than CO (FC) 8	*Kharif* 2013	**Ranked first at National level in IVT** for GFY (q/ha/day), DFY (q/ha/day) and quality traits [ADF, NDF and IVDMD (%)] **Promoted to AVT I (*Kharif* 2014)**

6. AICRP trials – *Kharif* 2014

Two varietal evaluation trials *viz*., IVT and First AVT has been conducted during *Kharif* 2014 using the entries nominated from different AICRP centres as per the technical programme of AICRP on FC. The results are furnished below.

In IVT, eight entries were sown along with the check CO (FC) 8 on 11.06.2014 in RBD, replicated four times. None of the entries significantly out yielded than CO (FC) 8 with respect to green fodder yield. However, the entry *viz*., IVTC 7 recorded significantly higher values for dry matter and crude protein yield than the check CO (FC) 8.

In AVT, seven entries were sown along with the check CO (FC) 8 on 11.06.2014 in RBD, replicated four times. Among them, AVTC 1 recorded significantly superior values for green fodder yield (210.41 q/ha) and dry matter yield (30.22 q/ha) over the check CO (FC) 8.

9. Salient findings:

- A promising Lucerne culture **TNLC 14** (ALP 3-1) has been **sponsored to AICRP on FC** for evaluation in the AICRP varietal trials (*Rabi* 2013-14). It will be proposed for conducting MLT from *rabi* 2015-16 onwards.
- Two superior fodder cowpea cultures *viz*., TNFC 01 (TNFC 0924) and TNFC 02 (TNFC 0926) were **proposed for conducting MLT during *kharif* 2014**. These two cultures have also been sponsored to AICRP trials during *kharif* 2012 and 2013 respectively. TNFC 01 (TNFC 0924) **had ranked first at National level in IVT**, with 1.6% and 2.9% superiority for GFY and DMY respectively. Also ranked first for GFY (q/ha/day), DFY (q/ha/day), CPY, plant height and LS ratio and hence forwarded to AVT (*kharif* 2013). Similarly, TNFC 02 (TNFC 0926) also **ranked first at National level in IVT** for GFY (q/ha/day), DFY (q/ha/day) and quality traits [ADF, NDF and IVDMD (%)] and hence promoted to AVT I (*Kharif* 2014).
- The fodder cowpea culture **TNFC 01 (TNFC 0924) will be proposed for release during 2016** after assessing its performance in the MLT/ OFT.

10. Remarks of the Technical Director based on the pre-review:

- The fodder cowpea culture TNFC 01 (TNFC 0924) may be recommended for release during 2016 after assessing its performance in the MLT/ OFT.
- The Lucerne culture TNLC 14 (ALP 3-1) may be proposed for conducting MLT from *rabi* 2015-16 onwards for two years.
- This project may be closed and a new research sub project may be proposed excluding the AICRP component as the evaluation part is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026).

1	Project Number	:	**CPBG / CBE / PBG / 13 / 10**
2	Project Title	:	**Evaluation and selection in cereal fodders under AICRP on Forage crops**
3	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4	Name(s) of the Scientist(s) with Designation	:	**C. Babu** Professor (PBG)
5	Project Period	:	(October 2013 to September 2016)

6. Objectives

i. Evaluation of genotypes in cereal fodder crops for fodder production potential and quality aspects under AICRP on Forage crops

7. Brief outline of the work carried out from the project initiation period

Conducted various breeding trials on fodder sorghum, maize, cumbu and fodder oats as per technical programme of AICRP on Forage crops in addition to university trials

- Fodder sorghum variety CO 31 was released during 2014 for general cultivation in Tamil Nadu.
- A total quantity of 275 kg breeder seeds of Multicut fodder sorghum CO (FS) 29 produced during *kharif* 2013 was supplied during *kharif* 2014.
- Conducted four co-ordinated varietal trials in fodder oats at DLF, Ooty during *rabi* 2013-14.

8. Work carried out during the review period

I. FODDER SORGHUM

1. Variety released at state level

S. No.	Crop/ Variety	Year of release	Special features
1.	Fodder Sorghum CO 31	2014	Higher green fodder yield (192 t/ha/year); Enhanced seed yield due to intact seeds; Low HCN (172 ppm) and crude fibre (19.80 %). High dry matter yield (49.73 t/ha/yr).

2. Breeder seed production

Year of Indent : *Kharif* 2015   Year of production : *Kharif* 2014

Target : 325 kg   Date sown : 23.06.2014

S. No.	Crop/ Variety	Quantity targeted (kg)	Area sown (ha)	Expected production (kg)	Date sown	Remarks
1.	Multicut fodder sorghum CO (FS) 29	325	0.60	325	23.06.2014	Processing of seeds in progress

II. FODDER MAIZE and CUMBU

AICRP trials – *Kharif* 2014

A total of three AICRP trials one in fodder maize and two in fodder cumbu was conducted using the entries nominated from different AICRP centres as per technical programme of AICRP on Forage crops during *kharif* 2014. The trial wise results are furnished in Table 8.

Table 8. Results of AICRP trials on fodder maize and cumbu (*Kharif* 2014)

S. No.	Name of the trial	No. of entries	Rep.	Plot size (m)	Date sown	Promising entries identified for		Range	
						GFY	CPY	GFY (q/ha)	CPY (q/ha)
1.	IVT Maize	10	3	4 x 1.8	12.06.14	African Tall	IVTM 6	472.2 to 689.8	4.93 to 10.33
2.	IVT PM	9	3	4 x 1.8	12.06.14	IVTPM 3 & 1	IVTPM 1	300.9 to 527.9	5.02 to 9.72
3.	AVTPM 1	8	3	4 x 3	26.06.14	AVT PM 4	AVT PM 4	333.3 to 497.2	5.05 to 7.71

III. FODDER OATS

1. AICRP trials – *Rabi* 2013-14

A total of four AICRP trials was conducted at District Livestock Farm, Ooty using the fodder oats entries nominated from different AICRP centres as per technical programme of AICRP on Forage crops during *Rabi* 2013-14. The trial wise results are furnished in Table 9.

Table 9. Results of AICRP trials on fodder oats (*Rabi* 2013-14)

S. No.	Name of the trial	No. of entries	Rep.	Plot size (m)	Date sown	Promising entries identified for		Range	
						GFY	CPY	GFY (q/ha)	CPY (q/ha)
1.	IVT	16	3	3 x3	03.12.13	IVT O SC 19	IVT O SC 5	177.8 to 540.7	4.4 to 14.9
2.	First AVT	12	3	4 x3	03.12.13	AVT O SC 1-16	AVT O SC 1-1	186.1 to 486.1	2.9 to 14.9
3.	Second AVT	7	3	4 x3	03.12.13	AVT O SC 2-5	AVT O SC 2-5	200.0 to 316.7	3.8 to 6.8
4.	Second AVT-Repeat	11	3	4 x3	03.12.13	AVT O SC 2R-15	AVT O SC 2R-15	172.2 to 236.1	3.3 to 6.2

2. AICRP trials – *Rabi* 2014-15

Three varietal trials on fodder oats *viz*., IVT, First AVT, and Second AVT were taken up on 21.11.2014 at DLF, Ooty as per technical programme of AICRP on Forage Crops.

9. Salient findings

- In the First Advanced varietal trial of fodder cumbu, two entries *viz*., AVTPM 4 have recorded significantly higher values for green fodder and crude protein yield over the check CO 8.
- In the Second Advanced Varietal Trial of Oats (Single cut), two entries *viz*., AVT O SC 2R-15 have recorded significantly higher green fodder yield of 236.0 q/ha. Similar trend was observed for crude protein yield.

10. Remarks of the Technical Director based on the pre-review:

- This project may be deleted to avoid duplication of work as the evaluation part of cereal fodder is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026) and evolutionary part is covered under another University sub-project (CPBG / CBE / PBG / 11 / 001) being handled by Dr. K. Iyanar, Asst. Prof. (PBG)

1.	Project Number	:	**CPBG /CBE/PBG/10/S33**
2.	Project Title	:	**Evolution of Lucerne genotype possessing high biomass and chlorophyll content**
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**C. Babu,** Professor (PBG)
5.	Project Period	:	(June 2010 to March 2016)

6. Objectives

- To evolve high chlorophyll and biomass yielding Lucerne genotypes.

7. Brief outline of the work carried out from the project initiation period

It is an externally funded project and preliminary screening of Lucerne genotypes for chlorophyll content was done and the identified genotypes have been allowed for seed production.

8. Work carried out during the review period

A total of 208 Lucerne germplasm lines comprising of those collected from different places and advanced breeding material generated from various breeding projects was subjected for this study. These lines were screened initially for the presence of chlorophyll content using SPAD Chlorophyll meter and DMSO method besides assessing for their green fodder yield potential.

Six entries *viz*., ALP 2-6, RRP 2-4, CCP 1-1, RCP 2-1, RAP 4-4 and CAP 3-1 were shortlisted based on the observations made on screening for chlorophyll content. Among them, three entries *viz*., CCP 1-1, RCP 2-1 and RAP 4-4 were obsessed with higher green fodder yield and chlorophyll content. Those three entries along with CO 1 were allowed for seed production in an isolated condition after assessing their performance twice for green fodder yield and chlorophyll content. Among the entries, RCP 2-1 and CCP 1-1 recorded significantly higher values in terms of estimated chlorophyll yield (kg/ha) and green fodder yield and yield attributing traits over the check CO 1. These two entries have been studied for a whole year for their fodder yield and chlorophyll potential against the Dharapuram local variety in larger plots after treating with *Rhizobium* and micronutrients.

The chlorophyll content ranged from 0.143 (%) in RCP 2-1 to 0.169 (%) in Dharapuram local variety. The chlorophyll content of CCP 1-1 (0.168%) was observed to be significantly on par with that of Dharapuram local variety. Since the final chlorophyll outturn essentially depends on the green fodder yield potential of genotypes, the entry CCP 1-1 which had recorded green fodder yield of 105.91 t/ha/yr and chlorophyll content of 0.168% found to produce higher estimated chlorophyll yield to the tune of 3.178 t/ha/yr closely followed by RCP 2-1 (2.891 t/ha/yr). The estimated chlorophyll yield of check varieties *viz*., Dharapuram local and CO 1 was recorded to be 2.805 and 2.647 t/ha/yr respectively.

Seed production

Seed production of the promising entries RCP 2-1 and CCP 1-1 was taken up during *rabi* 2014 in an area of 20 cents each under isolated conditions.

9. Salient findings:

- A total of six kg. of seeds in each was produced during the period under report and the ratoon crop was allowed for further seed production besides extending the area under seed production separately.
- One kg. seeds from each of the entries RCP 2-1 and CCP 1-1 were sent to Pune on 05.01.2015 for assessing their adaptability in different location with the local check.

10. Remarks of the Technical Director based on the pre-review

- This project may be continued and the numbering of the project may be followed as KANCOR/CPBG/CBE/FC/2010/R001.

1.	Project Number	:	**CPBG / CBE / PBG / 13 / 08**
2.	Project Title	:	**Evolution of forage grasses and evaluation of nominated entries of forage grasses for yield and quality under AICRP on Forage crops**
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**Dr. K. Iyanar** Assistant Professor (PBG)
5.	Project Period	:	October 2013 to September 2016

6. Objectives

- Hybridization and selection in CN hybrid grass for yield and quality
- Evaluation of genotypes in forage grasses for their fodder production potential and quality aspects under AICRP on FC

7. Brief outline of the work carried out from the project initiation period

Conducted different breeding trials on CN hybrid grass, Guinea grass and Buffel grass related to University sub project and AICRP on Forage Crops.

- Proposed two Cumbu Napier hybrids *viz*., TNCN 1076 and TNCN 1078 to AICRP on FC for evaluation in the AICRP varietal perennial trials (*Kharif* 2013).
- Conducting Perennial Varietal trials on Cumbu Napier hybrids, *Cenchrus ciliaris* and *Dicanthium* from *kharif* 2013 onwards.

8. Work carried out during the review period

I. CUMBU NAPIER HYBRID GRASS

1. Napier germplasm

A total of 54 germplasm accessions of Napier grass collected from different places/centres are being maintained throughout the year.

2. Cumbu Napier hybrid evaluation trial

A total of 15 hybrids superior to the existing popular hybrid CO (CN) 4 have been selected based on biomass and other desirable attributes and were planted in two replications for further evaluation for yield and quality against the checks CO (CN) 4 and CO (BN) 5. These entries were evaluated for green fodder yield for one year and the results revealed that, two hybrids *viz*., CO 7 x FD 462 and CO 7 x FD 450 were found record higher green fodder yield of 394.0 and 392.0 t/ha/yr respectively These hybrids will be subjected for quality analysis.

3. Promising Cumbu Napier hybrids proposed for AICRP trials

S. No.	Clone	Season sponsored	Destiny/ Research findings
1.	TNCN 1076 and TNCN 1078	*Kharif* 2013	Ongoing being perennial

4. AICRP trials – *Kharif 2014*

1. Varietal Trial in B x N hybrid 2013

Eleven entries were planted in RBD, replicated three times. Among them, three entries *viz*., VTBN 2, VTBN 7 and VTBN 4 have recorded significantly higher green fodder yield of 288 t/ha, 264 t/ha and 218 t/ha respectively over the mean (213 t/ha) over nine cuttings Almost a similar trend has been observed for dry matter yield also.

II. GUINEA GRASS

1. Guinea grass germplasm

A total of 104 germplasm accessions collected from different places/ centres are being maintained every year.

2. Characterization and documentation of germplasm accessions

A total of 60 Guinea grass germplasm accessions were characterized for morphological and biochemical traits. Based on high *per se* performance and biometrical estimation, two genotypes *viz*., GGLC 12 and GGLC 19 were identified as potential genotypes for green fodder yield. The genotypes FD 679 and GGLC 1 were found to be superior with regard to high crude protein with low crude fibre content. These genotypes could be used for the development of nutritive and palatable fodder varieties in Guinea grass.

III. *Cenchrus*

1. Germplasm collection and maintenance

A total of 210 accessions collected from Tiruppur, Erode and Coimbatore districts are being maintained for evaluation and utilization.

2. Varietal Trial in *Cenchrus ciliaris* (Perennial) 2013

Nine entries were planting along with the check CO 1 on 07.02.2014 in RBD, replicated three times. Among them, five entries *viz*., VTCC 4, VTCC 7, VTCC 1, VTCC 6 and VTCC 8 have recorded significantly higher green fodder yield in seven cuttings over the check CO 1 (533.31/ha). Almost a similar trend has been observed for dry matter yield also.

IV. *Dichanthium*

Varietal Trial in *Dichanthium* (Perennial) 2013

In the Varietal trial of *Dichanthium* eight entries were sown on 28.06.2013 in RBD, replicated three times. Among them, three entries *viz*., VTD 5, VTD 3, VTD 4 and VTD 1 recorded significantly higher green fodder yield in eight cuttings.

9. Salient findings:

- Two promising Cumbu Napier hybrid clones **TNCN 1076** and **TNCN 1078** have been sponsored to AICRP on FC for evaluation in the AICRP varietal trials (*Kharif* 2013).
- Guinea grass germplasm accessions have been characterized and documented

10. Remarks of the Technical Director based on the pre-review

- This project may be closed and a new research sub project may be proposed excluding the AICRP component, as the evaluation part is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026).

1. Project Number : **CPBG / CBE / PBG / 11 / 001**
2. Project Title : **Evolution of high yielding forage maize genotypes with improved fodder quality**
3. Name of the Department/Station : Department of Forage Crops, TNAU, CBE-3
4. Name(s) of the Scientist(s) with Designation : **Dr. K. Iyanar** Assistant Professor (PBG)
5. Project Period : September 2010 - August 2015

6. Objectives

- To develop high fodder yielding maize genotypes with improved fodder quality

7. Brief outline of the work carried out from the project initiation period

The hybrid progenies involving dent corn, sweet corn and baby corn types were synthesized and evaluated. In the segregating generation, a total of 90 progenies were selected based on the fodder yield related characters and forwarded to next generation by selfing. Due to continuous selfing, inbreeding depressing was observed in the progenies and hence twenty five single plants were selected from five progenies and were allowed for random mating in isolation and the resultant progenies are under evaluation.

8. Work carried out during the review period

The high yielding forage maize segregating progenies were evaluated. Among them, five progenies with low inbreeding depression were selected to assess the heterotic potential and the phenotypically superior and uniform single plants selected from F_4 cross combinations viz., FDM 3514-42, FDM 2514-46, FDM 1436-27, FDM 1422-39 and FDM 3414-61 were allowed to random mate each other in isolation. The resultant half sib progenies in FDM 3414-61 and FDM 3514-42 were found to perform exceedingly well than the average performance of F_3 generation for green fodder yield which ranged from 417g/plant to 523g/plant and crude protein recorded 8.78 to 11.47% with 8-10 days earliness in the progenies and showed significant improvement from the parental progeny. The result indicated that hybrid vigour could have been fixed in the progenies due to buffering capacity of random mating process by avoiding inbreeding depression in the population. Further selection in the progenies would unambiguously yield a high yielding composite variety with earliness in fodder maize.

9. Salient findings: Too early to report

10. Remarks of the Technical Director based on the pre-review

- A new research sub project may be proposed after completion of this project during August 2015 with the same objectives.

1	Project Number	:	Venture Capital Scheme (V 60 AE)
2	Project Title	:	**Production of sufficient and nutritious forage for university dairy farm and production of quality Nucleus, Breeders and truthfully labeled seeds/planting materials of forage crops**
3	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4	Name(s) of the Scientist(s) with Designation	:	**Dr. A. Kalamani** Professor and Head **Dr. K. Iyanar** Assistant Professor (PBG)
5	Project Period	:	April 2014 to March, 2015

6. Objectives

- To produce of sufficient and nutritious forage for university dairy farm and production of quality Nucleus, Breeders and truthfully labeled seeds/planting materials of forage crops

7. Brief outline of the work carried out from the project initiation period:

- Planting material on Cumbu Napier hybrid CO (CN) 4, CO (BN) 5 and Guinea grass CO (GG) 3 have been produced based on the indent from the dairy farmers.
- The seeds of fodder maize (African Tall), Multicut fodder sorghum CO (FS) 29, fodder cowpea CO (FC) 8, *Desmanthus* and Agathi were produced and distributed to the farmers.

8. Work carried out during the review period

A total of 13,55,386 numbers of planting material worth of Rs. 7,37,296/- was supplied to the dairy farmers of Tamil Nadu and neighboring states. A total of **12,502 kg seeds** of different forage crops worth of Rs. 20,62,902/- was supplied to the Dairy Farmers of Tamil Nadu. A total of **320 tonnes of green fodder** worth of Rs. 4,70,459/- was supplied to Dept. of Veterinary and Animal Sciences, TNAU.

9. Salient Findings

- Seeds and planting materials of improved forage crop varieties and hybrids are being produced and distributed to the farmers thus the newly released varieties have become popular among the farmers.

10. Remarks of the Technical Director based on the pre-review:

- This scheme may be continued as the production of green fodder and planting material is very vital and essential.

B. CROP MANAGEMENT

a) AGRONOMY

1.	Project Number	:	**DCM-CBE-AGR-12-005**
2.	Project Title	:	**Performance of Cumbu Napier hybrid grass CO (CN) 4 as influenced by micro nutrients under irrigated conditions**
3.	Name of the Department/Station	:	Department of Forage Crops, TNAU, CBE-3
4.	Name(s) of the Scientist(s) with Designation	:	**Dr. A. Velayutham** Professor (Agronomy)
5.	Project Period	:	June 2012 to September 2014

6. Objectives

- To study the effect of conjoint application of inorganic fertilizers and micronutrients on green fodder yield and quality of CN hybrid grass (CO(CN) 4
- To find out the economics of green fodder production under above system

7. Brief outline of the work carried out from the project initiation period

Field experiment had been initialed in field No.F2, New Area farm, Department of Forage Crops on 29.06.2012 as per the technical programme. Mechanical composition of soil and initial fertility status had been analyzed. The crop culture had been carried out as per the recommendation of Crop Production Guide. The data on growth and yield have been recorded. The forage crop CN hybrid grass CO (CN) 4 has been maintained by crop management practices. The data on growth, yield and quality parameters were subjected to statistical scrutiny.

8. Work carried out during the review period

The experiment on CN hybrid grass CO (CN) 4 was laid out with nine treatments *viz*., application of recommended dose of NPK (T1), NPK+$FeSO_4$ @ 50 kg/ha (T2), NPK+$FeSO_4$ @ 100 kg/ha (T3), NPK+$ZnSO_4$ @ 25 kg/ha (T4), NPK+$ZnSO_4$ @ 50 kg/ha (T5), NPK+$FeSO_4$ @ 50 kg/ha+$ZnSO_4$ @ 25 kg/ha (T6), NPK+$FeSO_4$ @ 100 kg/ha+$ZnSO_4$ @ 25 kg/ha (T7), NPK+$FeSO_4$ @ 50 kg/ha+$ZnSO_4$ @ 50 kg/ha (T8) and NPK+$FeSO_4$ @ 100 kg/ha+$ZnSO_4$ @ 50 kg/ha (T9) in RBD with three replications. The treatments were imposed as per schedule. Green fodder harvest was carried out as and when the fodder crop was ready for harvest. Fourteen harvests were made during the project period. The data collected on growth, yield and quality parameters were statistically analyzed. The results on pooled analysis are furnished in Table 10. The pooled analysis of data on green fodder yield over fourteen cuts revealed that application of recommended dose of NPK along with micronutrients *viz*., $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @25 kg/ha significantly improved the green fodder yield 2917 q/ha to 3696 q/ha which was 26 % higher than RDF. It also gave higher net return and B:C ratio (2.10).

Table 10. Pooled analysis of yield, quality and economics of BN hybrids as influenced by micronutrients under irrigated conditions (1-14 cuts) - 2012-13 to 2014-15

Treatment	Plant height (cm)	LS ratio	GFY (q/ha)	DMY (q/ha)	CPY (q/ha)	Crude protein (%)	Cost of Cultivation (Rs.)	Net return (Rs.)	B:C ratio
T_1 -NPK alone	171.92	0.30	2917	423	34.6	8.06	253688	183860	1.72
T_2 -NPK+$FeSO_4$ @ 50 kg/ha	178.33	0.34	3187	499	45.2	8.88	260688	217318	1.83
T_3 - NPK+ $FeSO_4$ @ 100 kg/ha	174.37	0.32	3095	476	42.3	8.71	267688	196517	1.73
T_4 - NPK+$ZnSO_4$ @ 25 kg/ha	183.42	0.36	3234	544	52.2	9.51	256288	228820	1.89
T_5 - NPK+ $ZnSO_4$ @ 50 kg/ha	180.68	0.35	3191	517	47.8	9.13	258888	219763	1.85
T_6 - NPK+ $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 25 kg/ha	200.35	0.44	3695	724	79.5	10.95	263288	290609	2.10
T_7 - NPK+ $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 25 kg/ha	190.83	0.39	3480	631	63.9	10.11	270288	251684	1.93
T_8 - NPK+ $FeSO_4$ @ 50 kg/ha + $ZnSO_4$ @ 50 kg/ha	193.90	0.41	3594	681	71.2	10.44	265888	273217	2.03
T_9 - NPK+ $FeSO_4$ @ 100 kg/ha + $ZnSO_4$ @ 50 kg/ha	187.25	0.38	3458	609	60.3	9.81	272888	245761	1.90
SEd	4.18	0.01	27	9	1.15	0.20			
CD (0.05)	8.90	0.02	81	26	3.44	0.42			

9. Salient Findings:

Application of recommended dose of NPK (150:50:40 kg/ha) along with $FeSO_4$ @ 50 kg/ha and $ZnSO_4$ @ 25 kg/ha was found to be advantageous in enhancing the growth, yield and quality of CN hybrid grass CO (CN) 4 besides fetching higher economic returns.

10. Remarks of the Technical Director based on the pre-review

- Pooled data (yield) to be given
- Salient findings to be given to CSM
- OFT to be conducted on the technology for adoption

1. Thrust Area

Performance evaluation of drip fertigation in Cumbu Napier hybrid grass

The experiment on the Performance evaluation of drip fertigation in Cumbu Napier hybrid grass CO (BN) 5 was laid out on 30.03.2015 in RBD with three replications. It consisted of seven treatments *viz*., Paired row drip system (60/90 x 50 cm) + Drip at 100% PE + N fertigation at 75% RDF (T_1), Paired row drip system (60/90 x 50 cm) + Drip at 100% PE + N fertigation at 100% RDF (T_2), Paired row drip system (60/90 x 50 cm) + Drip at 100% PE + N fertigation at 125% RDF (T_3), Paired row drip system (60/90 x 50 cm) + Drip at 125% PE + N fertigation at 100% RDF (T_4), Paired row drip system (60/90 x 50 cm) + Drip at 125% PE + N fertigation at 125% RDF (T_5), Paired row drip system (60/120 x 50 cm) + Drip at 125% PE + N fertigation at 75% RDF (T_6), Surface irrigation (5cm depth) + Soil application of N at 100% RDF (farmers' practice) (T_7)

FORAGE TECHNOLOGY DEMONSTRATIONS (2014-15)

During *Kharif* 2014, a total of 25 demonstrations were conducted comprising 10 demonstrations each on CN hybrid grass CO (CN) 4 and Fodder Maize (African Tall) and five demonstrations on Guinea grass CO (GG) 3 as detailed below.

During *Rabi* 2014-15, a total of 20 demonstrations 10 on Lucerne, five demonstrations each on Guinea grass CO (GG) 3 and Fodder Maize (African Tall) was conducted.

Table 11. Forage Technology Demonstrations (*Kharif*, 2014)

S. No.	Name and Address	Date sown
I	**Cumbu Napier hybrid grass CO (CN) 4 – 10 Nos.**	
1.	Shri. M. Palanisamy, No. 80, Athipalayam Road, Chinnavedampatti, Coimbatore.	08.08.2014
2.	Shri. Vijayakumar, 3/335B, Kuttai Thottam, M.G. Pudur, Sulur, Coimbatore	13.08.2014
3.	Smt. T. Rajeswari, 3/273, Chairman Thottam, M.G. Pudur, Sulur, Coimbatore	13.08.2014
4.	Shri. T. Dineshkumar, Pallear Thottm, Vaiyampalayam, Coimbatore	20.08.2014
5.	Shri. M. Ganesan, Ravathur Kilakku Thottam, Sulur.	20.08.2014
6.	Shri. K. Krishnamurthi, Perumpathi, Jamine Kaliyapuram, Pollachi	03.09.2014
7.	Shri. N.R. Srinivasa Rao, 3/6, Kolathupalayam, Palgri, Avinashi, Tirupur.	05.09.2014
8.	Hri. M. Dharmaraj, 2/125, Kongalappampalayam, Samathur, Pollachi.	08.09.2014
9.	Shri. Natarajan, Kulatheri Thottam, Kannapalayam, Sulur.	09.09.2014
10.	Shri. C. Makesh, Pappampatti Road, Kannampalayam, Sulur.	09.09.2014
II	**Guinea grass CO (GG) 3 – 5 Nos.**	
1.	Smt. Ramathal, Kalkuvari Thottam, Kinathukadavu.	04.09.2014
2.	Shri. Nanju kuttan, Kankkan Thottam, Athappakovundanur, Irugur	04.09.2014
3.	Shri. Ponnusamy, Poo Thottam, Muthukavundanur, Irugur	04.09.2014
4.	Shri. S. Arulmozhi,Peelicampatty, Tirupur	08.09.2014
5.	Smt. P. Velumani,Devarayapuram, Coimbatore	08.09.2014

III	**Fodder maize (African Tall) – 10 Nos.**	
1.	Shri. M. Subbaiya Gounder, Pudhu Thottam, Chinnavedampatti, Coimbatore	08.08.2014
2.	Smt. T. Annapoorani, Perumpathi, Jamine Kaliyapuram, Pollachi.	01.09.2014
3.	Shri. T. Ramkumar, Perumpathi, Jamine Kaliyapuram, Pollachi.	02.09.2014
4.	Th. Subramani, Parai Thottam, Pappampatti Road, Kannampalayam.	04.09.2014
5.	Smt. Indirani, Palkarar Thottam, Kannampalayam, Sulur.	04.09.2014
6.	Shri. M.Palanisamy, Palankarai, Tirupur Road, Avinsahi.	05.09.2014
7.	Shri. Kulandaivelu, Athappagoundanur, Irughur, Coimbatore.	08.09.2014
8.	Shri. Shanmugam, Palkarar Thottam, KG Pudur, Coimbatore.	08.09.2014
9.	Shri. K. Palanisamy, Thithipalayam, Perur, Coimbatore	08.09.2014
10.	Shri. Ammasai Gounder, Karikaran Thottam, Mathampalayam, Coimbatore	08.09.2014

Table 12. Forage Technology Demonstrations (*Rabi,* 2014-15)

S. No.	Name and Address	Date of Sowing
I.	**Lucerne - 10 Nos.**	
1.	Shri. Lakshman, Anaikatti, Coimbatore, Mobile No.: 94890 82082	27.11.2014
2.	Shri. M. Duraisamy, 3/X7, Kalangan Thottam, C.N. Palayam (P.O)., Karadivavi, Sulur, Coimbatore – 641 058 Mobile No.: 98422 36664	02.12.2014
3.	Shri. N. Srinivasan, Koluthapalayam, Palangari (P.O)., Avinashi Tk., Tirupur Mobile No.: 97874 53367	26.12.2014
4.	Shri. S. Periyasamy, 5/277, Near Rani Lakshmi Mill, Arasur, Coimbatore Mobile No.: 97906 10205	26.12.2014
5.	Shri. A. Varatharajan, Vadachithoor, Kinathukadavu, Coimbatore Mobile No.: 93616 80085	30.12.2014
6.	Shri. E. Venkatachalam, 2/375, Kulathur, Kuttai Thottam, Coimbatore 6410 062 Mobile No.: 93442 72610	09.01.2015

7.	Shri. M. Shanmugasundaram, Kurukkuvali Thottam, Kannampalayam, Coimbatore Mobile No.: 80565 76967	30.01.2015
8.	Smt. T. Backiyam, Pannimadai, Coimbatore, Mobile No.: 98420 11752	10.02.2015
9.	Shri. V. Srinivasan, S.F. No. 269/2, MG Chetty palayam, Oraikalpalayam, Annur, Coimbatore Mobile No.: 93448 31125	10.02.2015
10.	Shri. Kulandaivelu, Irughur, Coimbatore Mobile No.: 93632 28039	10.02.2015
II.	**Fodder Maize (African Tall) – 5 Nos.**	
1.	Shri. M. Selvaraj, 6/236, Kallipalayam, Vellamadai (P.O)., Coimbatore – 641 110. Mobile No.: 97501 33757	02.12.2014
2.	Shri. D. Selvaraj, 6/205, Kallipalayam, Vellamadai (P.O)., Coimbatore – 641 110. Mobile No.: 97867 93555	03.12.2014
3.	Shri. S. Natarajan, 4/823, Samanagounder Thottam, Kottaipalayam Road, Bilichi (P.O)., Coimbatore – 641 019 Mobile No.: 96778 75558	09.12.2014
4.	Shri. N. Krishnamoorthy, Koluthapalayam, Palangari (P.O)., Avinashi Tk., Tirupur Mobile No.: 97874 53367	10.12.2014
5.	Shri. K. Palanisamy, 3/125, Kaveri Tank Street, Theethipalayam (P.O)., Perur, Coimbatore – 641 010 Mobile No.: 98658 27757	10.12.2014
III.	**Guinea grass CO (GG) 3 – 5 Nos.**	
1.	Shri. S. Natarajan, 4/823, Samanagounder Thottam, Kottaipalayam Road, Bilichi (P.O)., Coimbatore – 641 019 Mobile No.: 96778 75558	04.12.2014
2.	Shri. K. Manickem, 9/70, Perumpathi, Jamine Kaliyapuram, Pollachi Mobile No.: 97873 79899	18.12.2014
3.	Shri. Gowri Sankar, Kannu Kuttan Thottam, Kurunchipalayam, Coimbatore Mobile No.: 97881 12589	26.12.2014
4.	Shri. R. Krishnamoorthy, 5/134-A, North Street, Chinna Thadagam, Coimbatore Mobile No.: 97873 67441	06.02.2015
5.	Shri. N. Sadhasivam, S/o. Natarajan, Poothottam, Athappagoundan Pudur, Irughur, Coimbatore – 641 103.	11.02.2015

LIST OF ONGOING RESEARCH PROJECTS

S. No.	Project No. and Title	Project leader(s)	Date of start	Date of closure
CROP IMPROVEMENT				
1.	**CPBG / CBE / PBG / NEW** Collection, evaluation, documentation and selection of *Cenchrus*, Deennath and *Bracharia* species	Dr. A. Kalamani	June 2014	May 2017
2.	**CPBG/ CBE/ PBG/ NEW** Evolving high biomass yielding genotypes in *Desmanthus* and *Stylosanthus*	Dr. A. Kalamani	June 2014	May 2017
3.	**CPBG / CBE / PBG / NEW** Evolution of leguminous forage crops (Lucerne and Fodder cowpea) for high yield and protein content	Dr.C. Babu	April 2015	March 2018
4.	**KANCOR/CPBG/CBE/FC/2010/R001** Evolution of Lucerne genotype possessing high biomass and chlorophyll content	Dr.C. Babu and Dr. K. Velayudham	June 2010	May 2016
5.	**AICRP/PBG/CBE/FCR/026** AICRP on Forage Crops	Dr.C. Babu and Dr.A. Velayutham	April 2012	March 2017
6.	**CPBG / CBE / PBG / 11 / 001** Evolution of high yielding forage maize genotypes with improved fodder quality	Dr.K. Iyanar	Sept. 2010	Aug. 2015
7.	**CPBG / CBE / PBG / NEW** Evolution of forage grasses (Cumbu Napier hybrid and Guinea grass) for high biomass and quality	Dr.K. Iyanar	April 2015	March 2018
CROP MANAGEMENT				
1.	**DCM/ CBE/ AGR/ NEW** Performance evaluation of drip fertigation in Cumbu Napier hybrid grass	Dr. A. Velayutham	March 2015	Feb. 2017

EXTENSION / OUTREACH PROGRAMMES CONDUCTED

Field day organized at Chinnavedampatti, Coimbatore

"Field day and Farmers Scientist Interactive meeting" had been organized by Dr. A. Velayutham, Prof. (Agron.) and Dr. C. Babu, Prof. (PBG) at Chinnavedampatti Village, Coimbatore on 22.08.2014.

Dr. A. Kalamani, Professor and Head and Dr. K. Iyanar, Asst. Prof. (PBG) Department of Forage Crops, TNAU, Coimbatore felicitated the meeting. About 30 enthusiastic farmers having interest to know the recent fodder production practices took part with zeal and got benefited.

Table 13. RESULTS OF MLT ON FODDER COWPEA CULTURES (*Kharif* 2014)

S. No.	Centre	Green fodder yield (t/ha)		
		TNFC 0924	TNFC 0926	CO (FC) 8
1.	RRS,Paiyur	25.72	23.32	21.24
2.	RRS,Vriddhachalam	34.50	27.50	26.50
3.	CRS,Veppanthattai	26.13	22.19	15.56
4.	Coimbatore	27.50	26.02	19.54
5.	ARS, Bhavanisagar	22.17	21.25	19.55
6.	VRS, Palur	15.00	17.83	16.50
7.	DARS,Chettinadu	7.24	5.43	3.92
8.	ORS Tindivanam	20.26	23.32	27.23
9.	ARS, Vaigaidam	23.70	20.22	16.10
10.	KVK, Papparapatty	12.83	11.42	10.33
11.	SRS, Sirugamani	15.41	13.92	12.42
12.	TCRS,Yethapur	27.25	21.92	16.67
13.	NPRC,Vamban	34.44	22.50	26.25
14.	ARS,Virinjipuram	21.30	19.10	27.60
	Total	**313.45**	**275.94**	**259.41**
	Mean	**22.39**	**19.71**	**18.53**
	% increase over the check CO (FC) 8	**20.83**	**6.37**	

Table 14. RESULTS OF MLT ON *CENCHRUS* CULTURE FDC 265

S. No.	Centre	Green fodder yield (t/ha/yr)	
		FDC 265	CO 1
1.	RRS, Paiyur	18.41	10.99
2.	Coimbatore	84.70	71.75
3.	ORS, Tindivanam	50.82	63.14
4.	VRS, Palur	7.56	7.98
5.	CRS,Veppanthattai	55.16	49.35
6.	RRS,Vriddhachalam	95.90	42.77
7.	DARS,Chettinadu	21.28	9.73
8.	KVK, Papparapatty	42.98	39.62
9.	TCRS,Yethapur	97.30	78.47
10.	SRS, Sirugamani	76.58	66.85
11.	NPRC,Vamban	48.16	38.85
12.	ARS,Virinjipuram	33.25	28.91
	Total	**632.10**	**508.41**
	Mean	**52.68**	**42.37**
	% increase over the check CO 1	**24.33**	

Table 15. RESULTS OF OFT ON FODDER COWPEA - TNFC 0924 (*Kharif* 2014)

S. No.	Name of the farmer	Location	Yield (kg/cent)	
			TNFC 0924	CO (FC) 8
1.	Mr. K. Palanisamy	Cauvery Tank Street, Theethipalayam (P.O)., Perur *via*., Coimbatore – 10	115.0	96.0
2.	Mr. D. Sivakumar	Methaiveedu Thottam, Perumpathi, Jaminekaliyapuram (P.O)., Pollachi – 642 110	110.0	93.0
3.	Mr. A. Murugesan	Karikaran Thottam, Chinnamathampalayam, Bilichi, Karamadai, Coimbatore –19	125.0	105.0
4.	Mr. M. Palanisamy	Athipalayam Road, Coimbatore	125.0	100.0
5.	Mr. N.Shanmugam	Poonthottam North, Irugur (*via*),Coimbatore 103	117.0	95.0
6.	Mr. P.Thangavelu	Chinnamathampalayam, Bilichi, Coimbatore – 641 019	122.0	105.0
7.	Mr.V.A. Natarajan	Sedan Thottam, Venkittapuram, Coimbatore 641 025	120.0	116.0
8.	Mr.R.Gopalswamy,	Ponnaiyagounder pudur, Chinnathottam, Senthampalayam, Coimbatore	118.0	100.0
9.	Mr.V. Sathya Seelan	Pasur, Coimbatore	125.0	110.0
10.	Mr.M. Manickavasagam	Karanampettai, Coimbatore	120.0	105.0
11.	Mr.S.Periyasamy	Avinashi road, Arasur, Coimbatore	122.0	90.0
12.	Mr.S.R.Palanicham	Ponniyan kadu, Arasur, Coimbatore	110.0	95.0
13.	Mr.R.Devarajan	P.N. Palayam,Coimbatore	125.0	100.0

14.	Mr.R.Parameshwar	Pelichi,Coimbatore	121.0	110.0
15.	Mr.Nagappan	Ashoka thotam, Press colony, Coimbatore	121.0	100.0
16.	Mrs.S.Sarathamani	Chinnamathampalayam, Plichi, Coimbatore	115.6	90.0
17.	Mr.P.Easwaran	Marku thotam, Thennampalayam, Sulur,	112.8	96.0
18.	Mr.V.Thangavelu	Mullu kambikadu thotam, Narasipuram, Coimbatore	110.0	85.0
19.	Mr.Chinnasawmy	Koli karrar thotam, Palladam road,Coimbatore	125.6	80.0
20.	Mr.Boobathi	Kooli thotam, Kannampalayam, Coimbatore	116.8	98.0
21.	Mr.Nantheeswaran	Jothidar thotam, Kannampalayam, Coimbatore	115.0	90.0
22.	Mr.Maheskumar	Chenthotam, Chellapampalayam, Kaniur	110.0	80.0
23.	Mr.Suresh	Kannampalayam, Sulur	120.0	115.0
24.	Mr.N.R.Sivakumar	Mattuthotam, Narasipuram, Coimbatore	114.0	104.0
25.	Mr.P.Nanjukutty	Santhi thotam, Periyanaikanpalayam	122.0	112.0
26.	Mr. K. Perumalsamy	Perumpathi, Jaminekaliyapuram (P.O)., Pollachi – 642 110	127.0	120.0
27.	Mr. R. Karuppusamy	Perumpathi, Jaminekaliyapuram (P.O)., Pollachi	110.0	108.0
28.	Mr. K. Manickem	Perumpathi, Jaminekaliyapuram (P.O)., Pollachi – 642 110	108.0	105.0
29.	Mr. C.Angamuthu	Pasuvapatti (Village), Perundurai, Erode (Dt.)	100.0	98.0
30.	Mr. M. Duraiswamy koundar	Muthuswamykounder, Pasuvapatti (Village), Perundurai, Erode (Dt.)	114.0	104.0
31.	Mr.A.Haja Moideen	S/o S.Abdul Jafar, Satyamangalm Melur, Pudukkottai	116.0	110.0
32.	Mr.R.Mahimairaj	S/o Rayar, Opp to St.Mary's church,Venkitakulam (PO), Thiruvarankulam Bk, Pudukkottai	120.0	113.0
33.	Mr.K.Karthikeyan	S/o Mr. S. Krishnasamy,M.Rasiamangalam , Near Pannai, Alangudi, Pudukkottai	115.0	102.0
34.	Mr.V.M.Antony samy	S/o Mariasusai,77, K.Rasiamangalm, Alangudi, Pudukkottai	110.0	86.0
35.	Mr.A.Krishnamorrthi	S/o Annamalai, Malavarayanpatti, Vamban (PO)-622 303, Alangudi, Pudukkottai	102.0	90.0
36.	Mr.P. Ramasamy	S/O, Perumal, Chettikulam (PO), Alathur (TK), Perambalur (Dt.)	115.0	80.0
37.	Mr.P. Ramaraj	S/O, Periyasamy, Kallai gramam, Oolaipadi (PO), Kunnam (TK), Veppur (Block), Perambalur (Dt.)	120.0	75.0
38.	Mr.R. Venkatesan	S/O, Ramalingam,Kallai gramam, Oolaipadi (PO), Kunnam (TK), Veppur (Block), Perambalur (Dt.)	118.0	87.0
39.	Mr.R. Saroja	W/O, Ramaraj, Ammapalayam, Mariamman koil street, Perambalur (Tk, Dt)	115.0	89.0
40.	Mr.R. Pugalenthi	S/O, Ramasamy, Sivan Koil street, Esanai (PO), Veppanthattai (Block), Perambalur (Dt.)	110.0	101.0

41.	Mr.N.Ramesh	Papparapatti - 636809, Dharmapuri (Dt.)	105.0	96.0
42.	Mr.A.Saravanan	S/o Angappan, Thotalampatti 636809, Dharmapuri (Dt.)	120.0	102.0
43.	Mr.K.Manoharan	S/o Kombai, Kovilur, Palakode, Dharmapuri (Dt.)	114.0	98.0
44.	Mr.C.Boobathi	S/o Chinnachamy, Yattranpatti, Madalur, Dharmapuri (Dt.)	115.0	100.0
45.	Mr.S.Dhanasekar	S/o Sunder, Clippanaicanalli, Thatharapatti, Papparapatti, Dharmapuri (Dt.)	103.0	86.0
46.	Mr.V.Samraj	S/o Venkadesh, Elumichanalli, Palacode, Dharmapuri (Dt.)	100.0	85.0
47.	Mr.P. Ganesan	2/6, Kali Koil St,V. Pudupakkam, Katterikuppam (PO), Vanur Taluk,Villupuram – 605 502	108.0	87.0
48.	Mrs. R. Alagumani	No. 17, Pilayar koil Street,Thalavanur (PO), Gingee Taluk,Villupuram – 604 205.	112.0	97.0
49.	Mr.K. Kannan	22, Nallavanur, Eswaran Koil street,Vanur Taluk, Villupuram	114.0	98.0
50.	Mr. A. Gnanaprakasam	12, Pilayar koil street,V. Panchalam,V. Nallalam (PO), Villupuram - 605 651	116.0	100.0
51.	Mr.D. Rajaraman	S/o Duraisamy,Salai Gramam ,Theevanur (PO), Tindivanam – 604 206.	122.0	105.0
52.	Mr.K. Gunasekaran	S/o Kannaya Gounder, ¼, Vinayagar Koil Street, Nallavoor,Vanur Taluk	120.0	108.0
53.	Mr.S. Senthamaraikannan	S/o Swaminathan, Mettutheru, Alanguppam (PO), Tindivanam	115.0	110.0
54.	Mr. C. Kuppu Saveri	S/o Chinnappan, 55, Madha koil Street, V. Panchalam, V. Nallalam (PO), Villupuram - 605 651	110.0	100.0
55.	Mrs.K. Selvarani	157, Drowpathi Amman Koil Street, T. Panchalam (PO), Tindivanam	120.0	95.0
56.	Mr.J. Ranganathan	S/o Janakiraman, 50, Pilayar koil Street, Thalavanur (PO), Gingee Taluk,Villupuram – 604 205.	127.0	103.0
57.	Mrs.A.Gnasoundari	Ettarai, Natarajapuram, Anandanallur	123.0	110.0
58.	Mr.R.Mahendravarman	Koppu, Anandanallur	128.0	112.0
59.	Mr.S.Baskar	Kalakud, Anandanallur	115.0	100.0
60.	Mr.S.Rajangam	Koppu, Anandanallur	120.0	105.0
	Total		**6964.8**	**5935.0**
	Average (Kg/cent)		**116.08**	**98.92**
	Average (t/ha)		**29.02**	**24.73**
	% increase over the check CO (FC) 8		**17.35**	

PROJECT WISE RECOMMENDATIONS AND ACTION TAKEN

S. No.	Project No. and Title	Remarks	Action taken
CROP IMPROVEMENT			
1.	**CPBG / CBE / PBG / 10 / 004** Collection, Evaluation, Documentation and selection of Cenchrus, Deenanath and Bracharia species. (June 2009 to May 2013) Project Leader: Dr. A. Kalamani	May be closed and new research sub-project may be proposed	Closed and new research sub-project obtained
2.	**CPBG/CBE/PBG/10/005** Mutation studies in Stylosanthes and Desmanthus to evolve high biomass yielding genotypes (June 2009 to May 2014) Project Leader: Dr. A. Kalamani	May be closed and new research sub-project may be proposed	Closed and new research sub-project obtained
3.	**CPBG / CBE / PBG / 13 / 09** Evolution of leguminous forage crops and evaluation of nominated entries of leguminous forage crops for yield and quality under AICRP on forage crops. (October 2013 to September 2016) Project Leader: Dr.C.Babu	May be continued	This project has been closed and a new research sub project was proposed excluding the AICRP component as the evaluation part is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026).
4.	**CPBG / CBE / PBG / 13 / 10** Evaluation and selection in cereal fodders under AICRP on Forage crops. (October 2013 to September 2016) Project Leader: Dr.C.Babu	May be continued	This project was deleted to avoid duplication of work as the evaluation part of cereal fodder is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026) and evolutionary part is covered under another University sub-project (CPBG / CBE / PBG /

S. No.	Project No. and Title	Remarks	Action taken
			11 / 001) being handled by Dr. K. Iyanar, Asst. Prof. (PBG)
5.	**CPBG /CBE/PBG/10/S33** Private Agency Scheme: Evolution of Lucerne genotype possessing high biomass and chlorophyll content (June 2010 to May 2016) Project Leader: Dr.C.Babu and Dr. K.Velayudham	May be continued	This project is continued with the new project number allotted by DR, TNAU as KANCOR/CPBG/CBE/FC/2010/R001.
6.	**CPBG / CBE / PBG / 13 / 08** Evolution of forage grasses and evaluation of nominated entries of forage grasses for yield and quality under AICRP on Forage crops (October 2013 to September 2016) Project Leader: Dr.K.Iyanar	May be continued	This project has been closed and a new research sub project was proposed excluding the AICRP component as the evaluation part is covered under common AICRP on FC project (AICRP/PBG/CBE/FCR/026).
7.	**CPBG / CBE / PBG / 11 / 001** Evolution of high yielding forage maize genotypes with improved fodder quality (September 2010 to August 2015) Project Leader: Dr.K.Iyanar	May be continued	Project is continued
CROP MANAGEMENT			
1.	**DCM/CBE/AGR/12/005** Performance of CN hybrid grass CO (CN) 4 as influenced by micro nutrients under irrigated conditions (June 2012 to September 2014) Project Leader: Dr.A.Velayutham	May be closed	Will be closed and a new research sub project will be proposed

Table 16. Quantity of seeds/ planting material produced and supplied (2014-15)

S. No.	Crop/ variety	Class of seeds	Quantity produced (kg)	Quantity supplied (kg)	Balance (kg)	Expected production in a month (kg)	Total quantity available (kg)
I	**SEEDS**						
1.	Multicut Fodder sorghum CO (FS) 29	BS	275.0	275.0	Nil	200.0	**200.0**
		FS	1164.0	1164.0	Nil	-	**-**
		TFL	1611.13	1611.13	Nil	2500.0	**2500.0**
2.	Fodder sorghum CO 31	TFL	94.03	94.03	Nil	1500.0	**1500.0**
3.	Maize African tall	BS	-	-	Nil	-	**-**
		FS	8946.0	6978.0	1968.0		**1968.0**
		TFL	1897.5	1897.5	Nil	5000.0	**5000.0**
4.	Fodder cowpea CO (FC) 8	BS	-	-	Nil	-	
		FS	548.95	548.95	Nil	-	**-**
		TFL	148.0	148.0	Nil	1500.0	**1500.0**
5.	Lucerne CO 2	TFL	7.145	7.145	Nil	150.0	**150.0**
6.	*Desmanthus*	TFL	543.4	543.4	Nil	2000.0	**2000.0**
7.	Puthiya soundal	TFL	17.8	17.8	Nil	150.0	**150.0**
8.	Agathi	TFL	226.8	226.8	Nil	1000.0	**1000.0**
II	**PLANTING MATERIAL**						
1.	CN hybrid CO (CN) 4 stem cuttings	-	8,92,964	8,92,964	50,000	1,00,000	**1,50,000**
2.	CN hybrid CO (BN) 5 stem cuttings	-	6,82,472	6,82,472	50,000	40,00,000	**40,50,000**
3.	Guinea grass CO (GG) 3 rooted slips	-	59,195	59,195	10,000	1,50,000	**1,60,000**

Table 17. Revenue generated through sale of seeds/ planting material/ green fodder (2014-15)

S. No.	Item	Quantity sold (kg/ Nos.)	Amount (Rs.)
1.	Seeds	13,512	22,22,424
2.	Stem cuttings / rooted slips	16,34,631	8,79,042
3.	Green fodder (tonnes)	324	4,76,299
	Total		**35,77,765**

PG STUDENTS' RESEARCH WORK ON FORAGE CROPS (2014-15)

ABSTRACT

INVESTIGATION FOR FODDER YIELD AND ITS COMPONENTS THROUGH GENETIC ANALYSIS IN COWPEA (*Vigna unguiculata* (L.) Walp.)

By

T. KEERTHIGA

Degree : Master of Science (Agriculture) in Plant Breeding and Genetics

Chairman : Dr. C. BABU, Ph.D.

Professor (PBG),

Department of Forage Crops,

Centre for Plant Breeding and Genetics,

Tamil Nadu Agricultural University,

Coimbatore – 641 003.

2014

Twenty two genotypes of fodder cowpea maintained in the Department of Forage Crops, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University were subjected to assess the variability, association and genetic diversity for ten traits *viz.*, plant height, days to 50 per cent flowering, days to maturity, number of main branches per plant, leaf : stem ratio, dry matter yield per plant, crude protein content, crude fibre content, crude fat content and green fodder yield per plant to select diverse parents for inclusion in the hybridization programme to evolve high green fodder yielding cowpea with better quality.

Five genotypes *viz*., FDC 2240, FDC 1259, TNFC 0924, TNFC 0926 and CO (FC) 8 were found to be superior for fodder yield and its related traits based on *per se* performance and identified for crossing programme. Variability components were found to be significantly higher in the traits *viz*., number of main branches, dry matter and green fodder yield per plant possessed high heritability and high genetic advance indicating the predominant role of additive gene action in their inheritance.

Results on association studies and path coefficient analysis clearly established the significant positive correlation and direct effect on green fodder yield per plant with the traits such as in plant height, number of main branches and dry matter yield per plant. Selection for these traits could be relied upon for increasing fodder yield.

D^2 statistics classified 22 genotypes into four clusters. It was extrapolated that, the genetic diversity was independent of geographical origin and that the genotypes of different origin were grouped in the same cluster and that of same source were found to be scattered in different clusters. Cluster analysis for qualitative characters using simple

matching coefficient fractioned all the genotypes into eight major groups with the values ranging from 0.35 to 0.86.

Seven diverse parents were chosen and crosses were made in a diallel mating design without reciprocals (model I, method II). The F_1s and the corresponding parents were evaluated for the above mentioned ten traits to identify best parents and hybrids.

Based on *per se* performance and *gca* effect, three parents *viz*., FDC 2239, CO (FC) 8 and FDC 1259 were identified as good combiners and suggested for recombination breeding for improving green fodder yield. Five hybrids *viz.*, FDC 1162 × FDC1259, FDC 2239 × FDC 2240, FDC 2239 × FDC 1259, FDC 2240 × TNFC 0926 and TNFC 0926 × CO (FC) 8 were identified as superior based on *per se*, *sca* effect and heterosis for green fodder yield. Thus, advancing these hybrids and effective selection in segregating generation would be rewarding and helpful in developing high fodder yielding varieties.

All the characters except plant height and days to maturity possessed significant D and H_1 values indicating the importance of both additive and non-additive gene action as revealed by Hayman's genetic and graphical analyses. The non-additive gene action was high in the traits such as plant height, days to maturity, crude protein content and green fodder yield per plant. However, graphical analysis exhibited the role of partial dominance for the traits *viz*., plant height, number of main branches and green fodder yield per plant, while crude fibre and crude fat content displayed complete dominance. The remaining traits were showing over dominance behaviour.

In the present study, the traits plant height, number of main branches, dry matter and green fodder yield per plant assumed greater significance in variability and association analysis and hence these traits may be given due importance during selection programme. Three parents *viz*., FDC 2239, CO (FC) 8 and FDC 1259 were selected as good combiners and five hybrids such as FDC 1162 × FDC1259, FDC 2239 × FDC 2240, FDC 2239 × FDC 1259, FDC 2240 × TNFC 0926 and TNFC 0926 × CO (FC) 8 were identified as superior for improvement of fodder yield and quality in cowpea.

PUBLICATIONS (2014-15)

Research articles: 6

Babu, C., K. Iyanar and A. Kalamani. 2014. High green fodder yielding new grass varieties. *Electron J Plant Breed*, 5(2): 220-229.

Babu, C., K. Iyanar, K. Velayutham and A. Kalamani. 2014. A high yielding Lucerne variety CO 2. *Electron J Plant Breed*, 5(3): 345-349.

Babu, C, K. Iyanar and A. Kalamani 2014. Evolution of high biomass yielding forage grasses and their production technologies. In: Forage Cultivation Technologies, TANUVAS, Chennai, pp. 36-49.

Dhasarathan M., C. Babu, and K. Iyanar 2015. Combining ability and gene action studies for yield and quality traits in Baby corn (*Zea mays* L.). SABRAO *Journal of Breeding and Genetics* 47 (1) 60-69.

Ramakrishnan, P., C. Babu and K. Iyanar. 2014. Genetic diversity in Guinea grass (*Panicum maximum* Jacq.) for fodder yield and quality using morphological markers. *Int J Plant Biol Res* 2(1): 1006.

Velayutham, A and C. Babu. 2014. Forage and Livestock scenario in Tamil Nadu. In: Souvenir: National Group Meet – *Kharif* 2014 of AICRP on Forage Crops held at SKRAU, Bikaner, Rajasthan, p 17 – 21.

Popular article: 9

Babu C., 2014. Protein banks for growth and development of livestock. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 25-30.

Babu C., A. Velayutham and K. Iyanar 2014. Establishment of model dairy farm and feeding methods. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 31-34.

Babu C and K. Iyanar, 2014. Success story of progressive forage farmer Th. R. Subbaiyan, Irugur. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 47-49.

Babu, C., K. Iyanar and A.Kalamani 2014. High green fodder yielding Lucerne variety CO 2. *Uzhavarin Valarum Velanmai*. Malar-5, Ithal-7, pp. 10 - 13.

Iyanar K., 2014. High yielding grasses for copious milk production. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 17-20.

Iyanar K., C. Babu and A. Kalamani, 2014. Seed production techniques in forage crops. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 36-40.

Kalamani A., 2014. Achievements of Department of Forage Crops. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 12-16.

Velayutham A., 2014. Cereal fodders. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 21-24.

Velayutham A., C. Babu and K. Iyanar, 2014. Nutrient status and preservation methods of forage crops. *Uzhavarin Valarum Velanmai* Malar-5, Ithal-7, pp. 41-45.

******