

CHAPTER - IX

AGRICULTURAL EDUCATION, RESEARCH AND EXTENSION

Tamil Nadu Agricultural University was formed in 1971. The University is functioning with the triple objectives of agricultural education, research and extension. It aims not only sustaining the self sufficiency in food production but also exploring the agricultural potential for export thereby improving the rural economy.

I. Agricultural Education

Liberalisation, globalization and privatization of the economy has created both new opportunities and challenges to Indian agriculture. To meet the above challenges of the agriculture sector competent technical manpower is to be created in adequate quantity. Agricultural education needs to be reoriented to cater to the needs of farming sector in terms of continuous upgradation of syllabi, introduction of need based courses in collaboration with public and private sector and introduction of innovative teaching methods.

TNAU is now offering twelve undergraduate degree programmes. The science programmes offered are; B.Sc. (Agriculture), B.Sc. (Horticulture), B.Sc. (Forestry), B.Sc. (Home Science) and B.S. (Agribusiness Management). The technology programmes offered are; B.Tech. (Agricultural Engineering), B.Tech. (Biotechnology), B.Tech. (Bioinformatics), B.Tech. (Horticulture), B.Tech. (Food Process Engineering), B.Tech. (Energy and Environmental Engineering) and B.Tech. (Agricultural Information Technology). Diploma in Agriculture is offered in six Research Stations of the University viz., Oilseed Research Station, Tindivanam, Agricultural Research Station, Bhavanisagar, Horticultural Research Station, Pechiparai, Rice Research Station, Ambasamudram, Regional Research Station, Aruppukottai and Agricultural Research Station, Kovilpatti with the enrolment of 29, 23, 19, 21, 15 and 14 students respectively during 2008-09.

TNAU has collaboration with 19 foreign, 10 national and six private Universities and Institutes for post graduate student research and training. The Department of Molecular Biology and Biotechnology is one of the pioneers in Agricultural Biotech Research in India. Biotechnology related research works were initiated in TNAU in early 1980s and these activities were later intensified in tune with the development in this field. Besides agricultural biotech research, this department is also offering M.Sc. course since 1989 and Ph.D. since 1990. The department has almost over two decades of experience in research and teaching in Biotechnology. A number of research projects supported by Government and International agencies are under operation. All the laboratories are well equipped with state-of-the-art equipments. These facilities give a good amount of hands-on experience to under graduate students.

The following are the important activities taken up during the academic year (2008-2009).

- e-learning resources for certain courses of B.Sc. (Agriculture) under the ICAR-NAIP scheme
- Video streaming of lectures by Under Graduate teachers was taken up
- Online examination system
- Diploma courses at Agricultural Research Station, Kovilpatti and Horticultural Research Station, Pechiparai
- Two affiliated colleges viz., Vanavarayar Agricultural College at Pollachi and Thanthai Roever Agricultural College at Perambalur were started

Apart from these during 2009-10, it is programmed to provide internet connectivity for the newly constructed hostels and to increase the bandwidth of existing Internet connectivity.

Students from TNAU undertake research in many foreign universities in countries like USA, United Kingdom, Canada, Australia, Japan, Mexico, Italy and South Africa. Recently, a collaborative dual degree programme (Post Graduate) between the TNAU and Cornell University in USA leading to M.Tech. in Food Processing and Marketing (to be given by TNAU) and MPS (Master of Professional Studies) to be given by Cornell University has been started from 2008-'09. The first batch of students have left for USA on 3rd June, 2009. Two Memoranda of Understanding (MOU) have been signed with foreign institutes viz., Copenhagen University, Denmark and National Park Board, Singapore for taking up collaborative research through faculty and student exchange programmes of post graduate studies.

II. Agricultural Research

The scientists of TNAU at ten colleges of seven teaching campuses, 36 research stations, 14 Krishi Vigyan Kendras (KVKs) and 5 Plant Clinic Centres (PCCs), are taking up research on need based problems that are brought out from various fora like Scientific Workers' Conference and Annual Crop Scientists' Meets. Research projects in TNAU are funded by Government of Tamil Nadu, Government of India and various National and International donors. Apart from these, under the ICAR's National Agricultural Innovation Project (NAIP), five research projects with an outlay of Rs.3.12 crores have been taken up. To facilitate the research in dryland agriculture a new Dryland Agricultural Research Station was established at Chettinad in Sivagangai district in May 2008 and a Floriculture Research Station at Thovalai, Kanyakumari district was established in July 2008.

During 2008-09, eight new crop varieties - CO (R) 49 rice, Paiyur (Ra) 2 Ragi, VRI (Gn) 7 Groundnut, PLR (B) 2 Brinjal, CO (CN) 4 Cumbu Napier Hybrid Grass, MDC (KO) 1 Green manure Kolinji, PKM (MT) 1 Manila Tamarind and MTP (CA) 1 Casuarina were released for cultivation by farmers. During this period, four new farm implements and five crop management technologies were also released for use by the farming community.

As per the National Seed Plan, the recommended Seed Replacement Rate (SRR) is 25% for self pollinated crops, 35% for cross pollinated crops and 100% for hybrids. To meet this requirement, the supply of sufficient quantity of breeder seeds of all the crops is ensured by the Tamil Nadu Agricultural University for the production of foundation and certified seeds by the Department of Agriculture and Private seed producers. A booklet entitled, "Potential Seed Plan for Tamil Nadu" was prepared by the Seed Centre, Tamil Nadu Agricultural University and provided to the Commissionerate of Agriculture, Chennai, for effective implementation of seed multiplication programme.

TNAU is focusing its research activities in areas viz., development of genetically modified crops and crop hybrids with resistance to major pests and diseases in crops like; cotton, brinjal, banana and rice. With assistance from ICAR under the special grant of Rs.50 crores, infrastructure facilities are developed in research stations as well as in teaching campuses of TNAU. Scientists are trained abroad in frontier areas like Nanotechnology.

With the assistance provided under Part II Plan scheme of the Govt. of Tamil Nadu, development of varieties in Bt cotton has been taken up. When the Bt cotton varieties are evolved, the farmers need not buy the Bt cotton hybrid seeds from outside every time. Instead, they can produce their own seeds of Bt cotton variety.

Economically viable technologies and products like Coconut tonic, Sugarcane Booster, Seri Dust, Biomineralizer, Master trap and Tomato and Brinjal Seed Extractor were developed by TNAU and identified for commercialization through private entrepreneurs.

Integrated management practices for eriophyid mite in coconut have been developed and large scale demonstrations were laid out in the farmers field at various districts of Tamil Nadu to manage the mite. *Hirsutella thompsonii* (Mycohit 1 per cent conidia + adjuvant) three sprays at fourteen days interval resulted in more than 60 per cent reduction of mite. Basal Stem Rot (BSR) disease caused by *Ganoderma lucidum* (Leys) Karst is the most destructive disease and it is a major limiting factor in coconut production especially in Tamil Nadu. Under field conditions, a new *Bacillus* based biopesticide formulation (EPC5+Pf1+Tv) as soil application @ 300g/palm significantly reduced the disease index and increased the coconut yield compared to individual application in different locations of Tamil Nadu. Interestingly, the *Bacillus* formulation significantly controlled eriophyid mite besides Ganoderma wilt. The efficacy of the *Bacillus* product in different parts of Tamil Nadu will be tested.

In Tamil Nadu, red rot disease in sugarcane was first observed in T.Edayar village in the South Arcot district during 1974-75. Sugarcane sett treatment with 125 g of Carbendazim 50 WP or 250 g of Carbendazim 25 DS in 250 litres of water along with 2.5 kg of Urea and dipping the setts for 5 minutes is recommended to manage the disease or application of liquid formulation of *Pseudomonas fluorescens* Pf1 @ 4lit/ha was found to be effective in reducing the incidence of red rot disease. On-farm trials are in progress in order to assess the efficacy of liquid formulation of *Pseudomonas fluorescens* against sugarcane red rot disease and to assess the effect of *Pseudomonas* liquid formulation on sugarcane growth and yield attributes.

A diagnostic kit for early detection of the red rot pathogen in sugarcane before expressing the red rot symptoms has been developed. The diagnosis is mainly based on a polyclonal antiserum developed against a mycelial protein (101 kDa) of the pathogen. This diagnosis procedure will help to monitor the sett borne nature of the red rot pathogen in different sugarcane growing areas and also select seed setts, which are free from pathogen. From this, one can monitor the movement of seed cane from one region to other region by doing ELISA test. Bioformulation containing endophytic *Pseudomonas* bacteria, which is capable of controlling the red rot disease and increasing the sugar recovery of the cane under field conditions has been developed.

A high yielding hybrid YRCH 1 castor was developed in the Tapioca and Castor Research Station, Yethapur which has been recommended for release in Tamil Nadu state during 2009. Application of the growth regulator, nitrobenzene at 100 ppm 10 days before flowering increased the number of female flowers in castor by 30 percent. Cultivation of the new castor hybrid YRCH 1 was demonstrated in the Vashista River sub-basin for the benefit of the farmers. In the same river basin, under the precision farming mode, field demonstrations were conducted in 219 ha in sugarcane, tapioca and banana with 50 per cent subsidy.

At present, Biofertilizers are supplied to the farmers as carrier based inoculants. As an alternative, liquid formulation technology has been developed in the Dept. of Agril. Microbiology, TNAU, Coimbatore which has more; advantages than the carrier inoculants. The benefits of the liquid biofertilizers are more shelf life (more than one year), zero contamination, more number of viable cells ($>10^9$ /ml), easy handling & transportation and better performance on crop growth and yield.

Farm machinery and implements for land preparation, rice transplanting operations, weeding and intercultural operations, threshers for multicrop utility and combines in large quantity are proposed to be supplied to the farmers at affordable cost by way of providing subsidy. Efforts are made to train the officials, farmers, artisans and manufacturers on the use and maintenance of farm implements and machineries. Ministry of Agriculture, GOI, has approved the scheme for establishment of "Centre for testing agricultura machines and

implements" in the Agricultural Machineries Research Centre, TNAU, Coimbatore. Further, linkages at National and International level on research endeavours are also undertaken.

Under the Rs.50 Crores special grant obtained from the Govt. of India, many research projects and training programmes were taken up. The funds are utilized for infrastructure development (Rs.10.71 crores), purchase of high-tech instruments and laboratory equipments (Rs.21.99 crores), human resource development (Rs.2.70 crores) and for undertaking frontier research projects (Rs.14.59 crores).

Research projects in frontier areas viz., nanotechnology, biotechnology, besides water management, nutrient management, environmental protection projects are conducted under 50 Crore special grant. Under nanotechnology, research works are carried out to develop nanoherbicides for the management of weeds in rainfed agriculture, to develop nano-fertilizers to increase the use efficiency, methods to separate dead seeds from the seed lot, methods to remediate the polluted soils, development of food packaging with nano membrane to increase the shelf life of food, nano-biosensor to detect pathogens in food and rice crops and neem based nano-pesticides for the management of insect pests. The other important projects under frontier areas are biodegradation of agricultural waste by white rot fungus, sugarcane red rot, root wilt management in coconut, aflatoxin and yellow mosaic virus management, formulation of liquid biofertilizers, development of hybrid coconut for chocolate making, developments of hybrids in sunflower, tomato, brinjal, bittergourd, off season moringa, climate change on crops, development of biocontrol agents, altering crop geometry for mechanization, large scale demonstration in cashew cultivation, hormonal manipulation for boll shedding in cotton and pulses and fertigation techniques for cut flowers.

Future Thrust in Research

Research will be focused on Development of Hybrids in major cereals and pulses. Development of cropwise package for organic farming and cropping system, formulation of designer fertilizer mixture for various crops, development of growth hormone consortia to boost the yield of crops and establishment of Automatic Weather stations in all the blocks of Tamil Nadu for weather forecasting will be taken up.

Increased impetus will be given for research on biological control of pests, diseases and nematodes management, biotechnological approaches for management of insect pests and diseases and transfer technology in IPM to farmers through different stakeholders like Non-Governmental Organizations (NGOs) and Self Help Groups (SHGs). Increased focus will be given for the development of ecofriendly strategies in integrated nutrient management and integrated pest and disease management. Research on evolving high yielding varieties tolerant to biotic and abiotic stresses through Molecular Approaches and Isolation of Genes Encoding Yield and Quality Traits will be given top priority. An advanced centre will be established for micro-irrigation exclusively.

Research on bioconversion of lignocellulosic biomass in to ethanol, developing sulphur bacterial inoculants for groundnut, production of food grade pigments from filamentous fungi will be taken up.

An advanced centre for nanotechnology applications in agriculture will be established under which synthesis and evaluation of nano fertilizers and nano herbicides for major crops, nanotechnological application for remediation of eco-system will be taken up.

Forestry

Research projects will be taken up to screen short rotation and high yielding industrial wood species suitable for timber, pulp wood, matches, and plywood industries through farm and agro forestry.

Home Science

Research projects will be taken up on reduction of micronutrient malnutrition through appropriate intervention strategies, to improve maternal health by achieving nutrition security and to create awareness on the consequences of obesity and strategies to overcome the same.

III. Agricultural Extension

Directorate of Extension Education of TNAU is primarily responsible for expeditious transfer of the latest technologies emanating from various research programmes of TNAU to the farming community and extension personnel of the state Agriculture Department through 14 KVKs, 5 Plant Clinic Centres, one Communication Centre and the Training Division.

To make Transfer of Technology effective, 134 Venture Capital Schemes on production of quality seeds, planting materials, biopesticides and fertilizers are operated at different centres of the University. The above inputs are supplied to the farmers in large quantities. Apart from the above, during the last three years, 131 consultancy projects were undertaken for the benefit of stakeholders.

The Directorate of Open and Distance Learning has programmed to organize three new Certificate Courses viz., Energy Efficiency Technologies, Solid Waste Management and Maintenance of Farm Implements and one Diploma Programme viz., Eco-friendly Pest Management along with the existing courses during 2009-2010.

TN-IAMWARM Project

In 2008-09, apart from the existing 9 sub-basins, TN-IAMWARM project has been introduced in 16 sub-basins (a total of 25 sub-basins) with an outlay of Rs.1472.35 lakhs. Precision farming in crops like sugarcane, banana, tapioca, vegetables and flowers (1750 ha) is given more thrust. Apart from this, demonstration of the System of Rice Intensification (SRI) in an area of 2581 ha, maize in 452 ha, pulses in 3494 ha, groundnut in 620 ha, sunflower in 209 ha, cotton in 160 ha, cocoa intercropping in coconut in 500 ha and thornless bamboo in 70 ha and organic farming in 220 ha were taken up.

The results of the demonstrations in various sub basins revealed the increase in the average yield of paddy to 5709 kg/ha under SRI compared to the conventional average yield of 4456 kg/ha (28 per cent). The net income obtained in SRI was Rs.22,985/- as against Rs.11,493/- in conventional method apart from water saving of 30 per cent. In maize, an average yield of 7943 kg/ha was realized with improved production technologies against the conventional yield of 7316 kg/ha (9 per cent increase). Demonstrations of improved production technologies in garden land pulses yielded 875 kg/ha as against 722 kg/ha in conventional method (21 per cent increase). Improved production technologies in oilseed crops like Groundnut (337 ha), Castor (75 ha) Sunflower (35 ha) and Gingelly (46 ha) revealed that these have recorded 20 per cent, 50 per cent, 26 per cent and 27 per cent increased yield respectively.

During the year 2009-10, it is planned to cover 14,983 ha under SRI and 1638 ha under precision farming. It is also planned to demonstrate Improved production technologies on gardenland pulses (3403 ha), groundnut (1743 ha), cotton (320 ha), sunflower (135 ha), maize (474 ha) and organic farming (245 ha) with a financial outlay of Rs.3009.65 lakhs.

National Agricultural Development Programme (NADP)

The National Agricultural Development Programme (NADP) was continued and implemented by TNAU in 2008-09 along with the line departments with an outlay of Rs.620.61 lakhs, for implementing the schemes on precision farming, establishment of agri-

clinics cum mini soil testing laboratories, agricultural mechanization, dry land development and maximizing crop productivity, promotion of organic farming and organic manure production, strengthening of quality seed production and distribution and augmenting pulses production through DAP spray. During 2009-10, six projects viz., production and supply of cassava mosaic virus free planting materials, promotion of organic manure production in nine districts of Tamil Nadu, response farming on dry land agriculture, large scale demonstration on management strategies of mealybugs in major crops of Tamil Nadu, introduction of mini portable sprinkler irrigation system for the coastal sandy soils of Tamil Nadu and enhancement of rainfed rice productivity are proposed to be taken up in TNAU with an outlay of Rs.450 lakhs.

Domestic and Export Market Intelligence Cell (DEMIC)

The Domestic and Export Market Intelligence Cell functioning in Tamil Nadu Agricultural University has released 19 price forecasts for major crops viz., Onion, Groundnut, Chillies, Black gram, Vegetables, Sunflower, Maize, Rice, Adipattam crops (Maize, Gingelly, Groundnut), Cotton and Karthigaipattam crops (Bengalgram, Cumbu, Sunflower, Coriander). One month before sowing of each major crop, a forecast on prices that are likely to be received during harvest of that crop is released. Due to this the farmers are able to take decisions on whether to sow that crop or not and also the extent of area. Similarly, during harvest of all major crops recommendations are made to sell the produce immediately or to store the same for sometime to fetch a better price. Thus, farmers are helped in getting better prices for each crop. In India, only in Tamil Nadu such price forecasts are being made and the reliability of these forecasts ranged from 92 to 98 per cent, when compared with the actual market prices. The forecasts were disseminated to the farmers through Tamil and English Dailies, All India Radio, Television, Krishi Vigyan Kendras, Dept. of Agricultural Marketing and Agri-Business and Regulated Markets.

Intellectual Property Rights (IPR) Cell

The IPR cell was established at the Directorate of Centre for Agricultural and Rural Development Studies (CARDS), TNAU, Coimbatore in 2008. The cell is imparting many awareness training and out-reach programmes to scientists, farmers, students and other stakeholders all over the state. The technical staff in the IPR cell is also improving their proficiency through attending various Intellectual Property trainings, conferences, road shows and seminars across the country. The main role of IPR cell is to facilitate individual patents filed by TNAU scientists in patent office with legal counsel from International Patent Attorney through IPR cell. Hitherto, five patents were obtained for new inventions, nine patent applications were filed and eighteen training programmes were conducted. The proposal for registration of extant crop varieties of TNAU has been taken up by the cell.

Dynamic Market Information through Mobile and Internet

Dynamic Market Information is the collaborative initiative of Tamil Nadu Agricultural University (TNAU), Coimbatore and Centre for Development of Advanced Computing (CDAC), Hyderabad to provide the daily price list of Agri-Horti commodities. The market price prevailing in Coimbatore, Oddanchatram, Trichy, Chennai, Kochi and Bangalore will be available in telephone No.0422-6611383 as well as in TNAU website www.tnau.ac.in under dynamic market information. The market price information is extended to farmers and stake holders through mobile phones as short message service. As on date around 700 farmers and 100 scientists have been enrolled with this facility.

Community Radio Station

Community Radio Station has also been established at Directorate of Extension Education for dissemination of location specific technologies and knowledge to the local people through local language.

New Farmers' Hostel

A State level New Farmers' Residency (Farmers' Hostel) has been constructed at Tamil Nadu Agricultural University, Coimbatore with the support of Indian Council of Agricultural Research, New Delhi. The Farmers Hostel will provide accommodation while the state level trainings are organised at TNAU, Coimbatore.

Future Thrust in Extension

Programmes like Agri-Portals, e-extension, cyber extension, market led agriculture, mega market, etc., will be taken up. DEMIC programme will also be continued.

The Tamil Nadu Agricultural University will work entirely to achieve 4 per cent and 8 per cent growth rate in agriculture and horticulture respectively and for sustainable agriculture development for the socio economic upliftment of the ultimately dependant farm public and its other clientele.