LOW LAND RICE SEEDER

- A Success Story

All India Coordinated Research Project on

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Introduction

Rice (*Oryza sativa*) is a staple food all over the world. Transplanting of rice seedlings in puddled soil is a widely accepted cultivation practice. Energy consumed in nursery raising, puddling and transplanting constitutes about 35-40 per cent of the total energy need in cultivating rice. During peak seasons labour is scarce which leads to transplanting. Aged seedlings result in reduced productivity. To overcome the scarcity of labour for transplanting in peak seasons there has been continuous demand for rice transplanter and other direct rice sowing machines. Since rice transplanters require special skills in the preparation of mat type nursery, development of simple equipment for direct sowing of rice was undertaken.

The area under direct sown rice is on the increase in view of the scarcity of labour. It was also observed that transplanted rice experiences nursery uprooting shock and the total duration get extended about 7-10 days. In direct sown rice crop, the transplanting shock is avoided and as a result the crop duration is reduced.

Traditional Practices

Transplanting of rice in puddled soil is a widely followed traditional cultivation practice. As labour involvement in nursery raising and transplanting contributes to 30 per cent of the total labour requirement in Rice cultivation, direct sowing by hand broadcasting has been in vogue from time immemorial, which involves additional labour for interculture. In this context adopting direct sowing of rice in puddled soil would cut down the cost of cultivation considerably.

Evolution / Design Process

A drum type low land rice seeder (Fig 1) was developed by the TNAU, Coimbatore centre of AICRP on FIM based on the IRRI design. The rice seeder was tested in the laboratory for determining the seed rate. Field evaluation trials were carried out in Coimbatore, Madurai and Agricultural Research Station, Bhavanisagar. The field tests revealed that the average effective field capacity of the rice seeder was 0.12

ha/h with 63 per cent field efficiency. Average seed rate with the seeder in the field was 85 kg/ha. The germination tests conducted with the seeder showed that the germination of rice seed was not affected by the continuous rotation of the seed drum. There is scope for drastic reduction in labour which is required for rice transplantation. Since the crop is row planted, intercultural operations like weeding become easier.

Salient Features

This equipment is used for sowing pregerminated rice seeds directly in wet land obviating the need for transplanting. The Rice seeder consists of two seed drum hoppers, two skids, a 600 mm diameter internally lugged ground wheel and a handle all fixed in a frame work made of 16 mm diameter conduit. The seeder is capable of sowing 8 rows at 150 mm row spacing or 6 rows at 200 mm row spacing. The field must be well prepared levelled and puddled atleast two days before operating the seeder.

To facilitate line sowing at 150 mm spacing suitable modifications were incorporated in the machine. For easy turning, swinging type handle was provided. Overall weight of the seeder has been reduced from 15.4 kg to 11.2 kg. Provisions were made in the seeder to have the row spacing at either 200 mm or 150 mm by making two separate seed drums. On the same frame the drums can be changed.

It requires two persons, one for operating the unit and other for helping the operator for filling the seeds and for turning at headlands. The overall dimensions of the unit are 1650 x 1600 x 690 mm. It weights 11.2 kg. The capacity of the machine is 1 ha / day with a cost of operation of Rs. 250 ha. Seed rate requirement is 50 kg/ha. Yield is at par with transplanted rice. Labour for transplanting is saved by 60 per cent. Weeding and interculture is made easy using long handled tools. The cost of the unit is Rs. 3500/-. The specifications of the seeder are given in the Table 1.

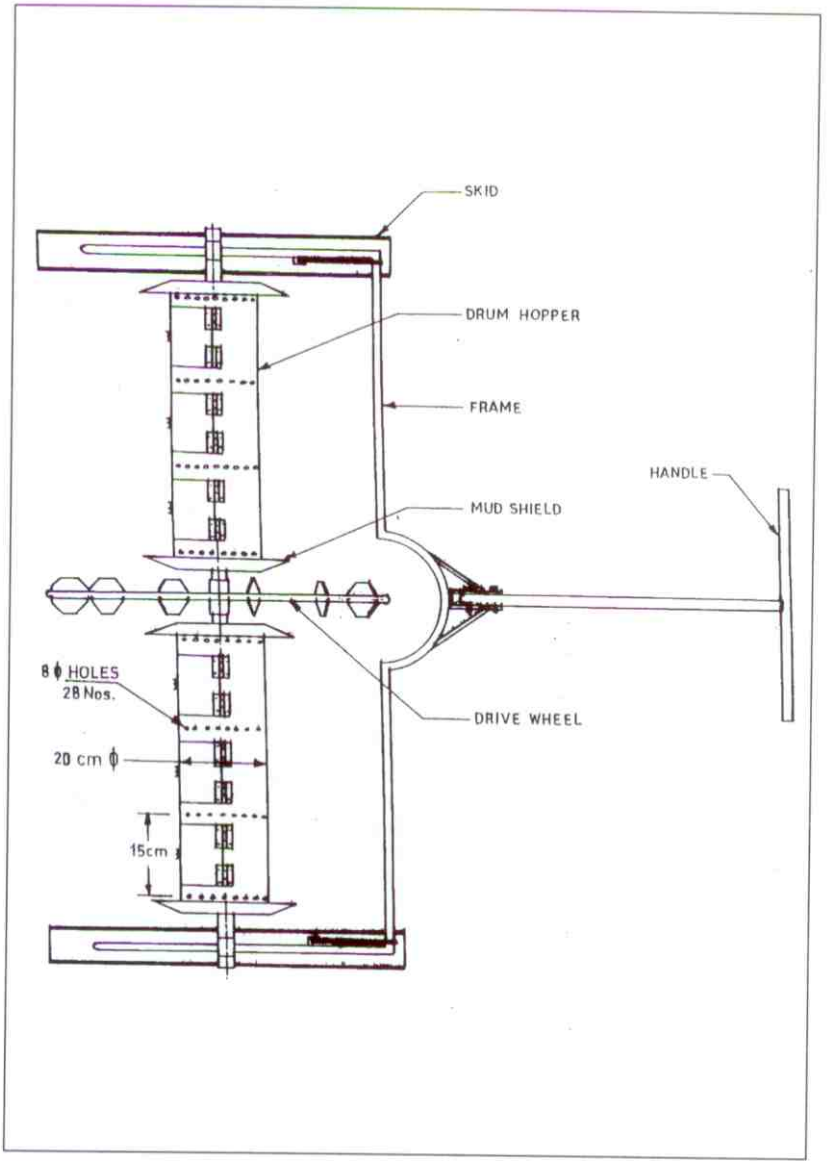

Fig 1 Schematic of TNAU Low land rice seeder

Table 1 Specifications of low land rice seeder

1	Name of Implement	Low land Rice seeder
2	Suitability to crop	Rice
3	Overall dimensions, mm	
	Length Width Height	1650 1600 690
4	Weight, kg (without seed)	11.2
5	Recommended forward speed, km/h	Walking in puddled soil
6	Nominal working width, mm	1600 / 1200
7	Power requirement	Manually pulled in puddled soil by one person
8	Type of metering mechanism	By rotation of drum
9	Number of rows	Eight
10	Row spacing, mm	200 / 150
11	Mechanism for driving metering	Ground wheel
12	Hopper	
	(a) Number	2
	(b) Capacity	5 kg each
	(c) Material	GI Sheet
13	Clutch for metering system	Not provided
14	Furrow opener	Not provided
15	Covering device	Wet Seeds fall into the puddled soil
16	Ground wheel	
	(a) Shape	Round with spokes and lugs
	(b) Material	Mild steel

Performance of the machine

TNAU,Coimbatore Centre of AICRP on FIM carried out on-farm trials of manually operated low land rice seeder in collaboration with the Agronomists on Rice Research Centres of TNAU namely, Coimbatore, Madurai, Aduthurai, Tanjore, Ambasamudram, Tirur, Bhavanisagar and Aliyarnagar to assess the performance in comparison with transplanted rice.

Field experiments were also conducted during 1997 at Tamil Nadu Agricultural University, Coimbatore to study the economics of different planting techniques and wet seeding of rice under lowland condition. Planting techniques viz. random transplanting, broadcasting and direct seeding of sprouted seeds of ADT-39 and CO-43 varieties were compared. In CO-43 direct seeding recorded the highest grain yield of 5.64 t/ha, net return of Rs.15,544/ha and the benefit cost ratio of 2.51. Broadcasting of sprouted seeds recorded the lowest grain yield in both the rice varieties. There was a mean increase of 7 per cent in grain yield for the seeder as compared to random planting.

The low land rice seeder was field tested (Fig 2) at Coimbatore, Aduthurai, Ambasamudram, Madurai and Tanjore areas in comparison with (conventional) transplanting by hand and broadcasting (Table 2). Plant population and yield data were taken. Grain yield was higher in the case of rice seeder in all the locations. Though the plant population is maximum in the broadcasted fields, grain yield was maximum in the fields sown with rice seeder due to greater number of panicles per plant (Fig 3).

On-farm trials were conducted in the farmers' fields at Pollachi, Negamam and Paramakkudi areas in collaboration with Krishi Vigyan Kendra and Rice Breeding Station, Tamil Nadu Agricultural University, Coimbatore.

Fig 2 Field operation of low land rice seeder

Fig 3 Crop stand with low land rice seeder

Table 2 Field performance of low land rice seeder in different agro climatic zones of Tamil Nadu

Sl. No.	Location	Variety	Plant population (no./m²)			Grain yield (t/ha)		
			T1	T2	T3	T1	T2	T3
1	Coimbatore	ADT 38	54	112	76	516	4 55	5.55
2	Aduthurai	ADT 38	50	72	64	5.09	5 25	5 72
3	Ambasamudram	ASD 16	50	72	64	4 04	4 02	4 27
4	Tanjore	ADT 36	47	55	51	5.60	5 80	7 60
5	Madurai	ADT 36	50	58	53	4.58	4 50	4.66
6	Bhavanisagar	ADT 38	51	68	65	8 58	7 45	8 65

T1- Transplanting T2 - Broadcasting T-3 Rice seeder

The low land Rice seeder was field tested at TNAU, Coimbatore centre on an area of 133 ha both at research farms and farmers' fields. Field test results of the seeder in Research Farms as well as in Farmers' fields are very encouraging. The following observations/feed back information were obtained from the farmers.

i) The drum seeded crop comes to harvest atleast 7 days earlier as compared to transplanted crop.
ii) Number of panicles per plant and number of plants per square metre area are more in the drum seeded crop.
iii) Grain yield increased by 6-7 per cent in the drum seeded crop.
iv) Weeds are to be managed with due care
v) There should not be rain within 5-6 days after sowing by the seeder.

Status of Technology

The low land rice seeder was extensively tested for its feasibility both at Research Farm and farmers fields in an area of 133 ha. The seeder has been released by Tamil Nadu Agricultural University. More than 227 prototypes have been sold to Research Farms and farmers and other agencies (Appendix-I) by the TNAU and local manufacturers. Linkages were developed with several manufacturers

and at present six manufactures have started production of the machine (Appendix II).

IIT, Kharagpur Centre of AICRP on FIM procured eight units and carried out prototype feasibility testing in Khalseuli, Tarapur, Kalkhona, Sabhapur and Madpur villages. Farmers were given the rice seeders and they have sown 110 ha area. Various varieties like B 7029, Lolat, IR-36 and Shankar were sown. The seed rate for these varieties during trials varied from 42-60 kg/ha. The field capacity of the seeder was found to be in the range of 0.1-0.14 ha/h with labour requirement of 15-20 man-h/ha.

Performance of low land rice seeder at farmers' fields at IIT, Kharagpur is given in the Table 3.

It is obvious from the Table 3 that the use of rice seeder saves around 80 kg of seeds per hectare of sowing with no necessity of nursery for seedling preparation. Hence, it saves a labour 321 man-h/ha and cost of Rs 3410/ha during sowing itself. Thus the scarcity of labour during pea transplanting season could be overcome with negligible investment at the start of the season. Though the weeding operation requires labour on par with the traditional transplanting method, the requirement is well spread out for one month after 21 days of sowing. Thus the farmer can make full use of family labour and avoid labour bottlenecks. A saving of Rs 3380/- in one sowing season indicates that a farmer with even one hectare can get back his investment on one drum seeder (Rs 1275/-) and 3 weeders (Rs 1200/-) in one season.

Field testing was carried out also at ANGRAU, Hyderabad; CIAE, Bhopal; UAS, Raichur and KAU, Tavanur centres of AICRP on FIM and covered 205 ha area on farmers' fields. The field capacity of the device at these centres varied from 0.08-0.14 ha/h. The average field efficiency was 75%. Its cost of operation is Rs 600/ha. The machine is commercialised at TNAU, Coimbatore; ANGRAU, Hyderabad and IIT, Kharagpur centres.

Table 3 Performance of low land rice seeder at IIT, Kharagpur

Sl. No.	Particulars	Rice seeder	Manual transplanting
1	Seed rate (dryseed), kg/ha	42	100
2	Speed of operation, km/h	1.43	-
3	Field capacity, ha/h	0.14	0.003
4	Number of seedlings/hill	3-4	3-9
5	Number of plants/m^2 (after 45 days of sowing)	27-48	58-78
6	Plant to plant spacing (After 45 days of sowing) cm	13-18.5	6-10
7	Labour requirement for sowing / transplanting, man-h/ha	15	336
8	Cost of sowing / transplanting, Rs/ha	600	4010*
9	Total cost of weeding, Rs/ha	2130	2100
10	Total cost of operation, Rs/ha	2730	6110
11	Yield, kg/ha	4658	3929

* *includes the cost of nursery preparation, seedling picking, transportation and transplanting*

Appendix - I

Production and Supply

1. Number of prototypes fabricated and sold by TNAU centre of AICRP on FIM:

2.

i)	KVK and other centres	:	12
ii)	R&D organisations	:	14
iii)	Farmers	:	51
	Total	:	77

2. Number of prototypes manufactured and sold by different manufacturers: 150

Grand Total: 227

Appendix - II

List of Manufacturers

1. M/s TUCAS Limited,
   Tudiyalur (P.O), Coimbatore - 641 034

2. M/s Kathiravan Industries
   Trichy Road, Singanallur, Coimbatore - 641 005

3. M/s Universal Agro Industries,
   SF No. 374/5, Near Bimetal Bearings,
   Maruthamalai Road, P.N.Pudur,
   Coimbatore - 641 041

4. M/s.Vigneshawara Textile Engineers,
   No.84, Extension Street No.1,
   Singanallur, Coimbatore - 641 005

5. M/s Beracha Engineers,
   436, Maruthamalai Road,
   P.N.Pudur (P.O), Coimbatore - 641 034

6. M/s Padma Vilas
   N.K.Patti Chanel Road,
   Melur - 625 106 (Madurai District)

7. M/s Valumpuri Industries,
   Maruthamalai Road,
   P.N.Pudur (P.O), Coimbatore - 641 034

8. M/s Premier Magnetos
   Hijli Co.op Development Society,
   Prem Bazar, Kharagpur-720 306 (West Bengal)

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..... A Step Towards Farm Mechanization

Substenance of a desirable level of agricultural productivity goes hand in hand with mechanization of different farm operations, which aims at achieving timeliness of operations, efficient use of inputs, improvement in quality of produce and safety and comfort of farmers, and reduction in loss of produce and drudgery of farmers.

The All India Coordinated Research Project (AICRP) on Farm Implements and Machinery (FIM) with its 28 centres in different parts of the country, has been endeavouring to develop, test and popularize need based farm implements and machinery for different regions. The research and development activity under AICRP on FIM involves design, development, testing and design refinement of farm implements and machinery. Prototype manufacturing activity is for multiplication of research prototypes for multi-location trials, development of manufacturing technology for new machines and promoting their manufacture by involving local manufacturers. Prototype feasibility testing activity of a Centre includes identification of farm mechanization needs under local agro-climatic conditions and identification and adaptation of machines to fill the identified mechanization gaps through their feasibility trials.

One-hundred-fifty-nine farm implements and machinery have been designed and developed under the AICRP on FIM. Eighty-three of these have been commercialized. This publication is one among the series of such publications being brought out by the Project on successful technologies.

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