

FACTORS RESPONSIBLE FOR POOR MECHANIZATION OF RICE TRANSPLANTING IN PAKISTAN

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ABSTRACT: In Pakistan, manual transplanting of rice is a common practice. Attempts had been made in past to introduce mechanical transplanting but no fruitful results reaped. These efforts were mainly made in public sector. The study was carried out to determine the factors responsible for poor mechanization of rice transplanting in country. The data was collected from districts i.e., Sialkot, Gujranwala, Hafizabad and Sheikhupura of Punjab province on pre-tested questionnaires form embodying factors, nursery raising, precision land levelling, high price of transplanter, cheap labour, wish to adopt mechanical rice transplanting, mechanical problem in machine, lack of training. The study indicated that nursery raising with specific technique was the major factor arresting mechanical transplanting. Secondly, land leveling was also found an impeding factor in the technology. Being imported machinery, high price was also found an important factor. Almost 100% farmers desired to adopt mechanical transplanting. Some practical solution of nursery raising and fabrication of machinery in the country with low price are to be determined.

Key words: Seedling, Transplanting, Mechanization, Precision Land Leveling.

INTRODUCTION

Rice is the second largest staple food in Pakistan. It is also the second biggest exportable commodity. In spite of favorable soil and environmental condition, yield is low at farmer's fields. The main reason for low yield is less population of plants. Rice transplanting is 100% done with manual labour. Transplanting of seedlings is a labour intensive operation in the cultivation of rice. It is also a skilled job and involves working with a stooping in a puddle field. Except Japan most countries in Asia are still using the traditional method of rice transplantation. Manually operated soil-bearing band seedling type of rice transplanter for single row appeared in Japan market in 1966 and became quickly popular in field. Later, the self propelled walking type soil bearing seedling transplanter was brought in market in 1986. Now Japanese engineers have developed a rotary type riding transplanter that is much popular among rice growers in Japan due to labour reduction and efficient working. These days researchers of Japan are working to develop a multi-purpose rice transplanter-cum fertilizer machine. This machine drops calculated fertilizer with computerized system in each hill at proper depth and transplant seedling at same time.

The process to mechanize paddy transplanting operation in the country was initiated in 1976, when the government imported two units of root-washed seedlings-transplanter from China. The

machines did not work satisfactory even after incorporating a few changes when evaluated under local conditions (Akhtar, 1981). In 1976, 50 units of 6-row root-washed paddy-transplanter were imported from North Korea. These machines were also found un-suitable when tested at Rice Research Institute, Kala Shah Kaku. In 1978, modifications were incorporated to improve an anchoring-capability and distribution-uniformity of seedlings, by team of Pakistani Engineers and Korean experts. The machines performance was found to be better than of the original but more time and labour were needed to trim and wash the seedlings. Growers not accepted the machine due to poor working. The Farm Machinery Institute (FMI) and rice programme of the PARC jointly worked in 1991 with M/S Guard Agricultural Research and Services (Pvt.) Ltd., Lahore, to evaluate the performance of Japanese "Yanmar" paddy transplanter using seedling-mats grown on plastic sheets to reduce both initial and operating cost (Mufti and Khan, 2002). The local manufacturing of this Japanese machine was also found difficult because of its design complexity.

The FMI continued its efforts for identifying a suitable, simple and low cost paddy transplanter (Khan, 1979). They modified Chinese 8-row self propelled machine, with row spacing of 23.8 cm. The machine was operated with a 3.2 hp diesel engine. The price of the machine was Rs.1,50,000/- which was accepted to growers but this machine not proved liable in the field so

required result were not achieved.

In Pakistan alternative of manual rice transplanting, i.e. manual parachute and mechanical parachute rice transplanting has also been tested. But these all alternates of manual rice transplanting can not popularize among the rice growers. Therefore, the present study was planned to check the factors responsible for the failures of mechanical transplanting of rice in Pakistan.

MATERIALS AND METHODS

In this study four major districts of Punjab Province, were chosen to identify causes of failure to popularize mechanization in rice transplanting. A total No. of 100 farmers were included in study, 25 from each district. The farmers having minimum 3 hectares of land for rice cultivation were selected who owned tractors. Following factors were studied:

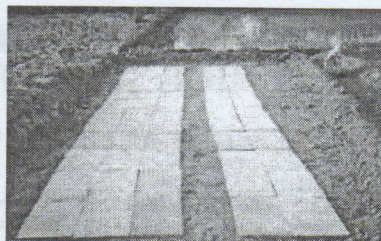
1. Nursery raising
2. Precision land leveling
3. High price of transplanter
4. Cheap labour
5. Wish to adopt rice transplanter
6. Mechanical problem in machine
7. Lack of training

Manual rice transplanting is the popular practice in the country. The above factors restricting the adoption of mechanical transplanting were studied by taking interviews of farmers of the four districts where rice is a common crop in the Province. The data were averaged and percentage calculations were made to assess the degree of effect.

Being the most important factor in mechanical transplanting, cost of seedling raising in plastic sheet and plastic tray for mechanical transplanting was compared with the conventional seedling raising for manual transplanting on actual rates prevailing in the field and adaptive research farms. Cost of transplanting with mechanical transplanters of Yanmar imported brand and HMC was compared with conventional manual transplanting on actual rates.



Mechanical parachute rice transplanting



Plastic sheet for rice seedling raising



Manual rice transplanting

RESULTS AND DISCUSSION

As is evident from table-1 the study indicates that price of rice transplanter had major impact on 68 % farmers included in the study. The 100% farmers wished to adopt mechanical rice transplanting. The 81% farmers viewed the need of training and 80% farmers viewed about precision land leveling. According to 76% farmers labour is cheaper than mechanical rice transplanting. The 60% farmers complained about mechanical problem in locally developed transplanter. All 100% farmers strongly said that raising of nursery was the main cause of failure of mechanical rice transplanting. For mechanical rice transplanting mat/ box for nursery is essential. Plastic trays/boxes are not available in market. Imported boxes are expensive. High temperature is problem in case of mat seedling in less thickness of plastic sheet. Transportation of mat nursery to the field is difficult job.

Table 1: FARMERS VIEW ABOUT FAILURE OF MECHANICAL RICE TRANSPLANTING

Factors	Siakot (No. of farmers)	Sheikhu-pura (No. of farmers)	Gujranwala (No. of farmers)	Hafizabad (No. of farmers)	Average	%age
Nursery raising	25	25	25	25	25	100
Land levelling	17	22	20	21	21	80
High price transplanter	15	20	15	18	18	68
Cheap labour	15	23	16	22	22	76
Wish to adopt rice transplanter	25	25	25	25	25	100
Mechanical problem in machine	14	15	14	17	15	60
Lack of training	20	22	19	20	20.25	81

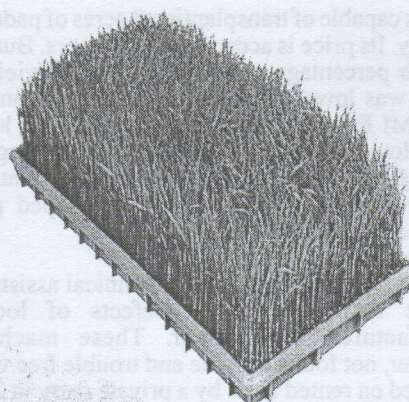
Table 2: Seedling raising cost per hectare.

Inputs	Plastic Sheet		Plastic Tray		Conventional method	
	Qty	Cost (Rs.)	Qty	Cost (Rs.)	Qty	Cost (Rs.)
Land (m ² /ha)	25	-	25	-	125	-
Seed (kg/ha)	25	375	25	375	15	225
Plastic sheet (1m x 1.4 m x 0.05mm each sheet/3 season)	50	584	-	-	-	-
Plastic trays(250 trays/ha for 5 seasons @Rs.50/tray)	-	-	250	2500	-	-
Cost for soil sieving/ha	-	500	-	500	-	-
Labour for seeding	-	100	-	100	-	50
Management cost	20-30 days	200	20-30 days	200	30-40 days	300
Fertilizer (N)+(P)	25	175g	(N)+(P)	25	(N)+(P)	115
Pesticide (Furadon)	15	175g	15	875g	70	70
Total (Rs)		1800		3715		750

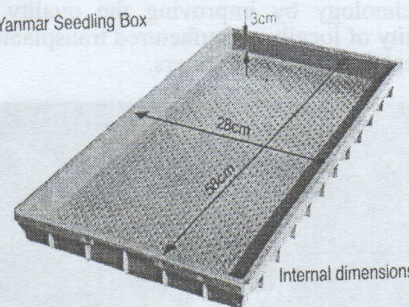
Table 3 Transplanting costs of Yanmar & HMC Paddy Transplanters with Plastic Sheet and Plastic Tray and comparative to Conventional Method

Items	Yanmar Paddy Transplanter	HMC Paddy Transplanter	Conventional Transplanting
A. Transplanting Cost	Rs/ha	Rs/ha	Rs/ha
a) Operating cost	2620	1800	-
b) Seedling raising cost with Plastic sheet.	1800	2800	-
c) Seedling raising in plastic trays	3715	3715	-
d) Conventional seedling raising cost	-	-	750
e) Seedling transportation in with plastic sheet/tray	375	375	-
f) Seedling uprooting/ Transportation and transplanting with conventional method	-	-	2500
g) Total cost.			
i) With plastic sheet	4795	3975	-
ii) With plastic tray	6525	5765	-
iii) Conventional method	-	-	2750

1. Nursery raising: Seedling raising cost is given in table-2. It was astonishing to note that paddy yield was lower in rice field where rice transplanting was done by locally developed rice planter as compared to manual field. Less plant population was the main cause of the low yield of paddy. The high number of missing hills was due to low density of seedling per square cm. The nursery grown on thicker mats (> 2.5 cm) is not possible to transplant with machine. Availability of the proper grown nursery is very important for mechanized rice transplanting. Otherwise, the dream of mechanized rice transplanting at large scale will never come true. Conventional seedling raising cost (Rs.750/ha) was cheaper than seedling preparation, transportation with plastic sheet (Rs.1800/ha) and seedling raising in imported synthetic plastic tray (Rs.3715/ha). Seedling raising in imported plastic tray is 5 time costly than conventional seedling raising (Anonymous 2002). Seedling in locally developed mat fillings with field soil is not optimum due to missing of plants in hills which is main cause of less population. We can overcome these problems by adopting special technique. Seedling raising cost in box/plastic tray (Rs.3715) was only the reasons of expansive rice transplanting. Seedling raising on plastic sheet is cheaper than boxes but not successful in field.



Yanmar Seedling Box



Standard plastic box with dimension



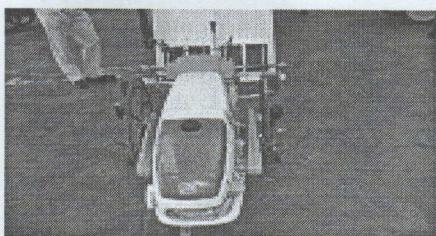
Uniform rice transplanting without missing hill

2. Precision land leveling: Farmers to the extent of 80% recorded (table-1) that land leveling factor was the cause of failure of non adoption of mechanized transplanter. It is evident that uneven level results uneven depth of water in the field. High depth of water causes floating of transplanted nursery on the 2nd pass of the machine pushing water to side. In shallow water depth, machine misses in transplanting of seedlings.

3. High price of rice transplanter: The third main factor for poor mechanization of rice transplanting is high price of imported rice transplanter. Farm Machinery Institute (FMI) NARC Islamabad had modified a Chinese rice transplanter to suitable for local farming conditions (Ahmed *et al.*, 1999). The modified machine was manufactured by M/S Heavy Mechanical Complex Taxila in two model i.e. MT-12 (12 rows) and RT-8 (8 rows). The model

RT-8 is capable of transplanting 3 acres of paddy in one day. Its price is acceptable to farmers. But due to high percentage of missing hills the yield of paddy was lower than manual rice transplanting. The FMI Engineers are giving reasons for lower yield, low plant population due to high %age of missing hills, poor quality of seedling mat and poor reliability of few locally developed parts (Khan *et al.*, 2004).

The FMI Engineers provided technical assistance to the HMC to rectify defects of locally manufactured transplanter. These machines however, not found reliable and trouble free when operated on rented basis by a private party in 2000 and 2001 rice transplanting seasons (Ahmed *et al.*, 2001). However, there is a need to further refine the technology by improving the quality and reliability of locally manufactured transplanter to its acceptability among farmers.



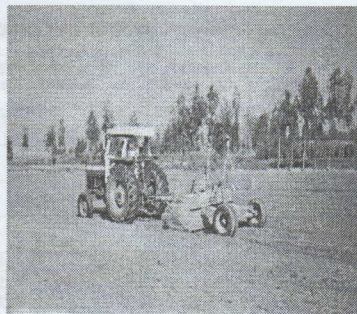
Walk type Japanese rice transplanter



Multi purpose Japanese rice transplanter



Locally developed rice transplanter



Laser land leveling equipment

4. Cheap labour: Labour required for manual rice transplanting is cheaper and easily available. Shortage of manual labour are complaining by farmers around the industrial towns of the Sialkot, Gujranwala, Sheikhpura and Lahore districts during the peak transplanting season. The operation is very laborious and consumes about 40 percent of the total labour requirements for producing the crop. Mostly, women perform manual rice transplanting operation and they consequently suffer from severe backaches while working. It is a very tiring task and is carried out under scorching heat in hot standing water with naked feet. The Labour transplants only 100,000 to 125,000 paddy seedlings per hectare against the recommended population of 200,000/ha. There is also a non uniform distribution of paddy seedlings, with more population along the edges than in center of the fields. Generally manual rice transplanting rate (Uprooting transportation and transplanting) is almost equal to the operational cost of locally developed rice transplanter (Rs.1800/ha) which is acceptable to the growers but it was not proved reliable in field.

Wish to adopt rice transplanter: All the interviewed farmers (table-1) indicated to adopt rice transplanter due to the reasons being shortage of labour availability and non achievement of plant population manually.

Mechanical problem in the machine: Farmers to the level of 60% gave their views that there are a lot of mechanical problems in the machine which hinder their adoption. After sale service and availability of spare parts is also a question in the field.

Lack of training: Farmers to the extent of 80% recorded their views that lack of training in the use of mechanical transplanter was also the cause of its non adoptions Government may provide facility of training to farmers to popularize the use of mechanical transplanter in the field.

CONCLUSION

1. The performance/working of locally developed rice transplanter is not reliable and acceptable among the growers.
2. Seedling raising is the biggest factor responsible for poor mechanization of rice transplanting in Pakistan.
3. Cost of seedling in boxes/plastic tray is expensive comparative to conventional method.
4. Mat seedling raising on plastic sheet is not successful for mechanical rice transplanting.
5. Lack of precision in land leveling of fields is also the significant factor impeding introduction of mechanical transplanting in country.
6. The 100% farmers want to adopt the mechanical rice transplanting.

Recommendations

1. There is a need to refine the technology by improving quality and reliability of locally manufactured machine to its acceptability to the farmers.
2. Seedling raising in box imported synthetic plastic tray is successful than mat seedling. Fabrication of machinery for synthetic plastic tray should be carried out in the country with low price.
3. The perfection is desired in the technology in order to achieve the higher plant population density which is necessary for increasing rice yield.
4. Establishing the facility for proper training of technology is needed.
5. Presently, research/development work on mechanical transplanting is negligible. Government should give special attention for the promotion of the mechanical transplanting technology.
6. Government should provide subsidy on rice planting machinery to growers as given in case of land leveling equipment in Punjab and National Water Course improvement program.

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