EFFECT OF DIFFERENT STAND ESTABLISHMENT TECHNIQUES ON RICE YIELDS AND ITS ATTRIBUTES

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ABSTRACT

To investigate the effect of various rice stand establishment techniques viz; double zero tillage, direct seeding of rice, brown manuring, transplanting on beds and conventional transplanting, the experiments were conducted at Chak 37 and Kot Nazir, Distt. Sheikhupura during 2006. The highest number of productive tillers/unit even (231.7) were noted in direct seeding followed by double zero tillage (219), bed planting (206.7) and conventional planting (200.2) respectively. Direct seeded crop produced smaller panicles that bore less number of grains (72.67) and grain weight (22.17g) which resulted lower grain yield. The crop established with double zero tillage produced the highest paddy yield (4.8 t/ha) that was statistically at par with conventionally planted crop (4.72 t/ha). The paddy yield in bed planting (4.43 t/ha) and brown manuring (4.23 t/ha) were at par and significantly higher than direct seeding (3.36 t/ha) that produced the lowest yield. The highest cost benefit ratio (1:1.91) was observed in double zero tillage.

Key words: Attributes, zero tillage, direct seeding, brown manuring.

INTRODUCTION

Rice (*Oryza sativa* L) occupies an important place in the economy of Pakistan. It not only meets the total domestic requirements of rice but also contributes a lot toward foreign exchange earning. It is grown on an area of 2.57 million hectares with an average yield of 2072 kg per hectare (Anonymous, 2006-07). Paddy yield of our country is lower than other advanced rice growing countries of the World. Low yields may be attributed to various substantial factors but sub optimum plant population and delayed planting are of significant importance (Mahmood and Walter, 1990). In Pakistan, rice seedlings are transplanted by hired labour that resulted in labour shortage throughout the transplanting period. The available teams do not care the plant spacing and keep the plant population sub optimum (Mann and Ashraf, 2001). To solve the problem of labour shortage, alternate methods of rice stand establishment are inevitable. Direct seeding of rice is a potential alternate, which, is a successful method in various rice growing countries of the world (Adair *et al*., 1992). Direct seeding and bed planting of rice are considered as resource saving technologies in USA and Australia contributing a lot in reducing environmental pollution and enhancing livelihood of the farming communities through increasing profit with reduced cost of production (Majid *et al*., 1996; Sharma, 1996; Murugaboopathi *et al*., 1991). In the present investigation five rice planting methods were tested. It is an effort to achieve the sustainability and stability in rice production systems.

MATERIALS AND METHODS

To investigate the effect of various stand establishment techniques in rice on yield and yield components, the experiments were conducted in a randomized complete block design with three replications with a plot size of 10x15 m at Kot Nazir and chak 37, District Sheikhupura during 2006. Direct seeding was done with the help of zero tillage drill in the 3rd week of June using seed of supper Basmati @ 10 kg/acre in a well prepared soil in watter condition. Nursery for transplanting was sown on the same date.

The experiments comprised of following treatments.

1. Double zero tillage
2. Direct seeding of rice
3. Brown manuring of rice
4. Transplanting on beds
5. Conventional transplanting

In double zero tillage, no tillage operation was performed after wheat harvesting. Field was irrigated a week before transplanting to make it soften for easy of thumb. For bed planting, beds were made with the help of mechanical bed planter after thorough land preparation. Transplanting on beds was done manually at a distance of 6 inches on both edges of the beds. For brown manuring, seeding of *Sesbania rostrata* was done at the time of planting the crop with the help of zero till drill. Sesbania crop was treated with a weedicide (MCPA @ 625 ml/ha) at the age of 35 days to kill it and to add organic matter in the soil. All agronomic practices were performed uniformly for all the treatments. Necessary data were recorded and analyzed using fisher's analysis of variance

technique and LSD was used to compare treatment mean at 0.05 probability (McClave *et al*., 1997)

RESULTS AND DISCUSSION

The results of the experiments conducted to investigate the effect of different stand establishment techniques on rice yield and its attributes are given in the table-1.

The results revealed that the crop established through double zero tillage technique attained the highest plant height (136 cm) over all the treatments. It may be due to addition of organic matter that enhance the fertility of the soil and pose significant effect on plant growth and development. The results further indicate that the transplanted crop attained the higher plant height as compared to direct seeded crop. It may be due to lower competition in space, sunlight and nutrients in transplanted crop than direct seeding. The productive tillers per unit area (m^2) were recorded highest in direct seeding followed by double zero tillage and bed planting, respectively. The lowest numbers of productive tillers/unit area were produced by brown manuring. It may be due to severe competition of rice plant with sesbania plants during early productive stage for space, sunlight and nutrient.

Table-1: Effect of different stand establishment techniques on rice yields and its attributes.

Treatments	Plant height (cm)	Productive tillers/m^2	Panicle length (cm)	Number of grains/panicle	1000 grain wt.(g)	Paddy yield (t/ha)
Double Zero tillage	136.1^{a}	219.0^{ab}	27.93^{a}	96.50^{a}	23.17^{a}	4.80^{a}
Direct seeding	126.6^{c}	231.7^{a}	25.23^{b}	72.67^{b}	22.17^{b}	3.36^{c}
Brown manuring	128.2^{bc}	186.3^{c}	27.67^{a}	93.83^{a}	22.83 ^{ab}	4.23^{b}
Bed planting	129.2 ^{bc}	206.7^{abc}	27.93^{a}	95.73^{a}	23.17^{a}	4.43^{b}
Conventional planting	130.2 ^{b}	200.2^{bc}	27.93^{a}	98.57^{a}	23.50^{a}	4.72^{a}
LSD at α: 0.05	2.782	26.65	0.9019	8.851	0.9676	0.2844

The means in rows bearing same letters do not differ significantly (P<0.05)

Productive tillers produced by conventionally planted crop were comparable with bed planting. The panicle length and number of grain/panicle in all transplanted treatments were significantly at par and higher than direct seeding. It may be attributed due to higher availability of nutrients in submerged field as compared to aerobic conditions. The grain weight attained by the crop established through conventional method was highest and significantly at par in double zero tillage, bed planting followed by brown manuring. The lowest grain weight was recorded from the crop established through direct seeding. These findings are in accordance with that of Awan *et al*., (2005) who reported lower grain weight in direct seeding on flat soil than other planting methods of rice. Most of the treatments differed significantly in producing paddy yield. Double zero tillage and conventional method produced significantly higher yield as compared to all other treatments. The lowest paddy yield (3.15t/ha) was recorded from direct seeding which may be due to lower number of grains per panicle and 1000 grain weight. Higher yield in transplanted treatments are attributed to good crop conditions, more availability of nutrient which resulted higher panicle length, number of grain/panicle and 1000 grain weight. It is concluded from the results revealed that double zero tillage and bed planting may be adopted as resource conservation technologies producing good crop yield.

Cost benefit ratio: The cost benefit ratio of different rice stand establishment techniques is given in table-2. The highest cost benefit ratio (1: 1.91) was noted in double Zero tillage followed by bed planting, conventional planting and brown manuring, respectively. The highest cost benefit ratio in double zero tillage may be due to high yield, saving of fuel and labour charges beared for tillage operation in the remaining stand establishment techniques. The lowest cost benefit ratio (1:1.14) was noted in direct seeding technique. It may be due to low yield, additional cost for weed management and high quantity of irrigation water.

Table-2: Effect of different stand establishment techniques on cost benefit ratio.

Treatment	Paddy yield (t/ha)	Cost (Rs./ha)	Income (Rs./ha)	Profit	Cost benefit ratio
Double Zero tillage	4.80	59660	114000	35643	1: 1.91
Direct Seeding	3.36	55057	79800	5793	1: 1.14
Brown manuring	4.23	60402	100462	21310	1: 1.66
Bed Planting	4.43	60452	105212	26010	1: 1.74
Conventional Planting	4.72	61045	104975	25180	1: 1.72

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