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Direct sowing-Alternate Method of Transplanting Rice

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Abstract— *Rice (Oryza sativa) is the major food crop in terms of production and economy and grown in all ecological regions of India. Rice is cultivated traditionally through transplanting of 20-25 days old seedling in the country. Due to unavailability of suitable technology for rice cultivation, there is a huge yield gap in rice production. Country has made target of self-sufficiency in rice production. This target can be achieved through adoption of Direct seeded rice cultivation technology of rice cultivation which also helps to adapt in the climate change scenario. Due to issues of water scarcity and expensive labour, direct seeded rice cultivation technology is adopting worldwide. To study the direct sowing of rice to overcome the difficulty of scarce and costly labor in transplanted rice, KVK Guntur has conducted an OFT in Guntur district. The study was carried out* ***in*** *two villages of Guntur district namely Morampudi and Kanteru villages in the years 2019-20 and 2020-21. From each selected village, 5 farmers practicing DSR and 5 farmers practicing Conventional Transplanting method during the same season were selected. The average yield was considerably high in TR (67 qtl/ha) compared to DSR (66 qtl/ha) method of cultivation. The total cost of cultivation in DSR was estimated to be Rs.47,000 per hectare. The total cost of cultivation in TR was estimated to be Rs. 53,000 per hectare. DSR with suitable conservation practices has potential to produce slightly lower or comparable yields as that of TPR and appears to be a viable alternative to overcome the problem of labor and water shortage. Despite controversies, if properly managed, comparable yield may be obtained from DSR compared with TPR.*

Keywords— ***Direct seeded rice, Transplanted rice, weed management, on farm trail***

I. INTRODUCTION

Rice (Oryza sativa) is the major food crop in India and occupies highest area among the cereal crops. Rice provides about 20 per cent of the global average calorie intake and its cultivation occupies 11 per cent of world agricultural land. Asia dominates the world in rice production as it accounts for about 90 per cent of world's rice area and 92 per cent of production. Direct seeded rice in Asia occupies about 28.3 Mha which is approximately 21 per cent of the total rice area in the region (Toriyama, 2005). Countries like USA and Australia extensively practicing direct seeding of rice are with profitable results as it avoids all the negative externalities in transplanting.

Rice is cultivated in India in a very wide range of ecosystems from irrigated to shallow lowlands, mid-deep lowlands and deep water to uplands. In India, transplanting is the mostly adopted method of rice establishment. However, depletion of water resources is forcing farmers to shift to Direct Seeded Rice (DSR). The direct seeding of rice refers to the spreading of seeds in fields before or immediately after pre-monsoon showers.

The need to increase productivity against rising labour costs for transplanting has led to a considerable increase in directs seeding in recent decades, particularly in South and Southeast Asia. The main motivating factor for shift in rice establishment method from transplanting to direct seeding in India is response to labour scarcity

(Balasubramanian, 2002) and lack of technically feasible transplanters. Direct seeded rice, a common practice before green revolution in India, is becoming popular once again because of its potential to save water and labour (Gupta et al.,2006).

Due to water scarcity and expensive labour, direct seeded rice cultivation technology is adopting worldwide. Direct seeded rice is a resource conservation technology and reduces water and labor use by 50%. Productivity of DSR is 5-10% more than the yield of transplanted rice. It offers a very exhilarating opportunity to improve water and environmental sustainability.

Direct seeding can be categorized as (1) Wet-DSR, in which sprouted rice seeds are broadcast or sown in lines on wet/puddled soil, and (2) Dry-DSR, in which dry rice seeds are drilled or broadcast on unpuddled soil either after dry tillage or zero tillage or on a raised bed. Another category of DSR is water seeding, in which sprouted rice seeds are broadcast in standing water. Wet-DSR is primarily done to manage the labor shortage, and is currently practiced in Malaysia, Thailand, Vietnam, the Philippines, and Sri Lanka. Furthermore, weed infestation is the major problem, which can cause large yield losses in direct seeded rice. Weed management in DSR can be done through chemical, hand weeding or stale seed bed method.

II. MATERIAL AND METHODS

The study was carried out **in** two villages of Guntur district namely Morampudi and Kanteru villages in the years 2019-20 and 2020-21. The major soils of this area are shallow to deep black soils. From each of the selected villages farmers were selected based on the extent of area under cultivation. From each selected village, 5 farmers practicing DSR and 5 farmers practicing Conventional Transplanting method during the same season were selected.

Table 1. Classification of direct-seeded rice (DSR) system

S.NO	System of direct seeding	Seed bed condition and environment	Sowing method practiced	Suitable ecology /environment
1.	Direct seeding in dry bed	Dry seeds are sown in dry and mostly aerobic soil	Broadcasting, Drilling or sowing in rows at depth of 2-3 cm	Mainly in rain fed area, some in irrigated areas with precise water control
2.	Direct seeding in wet bed	Pre germinated seeds sown in puddled soil, may be aerobic or anaerobic	Various	Mostly in favorable rainfed lowlands and irrigated areas with good drainage facility
3.	Direct seeding in Standing Water	Dry or Pre germinated seeds are sown mostly in anaerobic condition in standing water	Broad casting on standing water of 5-10 cm	In areas with red rice or weedy rice problem and in irrigated lowland areas

Source : (Joshi *et al*., 2013)

III. RESULTS AND DISCUSSION

In DSR the total cost of cultivation was found to be lower by 11.32 per cent (Rs.47,000/ha) when compared to TR (Rs.53,000/ha) method of cultivation. The total cost of cultivation in DSR was estimated to be Rs.47,000 per hectare. The total cost of cultivation in TR was estimated to be Rs. 53,000 per hectare (Table 2).

The average yield was considerably high in TR (67 qtl/ha) compared to DSR (66 qtl/ha) method of cultivation. The actual percentage yield difference is approximately **1.49%**, with TR yielding more than DSR. The gross returns obtained were Rs.1,21,605 and Rs.1,19,790 per ha for TR and DSR of rice cultivation respectively. The net returns were higher in DSR (Rs.72,790/ha) than that of TR (Rs.68,605/ha), this was due to high cost of cultivation in transplanted rice. The results were on par with the findings of Vinay et al. (2016) whose results showed that net returns were higher in direct seeded rice when compared to transplanted method of paddy cultivation. This was compliant with the findings of Yadav et al. (2013).

Table 2. Comparative cost of cultivation of paddy under TPR and DSR methods

Details	Transplanted rice (Rs per hectare)	Details	Direct seeded rice (Rs per hectare)
Land Preparation Cost (Ploughing, levelling, and puddling)	10000	Land Preparation Minimal, as less puddling is required:	9000
Labour Cost (Nursery preparation and transplanting)	9000	Labor Cost (Direct seeding and subsequent weeding)	5000
Seed cost	3000	Seed cost (Higher seed density)	4000
Water cost (Continuous flooding)	14000	Water cost	12000
Other costs (fertilisers and pesticides)	9000	Other costs (fertilisers and pesticides)	9000
Plant protection measures (weeds, insect pests and disease control)	8000	Plant protection measures (weeds, insect pests and disease control)	8000
Total cost of cultivation	53,000	Total cost of cultivation	47,000
Yield (q/ha)	67	Yield (q/ha)	66
Gross returns	1,21,605	Gross returns	1,19,790
Net returns	68,605	Net returns	72,790
B: C Ratio	1.2:1	B: C Ratio	1.5:1

IV. CONCLUSION

DSR looks to be a good substitute for TPR in light of the manpower and water shortage issues. With the right conservation techniques, DSR can deliver yields that are somewhat lower or comparable to TPR values. Disagreements notwithstanding, DSR can give yields that are comparable to TPR if handled correctly. DSR crops may partially or completely fail because to weeds if they are not effectively controlled. The dynamics of nutrients in soils under DSR require a great deal of investigation on the scientific front. Additionally, studies are required on weed control in DSR and soil ecology in rice fields. A site-specific production technology package for various rice production systems must be developed under various rice production zones.

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