

Double transplanting

– A contingent strategy for rice cultivation in low-lying areas

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Double transplanting is a traditional crop-establishment system in which rice seedlings are transplanted twice, first on secondary nursery, and then the main field. It is a contingent strategy in low-lying flood prone areas especially during Aman season rice. The need of double transplanting arises when the main field is not ready due to continuous stagnation of floodwater or due to delay in onset of monsoon. It is an indigenous technology developed by farmers to manage the risk of submergence. The single transplanted rice, the seedling height of young seedlings is not tall enough and has risk of submergence. Whereas, the height of double transplanted rice seedlings is tall and can withstand submergence relatively for longer time. In eastern India flood prone rice area occupies nearly 2.25 m ha most of which are rainfed. Uncertainty of monsoon makes sowing time of rice become unpredictable. Double transplanting, seems to provide solution under such situation. Sometimes this is used as a method for seedling multiplication under seedling scarce situation. This situation often arises when the established crop is damaged in field due to flash flood.

Key words: Double transplanting, Eastern India, Flood prone area, Rice cultivation

DDOUBLE transplant system is most prevalent in Eastern Uttar Pradesh (Ballia, Gazipur, Mau, Varanasi and Chandauli districts), Bihar, West Bengal, Meghalaya (Garo Hills region), Assam and Bangladesh. This method is known in different names that changes from region to region and country to country. In Assam, it is popularly known as *Ballan* system, Meghalaya as *Changgini geani*, Bihar as *Kharonha*, in eastern Uttar Pradesh as *Kalam* or *Sunda* and in Bangladesh as *Balon* system. The window for transplanting is very wide some times that is extend from early July to late August due to unfavourable moisture/water level in filed during early season. In delayed planting situation, it is not possible to maintained seedling health for 2-3 months in the same nursery due to overcrowding, nutrient deficiency and incidence of diseases like brown

spot and leafblast. Thus, double transplanting is desirable as contingent measure in flood prone lowlands of eastern India.

Crop management under double transplanted rice system

The requirement of seed (35-40 kg/ha) is significantly lower in double transplanting compared to conventional transplanted rice (60

kg/ha). In this method, seeds are first thickly sown in the primary nursery (*Bechan bari* in Assam). After 4 weeks, seedlings from primary nursery is uprooted and transplanted (9 to 10 seedlings/hill) in a secondary nursery (locally known as *Bolon bari* in Assam) with closer spacing (7–10 cm apart) with judicious fertilization. The secondary nursery maintained like a main rice field (*Dhan bari* in

Table 1. Difference between single and double transplanting

Characteristic	Single transplanting	Double transplanting
Variety	Photo-insensitive	Photo-sensitive
Duration	Short	Long
Water requirement	More	Slightly lower
Labour requirement	Less	More
Cost of production	Less	More
Weed	More	Less
Insect pest and disease	More	Less
No. of unfilled grains	More	Less
No. of panicles	Less	High
Yield	Less	More
Net return	Less	More
Straw as cattle feed	Soft and preferred by cattle	Hard and less preferred by cattle

Assam). The chemical fertilizers, and insecticides are used to nurture the seedlings. Subsequently, after 3 to 4 weeks, seedlings from secondary nursery are uprooted and transplanted in the main field when the seedlings are tall and the risk of flooding is over. The second transplanting is executed when the chance of occurrence of consecutive days of heavy rains is less, and even if it occurs, the tall seedlings would not be submerged. Thus, double transplanting avoids submergence of transplanted seedling from the heavy rain during the peak of the monsoon. At the time of final transplanting the primary nursery and the secondary nursery are also covered with sparse transplanting, so no land is wasted. In this system the labour requirement is slightly higher due to additional labour requirement for land preparation, seedlings uprooting, separation of seedlings and transplanting. The increased labour requirement intern increase the production cost. However, the increased cost of labour for two transplanting is compensated to a large extent by the less quantity of seeds, less number of irrigations, no weed management and higher yields obtained from *sanda* method of cultivation. The difference between single transplanting and double transplanting is given in Table 1.

Varietal selection in double transplanting

All the rice varieties are not suitable for double transplanting. Short duration photo sensitive cultivars are not suitable for double transplanting. These cultivars reach reproductive stage at particular date after sowing. In addition, the crop stand is less dense in the short duration double transplanted cultivars. Because the planting of aged seedling reduces tillers production compared to young seedlings due to shortening of time available for tiller production, which subsequently resulted in lower crop yield. Thus long duration (150 days) photoperiod sensitive rice varieties are suited for double transplanting. Cultivars commonly grown under double transplanting are given in

Table 2.

Reason behind higher crop yield under double transplanting over single transplanting of aged seedlings

Ensure optimum crop stand: The mortality rate of young seedlings under adverse weather (flood/drought) situation is more. Whereas, under double transplanted system, tall and aged seedling survive adverse environment better than young and single transplanted seedlings. Seedlings produced in this method is taller, healthier and easily overcome the high water depth at the time of transplanting or immediately after transplanting.

Transplanting of healthy seedlings: Under double transplanting, seedlings have thick culm and better food reserve. Thick culm prevents the lodging of rice crop and better food reserve helps the plants to withstand prolonged period of water logging.

Reduced competition of growth factors (water, nutrient, light): The competition for growth factors are drastically reduced under double transplanted system compared to conventional transplanting. Which intern reduces the chaffy grains (unfilled grains/panicle) and increases panicle weight and grain yield.

Minimum weed competition/growth: Due to less competition between plants in secondary nursery, seedlings had more shoot length, root length and volume than seedlings



Primary nursery



Transplanting in secondary nursery



Secondary nursery



Seedling from secondary nursery



Second transplanting in main field

Fig. 1. System of double transplanting

Table 2. Cultivars grown under double transplanting

State	Cultivar
UP, Bihar, Assam, Garo Hills district (Meghalaya)	Swarna, Ranjit, Swarna sub 1, Monoharsali Kehol, Resu, Barut, Tipi, Jabilin and Kochugisim

Table 3. Production economics of double transplanting vs single transplanting system

Characteristic	Single trans-planting	Double trans-planting
Grain yield (q/ha)	22.7	41.5
	39.5	47.1
	50.0	55.0
Cost of cultivation (₹/ha)	26,650	31,300
	31,445	38,658
Net return (₹/ha)	7,355	30,950
	15,062	32,610
	18,400	22,500
B:C ratio (₹/ha)	1.27	1.99

obtained from conventional nursery. Tall healthy seedlings suppress the weed growth better than short young seedlings.

Reduced insect pest and disease infection: Insect pest and diseased seedlings are omitted at the time of transplanting. Which prevents the further multiplication of disease and other pest.

Better aeration: Wide spacing and proper water management provide suitable micro climate for standing rice crop.

Higher nutrient use efficiency: The loss of nutrients especially nitrogen is greatly reduced under double transplanted system due to controlled water management.

The plants under the double transplanted plots are usually healthy, have longer panicles and more filled grains than the plants on the single transplanted parcels.

Economics of double transplanting

Overall the cost of rice production would be higher in the double transplanted systems due to the additional cost of labour for seedling uprooting, field preparation, and

transplanting, compared to conventional transplanting system. However, the higher cost of production under double transplanting was compensated by the higher yield of the system. In addition, the cost of inter culture operation is significantly lower in double transplanted system. The comparison of production economics of double transplanted and single transplanted rice is given in Table 3.

Advantages

- It permits a flexible late transplanting during the rainy season, which is its prime advantage.
- Generates more employment and efficient utilization of farm family labours.
- Ease labour scarcity and avoid high wage rate during transplanting due to flexibility in date of transplanting.
- Save the crop from drought and flood.
- Saving of seeds and seed cost.
- Reduced problem of weeds, insect pest and disease.
- Needs less N fertilizer, because *Sanda* is more efficient N use.
- Bears more number of tillers per hill, all tillers bear panicles, panicles are heavy; the grains are fully filled and test weight more, hence more grain yield.
- Avoids lodging, while in lowland condition the transplanted rice develops nodal tillers which promote lodging and yield loss.

Disadvantages

- Additional cost involved in land preparation and transplanting of seedlings.
- Rice straw produced from double transplanting cultivation system was

stiff and not preferred by the cattle as feed.

- It requires more number of labour for two transplanting, uprooting, and separation of seedlings.
- It suits only for long duration photo sensitive rice varieties like Moti, Swarna, etc.
- This system is not convenient for the big farmers because many plots need to be transplanted two times.

SUMMARY

Double transplanting is an appropriate technology to avoid submergence problem in the flood-prone rice ecosystem. It is a contingent strategy in low-lying flood prone areas to realise higher yield. In recent years we are witnessing frequent floods and drought in Easter India due to climate change which subsequently causes yield loss. Double transplanting is a climate resilient technology to low-land rainfed rice ecology. Though this technology requires higher labour, it reduce the production cost by reducing the weed infestation, relatively lesser incidence of insect pest and disease and reduced requirement of inputs like fertilizers, pesticides, and water due to seedling maintenance under smaller area. Higher productivity as well as significant net return from rice cultivation using double transplanting system indicates that farmers indeed gain by adopting this method of crop establishment. But the recent studies in farmers' field and research institute showed that double transplanting provides yield advantage over conventional methods especially in low-lying areas. So, instead of discarding the system, rice researchers must work on refining the system through developing appropriate varieties and other crop management practices for the system.

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