### **2.53 Mechanical transplanting**

The mechanical transplanting is the field establishment of the seedings raised in a modified dapog nursery as mat type od nursery trays, using the rice transplanters (Rickman et al., 2015). Mechanical transplanting is reorganized as the most provable solution to tackle with the problems related with the conventional methods of transplanting, in order to increase the productivity and the profitability obtained by the farmers (Illangakoon et al., 2017). The final yield is significantly increased by the mechanical transplanting method of plant establishment compared to other methods, through optimum plant density with adjustable spacing between the plants, less amount of missing hills and reduced transplanting shock with the seedling friendly transplanting method followed in the self-propelled walk behind type transplanter which is commonly used in Asian countries (Gaikwad et al., 2015; Islam et al., 2016; Rickman et al., 2015).

The popularization of the Mechanical transplanting between the farmers in the Asian region at where the farmers are highly adopted to the manual transplanting of rice has become a very important factor (Farooq et al., 2001). The Department of Agriculture, Sri Lanka has launched programs to give the technical knowledge to the farmers under the projects KOPIA and Yaya II, to develop an instinct on them to adopt to this new technology. (Bandara et al., 2017; Sri Lanka raises rice productivity with Korean technology, 2016)

The mechanical transplanting of rice increases the labor use efficiency which assures timeliness transplanting with speed transplanting while generating an alternative income source for the rural youth as operators in machines and in different nursery management practices. (Islam et al., 2016; Islam and Khan, 2017) For the manual transplanting of rice requires 8-12 labors for one hectare whereas only 3 labors are required to transplant 4 hectares with in one day. Mechanical transplanting can be considered as an operation with low health risk on labors when compared with the fatigue manual transplanting of rice with frequend bending and straighten up process which is not an ergonomically friendly. (Pradhan and Mohanty, 2014; Rickman et al., 2015)

The area required for the nurseries used for the mechanical transplanting is smaller than the space requirement for the conventional nurseries and it requires soil alone without pebbles to use as the media for raising seedlings. The amount of seed paddy requirement also low when compared with the direct seeding method of plant establishment.(Columbia and Division, 2013; Gaikwad et al., 2015; Hayleys empowers greater productivity via mechanised rice transplanter, 2013) The production cost can be reduced from 25% - 30%through the mechanical transplanting than the manual transplanting (Mahbubur Rashid et al., 2015).

The optimum space between the plants in this method ensures the photosynthesis efficiency and the vigorous growth of the plants through better penetration of sunlight, increased air circulation with the wide spread and deep percolated root system that facilitates efficient utilization of moisture and nutrients. The low plant population in the manual transplanted field ,which is a critical factor that affect the final grain yield can be avoided through mechanical transplanting. (Baloch et al., 2002; Farooq et al., 2001) The seedlings are pegged firmly in to the soil which reduced the transplanting shock and a uniform crop stand with vigorous growth can be obtained after field established using the transplanter (Illangakoon et al., 2017; Rickman et al., 2015).

Farmers could use soil alone as a media for raising seedling for rice transplanter with sprouted or dry seeds. tray soil

Dapog method required area is much smaller than conventional nurseries. Leveled seed bed should be made and center of the bed should be slightly higher than the edge to permit water to drain off the surface development and performance evaluation

cost of transplanting was Rs. 1152/ha and energy requirement was 230 MJ/ha. The maximum grain yield was observed in mechanical transplanting followed by manual transplanting, direct dry sowing and direct sprouted sowing. Mechanical transplanting

significantly increased grain yield by 23%, 37% and 63%; straw yield by 17%, 14% and 22%; and biological yield by 20%, 24% and 39% over manual transplanting, direct dry sowing and direct sowing of sprouted rice in puddled conditions, respectively.

Singh R., A. Kumar and S.S. Singh. 2005. Response of rice cv Pusa Basmati 1 to different planting methods, IRRN, 30

development and performance evaluation

Haytham et al. (2010) studied the preparation of mat – type seedlings for

mechanical paddy transplanter. A plastic box (58 cm × 28 cm × 3 cm) called a nursery box, was used for raising rice seedlings. This conventional soil seedbed system had 47

been a major problem viz., a nursery box filled with soil weighs about 6 kg, high cost of the nursery boxes and heavy and hard work. The seedling mat (120 cm × 28 cm × 3 cm) was established in a layer of treated rice straw arranged on a firm surface and has been developed in the Rice Research and Training Center, Egypt, to save the operation cost. This study showed the potential of SM technology to stimulate agriculture in the region and consequently led to increased productivity.

development and performance evaluation

Mechanical transplanting systems increased yield, improved labor efficiency, ensured timeliness in operation and faster transplanting.

Mechanical rice transplanting method generates employment and alternate sources of income for rural youth through custom services on nursery raising and transplanting. The mechanical transplanting of rice has been considered the most promising option, as it saves labor, ensures timely transplanting and attains optimum plant density that contributes to high productivity.

Mechanical transplanting facilitate for optimum plant spacing Optimum plant spacing ensures the plants to grow properly with their aerial and underground parts utilizing more solar radiation and nutrients.

Mechanical transplanter has high field capacity and farmers can transplant rice seedlings within very short time by using mechanical transplanter. Recently, mechanical transplanter is introduced in our country. As a new technology, this machine needs to be evaluated in different agro- ecological zone and in different rice season.

Techno-economic performance of 4-row self-propelled mechanical rice transplanter at farmers field in Bangladesh

Rice researchers regarded lower plant population as one of the major constraints in enhancing rice production in the area. In order to solve this problem and increasing plant population in rice fields, the Agricultural Department of the Punjab and Farm Machinery Institute of Pakistan Agricultural Research Council are trying to popularising the use of mechanical rice transplanters in this zone. Presently,

the main advantage of the mechanical transplanting reported the farmers was that the nursery plants are firmly pegged into the soil, provided that the field is precisely or laser levelled. In case of poor levelling, uniform transplantation is not possible. So, good transplantation requires;

very precisely levelled paddy

fields, 8-9 inches long nursery plants or at least 25 days old nursery, roots of the nursery plants should be free from pebbles and also not very bushy, and the paddy field should not be too much puddled and it should not be heavily irrigated on transplanting day

Diffusion Possibilities of Mechanical Rice Transplanters

Mechanical transplanting (MT) of rice is considered as a feasible option tominimize huge labour use with timeliness cultivation in rice.

MT of rice is the process of transplanting young seedlings, which have

been grown in a mat nursery using a rice transplanter (Joseph et al., 2015). In conventional manual transplanting (CT), 20-30 people are required to transplant 1 ha/day, but 3 people can transplant approximately 2 ha/day using the rice transplanter. The other advantages of MT include uniform spacing, optimum plant density, less transplanting shock and better employment opportunities for rural youth through the development of custom service business. It is also capable of adjusting desired within row space (WRS), per hill seedling number (PHSN) and planting depth (PD0 according to the seedling age (SA), soil type and the level of puddling done in the field.

Presently,

Impact of varieties, spacing and seedling management on growth and yield of mechanicaly transplanted rice

In Asia, a number of different transplanters are now being used to establish rice crops. Machines are manufactured in China, Japan, Korea and Taiwan with varying levels of complexity. Machines range in size from a two‐row, walk‐behind models to eight‐row, ride‐on models. Land must be well prepared for machine transplanting. The soil needs to be level and have sufficient bearing strength to carry the machine and support the planted seedlings. Fields may need to be drained one or two days longer than they are for hand transplanting to stop seedlings floating. Most mechanical transplanters place seedlings in rows either 20‐30 cm apart with in‐row spacing determined by ground speed or head speed of the tra

Rice Production Manual

Mechanical transplanting in rice involves transplanting specifically raised younger seedling of rice as a mat (mat type nursery) using a self-propelled mechanical rice transplanter at pre- determined and desired spacing. Machine transplanter was first developed in Japan in 1960s, whereas the earliest attempt to mechanize rice transplanting dates back to late 19th century. In Japan, development and spread of rice transplanters progressed rapidly during 1970s and 1980s. They also developed new technologies of seedling raising for rice transplanter (Tasaka et al., 1996). In

disseminate this technology, with the following objectives: ? Ensure quality seedlings in proper time by raising seedlings in the tray under plastic shade

? Ensure uniform spacing and planting depth of transplanted rice

? Save time and cost during periods

Seedling establishment in tray: needed for mechanical

of peak-labour demand

transplanting of rice

? Create new forms of employment through creation of seedling nursery entrepreneurs and transplanting service providers ? Improve farmers socio-economic conditions

2

machine transplantation resulted in earlier maturity of the crop (by 15 days) and 9% increased production compared to manual transplantation. Besides higher yield, 25-30% production cost was reduced by using machine transplanter.

The

Transplanting Rice Seedling Using Machine Transplanter : a Potential Step

Firstly it was seen that the area required to establish a paddy nursery is very small. Secondly the Kubota/ Hayleys demonstrations clearly showed that with proper nursery management and mechanized transplanting it will bring about as much as a 50% saving on seed paddy(compared to the broadcasting method). Furthermore, currently the formal seed paddy sector is only able to supply 30% of the seed paddy requirement to farmers. Therefore farmers are compelled to “grow” their own seed paddy which may be of poor quality and bring about a reduced yield at the time of the harvest. This saving will greatly contribute to the Agriculture Department’s endeavours to ensure that farmers have adequate supply of high quality seed paddy in the future. The

Without any doubt, the main reason that guarantees and proves a greater return on investment in the case of Kubota rice transplanter is the increase yield. Hayleys Agriculture has conducted many trials island wide including the Rice Research Institute at Bathalagoda and Samanthurai. These trials have proved that yield could be increased as much as 10-20% due to higher tillering per hill (20-25) when compared to the traditional broadcasting method.

Due to the benefits mentioned above, the government should encourage the adoptation of this technology by the farming community and perhaps provide loans/leasing facilities at concessionary interest rates through the financial institutions to the farmers

Hayleys Agriculture plants seeds of greater productivity through mechanized Rice Transplanter Saves on seed paddy, reduce weedicide usage and guarantees a greater yield

Mechanical transplanting improves labor efficiency, ensures timeliness in operation, faster transplanting and attains optimum plant density that contributes to high productivity (Islam et al., 2016 and Manjunatha et al., 2009).