Some Aspects of Paddy Rice Cultivation By Using a Seedling Transplanting Machine

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As was mentioned by Mr. Hoshino in the previous article, two types of rice seedling transplanting machines are now being marketed in Japan. The seedlings fed to these machines differ in their shape and quality.

Naturally, the method of growing seedlings as well as the method of cultivation in the paddy field also vary as to the seedlings with soil clod on their roots, the standard practice of cultivating has been established through experiments conducted with the development of the transplanting machine, since this type of seedling was quite different in quality from that of seedling for traditional hand transplanting.

On the other hand, the pattern of growing seedlings with root washed is close to that of seedlings for hand transplanting and they are cultivated in a way similar to the traditionally established practice. The transplanting machine, however, requires specific and uniform shape and quality of the seedlings, so that the method of growing such seedlings is now under investigation.

The present article deals with the method of growing seedlings with soil clod on their roots and also the cultivation practice of this type of seedlings planted in the paddy field.

Method of growing seedlings

Although the method of growing seedlings depends on the type of machine, the common aim is to get good mass of seedlings which brings uniform blocks of seedlings, containing the same number of seedlings of uniform growth.

Since either band type seedlings or mat type seedlings are cut into blocks before transplanted into the field, they may bring, if their stands are even, uniform seedling blocks.

Such mass of seedlings are obtained when the seeding is even, germination is well, and careful management is made throughout their growth.

The seeding density in the nursery box is ten times or more than the case at the traditional nursery bed for hand transplanting seedlings. The seeding density is so high that,

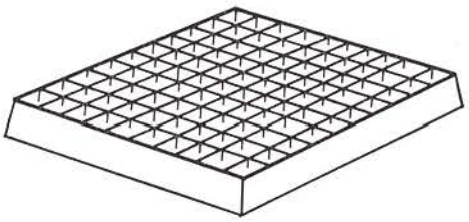

Fig. 1. Pot-type nursery box.

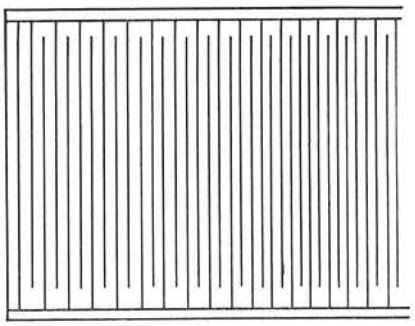

Fig. 2. Band-type nursey box.

when the seedlings grow to the third leaf stage* (25 days or more of nursing), the seedlings shade and hinder the growth each other. The seedlings then become feeble. They show the delay of growth just after transplanting. Pot type seedlings, however, grow in the nursery box sectioned into pots (= blocks) by lattice type septum, and the fixed number of seeds can be sown in each pot.

Careful management may bring uniform seedling blocks and these blocks are ready for use without cutting. If permitted to use bigger blocks, the seeding density decreases. Therefore, we can nurse the pot type seedlings having four or more leaves after 30 to 35 days, since the seedlings hinder their growth each other in lesser degree.

The points of management to get the mass of uniform and healthy seedlings are to keep the temperature optimum during germination, to control the water supply and to adjust the temperature during the growth of seedling. The growing method is summarized as below;

1) Amount of the seedlings required

Around 10 to 15 nursery boxes per 10 areas, depending on the planting density in the paddy field.

2) Nursery soil

Prepare about 60 liters of finely sieved lowland or upland soil. Extremely clayey soid or sandy soil is not suitable for nursery soil, since the soil does not allow favorable growth to seedlings. Besides the seedlings grown on such types of soil are not easy to handle with the transplanting machine. Acid soil which pH is 5.0 or so is preferable. If necessary, disinfect the soil.

3)Fertilizer

Fertilizer is mixed well with nursery soil before placing it into the nursery box. Optimum amount of fertilizer in elements (N, P_2O_5 or K_2O) is one to two grams per box.

4)Seeding

Take out awns and branches from the seed beforehand. After seeds were selected by specific gravity and disinfected, they were soaked in water and allow to germinate about one millimeter liong. The germinated seeds are placed evenly on the nursery soil and covered with thin soil. 200 to 250 grams in dry seeds are sown in each box.

5) Precaution after sown into the nursery box

Supply ample water, incubate at 30°C for two to three days in electric germinater. When it is hot enough, it may be incubated ouside. The nursery box, when seeds germinate evenly, are transferred to a vinyl tunnel or house. If it is warm enough outside, the box is left outside. The seedlings are kept free from too high or too low temperature. Too much moisture and desiccation are not favorable.

6) Transplanting

When the seedlings reach to the second to third leafstage and to 8~12 cm in hight after 15 to 25 days of nursing, they are transplanted into the field.

* Leaf unmber is counted out the primary incomplete leaf which has no leaf blade

Cultivation in the paddy field

Since the seedlings are younger in stage than that of hand-planting seedling, earing and maturation are apt to delay, bringing lower yield. Hence, the transplanting must be made seven to ten days earlier than the usual date for manual transplanting. The seedlings also have to be planted shallower to avoid the delay of growth. However, younger seedlings when transplanted shallower, start tillering two to three nodes lower and the number of tillers increases in total. This change causes, the increase in the number of panicles and bears higher yield, but sometimes causes the decrease in percentage of effective tillers by overtittering and the downfall of growth in later stage, resulting in lower yield, through the decrease in percentage of full ripened grains and the increase of lodging. Therefore, adequate management is required to regulate the growth of plants by modifying the way of applying the fertilizer and also by controlling the water.

The hardness of paddy field soil should be adequate for the transplanting machine. The

field has to be flat and the depth of water must also be shallow and even throughout the field. Shallow water keeps the seedlings from submergence and avoids the harmful effect of herbicide. If the field does not bear such features described above, it is safe not to introduce the machine.

Transplantation of young seedlings allow the emergence of more weeds in the field, since the duration of cultivation becomes longer. Moreover, the young seedlings are not strong enough to compete with weeds and also to resist against the herbicide. Labor saving weed control system must be established to introduce the transplanting machine in the field where the weeds are numerous and vigorous. The cultivating method of the rice plant transplanted by the machine are summarized as below:

1) Preparation of the field

Plow the field about 15 centimeters deep. Bury the stubble of crops and weeds in the soil. Pulverize and puddle the soil well and make the surface of the soil flat. After puddling, submerge the field for one to two days to settle the soil. Drain water, if necessary, to leave the field dry until its soil becomes hard enough to use the transplanting machine.

2) Transplanting

The depth of water at transplanting is one to three centimeters. Transplant 20 to 25 hills in 1 m^2 of the field, distance between rows is 30 to 33 centimeters, and that between hills is 10 to 18 centimeters. The depth of transplanting the seedlings is two to four centimeters.

3) Labor

An assistant following the machine operator is required to supply seedlings and to plant supplementary seedlings into the spot where the machine failed to transplant the seedlings. Supplementary transplanting is necessary only when the machine skipped in planting continuously.

4) Performance of transplanting machine

It takes one to two hours for the machine to plant the seedlings in the paddy field of 10 ares. The rate of skipping in planting is less than five per cent in ordinary condition.

5) Fertilizer

To prevent the plants from growing too thick and also from lodging, the amount of nitrogen in basal manure is cut a little and that in top-dressing is to be ample. The time of applying the additional manure is around 18 to 20 days before earing and other stages. Both phosphate and potash are applied at the time of plowing. The amount of elements of fertilizer is the same as that of usual case for hand transplanting.

6) Management of the paddy field after transplanting

Water depth is two to three centimeters for one to two weeks after transplanting the seedldings. Herbicide is applied either several days before planting after pudding, or four to six days after transplanting. Thereafter the management follows, in general, the practice established for the field where the seedlings are planted by hands. However, care must be taken to suppress the occurrence of disease and pest insects which often follows early transplanting and overtillering. Water control, that is drainage and intermittent irrigation during the cultivation, must be also made to control the growth of plants.