

Further Progress of the Paddy Rice Seedling Transplanting Machine in Japan

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After described on the development of paddy rice seedling transplanting machine in Japan by another author in the earlier issue of this journal, considerable progress has been made. More than 10 kinds of transplanting machine will appear in the market this fiscal year, including those for probing the potential market.

As was mentioned before, there are two types of machine according to the type of seedlings to be fed into the machine. One is for the seedlings with roots washed (temporarily mentioned as washed seedlings in the present article). The other is for those with soil clod on their roots (mentioned as now-washed seedlings).

The former type of seedlings is obtained from the traditional nursery bed by picking up and washing their roots. The latter one is grown in a special nursery box and the seedlings are cut out into small blocks without washing the roots before use. They have two to three leaves while the washed seedlings have five to six leaves as is the case of seedlings for hand transplanting.

Nonwashed seedlings are fed into the machine easily since they take the shape of block, while the washed seedlings have to be arranged on the same level so that the machine can pick up the fixed number of seedlings for transplantation. This causes some difficulties for designing the machine. Therefore, the number of machine for nonwashed seedlings is now much larger than that for washed ones.

There are numerous kinds of machine for nonwashed seedlings on the market. The labor for picking up from the nursery bed to prepare the washed seedlings is another problem. Since an adequate machine for picking the seedling up is not available yet, farmers have to spend the same amount of labor as is the case of traditional manual transplanting. It takes them eight hours per 10 ares of paddy field. Although the transplanting machine cut the labor for transplanting by 10 hours, from 12 hours to two hours, the use of the machine for washed seedlings can only cut the transplantation labor to a half, that is from 20 hours to 10 hours.

The features of the newly introduced machines are briefly described below.

Machine for washed seedling

In Fig. 1, a two-step-type machine is shown. It is connected with a tillar at the hitch and driven by PTO of a tiller through a V-belt. The seedlings are prepared as below; after they are picked from the bed, they are washed to take off the soil from their roots and separated from each other. The roots are cut to less than five centimeters and the foot of the seedlings is arranged and transferred to the seedling box of the machine.

Thereafter, two to four seedlings are taken out at their foots by a resin claw (Fig. 2). Another claw made from rubber (holding claw, see Fig. 3) holds them at the lower part of the seedlings and carries to above the seed-

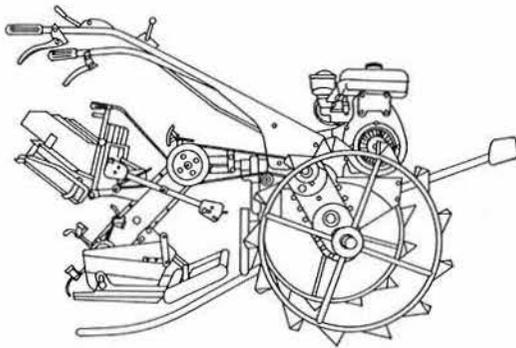
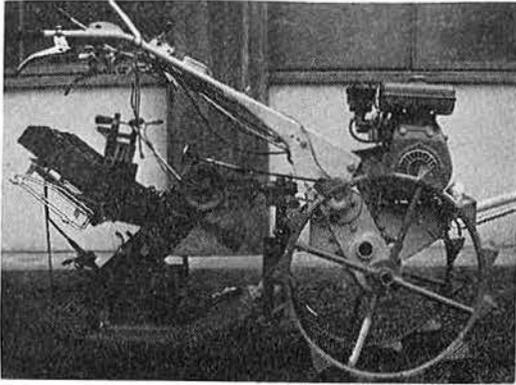


Fig. 1. Outline of washed seedlings type trans-planting and machine.

ling receiving spring. The seedlings when discharged there, travel forward by inertia to hit the plate (seedling stopper plate in Fig. 3),

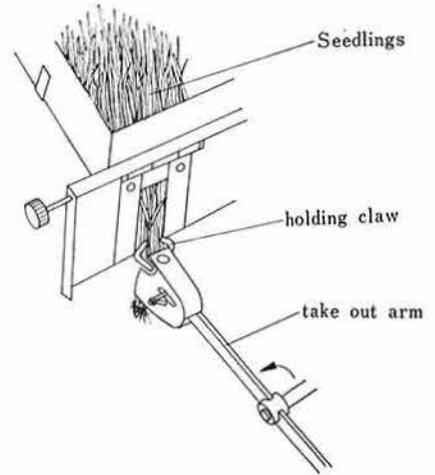


Fig. 2. Take out motion.

and the foot part of the seedlings is brought to the same level during the course of falling on the receiving spring.

The pinch spring, in turn, grasps the seedlings and then plants them into the soil by the rotation of the planting arm (Fig. 3). The machine plants the seedlings into two rows which are 30 centimeters wide. The distance of hill can be adjusted to 12, 15, or 18 centimeters by selecting the belt. The planting speed is about 120 to 180 seedling blocks per one row per minute. It takes one to two hours to cover the field of 10 ares.

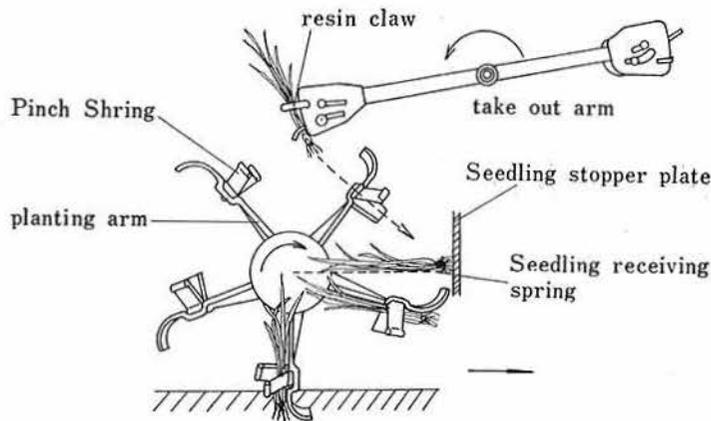


Fig. 3. Planting motion.

Machine for nonwashed seedlings

This type of machine appeared recently and has been designed to handle the seedlings grown in a nursery box to two to three leaves. The machines specify the type of seedlings. For this specification, four kinds of nursery box have been developed.

1) *Band type*: This box is divided by septa to provide bands of seedlings which are seven to ten millimeters wide. The bands are cut into blocks of 10 to 15 millimeters long before transplantation.

2) *Continuous band type*: In this type of box, the septa do not span from the edge to the edge of the box so that the seedlings when grown, take the shape of continuous band extending from one corner of the box to the opposite corner. This type of seedlings are also cut into blocks as is the case of band type seedlings.

3) *Pot type*: The box is divided into blocks of pots by a lattice like septum. The seedlings grown in this type of box are ready for use without cutting.

4) *Mat type*: Since the box is not sectioned by septa, the seedlings grow like a mat.

The machine makes blocks from the mat.

Of these four types, both the band type and continuous band type machines were developed earlier so that their performance is reliable and they are most popular among the farmers. The machines using the other type of seedlings, went into production around last year. The machine using the mat type seedlings is promising because this type of nursery box saves labor for sowing, and future improvement is anticipated.

Another change has been observed in the way of supporting the body of machine. Heretofore, transplanting machines, motor-driven and two-row-planting type or the more sophisticated ones, were all designed to travel

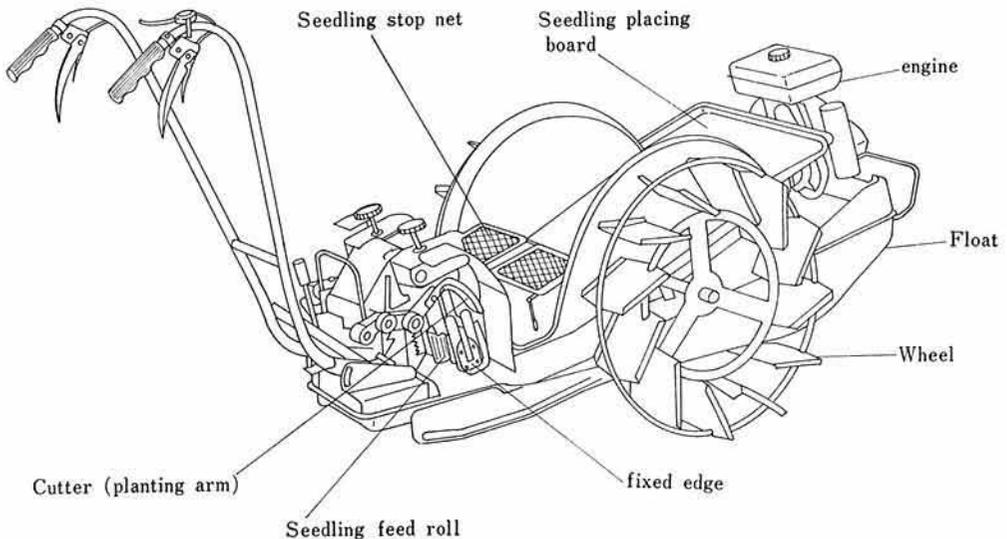
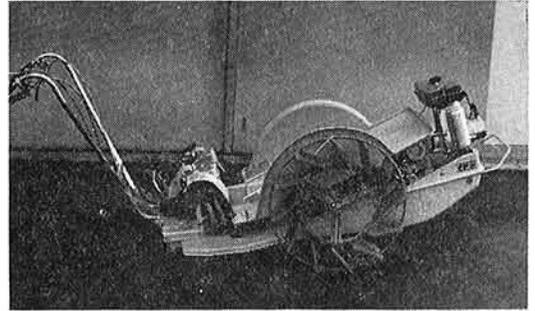


Fig. 4. Transplanting machine with float.

on the hard pan with steel wheels. Recently, machines supported by float appeared on the market and they are increasing in number. This change was made by cutting the weight of the machine. The new type of machine glides on the soil surface with a float. The precision of transplanting the seedlings is not affected even if the hard pan is not flat.

Fig. 4 shows a machine with a float. It is motor-driven and two-row-planting type, using continuous band type seedlings. The float supports the body so that the wheels propel the machine forward only. The band of seedlings on the board (seedling placing board of Fig. 4) is carried to the fixed edge by the

roll (seedling feed roll). Here a cutter makes the band of seedlings into blocks and then blocks are planted into the field. The seedling stop net controls the movement of the seedlings on the seedling placing board through pushing the leaf tips of seedlings. It also helps the seedlings to move into the planting system orderly. The height of the net is adjustable to the size of seedlings.

The top picture of Fig. 5 illustrates the cutter making the seedling blocks, and the lower one shows the process of planting the seedlings. Advanced type of planting machine for mat type seedlings will be explained another time.

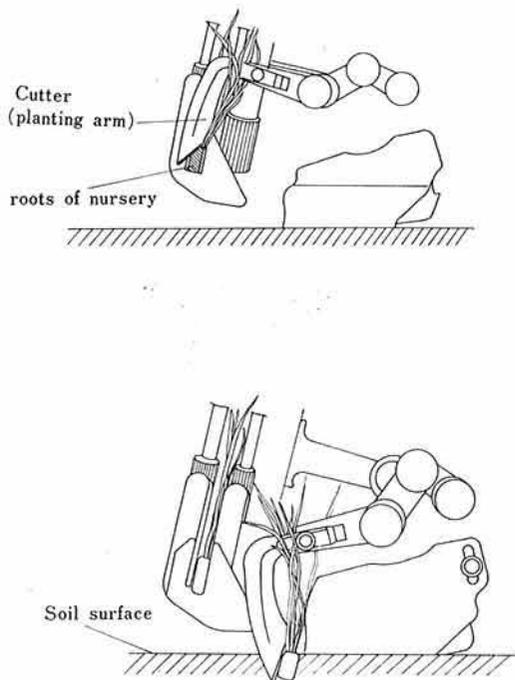


Fig. 5. Cutting and planting motion.