AGRICULTURAL MACHINERY

In order to meet the necessity of rapid mechanization of farm land, this station is actively engaged in the improvement of farm machinery and farm tools. In the past, researches had been directed to develop various rice seeding machines, harvesting machines and insecticide application tools. As the results, the following machines have been developed: rice seeder (for the use of transplanting machine), rice direct seeder, rice-husk charcoal producer, machines for integrated operation of rice nursery plate, fertilizer deep applicater (mounted to rice transplanter), mini-corn harvester, solar energy drying machine, etc. More efforts are presently laid on the development of seed huller for buckwheat and job's tears which are becoming more important in the upland field nowadays.

1. Machine for Making Rice Husk Charcoal

A prototype machine equipped with a feeder and a ventilator may process even wet rice husk into charcoal to reduce many unnecessary procedures in operation.

The heat content of rice husk charcoal bars is similar to that of wood-chips charcoal. However, this machine still has some problems, especially in the screw conveyer. It is necessary to continue some studies to find out suitable materials for making an endurable screw conveyer.

2. Combine Machine and Reaper

a. Combine machine:
During the havesting, most of paddy field are muddy and the rice was wet. Using combine machine, it can save a lot of time to dry. This combine machine also can select rice.

b. Reaper:
Easy to use and saves a lot of time.
In this district, the famers are lack of labor, and the wages are increasing every year. Besides, it is hard to find labor to work.

3. Improvement and Demonstration of Rice Straw Cutter and Spreader Attached on Tractor

The rice straw cutter and spreader are attacked on a tractor for cutting the straw into smaller pieces for being easier to turn down into the soils by the tractor.

The straw cutter cuts the straw by intermittent contact of a rotary knife and knife fitter. For dry straw, more than 73.6% of straw can be cut into less than 30 cm length and for fresh straw, it may reach to 82.64%. After the cutting, the straw are short enough for being easily mixed into the soil to improve the soil fertility. However, further improvement is necessary, since some of the straw twisted on the rotary shaft interrupting the smooth operation of the machine.

4. Development of a Seeder for Raising Seedling for Rice Transplanter

It is known that rice yield may be increased about 10% by using rice transplanter when compared with the conventional hand transplanting. However, the bottle-neck for the popular adoption of the machine by the farmers is that it requires a lot of seedling-boxes for raising seedlings and rather high facility investment. In order to minimize the cost instead of using seedling-boxes method, a woodframe-method was developed by Taichung DAIS for raising seedlings.

The investment for the latter method has been cut down to only NT 360,000 for each 100 ha of paddy field. According to the preliminary tests, the adoption of the woodframe-method can reduce the cost for raising seedling to NT 7 per box. In this study, a hand operated seeder was developed for sowing the pregerminated seeds within the woodframe.

It showed that 140 frames can be sown with the seeder which is about 50 times faster than that by hand sowing method. The seeder also can be used for covering seed with dried soil.

5. Attachment of Fertilizer Deep-Layer Applicator to Rice Transplanter

Deep placement of fertilizer is one of the effective ways of fertilization methods. It is not only helpful to save nitrogen fertilizer, but also increase the yield of rice. A fertilizer deep applicator was attached to a two-row rice transplanter for being able to transplant rice seedling and deep-placing the fertilizer simultaneously.

Attachment of fertilizer deep applicator to a two-row rice transplanter is simple and effective for the deep placement of fertilizers.

Rice transhplanting and deep placement of fertilizer may be performed simultaneously either in heavy soil or light soil. Fertilizer deep-placing saved 16.8-18.3% of nitrogen fertilizer, and increased the rice yield for 1.6-11%.

6. Use of Farm Machines for Improving Poorly Drained Paddy Fields

Three different treatments, namely, deep plowing with sub-soiler drawn by a farm tractor, deep plowing by placing rice husk in the subsoils, and placing drainage tubes underground were used to test their effects in improving the drainage conditions of the poorly drained paddy soils. The results showed that subsoiling was only slightly effective, but placing rice hull in the subsoil and constructing drainage pipe lines were rather effective for removing off the excessive water in the poorly drained soils. The yield increased from the three treatments were 6.5, 18.9, and 25.2% respectively.

7. Studies on the Improvement of Adlay's Huller

This experiment is focused on decreasing the milling breakage rate of adlay grain by using a conventional rice-huller.

Most of adlay grain was broken under the roller type rice-huller. It was found that rubber roller hardness, clearance and slippage between twin rollers were the three major factors correlated to the kernel breakage. More than 80% of hulling rate was obtaind by using the roller type rice-huller, under 95° hardness, 40% slippage, 50% of grain width clearance and 80% breakage rate.

From the experimental result, softer rubber rollers decreased adlay breakage rate. Under conditions of 13% grain moisture content, 75° hardness, 35% slippage, 40-45% of grain width clearance and twice dehulling process, 80% of hulling rate and 10% of kernel rate were obtained.