

On the Seeder Machine

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The seeding machine described in this paper is based on an idea fundamentally different from old ones. The upland farming centering around vegetable culture is intensive and highly advanced in technique in Japan but very low in the productivity of labor and in the efficiency of production. This fact must be carefully re-considered from view points of the labor situation in farm villages and the modernization of agriculture.

Taking these facts into consideration, this machine was devised to fit the agriculture, especially the vegetable culture in Japan.

This seeder machine consists of two parts, the seed tape machine for packing seeds with vinyl-tape and the tape seeder machine for seeding.

Outline of the seeder machine

In this method seeds are packed for seeding with water-soluble harmless vinyl-tape (poly-vinyl alcohol) about $20\ \mu$ thick and 2 cm wide to make a seed tape which encloses seeds at intervals of a fixed distance intervals of a fixed distance (Fig. 1). This method has such ad-

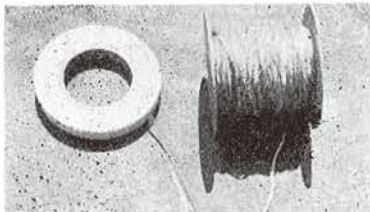


Fig. 1. Water-soluble vinyl before (left) and after (right) the enclosing of seeds.

vantages as saving time for seeding, seeding in good order and saving labor for thinning. And in case plants are grown in the field without temporary planting, this method makes the growth of plants and the quality of harvests more uniform than ordinary seeding, and saves labor for harvesting and for sorting of harvested crops. These results come from orderly seeding which prevents germination of surplus seeds. The saving labor by this method for thinning, harvesting and sorting is a result of the orderly location of the plants. In case the plants are located in good order the work of thinning is made efficient and easy, and there is nearly no need of consideration about the time of thinning, because the plants receive sunshine uniformly making no shade with one another. The time of thinning is the most concern in case of ordinary seeding. As the seeds are enclosed with water-soluble vinyl-tape, the tape must be dissolved as soon as possible after the setting of it in the earth. It is dissolved with moisture in the soil. The earthing, therefore, must be at least 1 cm deep in usual conditions of soils, and must not be shallower than 0.5 cm even in the soil moderate in moisture. It is necessary to earth a little deeper in such a light soil as the Kanto loam in dry conditions. In case of heavy clayey soils stamping must be done sufficiently before seeding. When the soil is too dry, irrigation is desirable.

Table 1 shows that the germination rate is lower at extremely high moisture but higher at the moisture between 35~60% in the

Table 1. Relations between the moisture in the soil and the germination of seeds (germination rate %)

Days after seeding														Total
		1	2	3	4	5	6	7	8	9	10	11	12	
95%	{ A	0	0	0	0	8	12	0	0	0	0	0	0	20%
	{ B	0	0	0	0	16	42	0	0	0	0	0	0	58
80	{ A	0	0	0	7	14	3	0	0	2	0	0	0	28
	{ B	0	0	0	18	15	14	12	12	0	0	0	0	71
60	{ A	0	0	0	15	17	14	8	7	5	0	0	0	66
	{ B	0	0	0	16	6	8	6	0	0	0	0	0	36
45	{ A	0	0	0	0	0	18	19	13	9	9	0	0	68
	{ B	0	0	0	0	0	16	17	7	6	0	0	0	46
35	{ A	0	0	0	0	0	15	18	19	14	9	0	0	77
	{ B	0	0	0	0	0	10	16	14	0	0	0	0	40
25	{ A	0	0	0	0	0	0	0	0	0	0	0	0	0
	{ B	0	0	0	0	0	0	0	0	0	0	0	0	0

Remarks Plant: Radish.

A: Tape seeding. B: Ordinary seeding.

tape seeding than in the ordinary seeding.

To dissolve the vinyl-tape in the moisture of soils, it is necessary to tamp the soil strongly in light soils. According to the results obtained by practical works in the field, the suitable depths of earthing for different kinds of crops are as follows: radish 2 cm, carrot and onion 0.5~1.0 cm. The depth must be changed a little according to the thickness of the tape.

Table 2 shows that the germination percentage is a little higher in case the tape is

practical difference among the results obtained.

This seeding method is mainly adopted in such root crops as the edible burdock, the carrot, the radish and the turnip. The method is also in use in direct seeding of the onion, parsley, lettuce and Chinese cabbage, and in nurseries of the cabbage, onion and tomato.

On the seed tape machine

1) How to make seed tapes

The seed tape machine is a tape maker about

Table 2. Relationship between the thickness of the tape and the germination of seeds

Crop	Thickness of tape	Days until the beginning of germination	Germinating energy	Germination percentage	Days for germination in average
Cabbage	20 μ	5 days	57.5%	59.0	6.80
	30	5	56.5	58.0	6.69
	40	5	51.0	55.0	7.21
	Control	5	54.0	57.5	6.60
Tomato	20 μ	7 days	81.0%	83.0	8.79
	30	8	84.0	87.0	8.60
	40	8	74.0	81.0	9.35
	Control	8	94.0	97.0	9.21
Rice	20 μ	9 days	79.0%	82.0	10.74
	30	9	81.0	86.0	10.88
	40	9	70.0	82.0	11.44
	Control	9	62.0	70.0	11.41

30 kg in weight equipped with a light electric motor which can be worked with the supply of power from an indoor wire for the light. The efficiency of the machine is about 2,000 m. of tape per 1 hr. (Fig. 2). The spacing and the

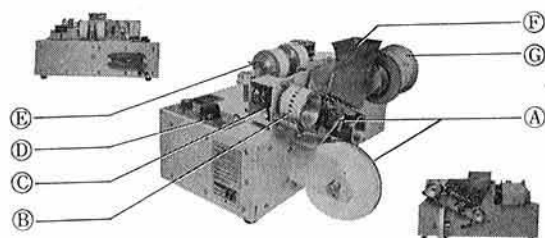


Fig. 2. Seed tape machine.
 A: Water-soluble vinyl film.
 B: Seed belt.
 C: Automatic stopper.
 D: Operating apparatus.
 E: Spooling apparatus.
 F: Seed hopper.
 G: Seed tape reeler.

number of seeds in a group can be changed at will by a change of the seed-belt and by turning the dial. The seed-enclosing tape is wound on the 500 m. reel to load the tape seeder machine with it for seeding. The tape enclosing seeds must be kept in a vinyl bag with silica-gel tightly sealed to prevent moisture, and stored in a cool and dark place. By the use of the leisure season, farmers can make the tape to seed an area of 30~50 ha or more with a machine in a year.

2) Seed tape and its materials

The seed tape is a seed-enclosing-film of polyvinyl alcohol (P.V.A.) tied with two fine cotton threads. The P.V.A. is dissolved in water within 1 min. and in the ordinary soil in 10~20 min.

Tape seeder machine and seeding work

The machine is used for seeding with the seed tape.

This small tractor-typed machine is equipped with various attachments for integrated work of furrowing, seeding and earthing (Fig. 3).

In addition to the above-mentioned type,

handcart-typed machines for a single furrow are also in use (Fig. 4). This type is neces-

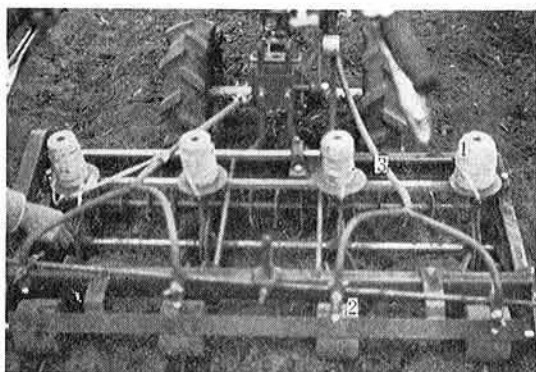


Fig. 3. Tape seeder machine.
 1. Seed tape
 2. Tamping wheel
 3. Pipe of sprinkler

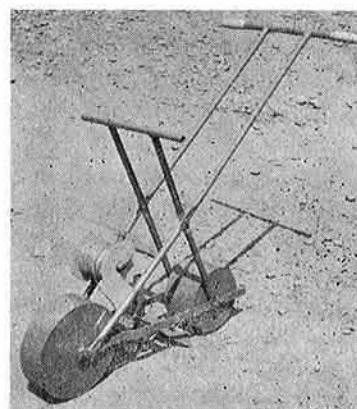


Fig. 4. Handcart-typed seeder.



Fig. 5. Growth of plants in a field seeded with the machine (Radish).

Table 3. Comparison in expense between seedings with the machine and by the ordinary method

Crop \ Item		Seeding		Thinning		Total		Cost of tape	Total expense
		time	wages	time	wages	time	wages		
Radish	Ordinary Seeder	min.	¥	min.	¥	min.	¥	¥	¥
		444.00	1,332	126.00	378	570.00	1,710	0	1,710
Burdock	Ordinary Seeder	60	180	29.20	188	89.20	268	85	453
		75.00	225	165.00	495	240.00	720	0	720
Carrot	Ordinary Seeder	13.00	39	135.00	405	148.00	444	85	529
		126.24	379	161.00	483	287.30	862	0	862
		70.30	211	43.00	129	113.30	340	165	505

Remarks: 1) Expense per 1a.
 2) Wages were estimated at ¥3 per min.
 3) Cost of tape was calculated estimating the materials and wages at ¥0.5 per m.

sary for small-scale seeding as in Japan, and convenient for experimental works.

Seeder machine and its economical survey

This machine has many advantages as mentioned above. The expense for the work with this machine is shown in comparison with

the ordinary method of seeding, including the wages for seeding and thinning as well as the costs for vinyl-tape and other materials, as follows.

As mentioned above this is a unique method obtaining sufficient results for seeding of vegetables. The seed tape is also effectively used for exact seeding in nurseries and in experimental fields of small size.