

Row Sowing of Germinated Paddy—the Solution to the Peasant Cultivator's Difficulties

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OF A TOTAL of about 769,716 acres cultivated under paddy in the Island in *maha* less than 10 per cent. is transplanted and 3 per cent. in *yala* on about half that extent cultivated. Transplanting as a means of increasing yields of paddy has been persistently advocated by the Department of Agriculture both by propaganda talks and actual demonstrations in cultivators' fields during the past several years. Of transplanting demonstrations alone either singly or combined with other operations such as weeding, application of fertilizers, &c., there have been several thousands carried out so far. Yet the headway made with this method of improving yields has been very slow.

In the Southern Division the acreage transplanted of a total of 128,847 acres cultivated was 2,861 in *maha* 1955-56 or 2.22 per cent. In *yala* 1955 of a total cultivable extent of 123,529 acres only 1,205 acres or 0.97 per cent. was transplanted. Worked on a possible transplantable extent of 43,657 acres in *maha* and 39,951 acres in *yala*, the extents transplanted in *maha* 1955-56 and *yala* 1955 represent 6.6 per cent. and 3.05 per cent. respectively. The number of demonstrations carried out on transplanting singly or combined with other operations during the past few seasons is as follows:—*yala* 1952—

172; *maha* 1952-53—228; *yala* 1953—804; *maha* 1953-54—1,198; *yala* 1954—1,133; *maha* 1954-55—1,118; *yala* 1955—858; *maha* 1955-56—990.

Yet, in spite of the determined effort made during the past eight seasons to popularize transplanting, all that was achieved was the raising of the transplanted extents from 1,359 acres in *maha* 1952-53 to 2,861 acres in *maha* 1955-56 and from 471 acres in *yala* 1952 to 1,205 acres in *yala* 1955.

In advocating this method of stepping up of yields we have failed in appreciating the difficulties of the peasant cultivator. Although he is convinced that transplanting, if properly carried out, will increase his yields, there are factors beyond his control which will not permit him to do it. Chief among these are (a) the uncertainty of the weather: nurseries cannot sometimes be raised or, if raised, have to be abandoned and the crop sown broadcast because the subsequent rains have failed or are too late to permit transplanting to be done, (b) the high cost involved which he, by experience, knows is far above the Rs. 40 to Rs. 50 per acre advocated, (c) the non-availability of manpower, (d) the attention necessary to protect the nurseries from cattle damage.

These problems received the close attention of the writer when after about two years' work in the Division it was realized that, unlike in the Kandyan areas, much headway could not be made in transplanting in the low country areas.

The advent of the Japanese inter-cultivator, which the writer was the first to test early in 1954 with a view to reducing weeding costs on transplanted paddy, suggested greater possibilities of its exploitation on broadcast paddy. This idea was tested out for the first time in the Island by the writer by sowing germinated paddy in rows in *yala* 1955 both under farm conditions and in cultivators' fields so as to permit inter-cultivation being done. The results were spectacular indeed in spite of the errors made with regard to spacing, period of germination of the seed paddy, quantity of the seed paddy used, &c.

In that season the preliminary trials carried out under cultivators' conditions were in two plots—one in Matara District and the other in Hambantota District. The yield per acre with a spacing of 12 inches was 54 bushels each. Germinated paddy was sown in rows.

The trials undertaken in the farms consisted of one plot (1/5 acre in extent) at Mapalana Farm and 6 plots (1/3 acre each in extent) at Ambalantota Paddy Station. In the Mapalana plot a spacing of 12 inches between rows was given but within the rows seeds were dropped about 6 inches apart. Two intercultivations with the Japanese weeder were given. The plot received the same manurial treatment per acre as the rest of the fields, viz., 1/2 cwt.

sulphate of ammonia, 1 1/2 cwt. superphosphate and 1/2 cwt. muriate of potash. The yield was 45 bushels per acre.

At Ambalantota, two spacings were given—12 inches and 10 inches—with two varieties of paddy, viz., *Rathkaraya* and *Suduheeneti* ICPY 15. The control plots were transplanted 12 inches $\times$ 4 to 6 inches. All plots received a manure mixture of 1/2 cwt. concentrated superphosphate and 1 1/2 cwt. sulphate of ammonia in three doses. Three inter-cultivations were given. The *Suduheeneti* row sown plot was affected by rains immediately after sowing. Germinated paddy was sown in rows. The cost of cultivation and yields were as follows:—

Ambalantota—Yala 1955

	Yield		Cost	
	Per Acre	Bushels	Per Acre	Rs.
<i>Variety—Rathkaraya</i>				
Transplanted (12" $\times$ 4"-6")	61	..	296	
Row sown 10"	..	49	..	256
Row sown 12"	..	46	..	246
<i>Variety—Suduheeneti ICPY 15</i>				
Transplanted (12" $\times$ 4"-6")	36	..	238	
Row sown 10"	..	40	..	266
Row sown 12"	..	38	..	246

Encouraged by the results, the method was advocated among cultivators in *maha* 1955-56. The response was very satisfactory. Thus 103 acres were row sown in the Galle District, 81 acres in Matara District and 81 acres in Hambantota District. Demonstrations were also carried out in the three Districts in cultivators' fields. Some of the yields obtained from the latter are shown in Table I.

TABLE I

Name of Field	Village	Plot Size (Acres)	Yield		Yield Per Acre Broadcast Con Plot Bush.
			Per Acre Demon. Plot Bush.	Per Acre Broadcast Con Plot Bush.	
Galle District					
Gambhedda ..	.. Ihala Keembiya	.. $\frac{1}{2}$	.. 56	.. 32.5	
Delgahakumbura ..	.. Ihala Lelwela	.. $\frac{7}{16}$	.. 61	.. 42.5	
Millagahaduwa-addara ..	.. Ihala Lelwela	.. $\frac{1}{2}$	.. 60	.. 41	
Thelegahakumbura ..	.. Thoragampitiya	.. $\frac{1}{2}$	.. 38	.. 22	
Thelekumbura ..	.. Kodagoda ..	.. $\frac{1}{2}$	.. 54	.. 21	
Moratuduwigura ..	.. Kodagoda ..	.. $\frac{1}{2}$	.. 23	.. 14	
Sitakandura ..	.. Walpola ..	.. $\frac{1}{2}$	.. 48	.. 16	
Udumulla ..	.. Hikkaduwa East	.. 1	.. 48	.. 28	
Potadeniya ..	.. Kalupe ..	.. 1	.. 40	.. 28	
Delgaha-addara ..	.. Maha Ehagoda	.. $\frac{1}{2}$	.. 37	.. 24	
Wattekumbura ..	.. Rekadahena	.. $2\frac{1}{2}$	.. 42	.. 15	
Diwela ..	.. Pilana ..	.. $\frac{1}{2}$	.. 48	.. 30	
Doleliyadda ..	.. Halgasmulla	.. $\frac{1}{2}$	.. 58	.. 26	
Pauselekumbura ..	.. Yatiyala ..	.. $\frac{1}{2}$	.. 60	.. 25	
Pauselekumbura ..	.. Yatiyala ..	.. $\frac{1}{2}$	.. 62	.. 32	
Walakumbura ..	.. Pannegamuwa	.. $\frac{1}{2}$	.. 56	.. 32	
Kirimetiwala ..	.. Dorape ..	.. $\frac{1}{2}$	.. 52	.. 32	
Goda-amuna ..	.. Heenetigala	.. $\frac{1}{2}$	.. 64	.. 28	
Matara District					
Mahakumbura ..	.. Kirilapone ..	.. 1	.. 44	.. 14	
Ilukketiya ..	.. Kirilapone ..	.. 1	.. 47	.. 26	
Miniranwala ..	.. Ginneliya ..	.. 1	.. 64	.. 17	
Sapugahadeniya ..	.. Ginneliya ..	.. 1	.. 46	.. 21	
Parakumbura ..	.. Andoluwa ..	.. $\frac{1}{2}$	.. 34	.. 12	
Mahakumbura ..	.. Mawarala ..	.. $\frac{1}{2}$	.. 34	.. 15	
Wijesindeniya ..	.. Rotumba ..	.. $\frac{1}{2}$	.. 38	.. 16	
Mullekumbura ..	.. Puhulwella ..	.. $\frac{1}{2}$	.. 60	.. 36	
Gorakedeniya ..	.. Puhulwella ..	.. 1	.. 64	.. 34	
Nawaruketiya ..	.. Hettiwela ..	.. 1	.. 68	.. 30	
Bokalekumbura ..	.. Godagama ..	.. $\frac{1}{2}$	.. 67	.. 23	
Kirillagahadeniya ..	.. Wewahamanduwa	.. $\frac{1}{2}$	.. 60	.. 45	
Lohhegeliyadda ..	.. Godagama South	.. $2\frac{1}{8}$	.. 75	.. 35	
Moyagamakumbura ..	.. Godagama South	.. $\frac{1}{2}$	.. 48	.. 28	
Karagahakumbura ..	.. Hettetiya ..	.. $\frac{1}{2}$	.. 52	.. 25	
Punchiwewa ..	.. Wewaehalagoda	.. $\frac{1}{2}$	.. 45	.. 32	
Siyambalamulla ..	.. Wewaehalagoda	.. 1	.. 48	.. 32	
Puwagahakumbura ..	.. Wewaehalagoda	.. $\frac{1}{2}$	.. 40	.. 24	
Hambantota District					
Dahasyaya ..	.. Helambagaswela	.. $1\frac{1}{2}$	.. 81	.. 34	
Medakumbura ..	.. Medagama ..	.. $\frac{1}{2}$	.. 79	.. 50	
Malttangakumbura ..	.. Kariwela ..	.. $\frac{1}{2}$	.. 88	.. 46	
Palugahakumbura ..	.. Beragama ..	.. $\frac{1}{2}$	.. 89	.. 48	
Moragedepela ..	.. Godakumbura	.. $\frac{1}{2}$	.. 89	.. 17	
Halpathkumbura ..	.. Ambala ..	.. $\frac{1}{2}$	.. 73	.. 20	
Polgahadeniya ..	.. Ovilana ..	.. $\frac{1}{2}$	.. 46	.. 28	
Hevenekkumbura ..	.. Galagama ..	.. $\frac{1}{2}$	.. 52	.. 21	
Kiringadeniya ..	.. Maha-heela	.. $\frac{1}{2}$	.. 78	.. 23	
Paragawakkumbura ..	.. Lunama ..	.. $\frac{1}{2}$	.. 62	.. 42	
Kandiyagawakumbura ..	.. Manneliya ..	.. $\frac{1}{2}$	.. 54	.. 36	
Wattogawakumbura ..	.. Kiula ..	.. $\frac{1}{2}$	.. 58	.. 40	
Kandabodakumbura ..	.. Pallegama ..	.. $\frac{1}{2}$	.. 56	.. 32	
Mullekumbura ..	.. Deniya ..	.. $\frac{1}{2}$	.. 48	.. 36	

The Senior Agricultural Assistant, Hambantota, adopted this method in 4 acres of his own fields at Hakmana and obtained an average yield of 80 bushels per acre where previously it was about 30 bushels per acre.

At the same time further tests were undertaken in *maha* 1955-56 at Labuduwa Farm and Ambalantota Paddy Station.

At Labuduwa Farm trials were carried out with the paddy varieties *Mas M 24*, *Murungakayan 302* and *Sulai*. A spacing of 10 inches between rows and 1-2 inches within the rows was given. The seed paddy was soaked for 24 hours and kept under pressure to germinate for a further 24 hours before sowing was done. It was found that 3/4 bushel of *Mas M 24* was sufficient to row sow one acre. In the case of the other two varieties a little over one bushel was used as seed rate. It was further found that with about 2 days experience one man and four women could row sow one acre in a day. One acre each was used for the trial plot and the control. The latter was transplanted 10 inches between rows and 4-6 inches within rows in the case of *Mas M 24* and *Murungakayan 302*, and broadcast and crop harrowed in the case of *Sulai*. All plots received a fertilizer dressing of 1½ cwt. saphos, ½ cwt. sulphate of ammonia and ½ cwt. muriate of potash prior to broadcasting, row sowing or transplanting, and ¾ cwt. sulphate of ammonia about 5 weeks after planting. Two interculturalations were given with the Japanese weeder in the case of row sown and transplanted plots. There was a severe outbreak of *Piricularia* on the row sown *Mas M 24* and *Sulai* and a Silver Shoot attack on the row sown *Murungakayan 302*. The latter

was also damaged by floods. The reduced the yields. The cost of cultivation and yields obtained were follows:—

Labuduwa—Maha 1955-56

	Yield Per Acre Bushels	Cost Per Acre Rs.
<i>Variety—Mas M 24</i>		
Row sown 10" (1 acre)*	67	271
Transplanted (10" × 4"-6"-1 acre)	84	421
<i>Murungakayan 302</i>		
Row sown 10" (1 acre)†	46	286
Transplanted (10" × 4"-6"-1 acre)	53	347
<i>Sulai 27614</i>		
Row sown 10" (1 acre)	25	235
Broadcast (1 acre)	31	294
* Severe <i>Piricularia</i> attack.		
† Severe Silver Shoot attack and damage caused by floods.		

At Ambalantota Paddy station, the varieties of Paddy, viz., *Pokkali*, *Sinnayan 398*, and *Rathkarayal* were used. The spacing generally given to the row sown plots was 10 inches but two plots were given a spacing of 8 inches. The plots were distributed in various blocks on the farm but unfortunately block (12 acres) suffered severely from water shortage with the result all yields from this block were low and these reduced the average yield of the station. In cases except one, after the normal soaking of the seed paddy for 24 hours was germinated under weight for a further period of 24 hours. In the exception, seed was allowed to germinate for 36 hours. Artificial fertilizers at the rate of 1½ cwt. sulphate of ammonia and ½ cwt.

concentrated superphosphate per acre were applied to each plot whether row sown, transplanted or broadcast. The Japanese weeder was used three

times in the row sown and transplanted plots. Details of yields obtained and the cost of cultivation are shown in Table 2.

TABLE 2
Ambalantota—Maha 1955-56

<i>Treatment</i>	<i>Acreage</i>	<i>Yield Per Acre Bushels</i>	<i>Cost Per Acre Rs.</i>
BLOCK G—VARIETY—POKKALI			
Transplanted 10" × 4"—5"	1 ..	87 ..	346
Row sown 10"	1 ..	69 ..	249
Broadcast	5 ..	60 ..	276
BLOCK C*—VARIETY—SINNANAYAN 398			
Row sown 10"	1 ..	35 ..	249
Broadcast	3 ..	35 ..	296
BLOCK C* VARIETY—RATHKARAYAL			
Row sown 8"	1 ..	40 ..	256
Broadcast	4½ ..	31 ..	287
BLOCK D—VARIETY—SINNANAYAN 398			
Row sown	1 ..	60 ..	268
Transplanted 10" × 4"—5"	7 ..	57 ..	328
Broadcast	2 ..	45 ..	296
BLOCK E—VARIETY—RATHKARAYAL			
Row sown 8"	¾ ..	59 ..	256 †
Row sown 10"	1 ..	37 ..	242 †
Transplanted 10" × 4"—5"	3½ ..	54 ..	324
Broadcast	2 ..	32 ..	234 §

Note.—* General yield of block C was very poor due to shortage of irrigation water.

† Preparatory implemental tillage could not be done. All such tillage was done with the mamoty, the usual cost of such tillage being Rs. 115 compared to an average cost of Rs. 77 in the case of other fields.

‡ Yields low due to outbreak of thrips and stem-borer.

§ Expenditure less because normal hand-weeding could not be given due to shortage of water.

It will be noticed that where row sowing of germinated paddy has been adopted an increase in yield over the broadcast paddy has been effected but that is more important is that there has been a general reduction in the cost of cultivation by over Rs. 25 per acre, a substantial saving from the point of view of the peasant cultivator.

Consequent on the maha 1955-56 demonstrations held in cultivators' fields, there was a sharp increase in the acreage row sown in yala 1956. At the time of writing 970 acres have been actually done. The acreage would have been considerably more but for the fact that several tracts throughout the Division were not cultivated in yala 1956 owing to the severe drought.

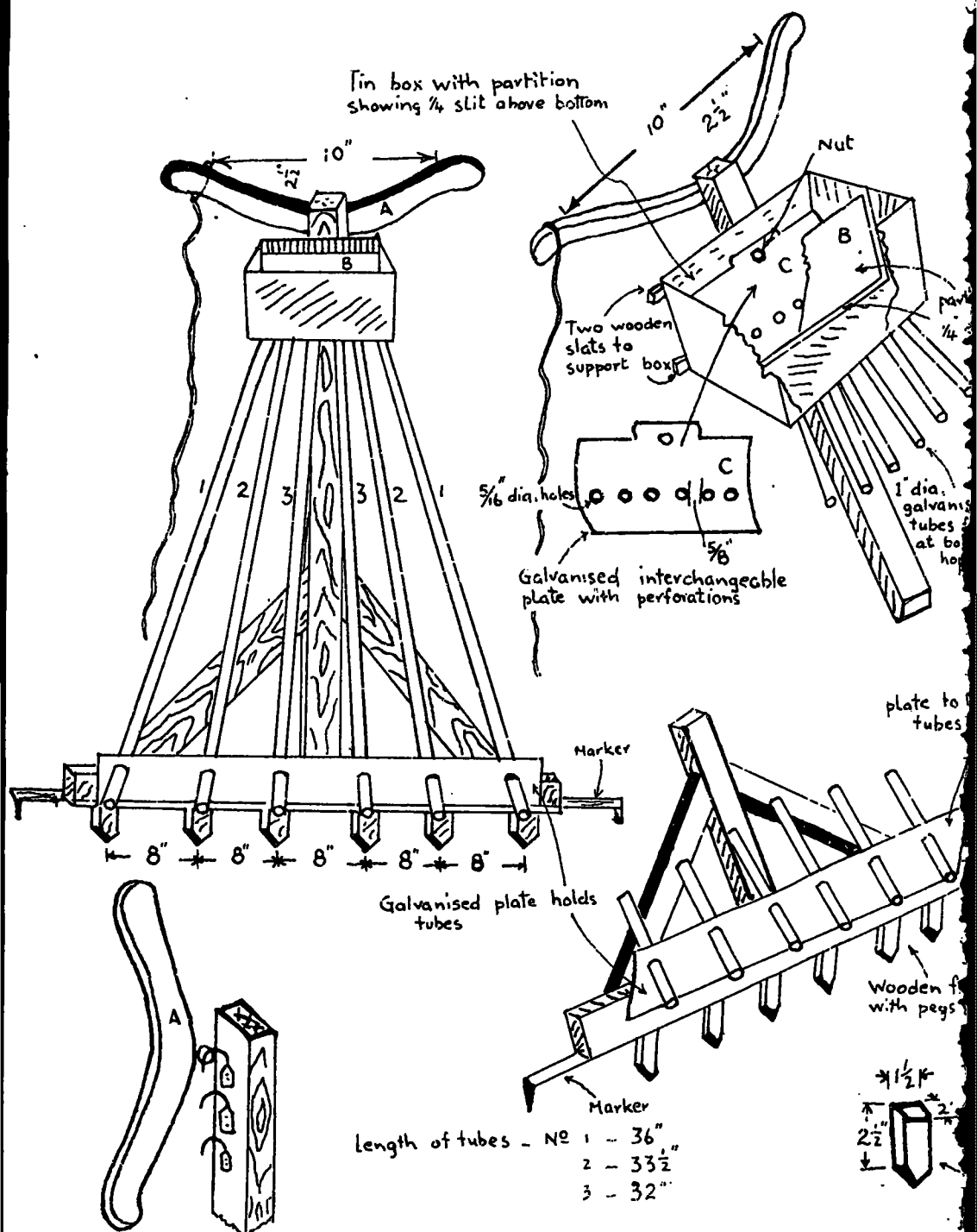


Diagram of Paddy Seeder

There was an incessant demand for weeders but unfortunately it was possible to supply only 75 and that too in April, 1956. A few cultivators who can afford the expense had however purchased one or two weeders for their use.

The trials were continued on the farms in *yala* 1956 with a view to testing other factors, chief among which was the reduction in cost on row sowing. In the normal process adopted so far, one man or boy was used to drag the marker followed by 3—4 women who dropped the germinated seed in the rows. This operation cost about Rs. 10 per acre and is relatively high compared to sowing paddy broadcast which involves only about 1/3 labour unit per acre per day. A combined seeder and marker (see diagram) was therefore designed to be worked by one labourer and this was tested out. With this inexpensive implement costing less than Rs. 12 and which can easily be turned out locally, 1½ acres could be row sown in one day by a woman, thereby reducing the cost of sowing to about Re. 1.25 per acre. With experience it should be possible for a woman to sow about 2 acres a day.

The seeder is similar to the Indian Seed Drill, but the tubes are of thin galvanized sheet. These are one inch in diameter and attached to a hopper which would take in about 4 measures of seed paddy. From the hopper, the seed passes on to a perforated disc which controls the seed rate. The perforated disc is interchangeable so as to adjust the seed rate. In the trials conducted, perforations of 5/16 inch were found to seed 34 measures of paddy per acre, while perforations slightly larger seeded 76 measures of paddy per acre. The varieties of paddy tested were

Sinnanayan and *Rathkarayal*. Perforations of 0.25 inches would probably seed about 24 measures per acre of these varieties. This would be a desirable seed rate. The correct size of perforations would have to be determined for some of the larger or smaller seeded varieties. In seeding the operator fills the hopper and carries an additional quantity of seed paddy in a basket attached to his or her waist. The operator walks backwards, dragging the seeder which is strapped to the waist, and stirs the paddy to ensure even distribution. In the trials conducted, a woman was found to be able to seed ¼ acre in about 45 minutes. But making allowances for the tediousness of the job, one should be able to seed at least 1½ acres a day. With experience the acreage seeded per day can be raised to two. An improvement which is being borne in mind is a simple device to drop 4—6 seeds at regular intervals of 3—4 inches apart. But this will be done only after trials have been conducted on the relative merits of row sowing in continuous rows as against row sowing at a regular spacing of 3—4 inches in the rows.

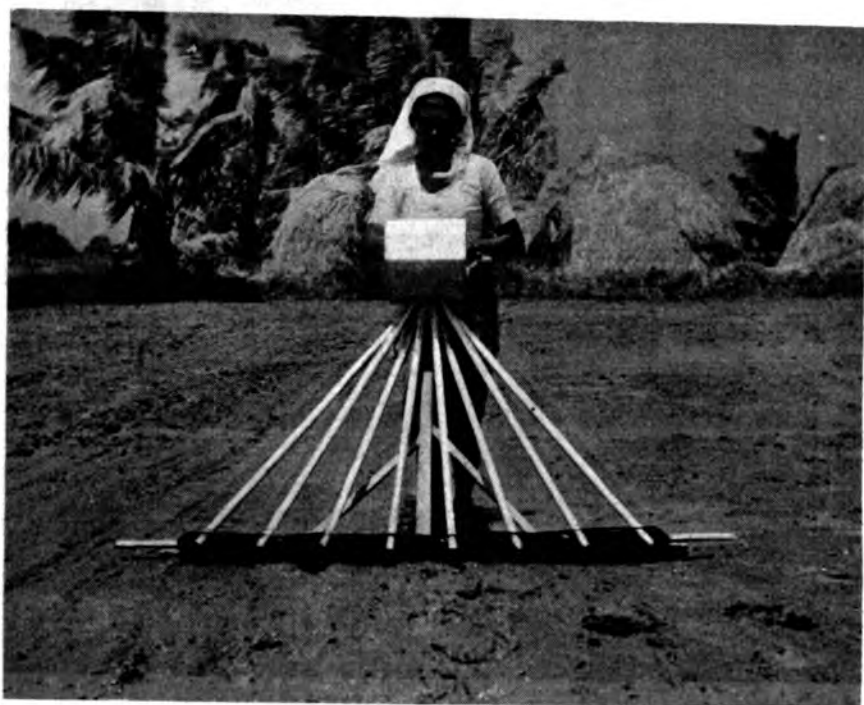
In the light of the results obtained with the trials and the readiness with which cultivators have taken to this method of cultivation as compared to transplanting, the following recommendations are made :—

- (a) Prepare the fields in the usual manner with 2 or 3 puddlings to ensure effective destruction of weeds.
- (b) While this is being done, select good seed paddy, immerse it in salt water, taking only the seeds that sink in the saline solution, treat this with a fungicide and allow it to dry in the shade.

- (c) Two and half days prior to sowing, soak the paddy in water for 24 hours and germinate it for 36 hours under weight.
- (d) The day prior to sowing drain the water off the fields so that they are slightly wet the following morning.
- (e) Broadcast half the fertilizer mixture on the evening of the day the water is being drained. At least 1 cwt. per acre should be applied.
- (f) Row sow the germinated paddy with the combined marker-seeder using about one bushel of seed paddy per acre the following morning. One and a half acres can be done at a cost of a woman labour unit.
- (g) Treat the fields thereafter as a broadcast plot.
- (h) About 2 weeks to 18 days after row sowing, depending on the growth of the seedlings, intercultivate 3 inches deep between the rows with the weeder, thinning out plants in the rows if necessary. The weeding operation will cost less than 1½ labour units compared to 12—20 needed for the first hand-weeding.
- (i) About 10-12 days after the first intercultivation, drain the water off, apply a quarter of the manure mixture between the rows of plants, adjust the intercultivator to a depth of 2 inches and work it. This second weeding will cost one woman unit of labour compared to about 8 women units for hand-weeding.
- (j) About 10-12 days later repeat the process mentioned in (i) above. Apply the other quarter of the fertilizer and adjust the intercultivator to work to a depth of 1 inch.
- (k) If preparatory tillage has been hurried and the weed growth is heavy as a result, a spraying of a 2-4-D preparation may be done to destroy "*Kudametta*" (*Fimbristylis miliacea*) within the rows of the paddy plants. The dosage is ¾ pints in 15 gallons of water. This may be necessary in rainfed areas.
- (l) The spacing recommended for short-season varieties of paddy (3½ to 4 months) is 8 inches between rows. Three intercultivations can be given with the 6 in. weeder. If late-maturing varieties are used, a 10 in. spacing between the rows is recommended.
- (m) An intercultivator costs about Rs. 25. It can be used with care for about 8—10 seasons. A combined seeder and marker can be turned out for about Rs. 12. The seeder can be used for several seasons.
- (n) This method of cultivation is not recommended for the present in swampy fields.

Discussion

The potentialities of this method of cultivation are great and it is anticipated that within a short time the majority of paddy tracts generally, and in particular in the rainfed areas



Row-sowing germinated paddy with the Seeder



Intercultivating seedling paddy with the Japanese Rotary Weeder





Close-up of six weeks old row-sown crop, showing satisfactory tillering



A later stage of the row-sown crop, showing luxuriant growth

will be cultivated by this method for the following reasons:—(1) Time and energy need not be spent on raising nurseries. Time is a major factor in rainfed areas where preparatory tillage is usually restricted to two weeks. This period can now be entirely devoted to effecting a satisfactory preparatory tillage and ensuring effective weed destruction. The laying of nurseries and subsequent transplanting of the seedlings involves heavy expenditure ranging from Rs. 50 to Rs. 75 per acre, which the average cultivator in spite of all the inducements offered by way of easy credit facilities finds it extremely difficult to afford. Whilst transplanting, if properly done, may in several cases give increases greater than those obtained from row sown paddy, it has not interested the average cultivator in view of the high cost involved. (2) Nurseries have to be fenced for protection from cattle damage—thus involving additional expenditure. (3) There is a considerable saving in labour which is a serious problem during cultivation in the major paddy tracts. The result is that a hurried cultivation is done and very often half the extent is sown late because the same labour has to be used. Weeding then becomes a problem and quite a number of cultivators cannot afford to weed the paddy. (4) There is a saving in seed rate over the broadcast paddy. A bushel per acre would be sufficient. In parts of the Island, e.g., Udukinda, a seed rate of 4—5 bushels per acre is common. In other parts the seed rate is about $2\frac{1}{2}$ bushels per acre. (5) There is very effective weed control in the growing crop and weeding costs have been reduced very appreciably. A woman can weed $\frac{3}{4}$ acre a day. About 24 labour units are thus saved during the three weeding operations. In rainfed

areas or in areas where irrigation is restricted, if dry weather prevails at the time of weeding, no weeding can be done. But with the advent of favourable weather within a week to 10 days intercultivation of the row sown areas can be done with the weeder as the rows will be clearly visible in spite of the very heavy growth of Kudametta consequent on dry weather. In broadcast fields under similar conditions it will be very difficult to distinguish the paddy plant from the weed and if weeding has to be done, the cost would be prohibitive. Most cultivators therefore do not weed such fields. (6) In rainfed areas there is the constant risk of having to discard the nurseries and to resort to sowing the paddy broadcast later if the land is dry at the time of transplanting. If transplanting is done later when favourable weather intervenes, the seedlings are too old and will not tiller. This risk is eliminated in row sowing because the seed has to be soaked and germinated only $2\frac{1}{2}$ days prior to sowing. If unfavourable weather prevails immediately after row sowing, the paddy field can again be lightly mudded and re-sown within $2\frac{1}{2}$ days.

Judging by the results obtained under cultivators' conditions an increase of at least 10 bushels per acre can be expected by the adoption of this method of paddy cultivation. In other words if the present non-swampy broadcast areas are cultivated row sown, an increase of perhaps 8 or 9 million bushels of paddy plus a saving of about a million bushels of seed paddy can be effected annually. There is good reason to believe that this can be done, judging by the enthusiasm with which cultivators in the Southern Province are taking to it.

This method of cultivation has opened up other lines of investigation. For instance, in future selection work emphasis will have to be laid on varieties which tiller profusely and which do not lodge. Optimum spacing for each variety, optimum seed rate, optimum period of soaking and germination of seed paddy, optimum dosage of fertilizers, best method of row sowing, e.g., sown continuously or with 4—6 seeds at a spacing of 3—4 inches, &c., will have to be determined.

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REFERENCE

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