I-6-3 COMPARISON AMONG DIFFERENT CULTIVATION METHODS

1. Investigators: Mohamed EL-KHOLY, Iwao MATSUMOTO and Tomizo KATO

2. Objectives : To study and evaluate the five (5) different cultivation methods from the view-points of system establishment.

3. Experimental Design and Procedures:

   1) Design:- Characteristics of each cultivation method were briefly listed as below

Plot No.	Name of Cultivation	Main operational process etc.	Area to be used
1.	Mechanical transplanting	Puddling & leveling by Rotary, transplanting by 6-rows transplanter; (No. of nursery box 120/f. with seed rate 200g/box	$\frac{1}{3}$f. (Block-A, field plot No. 13)
2.	Seedling broadcast (Transplanting)	Puddling & leveling by Rotary, transplanting by hand, (No. of special nursery box 90/f., with seed rate 200g/box	$\frac{1}{3}$f. (Block-A field plot No. 13)
3.	Traditional transplanting	Puddling & leveling by wooden bar & tractor, transplanting by hand (seed amount for nursery 75Kg/f.)	$\frac{1}{3}$f. (Block-A field plot No. 13)
4.	Mechanical direct seeding under wet field	Seeding by 6-rows YANMAR seeder (30cm row distance), seed amount 20Kg/f.	$\frac{1}{2}$ f. (Block-A field, plot No-14)
5.	Mechanical direct seeding under dry field	Seeding by 20 rows USA Grain Drill Seeder (15cm row distance), seed amount 36 Kg/f.	$\frac{1}{2}$ f. (Block-A field, plot, No-14)

(Notes) (1) As for land preparation, these five cultivation practices had the same procedure as follows; ① ② Chisel plowing (2 times) ③ Disk harrowing ④ Rotary harrowing ⑤ Levelling by laser plane.

(2) Other operational processes in plot No.1, 2 and 3 were the same as the standard mechanical transplanting system which has been established already. And the one in plot No. 4 and 5 were modeled as the system of Preliminary Trial Report No.1 and No. 2.

(3) 5 systems x 1 replication=5 treatment plots Area of each cultivation method (1 treatment plot) was $\frac{1}{2}$ - $\frac{1}{3}$ feddan.

2) Items to be surveyed:-

(i) Cultivation's characters; 1) Seed rate, 2) No. of hill or plant/m², 3) Seeding establishment 4) Planting depth, 5) Hill intervals and row distance, 6) Total yield to be harvested by Combine

(ii) Time requirement for main operations.

(iii) Others - composition of soil clod size, variation of seedling No. per unit area in case of Direct Seeding methods.

4) Summary of results:

1) General progress:- It was fair, The following points, however, should be noticed in this trial.

Namely, 1. Operation Accuracy was not so high because of the degree of operator's skill.

2. Dates of seeding and transplanting were rather late.

3. Weed growth was observed.

2) As to the labour requirement for each system, the most laborious pieces of work were found to be the sequence of jobs needed for preparing and handling of the seedling broadcasting system requiring 34.0 man-hours per feddan. The mechanized transplanting similarly needed 30.5 man-hours for raising and conveying seedlings. The transportation of seedlings alone

required 13 man-hours to complete. The systems of the minimum labor requirement were predictably the tow types of direct seeding system, both requiring 1,3 man-hours per feddan up to the equivalent stage, and additional 2.3 to 2.8 man-hours for planting. As to the transplanting process, the traditional manual system consumed 7,5 man-hours to distribute seedlings from nursery to the field and 4.8 man-hours for actual planting. The machine transplanting required 6.0 man-hours for planting operation. The discrepancy of the observed results from the common expectation that mechanization should achieve higher labour efficiency arose presumably from the fact that the operator lacked enough previous experience with the particular type of machine deployed and due to the relatively small size of the test plots which might have inconvenienced efficient machinery operations while favouring the manual processes. (Table-1)

3) Among these five different cultivation practices, comparatively high yields were recorded for plots No.1, No.3 and No.4, with the per feddan yields of 2.1 tons, 2.1 tons and 2.00 tons for each, while the lowest one was 1.80 ton for plot 5 (direct seedling in dry) due to poor germination and low seedling establishment ratio (Table-2). In this regard, measurement results of soil clod size distribution and the variation of seedling establishment in direct seeding practices seemed to explain clearly the above mentioned difference in yield levels between two direct seeding cultivation practices. (referring Fig-1 and 2).

5. Conclusion:

It can be said that, owing to the several constraints described in (4-1), the rice growth and their yield were inferior. Among these five (5) cultivation practices, the clear difference in labour requirement

for both planting operation and nursery preparation was recorded. It was difficult to overcome the poor germination in direct seeding under dry field condition.

6. Proposal for the next year:

Simple design of this preliminary trial should be improved by expanding the scope of work, incorporating the methodology of comprehensive systematic experiments.

Table-1. COMPARISON OF TIME REQUIREMENT ON MAIN OPERATION AMONG FIVE RICE CULTIVATION METHODS

Treatment plot / Item	Mechanical transplanting		Manual transplanting		Seedling broad-cast (Transplanting)		Direct seeding (Wet land)		Direct seeding (dry land)	
	Machine	Man-hr	Machine	man-hr	Machine	man-hr	Machine	man-hr	Machine	man-hr
Nursery bed preparation	Crusher	4		4.0		5.3		-		-
Seed preparation	Sieve	2		2.0		0.5		1.3		1.3
Up-rooting seedling		-		-		2.3		-		-
Seeding	Seeder	11.5	Seeder	15.0		0.3		-		-
Seedling transportation to the seed-bed field and seed bed to the main field	Tractor W/trailer	13.0	Tractor W/trailer	13.0		-		-		-
Subtotal		(30.5)		(34.0)		(1.3)		(1.3)		(1.3)
Seedling distribution		-		7.5		-		-		-
Transplanting	Transplanter	6.0		4.8		4.8		-		-
Seeding		-		-		-	Drill (6 rows)	1.5	Drill (20 rows)	1.0
Total		36.5		48.8		20.7		2.8		2.3

Table-2 MAIN CHARACTERS AMONG FIVE DIFFERENT CULTIVATION PRACTICES

	Name of cultivation (Treatment)	Seed rate	Seedling establish-ment ratio	Planting depth	No. of hill/m²	No. of plant	Row Distance	Hill Intervals	Total Yield 1	Total yield 2
		Kg/f.	%	cm			cm	cm	ton/f.	ton/ha
1.	Mechanical transplanting	24	-	1.7	3	12	33	12.6	2.05	4.88
2.	Seedling broadcast	18	-	3.5	16 /hill	14	-	(22.9)	1.85	4.40
3.	Traditional transplanting	75	-	3.2	15	14	-	(31.4)	2.14	5.10
4.	Mechanical direct seeding(wet field)	20	60.0	1.3	12.8 per 30cm × 30cm		(34)		2.00	4.76
5.	Mechanical direct seeding(dry field)	36.6	14.7	1.9	5.8		(43)		1.80	4.29

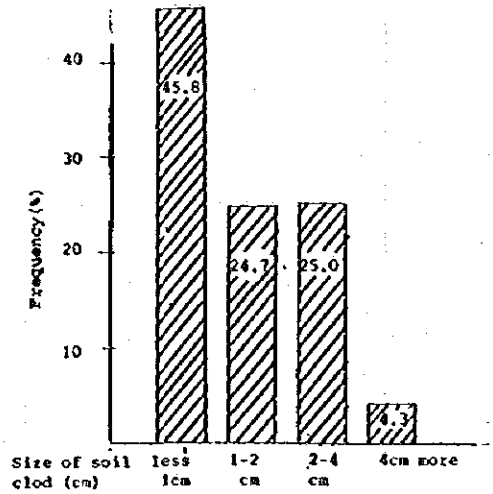


Fig-1 COMPOSITION OF SOIL CLOD IN THE PLOT No.5 (DRY FIELD) BEFORE SEEDING

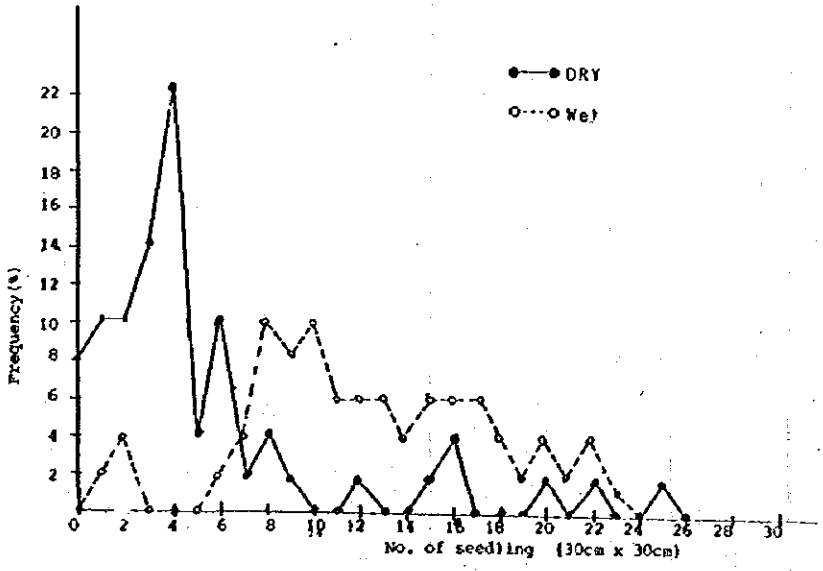


Fig-2 No. of plant per unit area, as of June 24th

I-6-4 EFFECTS OF LASER PLANE APPLICATION ON THE PADDY TOPOGRAPHY AND SEEDLING ESTABLISHMENT IN DIRECT SEEDED RICE UNDER DRY CONDITION

1. Investigators: Mohsen Ebrahim, Iwao Matsumoto and Tomizo Kato

2. Objectives : To compare & evaluate the effect of principal land leveling equipment (Laser-plane and Scraper) on the topography of paddy, size of soil clods and seedling establishment etc. from the view-point of system establishment.

3. Experimental Design and Procedures:

1) Design:-

Kinds of leveling equipment ..... 2 (Laser-plane and Scraper).

2 equipment x 1 replication = 2 treatment plot

Area of treatment plot was 1 feddan for each in Block-A, field plot No-27 and -28.

2) Items to be surveyed:-

(i) Status of levelness on the soil surface

(ii) Size of soil clods

(iii) Seedling number per 30cm x 30cm and its variation

(iv) Seeding depth

(v) Panicle number per 30cm x 30cm etc.

3) Cultivation practice:-

(i) Variety; Giza 175.

(ii) Operational process

(1) For last 2 years (1985, 86), the levelling work by using the Laser-plane had been continuously carried out on the same field (Block-A, field plot No. -27 and -28)

(2) In this trial, the following operational processes were taken, ① Grazing Egyptian clover ② , ③ Chisel plowing (2 times) ④ , ⑤ Disk harrowing (2 times) ⑥ Rotary harrowing ⑦ Levelling by Laser-plane (plot No. -27) or by Scraper (plot No. 28).

(iii) Seeding on May 23rd, seed rate 50Kg/f. (dry seed), by using U.S.A made Grain Drill Seeder (model TYE) with 15cm row distance.

(iv) Other practices followed as the operational process in Report No.2

4. Summary of results:

1) General progress:-

It proceeded well. The following, however, were noticed. ① Harmful effects of Herbicide were observed on the leaf of rice several days after Herbicide spray. ② Harvesting operation by using Combine Harvester was not so easy due to the lodging of rice plant.

2) As for the levelling accuracy, measurements of the degree of levelness on soil surface indicate that there were slight differences between plot No.1 (Laser plane) and plot No.2 (Scraper).

Laser-plane----- The elevation difference between the highest point and the lowest point was 5cm. Standard deviation wast 1.2cm.

Scraper plot----The elevation difference between the highest and the lowest was 10cm. Standard deviation was ± 2.1cm.

On the other hand, the length wise gradient of field along the direction from irrigation inlet to drainage out-let was more smoothly sloped in the Laser-plane plot (No.1) after planning, (No.2) after the operation. This status is shown in Fig-1 contour line map), Fig-2 (Gradient of field), and Table 1.

3) Comparing the components of soil clod sizes of seedbed between the two treatment plots (No.-1 & No.-2), there seemed to be no difference between them. (Fig-3).

4) The measurements of the seedling number per unit area and the variation of seed placement depth indicate that the germination of seeds buried 0 - 2 cm below the surface was better for the laser-plane plot, and that the established seedlings number and its range of variation for laser-plane plot exceeded those for the scraper plot.

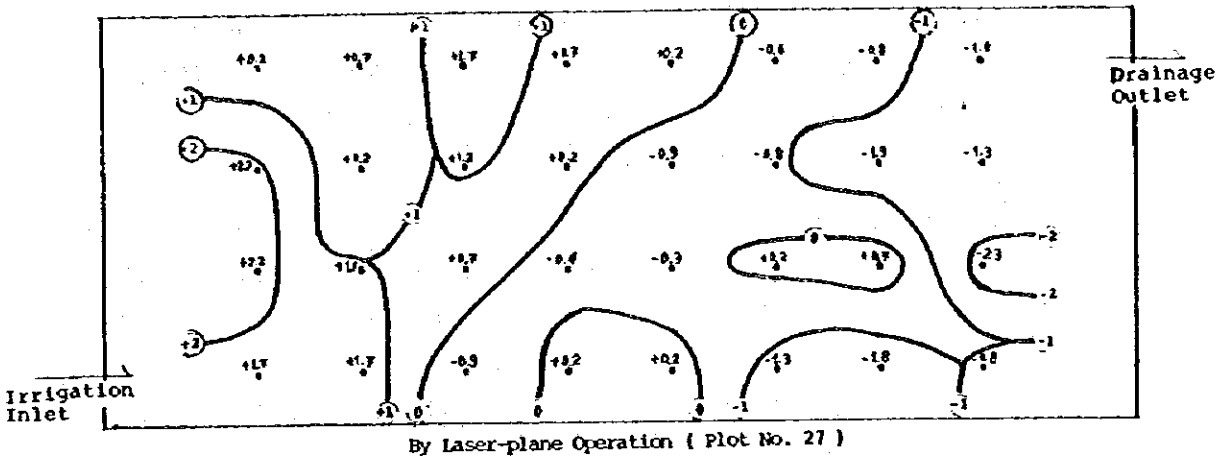
5) In spite of the above mentioned status, no big difference of panicle number per unit area was observed between the two treatments.

5. Conclusion:

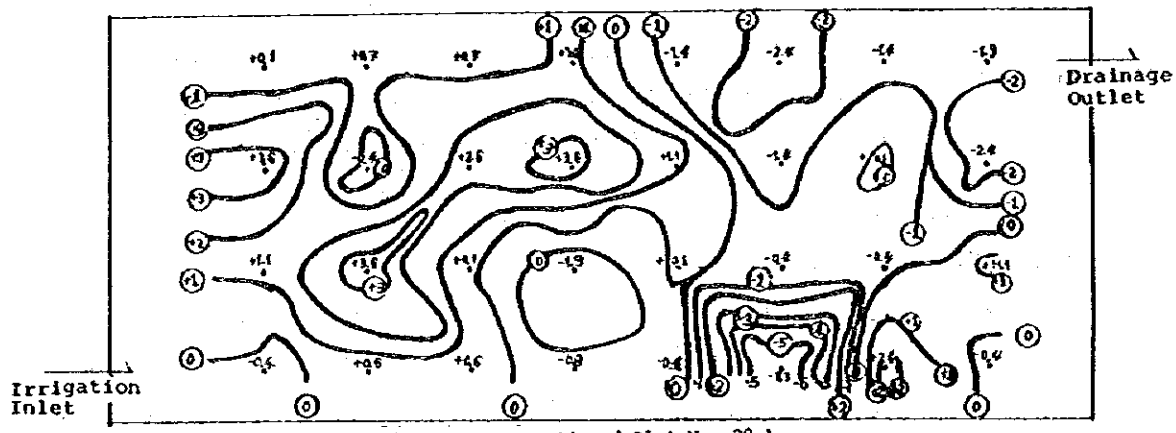
Summarizing the above mentioned points [(2 - 4)], it can be said that the remarkable effect of laser-plane was respectively observed on the levelling accuracy, seedling establishment. But this effect did not appear in panicle number per unit area at the late growth stage of rice under the condition in which the field had been leveled well already.

6. Proposal for next year:

It is necessary to compare the levelling and harrowing effect of scraper with that of Roller from the view-points of system establishment.



By Laser-plane Operation (Plot No. 27)



By Scraper Operation (Plot No. 28)

Fig.1 COMPARISON OF LEVELLING ACCURACY (CONTOUR MAP) BETWEEN TWO FIELDS WHERE WERE OPERATED BY LASER-PLANE OR SCRAPER

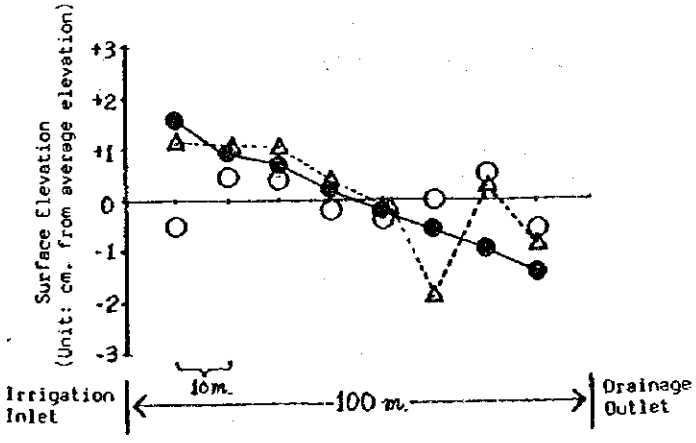


Fig.2 GRADIENT OF FIELD BEFORE & AFTER LEVELLING OPERATION

(Notes)

(Notes)

1. Surveyed on May 16th.
2. Figure shows the gradient (slope) of paddy field along the direction from Irrigation Inlet to Drainage Outlet.
3. After levelling by Laser-plane
   After levelling by Scraper
   Before levelling

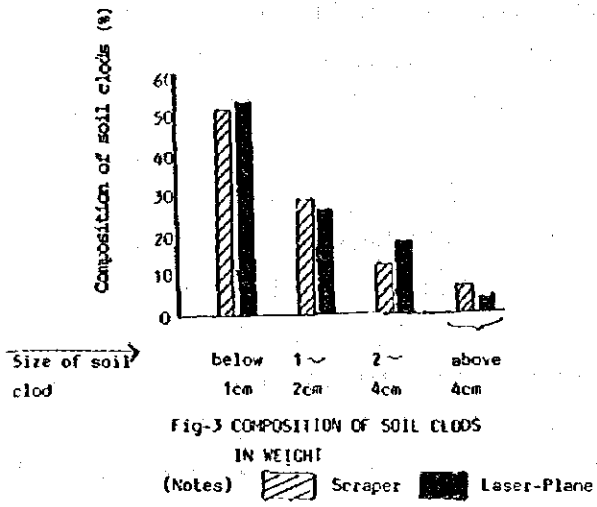


Fig-3 COMPOSITION OF SOIL CLODS IN WEIGHT

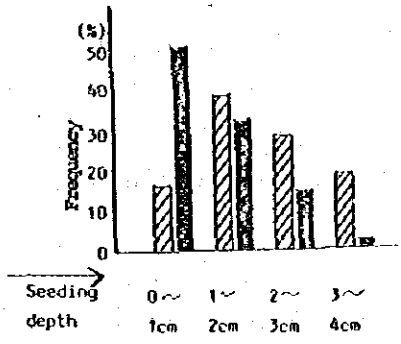


Fig-4 VARIATION OF SEEDING DEPTH

(Notes) 1) Surveyed on June 21st

2) Scraper Laser

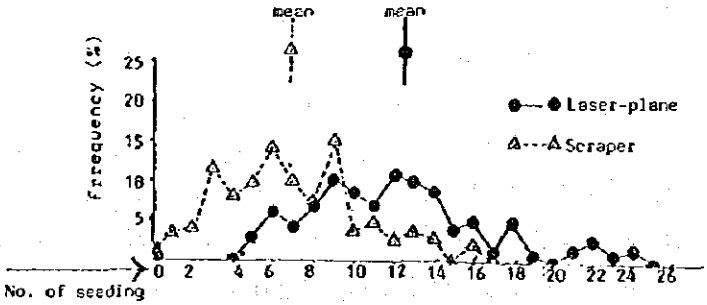


Fig-5 VARIETION OF SEEDLING ESTABLISHMENT

Table-1. Comparison of levelling accuracy and rice growth between Laser-plane & Scraper

No.	Name of Treatment	Levelling accuracy		No. of seedling/30cmx30cm			No. of panicle /30cm x 30cm			Field used
		S. D.	Max. - Min.	Mean	S. D.	Max. - Min.	Mean	S. D.	Max. - Min.	
1.	Laser-plane	±1.2 cm	(+2.2) - (-2.3) cm	12.5	± 5.6	34 - 4	40.1	± 11.2	68 - 13	Plot-27
2.	Scraper	±2.1	(+3.6) - (-7.3)	6.9	± 3.8	20 - 0	38.7	± 13.6	78 - 26	Plot-28
Before levelling		±1.4	(+2.4) - (-2.7)							Plot-27

I-7 HARVESTING AND POST-HARVESTING TECHNOLOGIES IMPROVEMENTS AND FACTORIAL REASSESSMENTS

I-7-1 RATIONALIZATION OF HARVESTING OPERATION DETERMINATION OF THE OPTIMUM HARVESTING TIME

Investigators: Sabri Gameel El-Wahab, Iwao Matsumoto

Objectives:

To determine the varietal characteristics specifically related to the harvesting operation and the post-harvesting processing, such as, the transition of moisture contents, shattering habits, the development of grain cracking, etc., so that the optimum harvesting time can be identified for each variety with special considerations for newly introduced ones.

Experimental design and procedures.

1. Varieties tested:
   Giza-175, Giza-181, G Z-1368, (these three are newly recommended varieties), and Giza-172, I R- 28 (conventional).
   The former three were grown by direct seeding cultivation methods and the latter two were by machinery transplanting.
2. Sample collection and testing procedures.
   The collection of samples took place at the interval of 3 to 4 days, starting 35 to 40 days after the heading dates.
   The cracked grain ratios were determined by inspecting and counting the cracked grains out of the sample of 200 hulled grains obtained by husking with test husker the grains on panicles which had been cut from the field as whole plants and sun-dried.
   The shattering losses were determined by measuring the percentages of threshed grains from the sample panicles having been placed on the flat floor and subjected to mechanical impacts generated by rolling a steel pipe weighing 1 kilogram over it.

Results:

With GZ-1368, a high percentage of shattering losses was observed, and the incidences of cracked grains were more numerous than with other varieties once the stage of maturity was reached.

Measured evidences showed that the moisture reduction proceeded rapidly upon the termination of maturing process, with the moisture contents approaching to 16 to 17 percents in some varieties.

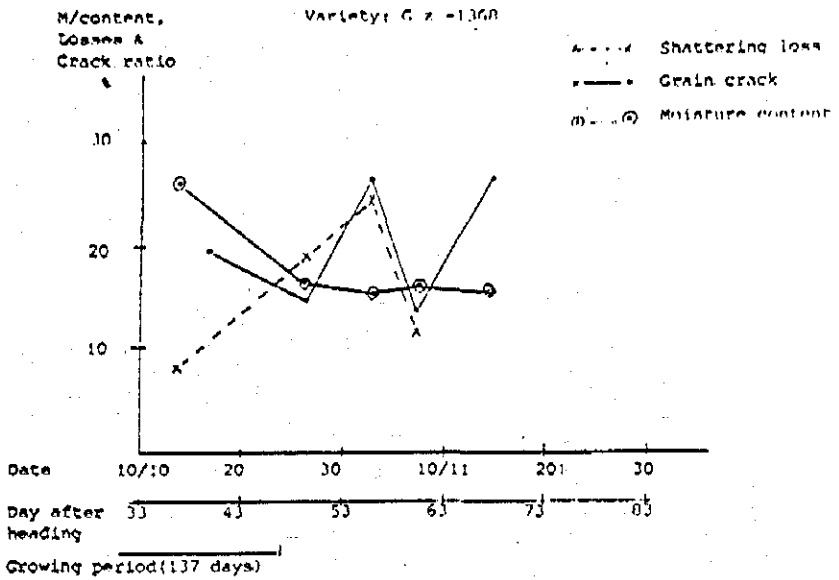
Conclusion and discussion

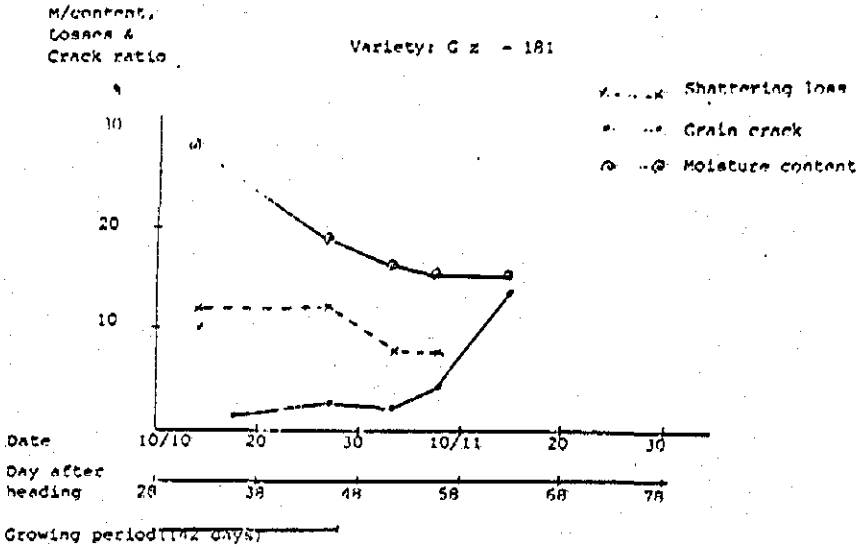
Observations and measurements confirmed the existence, with the newly introduced varieties as well, of the common phenomenon and problem that the delayed harvesting tends to engender the high incidences of shattering losses and the deterioration of grain qualities by increasing the proportion of cracked grains.

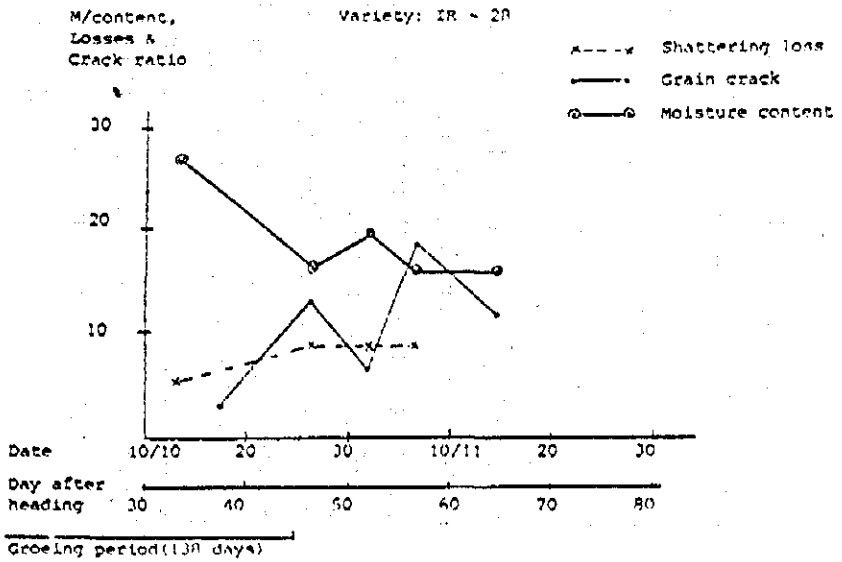
The shattering losses create a more serious problem in the mechanized harvesting by head-feeding type combine than in that by conventional type of combine. In the case of head-feeding type, the crop materials are first gathered by a somewhat complicated mechanism consisting of a reciprocating cutter-bar and a set of combing plastic fingers running rapidly on vertically moving rows of chains, which constantly shakes and rubs the top portion of target crop plants. After cutting, the crop masses are formed into a sort of two-dimensional continuous band-like structure, and held between a succession of chain conveyers, transported in an orderly but circuitous manner until they reach and are fed into the thresher unit. During these processes, there are a great many chances of pushing and shoving of the grain portion of the crop, an ideal condition for generating shattering losses. There exists virtually no facility for prevention of shattering or recovering fallen grains. In other words, this mechanism has the rationale of existence on the assumption that the intended crop materials possess a sufficient level of resistance to shattering.

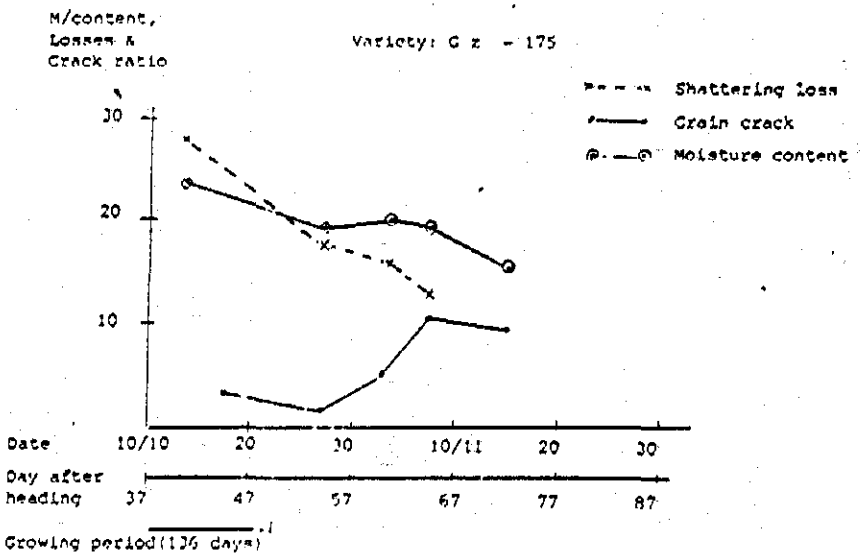
Unlike this head-feeding type, the conventional combines cut and gather crops by the simple reel-cutter-bar-auger-platform mechanism. The chances of occurrence of shattering losses are minimal and facilities for recovering loosen grains are inherent to the whole mechanism except for the shattering resulting from the reel action in front of the cutter table.

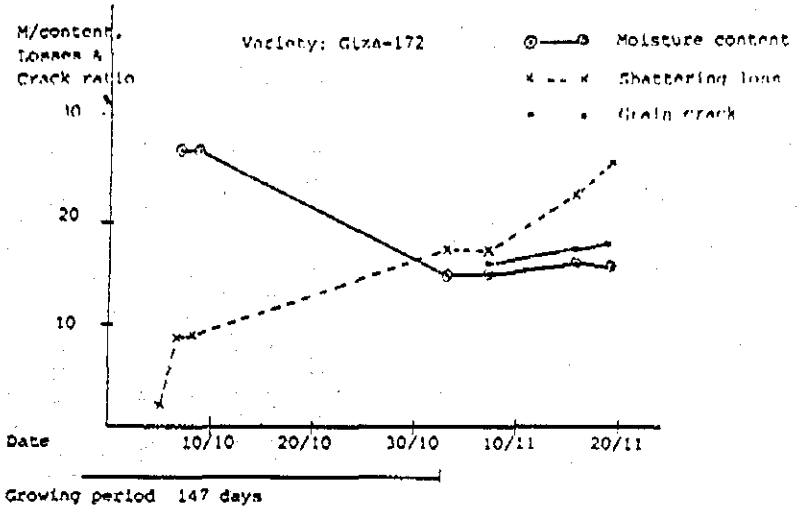
The surveillance of the maturity process and the changes of crop conditions are the crucial part of mechanized harvesting technology. Since it has been known that the dehydration proceeds rather rapidly after reaching maturity, it is a highly advisable practice to complete the harvesting operation within 10 days after the maturity date. This is a vitally important consideration in harvesting newly introduced varieties which have been identified with the characteristics of readier shattering.

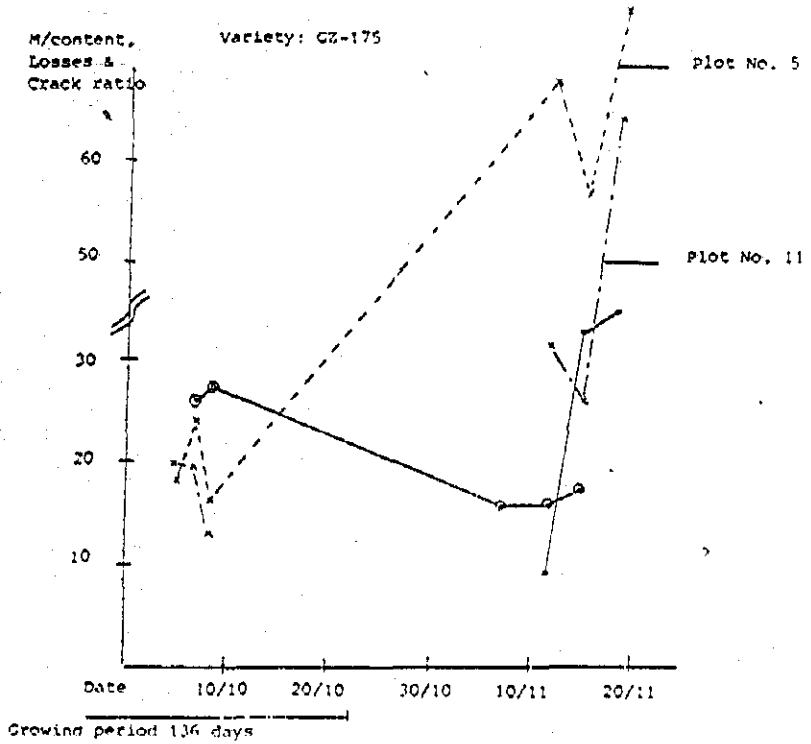

M/content,
Losses &
Crack ratio
Variety: G z -1360
Shattering loss
Grain crack
Moisture content
%
30
20
10
Date
10/10
20
30
10/11
20
30
Day after heading
33
43
53
63
73
83
Growing period(137 days)


M/content,
Losses &
Crack ratio
Variety: G z - 181
Shattering loss
Grain crack
Moisture content
%
30
20
10
Date
10/10
20
30
10/11
20
30
Day after heading
28
38
48
58
68
78
Growing period(142 days)


M/content,
Losses &
Crack ratio
Variety: IR - 20
Shattering loss
Grain crack
Moisture content
%
30
20
10
Date
10/10
20
30
10/11
20
30
Day after heading
30
40
50
60
70
80
Growing period(130 days)


M/content,
Losses &
Crack ratio
Variety: G z - 175
Shattering loss
Grain crack
Moisture content
%
30
20
10
Date
10/10
20
30
10/11
20
30
Day after heading
37
47
57
67
77
87
Growing period(136 days)


M/content,
Losses &
Crack ratio
Variety: Giza-172
Moisture content
Shattering loss
Grain crack
30
20
10
Date
10/10
20/10
30/10
10/11
20/11
Growing period 147 days


M/content,
Losses &
Crack ratio
Variety: GZ-175
Plot No. 5
Plot No. 11
60
50
30
20
10
Date
10/10
20/10
30/10
10/11
20/11
Growing period 136 days

I-7-2 COMBINE PERFORMANCES WITH SHORT-STATUED VARIETIES

Investigators: Essam M. Ghazy, Assar M. Assar, I. Matsumoto

Objectives: To assess the performances of a head-feeding type combine in harvesting newly introduced short-statued varieties.

Experimental design and procedures :

The cultivar Giza-175 (maturity period 136 days),transplanted by machinery and grown by standard cultivation practices, was used as harvesting crop material. Harvesting tests took place on 3rd November 1987, on plot No.2, Field Block A, R. M. C., with area of 2900 m²(100 m × 29 m).
Tested combine model: ISEKI HL-2500, cutting width 1.2 m, 4-row type.

Experimental Results

1. Field efficiency of the operation(ratio of actual capacity vs. theoretical one without turnings and stoppings, travelling at the constant speed of 0.54 m per second) reached 83.7 %, with the grain moisture content at 18.5 %.
2. Head losses and unthreshed grains in the discharged straws amounted up to 5 % at the travelling speed of 0.54 m per second. Main causes of these losses can be ascribed to ; 1) the relative ease of shattering with this variety, aggravated by the inevitable battering of panicles by gathering tines running vertically on rows of gathering chains in front of the header unit, and 2) the configuration of the crop plant which does not permit to feed all the panicles into the threshing cylinder. The recorded plant height ranged between 86.5 cm and 94.0 cm, with the mean at 88.3 cm. It is conceivable that there were many plants, the heads of which were not able to reach the threshing device because of too short straw lengths.
3. The harvesting date fell on the 149 th day after seeding, with the moisture content of grains at 18.5 % and that of straw at 50 %.

Conclusion and discussions.

With the crop conditions tested, the harvesting the short-statued cultivar Giza-175 with head-feeding type combine turned out to present a problem of relatively large losses in shattering and unthreshed panicles. The operation itself proved to be of high field efficiency one.
The timing should be advanced to avoid the shattering loss in the case of harvesting Giza-175. Further examinations of varietal characteristics in relation to combine harvesting are needed to ascertain suitable varieties for mechanized operations and to devise appropriate operating tactics in the actual applications.

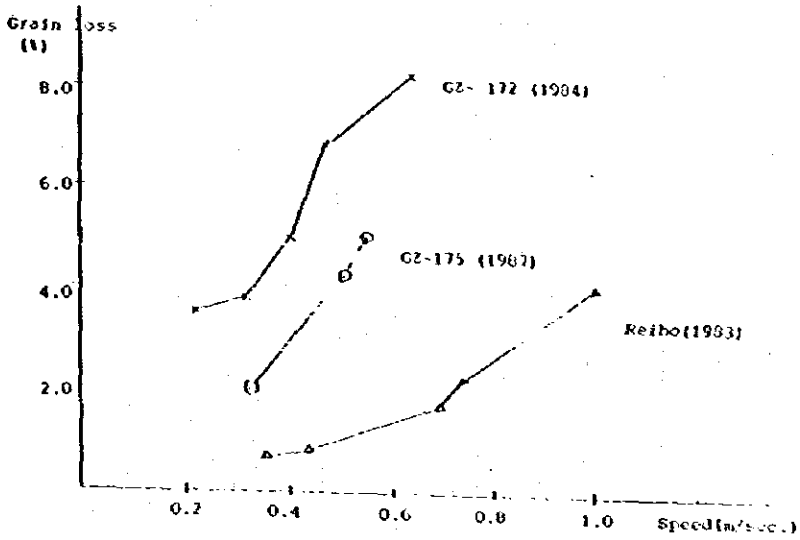


Fig. Working speed and Grain losses

Note: Variety GZ-172 - - M/content/16.3%, Standing angle/44.4°
Declining angle/77°, Plant height/120cm
Variety Reiho - - M/content/16.6%, Standing angle/45.0°
Declining angle/77° Plant height/101cm
Variety GZ-175 - - M/content/ 18.5% Standing angle/66.°
Declining angle/71.5Plant height/88.3cm

Variety: GZ-175, Moisture content: 18.5%

Loss(%) \ M/Sec		0.33	0.53	0.58		
Unthreshed loss		0.66	1.56	2.18		
Chaff loss		0.22	0.30	0.34		
Head loss		2.10	2.30	2.40		
Total loss		3.03	4.38	5.00		

Variety: Reiho, Moisture content: 16.6% (1983)

Loss(%) \ M/Sec		0.35	0.47	0.70	0.76	1.00
Unthreshed loss		0.23	0.32	1.05	1.39	2.92
Chaff loss		0.28	0.33	0.53	0.64	0.58
Head loss		0.15	0.19	0.37	0.43	0.63
Total loss		0.71	0.84	1.35	2.23	4.13

Variety: GZ-172, Moisture content: 16.3% (1984)

Loss (%) \ M/Sec	0.22	0.32	0.40	0.46	0.63	
Unthreshed loss	0.27	0.53	0.65	1.03	1.40	
Chaff loss	0.08	0.14	0.08	0.08	0.45	
Head loss	3.16	3.30	4.31	5.40	6.45	
Total loss	3.51	3.83	5.00	6.08	8.30	

SURVEY SHEET FOR OPERATING METHOD

Name of machine : ISEKI HL-2500

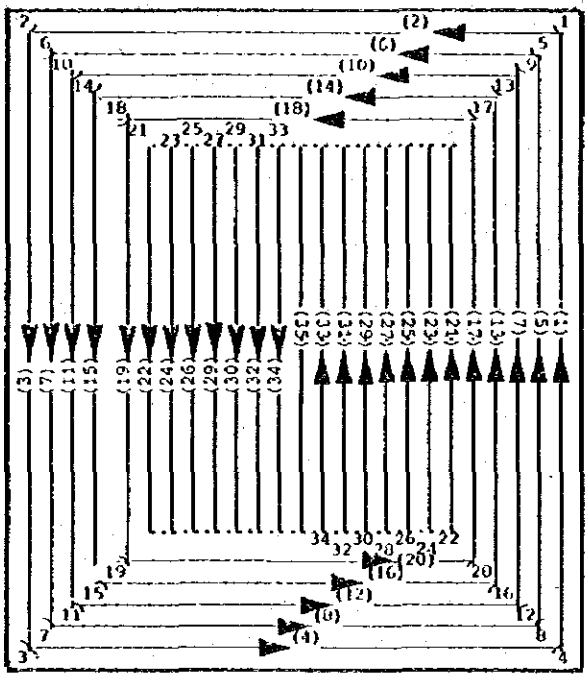
Date of test : 3 / 11 /1997

Location of test : R.N.C Field (Plot NO.2)

Area : 2910 m² (100 m X 29.1 m)

Variety : GIZA 175

Recorder : Essam & Assar



		Hour	Minute	Second
NOTE ,	* Operation time	1	2	11
	* Turning time	-	11	35
	* Adjusting time	-	-	31
	** Total time	1	14	17

I-7-3 PERFORMANCE IMPROVEMENT OF GREEN HOUSE-TYPE GRAIN DRIER (SOLAR GRAIN DRIER)

Investigators: Mohamed kholy, Essam M. Ghazy, T. Kato, I. Matsumoto

Objectives:

To determine the drying capacity of existing units under different conditions, and to assess the possibility of performance improvement by adding materials to enhance absorption of solar heat.

Experimental design and procedures:

Three units of solar grain drier, each having drying floor area of 16.2 m^2, were set up side by side and tested simultaneously. The configuration of the driers consists of a plastic film green house constructed over a drying bed with an aerating fan forcing the air out of the plenum chamber below the perforated floor. The solar heat is supposed to be trapped in the air above the grain and raise the temperature before the air goes through grain layer by vacuuming.

Two categories of experiments were planned and carried out accordingly.

1. Performance evaluation for increased loading capacities, varying the load at three levels, i.e., 2, 3, and 4 tons per single batch.
2. The determination of accelerating effects resulting from over-laying black net screens over the top of grain bed, changing the number of ply of net screens, i.e., single, double, and nil.

   The black net screens utilized were those usually used for diffusing or alleviating direct sunlight to protect young plants or special horticultural plants from too intense an exposure.

Items of measurement were as follows:

(1)Moisture reduction rates, by moisture meter(electrical resistance).

(2) Temperatures and relative humidities of ambient air, and temperatures inside the grain bed and in the air space below the plastic canopy of the green house by thermocouple temperature recorder.

(3) Solar radiation, by a properly calibrated solar meter with a millivolt recorder.(4) Air-flow volume, by heated wire anemometer.(5) Ratios of cracked grains, by inspecting hulled grains on transparency plate. Sample grains of 50 gram were husked by test husker and 200 grains of brown rice from each sample were scrutinized for the traces of developed crack lines. (6) Germination rates of seeds.

Results

1. Loading capacity trials were conducted on 8th October, and 2nd November. The amounts of incident solar radiation during experiment hours for those dates were, 4110 K Cal per M^2 and 3045 K Cal per M^2 respectively. The average moisture reduction rates were 0.88 %, and 0.49 % for each date.
   With the tested set-up of the equipment, no distinct differences in drying rates were observed among the loaded capacities under the same solar radiation and ambient air conditions.
2. When the double-ply black screen nets were placed on the surface of grain beds, a wider difference in moisture reduction rates was observed between the grains in the upper layer and those at the bottom.
   Actual average hourly reduction rates were, 0.61 % for the top portion, and 0.46 % for the bottom. The corresponding figures for the experiment with the single-ply covering were, 0.66 % and 0.58 %.
   The temperature rises of in-house air were 3.76 C for the double and 3.21 C for the single. Fig. 2, 3, and 4 illustrate the processes of moisture reduction by different treatments at three different levels inside the grain layers. With two sheets of black net coverings, although the temperatures were higher, the drying rate for the bottom portion was lower than that for the top, creating larger moisture differentials for grains depending on the location.
   The data for the control treatment of drying without heat-enhancing materials was not obtained due to power failure.
3. The moisture reduction rates decreased after around 3 p.m., and, if the aeration was continued, the grains eventually started to absorb moisture from the ambient air, as the relative humidity began to rise as a result of falling temperature.
4. The germination rates by a laboratory test at 30 degree C. exceeded 90 % for all treatments without distinct differences among them.

Conclusion and Discussions

With the on-going specifications of the equipment, the loaded quantities of grains up to 4 tons per batch did not significantly affected the drying rates. Therefore, from the economic point of view, the amount of loading should be raised to the maximum capacity of 4 tons.

Overlaying the grain surface with black net screens definitely raises the air temperature, but doubling the sheets seemed to retard the air flow and affect the uniform drying rates within the layer.

Drying rates after 3 p.m. decrease and the timing of termination should be carefully chosen to prevent possible moisture absorption.

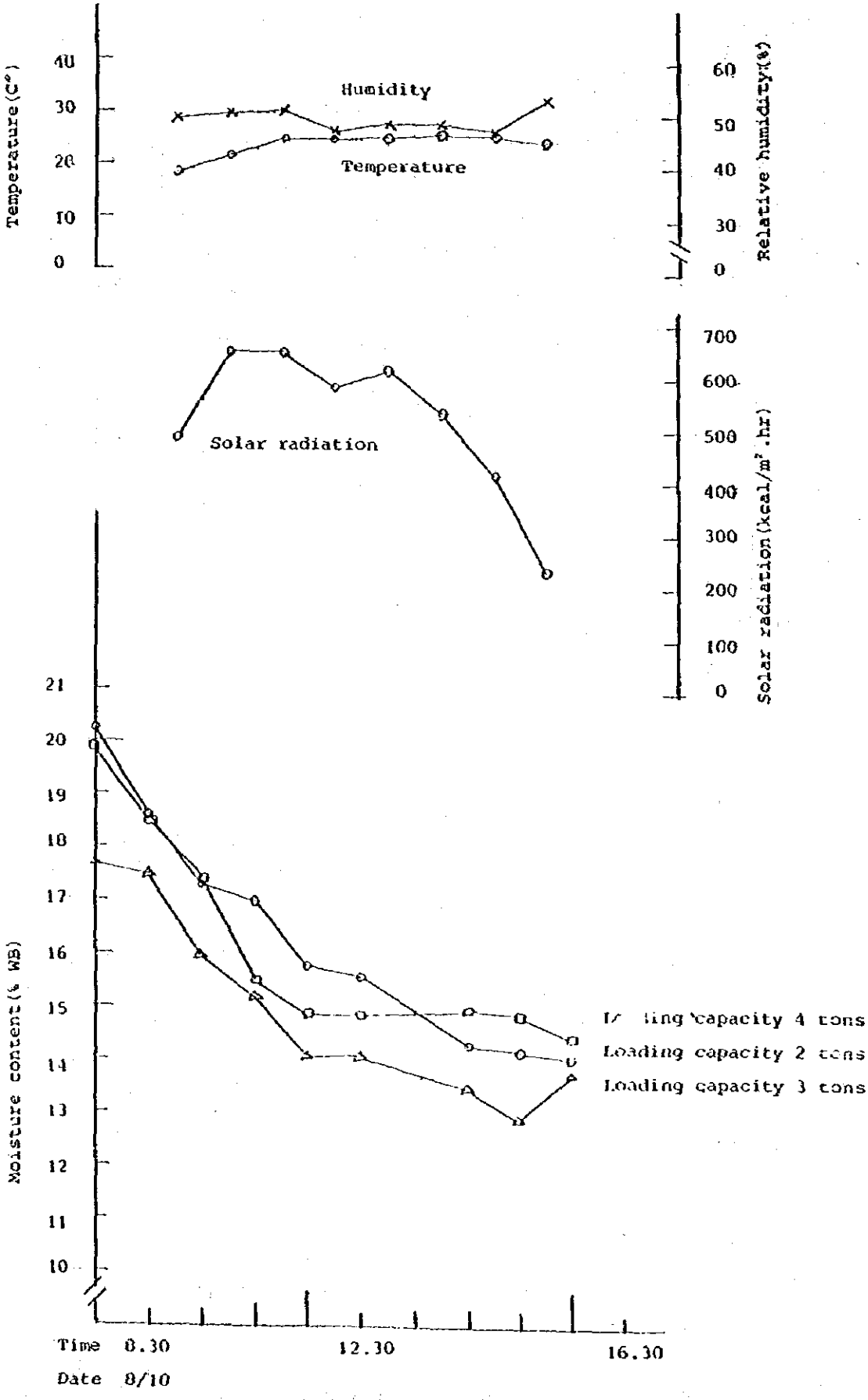
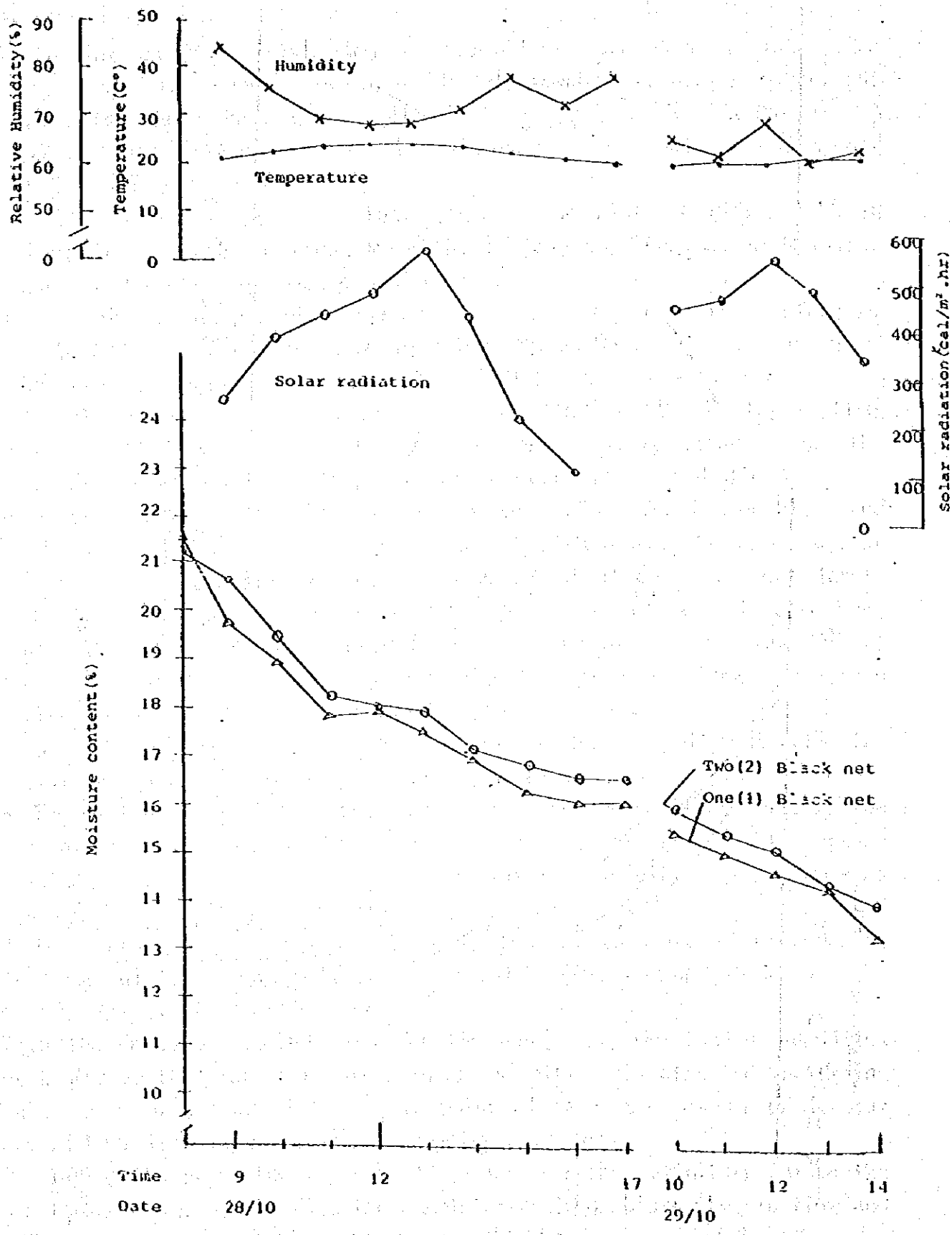
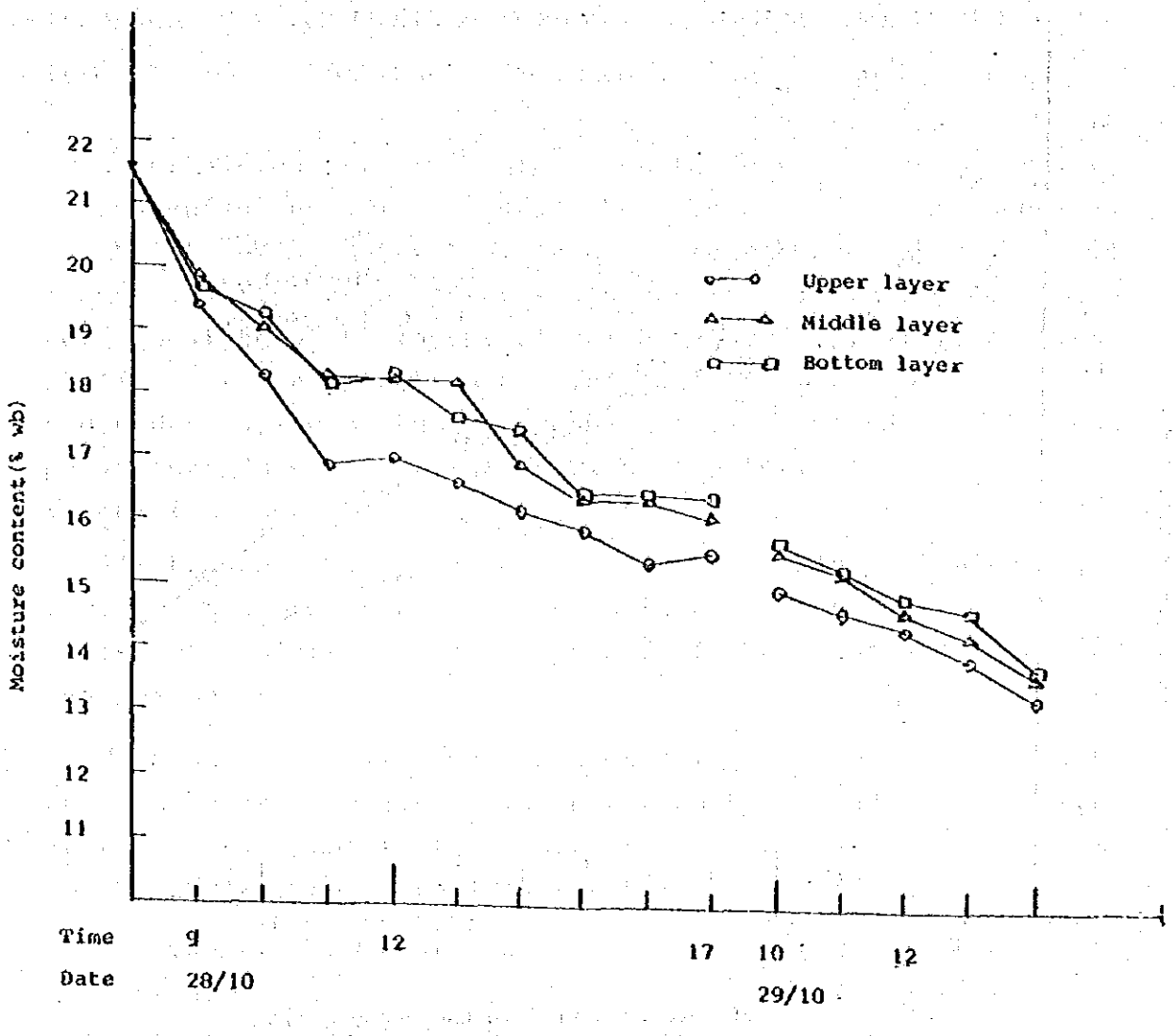


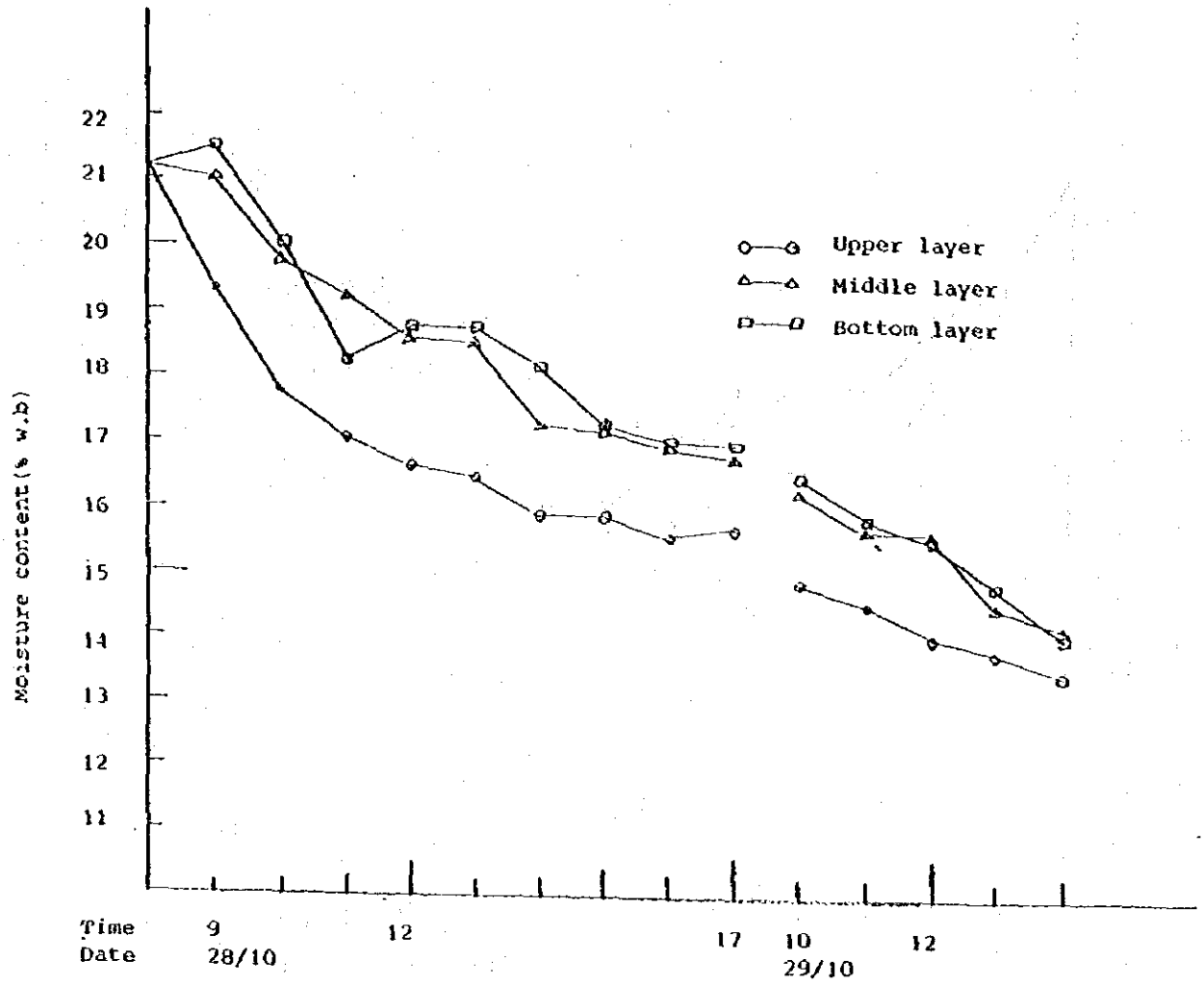
Fig. Moisture reduction in the grain



Fig, Moisture reduction in the grain



F-9, Moisture reduction in the paddy grain by using one(1) black net



Fig, Moisture reduction in the paddy grain by using two(2) Black net

II. TRAINING IN OPERATIONS AND MAINTENANCE OF MACHINERY AND EQUIPMENT

II-1 Outline of Activities in Workshop for Equipment Maintenance

A certain number of machines and technicians were recruited to replenish the existing staff to strengthen the technical capability of the workshop. In order to enhance the sense of responsibility, each operator was specifically assigned to a certain piece of equipment of which he assumed full responsibility for the operation and maintenance in perfect shape and and order. Besides, the workshop supervisor would carry out periodical checkups of the machines together with individual technicians appointed.

All transplanters (37 units) and rotary plows (8units) were repaired and repainted. Moving parts of combine harvesters (12 units) were disassembled and checked for necessary repairs and readjustments.

With an aim to improve and update the knowledge and skills, sessions of on-the-job training for machines and operators were held by a short-term expert and enginnering staffs during the transplanting as well as the harvesting season.

A warehouse for spare-parts was constructed. With the floor area of 180 m^2 (9m x 20m), and the 70 units of parts-shelves procured and installed, it is capable of storing a huge inventory of spare-parts. In order to facilitate a systematic stock control, a card system was introduced. Those spare-parts so far stockpiled in makeshift areas have been properly rearranged and classified according to their kinds and categories of machines they are intended to service.

Grain storage/drying shed was constructed to facilitate the work of post-harvesting processing. An aerating bin equiped with the grain circulating device was installed together with a rice mill. Laboratory apparatuses for drying and milling were furnished to facilitate to control the material flow and to monitor the product quality.

II-2 TRAINING ACTIVITIES AT R M C

I. Background - Achievement in the past years

1) Since the establishment of R M P P in the fiscal year of 1981, Training & Mechanization Division has successfully completed totally fifty-six (56) courses (totally 877 accpeted trainees) for these six (6) years (1981 - '86). Refer to Table-1.

2) We, however, come to know that the necessary expenses of the above mentioned training activities had been appropriated from U S A Agri-Mechanization project's fund under Dr. Sahrigi's management.
And since 1986 up to now, our training activities have been obliged to suffer severely from the budget insuffi--ciency because the above said U S A Agri-Mechanization Project has closed already.

3) With such background, our activities were focusing on univ. students training courses only. Totally 133 students were accepted in 1986, but there have been no more any basic mechanization training courses for government technical officers.

II. Outline of activities in 1987

1) For the purpose to re-inforce the activity, Training Div. with 7 staff members was newly established at R M C at the end of 1986.

2) In 1987, the following training courses were opened.
(A) 4 basic mechanization courses (for students and coun-

terparts in Satellite Field).

(B) 9 seminar courses (for Satellite and Kfs Gov. staffs).

Thus accepted number of trainees were counted 603 persons in total. Refer to Table-2. In addition, 2 special courses on the third country training were held here in R M C, as follows;

(C) Observation course on Basic Mechanization Nov. 30th, 12 trainees by EICA-Japan.

(D) - Ditto -

Dec. 2nd - 3rd, 15 trainees by EICA England.

III. Brief Commentary

1) Two Basic Mechanization Courses for satellite field (State farm staff members) in spring were carried out successfully. All trainees showed their keen interest and strong desire to study new technology. Their active behaviours were clearly reflected on the results of final examination and evaluation.

2) On the other hand, five (5) seminar courses were opened at the site of each satellite field during transplanting season. Those seminars consists of the following: Three (3) subjects. Namely, 1 Brief instruction on mechanical transplanting technique, 2 Movie film show (Golden Nile Delta), and 3 Demonstration of rice transplanting work in the field by Mr. YAMASHITA (Short term expert) etc.

These training actions at the time when the new satellite field (5 sites) started were timely and opportune.

It was highly appreciated by Egyptian Government (Dr. Sahrigi etc.).

3) From the view-points of up grading the instruc-- tor's capability in the field of teaching, the following two (2) actions were taken.

Point-1: To make a series of practical film slides on nursery making, and main new farm machinery, by their own hand.

Point-2: Opening a series of Kato's seminars on How to make farm machinery utilization planning in rice production, (Nov. 1986 - March 1987) totally 10 seminars, 15 counterparts for each, using Text-book.

4) As before mentioned, various kinds of training courses were opened under the budget limited situation. It can be said that those activities were proceeded based upon the maximum and best efforts of staff member of Training Div., which were really energetic, active and also admirable.

IV. Proposal for the fiscal year 1988

1) According to the reliable information from Egyptian Gov. (Dr. Yousef Wali = Minister of Agri., and Dr. Sahrigi = General Director of A M R I etc.), it seemed that they intended to establish the leading core of mechani--

zation training in Egypt through strengthening and reinforcing of R M C in near future. Under such recent trend, Dr. Sahrigi came to request strongly the tight co-operation to our Japanese Team in the field of training also.

In parallel with this request, Director of R M C (Mr. Eng. Osama Kamel) has started to discuss the preparation of a master-plan of the re-inforcement of training activity in Training Division R M C under the co-operation with Japanese Experts.

2) Outline of this master-plan

In this regard, it can be summarized into the following four (4) points.

Point-1: Total acceptable number of trainees would be around 3,600 persons through totally 102 training courses, focusing on technical officers in the Nile Delta region, for these 3 years (1988 - '91).

Point-2: In the composition of curriculum, much emphasis should be laid on practicals, and the main subjects should be composed of practical technology of mechanical transplanting, mechanical harvesting and grain drying, including mechanical direct seeding cultivation etc. Moreover, the diversification of training methods would be indespensable too.

Point-3: The necessary budget is 100,000 L.E/year.

Point-4: Through the realization of this master plan, one can expect to extend and diff-- use widely the fruitful results of R M C's activities which have been achieved for these seven (7) years since the establish ment of R M P P.

(Remarks)

The detail paper on master plant was submitted at the Team Leader Meeting at Brazil in February, 1988.

(Training Division)

1- Mr. Fathy El-Nemr
2- Mr. Abd El-Magid Romih
3- Mr. Mohamed Yousef
4- Mr. Abd El-Gawad Balli
5- Mr. Abd El-Rahman Emara
6- Mr. Refai Mohamed
7- Mr. Essam El-Saftawi
Mr. Tomizo Kato

Table-2 TRAINING DIVISION ACTIVITIES AT R.M.C IN 1987

A. Training Course:

Title of T. Course	Training schedule	Nos. of trainees	No. of days per course
1. Basic Mechanization Course (Transplanting)	From 28th Feb. to 3rd March	17 trainees	14 days
2. Basic Mechanization Course (for new staff)	From 4th April to 9th April	19 trainees	6 days
3. Practical training of Agri-Machinery for University students	From 27th June	27 trainees	6 days
4. Machinery harvesting course	From 28th Sep. to 30th Sep.	40 trainees	3 days
Total		103 trainees	29 days

B. Seminars:

1. Five (5) seminars at R.M.C, Gimmeza, Edfina, Serw and Saft Khalid at the season of transplanting (May - August) around 300 per seminar.
2. Four (4) seminars at R.M.C, Gimmeza and Edfina satellite field at harvesting season (November) around 2000 per seminar.
3. Scientific seminars:Direct seeding (August), Blast Disease Control (November).

The results of training for mechanized rice cultivation

Title of training	Yearwise	Training schedule (4 5 6 7 8 9 10 11 12 1 2 3)	Name of dispatched governorate and Nos. of trainees (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	Total	Nos.of training course	Nos.of days per course
Rice mechanization basic course	1982		148										148	10	6
											Sub total		148	10	
Rice mechanization basic course	1983		268										268	15	12
Advanced machinery course			13										13	1	6
Advanced cultivation course			12										12	1	12
											Sub total		293	17	
Rice mechanization basic course	1984			10	13	9	8	1	1	1			43	3	16
											Sub total		43	3	
Rice mechanization basic course	1985			8									8	1	12
Rice mechanization advanced course				9	8	7	1	1					26	2	12
Practical training of agricultural machinery for university students											136		136	12	6
Joint training program with Sakha Agricutural station												30	30	1	6
											Sub total		260	16	
Practical training of agricultural machinery for University students	1986												133	10	6
T o t a l			441	27	21	16	9	2	1	1	292	30	877	56	

Note ; (1) = Kafr El-Sheikh (2) = Sharkia (3) = Bihira (4) = Kalubia
(5) = Charbia (6) = Cairo (7) = El-Menia (8) = Beniswif
(9) = University students (10) = Joint training with Sakh Station

Details,

Rice mechanization basic course,	29 course,	467 trainees
Rice mechanization advanced course,	2 course,	26 trainees
Advanced machinery course,	1 course,	13 trainees
Advanced rice cultivation course,	1 course,	12 trainees
Executive engineer training course with Sakh,	1 course,	30 trainees
Practical training for University students,	22 course,	329 trainees

RMC, mechanization division. July.1986

III. DEMONSTRATION OF THE STANDARD TECHNOLOGY PACKAGE

III-1 DEMONSTRATION AT R M C

I. Objectives and Targets

This part of our activities is to exhibit a technical package of the exemplary mechanized rice cultivation system, as practised on an authentically practical scale using the R M C fields (56 feddans) and facilities with all the infrastructure, irrigation and road, prepared as it should be. The technical package was derived by modifying and improving the system already established through the verification trials in the preceding phase of the project.

Actual target yield was set at 3 tons per feddan(7.14 tons per hectare) as the average value obtained from different patches of mostly low fertility paddies reclaimed from saline marshy pieces of land. The yield records from the same fields in the previous growing season stood at 2.2 to 2.7 tons per feddan at the most. The points of improvement were sought in the following aspects of the entire system.

1. Improvement in the tillage operations, including more elaborate plowing, harrowing, and levelling procedures.
2. To establish a more densely populated crop community by increasing the number of plants per unit area, which is to be effected by the machinery adjustment to portion out larger seedling blocks from the nursery mat, and also by the increase of frequency of picking and planting strokes resulting in the closer hill spaces along the rows.
3. An increase in fertilizer dosages to facilitate more vigorous growth.

II. Results:

1) Summary of yield record;

A total paddy rice yield of 172.284 tons/56.08 feddan (average 3.072 tons/feddan) was recorded by harvesting by self-feeding Combine for all of production fields. This increased yield in 1987 season is equal to 121% of the yield record in 1986 season. For varietal breakdowns, 118% in IR-28 and 123% in Giza-171 respectively.
In this regard, refer to Table-1.

Table-1. Yield Records in 1987 Season

Variety Used	Name of Block	Total area of each Block ①	No. of plot in each Block	Total yield in each Block ②	Average yield ③ (③=②/①)	Average yield ④ (④=③x 100/42)	Ratio of 1987 record / 1986 record	Achievement score to the target
		f.	plots	tons	ton/f.	ton/h.	%	
IR-28	B	18.71	23	69.609	3.720	8.854	118	102.4%
	C	20.62	23	51.782	2.511 (3.185)	5.976 (7.590)		
	D	8.96	12	29.893	3.336	7.940		
Giza 171	A	7.79	8	21.000	2.695	6.414	123	
Grand total		56.08	66	172.284	3.072	7.311		

(Notes)

(i) Grain moisture content was 19% approximately at harvesting.

(ii) Field map was attached into Appendix-I.

2) Variation of yield among plots in each Block

A certain degree of variation of yield among plots was clearly observed. The results of yield-survey showed that as a whole there was some tendency of yield-decrease in parallel to the distance of Irrigation Branch Channel from Irrigation Inlet Gate (I.I.G). The longer the distance was from the I.I.G., the less the yield became. This yield variation depending upon the plot location matched with an actual observation that those plots situated at down-stream side of an irrigation canal were often left exposed without water for many hours, because of the impeded water flow due to the rampant weed growth in the ditch. Examples of variation on yield are described as follows (Table - 2)

Table-2. Examples of yield-variation

Name of Block	Plot No.	Rice growth in ripening stage	Area of each plot ①	Total paddy grain yield ②	Average yield ③ (③= ②÷①)	Remarks
	Plot		f.	Tons	ton/f.	
B	No.21	Good	0.924	3.6	3.896	Well-irrigated
	No.2	Poor	0.903	2.9	3.212	More weedy (i) Terminal I.B.C has much weed growth and poor irrigation.
C	NO.19	Good	1.002	3.5	3.493	Poor irrigated
	No.2	Poor	1.002	2.4	2.395	More weedy (ii) Terminal plots were less yielding

(Notes) A) Field map was attached into Appendix - I.

3) Operational Process;

A series of operations on the improved mechanization system were listed up as follows:

(i) Nursery: By using Kubota model Automatic Seeding Device (seeder), all the necessary nursery trays were seeded during the period of 10 days from May 10th to May 20th. It was 15 days earlier in this year than in 1986 season. General progresses on the nursery field were satisfactory even though the timings of irrigation were a little bit delayed due to Irrigation Office controls.

(ii) Operation on Regular Paddy Field: It consists of the following twenty-five (25) steps or processes as listed below. Here, improvement or newly added operational techniques in this 1987 season were shown with asterisks. Where;

* 1 Plowing No.1 (chisel plow) - Rotary plowing which was done with shallow depth (10cm) in 1986 have been cancelled in 1987.

* 2 Destroying Dike (Bottom plow) - It was to kill perenial weeds on Dike.

3 Harrowing (Disk Harrow).

* 4 Plowing No.2 (chisel plow).

* 5 Plowing No.3 (chisel plow).

Through these two plowing operations deeper plowing (15cm depth) was performed;

* 6 Hard-pan (or deep layer) breaking (subsoiler) - aimed at good drainage.

* 7 Gypsum application (Trailer & Manual) - 1 ton/f. aiming at improvement of high alkalinity soil.It should be continued for three years.

* 8 Dike-making (Dike making machine) - It is popu-- lar in Egypt.

* 9 Basal fertilizer application (Broadcaster & manual) - Ammonium Sulfate 100Kg/f., Super Phosfate 150 Kg/f. Potassium Sulfate 30 Kg/f. These amoun ts in 1987 were equal to 125% of that in 1986.

10 Irrigation.

* 11 Puddling & levelling (Tractor & wooden-leveler)- In 1986, this operation was carried out by dep-- loying power driven puddling equipment, and the results were found unsatisfactory because of insu fficient levelling and too much pulverizing action which created too soft textured a planting bed. Therefore, this year, the rotary puddler was replaced with a simpler and more literally down-to-earth traditional device.

12 Herbicide application No.1 (manual) - Ronstar 2l/f.

* 13 Transplanting (Riding type Rice Transplanter) - It continued from June 1st to June 15th (It started and was finished 15 days earlier than in 1986).

14 Replanting (manual).

15 Herbicide application No.2 (manual) - Mo granular 12 Kg/f. 7 days after transplanting.

* 16 Top-dressing No.1 (manual) - applied 10 days after transplanting. The amounts were as follows;
IR-28; 50 Kgr. (2 times more than last year's rate)
Giza-171; 25 Kgr. (same as the last year' rate)

17 Weeding (manual).
Hand weeding No.1, 6 man-days/f., 30 days after transplanting.
Hand weeding No.2, 6 man-days/f., 50 days after transplanting.

18 Top-dressing No.2 (manual) - The amount was as follows; Both of IR-28 & Giza 171.....Urea 25 Kg/f.

19 Rice Blast disease control (power sprayer + Swath-nozzle) - For Giza 171 only.....2 times sparying;
1st time.....25 days after transplanting.
2nd time.....immediately before heading.

* 20 Application of Rat control chemical (manual) - at ripening stage.

* 21 Bird control (manual) - at ripening stage.

22 Harvesting (head-feeding type combine & trailer).

23 Straw disposal (straw bailer).

24 Transportation of straw (trailer).

25 Drying grain on concrete flat (manual).

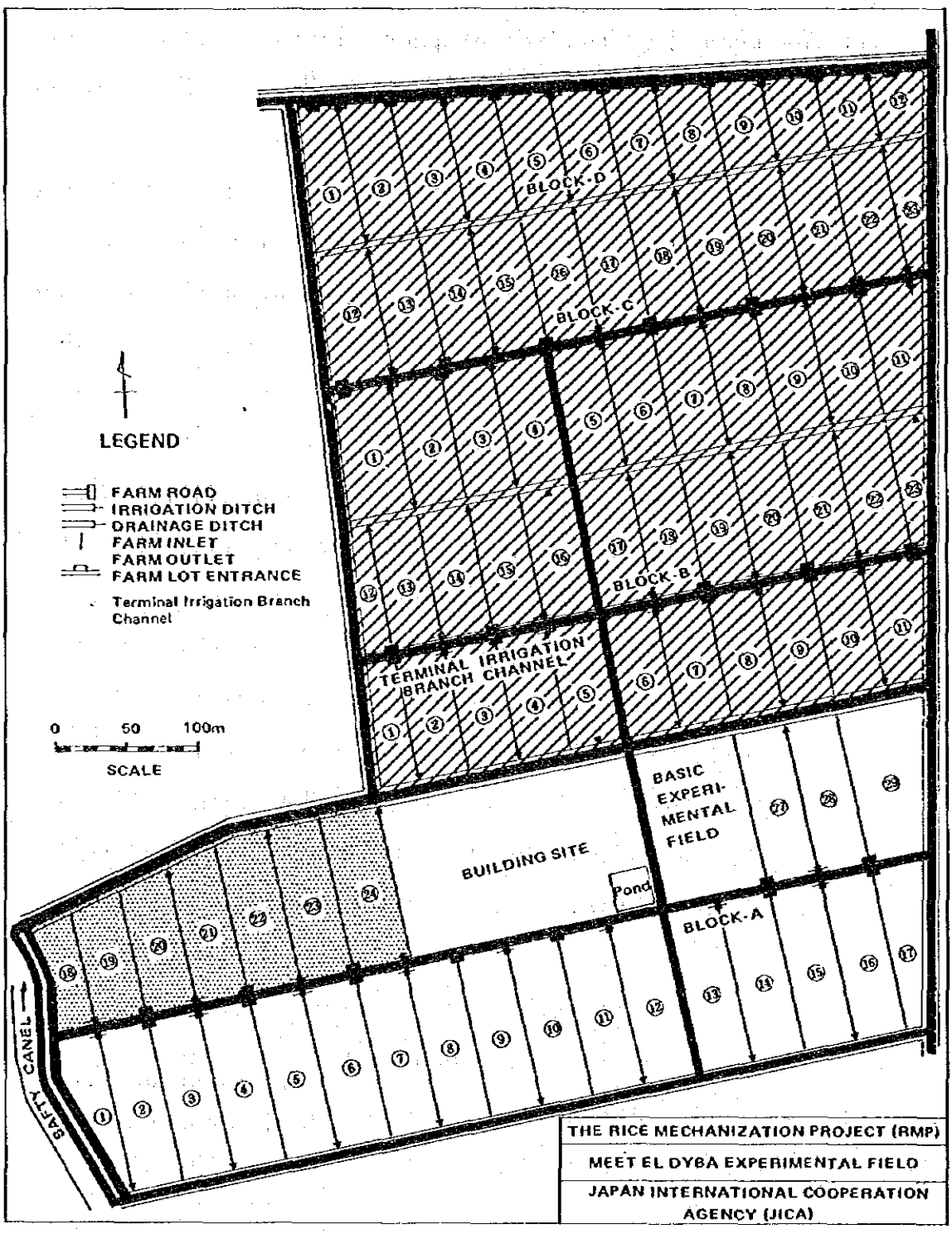
(Notes) Step 23. straw disposal was not so effi-- cient due to the frequent breakdowns of straw Bailer.

III. Others

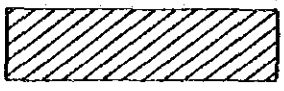
1) The target (3 ton/f.) of paddy grain yield was realized or attained enough. It, however, should be followed by economic evaluation later on.
2) It can be said that the above-mentioned activities (referring to II) were really effective in demonstrating rice production mechanization actually to many participants of seminar course and visitors which were held in Training Division, R M C.
3) Proposal to the work in near future.
   ① Operation Diary should be kept punctually to record the process for later examination of the problems and deliberation of improvement measures.
   ② It would be better to introduce newly recommended varieties (short culm, high resistant to lodging and blast disease, high yielding, and also with suitable characteristics to mechanization) for more efficient rice production mechanization if possible.

Production Div.
Mr. Abd El-Fatah
Abd El-Hy
Mr. Hamdy Emara
Tomizo Kato

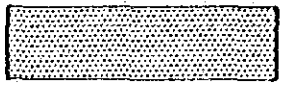
Appendix - I



Pumping Irrigation Water



IR – 28



Giza – 171

III-2 DEMONSTRATION AT FIVE SATELLITE FIELDS IN THE DELTA

1. Introduction

In spite of numerous and complex problems, the satellite fields operation in 1987 has been terminated with quite satisfactory results for the first year. However, the re-considerations for our overall activities through the project operation in this year give us many suggestions for better managements and operations of it. Especially when we collate them with the initial objectives of this satellite field project, there are a lot of points which we could improve.

Here, reflecting on the yearlong progress of the satellite operations, we summarize and discuss the overall results obtained in 1987 season for this segment of the project.

2. Background of S.F. project

The establishment of a standard mechanized rice cultivation system with transplanting method for middle and small scale farmers (3 to 5 feddans) in Egypt had been the ultimate task for the first and second phase of the project (Feb. 1982 to Aug. 1986). The staffs of R M P P and the Japanese Experts Team of J I C A had evolved the coope-- ration works to seek the system through various verifying experiments in Qallin experimental station (up to 1983) and in Rice Mechanization Center (RMC), Meet El-Dyba (from Apr. 1984 to Aug. 1986). After studying individual mechanical and agronomical technologies, they have been integrated organically, and the system have been established finally and successfully.

Although, the system has proved its' high and stable yield with less labour forces in R M C as well as some farmers' fields in Kafr El-Sheikh, the idea to verify the system in other regions of Nile Delta has been proposed. That was one of two principal motivations for the project until Mar. 1990. (The other one was to seek for other mechanized rice cultivation system, mainly direct seeding method).

3. Objectives of Satellite Field project

Therefore, the objectives of S.F. project were specified in R/D in Aug. 1986 as followings;

1) Verifying experiment on the mechanized rice farming.
2) Advice and guidance for the demonstrations of the mechanized rice farming.

The location and area of S.F. have been fixed as in five state farms (Gimmeza, Serw, Idfina, Saft : Khalid and Misir) and around 50 feddans, respectively.

Besides the objectives clarified in R/D, we added the following ones;

3) Clarify regional constraints of the system.
4) Transfer the technologies to the local staffs in S.F.
5) Open field seminar for farmers.

4. Characteristics of the system

Here, we must reconfirm the established system and define the special features in comparison with the traditional rice cultivation system, so that we could get

clear focus to our activities in S.F. Nexts are the special features of the established mechanized system;

1) System

(1) Organic and efficient uses of the machinery.

(2) Object of the system is medium to small scale farmers (3 to 5 feddans).

(3) Machines are to be employed from hiring center or some governmental organization.

(4) Modern and labour saving.

2) Seedlings or seedbed

(5) Raising seedlings by seedling trays.

(6) Special intensive cares are essential in nursery bed.

(7) Special seed treatments (disinfection and salt water selection).

(8) Early sowing (20th, Apr. to 20th, May) and early transplanting (15th, May to 15th, Jun.).

3) Field preparation

(9) Puddling by mechanical means.

4) Transplanting

(10) Use of young seedling (13 - 15cm, 2.5 of leaf age and 20 days seedlings).

(11) Use of transplanter.

(12) Less number of plants per hill (4 - 8) and more number of hills per m^2 ($24/m^2$) are quite uniformaly transplanted.

5) Fertilization

(13) Nitrogen is split-applied as followings; 50Kg/ha at basal, 20Kg/ha at 7 days after transplanting, 20Kg at 20 days before heading and 10Kg at heading.

6) Water management

(14) Intermittent irrigation

(15) Mid summer drainage (42 - 35 days before heading time, duration around 2 weeks).

7) Harvest, Thresh and Drying Paddy

(16) Use of self feeding type combine.

(17) Use of solar grain dryer.

5. Overall progress of the operation in 1987

1) Until field operation start

-3rd, Aug. 1986

R/D for extension of the project from 18th Aug. 1986 to 31st, Mar. 1990 was agreed upon.

-5th, Feb. 1987

Report on Preliminary Survey of Five Satellite Fields was submitted.

-12th, Feb.1987

Joint committe was held at Cairo and Tentative Schedule for Implementation was agreed upon.

-10th, Mar. 1987

New organization of R M C was announced.

-16th, Mar. 1987

Official letters were issued from R M C to State Farms for the cooperation for Satellite Field Project.

-22nd, Apr. 1987

Report on Soil Analysis of Five Satellite Fields have been submitted by Dr. Minoru Morooka.

-3rd, May, 1987

Report on Survey for Five Satellite Fields on The Rice Mechanization Pilot Project was submitted by Mr. Shunichi Hosono.

-21st, May, 1987

Arrival of the machinery and materials for the project from Japan to R M C site.

2) Land Preparation to Transplanting

(1) The field preparation; plowing and levelling.

Full-time engagements of S.F. supervisors started upon the awaited delivery of their motorcycles on 18th April. Although the field preparation got under way much earlier around the beginning of April, the timing was too late to get all the field patches prepared as they should be, especially in regard to the require-- ments for achieving the high degree of levellness needed for our purpose. The half of all Saft Khalid fields had been occupied by broadbeans up to the end of June. The difficulties resulting from such a delay just overwhelming to the available facilities and means for land preparation and the consequences were inevitably unsatisfactory.

(2) Seedbed preparation

The first field operation for each supervisor in S.F. had been seed bed preparations, which were done quite smoothly and rapidly, since there was none of obstacles for the enthusiasmos of the supervisors.

(3) Arrival of seeds

On the other hand, the seeds, which state farm had to provide, never arrived by the time of sowing, and were supplied from R M C. Besides, new varieties which we decided to use in S.F. were released from A R C a little bit late.

(4) Seeding

Accordingly, seed treatments, such as selection, disinfection and soaking seed, were started on 3rd of May finally. It was around 15 days behind the schedule.

Some difficulties arose in seeding operation due to the condition of seeding machine. Because the equip ments from Japan were delivered too late, we used the locally made seeding machines, which did not allow us to sow seed smoothly and uniformaly. Obviously, it caused some disuniformities of seedling stands later.

Soils for seedling trays had been sieved in R M C and were transfered to each S.F., though the quality was not best. Anyhow, we would prefer to obtain and process the soil in each farm site next year.

(5) Seedbed Managements

Generally, the seedbed managements were carried out tolerably, except some shortage of water (Misir), some diseases (Dumping off and Brown Spot) and some in sects (green worm and mole criket). However, they were not so serious and our countermeasures for them brought effects positively.

(6) Puddling of Main Fields

Since almost all the S.F. plots were not level enough as mentioned before, we had a hard time for puddling it. As is known commonly, soil condition becomes too soft when we try to move soil by puddling work in clayey soil. This fact obliges us to puddle the land once or twice within a couple of days. But, if the land is not uniform, water stays longer in lower part, making the soil too soft, while soil becomes too sticky in higher part due to lack of water. We suffered from this dilemma in most of the plots in most of S.F.

The problem of Saft Khalid was peculiar. The harvest of broad beans, which had been occupying the half of S.F. in Saft Khalid, was delayed as late as the end of June. And, there were quite deep cracks in the land, which would have been ammended by compaction if only the time would have allowed. Those complex factors forced us to deep puddling or some plots refused the machine to enter due to deep muddy soils.

(7) Transplanting operation

Success of cultivation by this system is much depending on uniform land condition and sucess of uniform transplanting. The former is, of course, depending on land levelling. The latter is mainly depending on success of puddling, which is mainly depending on land levelling.

Thus, land levelling is the key to bumper crops in the system. But, this land levelling problem is restricted within the state farm only, because farmers' fields are

much smaller (up to 2 feddans) from the beginning and are quite level. S.Fs. in the state farms consisted of large blocks (Appr. 50 feddans) and we had to separate them into small units (Appr. 1 feddan) tentatively.

Accordingly, transplanting operations could progress quite smoothly only where land levelling was tolerable. Generally speaking, there were many difficulties in them. Our main target next year is this point.

30th, Jun.

- Field demonstration of transplanting with the presence of Japanese Ambassador, His Excellency Mr. Hashimoto

(8) Transportation of Seedling Trays

As we have anticipated, we had to employ as many laborers as traditional transplanting needs. This, though, was due to the complete absence of infrastructure in S.F. and shortage of transportation means. We were not discouraged by the discrepancy between labor-saving philosophy of the system and the reality, but actually, it was true we consumed much energy for this operation.

We are very sure we could improve this operation in next year.

3) Main Field Management

All transplanting operations have been finished as

Oct. at Serw S.F. and ended on 1st, Dec. at Gimmeza S.f.

If we point out some limitting factors for this operation, it will be infrastructure and counter-measures for lodging. It is needless to stress here on the importance of farm entrances and farm roads for the operations of harvesting and transporting products.

Lodging in early ripening stage disturbs the translocation of the carbohydrate from leaves to spikelets. The one in late stage increases the grain loss by shuttering. In both cases, the harvesting operation by combine is obstructed. The main reason why we dared to introduce new varieties, Giza 181 and Gz 1368, instead of Giza 171 and Giza 172, is just to cultivate lodging-free rice. And, from this point of view, we were quite satisfied for the results. We may increase the area of new varieties next year.

6. Achievements

1) Yields

Total yield for each plot in each S.F. is shown in Table 1-1 to Table 1-5. The figures are net yields of the plots which were not measured one by one except representative ones. Maximum and average yields in each S.F. are shown in Tab. 2.

followings; 25th, Jun. = Idfina, 8th, Jul. = Misir, 5th, Jul. = Gimmeza, 9th, Jul. = Serw, 13th, Jul. = Saft Khalid. Thus, we overcame the most laborious operation, and started main field managements. Fertilization, amounts and timing of fertilizer application, is well established in the system, and we were only to follow it. Besides this, there are three main tasks in main field managements, i.e. irrigation and drainage, weed control and pests and diseases control.

(1) Irrigation and drainage

The report, which Mr. Hosono submitted in May about water requirements and availabilities in each S.F., suggests us to make additional irrigation facilities in Saft Khalid S.F. only. We brought two to 6 inches pumps there to overcome the water shortage. Actually, water shortage happened in Misir S.F. and two 5 inches pumps were dispatched to support the irrigation system.

The disorder of canal in Gimmeza S.F. cut water for around 5 days, obliging us to postpone puddling and transplanting operations for some duration.

The problem of poor drainage surfaced in Idfina S.F. It was caused by high drainage water level in the main public drainage outside the state farm. Therefore, we closed the drainage system leading to outside and pumped out the drained water 5 inches pump.

(2) Weed control

In relation to poor land leveling, we feared of wide spread of weeds in all five S.F., and waited for the dis

patch of the herbicides. Unfortunately, they arrived behind the desired time and Oxadiazon and Bentazone did not arrive.

We consumed much labor for hand weeding operation, but what way else could we have taken?

In Serw S.F., the rice plants were almost completely defeated by the explosion of the weeds growths.

Shortage of water sometimes induced weed difusion, as was seen partially in Giza 181 variety in Misir S.F., because, it diminishes the effect of applied herbicides and give much chances for weeds to grow.

(3) Pests and Diseases Control

Two main diseases, rice blast and brown spot, and one harmful insect, stem borer, have been observed. Rice blast has been observed at all S.F. while brown spot at Idfina, Gimmeza and Serw mainly. Stem borers have been seen in all S.F. but Gimmeza seems to have been attacked most severely.

We have applied Diazon 5% to control stem borers and EDDP 30% to rice blast and brown spot also. But, they were applied only partially and not enough, although the total losses which have been brought only by these pests and diseases were in the air.

(4) Harvest Operations

Compared to other operations, harvest operation was carried out rather smoothly. It started on 31th,

According to the tables, both the highest average and the highest yield were obtained in Gimmeza S.F., with 2.82 t/ha and 4.6 t/ha, respectively. The ave-- rage of all five S.Fs. is 2.0 t/ha. Although there is a fluctuation of yield within and between S.F., all S.Fs. yields, except MIsir S.F., exceeded the ones of each state farm.

Considering the late start of the project, late delivery of machines and materials and other trou-- bles, we could assess the first year of the project as quite successful one.

2) Experiences

More than the rice products, we have gained abun- dant experiences, with which we would be able to achieve real product targets next season. Especially, five supervisors have had numerous experiences and obtained new skilfullness. Their developed abilities may bring brilliant performances in the S.F. next season.

3) Evaluation of the degree of attainment of objectives

(1) Verifying experiment on the mechanized rice far- ming was decided not to be conducted this year, since one supervisor in one S.F. is not enough to conduct it besides 50 feddans operation.

(2) Advices and guidances for the demonstration of the mechanized rice farming were the duties for Japanese Expert Team, and were fulfilled tole- rably. They issued 17 technical guidances and

advices, which were reported periodically to the supervisors as well as to the S.F. project chief, Mr. Mahmoud Hamad Omar.

(3) Having clarified regional constraints of the system.

This can be considered as the most important objectives of S.F. operation, especially in first year. Due to the different conditions of soil, water, etc., we anticipated several constraints might surface in all S.Fs. And, as was anticipated, several difficulties arose (listed in Chapter VIII). If all constraints appeared in this operations season, we assume that we found out all problems in each region.

(4) Transfer the technologies to the local staffs in S.F.

One to two local staffs from the state farm attended to our S.F. demonstration activities. First of all, they attended the training courses which were held at R M C from 28th, Feb.to 14th, Mar. After getting the idea for the mechanized rice cultivation system through this training course, they started the actual operation with the supervisors from R M C. Though they alone may not be able to manage the mechanized rice cultivation system, they are sure to be of great helps in next operations.

(5) Open field seminar for farmers

-15th, Jun.

Idfina S.F. Demonstration of mechanical transplanting.

-29th, Jun.

Gimmeza S.F. Demonstration of mechanical trans-- planting.

-25th, Oct.

Idfina S.F. Demonstration of combine harvest.

-1st, Nov.

Gimmeza S.F. Demonstration of combine harvest.

7. The obstacles of the operation

All the problems up to transplanting operation were summarized in "Interim Report on Satellite Field Operation, Aug. 1987", and we only itemize them here again.

1) Seed supply was delayed (15 days behind the schedule).
2) Transportation means (Motor-cycles) were dispatched late (17th, Apr.).
3) Translocation of the machinery and equipments were delayed because of the late dispatch of motor-cycles.
4) Some state farms did not have enough facilities of house accommodations for the staffs and the operators from R M C.
5) Land preparation works were done unsatisfactorily due to the shortage of time.
6) Almost no land leveling operation could be done.

7) We suffered from labor shortage.

8) Agricultural materials, such as chemicals, fertilizer and etc., were supplied late.

9) There were no tolerable farm roads and entrances.

10) Soils for seedling trays were prepared in R M C and transfered to each S.F. later, which generated additional laborious work.

11) We were obliged to use local-made sowing machine, which did not allow us to sow seed uniformaly.

12) Due to the problems above mentioned, seeding was de--layed.

13) We had water shortage trouble in Misir and Gimmeza S.F.

14) The serious problem of poor drainage in Idfina S.F.

15) We had several troubles in puddling operations mainly due to the coarse land levelling.

16) There were neither respectable farm roads and entrances in S.F., nor suitable carriage, which obliged us to employ many laborers to carry seedling trays from seedbed to transplanting place.

17) Transplanter operators did not have enough knowledges about basic adjustments, maintenance and repairing of the machine.

The problems after transplanting operation can be itemized as follows;

18) Weed infestation of the fields;

Exactly as we anticipated, many weeds started to grow quite rapidly. This had been foreseen from the begi--

nning of the project, by the lack of levelling work, late startof land preparation, unavailability of chemicals or the late dispatch of them, shortage of water and so on.

19) Shortage of laborers

We tried to eliminated weeds by manual labor, though we realize that we could not employ so many labo-- rers.

20) Due to the insufficient storage facilities (capacity and condition), we had some difficulties in products storage.

8. Constraints to the system

As we clarified in the chapter III, one of the ob-- jectives of this S.F. project is to determine the con-- straints to the system in each region. These factors com- prise climatic condition, soil status, prevailing disea- ses, natural enemies, special noxious weeds and some so- cial problems, such as quality and quantity of irri-- gation water and regional drainage system. However, we must be careful enough not to mix them with general pro- blems or special problems of the state farm. Nexts are some of them.

1) Absence of small plot manager

The intended clients of this system are medium to small scale farmers (3 to 5 feddans), and the system is based on the premise that the farms are well taken care of by the owner. However, it is difficult to

employ so many field managers in S.F. This is our dilemma in S.F. operation.

2) The schematic cultivation and following the schedule is a must

Small farmers don't have to prepare so detailed a schedule for machinery dispatchments, puddling operation, transplanting, irrigation, etc., although the necessity to manage 50 feddans by one set of machinery obliged us to prepare a detailed schedule and we had to follow it strictly. So, the failure (if any) of the cultivation of 50 feddans does not necessarily signify the failure of the system.

3) Levelness of each plot is not as good as that of farmer's fields. The significance of levelling has been well explained in previous chapters.

4) Lack of Farm Roads, Entrances and Canals.

The infrastructure situation of the S.Fs. is such that on each site the field block of the area around 50 feddans is surrounded mostly on four sides by trunk farm roads and irrigation or drainage canals. Motorized vehicles can enter the field only by a limited number of entrances across the ditches. Branches of road or canal systems are almost nonexistent. The situation creates a special problem for our program.

5) Shortage of water

Because of the limitation in the available water supply within the whole state farm where our fields

were located, the demand for water often met with the conflicting needs of other plots in the state farm. Ordinary farmers may not have the similar problem as they can draw water more conveniently from public canals. Efforts for advance coordination between the competing parties are needed to cope with the situation.

Excluding those special problems of the state farms, the constraints to the system in each S.F. are as follows;

1. Gimmeza S.F.
   1) There are so many stem borers in this region that some protection means are essential.Future subject will be the timing of Insecticide application, since the chemical to control it is known already (Furdan).
   2) Rice blast, especially the neck node type, was observed no less frequently. We are going to conduct the experiment on the protection at the site of S.F. this coming season.

2. Misir S.F.
   1) Green worms appeared in seedbed, and were controled easily by Diazinon 5% Granule. We must monitor carefully in the next season if this insect will resume or not, so that we may be able to determine this insect as special problem of this area.
   2) The soil in this S.F. has been classified as

saline by Dr. M. Morooka, who is suggesting drainage installation consisting of tile drain with intercrossing mole drain.

3. Idfina S.F.

1) The soil is strongly saline and desalinization by above mentioned method is recommendable.

2) Due to the saline soil, the rice roots tend to loose the active energy easily, and nutrient balance will be disturbed. This may cause heavy attack of brown spot disease.

3) The water level in public drainage canal becomes as high as that of inside drainage system of S.F. in planting season. This is a common problem in this region, and some drastic mesure must be taken to bring it down by the government, such as the introduction of larger capacity pumps.

4. Saft Khalid

1) Rice blast disease has been seen in S.F.,although, further observation is needed to fix this disease as a common one.

5. Serw S.F.

1) The soil is extremely saline, and many damages by this could be observed in this operation. Desalinization, of course, is must, but special local experiment is required.

2) Same as Idfina case, there are many brown spots in this region, and this subject must be studied in connection with saline soil problem.

9. Conclusion

1) We have yielded satisfactor results in spite of various problems in first year operation.

2) We studied the constraints of the system in each region.

3) We have obtained numerous pieces of information concerning rice productions in each region.

4) Several local experiments to identify and overcome the constraints of the system will be conducted in S.F. in next season.

5) We brought impact to the state farms and neighboring farmers by the mechanized rice cultivation system.

Table 1-1

PLOT ALLOCATION AND PRODUCTION - GIMMEZA SATELLITE FIELD

0.200 ton	1.500 ton	3.50 ton	3 ton
0.500 ton	1.500 ton	2.50 ton	3 ton
0.400 ton	1.500 ton	2.50 ton	3.50 ton
0.400 ton	1.500 ton	2.50 ton	3.50 ton
0.500 ton	2.500 ton	3.00 ton	3.50 ton
1.500 ton	2.500 ton	3.50 ton	3.50 ton
2.00 ton	2.00 ton	3.50 ton	4.20 ton
	2.00 ton	3.00 ton	4.00 ton
	2.00 ton	3.00 ton	3.50 ton

Water pump

canal

2.00 ton	3.00 ton	3.00 ton
2.00 ton	2.00 ton	3.00 ton
1.500 ton	2.00 ton	2.500 ton
1.160 ton	2.00 ton	2.500 ton
0.500 ton	3.00 ton	3.500 ton
0.500 ton	3.00 ton	2.00 ton
0.500 ton	2.00 ton	2.00 ton

Farm road

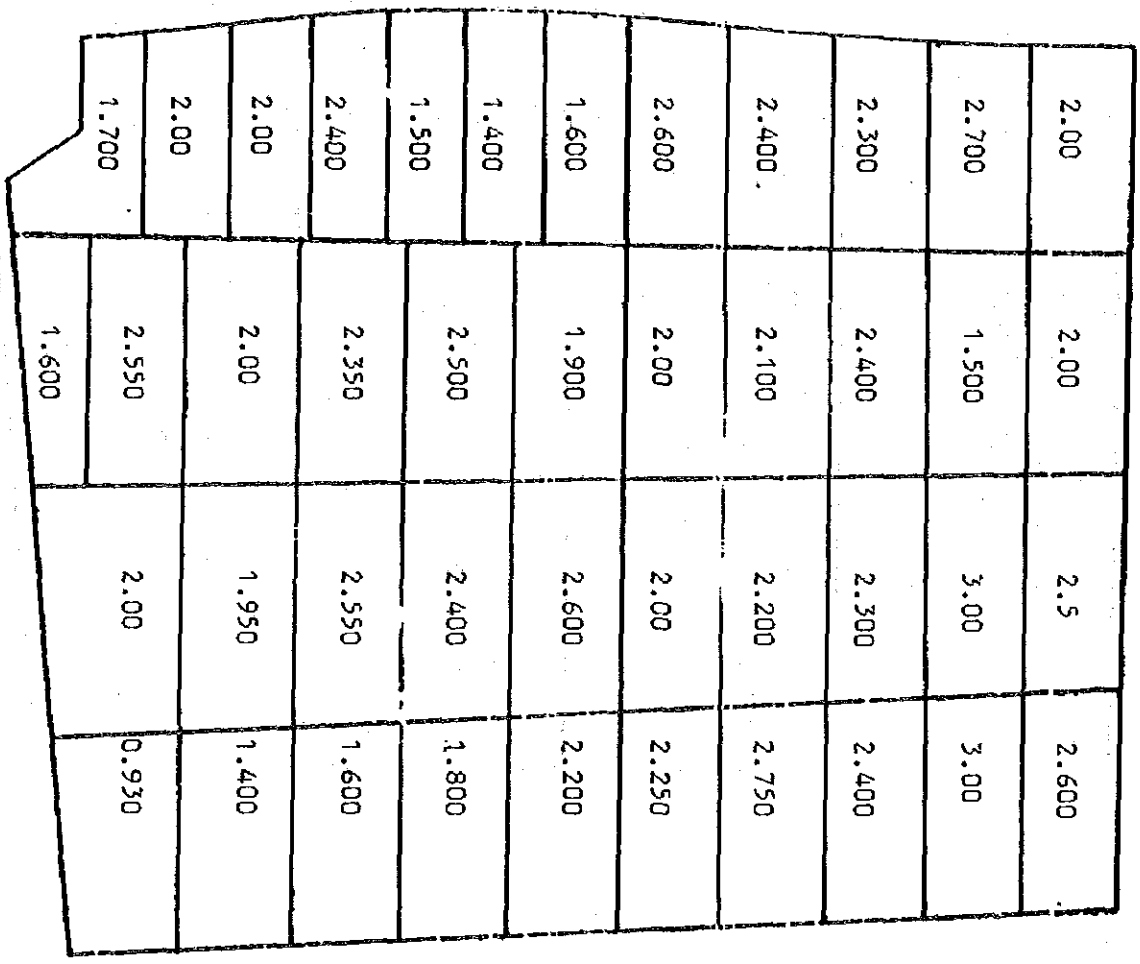
D canal

canal

Farm road

Table 1-2

PLOT ALLOCATION AND PRODUCTION - MISIR SATELLITE FIELD

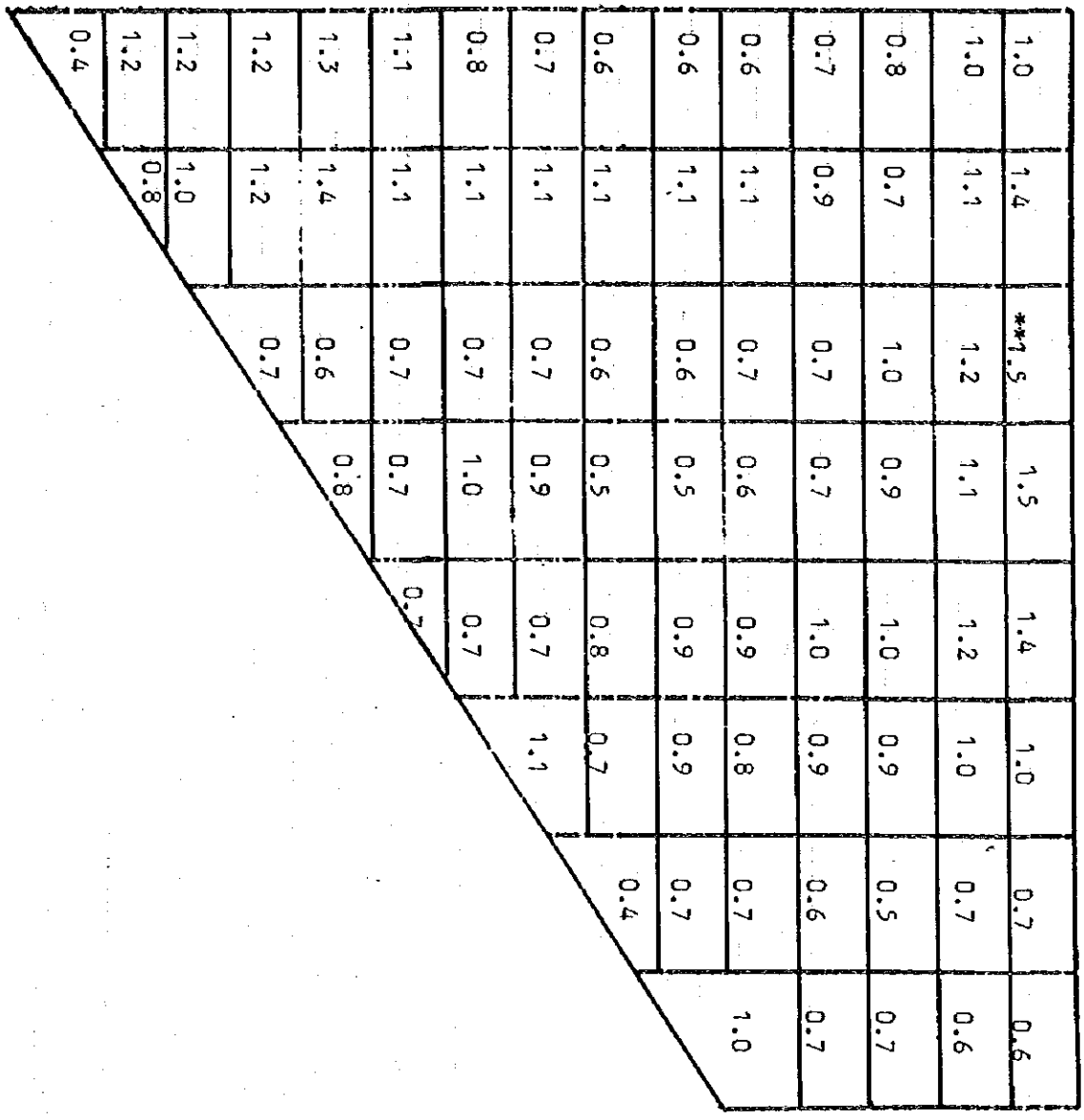


Giza 172

Giza 181

Table 1-3

PLOT ALLOCATION AND PRODUCTION - IDFINA SATELLITE FIELD



** Actual area 2300m²

Giza - 171

Giza - 1368

Table 1-4

PLOT ALLOCATION AND PRODUCTION - SERW SATELLITE FIELD

.711 ton	1 ton	1.230 ton	1 ton	2 ton	1.5 ton	1.5 ton	.849 ton	.600 ton	.600 ton	2 ton	1.5 ton	1 ton	.800 ton
.900 ton	.900 ton	.900 ton	.900 ton	1.500 ton	.700 ton	.500 ton	.600 ton	.600 ton	1.150 ton	2 ton	.660 ton	1.70 ton	1 ton
2 ton	1.150 ton	1.189 ton	1.100 ton	1.100 ton	2 ton	2 ton	1.5 ton	1.488 ton	3 ton				

Ref.....

*Giza 171 (10F)

*Giza 1368 (41F)

Table 1-5

PLOT ALLOCATION AND PRODUCTION - SAFT KHALID SATELLITE FIELD

2.200	2.400	0.910	1.050
2.036	2.475	0.200	0.700
2.100	2.775	0.200	0.375
2.571	0.900	0.200	0.500
2.736	0.900	0.250	0.300
2.736	0.630	0.380	0.300
1.683	2.00	1.800	1.125
2.154	2.100	2.400	2.050
2.154	2.253	3.357	1.500
2.433	2.592	3.049	2.00
2.433	2.844	3.046	2.100
3.410	2.787	3.003	2.00

Tab. 2. RESULTS OF HARVEST IN FIVE SATELLITE FIELDS (1987)

Item \ Location	Gimmeza	Misir	Idfina	Serw	Saft Khalid
Total Rice Area (F)	46	46	35	46	47
Total Production (T)	124	91.93	72.5	55.12	84.6
Average yield (t/f)	2.7	2.0	2.1	1.2	1.8
Varieties	Giza 171 Giza 181	Giza 172 Giza 181	Giza 171 GZ 1368	Giza 171 GZ 1368	Giza 172 Giza 181
Maximum yield (t/f)	4.6	3.0	3.4	3.0	3.4

IV. SUMMARIZATION OF GENERAL AFFAIRS OF R M P P 1981 - 1987

RESULTS OF TECHNICAL COOPERATION PROGRAMME

1. R M C Seminar

The R M C Seminars were conducted monthly by the Japanese Experts and Egyptian Counterpart Personnel in order to publicize the results of the verifying trials carried out in the Project and investigations in the Nile Delta. These Seminars discharged an important role in the exchange of technical views on mechanized rice cultivation and its related subjects with the Researchers of the National Rice Research Institute ,Professors of TANTA University and Extension Officers. The results of the Seminars are as follows :

Subject	Lecturers	Date of Seminar
1) Master Plan of Training Activities at the Rice Mechanization Center	Mr.T.Kato	2 Februaty 1984
2) Weed Control in the Egyptian Paddy Field	Dr.M.Takabayashi	2 September 1984
3) Studies on the Light - Curves of Carbon Assimilation of the Rice Plant	Dr.T.Tanaka	28 October 1984
4) The Economic Advantage of Rice Mechanization in Small and Middle - Sized Farms	Mr.S.Harada Mr.A.G.E.Baly Mr.M.E.Ahmed	25 November 1984
5) Raising of Seedling and Rice Transplanting	Mr.S.Sugawara Mr.Fatehy Nemr	6 January 1985
6) Mechanized Harvesting	Mr.Y,Kimura Mr.G.Essam Mr.M.Asar	27 January 1985
7) Nitrogen Transformation and its effects on Paddy Plant and Seasonal Change	Mr.S.El Nour Mr.Mohamed Yousef	25 March 1985

Subject	Lecturers	Date of Seminar
8) Framework of the Rice Mechanization System for Middle and Small Schale Farmers	Mr.S.Kimura	7 April 1985
9) Paddy Weed Control	Mr.Fatehy Nemr	30 June 1985
10) Problems encountered in traditional Rice Cultivation Techniques and the Technical Improtements Offered in Mechanized Transplanting	Mr.T.Numba Mr.S.El Tanga	15 July 1985
11) Actual Practices of high-Yielding Rice Cultivation through " Ideal Plant "	Dr.T.Tanaka	11 August 1985
12) Results of Trials and Survey conducted by the Agronomy Division, 1984	Mr.S.El Tanga	23 September 1985
13) Actual Practice of Rice Cultivation in Egypt	Mr.Hamdy E.	7 October 1985
14) Solar Grain Drying	Mr.J.Sato Mr.Y.Kimura Mr.M.Kholy Mr.M.Moustafa Mr.S.Looka	12 December 1985
15) Economic Effect of Mechanization Technology on the Development of Rice Farming	Dr.H.Horiuchi	25 March 1986
16) Basic Experiment on Stabilization and Establishment of Seedling with Direct Sowing	Mr.M.Nakayama Mr.Hamby E.	23 April 1986
17) Paddy Soil Desalting and Early Establishment of Seedling	Mr.T.Shigyo	23 April 1986
18) Field Observation Stuties on Rice Blast Occurrence and Meteorological Conditions in Paddy Field, Nile Delta, Egypt	Dr.O.Horino Mr.Fatehy Nemr Mr.Mohamed Yousef	24 September 1986

Subject	Lecturers	Date of Seminar
19) Agricultural Extension Service in Japan	Mr.Fetoh H.	25 November 1986
20) Physico-Chemical Analysis of Paddy Soils and Irrigation Water in the Nile Delta State Farms	Mr.M.Morooka Mr.Allaa S. Mr.Nour El Din Mr.Hassn S.	26 April 1987
21) Survey for Five Satellite Fields on the Rice Mechanization Pilot Project	Mr.S.Hosono Mr.Ahmed M.E. Mr.E.El Gawad	3 May 1987
22) On the Requirements for Extending Mechanized Rice Farming in the Five Satellite Fields	Mr.H.Kawakami Mr.A.G.E.Baly	21 June 1987
23) Guidance and Advice on Mechanized Rice Transplanting in the Five Satellite Fields	Mr.K.Yamashita	28 July 1987
24) Basic Experiments on Stabilization on Establishment of Seedling in Direct Seeding Rice Cultivation System	Mr.Watanabe Mr.Ibrahim Z.	20 August 1987
25)* Genetic and Pathological Studies on Resistance of Rice to Bacterial Blight	Dr.O.Horino	3 November 1987
26) Race Distribution of Rice Blast Fungus, Pyricularia Oryzae in Nile Delta , Egypt and Chemical Control of Blast	Dr.O.Horino	22 November 1987
27) For Advance Weed Control in R M P P	Mr.H.Morita	13 March 1988

* The Seminar was conducted at the National Rice Research Institute, Agricultural Research Center (A R C)

2. Report on R M P Project and Training Materials

The Project has prepared an Annual Report which covers its

activities and achivements up-to-date and includes an inventory of training materials and aids. Amongst the training materials is a 16 m/m film and relevant pamphlet produced to introduce the activities of the Project.

In making the 16m/m film, a film crew was dispatched twice to the Rice Mechanization Center in order to shoot on-the-spot photographs of the actual activities in progress both in the interior and the exterior of the Center.

As covered in the Report, the following is a list of the documentations and information materials now available at the Center.

1) Annual Report 1982-83
2) Preliminary Report on Research High Lights in 1983
3) General Information , Rice Mechanization Center
4) Theory and Practice of Fertelizer Techniques
5) Annual Report 1984-85
6) 16m/m Movie Film " Golden Nile Delta"
7) The Field Practice of Mechanized Rice Cultivation
8) Manual of Self Feeding Type Combine
9) Manual of Rice Transplanter
10) Rice Mechanization Pilot Project in Arab Republic of Egypt " General Report 1982 -'86 "
11) Results of Training and Survey on the Ex-Trainees for Technical Settlement
12) Economic Effects of Mechanization Technology on the Development of Rice Farming

3. Assignment of Japanese Experts

Eleven (11) long-term experts were assigned to the Project in accordance with the field of expertise described in the Record of Discussions (R / D). With respect to short-term experts, thirty eight (38) were assigned.

The following is a list of the Japanese Experts dispatched to the Rice Mechanization Center (R M C) from 1981/82 to 1987 /88.

Field \ Year	81/82	82/83	83/84	84/85	85/86	86/87	87/88	Total
(Long-Term Assignment)								
1.Team Leader	o		1	xo	2	xo	3	3
2.Agricultural Machinery	o		1 2			xo	3 4	4
3.Rice Cultivation	o		1			xo	2	2
4.Liaison Officer	o		1	x	o		2 x	2
Total								11
(Short-Term Assignment)								
5.Team Leader	1							1
6.Liaison Officer				1				1
7.Agricultural Machinery			1				2	3
8.Land Consolidation	1	2		2	2			6
9.Economic/Management			1	1	1	1		4
10.Soil and Fertilizer			1			1		2
11.Weed Control				1			1	2
12.Irrigation Facilities				1				1
13.Drainage and Soil				1				1
14.Grain Drying					1			1
15.Mechanization System				1		1		2
16.16 m/m Shooting				1	6			7
17.Blast Disease Control						1	1	2
18.Text Book					1			1
19.Direct Seeding					1		1	2
20.Water Management					1			1
21.Water Utilization Plan						1		1
Total	2	2	3	9	13	5	5	39

4. Training of Egyptian Personnel in Japan

Since 1981, Thirty eight (38) Egyptian Conterparts were

trained in Japan, and three (3) counterparts were left the R M C to overseas for their new jobs. It is desirable to them continiously to the Project so that the Project can be benefited from the trainings.

The Classification of this trainings are as mentioned belows :

Year / Field of Trainings	81/82	82/83	83/84	84/85	85/86	86/87	87/88	Total
1.Observational Tour	1	3	2	2	1			9
2.Rice Cultivation (G)		1		1	1	1		4
3.Diseases and Insect Pests of Rice Plant(G)			1		1	1	1	4
4.Rice Production Mechanization (G)			1	1	2	1		5
5.Mechanized Rice Cultivation (I)			2		1	1		4
6.Agricultural Machinery Maintenance (G)				1		1	1	3
7.Weed Control (I)				1	1	1	1	4
8.Agricultural Extension (C/P)					1	1	1	3
9.Economic Analysis (I)					1			1
10.Direct Seeding (I)							1	1
Total	1	4	6	6	9	7	5	38

(G) = Group Training, (I) =Individual Training, (C/P) = C/P Joint Training

5.Provision of Equipment and Machinery

The total amount of the grant for equipment and machinery was Two Million Two Hundred Sixty Thousand US Dollars (US $ 2,260,000) as of 1987/88. The expenditure was mainly used for the purchase of tractors, nursing seedling facilities,transplanters, combine harvesters, reapers, movable harvesters ,

Pumps, vehicles and related devices required to implement the activities and meet the objectives of the Project. Most of the equipment and machinery are in sound condition having been utilized properly.

Year	Equipment and Machinery	Expenditure
81/82	Instrument Shelter 1, Gas Welding Sets 1, Station Wagon 2,Toshafax 1, Duplicator 1, Battery Charger 1,Brige 1, Sprayer 1,Tractor 3,Transplanter 2, Car Washer 1, Paddy Harrow 1, Disk Harrow 1, Rotary Tiller 2, Tire 2, Others	US$ 140,000
82/83	Combine 2, Binder 2, Harvester 1, Rice Mill Unit 1,Micro bus 3. Refrigerator 3, Freezer 1, Air Conditionar 3,Typewriter 1, Draft Set 1,Slide Projector 1, 16 m/m Projecter 1, Tape Recorder 1, Nissan Patrol 2, Others	US$ 205,000
83/84	Tractor 4,Combine 3,Transplanter 3,Rotary Tiller 2,Plow 1, Drive Harrow 2,Loader 1, Strak Wheel 1,Broadcast Seeder 1,Soil Crusher 1,Pump Trailer 1, Hydraulic Press 1, Air Meter 1, Mechanic Set 10, Others	US$ 420,000
84/85	Micro bus 1, Microscope 6,Water still Unit 1, MRK Kjeldahl 1, Analytical Mill 1, Pocaket PH Meter 3, Nematode Detection Set 1, High Pressure Sterilizer 1, Shaker Water Bath 1, Combine 2, Jeep 1, Reaper 1, Others	US$ 350,000
85/86	Transplanter 4, Tractive Force Testing System 1, Mist Dust 5, Forage Cutter 1, Electric Sieve 2, Generator 2, Combine 1, Manual Wagon 1, Engine Cul Model 2,Transplanter Cut Model 1, Combine Cut Model 1, Others	US$ 420,000
86/87	Copy Machine 1, Direct Seeding Machine 1, Seeder 1, Tractor 5, Cage Wheel 5, Water Pump 5, Power Sprayer 5,Soil Selector 5, Puddler 5, Transplanter 5, Anemometer 3, Submargible Pump 1, Control Pannel 1, Sterilization System 1, Cone Penetrometer 1, Chlorophyll Meter 1, Others	US$ 375,000
87/88	Combine 5,Motor Cycle 6,Sprayer 1,Broadcaster 1,Grain Cruck Inspector 2, Mini Culti. 3, Subsoiler 1, Moisture Meter 1, PH Meter 2, Thresher 2, Agricultural Chemicals Spareparts of Machinery and Vehicles and Others	US$ 350,000
	T O T A L	US$ 2,260,000

6. Grant Aid and Local Cost Assistance from Japan

1) Grant Aid

The Construction of the Rice Mechanization Center, which includes a main building, auditorium Cafeteria, lodgings , nethouse, storehouse, workshop and water tank, was started in January 1982 and completed in March 1983.

The total cost of Five Million Two Hundred Thousand US Dollars (US $ 5,200,000) was paid by the Government of Japan.

2) Improvement of Experimental Field by Model and Pilot Infra - Structure

i) Kallin Experimental Field (11 Feddans)

Improvements to the experimental field at Kallin was made in 1982 and totalled Forty Five Thousand US Dollars (US $ 45,000) was paid. This amount covered the construction of farm roads, irrigation and drainage canals , diversion facilities and other related items.

ii) Meet El Dyba Experimental Field (98 Feddans)

Improvements of the field was completed by pilot infra-structure in June 1983, and uniform planting was implemented in 30 feddans in the same year, starting a full-scale experiment in 1984. However, soil conditions showed high PH (8.0 - 9.1) and also high salt concentration. In addition, shortage of irrigation water caused a considerable obstacle to the implementation of experiments. Therefore, experts on irrigation and desalting were dispatched in 1984 and model infra-structures were carried out based on their recommendations.

Total cost for construction of Meet El Dyba Experimental field was Five Hundred Sixty Five Thousand US Dollars (US $ 565,000). This involved for the construction of farm roads, irrigation and drainage canals, substructures , ridges, under drainage system, installation of water pumps and other related requirements.

3) Improvement works of Rice Mechanization Center

In 1986, well excavation and additional pump installation works was done and in 1987,construction of warehouses for grain dryer and agricultural machinery spare parts were completed. Totally Forty Five Thousand Five Hundred Forty Two US Dollars (US $ 45,442) was paid.

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