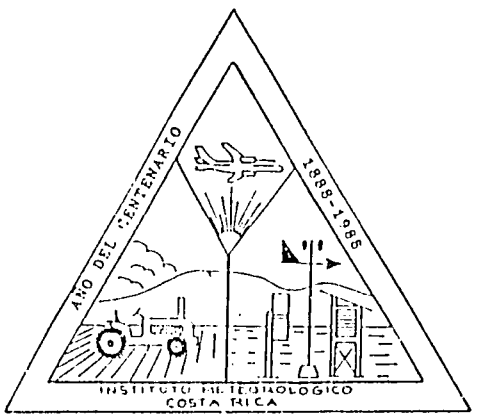
U.S. – ISRAEL CDR PROGRAM AGENCY
FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C., U.S.A.

YIELD IMPROVEMENT OF UPLAND RICE THROUGH MORE EFFICIENT UTILIZATION OF RAINFALL IN COSTA RICA



THIRD PROGRESS REPORT
SEPTEMBER 1988 – FEBRUARY 1989
GRANT No. DPE-5544-G-SS-7026-00/01

TAHAL CONSULTING ENGINEERS LTD

March 1989
R-89-06

TAHAL CONSULTING ENGINEERS LTD.
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10th March, 1989

Mr. B. Rock
Scientific Attache
U.S. Embassy, Tel-Aviv

Dear Sir,

Subject: Grant No. DPE-5544-G-SS-7026-00/01.
Third Progress Report September 1988 - February 1989

Please find enclosed one copy of the third progress report. Two additional copies have been sent to US-Israel CDR Program Agency for International Development, Washington, D.C.

This project has now been operational for 1½ years and is progressing according to schedule. The preliminary stage of the analysis of rainfall intensities has been completed and a scientific paper is in preparation. The field experiments are being set up and a "pilot" field experiment at Liberia has taken place and is reported.

My next visit to Costa Rica is schedule for June-July 1989.

Yours sincerely,

Jacob Lomas

U.S. - ISRAEL CDR PROGRAM AGENCY

FOR INTERNATIONAL DEVELOPMENT

WASHINGTON, D.C., U.S.A.

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GRANT NO. DPE - 5544 - G - SS - 7026 - 00/01

TAHAL CONSULTING ENGINEERS LTD.

MARCH 1989

EXECUTIVE SUMMARY

The project continued into the third six month period, September 1988 to February 1989. During this period the following basic acitivities were carried out.

1. The draft of the scientific paper was prepared including statistical analysis of the rainfall regime of the Guanecaste Region.

2. The experimental plot at Liberia was operational and detailed rainfall-runoff data collected during September-November 1988.

3. Alternative sites were selected at the University of Costa Rica experimental farm at Santa Cruz.

4. Dr. D. Illman USAID visited San Jose and met with J. Lomas and H. Herrera on January 30, 1989. The principal investigator was in Costa Rica from January 27th to February 27, 1989.

5. Total expenditure in US$72,090. For details see the following table.

1. **Rainfall intensity analysis - the preparation of a scientific paper.**

J. Lomas and H. Herrera have prepared the first draft of a scientific paper entitled "Rainfall intensity regime of the tropical north-western Pacific Zone of Costa Rica". The paper is being discussed presently and the necessary modifications made. Once completed the paper will be considered for publication. Herewith the papers' abstract.

RAINFALL INTENSITY REGIME OF THE TROPICAL NORTH-WESTERN PACIFIC ZONE OF COSTA RICA

by

Lomas, J. and Herrera, H.*

ABSTRACT

The maximum rainfall intensities of the north-western part of Costa Rica are based on an analysis of three representative meteorological stations with a twelve year record. Maximum rainfall intensities follow a gamma distrubtion pattern. On 35 to 40% of the rain days runoff is expected to occur.

Two distinct maximum rainfall intensity populations have been be noted: (a) very intense short duration events, with precipitation of up to 30 mm/day; and (b) much less intense, extended duration events with a wide range of daily rainfall amounts.

Regression slopes between maximum rainfall intensities and daily rainfall amounts are significantly different for the two populations. The first group's slope is 2.5-3.6 and changes randomly throughout the rainfall season. The second group has a uniform slope of 0.50-0.56.

The highly intensive maximum rainfall events account for some 20%-35% of the total rainfall population.

The relationship between maximum rainfall intensity and rainfall duration is extremely poor, although a negative exponential curve can be seen.

2. Installation of Research Equipment

The runoff batteries were constructed by Reiner Quesada Badilla at Alajuela and field tested. The critical importance of the horizontal setup of the drainage tanks was noted. Thus, it may be necessary to prepare a concrete base for the runoff batteries. Expected accuracy of the 2nd and 3rd tanks is approximately $\pm$5%.

The installation at Liberia (Finca de la Antonio Capella) was completed and field measurements of an experimental nature commenced on 1st September, 1988 in order to train the local observers and technicians in the experimental procedures as well as to "test" basic cooperative activities between the Instititions. Attached are worksheets of the basic data obtained for the months of September, October and November 1988. A number photographs of the experimental field at Liberia are also included.

The following sites have now been selected for the experiments to commence in June of 1989 (depending on the date of rice planting). Note the reallocation of the site at Santa Cruz.

Location	Property	No. of Experimental Plots
Liberia	Finca de la A Cappela	2
Santa Cruz	University of Costa Rica	2
Hacienda Arroz El Guanalaste	John Breally	1
Total		5

10 sets, at 4 soil depth levels, of tensiometers were ordered and arrived in Costa Rica in October 1988 from Ben Meadows Co. Inc., Georgia, USA. With the arrival of the teniometers all the necessary scientific equipment is now in Costa Rica.

3. Transfer of Technology - Planned Meeting

The first transfer of technology meeting has been planned and is scheduled for Monday June 26, 1989. For this meeting agricultural extention and rice production specialists from the MOA and agricultural commodity institutions have been invited. The following program is being prepared.

PROGRAM OF TECHNOLOGY TRANSFER - JUNE 26, 1989

08:30-10:00	The Agroclimate of Guanacaste	H. Herrera
10:00-10:30	Discussion	
10:30-11:00	Coffee	
11:00-12:00	The Water Requirement of Rice	J. Lomas
12:00-13:30	Lunch	
13:30-14:15	Results of rainfall intensity analysis	H. Herrera
14:15-15:00	Cultivation methods and water conservation and their possible effect on rice yields	J. Lomas
15:00-16:00	Discussion	

4. Visits to Costa Rica

Dr. Deborah Illman from the Office of the Science Advisor USAID, Washington, D.C. visited and discussed the project with J. Lomas and H. Herrera on Monday, January 30, 1989 in San Jose. Dr. Illman also visited the Tahal Consulting Engineers Ltd. office and met M. Slutz, and the Instituto Meteorologico Nacional and met Director General Lic. Heladio Zarate.

Mr. Lomas was in Costa Rica from January 27th to February 27, 1989.

5. Programmed Activities for the Following 10 Months

January to December 1989

	J	F	M	A	M	J	J	A	S	O	N	D
1. Scientific paper preparation	———	———	———	———	———							
2. Installation of runoff batteries		———	———	———	———	———						
3. Final adjustment of experimental program			———	———	———	———						
4. Commencement of field experiments					———	———	———	———	———	———	———	
4.1 Data analysis of field experiments						———	———	———	———	———	———	———
5. Programmed visit of J. Lomas					———	———	———					

OUR REF. NO. PROJECT 2859 (PROPOSAL C7-021)
PROJECTED DISBURSEMENT IN US$ FOR THE PERIOD MARCH 1, 1989 TO AUGUST 31, 1989

	Expenditure	Projection						Subtotal	Total Until
		Mar.	Apr.	May	June	July	Aug.	Projection	Aug. 1989
Salaries	19,566	300	300	300	4,300	600	600	6,400	25,966
Overheads	14,418	375	275	250	2,525	312	613	4,350	18,768
Equipment	10,216	---	---	---	---	---	---		10,216
Travel and Per diem	19,944	200	300	200	5,400	350	350	6,800	26,744
Other Direct Costs	7,946	1,000	500	500	400	300	1,500	4,200	12,146
Total	72,090	1,875	1,375	1,250	12,625	1,562	3,063	21,750	93,840

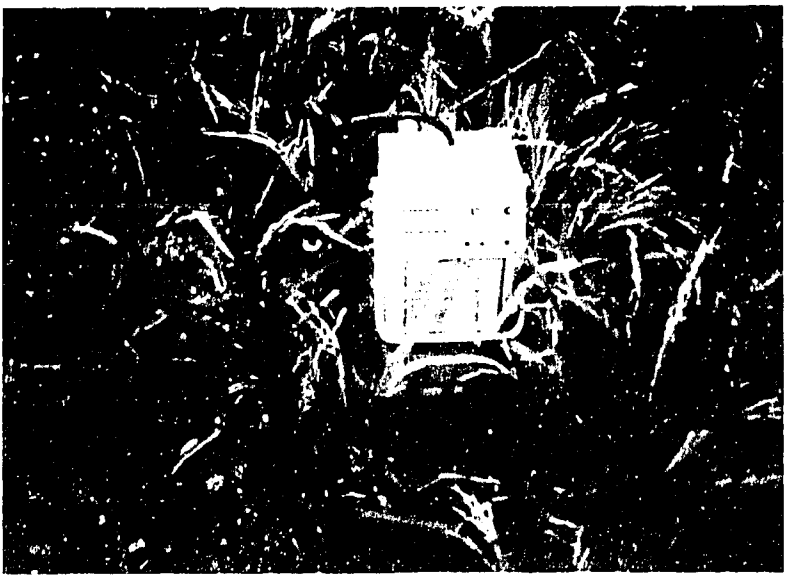
NOTE: Experimental Period June - October 1989

EXPERIMENTAL FIELD LIBERIA 1988

GENERAL VIEW SEP. 1988

RUNOFF BATTERIES 1988

SOIL MOISTURE MEASUREMENT



NEUTRON COUNTER

NEUTRON ACCESS TUBE

Runoff and Rainfall Data

Station: San Rafael - Liberia Month - September Year: 1988

Day No	Water height in tanks (mm)* 1	2	3	4	5	6	Rain intensity 5'	10'	15'	30'	60'	2h'	6h'	12h'	Cumulative Rainfall 5'	10'	15'	30'	60'	2h'	6h'	12h'	Day's total (24 hours)	Remarks
1							Beginning of measurement Sept 3/88																	
2																								
3	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- 55 days after sowing
4	22	0	0	25	0	0	42.0	24.0	16.4	12.6	6.7	3.4			3.5	4.1	4.6	6.3	6.7	6.7	6.9	7.1	7.1	
5	20	0	0	26	0	0	9.6	6.4	6.4	4.0	2.1	1.7			0.8	1.4	1.6	2.1	3.3	4.1	6.6	6.5	9.1	
6	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7	0	0	0	0	0	0	4.8	4.2	3.2	2.6	2.0	1.4			0.4	0.7	0.8	1.3	1.6	2.7	3.3	3.3	3.3	
8	40	0	0	65	0	0	15.2	9.0	8.0	7.0	6.5	5.0	2.0		1.1	1.5	2.0	3.5	6.5	10.0	11.9	12.8	15.7	
9	10	0	0	22	0	0	24.0	13.8	10.8	5.6					2.0	2.8	3.7	2.8	2.8	3.6	4.5	6.1	8.1	
10	220	0	0	410	0	0	36.0	31.6	27.2	23.4	15.5	9.0	3.5	2.2	3.0	5.3	6.8	11.7	15.9	17.9	19.9	26.5	26.7	
Sub-total	312	0	0	546	0	0																	68.0	
11	420	37	0	730	420	0	74.7	60.0	58.0	51.2	40.5	36.3	17.2		6.2	10.0	14.5	25.6	46.5	76.6	103.3	105.4	107.1	
12	0	0	0	5	0	0	13.2	12.6	9.2	4.6	2.5				1.1	2.1	2.3	2.4	2.5	2.5	3.6	4.2	4.7	
13	370	0	0	610	0	0	34.0	34.0	23.2	18.0	12.2	10.6	4.1		2.5	5.0	5.8	9.0	13.2	19.9	24.4	30.4	40.3	
14	200	0	0	155	0	0	34.8	24.0	18.8	14.4	8.1	4.3	1.5		2.9	4.1	4.7	7.1	8.1	8.6	9.0	11.8	13.0	
15	0	0	0	0	0	0	2.4	2.4	2.0						0.2	0.4	0.5	0.5	0.5	0.9	1.1	1.7	1.7	
16	20	0	0	45	0	0	24.0	19.2	17.2	9.4	4.7				2.0	3.2	4.3	4.7	4.7	4.7	4.8	5.2	5.2	
17	10	0	0	10	0	0	4.8	3.6	2.8	2.4	2.0	1.6	0.7		0.4	0.6	0.7	1.2	2.0	3.3	4.2	4.9	4.9	
18	135	0	0	340	0	0	49.2	31.2	23.6	15.6	9.4	6.7	3.4		4.1	5.2	5.9	6.8	9.4	16.7	20.4	20.4	20.5	- 70 days after sowing
19	5	0	0	5	0	0	4.8	4.8	4.0	3.6	2.6	1.8	0.8		0.4	0.8	1.0	1.9	2.6	3.7	4.5	4.5	4.5	
20	0	0	0	0	0	0	2.4	1.8	1.6						0.2	0.3	0.4	0.4	0.5	0.5	0.5	0.5	0.5	
Sub-total	1160	37	0	1900	420	0																	201.9	
21	15	0	0	10	0	0	35.6	22.2	15.2	9.2	5.2	3.2			3.3	3.7	3.8	4.6	5.2	5.4	5.5	5.5	5.5	
22	700	0	0	750	250	0	37.2	27.0	24.8	20.8	17.8	10.7	4.6		3.1	4.5	6.2	10.4	17.8	21.4	23.9	30.6	30.8	
23	720	240	0	730	710	60	147.6	126.0	92.0	54.0	33.4	17.4			12.3	20.0	23.0	27.0	33.4	34.6	35.1	35.1	35.6	
24	10	0	0	15	0	0	19.2	15.0	12.6	6.8	3.5				1.6	2.5	3.2	3.4	3.5	3.5	3.6	4.8	4.8	- Growth of primordius begins
25	0	0	0	0	0	0	7.2	4.2	2.8						0.6	0.7	0.7	0.7	0.7	0.7	0.9	1.0	1.0	(reproductive phase at 74/7c days)
26	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- Stuffing of plants begins
27	40	0	0	70	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(according to an observer)
28	0	0	0	0	0	0	0.0	3.6						0.0	0.0	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	
29	140	0	0	275	0	0	52.8	46.4	33.2	21.6	5.6				7.7	11.4	13.3	14.9	15.6	15.6	15.6	15.6	15.6	
30	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sub-total	1025	240	0	1850	960	60																	91.0	
Total	3597	277	0	4276	1380	60																	360.9	

Note:

- Total rainfall is measured from 07 hours of one day to 07 hours next day.
- Surface of tanks in cm^2 is as follows: Tank No. 1 = 4552, No. 4 = 4552; Tank No. 2 = 2566, No. 5 = 2566; Tank No. 3 = 2566, No. 6 = 2566
- Cumulative values were selected out of maximum values for each period.
- Intensities were selected and normalized to one hour of maximum value in each period.

* Data from tanks are given in mm height of water. To convert them to liters use the following factors: Tank No. 1 = Factor = 0.455, No. 4 = Factor = 0.455; Tank No. 2 = Factor = 0.257, No. 5 = Factor = 0.257; Tank No. 3 = Factor = 0.257, No. 6 = Factor = 0.257

PROJECT RICE - RUNOFF
AID/TAMALIPAN
AGROMETEOROLOGICAL DEPARTMENT

Runoff and Rainfall Data

Station: San Katazi - Liberia Month - October Year: 1988

Day No	Water height in tanks (mm)**						Rain intensity								Cumulative Rainfall								Day's total (24 hours)	Remarks
	1	2	3	4	5	6	5'	10'	15'	30'	60'	2h'	6h'	12h'	5'	10'	15'	30'	60'	2h'	6h'	12h'		
1	0	0	0	0	0	0	0.0	4.2	3.2	1.6					0.6	0.7	0.8	0.9	0.9	0.9	0.9	0.9	0.9	
2	460	0	0	750	80	0	85.2	75.0	60.0	38.8	30.3	20.4	7.0	5.4	7.1	12.0	16.2	19.4	30.2	40.6	41.9	41.9	41.9	
3	720	240	0	730	550	0																	28.0	- (Strip was missing)
4	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
6	40	0	0	40	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7	210	0	0	400	0	0	36.0	34.2	26.4	18.2	11.5	7.3	2.6		3.0	5.7	8.6	9.1	11.5	14.6	17.1	17.1	17.1	- 80 percent of plants are earing up
8	5	0	0	5	0	0	7.2	4.8	4.0	2.8	1.9	1.2			0.6	0.8	1.0	1.4	1.9	2.4	3.2	3.2	3.2	
9	720	6	0	730	550	0	147.6	133.8	121.2	72.4	36.4				12.3	22.3	30.3	36.2	36.4	36.4	36.4	36.4	36.4	
10	0	0	0	0	0	0	7.2	4.8	4.0	2.6	1.3				0.6	0.8	1.0	1.3	1.3	1.3	1.7	1.7	1.7	
Sub-total	2155	248	0	2635	1180	0																	129.1	
11	8	0	0	5	0	0	37.2	22.8	16.4	10.0	5.6	2.8			3.1	3.8	4.1	5.0	5.6	5.7	5.9	5.9	5.9	
12	590	0	0	730	40	0	88.8	72.0	60.4	49.8	28.4	14.4	6.0	3.5	7.4	12.0	16.6	24.9	28.4	28.8	39.6	39.7	39.7	
13	40	0	0	40	0	0	21.6	19.2	14.0	10.2	5.7				1.8	3.2	3.5	5.1	5.7	5.7	5.9	6.7	6.7	
14	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- In higher parts of plots grain is at milk stage; lower parts are at post-flowering stage.
15	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
16	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
17	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
18	0	0	0	0	0	0	13.2	11.4	8.4						1.1	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
19	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- Lower parts of plots are at liquid milk stage.
20	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sub-total	639	0	0	775	40	0																	54.4	
21	150	0	0	540	0	0	96.0	60.0	48.0	30.4	21.7	11.9	4.0		8.0	10.1	12.0	15.2	21.7	23.8	24.2	25.0	25.0	- Longest dry period received during growing period.
22	720	170	0	730	600	0																	78.9	
23	120	0	0	260	0	0	18.0	13.2	10.0	5.4	3.5	3.1	2.2		1.5	2.2	2.5	3.2	4.6	5.4	13.0	13.5	13.5	
24	10	0	0	5	0	0	8.4	6.0	4.4	3.0	1.9	1.0			0.7	1.0	1.1	1.5	1.9	3.2	4.9	6.0	6.1	
25	720	10	0	730	20	0	240.0	135.0	96.2						20.0	22.5	23.8	23.8	23.8	23.8	24.0	24.0	29.9	
26	5	0	0	5	0	0	32.4	18.0	12.4						2.7	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.1	
27	720	7	0	730	31	0	80.4	75.6	69.2	45.8	28.1	15.5			6.7	12.6	17.3	22.9	28.1	30.9	31.9	32.7	32.7	
28	20	0	0	15	0	0	52.8	32.4	23.6						4.4	5.4	5.9	5.9	5.9	5.9	5.9	5.9	5.9	
29	25	0	0	35	0	0	73.2	54.6	42.8	22.0					6.1	9.1	10.7	11.0	11.0	11.0	11.0	11.0	11.0	
30	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
31	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sub-total	2490	187	0	3050	651	0																	206.1	
Total	5283																						389.7	

Note:

- Total rainfall is measured from 07 hours of one day to 07 hours next day.
- Surface of tanks in sq.cm is as follows:
  Tank No. 1 = 4582 No. 4 = 4582
  Tank No. 2 = 2568 No. 5 = 2568
  Tank No. 3 = 2568 No. 6 = 2568

** Data from tanks are given in mm (height of water). To convert them to liters, use the following factors:
  Tank No. 1 = Factor = 0.458 No. 4 = Factor = 0.458
  Tank No. 2 = Factor = 0.257 No. 5 = Factor = 0.257
  Tank No. 3 = Factor = 0.257 No. 6 = Factor = 0.257

- Cumulative values were selected out of maximum values for each period.
- Intensities were selected and normalized to one hour of maximum value in each period.

8-Mar-89 rain-nov CR/20

RAIN-NOV

PROJECT RICE - RUNOFF
AID/TA/LIB.
AGROMETEOROLOGICAL DEPARTMENT

Runoff and Rainfall Data

Station: San Rafael - Liberia Month - November Year: 1988

Day No	Water height in tanks (mm) 1	2	3	4	5	6	Rain intensity 5'	10'	15'	30'	60'	2h'	6h'	12h'	Cumulative Rainfall 5'	10'	15'	30'	60'	2h'	6h'	12h'	Day's total (24 hours)	Remarks
1	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	460	0	0	750	130	0	182.4	122.4	94.0	56..	28.5				15.2	20.4	23.5	28.0	28.5	28.5	28.5	28.5	28.5	
4	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
5	15	0	0	15	0	0	27.6	18.0	14.8	12..	8.2				2.3	3.0	3.7	4.1	6.2	6.2	6.5	8.5	8.5	
6	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
7	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
8	0	0	0	0	0	0	3.6	3.6	3.2	2.4	1.4	0.5			0.3	0.6	0.8	1.2	1.4	1.7	1.7	1.8	1.8	
9	0	0	0	0	0	0	3.6	2.4	2.0	1.6	1.7	1.8			0.3	0.4	0.5	0.8	1.7	2.0	2.3	2.3	2.3	
10	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sub-total	475	0	0	745	130	0																	43.6	
11	0	0	0	0	0	0	3.6	3.0	2.4						0.3	0.5	0.6	0.7	0.7	0.7	1.0	1.3	1.3	
12	0	0	0	0	0	0	0.0	3.6	3.6						0.0	0.0	0.9	0.9	1.0	1.1	1.1	1.1	1.1	- Rice already ripe.
13	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
14	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
15	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
16	0	0	0	0	0	0	36.0	27.0	19.2	10.2					3.0	4.5	4.8	5.1	5.1	5.1	5.1	5.1	5.1	

Measured Yields

Harvesting was done manually on Nov. 17. Plot No. 1 yielded 55 kg paddy rice with about 12.5% moisture. Plot No. 2 yielded 46.5 kg. in terms of yield per hectar figures are:

Plot No. 1: 5500 kg/ha or 5.5 metric tons per ha; Plot No. 2: 4650 kg/ha or 4.65 T/ha.

Soil moisture during growing period was good, at times even some standing water, especially in the higher parts of the plots, where growth and yields were also better.

Sub-total							7.0
Total	475	0	0	745	130	0	48.6

Note:

- Total rainfall is measured from 7 hours of one day to 07 hours next day.
- Surface of tanks in which is as follows: Tank No. 1 = 450 sq. cm; No. 4 = 450 sq. cm
  Tank No. 2 = 250 sq. cm; No. 5 = 250 sq. cm
  Tank No. 3 = 250 sq. cm; No. 6 = 250 sq. cm

- Cumulative values were selected out of maximum values for each period.

- Intensities were selected and normalized to one hour of maximum value in each period.

* Data from tanks are given in mm (height of water). To convert them to liters, use the following factors: Tank No. 1 = Factor = 0.450; No. 4 = Factor = 0.450
  Tank No. 2 = Factor = 0.250; No. 5 = Factor = 0.250
  Tank No. 3 = Factor = 0.250; No. 6 = Factor = 0.250

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