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NATIONAL IRRIGATION ADMINISTRATION

RINCONADA / BUHI - LALO
(BICOL INTEGRATED AREA DEVELOPMENT - III)
A.I.D. LOAN NO. 492-T-056 A & B

AGRICULTURAL
PROGRESS
REPORT

REPORT NO. 3
JUNE 30, 1981

Republika ng Pilipinas
Pambansang Pangasiwaan ng Patubig
(NATIONAL IRRIGATION ADMINISTRATION)
(TANGGAPAN NG TAGAPANGASIWA)
Lungsod ng Quezon

3 August 1981

The Director
United States Agency for
International Development
1680 Roxas Boulevard
M a n i l a

ATTENTION: Mr. James Baird
General Engineering Office
USAID, MANILA

RE : Rinconada/Buhi-Lalo Project
(Bicol Integrated Area Development III)
Agricultural Progress Report No. 3
as of June 30, 1981

Dear S i r :

We are pleased to submit herewith for your perusal and evaluation the Agricultural Progress Report on the different agricultural activities within Rinconada/Buhi-Lalo Project as of June 30, 1981 .

We trust that in this report we have sufficiently covered all aspect of project activities in the agricultural sector to supply the necessary information you may wish to know at present.

Very truly yours,



CESAR L. TECH
Assistant Administrator

AGRICULTURAL PROGRESS REPORT

RINCONADA BUHI/LALO PROJECT

PREPARED FOR

THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

BY

THE NATIONAL IRRIGATION ADMINISTRATION

REPORT NO. 3

JUNE 30, 1981

TABLE OF CONTENTS

	PAGE
LETTER OF TRANSMITTAL	i
TITLE PAGE	ii
PROJECT LOCATION AND KEY MAP	iii
LIST OF TABLES	iv
INTRODUCTION	1
PART I. AGRICULTURAL SUPPORTING SERVICES	
A. Agrarian Reform	
1. Land Tenure Improvement	3
2. Operation Land Transfer	3
3. Judicial Constraints	3
B. Extension Services	
1. Personnel Deployment	5
2. Extension Support Services	5
3. Manpower Training and Development	5
4. Irrigators Association	9
5. Farmers Training	9
6. Cooperative Development Program	9
7. Anak Bukid Organization	10
8. Formation/Development of Rural Improvement Club	10
C. Agricultural Researches	
1. Rainfall and Evaporation Loss Monitoring	11
2. Conveyance Losses Determination	13
3. Water REquirement and Water Balance Study	13
4. Canal Rating and Stream Gaging Station	16
5. Residual Moisture Depletion Monitoring Study	16
D. Agricultural Credit	
1. Bank Institutions Furnishing Credit	20
2. Loan Repayment Status	20

	PAGE
E. Processing and Storage Facilities	20
PART II. AGRICULTURAL PRODUCTION	
A. Land Resource Utilization	
1. Volume of Production	23
2. Average Value of Fertilizer and Plant Protection Chemical Used	24
3. Farm Labor Input Used and Cost Per Hectare	24
4. Other Production Expenses	24
5. Average Capital Investment Per Hectare	24
6. Cost and Return of Palay Production Per Hectare	27
7. Farm Budget for Rice Demonstration Farm	27
B. Problems Encountered	32
APPENDICES:	
A. Fig. 1-11--Water Requirement, Evapotranspiration and Average Percolation Characteristics at Different Study Sites	34
B. Figs. 12-15-Stage-Discharge Relationship in Different Stream Gaging Station	45
C. Fig. 16 - Average Monthly Rainfall Distribution in BIAD III Project, Dry Season 1981	49
D. Fig. 17.- Farmers Organizational Chart	50
E. Fig. 18 - Weekly Average Rate of Moisture Depletion at Different Sites	51
F. Fig. 19 - 24-Rate of Moisture Depletion at Different Depth in Different Sites	52

LIST OF TABLES

TABLE NO.	TITLE	PAGE
1.	Tenure Status of Farm -Operator, Dry Season 1981	4
2	Issuance of Land Transfer Certificate Dry Season 1981	6
3	Deployment of Personnel by Agency and Services Rendered, Dry Season 1981	6
4	Extension Support Services, Dry Season 1981	8
5	Farmers Training Classes Conducted, Dry Season 1981	8
6	Samahang Nayan and Kilusang Bayan Organized, Dry Season 1981	10
7	Rural Youth Development (Anak Bukid) Dry Season 1981	10
8	Formation and Development of Rural Improvement Club (RIC), Dry Season 1981	11
9	Monthly and Average Daily Rainfall at BIAD III Project, Dry Season 1981	12
10	Monthly and Average Daily Evaporation at BIAD III Project, Dry Season 1981	12
11	Conveyance Losses in Different Canals of ULRIS, Dry Season 1981	14
12	Water Requirement and Water Balance Study Dry Season 1981	15
13	Rate of Soil Moisture Depletion and Soil Crack Characteristics in Different Sites of BIAD III Project	18
14	Initial and Final Moisture Content of Soil Samples before Occurrence of Rain at Different Depth of Soil Column	19
15	Farmers Served, Area Covered and Amount of Loan Granted, Dry Season 1981	19
16	Status of Loan Repayment by Lending Institutions	21

TABLE NO.	TITLE	PAGE
17	Processing and Storage Facilities, Dry Season 1981	22
18	Farmers Supervised with and without Credit Support Dry Season 1981	23
19	Average Rate of Use and Value of Fertilizer and Plant Protection Chemicals Used Per Hectare Dry Season 1981	23
20	Farm Labor Input Used by Field Operation Per Hectare, Dry Season 1981	26
21	Other Production Expenses Per Hectare, Dry Season 1981	28
22	Average Capital Investment Per Hectare Dry Season 1981	28
23	Cost and Return of Palay Production Per Hectare by Type of Farm, Dry Season 1981	29
24	Farm Budget of Rice Demonstration Farm Dry Season 1981	30
25	Disposal of Palay Production Per Hectare In Cavans Dry Season 1981	31
26	Value of Palay Disposal Per Hectare, Dry Season 1981	31
27	Incidence of Plant Pests, Diseases and Rodents Infestation, Dry Season 1981	32

INTRODUCTION

This season's development in the Institutional and Agricultural component of Rinconada/Buhi-Lalo (BIAD III) Project features an improvement in land tenure with the number of lessees increasing by 104.9 percent from 344 last season to 705 at present. Amortizing owners increased by 114.13 percent from the previous 276 to 591 to date. The total number of certificates of land transfer issued as of the period was 152.

During the period under review, identification of farmers, farmers listing and mobilization of farmers in the different rotational area were conducted. The farmers organization is envisioned to manage the operation and maintenance of the system upon project completion. Farmers training sessions held were on consultation conferences among rotation area leaders and supplementary farmditch leaders. The subjects covered were on NIA's plan on operation and maintenance, farmers organizational plan and water distribution scheme after rehabilitation.

Agricultural researches completed during the season included rainfall and evaporation loss monitoring, water requirement and water balance study, canal rating and stream gaging, conveyance losses determination and residual moisture depletion monitoring study.

The seasonal credit assistance extended by the Philippine National Bank (PNB) Iriga City Branch, Rural Bank of Rinconada and the Rural Bank of Nabua amounted to ₱146,852.85 benefitting some 104 farmers cultivating an area of 133.42 hectares. As of this report period, these lending institutions collected 48.44 percent of the total loan.

During this period, the total area planted was 1429.26 hectares tilled by some 1427 farmers. The gross production was 111,297.67 cavans, an average yield of 77.87 cavans per hectare.

The variable cost incurred during the season in irrigated and rainfed areas was ₱1,713.70 and ₱904.38, respectively. Fixed costs amounted to ₱1,172.39 for irrigated farms and ₱488.09 for rainfed areas.

The total rainfall during the dry season was 584.4 mm or an average of 3.2 mm per day. Rainfall peak was in January with 188.6 mm and was lowest during the month of March with only 43.7 mm.

I. AGRICULTURAL SUPPORTING SERVICES

A. AGRARIAN REFORM

1. Land Tenure Improvement

The Ministry of Agrarian Reform has accelerated the implementation of Operation Land Transfer in the service area. As of this period, benefited were 705 lessees and 591 amortizing owners with an aggregate area of 579.14 and 555.89 hectares, respectively. The detailed report is presented in Table 1.

A total of 152 Certificates of Land Transfer were awarded to some 137 farmers tilling a total aggregate area of 101.89 hectares. This represents 3.39 percent of the total programmed project area of 3000 has. located in 23 barangay in the municipalities of Nabua Bato, Buhi and and Iriga City combined. (Table 2)

The number of farmer-recipient of CLTs is less than the no. of amortizing owners. The Ministry of Agrarian Reform confirmed that farmers under Operation Land Transfer with or without CLTs issued are considered amortizing owners. It could be noted however, that there are farmer-recipients with two (2) or more Certificates of Land Transfer.

2. Judicial Constraints

The Ministry of Agrarian Reform (MAR) Legal Office extends legal assistance to parties concerned. As of this period, twenty mediation cases has been attended to and four referred cases were settled.

EXTENSION SERVICES

The extension activities in the project area were undertaken by the personnel form the Ministry of Agriculture (BAEx, BPI), Ministry of Agrarian Reform (MAR), the National Food Authority (NFA), and National Irrigation Administration (NIA). The extension services included information dissemination on dissemination on rice production technollgy. home management, rural youth organization, Samahang Nayon/

Table 1. Tenure Status of Farm Operators
Dry Season 1981

Municipality/Barangay	Lessee		Amort. Owner		Total	
	No.	Has.	No.	Has.	No.	Has.
I. Iriga City	45	42.00	10	5.68	55	47.68
a. Salvacion	45	42.00	10	5.68	55	47.68
b. San Antonio	28	22.00	6	4.08	34	26.08
c. La Medalla	14	8.31	-	-	14	8.31
d. Sto. Niño	54	28.48	16	13.48	70	41.96
e. Del Rosario Banao	40	21.88	-	-	40	21.88
Sub-Total	181	122.67	32	23.24	213	145.91
II. Buhi						
a. San Francisco	6	2.00	15	14.00	21	16.00
b. San Isidro	26	22.00	20	17.00	46	39.00
c. San Jose Salay	14	10.00	4	1.60	18	11.60
d. Los Angeles	74	24.08	120	81.52	194	105.60
e. Sta. Isabel	26	16.66	96	98.00	122	144.66
f. Sta. Justina	6	6.85	13	10.95	19	17.80
g. Antipolo	9	7.88	10	5.00	19	12.88
Sub-Total	161	89.47	278	228.07	439	347.54
III. Nabua						
a. Lourdes Young	40	48.00	36	31.42	76	79.42
b. Lourdes Old	30	30.00	30	11.30	60	41.30
c. La Opinion	40	40.00	8	9.00	48	49.00
d. Sagrada Paloyong	85	109.00	57	36.86	142	145.86
Sub-Total	195	227.00	131	88.58	326	315.58
IV. Bato						
a. Masoli	18	9.50	-	-	18	9.50
b. Niño Jesus	8	9.00	-	-	8	9.00
c. San Miguel	40	31.00	-	-	40	31.00
d. San Vicente	36	27.00	50	66.00	86	93.00
e. Sta. Cruz	26	25.12	-	-	26	25.12
f. Agos	40	38.38	100	150.00	140	188.38
g. Tres Reyes	-	-	-	-	-	-
Sub-Total	168	140.00	150	216.00	318	356.00
T O T A L	705	579.14	591	555.89	1,296	1,165.03

Source: MAR Field Team Office No. 144, Nabua, Camarines Sur

Cooperative Development and post harvest technology. The water management and organization of irrigators association were undertaken by the NIA.

Personnel Deployment

During the period, a total of 54 personnel was deployed in the project area. Compared to the previous season, there are 15 Community Organizers now assigned in the project area concerned primarily in the organization of viable irrigators association. Other personnel assigned and services rendered are presented in Table 3.

2. Extension Support Services

The extension services rendered by the field workers of the Ministry of Agriculture (BAEx, BPI) and the National Food Authority (NFA), consist of individual farm and home visits, group meetings and mass information (Table 4). Group meetings such as promotional/consultations, farmers classes homemakers classes, cottage industry, food production and food trades, and project tours, were conducted to promote continues education and improve cultural practices in farming and home management technology. Mass information was also rendered to supplement information dissemination as the need arises.

3. Manpower Training and Development

During the period, two (2) personnel from the Project's Agricultural Development Division actively participated in a 5-day seminar-workshop on the Five-year Agriculture Development Plan, Preparation which was held at the NIA Training Center, San Rafael, Bulacan. The seminar-workshop was designed to develop the technical capability of the agricultural staff in the preparation, implementation, monitoring and evaluation of agricultural development plans/ program of irrigation projects.

Moreover, the project has conducted a 2-day Staff Development Training-Workshop held at the NIA Training Center, La Trinidad, Iriga City. This Workshop was participated in by 15 Community

Table 2. Issuance of Land Transfer Certificates
Dry Season 1981

Municipality	No. of CLTs Issued		No. of Farmer-Recipients		Area Involved (Has.)		Total to date	
	Previous	Present	Previous	Present	Previous	Present	Recipient	Area
1. Iriga City	8	7	4	7	4.84	4.80	11	9.64
2. Buhi	55	15	53	14	43.60	10.29	67	53.89
3. Nabua	47	-*	47	-*	31.36	-*	47	31.36
4. Bato	20	-*	12	-*	7.00	-*	12	7.00

*No data given by MAR.

Source: MAR Team Office No. (44, Nabua, Camarines Sur

Table 3. Deployment of Personnel by Agency and Services Rendered
Dry Season 1981

Agency	No. of Personnel		Services Rendered
	Previous	Current	
1. Ministry of Agriculture			
a. BAEx	19	17	General Extension
b. BPI	8	7	Crop Protection and Seed Certification
			Organization/Training of Samahang Nayon and Kilusang Bayan
2. Ministry of Agrarian Reform	5	5	Land Tenure Improvement
3. National Food Authority	4	4	Marketing Services
4. Rinconanda/Buhi-Lalo (BIAD III) Project	6	6	Water Management
	-	15	Organization of cohesive and functional Irrigators Associations
T O T A L	42	54	

NOTE: MLGCD was not included due to the transfer of Samahang Nayon/Cooperative Development Program to the Ministry of Agriculture.

Organizers and 11 Technical Staff (6 from the Engineering Division; 5 from the Construction Division). Topics discussed were about small group organizing; community leadership and development, grassroots organizing and dynamics of group discussion, alignment of physical and institutional activities. The final output of the workshop was an integrated critical path method (CPM) of physical and institutional programs.

Likewise, three (3) personnel from the Agricultural Development Division and one (1) from the Operation and Maintenance of R/B-L BIAD III Project participated in a 4-day live-in seminar/training for field implementors at Badjao Lodge, Oas, Albay. This field implementors' seminar is in consonance with the NIA-Bayer Tie-up on educational program on crop protection as well as the establishment and operation of water management and crop protection demonstration farms in the project area.

4. Irrigator's Association

To effect an active participation of beneficiaries in the project, community organizers are in the process of organizing a "water-based" but professionally-managed irrigators association. During the period under review, identification of farmers, farmers listing, groundwork, mobilization, follow-up and meetings of farmers in the different rotational units/areas were conducted. Likewise, potential farmer-leaders had been identified in the rotational unit/area level. The potential farmer-leaders and prospective members were intensively involved in the review of paper location (design), walk-through of canal locations with survey team, confirmation of canal routes and location of structures (farm level facilities) and construction of farm level facilities in group by "takay system".

It is planned that the area presently served by the Lalo River Irrigation Systems (LRIS) will have three (3) Irrigation Associations (IAs) capable of managing the operation and maintenance of the system after rehabilitation. The IAs will be registered with the Securities and Exchange Commission (SEC). Similarly, the Lower Lalo (new areas) will

Table 4. Extension Support Services
Dry Season 1981

Particulars	Number		Attendance	
	:This Period	:To Date	:This Period	: To Date
Individual Farm and Home Visits	574	1166	983	1575
Sub-Total	574	1166	983	1575
Group Meetings				
a. Promotional/Consultation	7	133	109	235
b. Farmers Classes	10	19	185	368
c. Homemakers Class	10	66	335	1065
d. Cottage Industry	-	5	-	107
e. Food Production & Food Trades	2	5	75	255
f. Project Tours	2	4	53	119
Sub-Total	31	232	757	2149
Mass Information				
a. Technical	-	6	-	
b. Semi-Technical	3	6		
c. Radio Broadcast	1	8		
Sub-Total	4	20		

Source: Ministry of Agriculture

Table Table 5 . Farmers Training Classes Conducted by the
NIA and Other Agencies, Dry Season 1981

Training/Classes	NIA				Other Agencies			
	Session		Attendance		Session		Attendance	
	This Period	To Date	This Period	To Date	This Period	To Date	This Period	To Date
Project Orientation Seminar	-	23	-	1083	-	-	-	-
Consultation Conference Seminar	4	4	130	130	-	-	-	-
Farm Operation Method	-	-	-	-	-	16	-	525
Water Management Training	-	6	-	114				
Irrigated Crop Production Training						9	-	185
Training Barangay BRAPPRS					9	13	307	484
Total	4	33	130	1327	9	38	307	1194

have organized IAs and the scheme of organization basically the same with area under rehabilitation.

The detailed organizational set-up of the IA is presently being discussed by the farmer-leaders through consultation with the prospective members. (Please see Appendix D; Fig. 16)

5. Farmers Training

During this period, four (4) sessions on consultation conference were conducted at the Regional Training Center, La Trinidad, Iririga City. The training was undertaken by the NIA, Rinconada/Buhi-Lalo (BIAD III) Project, participated in by 130 rotation area leaders and supplementary farm ditch leaders of Zone I-A, I-B and II-A of the Upper Lalo Area. Topics discussed were NIA plan on operation and maintenance, farmers organizational plan and water distribution scheme after rehabilitation. The operation and maintenance, farmers organization and water distribution plans after rehabilitation are currently being consulted by the rotation area and supplementary farm ditch leaders with their prospective members.

The consultation conference is considered a training for farmer-leaders because the process used exercises on communication, decision-making, leadership and individual roles.

Likewise, the Ministry of Agriculture (BPI) conducted nine (9) training sessions on Barangay Rat and Pest Patrol Services (BRAPPS) in the service area. These were participated in by 307 farmer-beneficiaries (Table 5).

6. Cooperative Development Program

It will be noted that the status of Cooperative Development Program (Table 6) is the same as in the previous report. This is because of the transfer of cooperative development program from the Ministry of Local Government and Community Development to the Ministry of Agriculture.

Table 6. Samahang Nayon and Kilusang Bayan Organized
Dry Season 1981

Particulars	Organized	Registered	Membership	Insured
Samahang Nayon	18	18	800	44
Kilusang Bayan	2	2	400	440

Source: MLGCD Offices at Buhi, Nabua and Iriga City

7. Anak Bukid Organization

The Rural Youth Development Officers (RYDO) of the Ministry of Agriculture (BAEx) deployed in the project area organized 15 Anak Bukid Chapters with a total membership of 364 to date; of which 79 members are from Iriga, 150 from Nabua and 135 from Bato. The municipality of Buhi has no HYDO (Table 7). Compared with the previous report, there was an increase of four (4) Anak Bukid Chapters organized with 100 members.

Table 7. Rural Youth Development (Anak Bukid)
Dry Season 1981

Municipality	No. of Anak Bukid Org.		Total Membership	
	This Period	To Date	This Period	To Date
1. Buhi	-	-	-	-
2. Iriga	1	4	19	79
3. Nabua	2	5	60	150
4. Bato	1	6	21	135
Total	4	15	100	364

Source: Ministry of Agriculture Offices at Buhi, Iriga City and Nabua

8. Formation and Development of Rural Improvement Club

The activities along Rural Improvement Club are implementation of food and nutrition, home industry, clothing, home management and child development and family extension programs. Services rendered

under these activities were demonstration on food preparation and cooking, take home ration for pre-school children, feeding and monthly weighing of infants. Targeted recipients were 6-11 months infants, 12 - 60 months pre-school children, pregnant and nursing mothers. Trainings conducted were on homemakers class, cottage industry, food production and food trades. As of this report period, some 25 clubs have been organized in the project area with a total membership of 968, or with an increase of 2 clubs and 66 members, respectively (Table 8), compared with the previous report.

Table 8. Formation and Development of Rural Improvement Club (RIC)
AS OF June, 1981

Municipality	Number Organized		Total Membership	
	This Period	To Date	This Period	To Date
Buhi	1	7	36	206
Iriga City	-	5	-	262
Nabua	1	5	30	165
Bato	-	8	-	335

Source: MA (BAEx) Office at Nabua, Buhi, Bato and Iriga City

C. AGRICULTURAL RESEARCHES

The NIA R/B-L BIAD III Project conducted seasonal agricultural researches in preparation to the water management program implementation during the operation and maintenance of the irrigation system. These include rainfall and evaporation loss monitoring, water requirement and water balance study, canal rating and stream gaging, conveyance losses determination and residual moisture depletion monitoring studies. Results of these studies are needed in the development of cropping pattern/irrigation water delivery scheduling of the irrigation system.

1. Rainfall and Evaporation Loss Monitoring

During this period, four (4) raingauges and two (2) evaporation pans were used in monitoring rainfall magnitude and daily

Table 9. Monthly and Average Daily Rainfall at BIAD III Project
Dry Season (1980-1981)

Month	Rain Gauge Location				Monthly Average (mm)	Daily Average (mm)
	Antipolo	Los Angeles	Salvacion	San Vicente		
December	162.7	149.3	113.6	119.5	136.3	4.4
January	155.5	169.5	177.6	151.8	188.6	6.1
February	87.1	58.9	77.5	63.6	71.8	2.6
March	20.8	63.3	79.3	11.5	43.7	1.4
April	40.8	43.4	55.6	79.9	54.9	1.8
May	161.2	87.9	78.0	45.2	93.1	3.0
Total	728.1	572.3	581.6	471.5	588.4	19.3
Average	121.4	95.4	96.9	78.6	98.1	3.2

Table 10. Monthly and Average Daily Evaporation at BIAD III Project
Dry Season (1980-1981)

Month	Evaporation Pan Location		Monthly Average (mm)	Daily Average (mm)
	Antipolo	Salvacion		
December	154.879	-	154.879	4.996
January	203.634	153.848	178.741	5,766
February	165.457	141.778	153.618	5,486
March	210.457	211,370	210.914	6,804
April	278.451	166.117	222,284	7,409
May	193.401	191.797	192.599	6,409
Total	1206.297	864.91	1113.035	36.87
Average	201.046	144.152	185.506	6.145

Note: The Average value of functional data of each month was multiplied by the number of days for the month in the determination of monthly evaporation rate.

evaporation loss. Rain gauges were installed at approximately equal area covered while the evaporation pans were installed in Antipolo (Dam Site) and in Salvacion, Iriga City. Results of observations are presented in Table 10.

Table 9 shows that the month of December to May (except January) are generally dry considering a 5 mm/day threshold dry value of rainfall. The month of March has the lowest value of rainfall valued at 1.4 mm/day, compared with the month of January which has the highest value of 6.1 mm/day.

Considering the sites with monthly rainfall data, Antipolo (Dam Site) got the highest intensity and San Vicente got the lowest. Data indicated that within the project area, rainfall is highest in the upstream and lowest in downstream.

Table 10 shows the monthly and average daily evaporation loss. April has the highest evaporation loss of 222.284 mm. while February has the least with 153.618 mm. This indicates that evaporation loss decreases as there is an increase in rainfall distribution frequency.

2. Conveyance Losses Study

Results of conveyance losses determination using inflow-outflow method are shown in (Table 11). The total length covered in in the main canal is about 6.448 km. and 1.450 km. for Lateral G. It was found out that relatively low percentage of irrigation water was lost from Station 0 + 0475 to Station 4 + 4739 compared to Station 4 + 4739 to Station 6 + 448 of the main canal. Inflows was observed between Station 2 + 871 and 4 + 4739.

Higher percentage of water loss in Lateral G can be attributed to unmaintained embankment of the canal.

3. Water Requirement and Water Balance Study

Crop water requirement and adequacy of water were monitored from eleven (11) rotational areas of the system from December, 1980 to May, 1981. Observation sites were established depending

Table 11. Conveyance Losses in Different Canals of ULRTS
(January-May, 1981)

Canal/Station	Conveyance Loss (%)	Remarks
1. Main Canal		
0 + 0475 - 1 + 886	3.61	
1 + 886 - 2 + 868	-2.93	Inflows from
2 + 871 - 4 + 4739	4.63	Paddy Field
4 + 4739 - 5 + 448	12.30	
5 + 448 - 6 + 448	17.00	
2. Lateral G		
0 + 040 - 1 + 450	18.66	

on the speed of farming activity and the time by which areas were
on the speed of farming activity and the time by which areas were
planted.

Result showed that the average water requirement within the
area is 10.09 mm/day. It was observed that 5.04 mm was lost
through evapotranspiration and 5.05 mm was lost through deep perco-
lation per day.

The average total inflow recorded was 6.65 mm/day where 3.63
mm/day where 3.63 mm was contributed by rain and 3.00 mm was sup-
plied through irrigation.

The computed average water use efficiency is 152.18%. The
value indicates that most of the study sites selected experienced
water shortage (Table 12). Causal factors observed were:

- a. Distance is far from the source (Ralat 1-2, MC-13 and MC-8).
- b. Suspension of irrigation delivery because of ongoing con-
struction (Ralat A-1, MC-6 and MC-4).
- c. Farmers attitude of using uncontrolled flooding method and
alternate irrigation and drainage.
- d. Low impounding capacity of paddy dikes.

Table 12. Water Requirement and Water Balance Study
Dry Season 1980-1981 (December-May)

Location	Zone Number	Rotational Area No.	W R mm/day	E T mm/day	P mm/day	Rainfall mm/day	Irrigation Inflow mm/day	Total Inflow mm/day	WUE %	Remarks
San Isidro	I-A	LAT. A-I	19.71	6.25	13.46	3.50	2.89	6.39	308.45	
San Francisco	I-A	MC-2	7.60	4.90	2.70	3.40	2.23	5.63	134.99	
San Isidro	I-A	MC-4	11.94	5.30	6.64	0.70	5.17	5.87	203.41	
Sta. Isabel	I-B	MC-5	7.81	6.03	1.78	4.90	0.76	5.68	137.98	
San Jose Salay	I-B	MC-6	9.70	5.80	3.90	1.10	2.56	3.66	265.03	Terminated at flowering stage
San Jose Salay	II-A	MC-8	9.53	4.67	4.86	3.50	5.92	9.42	101.17	
Los Angeles	II-A	LAT. H	15.34	6.82	8.52	3.70	1.11	4.81	318.92	
Los Angeles	II-A	MC-10	8.05	4.02	4.03	2.00	2.91	4.91	163.95	
Del Rosario Banao	II-C	MC-11	5.50	3.60	1.90	9.50	5.80	15.30	35.95	
Sto. Niño	II-C	MC-13	7.20	3.80	3.40	3.40	1.70	5.10	141.17	
Sto. Niño	II-C	I-2	8.60	4.20	4.40	4.20	1.90	6.10	140.98	
Average			10.09	5.04	5.05	3.63	3.00	6.63	152.18	

Note: Rice Variety Used: IR-36

WR - Water Requirement
ET - Evapotranspiration
P - Percolation Loss
WUE - Water Use Efficiency

$$WUE = \frac{ET + P}{\text{Total Inflow}} \times 100$$

Weekly water requirement, percolation and evapotranspiration for different study sites were plotted in Fig. 1 to 11. (See Appendix A, Fig. 1-11, pp. 40).

4. Canal Rating and Stream Gaging

From January to May, 1981, three (3) rating graphs were developed and two (2) stream gaging stations were established. Rating graphs developed were for the headgate of the Upper Lalo River Irrigation System main canal, Lateral G and in the section separating Division A from Division B of the existing system. Stream gaging stations were established in Caorasan Creek and Los Angeles Drainage Creek. A stage-discharge graph in Caorasan Creek had been developed while depth observations are continuously taken in Los Angeles Creek in relation to irrigation water delivery.

Figures 12, 13, 14 and 15 show the stage discharge relationship (Appendix B) in the different stations. The graphs estimate the volume of water passing through the rated section to determine whether enough water is being diverted to the service area of any particular canal of the system. The rating graph developed in the section separates Division A and Division B and aims to further check whether excessive irrigation is taking place in Division A which is near the source of water.

The graph for the headgate of the Upper Lalo River Irrigation System Main Canal was made to know the volume of water flowing at any given water depth and that the section rated before has been a part of the line portion of the main canal.

On the other hand, the stream gaging station aims to determine the amount of water going to the drainage ways as a result of irrigation activity and rainfall occurrence.

5. Residual Moisture Monitoring Study

Residual moisture depletion monitoring study was conducted from February 26 to April 8, 1981 using five (5) selected sites. The moisture content at field capacity and soil texture of each site were determined prior to determination of moisture content of the soil

samples collected at weekly interval. Depth of sampling used was 30 cm. to correspond to the assumed depth of root zone. Further, the 30 cm. core sample was divided into three (3) 10 cm. sample to determine how long the 10-20 cms. and 20-30 cms. sample will be affected by normal air drying. Other data collected were depth and width of soil crack at controlled location in relation to soil moisture content. Sampling started within a week after the rice crop grown at the selected site was harvested.

The average rate of moisture depletion in the five (5) sites selected was 5.38% per week. It could be noted from Figure 18 to 24 (Appendix E and F) that the rate of moisture loss was relatively high during the 1st and 2nd week of observation than any other week. Table 13 shows that the fastest rate of moisture depletion took place in Los Angeles site, where soil is loamy. Taking the average of moisture loss of other sites having the same textural classification, it was found out that water loss was higher in clay soil than in silt loam soil. The average estimated moisture content at permanent wilting point of the soil samples was 25.35%. This value was determined by using established relation that moisture at permanent wilting point is 50.0% of moisture at field capacity.

As shown in Table 4, referring to 0-10 cm. column, three (3) out of five (5) sites had reached the average estimated percent moisture content at permanent wilting point. However, the 10-20 and 20-30 cm. column or soil had moisture content above the estimated moisture at permanent wilting point. This indicates that even after a month, there is enough moisture available within the 10-30 cm. soil column to lessen soil saturation water requirement.

Estimate of water requirement for saturation at any given time was not projected because of a very short duration of the study. Other study will be conducted this coming dry season of 1981-1982 to gather more data necessary to safely estimate water duty for the project area during land soaking operation.

Table 13. Rate of Soil Moisture Depletion and Soil Crack Characteristics in Different Sites of BIAD III Project

P l a c e	Soil Texture*	Average Rate of Soil Moisture Depletion % Per Week	% Moisture at Field Cap.	Soil Crack and Soil Characteristics**		
				Depth (mm)	Width (mm)	Moisture Content %
Masoli	Silt Loam	5.62	54.72	120	46	28.2
San Vicente	Silt Loam	3.80	50.36	273	63	40.0
San Antonio	Clay	4.92	53.66	160	50	27.5
Sto. Niño	Clay	5.20	50.06	130	32	26.0
Los Angeles	Loam Soil	7.35	44.75	110	20	30.4
Average		5.38	50.71	158	42	30.4

* Determined using hydrometer method of soil textural analysis.

** Considered before first rainfall occurrence.

Table 14. Initial and Final Moisture Content of Soil Samples
Before Occurrence of Rain at Different Depth of Soil
Column

P l a c e s	I N I T I A L					F I N A L				
	Crack Cha. MM		Depth of Sampling (CM)			Crack Cha. MM		Depth of Sampling (CM)		
	Depth	Width	0 - 10	10 - 20	20 - 30	Depth	Width	0 - 10	10 - 20	20 - 30
San Vicente	22	7	60.2	61.1	65.2	170	40	39.6	44.8	60.1
Masoli	68	30	40.8	47.3	48.7	120	45	22.1	27.8	35.0
San Antonio	20	6	40.6	42.60	42.0	160	40	23.3	28.0	31.3
Sto. Niño	18	12	45.64	50.3	55.5	160	36	30.35	37.8	40.6
Los Angeles	22	13	34.1	35.6	37.2	120	22	12.0	20.4	29.0

Table 15. Farmers Served, Area Covered and Amount of Loan Granted
Dry Season, Crop Year 1981

Lending Institutions	Farmers Served		Area Covered		Amount of Loan	
	No.	%	Has.	%	P	%
Rural Bank of Rinconada	5	4.81	6.5	4.87	7,800.00	5.31
Municipal Rural Bank of Nabua	51	49.04	56.5	42.35	39,900.00	27.17
Philippine National Bank	3	2.88	5.0	3.75	6,000.00	4.08
Buhi	11	10.58	15.92	11.93	18,044.85	12.29
Bato	34	32.69	49.5	37.10	75,108.00	51.14
T o t a l	104	100.00	133.42	100.00	146,852.85	100.00

Source: Rural Bank of Rinconada, Municipal Rural Bank of Nabua, Philippine National Bank, Iriga Branch.

D. AGRICULTURAL CREDIT

1. Bank Institutions Furnishing Credit

During the period, the Rural Bank of Rinconada, Municipal Rural Bank of Nabua and the Philippine National Bank provided the credit needs of the farmers within the project area. The amount of loan per hectare provided under the Masagana 99 program was ₱1,200.00 per hectare with 6% interest per cropping season. A total of 104 farmers cultivating an aggregate area of 133.42 hectares availed themselves of supervised credit amounting to ₱146,852.85 (Table 15).

2. Loan Repayment Status

Table 16 shows the status of loan repayments by lending institutions during the period. The total loan granted as of the previous cropping season amounted to ₱319,587.50 where only 27.62 percent (average for all the institutions) have been repaid by the farmer-borrowers.

For the season under review, of the total loan of ₱146,852.85 only 48.44 percent repayment was received as of date.

E. PROCESSING, MARKETING AND STORAGE FACILITIES

During this period, no changes in number and capacities on processing, marketing and storage facilities was reported in the project area. The palay produce were sold to the 36 existing buying station in the area of which one is operated by the National Food Authority (NFA) and 35 are privately-owned.

The two (2) warehouses owned and/or leased by NFA with a combined capacity of approximately 30,000 cavans of palay are the only available storage facilities in the area. Some 113 ricemills, 21 of which are type and 92 are kiskisan with total capacities of 230.70 cavans/hr. and 502.25 cavans/hr., respectively.

Dryers and threshers are available although its present number (Table 17) is deemed inadequate to cope with the needs of the farmers by the time the system operates. However, it was discovered that not all dryers and threshers are registered. Similarly, the present number of warehouses are enough to store the expected volume of palay that would be produced.

Table 16. Status of Loan Repayment by Lending Institutions
As of June, 1981

Lending Institutions	Amount of Loan (₱)		Repayment (₱)		Percent of Repayment	
	Previous	Current	Previous	Current	Previous	Current
Rural Bank of Rinconada	19,200.00	7,800.00	13,911.00	7,800.00	72.45	100.00
Municipal Rural Bank of Nabua	190,887.50	39,900.00	10,125.00	27,000.00	5.30	67.67
Philippine National Bank, Iriga City	22,800.00	6,000.00	11,316.75	6,000.00	49.63	100.00
Buhi	12,300.00	18,044.85	12,300.00	1,000.00	100.00	5.54
Bato	74,400.00	75,108.00	40,590.00	29,340.00	54.56	39.06
T o t a l	319,587.50	146,852.85	86,242.75	71,140.00	27.62	48.44

Sources:

1. PNB - through BAEx Technicians
2. Municipal Rural Bank of Nabua
3. Rural Bank of Rinconada

Table 17. Processing and Storage Facilities
Dry Season 1981

Particulars	Number	Total Capacity :Cav./hr.	Total Storage :Cap. (cav.)	Remarks
Ricemills				
Kono	21	230.70	-	
Kiskisan	92	502.25	-	
Warehouse	2		30,000	NFA-owned
Dryers	2	10		NFA-owned
Threshers	90	450.00		Privately-owned

Source: NFA, Palestina, Pili, Camarines Sur.

II. AGRICULTURAL PRODUCTION

A. LAND RESOURCE UTILIZATION

1. Volume of Production

The total of 1,429.26 hectares tilled by some 1,427 farmers was planted during the season. Some 104 farmers supervised by BAEX technicians with credit support tilling some 133.42 hectares obtained a total yield of 11,647.57 cavans. The farmers supervised without credit tilling an aggregate area of 1,295.84 hectares reported a total production of 99,650.10 cavans or an average yield of 76.90 cavans. For all farms, the average yield was 77.87 cavans per hectare (Table 18).

However, results of Farm Management Survey showed an average yield of 60.44 cavans per hectare in irrigated areas and 17.69 cavans per hectare in rainfed areas. Moreover, Crop Cutting Survey showed an average yield of 60.75 cavans per hectare in irrigated areas and 28.6 cavans per hectare in rainfed areas.

Table 18. Farmers Supervised with and without Credit Support
Dry Season 1981

Particulars	Number of: Farmers	Area Planted: Harvested (has)	Total Yield: (cavans)	Ave. Yield (cavans)
A. Supervised with Credit Support	104	133.42	11,647.57	87.30
B. Supervised without Credit Support	1,323	1,295.84	99,650.10	76.90
Total/Average	1,427	1,429.26	111,297.67	77.87

Source: MA Production Technicians

2. Average Value of Fertilizer and Plant Protection Chemical Used

During the season under review, the average value of fertilizer and plant protection chemicals used in irrigated and rainfed farms was ₱265.47 and ₱72.40, respectively. For all farms, average value of fertilizer and plant protection chemicals used amounted to ₱255.68.

The average quantity of fertilizers used by farmers in irrigated farms was 1.72 bags per hectare. The rate of insecticides used for irrigated farms was 0.65 quart and 0.52 quart for rainfed areas. Weedicide used was 0.68 quart for irrigated farms and 0.65 quart for rainfed farms (Table 19).

3. Farm Labor Input and Cost per Hectare

During the period, the farm labor requirement per hectare starting from land preparation to storing of produce was 75.42 man-days for irrigated farms and 56.79 man-days for rainfed areas. For all farms, about 72.13 man-days were required for the whole operation valued of ₱807.79 (Table 20).

4. Other Production Expenses

Table 21 shows other production expenses per hectare during the period. Other production expenses incurred by farm operators were food for laborers, tractor fuel and oil, transportation, interest on loans, land tax and irrigation fees amounting to ₱484.31 and ₱243.28 for irrigated and rainfed farms, respectively. For all farms, other production expenses averaged ₱466.89 per hectare. The irrigation fee of ₱195.00 was based on three (3) cavans per hectare during dry season.

5. Average Capital Investment Per Hectare

The average capital investment per hectare for the period under review was ₱6,267.64 and ₱6,423.57 for irrigated and rainfed farms, respectively. For all farms, average capital investment amounted to ₱5,748.58.

Table 19. Average Rate and Value of Fertilizer and Plant
Protection Chemicals Used Per Hectare
Dry Season 1981

Particulars	Owner Operator		Amortizing Owner		Leasehold		Share Tenant		Average		All Farms
	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	Irrigated	Rainfed	
Fertilizers											
Quantity (bags)	1.66	-	1.82	-	1.48	-	2.40	-	1.72	-	1.75
Value (₱)	169.88	-	138.88	-	165.00	-	246.55	-	179.95	-	184.27
Insecticides											
Quantity (quarts)	0.65	0.55	0.57	-	0.65	0.54	0.72	0.46	0.65	0.52	0.62
Value (₱)	42.84	40.51	37.35	-	45.49	41.85	50.41	35.56	44.02	39.31	42.26
Weedicides											
Quantity (quarts)	0.66	0.84	0.88	-	0.70	0.24	0.50	0.86	0.68	0.65	0.50
Value (₱)	38.12	46.36	54.53	-	38.26	12.00	35.09	40.91	41.50	33.09	29.15
Total Cost	250.84	86.87	230.76	-	248.75	53.85	332.05	76.47	265.47	72.40	255.68

Source: Farm Management Survey

Table 20. Farm Labor Input Used by Field Operation Per Hectare,
Dry Season 1981

Field Operation	I r r i g a t e d		R a i n f e d		A l l F a r m s	
	Man-days	Value (₱)	Man-days	Value (₱)	Man-days	Value (₱)
Land Preparation	14.11	284.68	14.02	216.79	14.06	249.66
Seedbed Preparation	3.14	18.84	2.67	18.00	3.12	18.81
Seedbed Care	0.64	12.12	-	-	0.64	12.12
Transplanting	18.65	130.07	9.65	15.96	17.11	114.16
Weeding	3.76	37.30	5.10	38.97	4.16	37.87
Spraying	0.96	10.15	1.02	10.03	0.98	10.12
Fertilizing	0.72	12.71	-	-	0.72	12.71
Irrigation	0.96	23.75	-	-	3.96	23.73
Harvesting	26.02	480.81	22.91	128.24	24.42	301.04
Drying	2.44	24.39	1.42	14.19	1.94	19.39
Storing	1.02	8.16	-	-	1.02	8.16
Total	75.42	1,042.98	56.79	442.18	72.13	807.77

Source: Farm Management Survey

The six percent interest on capital was computed based from the total capital investment. Land rental was paid by leaseholders and the amount of land tax incurred by owner-operators were ₱15.61 and ₱7.85 for irrigated and rainfed farms, respectively. The total capital investment amounted to ₱977.39 and ₱488.09 for irrigated and rainfed farms, respectively. For all farms, the average capital investment amounted to ₱691.38 (Table 22).

6. Cost and Return of Palay Production Per Hectare

During the season, the cost of production per hectare in irrigated and rainfed farms in the project area were ₱2,886.09 and ₱1,392.47, respectively. For all farms, the cost of production per hectare amounted to ₱2,350.00. The total variable cost for irrigated farm was ₱1,713.70 per hectare and ₱904.38 for rainfed areas. Fixed costs amounted to ₱1,172.39 and ₱488.09 per hectare for irrigated and rainfed areas, respectively.

The average production in irrigated farm was 60.44 cavans per hectare valued at ₱3,851.98. This generated a net return of ₱2,138.28 considering only variable cost. In rainfed areas with a mean yield of 17.69 cavans per hectare valued at ₱1,143.29, the net return was ₱238.91 considering only the variable cost (Table 23).

7. Farm Budget for Rice Demonstration Farm

Table 24 shows the production, expenses and net income of the Rice Demonstration Farm in the project service area. During the report period, the 0.63 hectare planted to IR-36 (certified) produced a total yield of 2,988 kg. (59.76 cavans) valued at ₱3,585.60. On the other hand, the total production cost incurred was ₱2,006.35. Of this amount, harvester's share accounted for the highest item of expense followed by fertilizers and landowners share with 24.40 percent, 15.84 percent and 14.37 percent, respectively. This generated a net return of ₱1,579.25.

This season's total production of 59.76 cavans is 87.88% of the previous harvest (wet season, 68 cavans) representing 12.12% yield reduction. Yield difference of the two (2) planting season

**Table 21. Other Production Expenses Per Hectare
Dry Season 1981**

Particulars	Irrigated	Rainfed	All Farms
Food for Laborers	113.54	102.45	108.13
Tractor Fuel and Oil	139.80	111.04	135.55
Transportation	29.36	21.94	18.35
Land Tax	15.61	7.85	9.86
Irrigation Fees	195.00	-	195.00
Total	484.31	243.28	466.89

Source: Farm Management Survey

**Table 22. Average Capital Investment Per Hectare
Dry Season 1981**

Particulars	Irrigated	%	Rainfed	%	Average All Farms	%
A. Land	₱3,015.87	41.62	₱1,742.92	25.22	₱2,017.09	31.32
Work Animals	433.56	5.98	855.42	12.38	651.18	10.11
Machineries	2,766.54	38.19	3,763.95	54.46	3,024.57	46.96
Tools & Equipt.	51.67	0.71	61.28	0.88	55.74	0.87
Sub-Total	₱6,267.64	86.50	₱6,423.57	92.94	₱5,748.58	89.26
B. Interest (6%)	₱ 376.06	5.19	₱ 385.41	5.58	₱ 344.91	5.36
Land Rental	548.35	7.57	69.73	1.01	304.31	4.73
Depreciation	37.37	0.52	25.10	0.36	32.30	0.50
Taxes	15.61	0.22	7.85	0.11	9.86	0.15
Sub-Total	₱ 977.39	13.50	₱ 488.09	7.06	₱ 691.38	10.74
Total	₱7,245.03	100.00	₱6,911.66	100.00	₱6,439.96	100.00

Source: Farm Management Survey

Table 23. Cost and Return of Palay Production Per Hectare
by Type of Farm, Dry Season 1981

Particulars	Irrigated	Rainfed	All Farms
I. Returns			
A. Production (cav.)	60.44	17.69	38.64
B. Value (₱)	3,851.98	1,143.29	2,470.86
II. Cost			
A. Variables:	131.55	154.37	143.33
1. Seeds	131.55	154.37	143.33
2. Fertilizers	179.95	-	179.95
3. Insecticides	44.02	39.31	42.26
4. Weedicides	41.50	33.09	29.15
5. Labor	1,042.98	442.18	807.79
6. Food for Laborers	113.54	102.45	108.13
7. Fuel & Oil	139.80	111.04	135.55
8. Transportation	20.36	21.94	18.35
Sub-Total	1,713.70	904.38	1,464.51
B. Fixed:			
1. Land Rental	548.35	69.73	304.31
2. Interest on Capital	376.06	385.41	344.91
3. Depreciation	37.37	25.10	32.30
4. Taxes	15.61	7.85	9.86
5. Irrigation Fees	195.00	-	195.00
Sub-Total	1,172.39	488.09	886.38
Grand Total	2,886.09	1,392.47	2,350.89
III. Net Return			
A. Above Variable Cost	2,138.28	238.91	1,006.35
B. Above Total Cost	965.89	- 249.18	119.97

Source: Farm Management Survey

**Table 24. Farm Budget of Rice Demonstration Farm
Dry Season 1981**

Particulars	Amount (₱)	Percentage
Area (has.)	0.63	
Production (cavan) ^{1/}	59.76	
Gross Value of Production (₱) ^{2/}	3,585.60	
Production Cost (₱)	2,006.36	
Land Preparation	236.25	11.78
Cost of Seeds ^{3/}	42.50	2.12
Seedbed Preparation	14.00	0.70
Transplanting	150.00	7.48
Fertilizers & Chemicals:		
a. Weedicides	63.00	3.14
b. Pesticides	97.50	4.86
c. Fertilizers	317.50	15.82
Crop Maintenance	84.00	4.19
Other Costs:		
a. Irrigation Fee	126.00	6.28
b. Landowner's Share	288.00	14.35
c. Harvester's Share	489.60	24.40
d. Hauling	16.00	0.80
e. Transportation	32.00	1.59
f. Food for Laborers	50.00	2.49
Net Income	1,579.25	100.00

1/ 1 Cavan = 50 kg.

2/ Based on ₱1.20/kg.

3/ IR-36 Certified

Table 25. Disposal of Palay Production Per Hectare, In Cavans
Dry Season 1981

Particulars	Irrigated	Rainfed	All Farms
Land Share	8.69	1.04	4.79
Harvester & Thresher Share	7.68	1.99	4.78
Farmers Share	44.07	14.66	29.07
a. Sold or to be sold	20.94	1.33	10.94
b. Household Use	21.03	12.20	16.53
c. Used for Seeds	1.97	0.89	1.42
d. Used for Feeds	0.13	-	0.06
e. Paid to Creditors		0.24	0.12
Total	60.44	17.69	38.64

Source: Farm Management Survey

Table 26. Value of Palay Disposal Per Hectare
Dry Season 1981

Particulars	Irrigated (₱)	Rainfed (₱)	Ave. All Farms (₱)
Land Share	548.35	69.73	304.31
Harvester & Thresher Share	480.81	128.24	301.04
Farmers Share	2,822.82	945.32	1,865.51
a. Sold or to be sold	1,319.36	78.77	686.80
b. Household Use	1,367.02	792.90	1,074.28
c. Used for Seeds	128.25	57.90	92.38
d. Used for Feeds	8.19	-	8.03
e. Paid to Creditors	-	15.75	4.02
Total/Average	3,851.98	1,143.29	2,470.86

Source: Farm Management Survey

was attributed to the construction of some structures along the service canal serving the demonstration farm, resulting to the total cut-off of water supply for a period of three (3) weeks. This occurred during the entire tillering stage of the rice plants.

B. PROBLEMS ENCOUNTERED

1. Incidence of Pests and Diseases

The occurrence of pests and diseases in the project area affected 26 hectares of agricultural lands involving 19 farmers. The most common pests and diseases were green leafhoppers, caseworms, leaf folders and armyworms (Table 27).

2. Rodent Infestation

Rodents affected five (5) hectares in the service area involving 10 farmers.

Table 27. Incidence of Plant Pests, Diseases and Rodents Infestation, Dry Season 1981

Particulars	Farmers Involved (Ha.)	Area Infested (Ha.)	Area Treated (Ha.)	Area Saved (Ha.)	Remedies Undertaken
A. Pests & Diseases					
1. Green Leafhoppers	10	3	3	3	Sprayed with Chemicals
2. Caseworms	2	2	2	2	
3. Leaf Folders	2	1	1	1	
4. Armyworms	5	20	10	10	
Sub-Total	19	26	16	16	
B. Rodents	10	5	5	5	Poison Baiting
Total	29	31	21	21	

Source: Ministry of Agriculture (BPI) Offices at Nabua, Bato, Buhi and Iriga City

A P P E N D I C E S

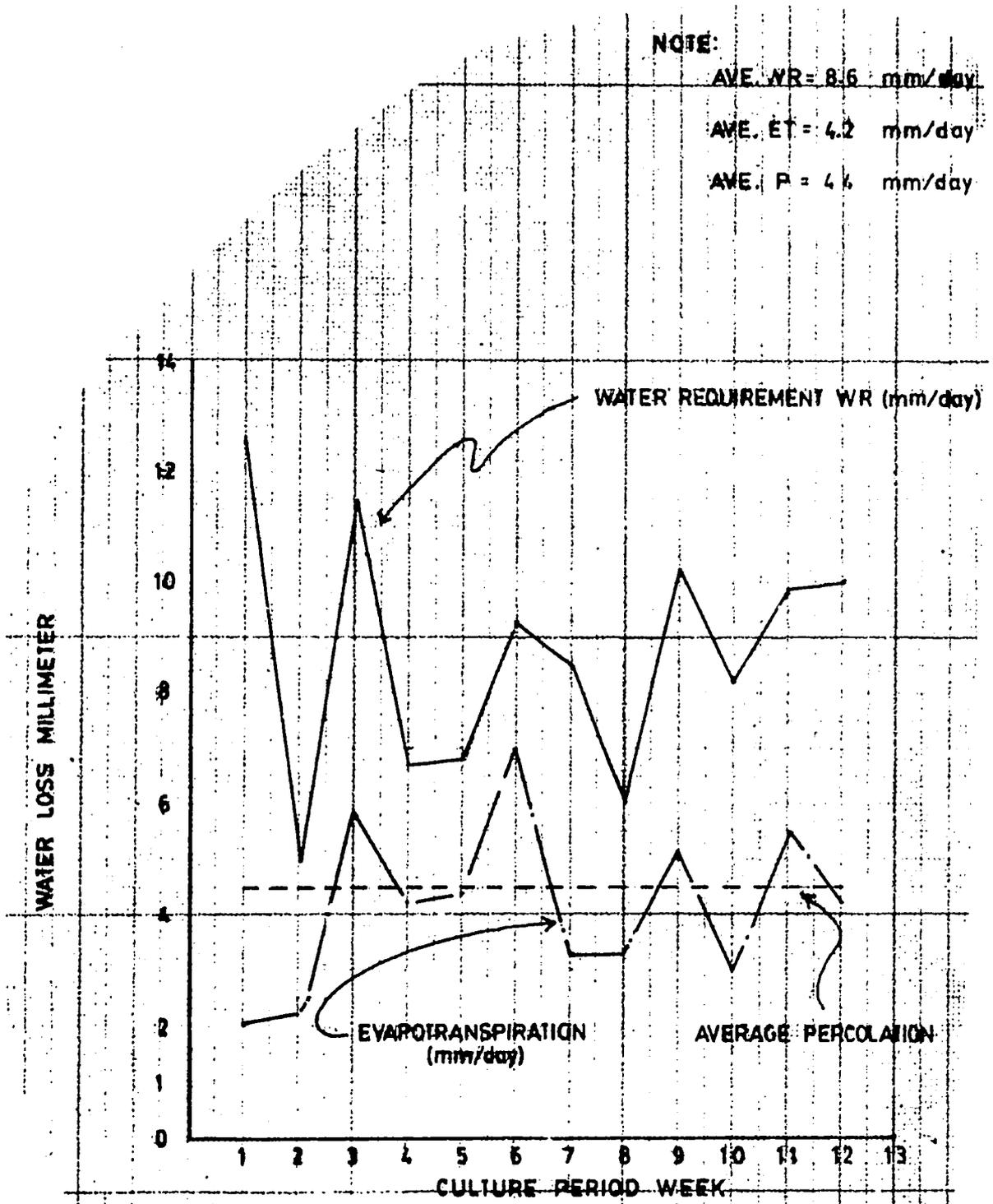


FIG.1 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT STO. NIÑO (RALAT 1-2) IRIGA CITY 1981 (DRY SEASON)

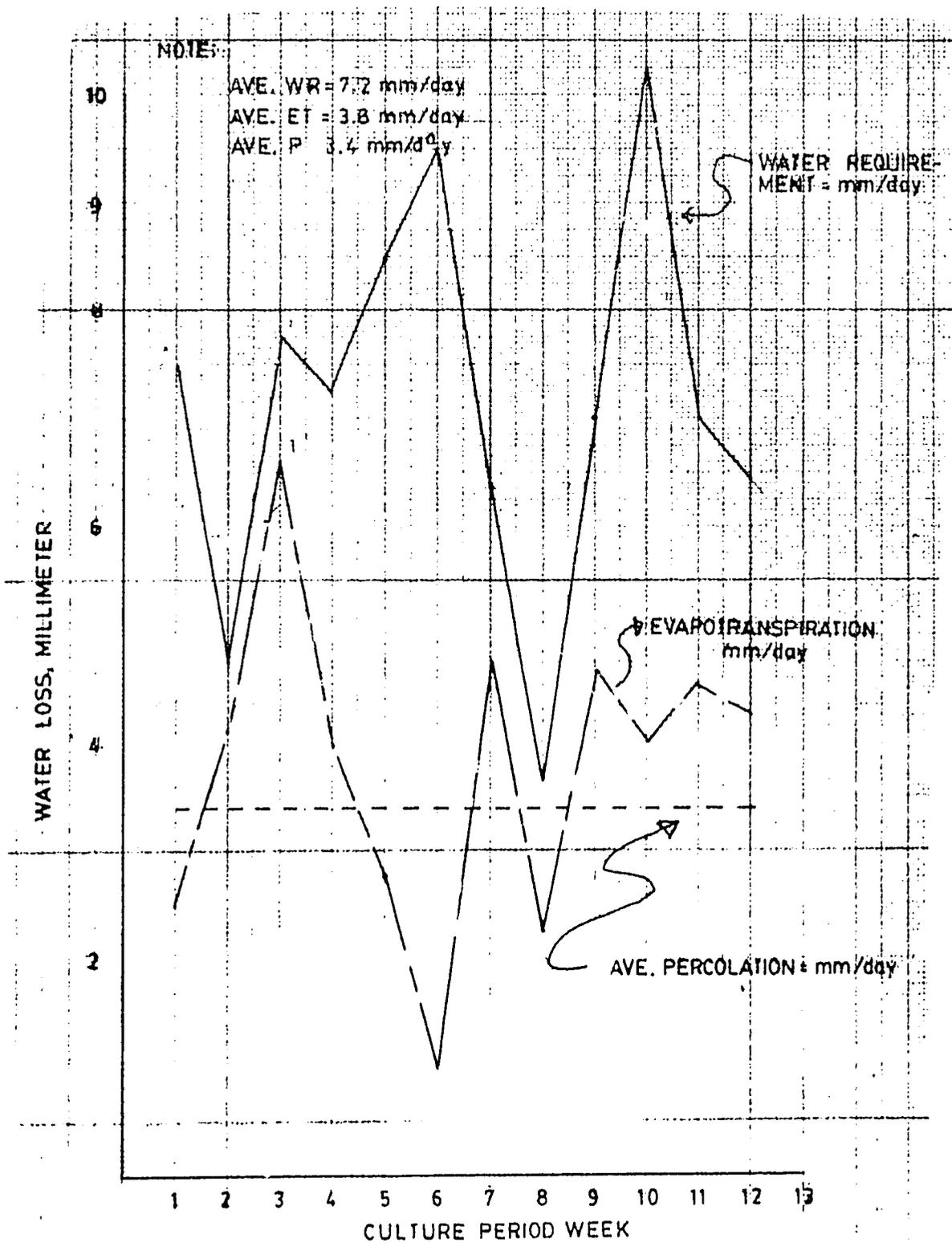


FIG 2 GRAPH SHOWING WATER REQUIREMENT EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT STO. NIÑO (RAMC 13) IRIGA CITY (1981 DRY SEASON)

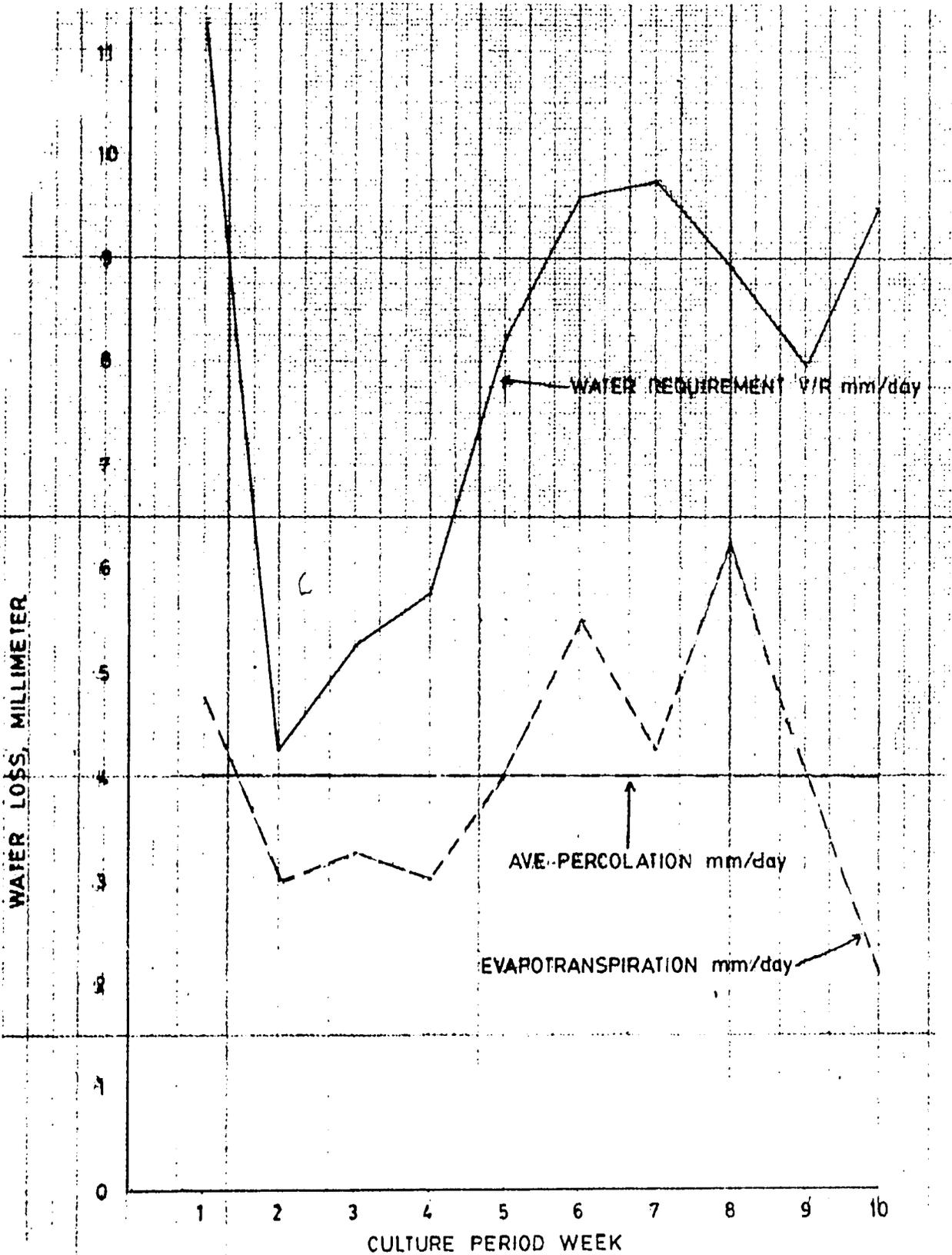


FIG 3 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTIC AT LOS ANGELES (RAMC 10) BUHI CAM SUR (1981 DRY SEASON)

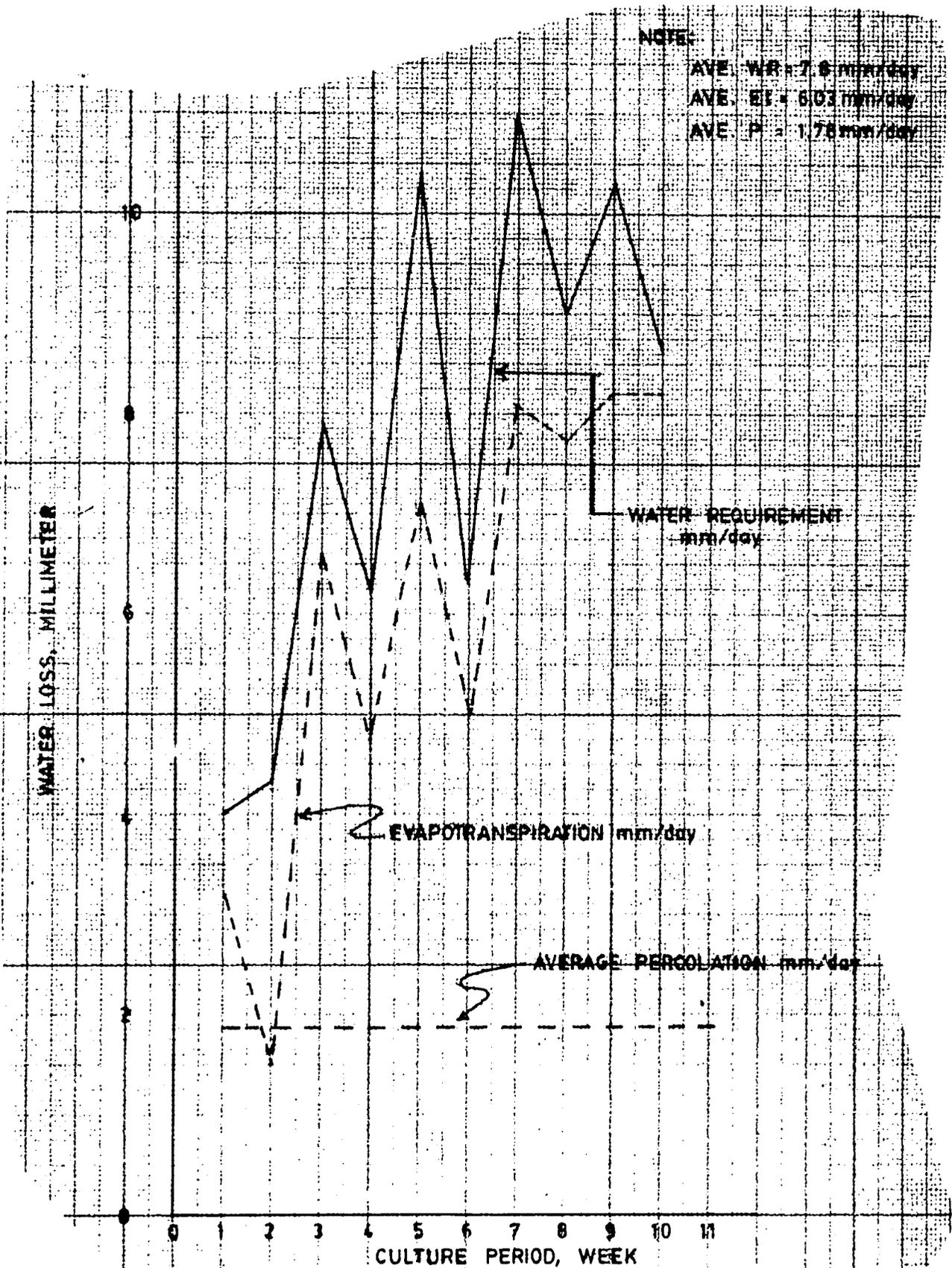


FIG. 4 GRAPH SHOWING WATER REQUIREMET, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT STA. LABEL (RAMC 5) BUHI (1981 DRY SEASON)

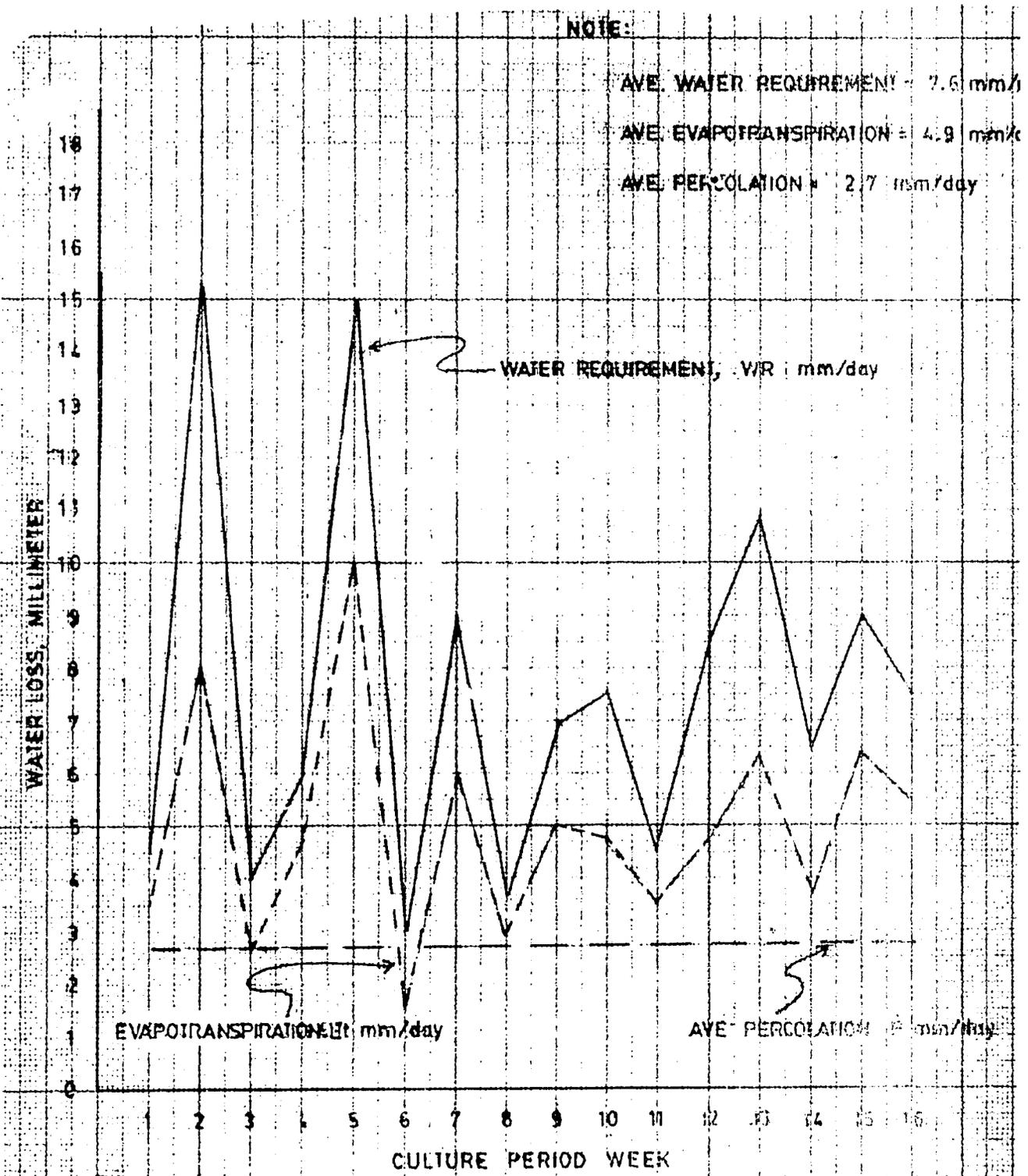


FIG. 5 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT SAN FRANCISCO (RAMC 2) EUIH CAM SUR (1981 DRY SEASON)

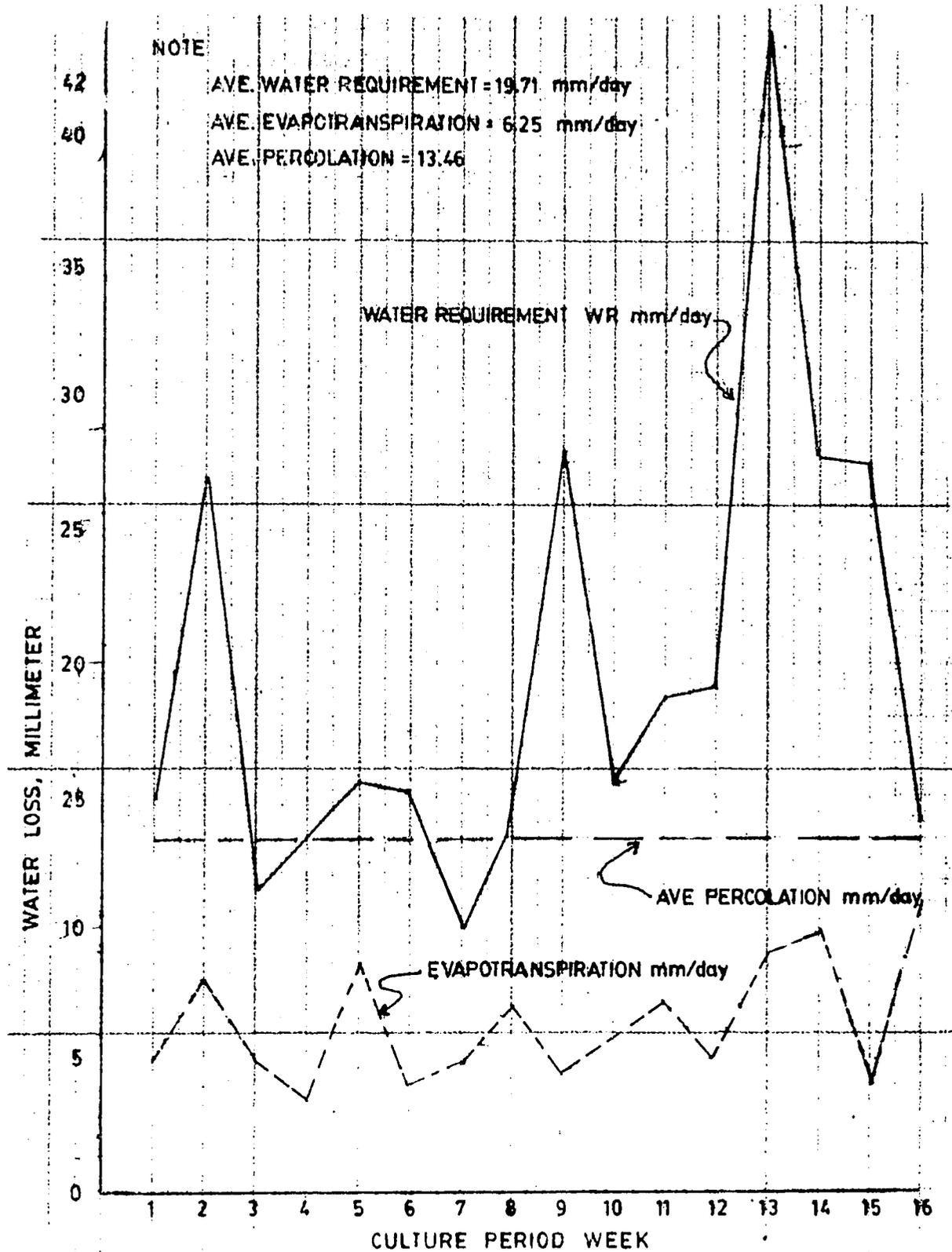


FIG 6 GRAPH SHOWING WATER REQUIREMENT EVAPOTRANSPIRATION AVERAGE PERCOLATION CHARACTERISTICS AT SAN ISIDRO (RALAT A-1) BUHI CAM. SUR (1981 DRY SEASON)

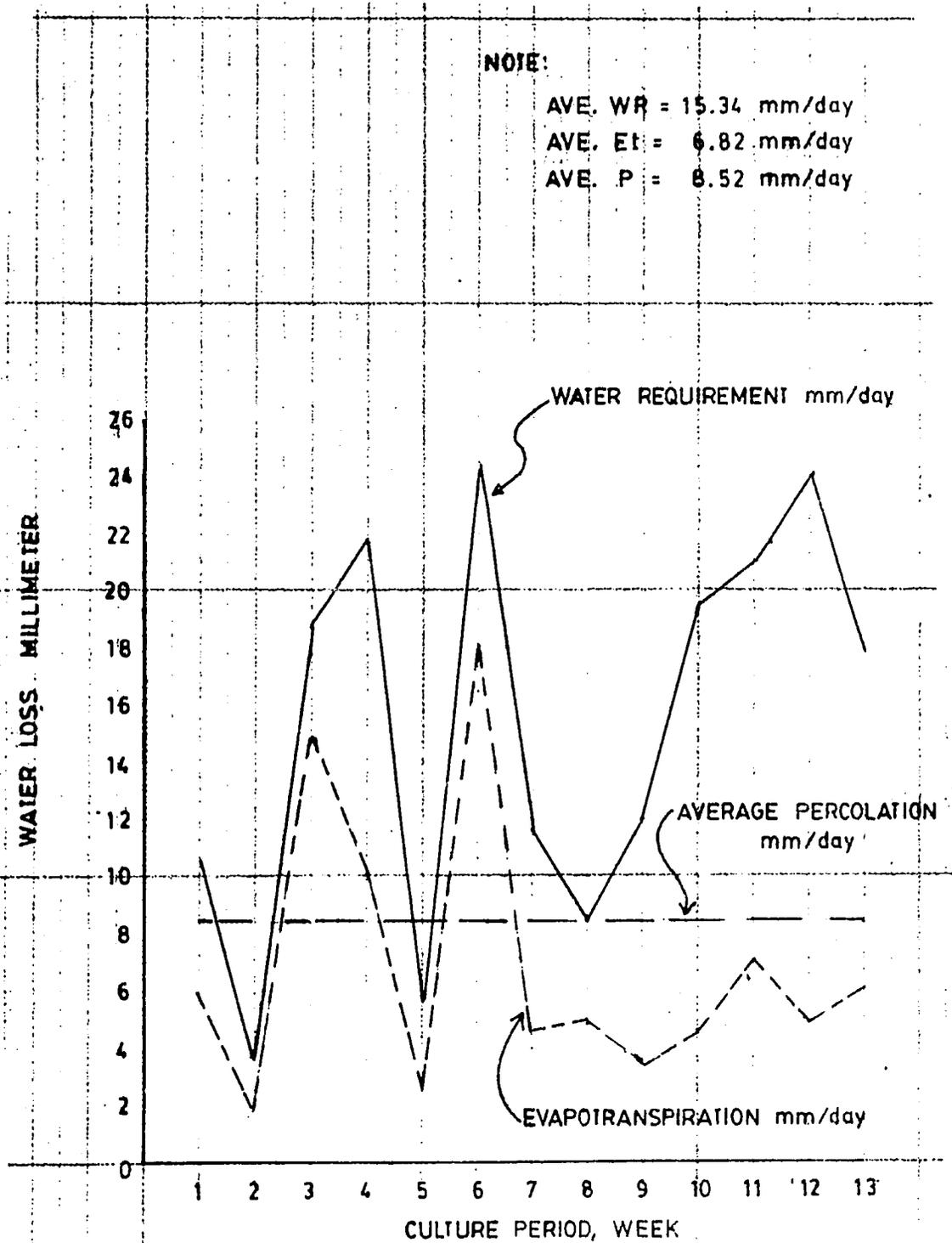


FIG. 7 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND PERCOLATION CHARACTERISTICS AT LOS ANGELES (RALAI A) BUHI CAM SUR (1981 DRY SEASON)

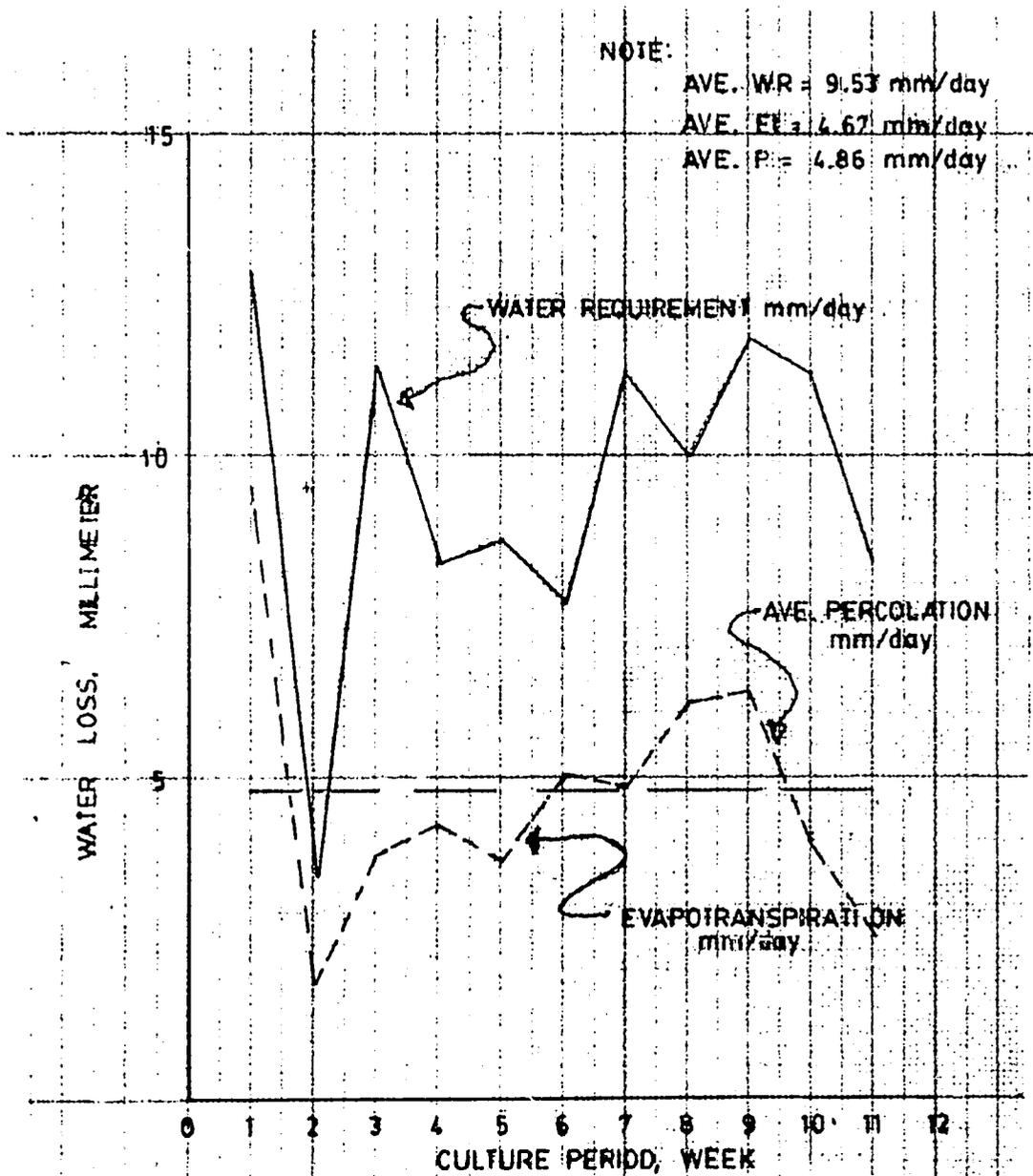


FIG 8 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT LOS ANGELES (RAMC 8) BUHI CAM. SUR 1981 DRY SEASON

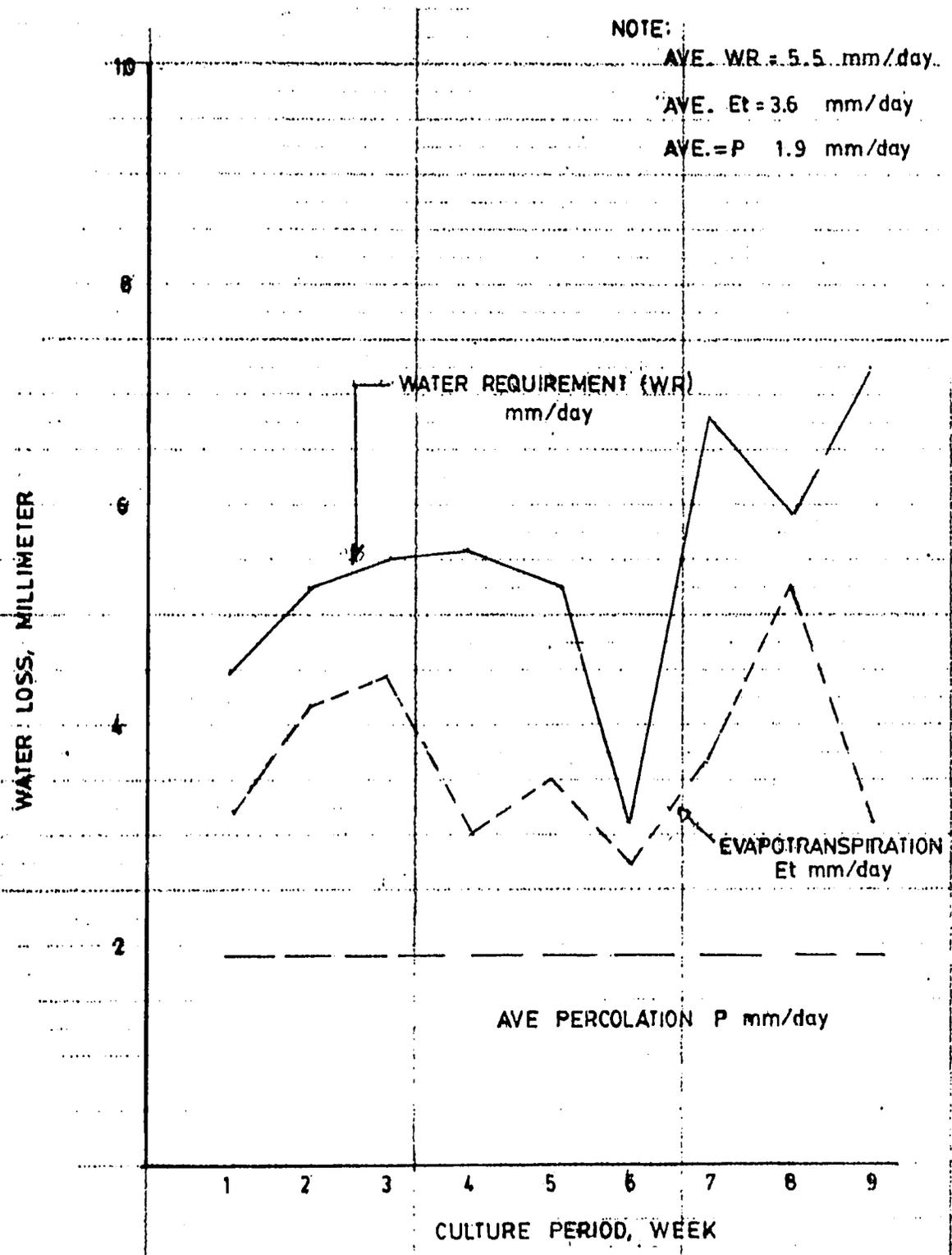


FIG. 9 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIR. AND AVERAGE PERCOLATION CHARACTERISTICS AT DEL ROSARIO BANAQ (RAMC 11) IRIGA CITY 1981 DRY SEASON

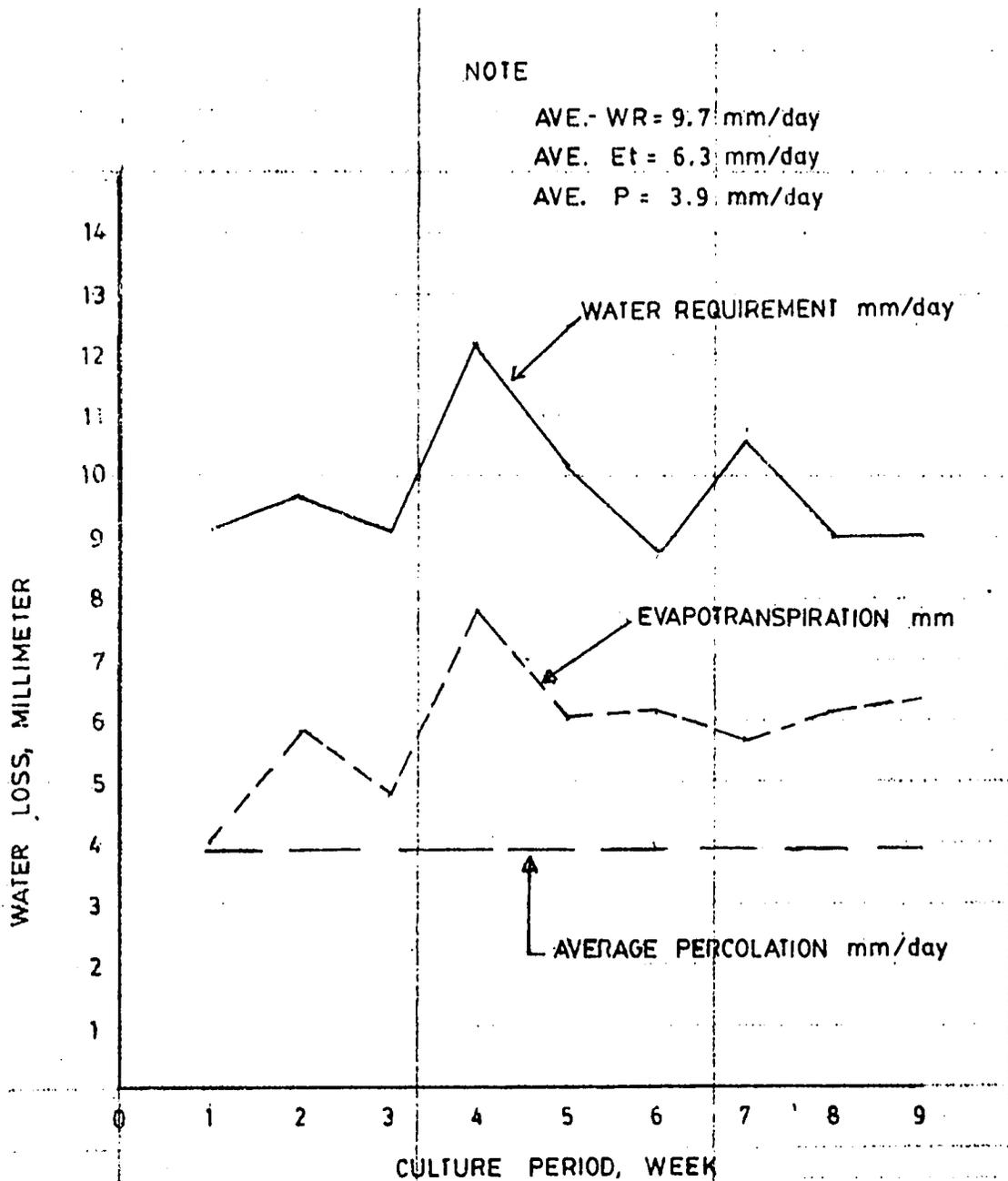


FIG. 10 GRAPH, SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT SAN JOSE SALAY (RAMC 6) BUHI, CAM SUR (1981 DRY SEASON)

NOTE: DATA COLLECTION TERMINATED AT THE 9th WEEK BECAUSE OF OPERATIONS SHUT DOWN.

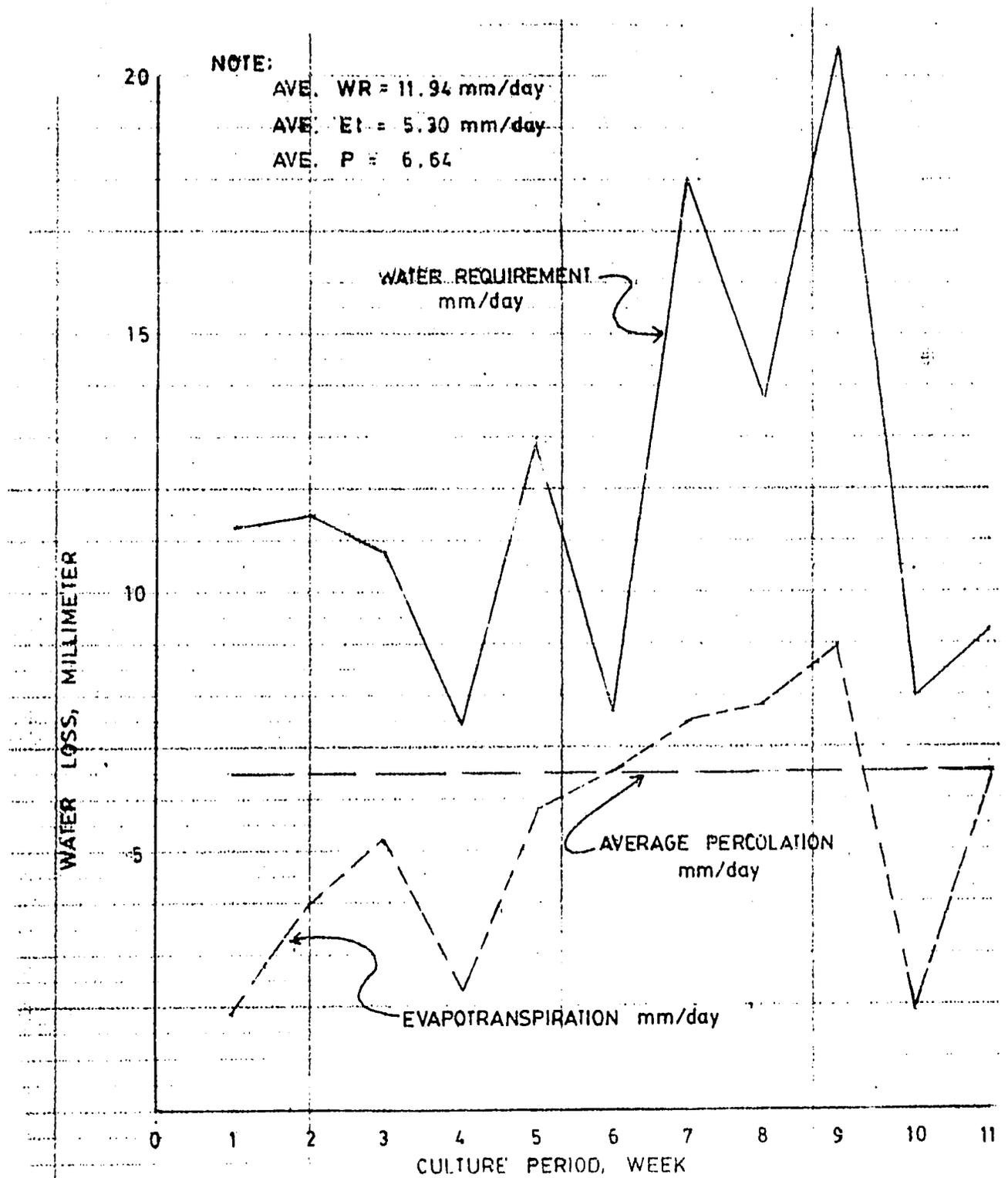


FIG. 11 GRAPH SHOWING WATER REQUIREMENT, EVAPOTRANSPIRATION AND AVERAGE PERCOLATION CHARACTERISTICS AT SAN ISIDRO II (RAMC 4) BUHI, CAM. SUR (1981 DRY SEASON)

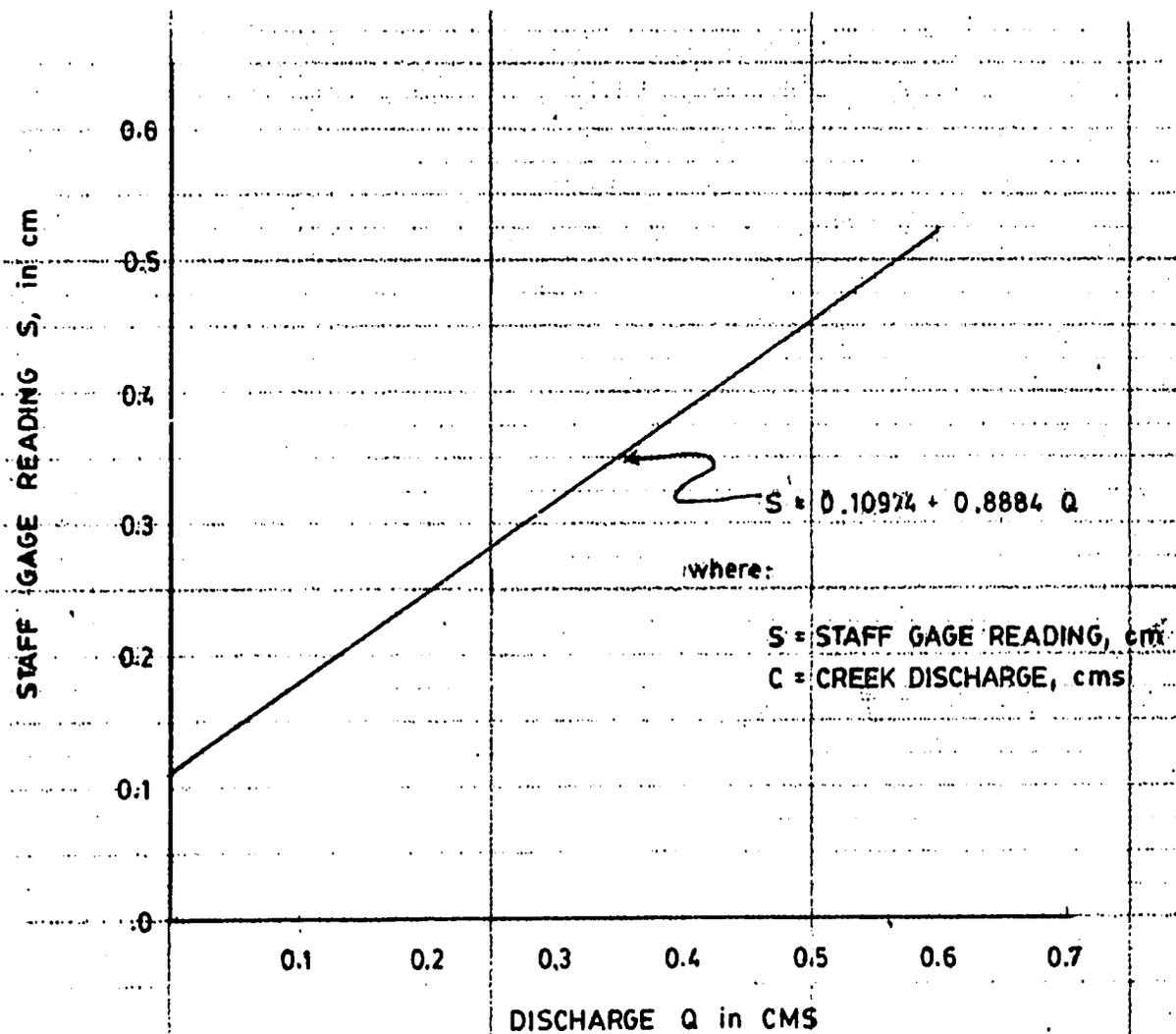


FIG. 12 STAGE-DISCHARGE RELATIONSHIP IN CAORASAN CREEK
(SAN ISIDRO, BUHI, CAM. SUR)

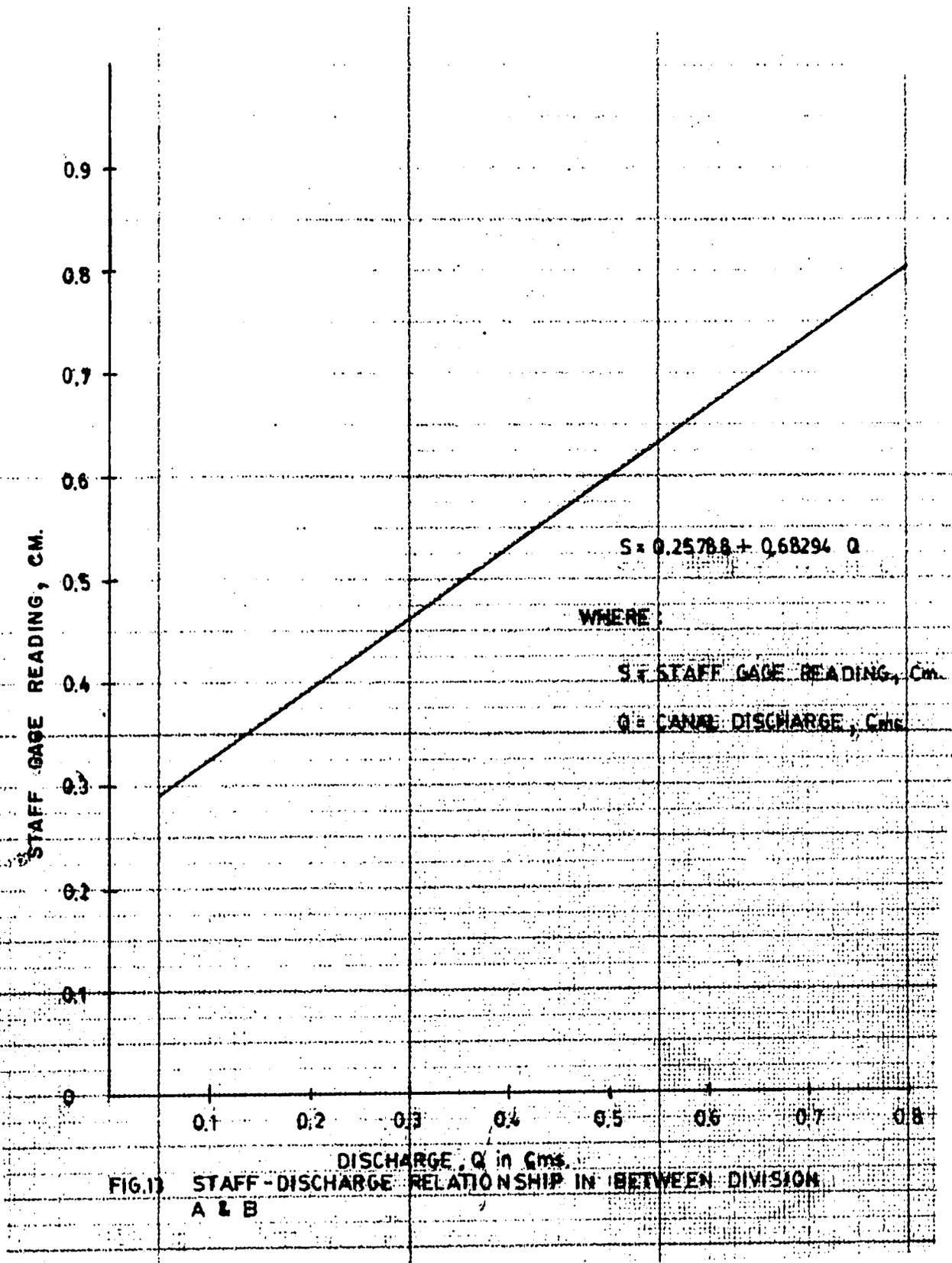


FIG.1) STAFF-DISCHARGE RELATIONSHIP IN BETWEEN DIVISION A & B

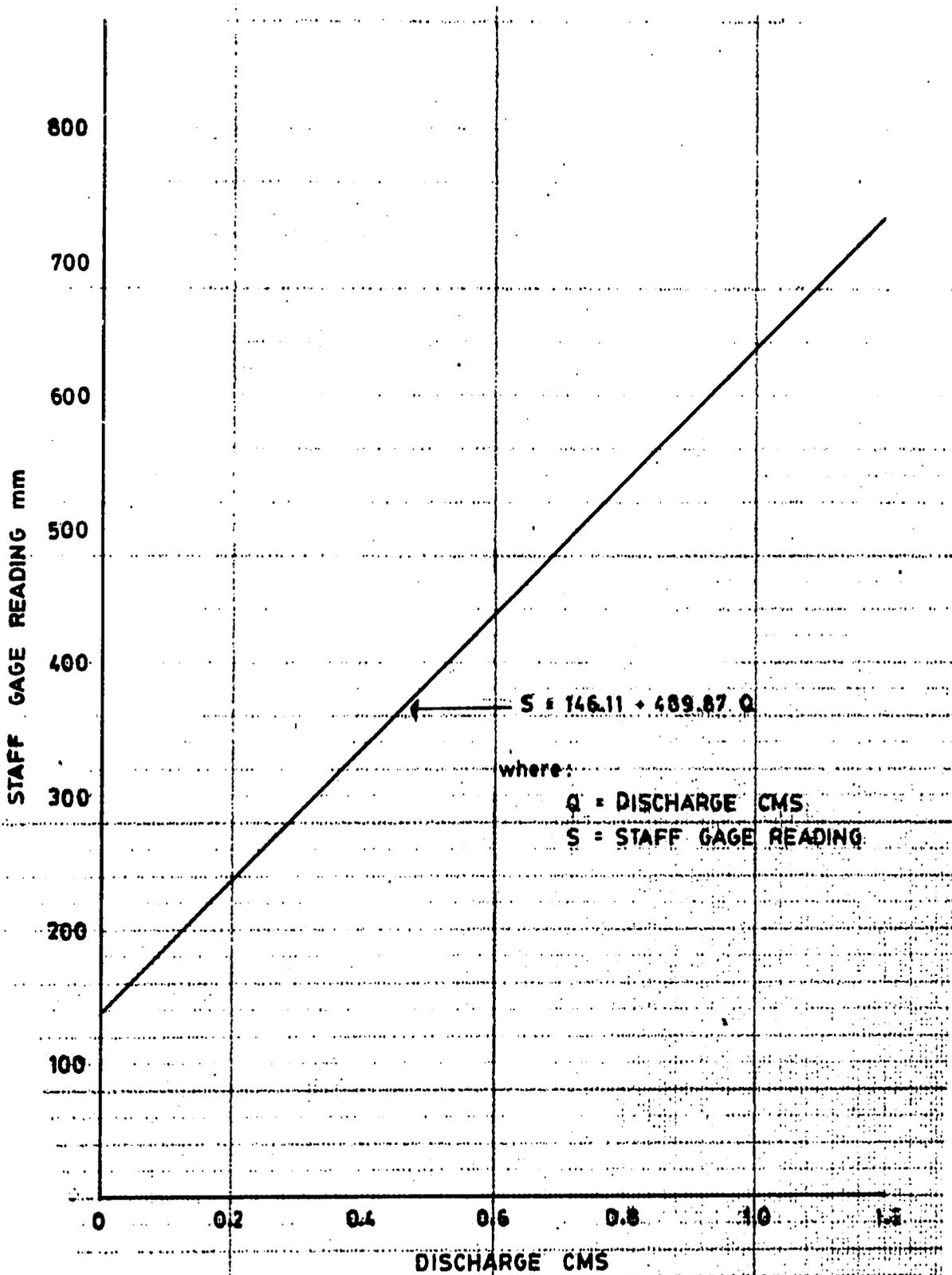


FIG. 14 STAGE - DISCHARGE RELATIONSHIP IN ULRIS MAIN CANAL
 (TAKEN AFTER LINING STA: 0+047-0+0200)

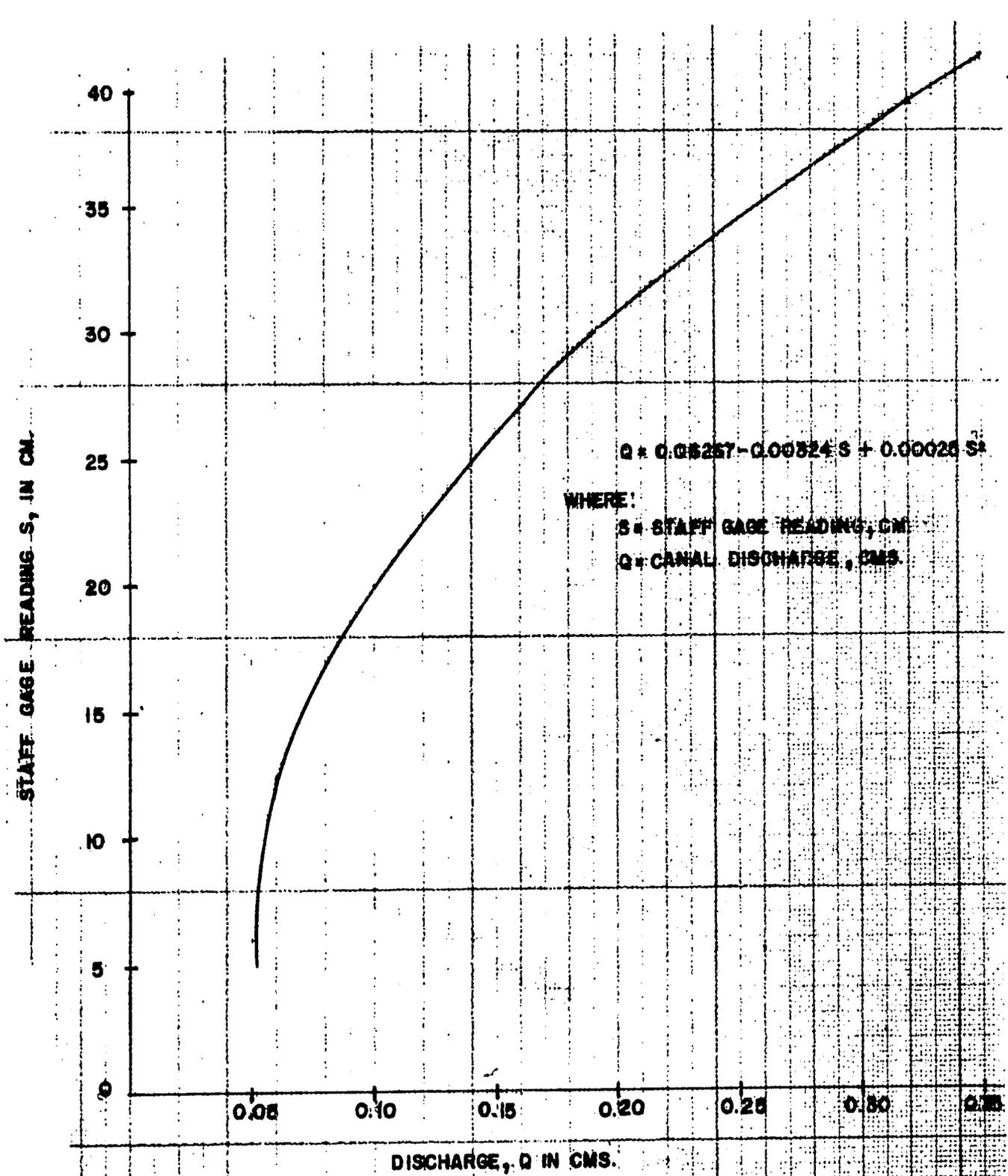


FIG. 15 STAGE-DISCHARGE RELATIONSHIP IN LATERAL 6 (LR18)

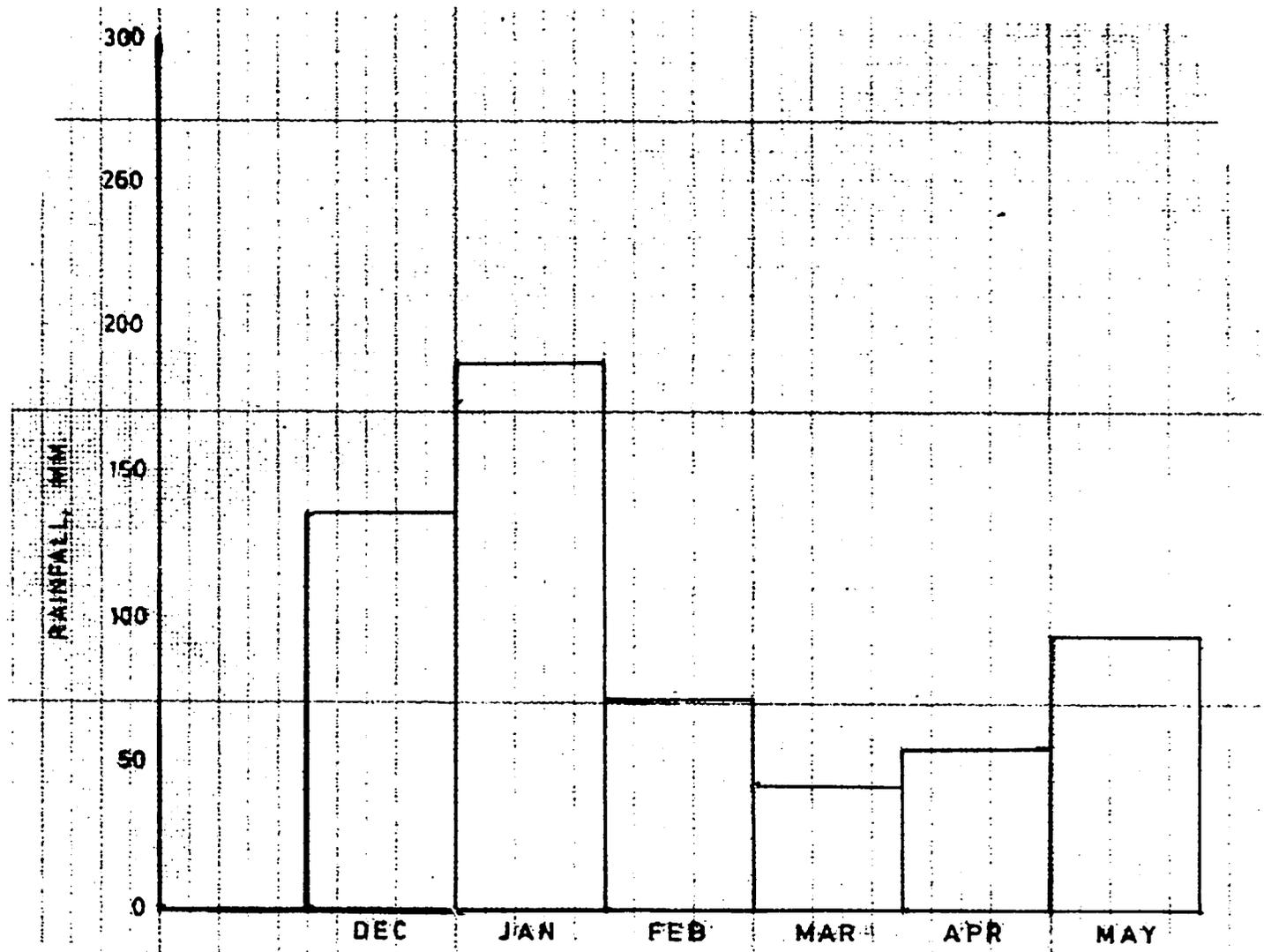
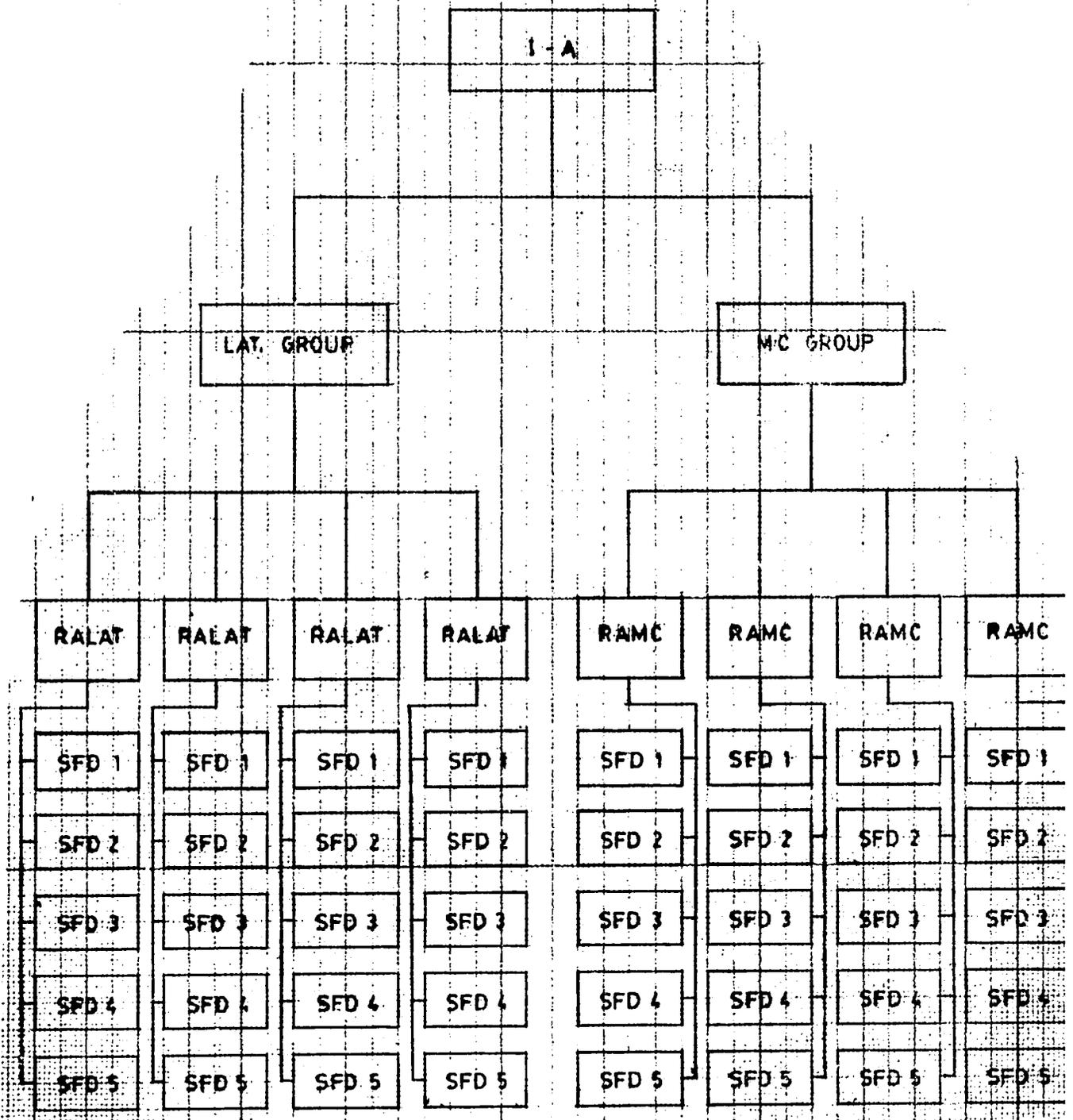


FIG. 16 AVERAGE MONTHLY RAINFALL DISTRIBUTION AT BIAD III PROJECT RINCONADA (DRY SEASON 1980-81)

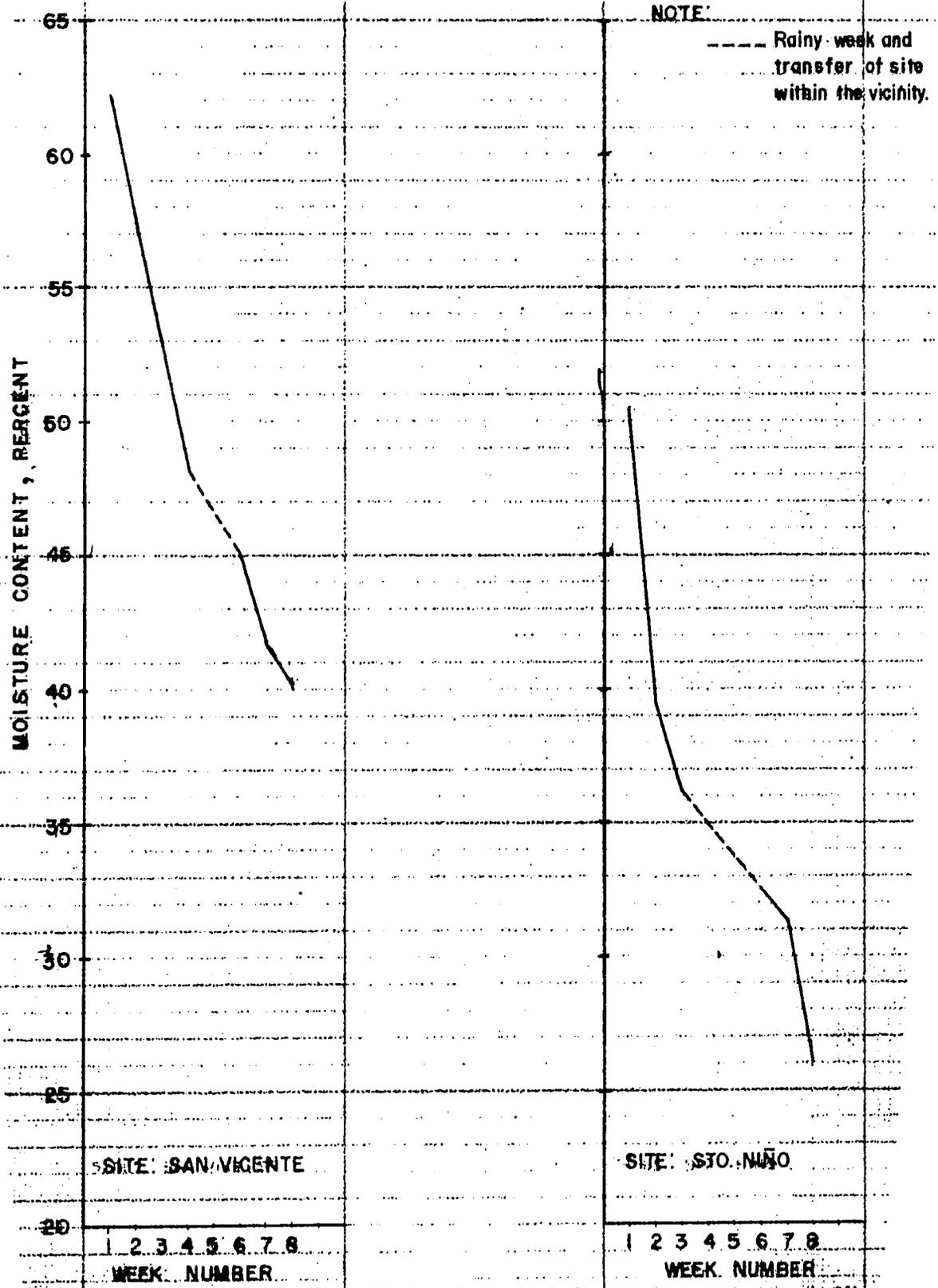
FIG. 17 PROPOSED I-A STRUCTURE



APPENDIX E

NOTE:

----- Rainy week and transfer of site within the vicinity.



SITE: SAN VICENTE

SITE: STO. NIÑO

1 2 3 4 5 6 7 8
WEEK NUMBER

1 2 3 4 5 6 7 8
WEEK NUMBER

FIG. 18 GRAPH SHOWING WEEKLY AVERAGE RATE OF MOISTURE DEPLETION IN SAN VICENTE & STO. NIÑO.

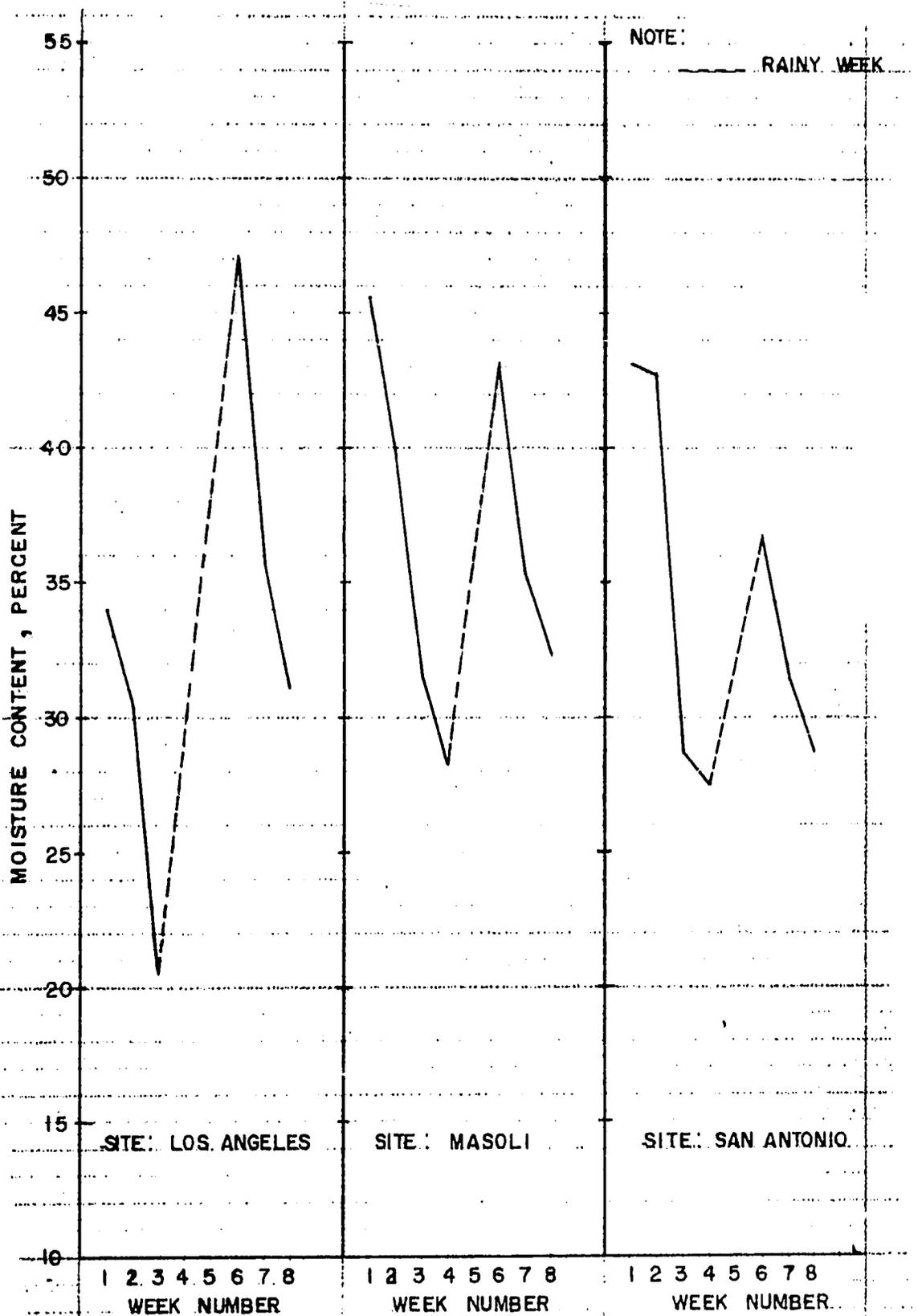


FIG. 19 GRAPH SHOWING WEEKLY AVERAGE RATE OF MOISTURE DEPLETION IN LOS ANGELES, MASOLI AND SAN ANTONIO.

APPENDIX F

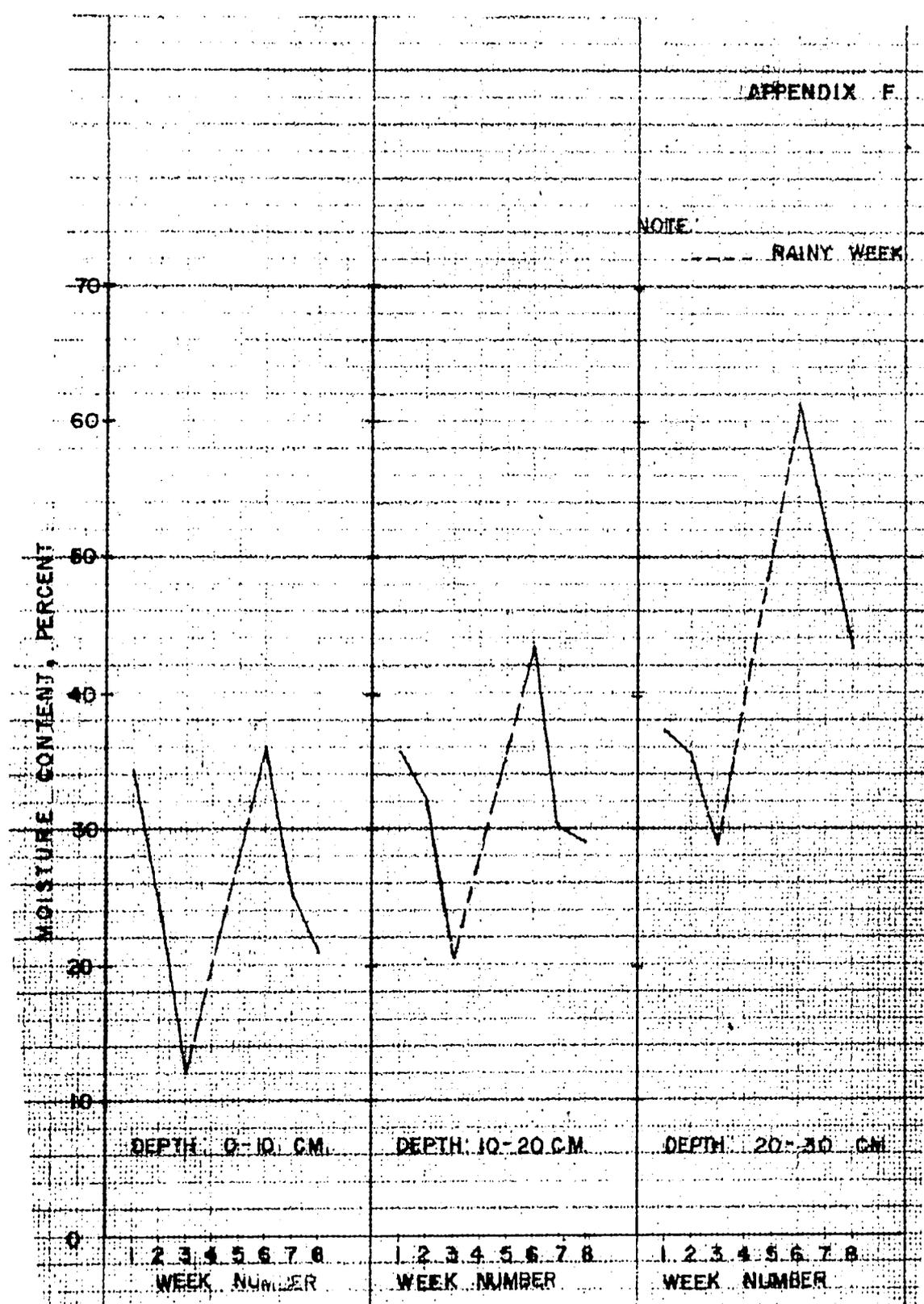
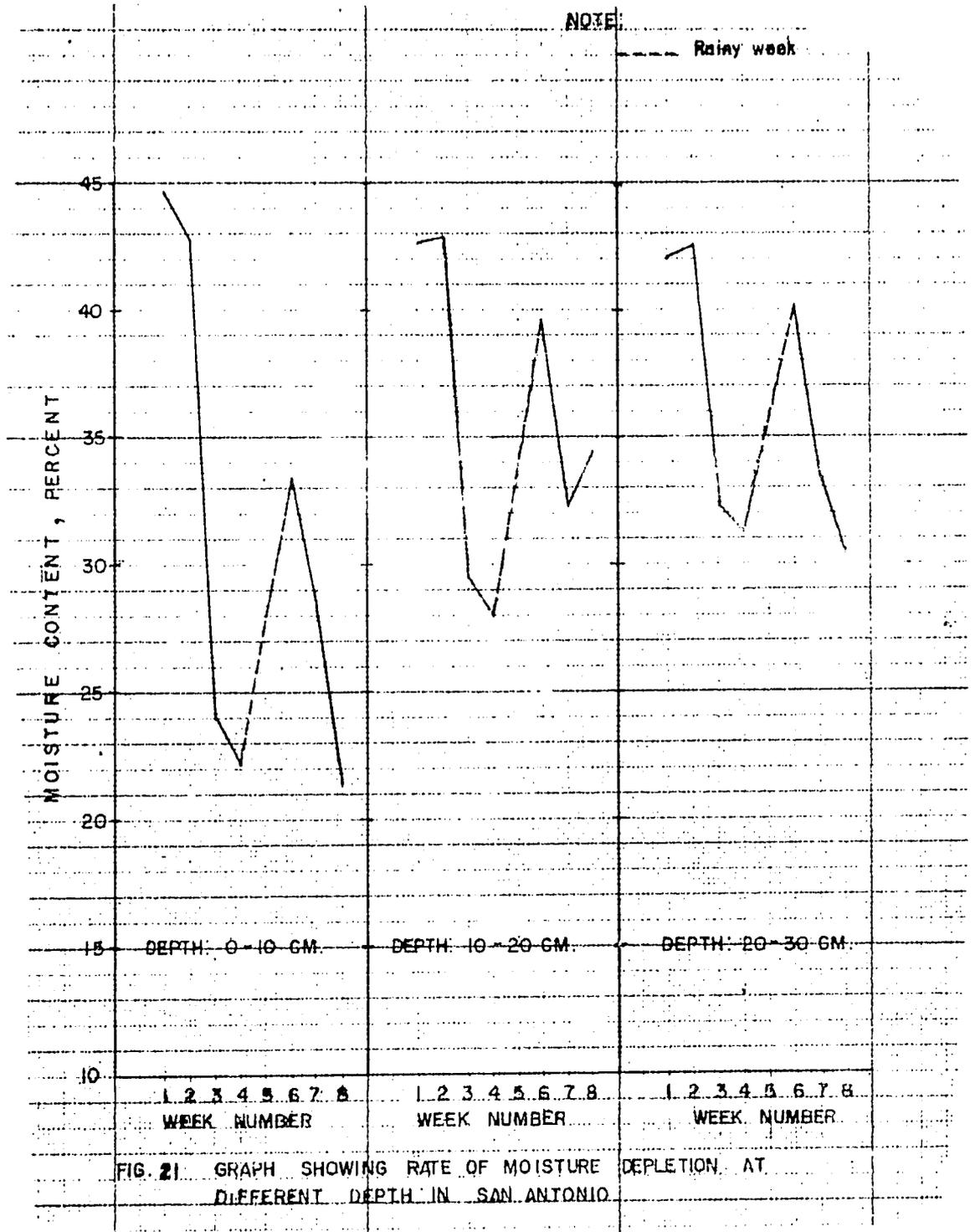


FIG. 20 GRAPH SHOWING RATE OF MOISTURE DEPLETION AT DIFFERENT DEPTH IN LOS ANGELES.



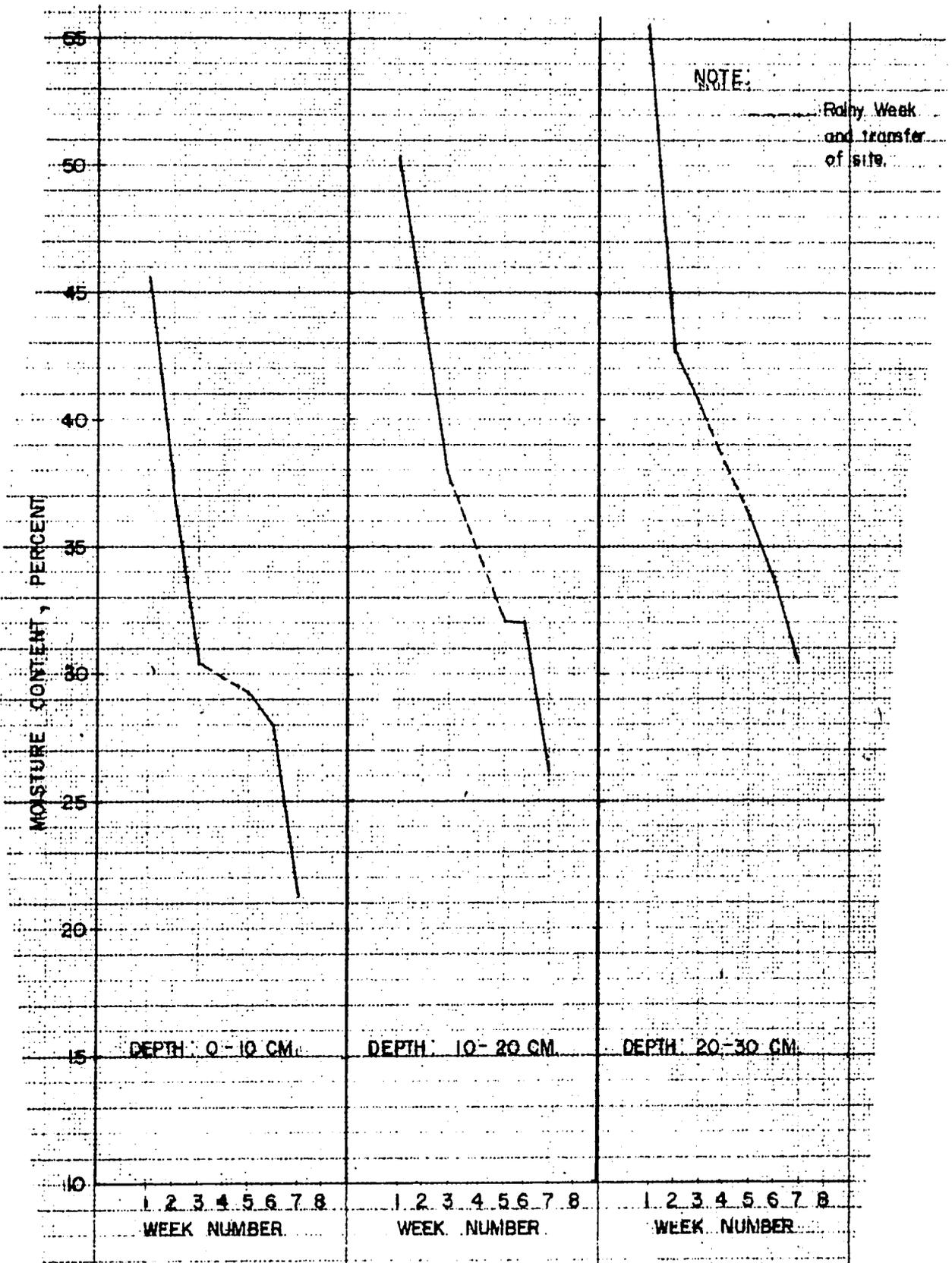


FIG. 22. GRAPH SHOWING RATE OF MOISTURE DEPLETION AT DIFFERENT DEPTH IN STO. NIÑO.

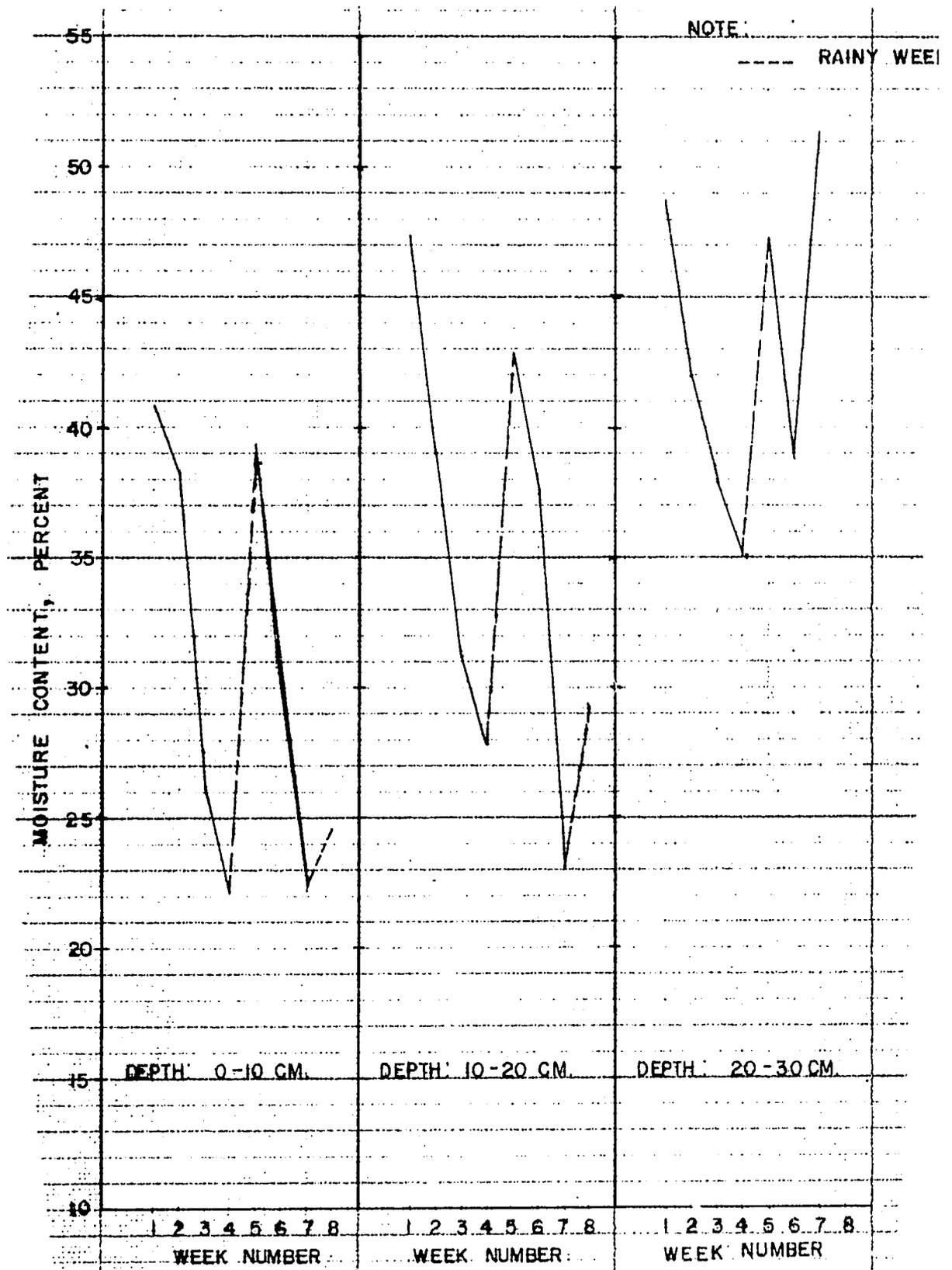
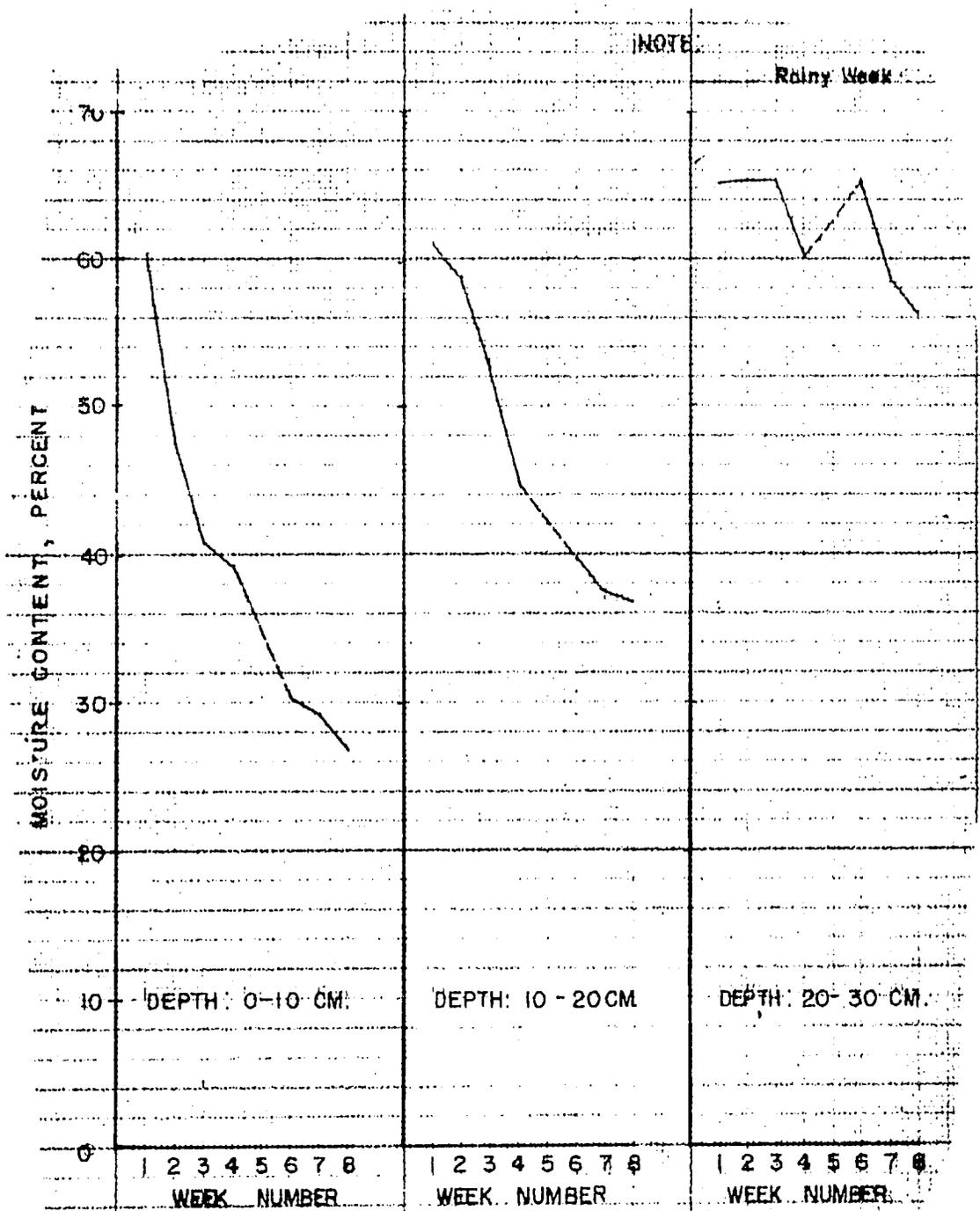


FIG. 23 GRAPH SHOWING RATE OF MOISTURE DEPLETION AT DIFFERENT DEPTH IN MASOLI



NOTE: Rainy Week

FIG. 2A. GRAPH SHOWING RATE OF MOISTURE DEPLETION AT DIFFERENT DEPTH IN SAN VICENTE.