THE ISLAMIC REPUBLIC OF PAKISTAN

FEASIBILITY REPORT

ON

AGRICULTURAL DEVELOPMENT PROJECT

WITH

WIDENING OF PAT FEEDER CANAL

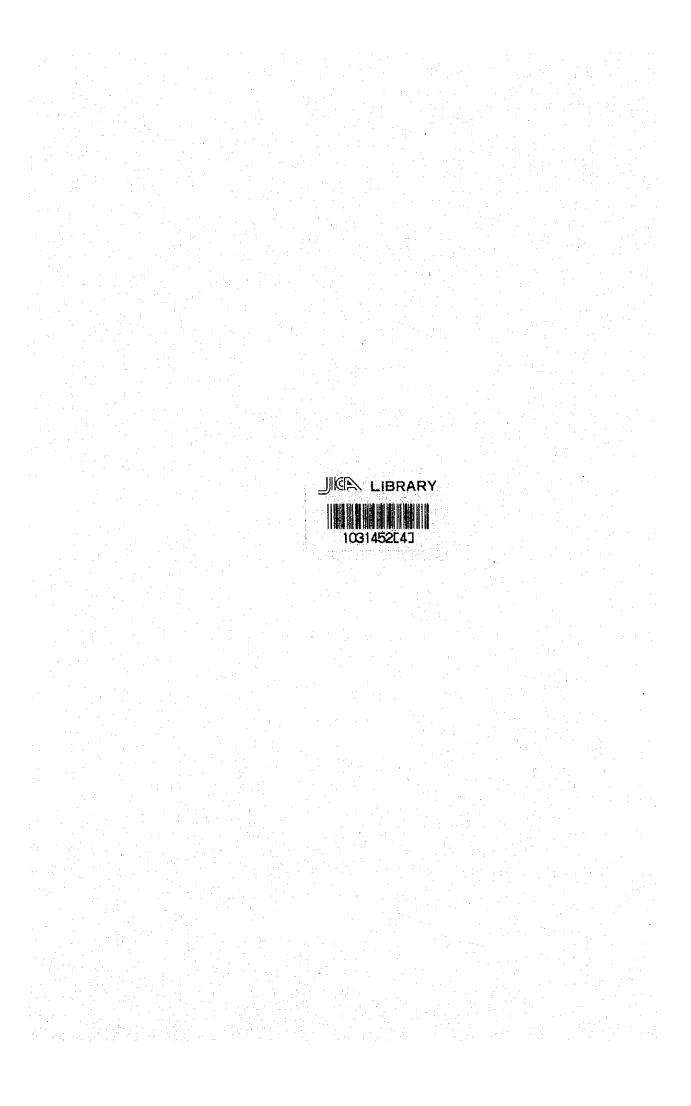
VOLUME III (APPENDIX-II)

DECEMBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY



119



THE ISLAMIC REPUBLIC OF PAKISTAN

FEASIBILITY REPORT

ON

AGRICULTURAL DEVELOPMENT PROJECT

WITH

WIDENING OF PAT FEEDER CANAL

VOLUME III (APPENDIX-II)

DECEMBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

AFT	
OR (5)	-
82-79	
	-

No=

国際協力事業団
慶次 584. 39.224 <u>日17-0</u> 房白 584. 39.224 日17-0 83.33
登録No.1 109885 <u>AFIT</u> 8

	CONTENTS OF APPENDIX
Chapter IV T	he Project
IV.2	Project Formulation
IV.2.1	Crop Water Requirement
IV.2.1 IV.2.2	사실 이 사람 김 승규는 것에서 물건을 가지 않는 것을 방법 수요? 神秘에서 가지 못 물건하는 것이 가지 않는 것이 가지 않는 것이 가지 않는 것이 같이 하는 것이 같이 하는 것이 같이 하는 것이 하는 것이 하는 것이 하는 것이 하는 것이 하는 것이 같이 하는 것이 같이 같이 하는 것이 같이 않는 것이 같이 않는 것이 같이 않는 것이 같이 않는 것이 없다. 것이 같이 있는 것이 않는 것이 않는 것이 없는 것이 없는 것이 않는 것이 없다. 것이 않는 것이 않는 것이 없는 것이 없는 것이 없는 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 없는 것이 없 않는 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 없는 것이 없다. 것이 않은 것이 없는 것이 없는 것이 없는 것이 없는 것이 없다. 않은 것이 없는 것이 없는 것이 없는 것이 없는 것이 없는 것이 않는 것이 않이 않이 않이 않아. 것이 않은 것이 않이 않이 않이 않아. 않아. 것이 않아. 않아. 것이 않아. 않아. 것이 않아. 것이 않아. 것 않아. 것이 않아. 않아. 것이 않아. 것이 않아. 것이 않아. 않아. 것이 않아. 것이 않아. 않아. 않아. 않아. 것이 않아. 것이 않아. 않아. 것이 않아. 것이 않아. 것이 않아.
IV.2.2 IV.2.3	Leaching Water Requirement Intake Rate
IV.2.3 IV.2.4	
IV.2.4 IV.3	Drainage from Hilly Land
	Proposed Agriculture Development
IV.3.1	Farmers' Intention Survey and Food Balance Projection
IV.3.2	Proposed Cropping Patterns
IV.3.3.	Target Yields of Selected Crops "With Project"
IV.3.4	Farm Mechanization and Labour Balance
IV.3.5	Farm Practices and Input Materials Requirement
IV.3.6	Livestock Farming Plan
IV.4	Proposed Facilities
IV.4.1	Hydraulic Calculation
IV.4.2	Observation and Analysis on Discharge of Pat Feeder
IV.4.3	Hydraulic Design of Canal Structure
IV.4.4	Constant Head Orifice Turnout
IV.4.5	Design of Bridges
IV.4.6	On-farm Development
IV.5	Pilot Project
IV.6	Project Cost
Chapter V P	roject Implementation and Operation
V.3	Operation and Maintenance

Chapter VI	Project Justification
VI.2	Economic Evaluation
VI.2.1	Price Analysis
VI.2.2	Analysis of Agricultural Benefits

V1.2.3 Gross Production and Production Cost

- VI.2.4 Revaluation of Project Cost
- VI.2.5 Internal Economic Rate of Return

0.61.5

- VI.3 Financial Analysis
 - VI.3.1 Farm Budget Analysis

a de la construcción de la construcción de Construcción de la construcción de	n han an ann an Airleann ann an tha an tha ann an tha ann an tha an An 1917 an tha ann an tha an tha ann an tha ann an tha an
	LIST OF TABLE
Table IV.2-1	Reference Crop Evapotranspiration by Blaney-Criddle
	Method at USTA MOHAMMAD
Table IV.2-2	Reference Crop Evapotranspiration by Radiation
	Method at USTA MOHAMMAD
Table IV.2-3	Reference Crop Evapotranspiration Method at USTA
	MOHAMMAD
Table IV.2-4	Calculation of Unit Water Requirement for Sorghum
Table IV.2-5	Calculation of Unit Water Requirement for Rice
Table IV.2-6	Water Requirement for Land Preparation Stage of
	Rice
Table IV.2-7	Calculation of Unit Water Requirement for Sunflower
Table IV.2-8	Calculation of Unit Water Requirement for Pulses
	(Kharif)
Table IV.2-9	Calculation of Unit Water Requirement for Soybeans
Table IV.2-10	Calculation of Unit Water Requirement for Sugarcane
Table IV.2-11	Calculation of Unit Water Requirement for Wheat
Table IV.2-12	Calculation of Unit Water Requirement for Rapes &
a de la companya de A de la companya de la A de la companya de la	Mustard
Table IV.2-13	
	(Rabi)
Table IV.2-14	Calculation of Unit Water Requirement for Fodder
Table IV.2-15	Water Requirement Case 1
Table IV.2-16	Water Requirement Case 2
Table IV.2-17	
Table IV.2-18	
Table IV.2-19	
Table IV.2-20	Leaching Water Requirement
Table IV.2-21	Intake Data Obtained from a Test Cylinder
Table IV.2-22	Basic Intake Rate
Table IV.2-23	Salient Hydrologic Features on Flood Control Plan
Table IV.2-24	
Table IV.2-25	Construction Cost of On-farm Facilities
Table IV.3-1	Summary of Farmers' Intention Survey
Table IV.3-2	Crop Selection in Farmers' Intention Survey
	ning of the second s Second second

Table IV.3-3 Questionary on Farmers' Intention Survey Table IV.3-4 Response to Farmers' Intention Survey (1) n Table IV.3-5 (2)Table IV. 3-6 (3)77 Table 1V.3-7 ** (4) Table IV.3-8 n (5)Table IV.3-9 (6)11 Table IV.3-10 (7)Table IV. 3-11 Ħ (8)Table IV.3-12 11 (9) Table IV.3-13 11 (10)Table IV.3-14 Π. (11)Table IV. 3-15 (12)Table IV.3-16 (13)Table IV.3-17 (14)Table IV.3-18 Calculation for Daily Calorie Intake of Pakistan Table 1V.3-19 Calculation for Per Capita Food Consumption for the Year 2000 Table IV.3-20 Estimation on the Minimum Food Demand in Pakistan for the Year 2000 Table IV. 3-21 Land Utilization and Cropped Area in Pakistan Table IV.3-22 Agriculture Production in Pakistan Table IV.3-23 Agriculture Production in Balchistan Table IV.3-24 Estimation of the Food Balance in Pakistan Estimation of the Food Balance in Baluchistan Table IV.3-25 Table IV.3-26 Cropping Types by Profile Salinity Class (Case-3) Table IV.3-27 Crop Salt Tolerance Levels for Different Crops Table IV.3-28 Proposed Cropping Plan in Each Case Table IV/3-29 Experimental Yields of Selected Major Crops Table IV.3-30 Experimental Yields by Rate of Applied Fertilizer Table IV.3-31 Estimation on Target Yield by Land Class, with Project, in Future Table IV.3-32 Target Yield per Hectare (Weighted Average by Land Class)

Table IV. 3-33	Proposed Farm Operation Systems with Mechanization
	(Area Coverage = 70 percent)
Table IV.3-34	Estimated Farm Operation Capacity
Table IV.3-35	Estimation on Machinery Cost
Table IV.3-36	Requirement of Farm Labour and Animal Power, without
	Mechanization
Table IV.3-37	Requirement of Farm Labour and Animal Power, with
	Mechanization
Table IV.3-38	Labour Requirement, Sorghum
Table IV.3-39	u , Rice
Table IV.3-40	", Kharif Oilseeds (Sunflower)
Table IV.3-41	", Kharif Pulses (Soybean)
Table IV.3-42	", Sugarcane(Plant) and Others
Table IV.3-43	", Sugarcane(Ratoon) and Others
Table IV.3-44	Wheat
Table IV.3-45	", Rabi Oilseeds (Mustard)
Table IV.3-46	", Rabi Pulses (Gram)
Table IV.3-47	" , Fodders (berseem) and Others
Table IV.3-48	Labour Requirement per 1,000 Acres of Command Area
Table IV.3-49	Draft Animal Requirement per 1,000 Acres of Command
	Area
Table IV 3-50	Farm Labour Balance, with Project
Table IV.3-51	Requirement of Input Materials in the Project Area
Table IV.3-52	Farm Practices and Input Materials, Sorghum, with
	Project
Table IV.3-53	, Rice, "
Table IV.3-54	", Sunflower, "
Table IV.3-55	u, Soybean, u
Table IV.3-56	", Sugarcane, "
Table IV.3-57	" " " " " " " " " " " " " " " " " " "
Table IV.3-58	", Mustard, "
Table IV.3-59	, Gram, "
Table IV.3-60	, Berseem, "
Table IV.3-61	Flock Size and Composition of Sheep

Table IV.3-62	Total Requirement of TDN and DCP
Table IV.3-63	Feed Production in the Project Area
Table IV.5-1	Hydraulic Calculation for Branch Pipe
Table IV.5-2	Hydraulic Calculation for Branch Line Required Water Pressure and Pipe Diameter
Table IV.5-3	Required water pressure and ripe planetel
Tab1e IV.6-1	Investment Cost of the Project
Table IV.6-2	Disbursement Schedule (Case 1 & Case 3)
Table IV.6-3	(Case 2 & Case 4)
Table V.3-1	Irrigable Area and Canal Length in each S.D.O.
Table V.3-2	Proposed Length of Distry, Minor and No. of Extens-
	ion Office in the Project Area
Table V.3-3	List of the Project Facilitics
Table VI,2-1	Estimation of Standard Conversion Factor (SCF) for
	Pakistan
Table VI.2-2	Estimation of Conversion Factor of Consumption (CFC)
。 第二人 医牙肉的 化结束 小鸡 的复数 图 1991 年代 - 1995 年代 -	for Pakistan
Tab1e VI.2-3	Balance of Trade, Pakistan
Table V1.2-4	Production, Trade and Consumption of Rice and Wheat
	in Pakistan
Table VI.2-5	Farm-gate Prices of Agricultural Inputs and Outputs
Table VI.2-6	Economic Prices of Trade Crops
Table VI.2-7	Economic Price of Fertilizer
Table VI.2-8	Price Estimation of Animal Works
Table VI.2-9 Table VI.2-10	Machinery Cost per Day Machinery Cost by Crop per Across with Preject
Table VI.2-10	Machinery Cost by Crop per Acre, with Project Financial Price of Fertilizer
Table VI.2-11 Table VI.2-12	Wholesale Price Index Nembers
Table VI.2-13	Consumer Price Index Numbers
Table VI.2-14	Cropping Area with Project
Table VI.2-15	$\left\ \left\ \left\ \mathbf{A} \right\ \right\ _{\mathcal{H}} = \left\ \left\ \mathbf{A} \right\ _{\mathcal{H}} + \left\ \left\ \mathbf{A} \right\ _{\mathcal{H}} + \left\ \left\ \mathbf{A} \right\ _{\mathcal{H}} + \left\ A$
Table VI.2-16	Yield Projection by Year
Table VI.2-17	Total Labour Requirement at Present and without
	Project

		물건 사람이 전 것을 하는 것은 것을 수 있는 것을 가지 않는 것을 했다.
	Table VI.2-18	Total Labour Doautrowoot with Dusiant Cons. 7
	Table VI.2-19	Total Labour Requirement with Project, Case 3 Crop Budgets
	Table VI.2-19	이 가지 못했는 것을 즐고 있는 것 같아요. 이 것 같아요. 이 가지 않는 것 않는
		Grop Production Cost per Acre - Kharif Crops -
	Table VI.2-21	Crop Production Cost per Acre - Rabi Crops -
	Table VI.2-22	Gross Production Value with Project (1)
	WILL VIT 0.07	- In the Beneficial Area of Case 3 -
	Table VI.2-23	Gross Production Value with Project (2)
		- In the Remaining Area -
	Table VI.2-24	Production Cost with Project (1)
		- In the Beneficial Area of Case 3 -
	Table VI.2-25	Production Cost with Project (2)
		- In the Remaining Area -
	Table VI.2-26	Economic Cost of Farm Labour
	Table VI.2-27	Incremental Benefits, Case 3
	Table VI.2-28	Economic Value of Construction Cost, Case 1 & 3
н. — н. Н	Table VI.2-29	Economic Value of Construction Cost, Case 2 & 4
	Table VI.2-30	Economic Value of O & M Cost
	Table VI.2-31	Price Structure of Construction Materials
	Table VI.2-32	Project Economic Cost and Return, Case 1
	Table VI.2-33	Project Economic Cost and Return, Case 2
	Table VI.2-34	Project Economic Cost and Return, Case 3
	Table VI.2-35	Project Economic Cost and Return, Case 4
	Table VI.3-1	Farm Budgets

LIST OF FIGURE

그는 것 같은 것 같
Result of Cylinder Intake Rate (Jhatpat No.1)
Result of Cylinder Intake Rate (Jhatpat No.2)
Result of Cylinder Intake Rate (Umurani No.1)
Result of Cylinder Intake Rate (Umurani No.2)
Result of Cylinder Intake Rate (Umurani No.3)
Result of Cylinder Intake Rate (Judher No.1)
Result of Cylinder Intake Rate (Judher No.2)
Result of Cylinder Intake Rate (Judher No.3)
Proposed Cropping Calendar
Crop Rotation Plan (Case 3)
Discharge Coefficients for Vertical-Faced Ogee Crest
Ratio of Discharge Coefficients due to Tail- water Effect
Condition of Load
Stress Distribution
Rectangular Section
T-Beam Section
Upper Structure
Load for Middle Slab
Load for Exterior Girder
Pier
Abutment

Fig.1V.4-12	Weight and Load
Fig.IV.4-13	Upper Structure
Fig.IV.4-14	Pier
Fig. IV.4-15	Abutment
Fig.IV.4-16	Wall
Fig.1V.5-1	Shape of Pilot Farm
Fig.1V.5-2	Main Pipe Line
Fig.V.3-1	Present Organization Chart of Irrigation and Power Department (1)
Fig.V.3-2	Present Organization Chart of Irrigation and Power Department (2)
Fig.V.3-3	Proposed Organization Chart of Operation and Maintenance of the Project
Fig.V.3-4	Location of S.D.O.and Boundary Line of Tehsil and S.D.O.

Fig.VI.2-1

.

Marginal Opportunity Cost of Farm Labor

CHAPTER IV. THE PROJECT

IV.2.1 Crop Water Requirement

1) General

For estimation of crop water requirement (ETcrop), many factors are required; climate data, crop calendar, crop character, etc., and following three-stage procedure is recommended:

First stage - to calculate the reference crop evapotranspiration based on climate data

Second stage - to determined the crop coefficient by crop calendar

Third stage - to calculate the crop water requirements based on reference crop evapotranspiration, crop coefficient, agricultural practices.

Crop water requirements are calculated with the stage procedure recommended the below:

2) Reference Crop Evapotranspiration

There are many methods to calculate the reference crop evapotranspiration (ETo), however, the following four methods are considered for the Project; Blaney - Criddle method, Radiation method, Penman method and Pan evaporation method, which are recommended by "Crop Water Requirement" Irrigation and Drainage Paper No.24, FAO.

Observed climate data are very importance for the estimation of the ETo, therefore, selection of the calculation method is based on the availability of observed climate data and the required accuracy of the ETo.

There are no climate data observed in the Project Area, however, the 10-years meteorological records were collected at the following three meteorological stations in the vicinity of the Project Area.

° Jacobabad Meteorological Station

° Usta Mohammad Meteorological Station ° Sibi Meteorological Station But, since Sibi station is located at about 150 km north from the Project Area, the observation data of Sibi station cannot be applied for the ETo calculation of the Project. Therefore, the observation data of Jacobabad station and Usta Mohammad station will be considered for the ETo calculation of the Project and the observed data of both stations are tabulated as follows:

Data Observed by Jacobabad and Usta Mohammad Station

Station	Precipi- tation	Temper- ature	Humidity				Evapo- ration
Jacobabad	0		0	x	0	X	x
Usta Mohammad	0	Q		• 0	x	ο	0

Note: o ---- available

---- not available

On the other hands, required meteorological data by the four recommended methods are as follows:

00001100 24				an Salatan			, let
Temper-	불상품 이 가슴? 같이 아이라 가슴?		Sun-	Radi-	Evapo-		1. A (A)
Method ature	Humidity	Wind	shine	ation	ration	Enviro	<u>n</u>
Blaney - Criddle *	0	0	0			0	
Radiation *	0	0	*	(*)		0	
Penman *	*	*	*	(*)		0	
Pan evaporation	0	0			*	*	

Observed Data Required by the Methods

Note: *; measured data, 0; estimated data, (*); if available, but not essential

According to the tables mentioned above, the applicable methods are Blaney - Criddle method, Radiation method and Pan evaporation method by the observed data of Usta Mohammad station. Sunshine data in Radiation method is required when solar radiation is estimated from extra terrestrial radiation which is obtained by the latitude. However, solar radiation was observed at Usta Mohammad station by the unit of langley $\frac{1}{2}$, so that sunshine data is not necessary.

Note: 1/ The unit of langley (calories per square centimeter) are converted to millimeter of water per day by following formula:

> $Rs[mm/day] = Rs[langley] \times 10 \div (595.9 - 0.55T)$ in which T = mean air temperature [°C]

Monthly reference crop evapotranspirations calculated by the abovementioned three methods are tabulated below. (Calculation procedures of each methods are shown in Table IV.2-1 to Table IV.2-3 in this Appendix).

	<u> </u>	ethod	Radiation	Method	Pan Me	thod
Month	inch/month	mm/month	inch/month	mm/month	inch/month	mm/month
January	1.95	49.6	2.57	65.2	2.28	57.9
February	2.86	72.8	3.19	81.2	2.83	71.9
March	5.36	136.4	5.61	142.6	5.66	143.8
April	6.96	177.0	6.85	174.0	7.90	200.7
May	8.90	226.3	7.82	198.4	12.31	312.7
June	9.45	240.0	7.68	195.0	10.95	278.1
July	8.90	226.3	7.19	182.9	9.35	237.5
August	6.60	167.4	6.11	155.0	8.03	204.0
September	5.67	144.0	6.15	156.0	6.66	169.2
October	4.53	114.7	5.49	139.5	5,71	145.0
November	3.06	78.0	3.66	93.0	3.37	85.6
December	2.08	52.7	2.92	74.4	2.07	52.6
Total	66.32	1,685.2	65.24	1,657.2	<u>77.12</u>	1,959.0
					n en	

Monthly Reference Crop Evapotranspiration

On the other hands, it is said that modified Penman method would offer the best results with minimum possible error of plus or minus 10 percent in summer, and up to 20 percent under low evaporative conditions. the Pan method can be graded next with possible error of 15 percent, depending on the location of the pan. The Radiation method, in extreme conditions, involves a possible error of up to 20 percent in summer. The Blaney -Criddle method should only be applied for periods of one month or longer; in humid, windy, mid-latitude winter conditions an over and under prediction of up to 25 percent has been noted.

The results by Pan evaporation method are applied for the reference crop evapotranspiration, because possible error by Pan evaporation method is the lowest among three methods considered and peak monthly ETo and total (annual ETo) are the highest among three.

3) Crop Coefficient

The crop coefficients (Kc) are presented to relate ETo to crop evapotranspiration (ETcrop). The Kc value relates to evapotranspiration of a disease-free crop grown in large fields under optimum soil water and fertility condition and achieving full production potential under given growing environment. ETcrop can be found by:

ETcrop = Kc x ETo

The factors affecting the Kc value are mainly the crop characteristics, crop planting or sowing data, rate of crop development, length of growing season and climatic conditions, specially, crop calendar and length of growing season. These important data such as crop calendar and length of growing season are given in Fig. IV.3-1 cropping calendar in Appendix IV.3-2. According to the given cropping calendar and rate of crop development, the Kc value of 10-days period for each proposed crop are obtained and shown in Table IV.2-4 to Table IV.2-14 in this Appendix.

4) Crop Water Requirement

Taking into the consideration above condition, the crop water requirement for each crop based on the 10-day period was calculated as shown in Table IV.2-4 to Table IV.2-14 in this Appendix.

Annual water requirements were calculated based on three cropping patterns, that is, Case 1, Case 2 and Case 3, and the results are shown in the Table IV.2-15 to Table IV.2-18 in this Appendix. The summary are as follows:

<u>Annual Water Requirement</u>

			(Uni	t: MAF
Description		Case 1	Case 2	Case :
ater requirement at the Guddu	÷			
Kharif Crop	· · ·	2.069	1.714	2.069
Rabi Crop		1,292	1.115	0.83
Drinking Water		0.053	0.048	0.05
Total		3.414	2.877	2,95
ater requirement at Outlet			an an taon an t Taon ang taon	
Kharif Crop		1.422	1.180	1.42
Rabi Crop		0.885	0.813	0.57
Drinking Water		0.036	0.033	0.03
Total	4	2.343	2.026	2.03

Remarks mm/day 66.32 1;685.2 2.08 52.7 15 3 3.46 Dec. 59.5 0.23 0.24 VI-1 0.146 0.102 0.067 1.7 31 5 G Blaney-Criddle Method at Usta Mohammad 0.30 VI-1 3.06 78.0 Nov. 69 5 20.8 0.24 4.22 2.6 30 19 0.52 VI-1 4.53 31 177.0 226.3 240.0 226.3 167.4 144.0 114.7 Oct. 80.0 26.7 0.26. 5.27 3.7 58 Sept. 0.189 5.67 0.71 I-IV 88.5 31.4 0.28 6.28 30 4 60 1.00 0.213 6.60. Aug. 0.16 0.30 32.8 6.93 VI-1 31 5.4 533 1.10 8.90 0.232 0.287 0.315 0.287 7.36 93.5 34.2 0.31 Jul. 1-7 7.3 31 47 mid. 9.45 97.0 1.13 0.32 Jum. 36.1 7.87 1.50 V-1 30 0.0 0 34 31 8.90 33,9 93.0 0.93 0.31 7.31 1-7 7.3 Reference Crop Evapotranspiration by May 34 0.76 84.5 6.96 Apr. 29.2 0.29 6.22 30 V-1 5.9 31 0.173 0.27 5.03 136.4 73.5 0.61 5.36 23.1 Mar. **Ι-**Λ 4.4 31 37 72.8 61.5 16.4 0.25 3 89 0.47 Feb. 0.102 2.86 Γ-Λ 2.6 20 700 45 5 0.063 0.35. 0.24 49.6 55.5 13.1 3.37 1.95 VI-1 Jan. 9 54 31 Related Humidity (min.) Month Сц. ŝ of FAO tem. m/s inch/month Table IV.2-1 mm/month inch/day n/n Blook by Fig.1 Daytime 1.33u Discription T. (mean daily Wind Velocity mm/day P(lat 28°11') days P x (0.46+8) Ξ, Sunshine Ľ. ETO

Appendix IV,2-1 Page .7

Remarks mm/day mm/day 65.24 mm/day 1.657.2 m/s *0*/0 74.4 2.92 15.3 0.63 66.5 0.24 0.094 Dec. I-III 292 0 2 3 2 2.4 31 3.66 0.197 0.205 0.177 0.122 0.69 0.30 93.0 Nov. 20.8 66.5 I-III 3.1 30 د د с. С 332 5.49 I-III 64.0 0.52 195.0 182.9 155.0 156.0 139.5 Oct. 26.7 0 77 4.5 5.6 31 428 7.4 6.15 Sept. 68.5 . 66°0. 0.71 31.4 I-III 30 5.2 6.2 7.8 451 63.5 6.11 1.00 32.8 I-III 0.80 5.0 .2 Aug. 0.9 435 7.5 31 7.19 58.0 1.10 0.82 Jul. 34.2 9 Q ດ ທ III-II 0.256 0.232 31 467 8.1 7 68 0 83 44.5 1.13 11-1 30 36.1 Jun. 6. 5 0 490 8.5 7 1 7.82 64 0.252 40.0 142.6 174.0 198.4 0.93 33.9 0.82 II-I 7.0 492 ເກ 80 31 May 0.228 40.5 29.2 0.78 6.3 0.76 11-1 6.85 2 80 Apr. 30 470 8.1 Mar. 0.72 48.0 0 61 II-1 0.181 23.1 5.61 4.6 н S 416 н. 31 2.9 81 2 56.5 3.19 0.083 0.114 Feb. 16.4 0.64 0.47 I-III 3.7 58 78 5.00 341 I-III 65.2 13.1 0.60 61.0 0.35 2.57 Jan, 2.9 2.1 31 289 4 Mon th inch/month (595,9-0,55T Solar Radiation inch/day mm/month Ly x 10 Discription Wind Velocity mm/day Fig.2 of FAO days W (Table 4) RH mean T. (°C) W. Rs ETo Rs=

Reference Crop Evapotranspiration by Radiation Method at Usta Mohammad

Table IV.2-2

Appendix IV.2-1 Page 8

Remarks 77.12 1,959.0 52.6 66,5 3.19 2.07 0.65 0.074 0.101 0.183 0.263 0.397 0.365 0.302 0.259 0.222 0.184 0.112 0.067 Dec 31 24 85.6 0.65 3.37 5.18 66.5 Nov 30 30 0.65 64 0 8.79 5.71 71.9 143.8 200.7 312.7 278.1 237.5 204.0 169.2 145.0 Sept. Oct. 52 31 light 0.65 6.66 68. S 12.36 10.25 30 70 0.65 0.65 8.03 63.5 Wind Velocity < 175 km/d Aug. 10.0 31 12.16 18.94 16.84 14.39 9.35 58.0 Jul 109 3.L 40 < RH mean < 70% 0.65 7.90 12.31 10.95 44.5 Jun. 113 30 0.65 40.0 31 May 93 0.65 40.5 76 Apr. 30 0.65 8.70 5.66 48.0 Mar. 5 31 2.83 0.65 56 S 4.35 Feb. 28 46 0.65 57.9 61.0 3.50 2.28 Jan. сı M 31.5 Mon th Wind Spead (km/d) inch/month mm/month. inch/day Discription (inch) % Wind Velocity davs RH mean RH mean E pan ЕTо 2

Reference Crop Evapotranspiration by Pan Evaporation Method at Usta Mohammad

Table IV.2-3

Dec																			per F	
Nov			/				/								0	8 0.50	5 0.68 0.50		0 0.30 0.13	
Oct.	20	/			//	//	/		/	0.50				0.68 0.50	0.85 0.68 0.50	0.97 0.85 0.68	1.06 0.97 0.85		0.89 0.75 0.50	
							1							0.97 0.85	1.06 0.97	1.10 1.06	1.09 1.10		1.06 1.00	
Sept.					X A									1.09 1.10 1.06	1.02 1.09 1.10	0.85 1.02 1.09	0.54 0.85 1.02		38 1.02 1.07	
Aug.														0.85 1.02 1.0	0.54 0.85 1.0	0.38 0.54 0.8	0.28 0.38 0.5		0.51 0.70 0.88	
Jul.				31			X							0.38 0.54	0.28 0.38	0.23 0.28 0	0.23 0		0.22 0.36	
Jun.	21	/	/											0.23 0.28	0.23				0.06 0.13	
												0.33								
Month May					1.0	0.0	0.8	07	0.6	× C	04	0.3		Crop						

Appendix IV.2-1

Page 9

0.15

0.34

0.56

1.52

1.64

1.84

2.35

2.38

2.26

2.51

1.83

1.32

1.20

0.66

0.39

0.22

ETcrop (inch) Pre-irrigation Water Requirement

0.50 0.50 0.50

0.50 0.50

0.34 0.15

0.56

1.84 1.64 1.52

2.35

2.38

2.26

0.72 0.89 1.16 1.20 1.32 1.83 2.51

Juli Aug. Juli Aug. 10 30 10 30 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 1.00 10 1.01 10 1.01 10 1.01 10 1.00 10 1.00 11 1.01 10 1.01 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 10 11 0.40 11 0.40 11 0.40 11 0.40	Sept. Dec.		7								1.04 0.98 0.90 0.80 0.60	1.06 1.04 0.98 0.90 0.80 0.60	1.04 1.06 1.04 0.98 0.90 0.80 0.60	1.01 1.04 1.06 1.04 0.98 0.90 0.80 0.60	1.04 1.03 1.00 0.93 0.82 0.58 0.35 0.15	0.222	11 10 10 10 10 10 10 11 10	2.95 2.26 2.24 2.15 1.59 1.14 1.34 0.17	0.44 0.40 0.40 0.40 0.40 0.30 0.22 0.10	
에 특히 가지 만에 다는 것이 있는 것이 하게 해야 하지 않는 것이 같이 있는 것이 있는 것이 있는 것이 없다. 이 것이 없는 것이 좋아 있는 것이 좋아? 나라 나라 나라 나라 있는 것이 있는 것이 있			5				Nersery Stage	ares is 1/20 of planning area			1.00 1.00 1.01 1.04 1.06	1.00 1.00 1.00 1.01 1.04	0:05 1.00 1.00 1.00 1.01	0.05 1.00 1.00 1.00	0.52 0.76 1.00 1.01 1.03		10 10 11 10 10	1.58 2.30 3.31 2.58 2.63	0.20 0.30 0.44 0.40 0.40	2.50 1.71

2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4 5 6 7 8 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 28 27 28 29 30 31 19.6 - 40 = 0.49 0.1 × B days = 0.9 27 0.1 × 8 days = 0.8 2.8 <u>0</u> 5 2.8 x 7 days = 19.6 0.4×8 × j= 3.2 4 0.1 x 3 days = 0.3 04×3 - 7 1.2 Pore Space of Top Soil Percolation Third trrigation : Standing Water , Vi⊒L 68.5-40 = 1.71 4.5 × 9 days = 40.5 2.8 × 10 = 28.0 Sub-total 68.5 Percolation Second Irrigation : Standing Water Eveporation Table IV. 2 - 6 Water Requirement for Land Preparation Stage of Rice Percolation Evaporation Sub-total Sub total Total Sub-total First Irrigation : 2.50 Same as the Left 2.8 × 10 = 28.0 Sub total 100.0 100.0 + 40 = 2.50 - 46.0 2.7 × 10 deys = 27.0 4.6 × 10 2.8 × 10 = 45.0 - 8.4 - 2.01 80.4 2.7 × 10 days = 27.0 June 4.5×10 Sub-total 80.4 ÷ 40 2.8× 3 - 0.79 31.5 4 2.7 × 10 days = 27.0 Sub-total 4.5× 1 31.5-40

-							1		, 				<u> </u>	<u> </u>		Γ							-		
						 										· · · ·						<i>i</i> .			
Dec.			1 1 1 1 1 1 1 1 1 1		15															0.25		0.06	0.067	2	0.02
		14 - 4 <u>8 1</u> 19 41 6 19			1								 		л Д. Лаг				50	0.38 0.	- 20 	50	Ö	10	0.13 0.
				1														0.50	0.75 0.	51 0.		0.39 0.		1	0.48 0.
Nov.																	0.50		1.02 0.	57 0		0.63 0.	0.112	10	0.71 0.
Z		<u></u>		1												0.50	0.75 0.		1.13 1.	0.58 0.		0.88 0.	d	10	0 66 0
		<u>8</u>											-			0.75 0.	1.02 0.	+	1.15 1.	0.54 0.		1.02 0.		10	1.88 0.
Oct.		<u></u>							 							· [1.13 1.(1.15 1.	1.08 1.	0.43 0.		1.07 1.0	84		1.97 1.3
Ŏ		· · ·					ŕ	/					· .			1.13 1.02	1.15 1	1 i i	0.86 1.(0.26 0.		1.00 1.(0.184	10 10	
200 						1	[<u> </u>		· · · · · ·	1					85 1.(11 11	1.84
, T					16											8 1.15	1.08 B	ii-	0 0.52			o	53	10 1	9 2.08
Sept.				1											1771 1277 147 147	6 1.08	2 0.86	f0 0.52	3 0.40	0.16		7 0.67	0.222		1.49
				H												2 0.86	0 0.52	o	0.3			0		10	1.0
ö				-			<u></u> 8									0 0.52	3 0.40	0.33				5 0. 28	g	1	0.80
Aug.	∽⊨		$\left \right $										1		ara 1997 - Sa 2997 - Sa	3 0.40	0.33					7 0.16	0.259	10	3 0.41
	5 2		4											$\overline{\Lambda}$		0.33						0.07		10	0.18
			<u> </u>				. :																		
Jul.												<u></u>													-
	-										 			1. 194						-					
Jun.		2000 1000 1000													3. 					1. 1. 2. 1					
								-										•							
Wonth			Cropping	Calendar					» o j c	5 c	ו סיכ	5 C) 4 5 C			Crop	Coefficient	by lime				Kc	ETo (inch/day)	days	ETcrop (inch)

Dec																						
Nov.																						
				31																		
Oct.			/												0.40	0.70 0.40	0.28 0.10	0.184	10 11	0.52 0.20		
		1									-			0.40	0.70 0.	1.01 0.	 0.53 0.	0	10	0.98 0.		
	20	Γ											0.40	0.70	1.01	1.13	0.81		10	1 80		
Sept													1.01 0.70	1.13 1.01	5 1.13	1:15	99 1.00	0.222	10 10	1 2.22		
		2011년 - 111년 1111년 - 111년 - 111년 1111년 - 111년 - 111년 - 1111년				Ź		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1		1			1.13 1.0	1.15 1.	1.07 1.15	0.85 1.07	 1.05 1.09		11	2.99 2.41		
Aug.					[[1.15	1.07	0.85	0.47	0.89	0.259	10	2.31 2		
				31									5 1.07	0.85	3 0.47	0.33	0.68		10	1.76		
Jul.			h			200		1	1				47 0.85	33 0.47	24 0.33	0.24	26 0.47	0.302	0(11	0.79 1.56	80	
		1									2		0.33 0.4	0.24 0.3	0.2		0.14 0.2	0	10 10	0.42 0	0.60 0.60	
	21	[]											0.24				0.06		10	0.22	0.60	
Jun		/**									0.33							0.365			0.60	
							-					- ^ -										
May															·							
Month		Cropping	Calendar		*	- c) 0 - C) (0 5 (1	9			Crop	Coefficient	DA Eme		I	Yc.	ETo (inch/day)	days	ETcrop (inch)	Pre-irrigation	Water

Appendix IV.2-1 Page 13

											-							· · · ·			1 a. (
Dec						: .		· · ·								- 1			е 1 т.	ни 1944 г. -			200 2010	
						-				2 											<u></u>		~	
	94. 1827 (1		[30		- 1. 1.1												0.45		0.11	0	10	0.12	
Nov									 : 				· · ·				0.45	0.70		0.29	0.112	10	0.32	
											:		•	: • • •		0.45	0.70	0:90		0.51	2	10	0.57	
															0.45	0.70	0.90	1.02		0.77		11	1.56	
oct O	5				1. 				/	/					0.70	0.90	1.02	1.08		0.93	0.184	10	1.71	•. •.
													 		0.90	1.02	1.08	1.10		1.03		10	1.90	
							1						. :		1.02	1.08	1.10	1.09	s:	1.08		0	2.40	
Sept.			1			X									1.08	1.10	1.09	1.03		1.08	0.222	10	2.40	
						l							- - - 5-14		1.10	1.09	1.03	0.91		1.03		õ	2.29	
															1.09	1.03	0.91	0.57		0.90		-	2.56	
Aug.					4	V		1. 1 1. 1 1. 1							1.03	0.91	0.57	0.39		0.73	0.259	õ	1.89	
						Ĩ,					•				0.91	0.57	0.39	0.30	- 1, 	0.54		10	1.40	
			1	3		-								-	0.57	0.39	0.30	0.25		0.38		-	1.26	
ll In			//												0.39	ĝ	0.25			24	0.302		0.72	C C
ſ		1	1									N			0.30	0.25 0				0.14 0.		10	0.42	0 50 0
		/								 					0.25					0.06		10	0.22	0 50
Jun.	5					· ···										- 					0.365	· ·		0.50
										-														
						. :																	1 2 M	
May											•													
			<u> </u>		<u></u>	 	 		 0.7		 ທີ	4 0			1	<u> </u>	<u>.</u>	<u> </u>	<u></u>					
Month		ping	ndar				1		:			· · .			Coefficient	ime		•		l ° ⊻	ich/day	davs	ETcrop (inch)	oation
Ň		Crop	Cale		·. :	•				5				Cron	Coefi	₽ Åq					ETo (inch/dav)		Tcrop	Pre- irrioation

Month	Feb.	
Calendar		
•••••••		/
		1
: :		
2.6		
e C		
		/
ŝ		7
o v		-
3		
L		
Crop Coefficient	0.23 0.23 0.24 0.26 0.29 0.32 0.36 0.40 0.45 0.49 0.52 0.54 0.56 0.57 0.58 0.59 0.59 0.59 0.59 0.59 0.55 0.55 0.52 0.48 0.45 0.41 0.37 0.33	
by Time	0.45 0.45 0.47 0.51 0.57 0.53 0.71 0.80 0.89 0.97 1.03 1.08 1.11 1.14 1.15 1.17 1.18 1.18 1.18 1.17 1.16 1.109 1.03 0.97 0.90 0.82 0.74 0.65	
	0.45 0.45 0.47 0.51 0.57 0.53 0.77 0.80 0.89 0.97 1.03 1.08 1.11 1.14 1.15 1.17 1.18 1.18 1.18 1.18 1.14 1.09 1.03 0.87 0.99 0.82 0.24 0.55	
	0.45 0.46 0.49 0.54 0.60 0.58 0.38 0.76 0.85 0.34 1.01 1.05 1.10 1.13 1.15 1.17 1.18 1.18 1.18 1.18 1.18 1.18 1.17 1.06 1.03 0.38 0.30 0.82 0.73 0.55	,65 1
1	0.45 0.46 0.49 0.54 0.66 0.68 0.76 0.68 0.76 0.68 0.76 1.01 1.06 1.10 1.15 1.17 1.18 1.18 1.18 1.18 1.18 1.18 1.17 1.16 1.13 1.08 1.03 0.36 0.390 0.82	0.73 0.65
kc K	0.05 0.15 0.25 0.36 0.48 0.52 0.58 0.64 0.72 0.80 0.88 0.96 1.03 1.07 1.11 1.14 1.15 1.17 1.18 1.18 1.17 1.16 1.14 1.01 1.06 1.02 0.96 0.89 0.75 0.56 0.38 0.34	0.30 0.14
ETo (inch/day)	0.101 0.183 0.183 0.263 0.397 0.397 0.365 0.302 0.259 0.222 0.184 0.112 0.184	0.074
days	5 8 10 10 11 10 10 10 10 10 10 10 10 10 10	:
ETcrop (inch)	0.03 0.12 0.45 0.66 0.87 1.36 1.53 1.68 2.86 3.18 3.89 3.50 3.76 3.61 3.35 3.44 3.82 3.03 3.06 3.36 2.62 2.60 2.58 2.10 2.02 2.15 1.14 1.08 1.00 0.50 0.38 0.28 0.25	0.22 0.11
Pre-irrigation 0.		
Water		

Calculation of Unit Water Requirement for Wheat Table IV 2-11

May 0.263 0.03 Apr. 0.13 0.02 0.03 ເດ 0.08 0.25 0.20 0.21 0.21 9 0.21 0.40 0.42 0.42 0.33 0.25 0.40 0.25 Ę 0.70 Mar. 0.38 0.183 0.70 0.94 0.72 0.54 0.43 0.25 0.66 <u>5</u> 0.61 -0.86 0.50 1 12 1.12 0.66 0.27 0.13 0.25 0.72 0.54 0 0.65 0.86 1.00 0.65 0.55 0.54 0.81 ω 0.94 1.08 1.10 Feb. 0.38 0.72 1.00 0.58 0.97 0.98 0.101 0.98 9 1.14 1.08 1.10 0.47 1.08 1.16 1.09 0.94 0.58 1.09 0 1.14 1.14 1.14 1.16 1.16 0.54 1.08 1.14 1.16 1.16 1.16 0.93 0.93 0.57 (----0.074 0.57 1.14 1.14 1.11 1.14 Jan. 1, 16 1.16 0.53 0.84 0.84 10 0.58 1.16 1.06 0.43 0.82 0.82 2 1.14 1.06 0.58 0.68 0.92 1.08 0.31 1.16 0.86 0.77 0.77 1.04 _ Dec. 1.14 1.08 0.86 0.62 0.25 0.91 0.57 0.067 0.61 0.61 0 0.54 0.62 0.92 0.50 0.72 0.48 1.08 0.65 0.17 0 0.46 0.92 0.68 0.56 0.50 0.33 0.33 0.39 0.58 0.91 0.35 0.52 2 Nov. 0.72 0.34 0.68 0.56 0.50 0.112 0 0.50 0.28 0.25 0.56 0.22 0.33 0.33 0.33 0.58 10 0.26 0.50 0.26 0.13 0.59 F 0.04 0.25 0.04 Oct. 0.184 0.37 ഹ 0.17 0.17 Sept - - -. 60 80 0.4 4 N O ່ ດ ю Ю N ETo (inch/day) Water Requirement Month Pre- irrigation ETcrop (inch) Coefficient Cropping Calendar by Time days Š Crop

	T	-	Ī	 	T	ľ.					 -		T			T							Pag	-		
		+ : +		- - -																						
																		з								
Ŀ,				8										1.4 1.1 1.1			-)	· · · ·	Ò	ŝ		3		
Mar.				н н н					 									0	3 0.50		5 0.10	0.183	10	3 0.18		0 1 0
			₽									: 						3 0.50	3 0.73		3 0.25		2	0.46		0.46
ġ		-/														0	0.50	3 0.73	1 0.93		1 0.43	с Ц	00	5 0.35		0.35
Feb.													<i></i>			3 0.50	3 0.73	4 0.93	9 1.04		5 0.64	0.101	10	0.65		0.65
	5	1													3 0.50	3 0.73	1 0.93	1.04	3 1.09		7 0.86		2	0.86		0 86 0
										1			-		3 0.73	t 0.93	<u> </u>	3 1.09	1.08		0.97	4		0.79		0 <u>7</u> 0
Jan.					 	1	1	/		·					0.93	9 1.04	3 1.09	2 1.08	9-1.02		1.03	0.074	2	0.76	: .	0.76
						Ŵ	/		-			: . .			1.04	1.09	ļ	1.02	0.89		1.02		10	0.75		0 75
					. . 	4									1.09	1.08		0.89			0.94	2	11	0.69	· ·	090
Dec.															1.08	1.02	1	3 0.62	0.48		0.96	0.067	10	0.64	• .	0.64
				30		ļ (:						1.02	0.89	· · · · · · ·	0.48	0.40		0.68		<u></u>	0.46		0.46
×.		-		۳ 			Ì							-	0.89	3 0.62	Ö	3 0.40	0.38		3 0.55	3	10	0.62	[0.67
Nov.			\prod				- 1 								3 0.62	0.48		0.38			0.38	0.112	10	3 0.43	0.20	0 63
		\downarrow	 _	· · · · ·							\mathbf{h}	V-	24		0.48	0.40	0.38				0.25		1	0.28	0.20	س_ حف س
			1			•.									0.40	0.38					0.16	4	11	0.32	0.20	0.53
Oct.		Ψ.		2	3.		-					i 			0.38						0.08	0.184	0	0.15	0.20	
		1		:											- 191 - 121 - 121										0.20	0.20
د									:							-	:			· · · ·			<u>S. 1</u>	· · ·		
Sept.								•.			:							1000 1000 1000 1000 1000 1000						· · .	2	
																1.5.2										
nth		ពីប	Gi		<u>~</u>		2	ກ ເ ວິດ		0.1	9 I 0 (3 7			ient	2		n de la Norte de Norte de			n/day)	S,	inch)	ition	ient.
Month		Cropping	Calendar		;	•				2 	•	 2.	- - 		Crop	Coefficient	An An		· ·		Kc	ETo (inch/day)	days	ETcrop (inch)	Pre-irrigation	Water Beduirement

Appendix IV.2-1 Page 18

Month	Sept.	۲.		oct		Nov.	УС	2. ¹⁹ 195 1101	Dec.			Jan.			Feb.			Mar.		<	Apr.
																38					
																		1	1		
Calendar				1		#												<u>1997</u> 1917 1917 1917	-	1	
		-						-									· .				
								-				Ľ									
- c								- 415 - 11 - 11 - 11 - 11 - 11 - 11					1								1.1.1
		-	 .																		1.2
														/							1.
		<u> </u>																			
5				Ň														•			
						. 	 									/					1
1 (5 (. 					1					
							 						. N								1.5
			0.40	0.45 0.	0.52 0.6	0.65 0.91	91 1.07	7 1.14	4 1.17	1.17	1.15	1.10	1.01	0.88	0.70	0.50	0.30				1.1.1
Crop		7.		0.40	0.45 0.1	0.52 0.65	55 0.91	1 1.07	7 1.14	1.17	1.17	1.15	1.10	1.01	0 88 0	0.70	0.50	0.30			122
Sien :				Ö	0.40 0.4	0.45 0.52	52 0.65	5 0.91	1 1.07	1.14	1.17	1.17	1.15	1.10	1.01	0.88	0.70	0.50 (0.30		-
oy Hime					0.2	0.40 0.45	15 0.52	2 0.65	5 0.91	1.07	1.14	1.17	1.17	1.15	1.10	1.01	0.88	0.70	0.50 0	0.30	1,411
				· · · ·		1.40	10 0.45	5 0.52	2 0.65	0.91	1.07	1.14	1.17	1.17	1.15	1.10	1.01	0.88 0		0.50 0.30	5
						-	0.40	0 0.45	5 0.52	0.65	0.91	1.07	1.14	1.17	1.17	1.15	1.10	1.01 0	0.88	0.70 0.	50
	· .					5. <u>- 1. (</u> 						••									1.11
Kc			0.07 0	0.14 0.	0.23 0.34	34 0.49	19 0.67	7 0.79	9 0.91	1.02	1.10	1.13	1.12	1.08	1.00	0.89	0.75	0.57 (0.40 0	0.25 0.13	(m
ETo (inch/day)	0.22	0.222	0	0.184		0.112	2		0.067			0.074			0.101)	0.183		0.263	8
days		10	10	10 1	11 10	10 10	0 10	10	10	11	10	10	11	10	10	œ	10	10	11	10 10	
ETcrop (inch))	0.13 0	0.26 0.47	47 0.38	38 0.55	5 0.75	5 0.53	3 0.61	0.75	0.81	0.84	0.91	1.09	1.01	0.72	1.34	1.04 0	0.81 0	0.66 0.34	1 2
Pre-irrigation		0.33	0.33 0	0.33 0.3	0.33 0.33	33 0.33	n														2.2.2
Water Recritrement	- 1. 	0.33	C S S C		1.1.1.1	0 71 0 00	0 0 7 1 0	с; С Ц		L r c			č		ć	ç, C					

Month	S S	Sept		Oct.			Nov.			Dec.	- 12 A		Jan.	•		Feb.		V	Mar.		Apr.	
Cropping	:		/	//													/	1				
Calendar	<u> </u>						1				 							/				
																-						
с , - ,												· · ·		1			- - -					
- (ſ	-	f		 -	. .						· · ·
								\mathbf{h}									 					
ທ (ວິ (- -						-			
	[- - -					- - - -	 .					
0.7																	<u>`</u>					
-90 0		 								· .					 -		╞╌╌					
0 O	-										7					<u>.</u>						
0.4				· •			· ·	 . .			т. 194											
																					·	
Crop				0.60	0.63	0.68	0.75	0.86	0.96	1.03	1.05	0.50	0.93	1.05 0	0.60	0.93 1.	1 00	1				
Coefficient					0.60	0.63	0.68	0.75	0.86	0.96	1.03	1.05	0.50	0.93	1.05 0	0.60	0.93	1.00				
by Time						0.60	0.63	0.68	0.75	0.86	0.96	1.03	1.05 0	0.50 0	0.93	1.05 0.	0.60 0.	0.93 1.	1.00			
•				11 - 11 - 11			0.60	0.63	0.68 0.75		0.86	0.96	1.03	1.05 0	0.50 0	0.93 1.	1 02 0	0.60 0.	0.93 1.00	0	1 	
					an a			- - - -														
	·:			- 			•				4. 	÷.					 					
Kc	·		- 1 - 1 - 1 - 1	0.15	0.31	0.48	0.67	0.73 (0.81	0.89	0.98	0.89 (0.88 0	0.89 0	0.77 0	0.88 0.	0.90 0.	0.63 0.	0.48 0.25	2		
ETo (inch/day)			:	0.184			0.112		1	0.067			0.074	1. A. 1. 1. 1.	0	0.101		ö	0.183			
days		-		10	10 1 1	10	10	10	10	10	11	10	10	11	10	10	8	10	10 11			
ETcrop (inch)	·			0.28	0.63	0.54	0.75	0.82	0.54	0.60	0.72 0	0.66	0.65 0	0.72 0	0.78 0	0.89 0.	0.73 1.	1.15 0.	0.88 0.50	0	2. ²¹ -	
Pre-irrigation			0.50	0.50	0.50	0.50						<u></u>										-
Water																			ŀ			

. . .

Table IV. 4 - 15	Water Requirement	(Case 1. Q	= 8,200 cusecs)
------------------	-------------------	------------	------------------

							,												· · · ·					·			
Description		Unit		Jan.			Feb.			Mar.	: 		Apr.	·		May		*.	Jun.			Jul,	And the second second second		Aug.		
Unit Crop Water Requirement	2 		1																								
• Sorghum	·····	inch															·		0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26
• Rice		"																0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66
• Oilseed (Sunflower)		<i>i</i> 1																					0.44	0.62	0.85	1.24	1.26
Pulses (Mungbeans)	· · · · · · · · · · · · · · · · · · ·	ņ	н н д														:		0.60	0.82	1.02	1.39	1.56	1.76	2.31	2.99	2.41
Pulses (Soybeans)	- 14 1	"																						+	1.89		£
• Sugarcane & Others		u u	0.25	0.22	0.11	0.22	0.47	0,56	0.89	1.10	0.97	1.36	1.53	1.68	2.86	3.18	3.89	3.50						- -	3.06		1
• Wheat			0.82	0.84	0.93	1.09	0.98	0,65	1.12	0.70	0.42	0.21			·												
• Oilseed (Rapes Mustard)			0.75	0.76	0.79	0.86	0.65	0.35	0.46	0.18							••• <i>`</i> ,					• • • • • • • • •					
• Pulses (Gram)		"	0.81	0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13													
• Fodder (Berseem) & Others		"	0.66	0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50	_					<u>.</u>							<u> </u>			
Water Requirement				1																							
• Sorghum	9 %	inch	· · · ·	· · · · · ·					·				<u>+</u>						0.05	0.06	0.08	0.10	0.11	0.12	0.16	0.23	0.20
• Rice	20 %		_			<u> </u>											······································	1			·				0.61		
• Oilseed (Sunflower)	14 %	"	_						 		1. 1						<u> </u>							1	0.12		<u> </u>
• Pulses (Mungbeans)	3 %																	1 <u>1</u> 17	0.02	0.02	0.03				0.07		
• Pulses (Soybeans)	9 %									·			· · ·				· · · · ·		<u>.</u>					<u> </u>	0.17		
Sugarcane & Others	5 %	"	0.01	0.01	0.01	0.01	0.02	0.03		0.06	0.05	0.07	0.08	0.08	0.14	0.16	0.19	t	<u> </u>						0.17		1 1 1 1 1
• Wheat	54 %		0.44	0.45	0.50	0.59	0.53	0.35	0.35	0.38	-		·												0		0.10
• Oilseed (Rapes Mustard)	20 %	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.15		1					0.04		· · ·			· · · · · ·		<u> </u>										
• Pulses (Gram)	13 %			·					i	0.14		0.09	0.04	0.02		- 	<u> </u>							:	<u> </u>		
• Fodder (Berseem) & Others	8 %		0.05	0.05	0.06	0.06	0.07	0.06	0.06	0.07	0.04			·		_	<u> </u>		:		<u> </u>	<u></u>					
Total		- U	0.76	0.77	0.85	0.97	0.88	0.60		0.69	0.43	0.27	0.14	0.10	0.14	0.16	0.19	0.35	0.73	1.07	1.22	1.28	1.37	1 14	1.28	1 5 7	1 30
Water Requirement (Net)		cusecs	3.19	3.23	3,25	4.07	3.70	3.15	2.52					1 - A - A		السيوجي						1. I.			5.42		1
-do - Including Field Losses		"			4.06	5.09	4.62	3.94	3.15	3.62	2.05	1.42	0.74	0.53	0.74	0.84	0.91	1 84	3.83	5.62	6.41	6.77	6.54	6.04	6.77	7.54	6.05
Drinking Water Requirement				0.07						0.07					1 - C.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.1		1 A 1 A 4 A 4		1	1. 1. 1. 1. 1. 1.	1	·	0.07		1
Water Requirement Including F.L and D.W			4.06	4.11						3.69			1				1.	1 .				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	1	6.84		
- do - Including Water Course		"	4.78							4.35		11. <u>/</u>								· · · · ·		· · · · · · · · · · · · · · · · · · ·			8.05		<u> </u>
-do - Including Minor		"	5.31	5.38			inter it			4.83				1.1.1.1		1.1	1.11	a tata a			1	a de l'élére e s	1 1.1.1.1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	8.95		<u> </u>
- do - Including Conveyance Loss	es		6.94	7.03						6.31				·	1.38					1.11.11.11.1			<u>िल्ल</u> ान		11.69		
Total Water Requirement					ł				L	3,862												<u> </u>			7,157		
- do							10.00					1. S.	1.11	1											0.142		
	 ,		4	L		L																			1	0.57-1	

ter Requirement (Case 1 . Q = 8,200 cusecs)

Jan.	·· ···································		Feb.			Mar.			Apr.			May		1.10 (5.2)	Jun.			Jul.			Aug.			Sept.			Oct			Nov.			Dec.	T	Total
																						 								Γ					TOTA
· · · · ·	ļ 														0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26	2.38	2.35	1.84	1.64	1.52	0.56	0.34	0.15				23.17
														0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66	2.64	2.55	1.99	1.44	1.56	0.27				-		41.95
· · ·																						<u> </u>	· · · · · · · · · · · · · · · · · · ·			1.84	1.97	1.88	0.99	0.71	0.48	0.13	0.02		16.00
							<u> </u>								0.60	0.82	1.02	1.39								0.98									20.58
								 							0.50	0.72	0.92	1.22	1.26	1.40	1.89	2.56	2.29	2.40	2.40	1.90	1.71	1.56	0.57	0.32	0.12				23.74
	+								1.53		2.86	3.18	3.89	3.50	3.76	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62	2.60	2.58	2.10	2.02	2.15	1.14	1.08	1.00	0.50	0.38	0.28	68.97
<u></u>	0.93	100 100			l			0.21	0.03					a fini Na si								:							1				0.61		13.16
	0.79										1 <u>-</u>		an an an an An an an An				1		-					- <u>.</u>		0.20	0.35	0.52	0.48	0.63	0.62	0.46	0.64	0.69	9.39
	0.91							0.66	0.34	0.13															0.33	0.46	0.59	0.80	0.71	0.88	0.75	0.53	0.61	0.75	16.11
).65	0.72	0.78	0.89	0.73	1.15	0.88	0.50				_														_	0.50	0.78	1.13	1.04	0.75	0.82	0.54	0.60	0.72	13.84
- 1																: 																			
	-							-	-						0.05	0.06	0.08	0.10	0.11	0.12	0.16	0.23	0.20	0.22	0.22	0.17	0.15	0.14	0.05	0.03	0.01				2.10
													·	0.17	0.42	0.73	0.86	0.86	0.85	0.60	0.61	0.68	0.53	0.53	0.51	0.40	0.29	0.31	0.05	·	· · · ·				8.40
· · ·				1707 			:						· · ·		-				0.06	0.09	0.12	0.17	0.18	0.21	0.30	0.26	0.28	0.26	0.14	0.10	0.07	0.02	0.00	110 C	2.26
							· · · ·								0.02	0.02	0.03											0.01		-				-	0.63
			144 144 1844 144 251 - 144	•											0.05	0.06	0.08	0.11	0.11	0.13	0.17	0.23	0.21	0.22	0.22	0.17	0.15	0.14	0.05	0.03	0.01				2.14
	0.01					0.06	0.05	0.07	0.08	0.08	0.14	0.16	0.19	0.18	0.19	0.20	0.17	0.17	0.19	0.15	0.15	0.17	0.13	0.13	0.13	0.11	0.10	0.11	0.06	0.05	0.05	0.03	0.02	0.01	3.46
1.1.1.1.1.1		1. 1. 1.	· · · · · · · · · · · · · · · · · · ·					0.11	0.02		<u> </u>	·			_							_		нана 1991 —		0.09	0.20	0.32	0.31	0.39	0.49	0.35	0.33	0.42	6.85
	0.16			<u> </u>	34 2.3		1				<u> </u>					_						-			—	0.04	0.07	0.10	0.10	0.13	0.12	0.09	0.13	0.14	1.86
1				<u></u>			· · · · ·		0.04	0.02						· · · · · · · · · · · · · · · · · · ·							_	-	0.04	0.06	0.08	0.10	0.09	0.11	0.10	0.07	0.08	0.10	2.02
· · · · ·		<u>e Pricese</u> S S S Seaver	1997 - 1998 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	<u></u>			0.04	ļ								<u> </u>		-							1	0.04	0.06	0.09	0.08	0.06	0.07	0.04	0.05	0.06	1.07
.77	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	0.97	946 - A. A.			0.69	0.43	0.27	0.14	0.10	0.14	0.16	0.19	0.35	0.73	1.07	1.22	1.28	1.37	1.14	1.28	1.57	1.32	1.38	1.48	1.37	1.40	1.58	0.93	0.90	0.92	0.60	0.61	0.73	30.83
.23	3.25	4.07	3.70	3.15	2.52	2.90	1.64	1.13	0.59	0.42	0.59	0.67	0.73	1.47	3.07	4.50	5.13	5.42	5.23	4.83	5.42	6.03	5.59	5.80	6.22	5.76	5.88	6.03	3.91	3.79	3.86	2.51	2.55	2.79	
.04	4.06	5.09	4.62	3.94	3.15	3.62	2.05	1.42	0.74	0.53	0.74	0.84	0.91	1.84	3.83	5.62	6.41	6.77	6.54	6.04	6.77	7.54	6.98	7.25	7.78	7.19	7.35	7 54	4 88	474	4 83	3 14	3 18	3 48	
.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
-	4.13	D. 10	4.09	4.01	3.22	3.69	2.12	1.49	18.0	0.60	0.81	0.91	0.98	1.91	3.90	5.69	6.48	6.84	6.61	6.11	6.84	7.61	7.05	7.32	7.85	7.26	7.42	7.61	4.95	4.81	4.90	3.21	3.25	3.55	
			3						0.95						4.59																				
			65 / J				21	1.94		0.78	1.05																								n and a second s
								2.54	1.38	1.02	1.38				6.67																				
					<u> </u>			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	842		842	952	1,022	1,995	4,082	5,949	6,773	7,157	6,912	6,388	7,157	7,961	7,377	7,651	8,200	7.596	7.761	7.961	5.180	5.027	5 125	3 359	3 403	3717	
085	0.094	0.107	0.097	0.067	0.067	0.077	0.048	0.031	0.017	0.012	0.017	0.019	0.022	0.040	0.081	0.118	0.134	0.142	0.151	0.127	0.142	0.174	0.146	0.152	0.163	0.151	0.154	0.174	0.103	0.100	0.102	0.067	0.068	0.081	3.414

	IV. 4 - 1	<u>v v</u>	valer r	Require	<u>ment</u>	<u>(Ca</u>	<u>se 2,</u>	$\underline{\mathbf{O}} = 6,$	700 ci	<u>isecs</u>)		,			•		ч. На страната					a 	•		tu Sutji u	
Description	Unit		Jan.			Feb.	****		Mar.		T	Ápr.		<u>}</u>	May		<u> </u>	Jun.		[Jul.			Aug	*****	
Unit Crop Water Requirement				1		Γ		1		1	· · · ·	1	1		<u> </u>	<u> </u>]			<u> </u>			• 	
• Sorghum	inch								<u> </u>			<u> </u>						0.50	0.72	0.89	1 16	1 20	1 22	1 02	2.51	12.2
• Rice	"									· · · · · ·							0.86	1.1	3.63					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3.39	
• Oilseed (Sunflower)	11.2				1					+				 					0.00	7.20	4.01					
• Pulses (Mungbeans)				2 J	•													0.60	0.82	1.00	1 00				1.24	
Pulses (Soybeans)	11	• • • • • •	<u> </u>														·····	<u> </u>	· · · · · · · · · · · · · · · · · · ·	1.02		+	-		2.99	- -
Sugarcane & Others	<i>n</i> ,	0.25	0.22	0.11	0.22	0.47	0.56	0.89	1.10	0.97	1.36	1 53	1.68	2.86	3 18	3 80	2 50	0.50	0.72	0.92	1.22	1.26	1.40	1.89	2.56 3.36	2.29
• Wheat	"	0.82	0.84	0.93	1.09	0.98	0.65	1.12	0.70	0.42	0.21	0.03	1.00	2.00	0.10	0.00	5.50	3.70	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62
· Oilseed (Rapes Mustard)	,,		· • • • • • • • • • • • • • • • • • • •	0.79			<u> </u>	i					· ·				· .									
• Pulses (Gram)	n			0.91		<u> </u> ;-	0.72			<u> </u>	0.66	0.34	0.13		:	<u> </u>			· · ·				ļ			
• Fodder (Berseem) & Others		+	+	0.72	. · · · · · · · · · · · · · · · · · · ·	<u> </u>						0.01	0.75													
Water Requirement	-					<u> </u>												······································		· · · ·					 	
• Sorghum 7 %	inch		<u> </u>	· · · · ·												·	· ·	0.04	0.05							
• Rice 17 %												·····			· · ·		0.45		1.1.1.1.1.1			t	<u> </u>	+	0.18	· · · · · · · · · · · · · · · · · · ·
· Oilseed (Sunflower) 12 %	"					<u>14 64.</u> 1						· · ·					0.15	0.36	0.62	0.73		• • • • • • • • • • • • • • • • • • • •			0.58	+
Pulses (Mungbeans) 3 %		-									<u>1.1.1</u>											• :			0.15	
Pulses (Soybeans) 7 %	<i>"</i>								<u>_</u>													 	ł	1	0.09	_
• Sugarcane & Others 4 %	"	0.01	0.01	0.00	0.01	0.02	0.02	0.04		0.01	0.0-							0.04	0.05	0.06	0.09	0.09	0.10	0.13	0.18	0.16
• Wheat 45 %	11	0.37	0.38	0.00	0.01	0.02	0.02	0.04	0.04 10.22	0.04	0.05	0.06	0.07	0.11	0.13	0.16	0.14	0.15	0.16	0.13	0.14	0.15	0.12	0.12	0.13	0.10
• Oilseed (Rapes Mustard) 17 %		· · · · · ·		0.12							0.09	0.01									-					1.1 1.1 1.1 1.1
• Pulses (Gram) 11 %		1	1.1.1.1.1.1.1.1	-							0.07	0.04	0.01		• • • •			· .				·]	[ļ. <u></u>
• Fodder (Berseem) & Others 7 %				0.05				· · · · · · · · ·			0.07	0.04	0.01													
Total									1		0.04	0.11	0.00					<u> </u>								
Water Requirement (Net)	cusecs	272	2.00	267	2.44	0.74	0/00	0.65	0.50	0.30	0.21	0.11	0.08	0.11	0.13	0.16	0.29	0.61	0.90	1.01	1.08	1.14	0.94	1.07	1.31	1.09
- do - Including Field Losses		3.41	3.47	3.34	0.44 1 21	3.80	2.03	3.97 A AG	2.35	1.3/	0.88	0.46	0.34	0.46	0.55	0.61	1.22	2.56	3.78	4.24	4.54	4.35	3.95	4.50	5.00	4.58
Drinking Water Requirement		0.06	0.06	0.04	0.06	0.06	0.06	0.06	2.94	1.71	1.10	0.58	0.42	0.58	0.68	0.76	1.52	3.20	4.73	5.30	5.67	5.44	4.94	5.62	6.25	5.72
Water Requirement Including F.L and D.W		3.47	3 53	3.40	1 27	2.05	2.24	4 52	0.00	0.00	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
– do – Including Water Course		4 09	4 1 5	4.00	5 1/	3.95	3.34 2712	4.5Z	3.00	1.78	1.16	0.64	0.48	0.64	0.74	0.82	1.58	3.26	4.79	5.36	5.73	5.50	5.00	5.68	6.31	5.78
– do – Including Minor										1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0.75	0.56	0.75	0.87	0.97	1.86	3.84	5.63	6.31	6.74	6.47	5.88	6.68	7.43	6.80
- do - Including Conveyance Losses		5.04	-4.01	4.4 5	3.71	01.0	4.37	5.91	3.92	2.32	1.52	0.83	0.63	0.83	0.97	1.08	2.07	4.27	6.26	7.01	7.49	7.19	6.53	7.42	8.25	7.56
Total Water Requirement	"	3 622	0.02 3.697	0.01 2 EE 7	7.40 A.ECC	0.74	$\frac{5./1}{2.40^{-1}}$	1.73	5.13	3.04	1.99	1.09													10.79	L
— do —											1,216				777	861	1,655	3,413	5,005	5,609	5,993	5,754	5,225	5,939	6,602	6,048
	M.A.F	0.072	0.073	0.078	0.091	0.082	0.055	0.094	0.062	0.041	0.024	0.013	0.010	0.013	0.015	0.019	0.033	0.068	0.099	0.111	0.119	0.126	0.104	0.118	0.144	0.120

い第二日に		
Contraction in	(Case 2, Q = 6,700 cusecs)	
	<u>(0100 2.7 d. 07.00 00000 7</u>	

Jan.			Feb.	1	<u></u>	Mar.	l i i i i i i i i i i i i i i i i i i i		Apr.			May			Jun.		-	Jul.	,		Aug.		-	Sept.			Oct			Nov.		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	Dec.		Total
																						-	- 												
	++				ļ										0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26	2.38	2.35	1.84	1.64	1.52	0.56	0.34	0.15				23.17
	ļ	-	· ·		ļ					··		1999 - 19		0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66	2.64	2.55	1.99	1.44	1.56	0.27	-					41.95
											ļ								0.44	0.62	0.85	1.24	1.26	1.49	2.08	1.84	1.97	1.88	0.99	0.71	0.48	0.13	0.02		16.00
			:												0.60	0.82	1.02	1.39	1.56	1.76	2.31	2.99	2.41	2.22	1.80	0.98	0.52	0.20							20.58
															0.50	0.72	0.92	1.22	1.26	1.40	1.89	2.56	2.29	2.40	2.40	1.90	1.71	1.56	0.57	0.32	0.12				23.74
										1.68	2.86	3.18	3.89	3.50	3.76	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62	2.60	2.58	2.10	2.02	2.15	1.14	1.08	1.00	0.50	0.38	0.28	68.97
0.84	0.93	1.09	0.98	0.65	1.12	0.70	0.42	0.21	0.03											н 1. г.		- ·				0.17	0.37	0.59	0.58	0.72	0.91	0.65	0.61	0.77	13.16
0.76	0.79	0.86	0.65	0.35	0.46	0.18																				0.20	0.35	0.52	0.48	0.63	0.62	0.46	0.64	0.69	9.39
0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13			1		1. e. e.										0.33	0.46	0.59	0.80	0.71	0.88	0.75	0.53	0.61	0.75	16.11
0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50																			0.50	0.78	1.13	1.04	0.75	0.82	0.54	0.60	0.72	13.84
																											1								
	ج بالدين ال														0.04	0.05	0.06	0.08	0.08	0.09	0.13	0.18	0.16	0.17	0.16	0.13	0.11	0.11	0.04	0.02	0.01				1.62
										e Le c				0.15	0.36	0.62	0.73	0.73	0.72	0.51	0.52	0.58	0.45	0.45	0.43	0.34	0.24	0.27	0.05						7.15
																			0.05	0.07	0.10	0.15	0.15	0.18	0.25	0.22	0.24	0.22	0.12	0.09	0.06	0.02	0.00		1.92
															0.02	0.02	0.03	0.04	0.05	0.05	0.07	0.09	0.07	0.07	0.05	0.03	0.02	0.01							0.62
													· · · ·		0.04	0.05	0.06	0.09	0.09	0.10	0.13	0.18	0.16	0.17	0.17	0.13	0.12	0.11	0.04	0.02	0.01				1.67
0.01	0.00	0.01	0.02	0.02	0.04	0.04	0.04	0.05	0.06	0.07	0.11	0.13	0.16	0.14																		0.02	0.02	0.01	2.74
		0.49			1		· · · · · · · · · · · · · · · · · · ·				1		1									· · ·			}							0.29		+	5.91
0.13	0.13	0.15	0.11	0.06	0.08	0.03												· .	:									-				0.08	ļ		1.61
0.09	0.10	0.12	0.11	0.08	0.15	0.11	0.09	0.07	0.04	0.01															0.04	0.05	0.06	0.09	0.08	0.10	0.08	0.06	0.07	0.08	1.77
0.05	0.05	0.05	0.06	0.05	0.08	0.06	0.04																a trais			0.04	0.05	0.08	0.07	0.05	0.06	0.04	0.04	0.05	0.97
0.66	0.70	0.82	0.74	0,50	0.85	0.56	0.36	0.21	0.11	0.08	0.11	0.13	0.16	0.29	0.61	0.90	1.01	1.08	1.14	0.94	1.07	1.31	1.09	1.14	1.20	1.13	1.15	1.33	0.79	0.75	0.78	0.51	0.51	0.61	25.98
1999 - C. 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 1993 - 19	1.150.77										1																					2.14			
3.47																																2.68			<u>.</u>
0.06	1 - C - C - C - C - C - C - C - C - C -		5. ·		2 1				1 1 1 1 N N	and the second		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													1							0.06			
3.53	3.40	4.37	3.95	3.34	4.52	3.00	1.78	1.16	0.64	0.48	0.64	0.74	0.82	1.58	3.26	4.79	5.36	5.73	5.50	5.00	5.68	6.31	5.78	6.05	6.41	5.99	6.10	6.41	4.21	4.00	4.16	2.74	2.74	2.97	
4.15	4.00	5.14	4.64	3.93	5.31	3.53	2.09	1.37	0.75	0.56	0.75	0.87	0.97	1.86	3.84	5.63	6.31	6.74	6.47	5.88	6.68	7.43	6.80	7.11	7.54	7.05	7.18	7.54	4.95	4.70	4.89	3.22	3.22	3.50	
1	1	1.1.1	1 5	E 5 17		1.11					*			1						the second s							· · ·	· .	1 I I I I I I I I I I I I I I I I I I I	1	1.2.4.4	L 1	1	3.88	
and the second second			1. S. S. S. S. S.	1 . · · · .		8 g.	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	· · · · · · · · · · · · · · · · · · ·			1	1.								· · · · ·	i		+					والمناسب المراجب			I		14	5.08	
(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	1.00 1.00				t				12.2.2.2.2	1	t	-				· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·				<u></u>	_		L				<u></u>					3,108	· · · · · · · · · · · · · · · · · · ·
1.1.1	1971 - 19 A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.A.	ST44.1			1				1 1 1 1 1 1 1		t			+												· · · /							1 1 1 1 1	0.068	1

Table	IV. 4 - 17	Water	Requirement	(Case 3,	Q = 8.200	cusees):
			noounomone	1 0000 0,	0,200	Cuaeca	1

	<u>Table</u>	<u>V. 4 - 1</u>	7 Wa	nter R	equirer	nent	(Case	<u>3, C</u>	2 = 8,2	00 cu:	secs)		· · · · ·	بر د		· ·	1. j.				.*		4 				n Maria
Description		Unit	T	Jan.			Feb.			Mar.		<u> </u>	Apr.		r	May			Jun.		T	Jul.	08-808-4-0	T			T
Unit Crop Water Requirement				 			· · · ·			1	T		T	Γ		iviay						- Jui.	T	+	Aug.		
• Sorghum		inch	·																0.50	0.72	0.89	1 16	1 20	1.32	1 0 2	9 61	0.00
Rice		"													<u> </u>			0.86		3.63			1	and the second	1997 B. 1997		2.20
• Oilseed (Sunflower)		IJ											<u> </u>				· · · -						+				1.26
Pulses (Mungbeans)		**										 	+						0.60	0.82	1.02	1.39		1.76	· · · · ·		· · · · · · · · · · · · · · · · · · ·
• Pulses (Soybeans)	4.5	"															:-		l	0.72				1.40			
Sugarcane & Others	<u> </u>	u .	0.25	0.22	0.11	0.22	0.47	0.56	0.89	1.10	0.97	1.36	1.53	1.68	2.86	3.18	3.89	3.50						3.03			
• Wheat		.,	-		- finite and the						· · ·	- A - A	0.03	1											0.00	0.00	2.02
• Oilseed (Rapes Mustard)		11	0.75	0.76	0.79	0.86	0.65	0.35	0.46	0.18	<u> </u>																
• Pulses (Gram)			0.81	0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13			···										
• Fodder (Berseem) & Others		"	0.66	0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50																
Water Requirement													1	 											<u> </u>		
• Sorghum	9 %	inch	1										1						0.05	0.06	0.08	0.10	0.11	0.12	0.16	0.23	0.20
• Rice	20 %	,,									1							0.17			h						0.53
• Oilseed (Sunflower)	14 %	1997 - 1997 1997 - 1997 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1												· · · · · ·										0.09	·· ···		
Pulses (Mungbeans)	3 %							<u> </u>						·					0.02	0.02	0.03	0.04	1	0.05			
• Pulses (Soybeans)	9 %	"						1.1						· · · ·			-					1.1.7		0.13			I
Sugarcane & Others	5 %		0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.06	0.05	0.07	0.08	0.08	0.14	0.16	0,19	0.18	0.19	0.20	0.17	0.17	0.19	0.15	0.15	0.17	0.27
• Wheat	34 %	"		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1.1 5414 1.1 4	4			i		0.14						· . ·										
· Oilseed (Rapes Mustard)	13 %		0.10	0.10	0.10	0.11	0.08	0.05	0.06	0.02																	
• Pulses (Gram)	8 %	1997) 1997 - 1997 1997 - 1997 - 1997	0.06	0.07	0.07	0.09	0.08	0.06	0.11	0.08	0.06	0.05	0.03	0.01													
• Fodder (Berseem) & Others	5%	"	0.03	0.03	0.04	0.04	0.04	0.04	0.06	0.04	0.03																
Total			0.48	0.50	0.54	0.62	0.55	0.40	0.65	0.44	0.28	0.19	0.12	0.09	0.14	0.16	0.19	0.35	0.73	1.07	1.22	1.28	1.37	1.14	1.28	1.57	1.32
Water Requirement (Net.)		cusecs			2.06		A. 17									1								4.79			
- do - Including Field Losses			2.52	2.63	2.58	3.26	2.89	2.63	3.41	2.31										*****				5.99	· · · ·		1
Drinking Water Requirement				1. S.	1.1.1.1.1.1.1.1		1 A 2 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4 A 4	5 S S S S S	1. C. 1979 A. C.	1. 1. 1. 1. 1. 1. 1.						· · · · · · · · · · · · · · · · · · ·		······		1.2.2		· · · · ·		0.07			
Water Requirement Including F.L and D.W			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	127 127 12	2.65	A STATE OF A							1.			· · · · · · · · · · · · · · · · · · ·					10.0						7.00
- do - Including Water Course			3.05	3.17	3.12	3.91	3.48	3.17	4.10	2.80	1.65	1.26	0.82	0.64	0.95					Sec. and				7.13			
– do – Including Minor			3.39	3.52	3.46	4.35	3.87	3.52	4.55	3.11	1.84	1.40	0.92	0.71	1.05					1.1.1	7.4						9.15
- do - Including Conveyance Losses	an a Africa Arti	ana ana an Taona	4.43	4.61	4.52	5.68	5.05	4.61	5.95	4.07	2.40	1.82	1.20	0.93						3.1.1.1	1. 1. 1. 1. 1. N						11.96
Total Water Requirement								1.			·		732		842						100 C 100 C 100 C 100 C						7,322
do					f				· · · · ·			1. S.	0.015					F						1			0.145

Water Requirement (Case 3, $\Omega = 8,200$ cusecs)

	Jan.	.		Feb.	T	-	Mar.			Apr	•		May			Jun.	- 2 ¹ 2 - 1		Jul.			Aug.			Sept.			Oct.		1	Nov.		<u> </u>	Dec.		Total
							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1																	1				<u> </u>	/ ~~		<u> </u>	T		T	T	
	<u></u>				ļ											0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26	2.38	2.35	1.84	1.64	1.52	0.56	0.34	0.15				23.17
				ļ											0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66	2.64	2.55	1.99	1.44	1.56	0.27					-	41.9
													a a a a			1			· · ·		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			l		h				L	0.71	0.48	0.12	0.02	-	
ļ													1			0.60	0.82	1.02	1.39					1	2.22						0.71	0.40	0.15	10.02	-	16.0
												an a				0.50	0.72	0.92	1.22	1.26	1.40	1.89	2.56	2 29	2 40	240	1 90	1 71	1 50	0.57	0.32	0.12				20.5
	0.22	0.11	0.22	0.47	0.56	0.89	1.10	0.97	1.36	1.53	1.68	2.86	3.18	3.89	3.50	3.76	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62	2.60	2.58	2.10	2.02	2 15	1 1/	1.02	1.00	0.50	0.20	0.28	23.7
	0.84	0.93	1.09	0.98	0.65	1.12	0.70	0.42	0.21	0.03			†	17.5																	·	0.91				68.9 13.1
	0.76	0.79	0.86	0.65	0.35	0.46	0.18																					· · · · · · · · · · · · · · · · · · ·				0.62			_	
	0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13		1			1										0.33								1 1 1	0.75	9.3
	0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50															·				····		<u> </u>	· · ·	<u> </u>	+	· · ·		0.75	<u>L</u>
						- 1 A - 1				1	- <u> </u>																0.00	0.70	1.15	1.04	0.75	0.02	0.94	0.00	0.72	13.8
															:	0.05	0.06	0.08	0.10	011	0.12	0.16	0.23	0.20	0.22	0.22	0.17	0.10	0.14	0.05	0.03				<u> </u>	
												 			0.17	0.42															0.03	0.01			<u> </u>]	2.1
									<u> </u>					· · · · ·	-				· .																	8.4
ľ			· · ·													0.02	<u></u>	0.02												0.14	0.10	0.07	0.02	0.00		2.26
																									0.07									 		0.6
	0.01	0.01	0:01	0.02	0.03	0.04	0.06	0.05	0.07	0.08	0.08	0.14	0.16	0.10	0.10	0.05	0.00	0.08	0.11	0.11	0.13	0.17	0.23	0.21	0.22	0.22	0.17	0.15	0.14	0.05	0.03	0.01	- 1.			2.14
	0.29	0.32	0.37	0.33	0.22	0.38	0.24	0.14	0.07	0.01			0.10	0.13	0.18	0.19	0.20	0.17	0.17	0.19	0.15	0.15	0.17	0.13	0.13				1. I		1.1.1.1.1.1.1.1	0.05			11	3.46
1		1	· · · · · · · · · · · · · · · · · · ·	0.08											<u> </u>					· ·		1.4.4 			-							0.31			<u>↓</u>	4.48
٩÷	100							0.06	0.05	0.03	0.01									<u>.</u>						1.						0.08			┟┉╧╼╍┟╸	1.22
· · ·	1. 1. 1. 1. 1. 1.	 The spectrum 				· · · · · · · · · ·		0.03		0.00	0.01											· .				0.04	0.04	0.05	0.06	0.06	0.07	0.06	0.04	0.05	0.06	1.30
╈			†							0.12	0.00	0.14	0.10	0.10													0.00	0.04	0.06	0.05	0.04	0.04	0.03	0.03	0.04	0.68
	2 10	2.06	2.60	2 31	2.10	2.00	1.85	1.07	0.10	0.12	0.09	0.14	0.16	0.19	0.35	0.73	1.07	1.22	1.28	1.37	1.14	1.28	1.57	1.32	1.38	1.48	1.27	1.24	1.36	0.72	0.64	0.63	0.40	0.39	0.46	26.67
+			l						1.00	0.50	0.38	0.59	0.67	0.73	1.47	3.07	4.50	5.13	5.38	5.27	4.79	5.38	6.00	5.55	5.80	6.22	5.34	5.21	5.19	3.02	2.69	2.65	1.68	1.64	1.76	
	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.03	0.47	0.74	0.64	0.91	1.84	3.83	5.62	6.41	6.72	6.59	5.99	6.72	7.49	6.93	7.25	7.78	6.67	6.51	6.49	3.78	3.36	3.31	2.10	2.05	2.20	
	2.70	2.65	3.33	2.96	2.70	3.48	2.38	1 / 1	1.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
	3.17	3.12	3.91	3 48	3.17	4 10	2.30	1.41	1.07	0.70	0.54	0.81	0.91	0.98	1.91	3.90	5.69	6.48	6.79	6.66	6.06	6.79	7.56	7.00	7.32	7.85	6.74	6.58	6.56	3.85	3.43	3.38	2.17	2.12	2.27	
┢	3.52	3.46	4.35	3.87	<u></u> 2 62	т. (U Л ББ	2.00	1.00	1.20	0.02	0.04	0.95	1:07	1.15	2.24	4.59	6.69	7.62	7.99	7.83	7.13	7.99	8.90	8.24	8.61	9.23	7.93	7.74	7.72	4.53	4.04	3.97	2.55	2.49	2.67	
÷								1.04	1.40	0.92	0,71	1.05	1.19	1.28	2.49	5.10	7.44	8.47	8.88	8.70	7.92	8.88	9.89	9.15	9.56	10.26	8.81	8.60	8.58	5.03	4.48	4.42	2.84	2.77	2.96	
$\left \right $	+.01	4.92	0.08	5.U5	4.61	5.95	4.07	2.40	1.82	1.20	0.93	1.38	1,56	1.67	3.26	6.67	9.72	11.07	11.61	11.38	10.35	11.61	12.93	11.96	12.50	13.40	11.52	11.25	11.21	6.58	5.86	5.77	3.71	3.62	3.87	
Ľ	,010	2,703	5,470	3,094	2,019	3,043	2,489	1,471	1,117	/32	567	842	952	1,022	1,995	4,082	5,949	6.773	7.1026	5.962	6.334	7.102	7 911	7 322	7 651 8	2 200	7 0 4 7 6	2002	ادءه ۽	1000	2	0 - 00	0.070	0.04-	0.070	
Ľ	000	0.000	0.009	0.061	0.045	0.072	0.049	0.032	0.022	0.015	0.011	0.017	0.019	0.022	0.040	0.081	0.118	0.134 (0.141	0.152	0.126	0.141	0.173	0.145	0.152) 163	0.140 0	0.137	0.150	0.080	0.071	0.070	0 045	0 044	0.052	2.959

Appendix IV.2-1 Page 22

.

Table	IV. 4 18	<u>N N</u>	later	Requir	ement	((ase 4	,Q ≠	6,700	cusecs	:_)			· · · ·				e e e								
Description	Unit		Jan.			Feb.	·		Mar.			Apr.			Мау			Jun.			Jul,			Aug.		
Unit Crop Water Requirement		н							an bild to the bill sizes			.*					· .			a este da Agregada						
• Sorghum	inch																	0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26
• Rice																	0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66
• Oilseed (Sunflower)	"												·····									0.44	0.62	0.85	1.24	1.26
• Pulses (Mungbeans)	"										÷ .							0.6 0	0.82	1.02	1.39	1.56	1.76	2.31	2.99	2.41
• Pulses (Soybeans)	11																	0.50	0.72	0.92	1.22	1.26	1.40	1.89	2.56	2.29
Sugarcane & Others	"	0.25	0.22	0.11	0.22	0.47	0.56	0.89	1.10	0.97	1.36	1.53	1.68	2.86	3.18	3.89	3.50	3.76	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62
• Wheat		0.82	0.84	0.93	1.09	0.98	0.65	1.12	0.70	0.42	0.21	0.03														
· Oilseed (Rapes Mustard)		0.75	0.76	0.79	0.86	0.65	0.35	0.46	0.18												:	: :				
• Pulses (Gram)	11	0.81	0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13			,						· .	1.1 · · ·			11 X.
• Fodder (Berseem) & Others		0.66	0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50																
Water Requirement				· · · ·												А.										
• Sorghum 7 %	inch			ľ		· · ·											1	0.04	0.05	0.06	0.08	0.08	0.09	0.13	0.18	0.16
• Rice 17 %	"				1												0.15	0.36	0.62	0.73	0.73	0.72	.0.51	0.52	0.58	0.4
Oilseed (Sunflower) 12 %	"																		n de Nacional de la composition			0.05	0.07	0.10	0.15	0.1!
Pulses (Mungbeans) 3 %										1			n an Tala Nata		-			0.02	0.02	0.03	0.04	0.05	0.05	0.07	0.09	0.0
Pulses (Soybeans) 7 %	1		1					:										0.04	0.05	0.06	0.09	0.09	0.10	0.13	0.18	0.1
Sugarcane & Others 4 %	"	0.01	0.01	0.00	0.01	0.02	0.02	0.04	0.04	0.04	0.05	0.06	0.07	0.11	0.13	0.16	0.14	0.15	0.16	0.13	0.14	0.15	0.12	0.12	0.13	0.1
• Wheat 34 %		0.28	0.29	0.32	0.37	0.33	0.22	0.38	0.24	0.14	0.07	0.01						. :			· .					
Oilseed (Rapes Mustard) 13 %		0.10	0.10	0.10	0.11	0.08	0.05	0.06	0.02															· · ·		
• Pulses (Gram) 8 %		0.06	0.07	0.07	0.09	0.08	0.06	0.11	0.08	0.06	0.05	0.03	0.01													
• Fodder (Berseem) & Others 5 %	1 1 1 1 1	0.03	0.03	0.04	0.04	0.04	0.04	0.06	0.04	0.03											· · · ·					
Total		0.48	0.50	0.53	0.62	0.55	0.39	0.65	0.42	0.27	0.17	0.10	0.08	0.11	0.13	0.16	0.29	0.61	0.90	1.01	1.08	1.14	0.94	1.07	1.31	1.0
Water Requirement (Net)	cusecs	2.02	2.10	2.02	2.60	2.31	2.05	2.73	1.76	1.03	0.71	0.42	0.34	0.46	0.55	0.61	- 1.22	2.56	3.78	4.24	4.54	4.35	3.95	4.50	5.00	4.5
do Including Field Losses		2.52	2.63	2.53	3.26	2.89	2.56	3.41	2.20	1.29	0.89	0.53	0.43	0.58	0.69	0.76	1.52	3.20	4.73	5.30	5.67	5.44	4.94	5.62	6.25	5.7
Drinking Water Requirement		0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.0
Water Requirement Including F.L and D.W	11 -	2.58	2.69	2.59	3.32	2.95	2.62	3.47	2.26	1.35	0.95	0.59	0.49	0.64	0.75	0.82	1.58	3.26	4.79	5.36	5.73	5.50	5.00	5.68	6.31	5.7
- do - Including Water Course	"	3.04	3.16	3.05	3.91	3.47	3.08	4.08	2.66	1.59	1.12	0.69	0.58	0.75	0.88	0.96	1.86	3.84	5.63	6.31	6.74	6.47	5.88	8.68	7.43	6.8
- do - Including Minor	"	3.38	3.51	3.39	4.34	3.86	3.42	4.53	2.96	1.77	1.24	0.77	0.64	0.83	0.98	1.07	2.07	4.27	6.26	7.01	7.49	7.19	6.53	7.42	8.25	7.5
- do - Including Conveyance Losses	"	4.42	4.59	4.43	5.67	5.05	4.47	5.92	3.87	2.31	1.62	1.01	0.84	1.08	1.28	1.40	2.70	5.58	8.18	9.17	9.7 9	9.40	8.54	9.70	10.79	9.8
Total Water Requirement																						8 5,754				
- do	M.A.F	0.054	0.056	0.059	0.069	0.061	0.043	0.072	0.047	0.031	0.020	0.012	0.010	0.013	0.016	0.019	0.033	0.068	0.099	0.111	0.119	0.126	10.104	0.118	8 0.144	10.12

Water Requirement (Case 4, Q = 6,700 cusecs)

, -

	Jan.			Feb.			Mar.			Apr.			May			Jun.			Jul.			Aug.			Sept.			Oct			Nov.			Dec.		Total
				_										1990 - M]			T									T	<u> </u>		1		
																0.50	0.72	0.89	1.16	1.20	1.32	1.83	2.51	2.26	2.38	2.35	1.84	1.64	1.52	0.56	0.34	0.15	-			23.17
															0.86	2.12	3.63	4.28	4.31	4.24	2.98	3.03	3.39	2.66	2.64	2.55	1.99	1.44	1.56	0.27			-			41.95
																				0.44	0.62	0.85	1.24	1.26	1.49	2.08	1.84	1.97	1.88	0.99	0.71	0.48	0.13	0.02	1 <u>.</u>	16.00
							 									0.60	0.82	1.02	1.39	1.56	1.76	2.31	2.99	2.41	2.22	1.80	0.98	0.52	0.20							20.58
																1 1 1		1 A							2.40											23.74
0.25	0.22	0.11	0.22	0.47	0.56	0.89	1.10	0.97	1.36	1.53	1.68	2.86	3.18	3.89	3.50	3.76	3.91	3.35	3.44	3.82	3.03	3.06	3.36	2.62	2.60	2.58	2.10	2.02	2.15	1.14	1.08	1.00	0.50	0.38	0.28	68.97
0.82	0.84	0.93	1.09	0.98	0.65	1.12	0.70	0.42	0.21	0.03			t a														· · · · · ·				+	+		0.61		13.16
0.75	0.76	0.79	0.86	0.65	0.35	0.46	0.18																				0.20	0.35	0.52	0.48	0.63	0.62	0.46	0.64	0.69	9.39
0.81	0.84	0.91	1.09	1.01	0.72	1.34	1.04	0.81	0.66	0.34	0.13							:					<u> </u>			0.33	0.46	0.59	0.80	0.71	0.88	0.75	0.53	0.61	0.75	16.11
0.66	0.65	0.72	0.78	0.89	0.73	1.15	0.88	0.50													 				 		0.50	0.78	1.13	1.04	0.75	0.82	0.54	0.60	0.72	13.84
					-																															
															1	0.04	0.05	0.06	0.08	0.08	0.09	0.13	0.18	0.16	0.17	0.16	0.13	0.11	0.11	0.04	0.02	0.01		<u> </u>		1.62
			÷.,												0.15	0.36	0.62	0.73	0.73	0.72	0.51	0.52	0.58	0.45	0.45	0.43	0.34	0.24	0.27	0.05						7.15
															F				1	0.05	0.07	0.10	0.15	0.15	0.18	0.25	0.22	0.24	0.22	0.12	0.09	0.06	0.02	0.00		1.92
								:				Î.	·	·	1	0.02	0.02	0.03	0.04		†				0.07		· · · · · · · · · · · · · · · · · · ·				<u> </u>					0.62
														н 1 г. – у		1									0.17			<u> </u>	<u> </u>	0.04	0.02	0.01				1.67
0.01	0.01	0.00	0.01	0.02	0.02	0.04	0.04	0.04	0.05	0.06	0.07	0.11	0.13	0.16	0.14																		0.02	0.02	0.01	2.74
0.28	0.29	0.32	0.37	0.33	0.22	0.38	0.24	0.14	0.07	0.01		-							· · · · · · ·										14.1.1			1.1.1.1	1.1.1.1.1.1.1.1	0.21		4.48
0.10	0.10	0.10	0.11	0.08	0.05	0.06	0.02											· · · · · · · ·									44		-		<u> </u>			0.08	1 - C. A.	1.22
0.06	0.07	0.07	0.09	0.08	0.06	0.11	0.08	0.06	0.05	0.03	0.01															0.04	<u> </u>				<u> </u>			0.05		1.30
0.03	0.03	0.04	0.04	0.04	0.04	0.06	0.04	0.03		1																	} ∤				· · · ·	l		0.03		0.68
0.48	0.50	0.53	0.62	0.55	0.39	0.65	0.42	0.27	0.17	0.10	0.08	0.11	0.13	0.16	0.29	0.61	0.90	1.01	1.08	1.14	0.94	1.07	1.31	1.09	1.14	1.20		· 1			1 The second	1		0.39		23.40
		1 20 202 20 20		1					-	1.	_			Concernant Pro-																				1.64		
																																		2.05		
																																		0.06		
	- たんしん しんせい		ました ちょうろう	1				1	19 A	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1												÷	and the second se									1		2.11		
		 Address 										and the second division of the second divisio			and the second sec		1 A A A A A A A A A A A A A A A A A A A				L +	r		1 1 1 1 1 1		Contract of the second					[1] A. M. D. M.	A REAL PROPERTY OF A REAL PROPER		2.48		
3.38	3.51	3.39	4.34	3.86	3.42	4.53	2.96	1.77	1.24	0.77	0.64	0.83	0.98	1.07	2.07	4.27	6.26	7.01	7.49	7.19	6.53	7.42	8.25	7.56	7.90	8.38	7,38	7.50	7.57	4.67	4.20	4.27	2.76	2.76	2.96	· · · · · · · · · · · · · · · · · · ·
4.42	4.59	4.43	5.67	5.05	4.47	5.92	3.87	2.31	1.62	1.01	0.84	1.08	1.28	1.40	2.70	5.58	8.18	9.17	9.79	9.40	8.54	9.70	10.79	9.88	10.33	10.95	9.65	9.80	9,90	6.10	5,49	5.58	3.61	3.61	3.87	
																																		2,209		<u>e e te e</u> Sta
1.11	and the second se	0.059	10 C 10 C 10 C 10 C		1 A.						T		-												in a second							1 · · · ·	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 4 19 1	1 / A	2.599

Irrigation (1) + (7) = (9)day Interval 21 ц 4 ∞ 4 4 53 ∞ 44 22 5 0.80 $(8) = (7) \div 0.75$ inch 6.5 3.0 2.00 4.4 2.2 3.3 3.0 7.2 4.0 Application 4.6 Irrigation Depth of н О ШШ 164 72 105 184 55 22 77 117 83 81 inch 5.4 $(4) \times (5) \times (6)$ 4 8 2.3 2.3 с. З 1-6 2.0 2.2 Soil Water З**. 1** 2.4 Available Readily E 58 H 123 79 138 58 58 88 41 62 56 65 Rooting E Depth 4 8 0 0.6 л. О ч Ч 0.6 9 0 б. 0 1 °1 9 . . Correction ETcrop for 2 1.0 0.7 1.0 1.0 1.0 0.7 1.3 1.3 I.3 1.3 $(4) = (2) \times (3)$ mm/m Soil Water Available Available Fraction of Readily 88 104 72 96 80 104 32 80 72 50 Available Soil Water 0.60 0.50 0.65 0.20 0.50 0.35 0.55 0.45 0.65 0.45 3 Moisture mm/mm Soil 160 160 160 160 160 160 160 160 160 160 3 5 8 6.9 6 6 8 5.3 о 5 2.00 2.7 3.4 2.9 inch mm per day ETcrop [max] Ð 0.228 0.208 0.115 0.272 0.108 0.134 0.347 0.233 0.112 0.391 Crops Rape, Mustard Pulses(Rabi) (Kharif) Sunflower Sugarcane Sorghum : Soybeans Name of Pulses Fodder Wheat Rice

Table IV.2-19 Depth of Irrigation Application & Irrigation Interval

IV.2.2 Leaching Water Requirement

"Crop Water Requirement" published by FAO recommends about leaching water calculation as follows:

Leaching requirement (LP) is the minimum amount of irrigation water supplied that must be drained through the root zone to control soil salinity at the given specific level. For sandy loam to clay loam soils with good drainage and where rainfall is low the leaching requirement can be obtained from:

for surface irrigation methods (including sprinklers)

$$LR = \frac{ECw}{5ECe - ECw}$$

for drip and high frequency sprinkler (near daily)

$$R = \frac{ECw}{2Max ECe}$$

where:	ECw	= electrical conductivity of the irrigation water,
	and the second	mmhos/cm
	ECe	= electrical conductivity of the soil saturation
*		extract for a given crop appropriate to the toler-
		able degree of yield reduction
· · ·		
	MaxECe	= maximum tolerable electrical conductivity of the
· .		soil saturation extract for a given crop

In this Project, the surface irrigation methods are recommended and the electrical conductivity of the irrigation water is 0.4 mmhos/cm, so that the formula is as follows:

$$LR = \frac{0.4}{5ECe - 0.4}$$

According to the ECe showing in the Table IV.3- in the Appendix and above formula, leaching requirements are calculated and the results is shown in Table IV.2-20 in the Appendix.

Leaching Water Requirement [WRxLR] inch	0.61	1.25	0.99	2.25	0.50	1.54	0.21	0.17	1.75	0.95	
LR= $\left[\frac{ECW}{5 \times ECe - ECW} \times \frac{1}{0.7}\right]$	0.029	0.039	0.071	0.124	0.023	0 023	0.019	0.023	0.124	0.080	
Electrical Conductivity of Irrigation water [ECw] mmho/cm	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Solt Tolerance for 100% Yeild [ECe] mmho/cm	4 0	3.0	1.7	1.0	5.0	5.0	6.0	5.0	1.0	1.5	
Water Requirement for Growing Season [WR] inch	21.17	31.95	14.00	18.18	21.74	66.97	11.16	7.39	14.11	11.84	
Name of Crop	Sorghum	Rice	Sunflower	Mungbeans	Soybeans	Sugarcane	Wheat	Rupes	Gram	Berseem	

Table IV.2-20 Leaching Water Requirement

IV.2.3 Intake Rate

Since most of the soils in the Project Area are silty clay loam, the measuring sites of intake rate are selected at the following three locations; downstream of Jhatpat distributary (disty), upstream of Umurani disty and downstream of Judher disty.

The intake rate was measured with a cylinder with 25 - 30 cm in diameter and 30 - 40 cm in height. Since as a general rule, more than two cylinder tests should be made in a given location to obtain a representative sample, two cylinder tests were made in downstream of Jhatpat disty while three tests in upstream of Umurani disty and downstream of Judher disty respectively.

Table IV.2-21 shows the observed results which are the relationship between cummulative time and cummulative intake of each test cylinder. Usually the intake rate plotted against time on a logarithmic scale will be shown in a straight line, which can be represented by the following equation:

I = KTⁿ [equation I] in which: I = intake rate (mm/hr)

K = a constant and the value on the ordinate when time T [min.] on the abscissa has a value of 1.0

n = constant showing the slope of the line

When a rather light and frequent irrigation is applied, the irrigation may be completed before the final intake rate is reached.

Since the initial rates considerably exceed the final rates, amount of water in the soils can best be represented by the accumulated depth (D) of water that has entered the soils. This quantity is represented by an integral of the above-mentioned equation as,

 $D = \frac{K}{n+1} T^{n+1} = CT^{m} [equation D]$

The constant values, C $\mbox{\sc m}$, can be obtained from the equation D with the accumulated depth (D) and time (T) which are observed by the field works.

Fig.IV.2-1 to Fig.IV.2-8 show the observed data and the lines showing the equation D and the equation I obtained the said data.

The basic intake rate can be obtained to put $T = 600 \times n$ value into $I = KT^{n}$. As shown in Table IV.2-22, the basic intake rate of each observed field and averages of each observed field and all test cylinder are as follows:

	and the second	and the second second second	
Tabulation o	f Basic 1	ntake	Rate

Observed Field	Basi	c Intake Rate
Average of Jhatpat		0.341 mm/hr
Average of Umurani		4.99 mm/hr
Average of Judher		3.08 mm/hr
Averave in all basic intake rate		3.11 mm/hr

Appendix IV.2-3

Page 3

Intake Data Obtained from a Test Cylinder Table IV, 2-21

Cumulative Time	Cumulative Intake	Cumulative Time	Cumulativ Intake
(min.)	(mm)	(min.)	(mm)
3	1.0	1	2.0
5	1.5	· · · · · · · · · · · · · · · · · · ·	3.0
10	2.0	10	3,0
25	3.0	30	4.0
55.8.5	4.0	60	4.0

Umurani No.1

<u>Umurani No.3</u>

Cumulative	Cumulative	Cumulative	Cumulative	Cumulative	Cumulative
Time	Intake	Time	Intake	Time	Intake
(min.)	(mm)	(min.)	(mm)	(min.)	(mm)
1	4,0	1	2.0	1	3.0
3	7,0	2	4.0	2	4.0
5	8,0	4	6.0	3	6.0
7	9,0	6	7.5	4	7.5
10	10,0	8	9.0	5	8.0
15	12,0	10	10.0	6	9.0
20	13,0	20	15.0	8	10.5
30	14,0	30	18.5	9	11.5
90	19,0	60	24.0	10	12.0
		· · · · · · · · · · · · · · · · · · ·		15 20 30	12.0 12.0 12.0

	·						
Judhe	er No.1	Judher	<u>No.2</u>	Judher No.3			
Cumulative Time (min.)	Cumulative Intake (mn)	Cumulative Time (min.)	Cumulative Intake (mm)	Cumulative Time (min.)	Cumulative Intake (mm)		
1	4.0	· 1·	2.0	1	3.0		
2	10.0	2	4.0	2	5.0		
3	12.0	3	5.0	3	6.0		
4	13.0	4	6.0	4	7.5		
5	13.0	5	6.0	5	9.0		
6	14.0	6	7.0	6	9.5		
7	14.0	- 8	8.0	. 7 ,	11.0		
8	15.0	10	9.0	· · 8	12.0		
9	15.5	20	10.0	9	13.0		
10	16 0	30	10.0	10	14.0		
15	17.0	90	10.0	15	15.0		
20	18.0			20	16.0		
30	19.0			30	18.0		
90	21.0			90	28.0		

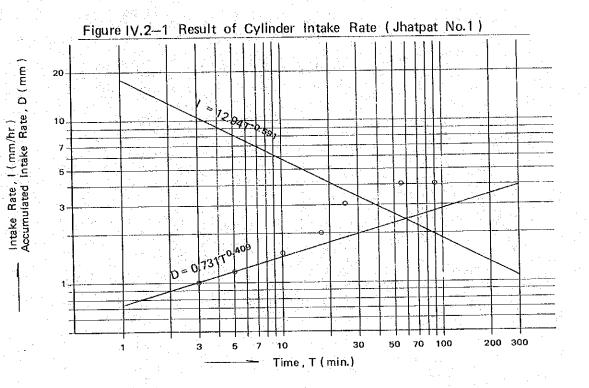
 $I = 17.94(600 \times 0.591)^{-0.591} = 0.558$ $I= 21.59(600 \times 0.831)^{-0.831} = 0.124$ 0.341 $I = 91.84(600 \times 0.661)^{-0.661} = 1.76$ $I = 96.34 (600 \times 0.553)^{-0.553} = 3.89$ 4.99 6.08 3.08 $I = 132.0(600 \times 0.700)^{-0.700} = 1.92$ $I = 66.02(600 \times 0.664)^{-0.664} = 1.24$ 3.11 $I = 87.28(600 \times 0.407)^{-0.407} = 9.31$ I = 111.8 (600 \times 0.509) $^{-0.509}$ = $\frac{\text{Ib} = K(600 \times n)^n}{(mn/hr)}$ I= 17.94T^{-0.591} I= 96.34T^{-0.553} I= 132.0T^{-0.700} I= 21.597^{-0.831} I= 91.84T^{-0.661} I= 87.28T^{-0.407} I= 66.02T^{-0.664} I= 111.87^{-0.509} I= KTⁿ (all basic intake rate D= 0.731T^{0.409} D= 2.453T^{0.593} D= 2.129T^{0.169} D= 3.592T^{0.447} D= 7.334T^{0.300} D= 3.275T^{0.336} D= 4.515T^{0.339} D= 3.794T^{0.491} D= CT^m No.2 No.2 No. 3 No.3 Jhatpat No.1 No.2 Jmurani No.1 Judher No.1 Station Average Average Average Average

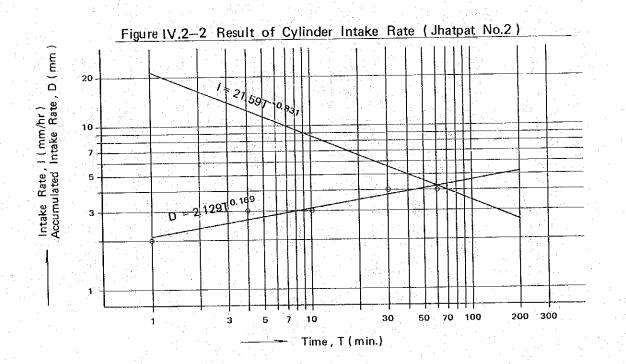
Table IV.2-22 Basic Intake Rate

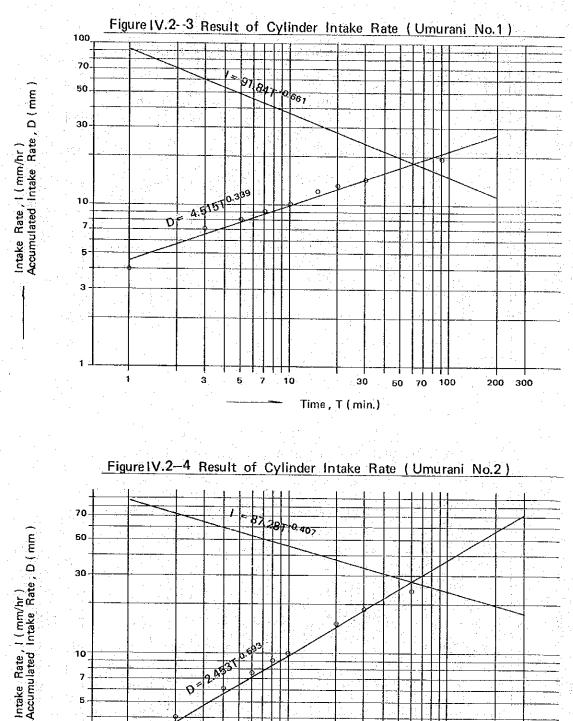
Appendix

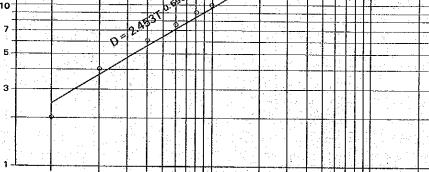
Page 4

IV.2-3



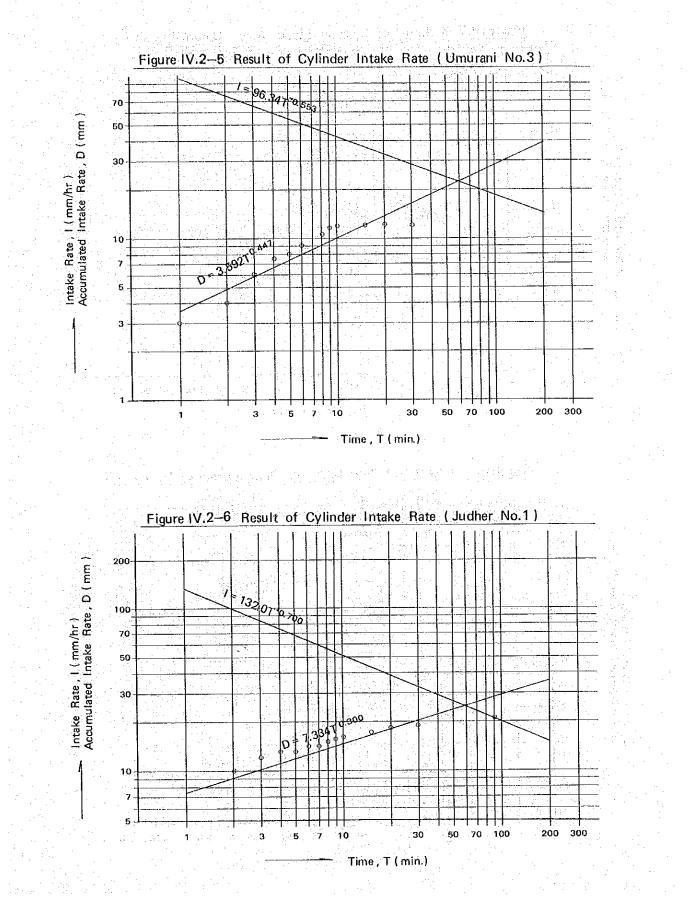






1 3 5 7 10 3 0 30 30 30 30 30 50 70 100 200 300

Time , T (min.)



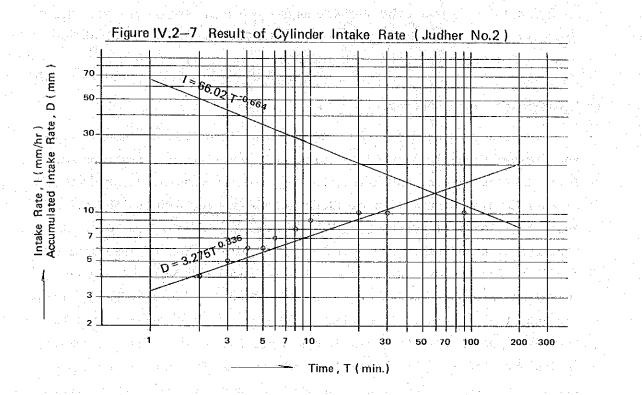


Figure IV.2-8 Result of Cylinder Intake Rate (Judher No.3)

