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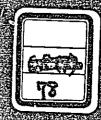
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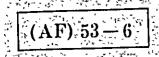
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## FEASIBILITY STUDY ON

THE AGRICULTURAL DEVELOPMENT IN THE CHOLUTECA RIVER BASIN

VOL. III ANNEXES

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MAY 1978

JAPAN INTERNATIONAL COOPERATION AGENCY

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## ANNEX H IRRIGATION ENGINEERING STUDIES

## H IRRIGATION ENGINEERING STUDIES

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H1. L. Choluteca Coastal Plain

H1. 1 Choluteca Coastal Plain. H1.1.1 Project Area

The Choluteca coastal plain extends over 550 km<sup>2</sup> to the south of the Pan-American Highway crossing through the Choluteca Department. The Choluteca river stretches southwest across the center of the coastal

3 \* ×\_

plain and debouches into the Pacific Ocean. The Choluteca coastal plain undulates within the altitude of 5 m to 35 m above mean sea level.

Choluteca city, with a population of approximately 26,000, is located to

the northeast of the plain.

The irrigable area in the plain is delineated by topographic and land capability conditions. The area will be bounded on the north by El Papalon and Ola district, on the east by Sampile river, on the south and west by the uncultivable land facing the Fonseca Bay. The gross irrigable area totals 36,000 ha, out of which 25,500 ha are delineated as net irrigable area, which is called as the Choluteca Plain.

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The Choluteca Plain of 25,500 ha is divided into 2 parts, i.e. Western Plain of 16,000 ha and Eastern Plain of 9,500 ha, as shown in Fig. - HI based on the irrigation cost, present land use and soil conditions. The Western Plain is much favorable to the Eastern Plain for an agricultural development in every aspect, and therefore the Western Plain of 16,000 net ha is selected on the Project area.

The climate in the Choluteca Plain is clearly divided into the rainly season from May to October and the dry season from November to April. Nearly 90% of the annual rainfall concentrates in the rainly season.

Table-HI shows the availability of the meteorological data in the Choluteca Plain, \*as well as in and around the Choluteca river basin as a whole. According to the available records at the Choluteca meteorological station, the average annual rainfall for the period of 28 years (1943 -1975) was 1,953 mm. The average annual A-pan evaporation at Choluteca was 2,588 mm. The average monthly temperature and the relative humidity are . summarized as follows:

The for the second s

Average monthly temperature and relative humidity at Choluteca 

JAN. FEB. MAR. APR. MAY JUL. AUG. SEP. OCT. NOV. DEC \_ مرفع \_ \_ \_ ÷\_\_\_\_\_ 28.0 28.4 29.0 29.8 28.4 27.3 27.8 27.1 26.0 26.4 26.8 27.3 Temperature

55.7 54.5 58.0 59.6 73.7 80.4 69.6 76.1 83.8 87.1 70.3 58.0 Humidity (%) Present.Irrigation System and the set of the set of the set

(°C)

H1.1.2

In the Choluteca Plain, several irrigation systems have been operated, using surface water taken from the Choluteca river and other streams and groundwater. The present surface irrigation facilities cover a total area of about 2,030 has Major systems are operated for sugar cane cultivation by the two sugar companies (ACHSA and ACENSA) on the right bank of the Choluteca river. ACHSA farms, located in the center of the Western Plain, have 1, pumping station for surface , irrigation of approximately 990 ha. ACENSA farms, scattered, around ACHSA farms, have 2 pumping stations for surface irrigation of about 420 ha. In addition, the Lujosa Experimental station has a portable pump for irrigation 30 ha. A few independent farmers also have portable pumps for their own irrigation. a a construisti site ,

The area having facilities for groundwater irrigation totals some 2,335 ha in the plain. Major systems are also operated by ACHSA (760 ha) and ACENSA (860ha). In addition, the farmers' cooperatives under INA program in the Monjaras - Buena Vista area have wells for groundwater irrigation over a total land of some 400 ha. n Theoler of st

The existing irrigation systems in the Choluteca Plain are sumin which got the third that the said the stands . marized in Table-H12. a contract a fibricity with the star second

H1.2 Middle Reach Valleys Hang wind the H1.2. H Firrigable Area At an aster is -

In the middle reaches of the Choluteca river basin, there extend some terraces suitable for agricultural development. In order to make water balance study of the basin, preliminary study and reconnaissance survey have been made in the Middle Reach Valleys of the Choluteca River. And the second state of the second stat

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Through the preliminary study, 6 sub-areas scattered in the valleys within 5-60km distance from Choluteca city have been mapped out as suitable for future irrigation, in addition to the presently irrigated areas. These sub-area are shown in Fig.-H2 and tabulated as follows: 

	et irrigabl area (ha)	le	Approximate land level from Choluteca river bed (m)
	210		17
	90		23
	150		23
、 -	250		10
	100		15
	540		15
	·		
~	1,340		
<u> </u>			

The sub-areas are located at the altitudes ranging from El. 60 m to El. 220 m. At present, the areas are generally the pasture land or small scale rain-fed farm land for cultivation of maize. sorghum, The average annual rainfall in the recent 10 years at Los etc. Encuentros is approximately 1,613 mm. Water of the Choluteca River will possibly pumped up to irrigate these areas in the long run.

H1.2.2 Present Irrigation Systems 

-5 settlement farms and cooperative farms having the gross irrigable area of approximately 340 ha, and some independent farms are scattered in the terrace of the Orocuina Valley. In these farms,

· · · · · irrigation facilities such as portable pumps with diesel engines, all B delivery pipes, pipe lines of shifting type, canals, and small related structures have been constructed. - Water of the Choluteca river is pumped up by the portable pumps and conveyed to the farms through pumped up by the portable pumps and conveyed to the larms intrough canals by free flow, or through pipe lines of the shifting type by pressure flow. The outline of the present irrigation system is summarized in

H 4

Table-H13.

H-5--

H1:3:1 Trrigable Area

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The San Juan de Flores area is located along the Choluteca river, some 35 km to the north-east of Tegucigalpa. The area is formed by flood plain and terraces with altitudes ranging from El. 600m to El. 700m, and is surrounded by moutains of 700-1,300 m in height. The flood plain (El. 600-El. 635 m) and terraces (El. 635-El. 700 m) have ground surface slope of less than 5%.

· . ·

3 - 1

Climatological data at Paso la Ceiba in the area is available. The average annual rainfall for the period of 8 years (1967-74) was 1,349 mm. The average monthly mean temperature and relative humidity (1972-76), as well as the average monthly evaporation measured with Class A-pan and Piche evaporator for a period of 6 years (1971-76) at Paso la Ceiba are as shown in Table-H8:

a The Landau and a first

In the San Juan de Flores, Area, there is' a sugar mill under construction by ACANSA at a site about 5 km south from San Juan de Flores village. The mill has processing capacity of 1,814, tons per day, and it is estimated to require about 272,100 tons of sugar cane a year with a net annual processing period of "150 days . If the average unit production of cane is assumed at 118 tons/ha, the cane field necessary. for the ACANSA mill will be estimated at 2,300 has The net irrigable area in the San Juan de Flores Area is; however, limited to about the and the start of the start of the second start 1,200 hå. The second a second a second

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Present Irrigation Systems H1.3.2 and the second second second and second and the second second second second second second second second second

Irrigation facilities such as intake weir, siphon, desiliting basin, main canal, 9-lateral canals and related structures have been constructed to cover the area of 1,140 har The irrigation (water taken) at the San Juan de Flores weir is conveyed to the desilting basiness? through head reach on the left bank of the river. A siphon is constructed below the desilting basin, and the water is delivered to the right bank of the river.

The main canal of 13.2 km in total length (partly lined) stretches northwestward along the terrace, and 9 lateral canals branch off from the main canal.

The irrigation water was designed to be taken approximately 1.5 m<sup>3</sup>/sec at the San Juan de Flores intake weir. However, the control gate installed in the intake weir of the gravity type was broken about 10 years ago and has not been rehabilitated yet. Accordingly, the control of the design water surface elevation is not kept accurately.

A siphon located at approximately 600 m northeast of the intake weir has no screen in front of its inlet\*portion, and has silted and sprung numbers of leaks. The discharge at full flow in the canal on the right bank was estimated at around 600 (/sec. The main canal downstream from the siphon stretches alongside the river and faces a 20-m high cliff of the terrace. This stretch is subject to rockfalls, land slides and bank erosion. Likewise, the main canal at a point at approximately 200 m from the existing pumping station is also subject to land slides and bank erosion.

Due to the constraints mentioned above, full irrigation water has not been conveyed to the farm land through the existing main canal and related structures, and consequently the actual net irrigable area is estimated at only 200 ha. The rehabilitation of the irrigation systems, therefore, has been planned by MRN and the rehabilitation work is scheduled to start in 1978.

H2: JESIGN IRRIGATION WATER REQUIREMENT H2, 1, Water Requirement in Choluteca, Plain

- H 8 -

H2.1:1 , General 

In accordance with the cropping patterns proposed for the project. area, crops are sugar cane, maize, cotton, sorghum, beans, sesame, rice, melon, water melon, vegetables, and pasture.

The project area i.e. the Western Plain is divided into 3 divisions in accordance with the proposed canal layout, which may facilitate a stage-wise development. The design irrigation water requirements are estimated by the following procedure:

- State State Strate States Calculation of the potential evapotranspiration (1)
- Calculation of the consumptive use on crops (2)
- Calculation of the net irrigation water requirement; deduction (3) of effective rainfall for crop from the consumptive use.
- (4) Estimate of irrigation water requirement, dividing the net irrigation water requirement, by the overall irrigation efficiency which is estimated on the basis of losses due to application and conveyance.

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H2.1.2 Potential Evapotranspiration

Several methods of estimating the potential evapotranspiration have been compared to select the most suitable one, on the basis of such climatic records as temperature, sunshine hours, wind velocity, relative humidity, and Class A-pan evaporation obtained at Choluteca and the standard particular participation and meteo-station. م میں ایک ایک میں بادی ہوئی کا ایک ہوئے کہ ایک ہوئے کہ ایک میں ایک ایک ہوئے ایک ہوئے ایک ہوئے کہ میں ایک میں ایک میں ایک میں ایک میں ایک میں ایک میں ای

Four popular methods, namely, Modified Blaney-Cliddle, Modified Penman, Hargreaves, and Christiansen-Hargreaves, have been compared to select the suitable method for estimating the potential evapotranspiration. The results are shown in Table-H4. The comparative analysis revealed that the Modified Blaney-Cliddle method would bring excessively lower values, while the Modified Panman method and

ار این میشد. ۲۰ ماه می این می توراند این این این این این این این این این می توراند. ۱۹ مورد می مدین می مورد می این این این این می تورد می تورد می تورد می تورد می توراند. Hargreaves method tend to produce higher values than those of the A-pan records. Consequently, the Christiansen Hargreaves method is supposed to be most suitable for estimating the potential evapotranspiration in the Project area. and the second states and the The Christiensen-Hargreaves method is a modification of the

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Hargreaves formula in terms of wind, sunshine and elevation factors, and the method is explained as follows: 2- Ep = 17.4, x dax. To x Fhax Fw x Fs x Fe Fh = 0.59 - 0.55 lln

 $F_{s} = 0.75 + 0.0255 \times \sqrt{Wkd}$  $F_{s} = 0.478 + 0.58 S$ 

Fe. = 0.950 + 0.0001 E ราง มาการระบบ และ และ ไม่ยะเหมืองเหมือง เราะเราะ

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Where, the states of the state

Hn : Mean noon humidity in decimally (%) 0.40 Hm + 0.60 Hm<sup>2</sup>

Wkd: Mean wind velocity (km/day) at the level of 2 m above the

ground surface S .: Mean monthly sunshine hour (%) and when the state the state of the second

Hm : Mean daily relative humidity (%)

Example Example 2 Elevation above the sea level

H2.1.3 Cunsumptive Use

The consumptive use depends on (1) potential evapotranspiration, (2) crops to be grown, and (3) their growth stages at different times of the year.

The formula for estimating the consumptive use is as follows: C = Ep x K c

د میکانده آمادی در میکانده آمادیکی ورو سی مدر آماد است. پر ا

Where, Starte Startes and Star C C Consumptive use in mm

Ep :: Potential evapotranspiration in mm 1: 1× 0 0

Kc : Crop consumptive use coefficient.

The data on crop consumptive use coefficient/1 provided by by G. Hargreaves have been adopted. The crop coefficient curves are shown in Fig.-H7 to Fig.-H15. The calculating procedure of the consumptive use is shown in Tables-H29 to H-43, and peak consumptive use for each crop is shown in Table-H55.

H2.1.4 Effective Rainfall and the state of t

Daily rainfall records for the period of 28 years at Choluteca meteo-station and for the period of 10 years at Azucarera Choluteca (ACHSA) sugar cane farm have been used for estimating the effective rainfall. The effectiveness of rainfall depends on several factors such as the volume and intensity of rainfall, characteristics of soils, rate of consumptive use, and irrigation practices. Accordingly, empirical and practical judgement is necessary in estimating the effective rainfall. Two estimation procedures have been used in conformity with the irrigation practices proposed by the project; namely furrow irrigation in the sugar cane field and other dry crop field, and flooding irrigation in the paddy field.

(1) Probable rainfall in the field of sugar cane and other dry crops:

On the basis of the monthly rainfall records obtained at two stations (Choluteca meteo-station and ACHSA) and other records in Cadeño, the probable drought monthly rainfall of 90 % recurrence for estimating the irrigation water requirement on dry crops is calculated by Gumbel method. The results are summarized as follows:

<u>/1</u> Source;
(1) Journal of the Irrigation and Drainage Division; Proceedings of the American Society of Civil Engineers, March 1968.
(2) Contribución al Plan de Emergencia Nacional para la Producion de Arroz y actros Cultivos Bajo Riego, PROYECTOS PNUD-FAO, Junió 1976.

Hill:	به ۲۰۰۰
Period of record	90% recurrence annual drought rainfall
1 Cholutera meteo-	· · · _ ·
station 28 years	1,458 mm
2. Szucarera Choluteca 10 years	1,338 mm
3. Cedeño	1,559 mm
Average:	1,452 mm

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In calculating irrigation water requirement, the average annual drought rainfall (90% recurrence of 1,452 mm) is distributed monthly according to the proportion of average monthly rainfall calculated based on the data obtained at Choluteca meteo-station and ACHSA.

(2) Effective rainfall in the field of sugar cane and other dry crops:

The relationship between average monthly effective rainfall, mean monthly rainfall and average monthly consumptive use has been developed by US Department of Agriculture, Soil Conservation Services (USDA, SCS), and it appears adoptable to the estimate of effective rainfall for sugar cane and other dry crops in the project area. The USDA, SCS has developed a procedure for estimating effective rainfall by processing long term climatic and soil moisture data. To avoid complexity, neither the soil intake rate nor rainfall intensities are considered in the USDA, SCS procedure.

From total rainfall and monthly consumptive use, effective rainfall values were computed and shown in Table-H1O. The values were based on a 75 mm net irrigation application, which is equal to the available storage capacity in the root zone at the time of irrigation application. To convert this data to other net depths, factors were worked out and they are shown in Table-H11. The monthly effective rainfall cannot exceed the rate of consumptive use. If it does, lower value of the two is taken as an effective rainfall.

(3) Effective rainfall in the paddy field

Concerning the daily rainfall record for the period of 10 years out of 28 years obtained at Choluteca, the effective rainfall is

- H 12 calculated by daily water balance method under the following assumptions.

- ulated by daily water balance method under the following assumps.
  1) Daily rainfall R mm Effective rainfall.mm
  More than 80 mm but
  more than 50 mm but
  more than 5 mm R x 0.8
  Less than 5 mm 0
  2) Percolation 3 mm/day during the whole year.
  On the basis of the results of effective rainfall calculated by
  above mentioned method, the probable drought annual effective rain-

the above mentioned method, the probable drought annual effective rain-fall with 90 % recurrence is calculated by the Gumbel method. The probable drought annual effective rainfall is distributed in accordance with the proportion of average monthly effective rainfall, and the distributed effective rainfall shown in Table-H6' is adopted in the calculation of the irrigation water requirement of rice Lander and the second of the second s H2.1.5 Percolation adore the secondary and the adored proceeding of the

As a result of permeability test, the permeability coefficient of the subsurface soil at about 1.0 m below topsoil layer is estimated at 10<sup>-4</sup> cm/sec to 10<sup>-5</sup> cm/sec. In estimating irrigation requirement of rice, the percolation of paddy field is assumed to be 3.mm/day during the whole year, because the paddy field will be reclamated where the soil has poor draiability.

H2.1.6 Net Irrigation Water Requirement The net irrigation water requirement is obtained by deducting the

effective rainfall from the crops consumptive use. The estimates of the net irrigation water requirement for each crop are shown in Table-

H19 to Table-H43. H2.1.7, Irrigation Efficiency

.Irrigation efficiency is the percentage of irrigation water, that is stored in the soil to water available for consumptive use by crops. تىپى تەمۇرىيا مەيلىرىيا جەرىپىلەيتىن ئۆلىمە ئەرىخىتىكە ئىچىمىدە يۇلىرى مەتتىر بىرىيا بىرى ئىلى ئىرىيا تىمارىيى

When the water is measured at the farm head gate, it is called as the application efficiency, and when measured at the point of diversion it may be called as the irrigation efficiency. The following efficiencies in the application and conveyance of irrigation water have been adopted.

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ne apprication in the set of the set

(1) Application efficiency (Ea):

Application losses in the fields will include deep percolation and surface runoff. The application efficiency is affected mainly by the skillfullness of irrigators, the irrigation method and soil and topographical conditions. In view of the favorable soil textural and topographical conditions in the project area, the application efficiency is estimated at 65 %.

with reference to the standard commonly used in the United States. a a start way and the state as the

(2) Distribution efficiency (Edl) from branch canal to field inlet:

. . . . Distribution efficiency of the unlined and earth lined distribution canals provides for canal water loss from branch canal to the field inlets. The distribution efficiency is taken at 85 %.

et with the the transformation of the second of the

(3) Distribution efficiency (Ed2) of headreach and main canals: أميحه الأرابي فركته وأحده

Distribution efficiency of the concrete lined canal also provides for water loss in the canal between headreach and main canals. The

distribution efficiency is taken at 95 %.

(4) Irrigation efficiency (Ei)

The irrigation efficiency is calculated from the three efficiencies as follows:

Ei (%) = Ea x Edl x Ed2

= 65% x 85% x 95%

= 52.5%

2 Source; AMES IRRIGATION HANDBOOK published by W.R. AMES. in the second and the second second and

H2.1.8 Irrigation Water Requirement The irrigation water requirement is the sum of the net irrigation water requirement and the losses mentioned above. It is calculated as; Irrigation water requirement = <u>Net irrigation water requirement</u> The results of the

The results of the estimation are shown in Table-H17. to Table-H18. Water Réquirement in Madrin Della Martin Start Martin H2.2 Water Requirement in Middle Reach Valleys In accordance with the cropping pattern proposed in the middle

reach valleys, crops are rice, beans, maize, and vegetables. 记制的过去时的

The design irrigation water requirements for the Middle Reach The design irrigation water requirements to the the transformer values have been estimated at 3.44 [/sec/ha, as explained hereunder.

(1) Potential evapotranspiration:

The potential evapotranspiration calculated for the Choluteca coastal plain according to the Christiansen-Hargreaves method has been applied to the Middle Reach Valleys because no meteorological data to estimate potential evapotranspiration are available in the valleys.

(2) Consumptive use: 

العون المولولية التي المراقب المراقبة المراقبة المراقبة المراقبة المراقبة المراقبة المراقبة المراقبة المراقبة ا المولولية المراقبة الم المولولية المراقبة ال مولولية المراقبة الم The calculating procedure is shown in Table-H45 to Table-H49. Peak consumptive use for each crop is shown in Table-H55. ' <u>- 2 - 2</u> - 111'' N - 2 - 2 - 2

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and the production of the december of the state of

(3) Effective rainfall:

ما شهبه شده آن معصفت کی کیدی در بید . ما شهبه شده آن معصفت کی کیدی در بید .

"> Daily rainfall records for the period of 28 years at Choluteca meteo-station and for the period of 10 years at Los Encuentros have been used for estimating the effective rainfall.

a). Probable rainfall in field of dry crops:

According to monthly rainfall records obtained at the two stations, the probable drought rainfall with 90.% recurrence is calculated by the Gumbel method for estimating the monthly effective rainfall for dry crops. The results are as follows: The results are as follows:

H·15Х	
Name of station	0% recurrence al drought rainfall
Choluteca meteo-station 28 years Los Encuentros	1,458 mm 852 mm
Average	1.155 mm

-

- In calculating the irrigation water requirement, the average annual drought rainfall with 90 % recurrence of 1,155 mm is distributed to each . month according to the proportion of average monthly rainfall calculated from records at Choluteca and Los Encuentros. --

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b) Effective rainfall for dry crops:

The effective rainfall for dry crops is estimated according to the USDA, SCS method, and the results are shown in Table-H10 to Table-Hll. -

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The probable monthly effective rainfall for paddy has been assumed to be the same value as calculated for the Choluteca ~ · · · coastal plain." 🥍

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(4) - Percolation: A Section Section 1

The percolation of paddy field is assumed at 3 mm/day throuout the year, the same as for the Choluteca coastal plain.

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(5) Net irrigation water requirement

The net irrigation water requirements for the proposed cropping patterns are shown in Table-H45 to Table-H49.

\* (6) Irrigation efficiency:

The following irrigation efficiencies are assumed in calculating the design irrigation water requirement.

Application efficiency in the farm: Distribution efficiency from secondary canal to farm ditch: Distribution efficiency in delivery pipe and main canal: 95 % Therefore, the irrigation efficiency is estimated at 52.5 %. (7) Irrigation water requirement: Table-H44 shows the monthly irrigation water requirement,

and the design irrigation water requirement is estimated at 1.72 [/sec/ ha, basing on the pump operation for 12 hours.

H2.3 Water Requirement in San Juan de Flores Area and a des antes and · Il a gar. *2* 1 S

In accordance with the proposed cropping pattern in the San Juande Flores Area, the crop is only sugarcane. The design irrigation water requirement is estimated at 1.44 {/sec/ha, as explained hereunder. (1) Potential evapotranspiration:

Several climatic records such as monthly mean temerature, monthly relative humidity and monthly evaporation measured with Class A-pan and Piche evaporator are available at Paso La Ceiba meteo-station. According to these climatic records, the potential evapotranspiration is calculated by G. Hargreaves method. The estimated value of the potential evapotranspiration tends to be higher than the observed values of the evaporation measured with Class A-pan and Piche evaporator. Accordingly, the average value of the evaporation measured with Class 1997, - J. S. F. F. S. . When a to a to a A-pan is adopted for estimating the design irrigation water requirement.

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an an an Anna a Anna an Anna an	
Potential Evapotranspiration and Evaporation	,
in San Juan de Flores Valley	
and a margin of the second	

Unit: ៣៣

مَنْ الْمَنْ الْعَنْ ا مَنْ الْعَنْ الْ الْمُنْ الْعَنْ	Potential	<u> </u>	E.P.
۲۰ ۲۰۰۵ میلوند که ۲۰۱۵ ۲۰۱۵ میلید از این از این ۲۰۰۵ میلید از این از ۲۰۰۵ میلید از این از	G. Hargreaves	A-pan (6 years)	Piche Evaporation (6 years)
JAN.	163.6	110.7	121.4
FEB		130.6	141.8
MAR	234.3	184.6	210.3
APR.	251.9	189.2	218.0
MAY	234.3	172.5	176.0
JUN.	172.0	129.6	104.3
JUL.		125.5	105.8
AUG.	184.4	128.8	108.7
SEP.	171.4	122.4	91.1
ОСТ.	145.0	111.1	84.5
NOV	152.0	93.0	85.0
DEC.	140.4	99.1	110.0
Annual	2,210.1	1,597.1	1,556.6

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(2) Consumptive use: -

The calculating procedure is shown in Table-H51 to H53. Peak consumptive use for each crop is shown in Table-H55.

(3): Effective rainfall:

-Daily rainfall records for the period of 8 years at Paso La Ceiba have been used in estimating the effective rainfall. The monthly rainfalls are shown in Table-H9.

The second s ه -ئي -∓--

Since the data duration is only 8 years, minimum value of annual rainfall of 533.1 mm is adopted as design monthly drought rainfall in estimating the effective rainfall. The effective rainfall is estimated by using the standard table given in Table-H10 to Table-H11. •

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ې لوند و د آړې د لکه و د مړو and the second sec 227.5-2 (4) Net irrigation water, requirement: The net irrigation water requirement is obtained by deducting the effective rainfall from the consumptive use for crops. The results of the calculation are shown in Table-H50.

н. 18. – 

(5) Irrigation efficiency:
The irrigation efficiency is assumed as follows:
Application efficiency (Ea)
Distribution efficiency
(Fall)
95 %

Pump; and stilling. pond (Edl) 95 % Main-canal and secondary canal (Ed2) Irrigation efficiency  $Ei = Ea \times Ed1 \times Ed2$ , = 52.5 %. (6) Irrigation Water Requirement: . E S

Table-H50 shows monthly irrigation water, requirement, and the design irrigation water requirement is estimated at 1.44 (//sec/ha, basing on the pump operation for 12 hours. 

H3 SOIL WATED CHADACTER H3 SOIL WATER CHARACTERISTICS AND WATER QUALITY H3.1 Effective Root Zone and Moisture Extraction Pattern

\_\_\_\_H 19 = -

According to the field survey, the effective root zones of sugar cane appeared to range from 0.6 to 0.9 m. The effective root zones

of other. dry crops are determined on the basis of the data /3 provided by G. Hargreaves. They are summarized as follows:

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Crop	Representative effective root zone (m)	
Sugar cane	0.9	
Beans Beans	0.6	
Maize 0.6 0.9	0.9	
Cotton 0.9 - 1.2	1.2	
Melon 0.6 - 0.75	0.75	
Water Melon + 12:0.6 -: 0.75	0.75	
Sorghum 3 to a track and the O.6.	0.6	
Sesame ATT 255 1 1.65-0.9	0.9	
Pasture start we will 0.45 - 0.75	0.75	

.The moisture extraction pattern of each crop is determined in accordance with the patterns proposed in. "AMES Irrigation Handbook" published by:W:R: AMES: The moisture extraction pattern of each crop is shown in Fig.-H29.

H3.2 Soil-Water Characteristics

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According to the field investigations (cylinder intake rate test at 10 spots in the Choluteca coastal plain and 2 spots in San Juan de Flores Area) and the laboratory test on soil-water characteristics. such as i) basic intake rate, ii) field capacities, iii) wilting point, iv) available moisture, and v) readily available moisture have been estimated as follows: the atters of the see S Principal and a state of the state of the

3 Source; WATER REQUIREMENTS MANUAL FOR IRRIGATED CROPS AND RAINFED AGRICULTURE, Utah State University; 1977.

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H3.2.1 Basic Intake Rate The cylinder intake rate of soils are obtained by the following formula. I = KT<sup>n</sup> to the following where, I : Cylinder intake rate in mm/hr. T : Time in minutes k; n = Coefficient The basic intake rate is calculated with T as 600x (1-n). The red

The basic intake rate is calculated with T as 600x (1-n). The results range from 3.4 to 32:4 mm/hr as shown in Table-H62 and in Fig.-H18 to Fig.-H28.

H3.2.2 Field Capacity

Full water is supplied to soil, and then water content of the soil is measured after 24 hours. The water content of the soil is field capacity. The field capacity of the soil in the Project area was measured at the MRN laboratory in Tegucigalpa, the results are shown in Table-H63:

men sala sa ja taitag na sa makan ana sa pakana

H3.2.3 Wilting Point

The wilting points, for crops have been estimated by dividing the water contents of the soil for PF. 3.0 by 1.84. The results are shown in Table-H63.

H3.2.4 Available Moisture

The available moistures per soil depth of 10 cm are estimated by the following formula. A.M. =  $(F.C - W.P) \times A.S.G.$ Where, A.M. : Available Moisture in percent/10 cm

F.C : Field Capacity in percent W.P : Wilting Point in percent A.S.G. : Apparent Specific Gravity

الم المحمد ا المحمد محمد المحمد ا محمد المحمد ا The results range from 14 to 26 mm/10 cm as shown in Table-H63. 

H3.2.5 Total Readily Available Moisture

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On the basis of the effective root zone of each crop, moisture extraction patterns have been assumed in each soil. The available moisture calculated by the formula given in H3.2.4 was applied to the effective root zone of each crop, and according to the moisture extraction pattern on each crops, the available moisture of each soil layer have been obtained.

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In calculating the moisture extractions of each soil layer, an important soil-layer-for growth of crops has been found, and its' moisture extraction is judged as the total readily available moisture. The results are shown in Table-H64.

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H3.2.6 Irrigation Intervals

· 동물 : 2011년 1월 2011년 - 1911년 1월 2011년 1월 20 The minimum irrigation intervals of each crop are estimated by the following formula: "" wind there we are a state to the second of the ----- Min.-Irrigation-Interval ------ Total Readily Available Moisture (mm) Max. Consumptive use (mm/day) The results are shown in Table-H65.

111 - AF 11月 - 12日 H3.4.7 Furrow Length

The furrow intake rate test could not be carried out due to the continued rainfall during the period of field investigation. Therefore, the maximum furrow length is estimated on the basis of the cylinder intake rate and available moisture.

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In accordance with the USDA SCS standard, the soil types have been classified into the following 3 types basing on the cylinder intake rate and available moisture obtained by field and laboratory tests. 

Soil Type in The Project Area

loams	ely coarse textured oams and fine sandy 12.5 - 19.2 12:7 - 38.1
	textured very fine a 14.6 - 20.9 6.4 - 19.1
	xtured sandy clay lays and clay

standard is as follows:

Maximum Length of Runs for Furrow (Unit: mm)

	N A TANK A SAALA STA	- the transformer of the second s
	Moderate coarse	Medium textured Fine_textured
Slope		
%		loams and silt clays and clay
	the weat of the transfer of the second	
0.25(1/400		395 - 289 350 - 250
0.50(1/200	) 304 - 220	273 - 198 236 - 167
0.75(1/130	243 - 175	213 - 152 190 - 129

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The length of run for furrow on existing farm in the Project area is 200 to 250 m, and irrigation water is supplied into farm without troubles. Considering the existing furrow length and the maxium furrow length estimated for each soil type, the length of run for furrow of 200 m is adopted for the design of the irrigation systems. no and minor H3:3 Water Quality λ, 

H3:3.1 Choluteca Coastal Plain

.The water quality of the Choluteca river and groundwater in the Project area was investigated at site from August to September, 1977. PH test and electric conductivity test were carried out, and the results as presented in Table-H60 and Fig.-H30, indicate that the water quality is adequate for continued profitable agriculture, without adversely affecting the crop growth, impairing the quality of crop products, or damaging the soil on which crops are grown.

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-----H3.3.2 San Juan de Flores Area

The water quality of the Choluteca river adjacent to the San Juan de Flores sugar cane field was investigated at site in September 1977. PHotest and electric conductivity test on the water were carried out, and the results of the investigation as shown in Table-H6O and Fig.-H 31, indicate that the water quality is adequate for irrigation purpose. . . . .

H4 IRRIGATION METHOD

+• on will be H4.1 Alternatives have and show the state of the The Charles . V 4.7 · Various alternative methods of sirrigation will be conceivable

in the Project area. They include: What have the start of a start the ford a) "Surface" irrigation method:

- furrow irrigation method

- flooding irrigation method

and and the state of the state

b) Spray irrigation method: -- sprinkler irrigation method

c) Subirrigation method

and the set of the set

, d) Trickle irrigation method and the termination of the second state of the second s Characteristics: of each method:are)discussed hereunder: 55 - 55 - 55 (A) Surface Irrigation Method

. The surface irrigation methods such as furrow irrigation method, flooding irrigation method and border stripe irrigation method are suitable for deep soils of slow, moderate and moderately rapid permeability, planted with deep-rooted crops in areas with uniform, but relatively flat slopes ranging from 0 to 3 %. 

The Project area is undulated gently, and the slope of the ground surface varies within the range of 0 to 2 %. The basic intake rate calculated on the basis of the results of cylinder intake rate tests varied within the range of 3 to 32 mm/hr. second to the form received

اليان اليوني المستورية المراجع . الم المراجع المراجع المراجع المراجع . Therefore, any of the surface irrigation methods mentioned above is applicable to the Project area. However, the border strip irrigation method requires more careful land levelling than the furrow irrigation method, and the installation cost of the border strip irrigation method tends to be more expensive than that of the furrow irri-gation system. 

H.251 -. .' (B) Spray irrigation method

The sprinkler irrigation method is generally applicable to rapidly permeable and shallow soils in the regions where the slope is too steep for the topography is too irregular for other method and the climatic conditions are humid. أية حي إلم

However, the sprinkler irrigation method has a disadvantage of decreasing the irrigation efficiency due to the influence of wind velocity. The monthly and seasonal average of daily maximum wind

velocity at the Choluteca station are as follows:

No. 1. Antonio M. Marian Andrew Constant Wind velocity

(m/sec) , JAN FEB MAR APR MAY JUN JULAUG SEP OCT NOV DEC Average 5.7 5.7 4.3 4.3 3.1 2.3 3.8 wind 3.1 2.4 2.5 3.7 5.4 velocity Note: Records during the period of 7 years (1970 - 76): Average Seasonal Wind Velocity and the second (m/sec) Rainy season (Nov. - Apr.) Rainy season (May - Oct.) 4.85 2.87 

According to the wind velocity data, the lateral spacing of sprinkler is designed as 30 % of the diameter of the coverage. Accordingly, the installation cost of the sprinkler system will increase when it is designed according to the standard design criteria. Therefore, "the sprinkler irrigation system is not recommended in the Project area. \_\_\_\_\_

(C) Subirrigation method and trickle irrigation method N THE REPORT FROM THE

From the viewpoint of irrigation water saving, these 2 artificial irrigation methods are applicable to medium to very light textured top soil and stable subsoil of moderately rapid permeability in the semiarid and arid zones where the slope of field surface is very flat. 

However, the subirrigation method and trickle irrigation method need

the installation of special equipment for irrigation such as aluminum pipe lines, raisers, nozzles, vinyl pipes, etc. The installation cost of the subirrigation method and trickle irrigation method will therefore tend to be more expensive than that of the surface irrigation method.

H 26 -

H4.2 Recommendable Irrigation Method The 6 alternative irrigation methods outlined above have been compared in the light of the soil water characteristics in the irrigation area as described in Chapter H3. For sugar cane and other dry crop cultivation, three alternative methods have been economically compared in detail. They are:

. \	Furrow irrigation method
	-
2)	Border strip irrigation method
3)	Border strip irrigation method
	م المراجع

As shown in Table-H16, the furrow irrigation method appears most economical. In view of the economical viability, as well as operational simplicity, it is recommended to apply the furrow irrigation method for cultivation of sugar cane and other dry crops.

For cultivation of paddy and pasture, the flooding irrigation method will only be applicable technically and economically.

H 27 -

DESIGN OF IRRIGATION AND DRAINAGE FACILITIES H5:1, Irrigation System for Choluteca Coastal Plain

H5.1.1 Existing Pumping Stations of ACHSA and ACENSA

Two existing pumping stations of ACHSA and ACENSA taking irrigation water from the Choluteca river, have enough capacities and suitable

2. . .

operation system for irrigating approximately 1,630 ha. Accordingly,

the following alternatives have been studied:

Fand of the filling to the book of of ACHSA and ACENSA farms of 1,630 ha in the future.

· 你就像你是你的神话。""你……"

(b) Gravity irrigation with water taken from the intake weir at 0.5 El Papalon and distributed by the branch canal RB-1 will be newly planned.

. The economic comparison of the two alternatives resulted that Plan (a) is more economical. The existing pumping stations will be planned. therefore, to be integrated in the Project.

In planning the irrigation systems, the use of the existing wells for groundwater irrigation in the ACHSA and ACENSA farms will not be considered because of the scarcity of water and difficulty in operation and maintenance of such wells.

H5.1.2 Canal Layout

Two alternative intake weir sites have been planned, one at El Papalon and the other at Las Basas so as to convey irrigation water by gravity. The irrigation systems will be divided into the Western Plain Area and the Eastern Plain Area. The overall canal layout of the Western Plain Area and Eastern Plain Area is shown in Fig.-Hl.

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(1) Canal Layout for Western Plain Area: The net irrigable area is 14,370 ha excluding ACHSA and ACENSA farms of 1,630 ha (net) irrigated by the existing pumping stations. The irrigation water is taken at El Papalon intake weir, and conveyed through main canals, branch canals and secondary canals to each tertiary canal.

The net irrigable area of 3,600 ha on the left bank of the Choluteca river is irrigated by water conveyed through a siphon, from the right bank.

One booster pumping station will be installed at a point 3:5 km west of the El Papalon intake weir to supply irrigation water to 350 ha (net). in the Ola area.

The total length of the canals for the Western Plain Area is as follows:

Main-Canal state for a set of the set of 26.3 set of set of set of the set of

. . .

(2) Canal Layout for Eastern Plain Area (2) and the cast of the second s

The irrigation water will be taken at Las Basas located at about 5 km north of the Choluteca city, and conveyed through head reach, main canals, secondary canals and tertiary canals to each farm.

The total length of the canals for the Eastern Plain Area is summarized as follows: Head reach Main canal Branch canal Secondary, canal 58 H5.1.3, Typical Farm Layout

Generally, topographical conditions in the Cholutec Coastal Plain is characterized by gentle undulation with the slope of less than 2%. 

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As discussed in Chapter H4, the furrow irrigation method (with average furrow length of 200 m) for sugar cane and other dry crops and the flooding irrigation method for rice will be applied. In deciding the service unit for irrigation, the average length of farm ditch will be set at 600 m, in view of the topographic conditions and the operation and maintenance aspects.

rete by the A typical tertiary canal will cover 12 service units. Typical farm layout below the tertiary canals is shown in PLATE No. 20 of the main report.

H5.2 Disign of Choluteca Coastal Plan Irrigation Systems

H5.2.1 Topographical Maps

Th this design, topographical maps of 1/5,000 scale with one meter contour intervals covering an area of 15,820 ha on the right bank of the Choluteca river have been used. For the design of irrigation systems of the area where the large scale map is not available, the maps of 1/50,000 scale with 20 m conter intervals have been used.

and the state of the for a first and and a second

For design of the intake structures, a map of 1/1.000 scale was *\**. prepared for the El Papalon and Las Basas sites during the field survey period.

H5.2.2 Design of Typical Canal Cross Sections

(1) Flow Formula

Manning's formula is adopted for design of the irrigation canals.

ni Manning's' formula 200 ai ognadot - to s

 $V = \frac{1}{R} \frac{2}{3} \frac{1}{2}$  $\mathbf{V} = \frac{\mathbf{n}}{\mathbf{n}} \sum_{\mathbf{v} \in \mathbf{V}} \mathbf{R} \sum_{\mathbf{v} \in \mathbf{V}} \mathbf{I} \sum_{\mathbf{v}$ 

Where

V: Mean velocity (m/sec) I: Hydraulic gradient n: Coefficient of roughness 0: R: Hydraulic radius, A/P (m) Flow area (m<sup>2</sup>) A:

P: Wetted perimeter (m)----

Discharge (m<sup>3</sup>/sec)

- - - -

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(2) Coefficient of Roughness, n, is as follows: Adopted coefficient of roughness, n, is as follows: Concrete lined canal Earth lined canal Earth canal (3) Allowable Velocity The allowable velocity of canal flow is set within the following ranges: Concrete lined canal Earth lined canal, 0:2 0.6 and earth canal معار بر محمد بر محمد الأروكية الأقريما و ق \*. . (4) Canal Bottom Width (B)/Water Depth(h) Ratio B/h ratio is determined in accordance with the empirical data mentioned in "Canal and Related Structures" published by U.S.B.R. The B/h ratio in the design of canals is shown in Table-H56. enere come regarding a stread a contractive fighting of the state we find the set of the state of the

- (5) Side Slope The side slope of each type of canal is adopted as follows: Concrete lined canal and earth canal B≤ 0.7 m, 1:1.5 Earthen lined canal and earth canal B≥ 0.7 m, 1:1.5
- (6) Free Board

Free board is determined according to canal water depth, fluctuation of roughness coefficient and wave actions. However, as for the free board of head reach, main canals, branch canals and secondary canals, the peak design discharge is designed to flow within one-third of the free board in the ordinary design. Therefore, the free board on each canal is determined as shown in Table-H56. (7) Canal Lining Rocks, gravels and coarse sand will be underlain, and canal lining will be required to control seepage losses. Therefore, two types of canal lining is designed as follows: Type of lining Type of lining (cm)

Concrete lining Earthern lining Earthern lining Earthern lining

(8) Typical Canal Cross Section

According to the above-mentioned item (1) to (7), typical cross sections for the irrigation canals have been designed as shown in -Fig.-H32 to Fig.-H34 and PLATE No.16 of the main report.

H5.2.3 Design of Structures Related to Irrigation System

ب المرب

A number of structures such as weirs, bifurcation structure, siphon, turnouts, cross regulators, drops, culverts, bridges, spillways, and water measuring devices are required in conjunction with the irrigation canals. The locations of these structures in the Western Plain are shown in PLATE No. 14 of the main report, and the number of the required structures is given in Table-H69.

For design of the related structures, the following flow formula and the coefficient of roughness have been applied:

Manning's formula:  $V = \frac{1}{n} \cdot R^{2/3} \cdot I^{1/2}$ Coefficient of roughness Concrete structures: n = 0.017Precast concrete pipe: n = 0.016

- : .

(1) Intake Weir Weir

- H 32 -H-Q curve of the intake weir is estimated on the basis of the profile sections of the river, cross sections of the site and discharge records obtained at Los Encuentros. Peak flood discharge, 1% chance of recurrence calculated from the discharge records is estimated to be 2,600 m<sup>3</sup>/sec at the El Papalon intake weir. The design of intake weir is shown in PLATE No. 17, of the main report, and the principal features of the intake weir are summarized as follows:

Principal Features of El Papalón Intake Weir - Jarsi - Barsi -LEALS HELL

1. Type of Weir Weir Ogee Crest Concrete Weir

2. River Bed Elevation at Weir (m) 20.50

3. Intake Water Level (m). 23.80 

Max Intake. Discharge (m<sup>3</sup>/sec) 20.45 4.

5. Crest Elevation of Weir (m) 23.80

Plood Water Level (m) 6. 7. Design Plood Discharge (m<sup>3</sup>/sec). 22,600

8. Total Length of Weir (m) 140.0

9. Length of Fixed Weir (m) 10. Width of Scouring Sluice (m) . 9.0

Height of Weir (m)
Height of Apron (m)
Intake Structure

(2) Intake Structure

the investor in the second second The 3 intake gates are installed at a point 22.5 m downstream from the trash rack at the intake bay for the design discharge of 20.45 m<sup>3</sup>/sec. The intake gates are of the roller gate type with motors. The intake water level for the design discharge is fixed at 23.80 m. The intake gates are of the roller gauge water level for the design discharge is fixed at 23.80 m.

(3) Desilting Basin The desilting basin is installed at a point 13 m downstream of the intake, and designed to evacuate suspended loads of more than 1.0 cm in diameter.

Ĩ, (4) Booster, Pumping Station A CARACTER AND A

A booster pumping station is designed to supply irrigation water to the secondary canal R-0-1. The pumping station with 5 centrifugal type pumps and 1 stand-by pump is designed to be operated for 16 hours a day will have a total capacity of 44 m /min, with the total head of 5 m.

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(5) Flood Protection Bank 

The flood protection banks are required in the upstream section of El Papalon intake, weir, site along the Choluteca river. The crest of the banks, is designed, to be 1.5 m above the flood water elevation. The side slope of the banks is, 1, to 2, and the crest width is 5m. The banks are required for a total, length of 17 km. -

e a construction of the second s

(6) Bifurcation Structure

A bifurcation structure is required at the junction of headreach and main canals, to bifurcate irrigation water. The parshall flumes are also provided at the downstream of the bifurcation structure to measure and ្រះរ control the discharge.

(7) Siphon Elegrated Fritziggenfirger 1

A siphon is required on the branch canal RB-1 at approximately 2 km north of El Palenque to convey the canal water across the Cholateca - river. The flow in the barrel is a pressure flow, and the flow velocity in the barrel is designed to be 1.5 times the velocity in the upstream canal to avoid silting.

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(8) Turnouts

A turnout is a structure to distribute water from a canal to a lower grade canal...In designing, turnouts are classified into the following 3 types: 이 가지 않는 것이 같은 것이 있는 것이 있는 것이 있는 것이 있는 것이 없다.

Туре	Barrel
A-I** ]	Box 0 > 0.7  m./sec For Main Brach, Precast Con. Pipe $0 \le 0.7 \text{ m}./\text{sec}$ Secondary canal
B	V. S. W. S.

(9) Cross Regulators

alators

In order to maintain a certain water level at the points of water the diversion or off-taking irrespective of the discharge, cross: regulators are provided where a number of, turnouts are densely provided or where any a fairly large discharge is diverted. The following 8 types of the set cross regulators are designed, according to the design discharge of the structures and types of canals. Service Service

Туре	Canal	Discharge (m <sup>3</sup> /	sec) Remarks
A-I	Concrete lining canal	0 ≥ 19	With double box
A-II	11	Q - <u>&gt;</u> 19 -	Flume type
A-III	II 	. 19 > Q ≥ 15	With single box barrels caste of
B-I	Earth canal	$10 > 0 \ge 0$	With single box 7
B-II	ารการการการการการการการการการการการการกา	0.7,> 0., ≥ 0,	55 With precast con.
B-III	· · · · · · · · · · · · · · · · · · ·	<u>0.7 2 0 - 2 0.</u>	55 Flume, type
C-I: : C-II		2 Q < 0: Q < 0. Q < 0.	pipe

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(10). Drop

\*\*\* Drops are required where the topography along the canal has a steeper slope than that of proposed hydraulic gradient in the canal. Wooden stoplogs are provided on the structure to keep the flow velocity low and the upstream water surface high enough to permit the distribution ' through the upstream turnout.

The following two types of drops are designed, according to the ى ئۆلۈكىرى بەيتىپىدىن - ئۆكۈكى بىرى - ئەيدىزىيىنى ئىلغىرى بىر يۇن سىتىپىدىن ئېيىلىرىكىيە - سىچى تىكە بىرى بىرىكى شەرە مىز design discharge

 $D_e sign discharge <math>1 + 10^{\circ} L^{101}$   $D_r op type <math>0 > 2 \cdot m./sec$  Inclined of - to an Alt rid · . . Inclined drop . . . T'  $2 \leq 2 \frac{3}{5}$ /sec Vertical drop

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Culverts are required where canals cross a farm road or a linked road. The size of culvert is determined to pass the design discharge as a free-flow with an ample clearance. The flow velocity in the barrel is designed to be 1.3 times the velocity in the adjacent canal to avoid silting forme at harris and we -

an and and and the second of the second of the Culverts are classified into the following two types, according

Type

Design discharge

 $Q \leq 0.7 \text{ m}^3/\text{sec}$ i) Precast concrete pipe type ii) Concrete box barrel type.  $0 > 0.7 \text{ m}^3/\text{sec}$ 

 สู่หรูงรู้หน่งระหน่าวสุข (12) Bridges

Bridges will be constructed at location where the width of canal is more than 10 m, as a result of the economical comparison between culverts and bridges.

The effective widths of bridges are 6 m for main farm roads and 3 m for secondary roads. Bridges are designed to pass a 30-ton trailer truck for main farm roads and a 20-ton trailer truck for secondary roads. The minimum clearance between the water surface and the girder bottom is 1.0m.

s 1.0m. And the providence of the second s

(13) Spillway

Two types of spillways are adopted in this canal system. One is a spillway with slide gate. This type of spillway is required at the end of main canals, branch canals, and secondary canals to empty the canal in case of emergency or clearing and repairing the canal. Another is an overflow type spillway. This type of spillway is provided to spill out 이 가슴에 있는 것이 있는 같은 것이 있는 것

-- II 36 excess water which would otherwise cause unfavorable high water surface in the canal. The discharge spilled out is released to a stream or drainage canal. (14) Water measuring device The day-to-day measurement of water is required to know a daily

water use and to compare it; with inflow, reserves and demands. This can only be accomplished by knowing, with reasonable accuracy, it is the the amount of water being diverted, withdrawn from storage and delivered. Accurate and reliable measurement is essential for the efficient use of water, and is also needed to establish the charges to water users and In this design, on the basis of technical comparison of water measuring . devices, the following two types of the measuring structures are proposed to be provided at the head of every canal.

-	the first of the second s
	Measuring Flow condition Remarks
Туре-А	Parshall flume Open flow For turnouts related to Main, Branch, Secondary canal
Type-B	Constant head Pressure For turnouts related orifice gate flow to tertiary canal
	The second se

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. . . . in the second H5.3 Design of Choluteca Coastal Plain Drainage Systems ۰. La his internation of shards, out as a so the con-

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H5.3.1. Design Surface Drainage Requirement

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The drainage requirement in the Choluteca Coastal Plain has been estimated at 6.0 %/sec/ha of its drainage area on the basis of the following assumptions and procedures:

(1) Design rainfall: - 2-- 1, -

The design daily rainfall is determined at 148 mm, equivalent to the rainfall with 10 % chance of recurrence according to the rainfall records at Choluteca, since the rainfall pattern in the area is almost the high intensity rainfall. The probable rainfall shown in Fig.-HI6 is calculated by the Gumbel method. The recorded maximum daily rainfalls at the Choluteca station are as follows: 

Maximum daily rainfall (mm)

1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 Year Max. daily

rainfall(mm) ~84 - 117 55 109 99 92 83 -119 139 148 89 (2) Runoff:

. In considering the rainfall consumed in farm as evapotranspiration, approximately 70% of the design rainfall is assumed to be the

runoff. Stard and have started and -

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(3) Drainage period:

The excess water will be designed to be drained within 2 days. · , . - - - -, - --

× . . . . H5.3.2. Layout of Drainage System

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The drainage canal layout is prepared to make maximum utilization of the numerous natural channels on the right bank of the Choluteca river. Particularly the old course of the Choluteca river will be utilized as the main drain in the drainage system.

34 main drains, 19, secondary drains, and a number of collector drains branching off from main drains and secondary drains will be provided to collect the excess water conveyed through field drains, ូទ្ន ។ ៖ ទ័ 

and release the water to the Choluteca river and other streams. The total length of main drains is approximately 190 km, and the drainage canal layout is shown in Fig. -Hl

Numerous field drains are provided to convey the water in farms, and the layout of field drains is shown in the typical farm layout in H5.3.3 Design of Drainage Canals and Related Structures
(1) Design Criteria of Typical Drainage Sections:

a) Flow formula:

Manning's formula is adopted for the design of the drainage the drainage Manning's formula

Manning's formula  $V = \frac{1}{n^3} \cdot \frac{1}{R^2/3} \cdot \frac{1}{I/2}$ where, n: Coefficient of roughness (0.035) b) Allowable velocity:

The allowable maximum velocity of drainage flow adopted is 0.9 m/sec. CONTRACTOR

c) B/h ratio, shape of canal embankment and free board; The B/h ratio, slope of canal embankment, and free board are was determined in accordance with the same design criteria mentioned in Chapter H5.2. in the states of the

- The I will be seen in a first with an ear way that will Typical Drainage Canal Cross Section: (2)

On the basic design criteria mentioned under (a) to (c) above 9-types of typical drainage canal cross sections have been designed as shown in Fig.-H34.

and the second strength and the second strength and the second strength and (3) Related Structures: 

Numerous related structures such as drops, cross drains, and bridges are required in relation to the drainage canals. The number of structures required is given in Table-H69. The related structures are designed based on the same design criteria and procedures mentioned in Chapter H5.2.

H5 4 Design of Farm Road Systems

H5.4.1 Present Road Systems

1 1. O. O. W. M. B. H. B. B. Wester and a start of Major existing asphalt paved roads in and around the Choluteca coastal plain are i) Pan American Highway running to the north of the plain, and ii) highway running from the point 8km from Choluteca city on the Pan American Highway to Cedeno. The last highway runs through the center of the right bank of the Choluteca river, along which two sugar factories and other major villages are located.

14 ° 4

Numerous non-paved roads branch off from the above highways and from Choluteca city. However, it is necessary to establish a systematic road network to attain efficient transportation of goods and supplies to the project area, for transport of farm products, for communication between farmers Settlements, for operation and maintenance of project facilities, and for farm operation.

H5.4.2 Proposed Link Road and Farm Road Systems D BITAN ...... (1) Link road; Is a first 12350

A link road is proposed to be the gravel metaled road. The proposed network of link roads in the Choluteca Plain is shown in Fig.-H1. It will link up two sugar cane factories, Pan American Highway, Choluteca city and Cedeno, crossing the Choluteca river. The total length is 16 km.

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The farm roads will be classified into the following 3 types:

(a) Main farm road

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Main farm road of 78 km long is proposed along head reach, main canals and branch canals, and is designed as gravel-

\_paved road.

(b) M Secondary: farm iroad . . . . .

Secondary farm road of 118 km long is proposed along secondary canals, and is designed as non-paved road.

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محمد میرون کار از استعمال کاری میرون میرون کاری و در بالای در میرون کاری در میرون میرون کاری کاری کاری کاری کا این از استار میرون میرون میرون کاری محمد میرون کاری در میرون کاری در میرون میرون میرون میرون کاری کاری کاری و م این کاری میرون کاری میرون کاری میرون کاری میرون کاری کاری کاری کاری کاری کاری کاری کاری
(c) Tertiary farm road
Numerous tertiary farm roads are proposed along tertiary
cenals, and type and a second s
canals, and typical layout is shown in PLATE NO. 20 of the main report.
the main report.
H5.4.3 Design and a family of the second
H5.4.3 Design of Roads and Related Structures
(1) Design of Link Road and Farm Road
a) Live load
Class of road
1. Link road and main farm road
2. Secondary road
3 伊西田市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市
the first and the second state of the second s
b) Horizontal and vertical alignment:
م لا تواري از شداد الموارية بلا المستقد المستقد المستقدين المحمد المحمد الموارية من الموارية من المراجع المستق المواري از شدار المحمد المستقد المستقد المحمد ال المواري المحمد المحم
(1) as a grant of the same and the same of the same
Class of road Slope Aax: Local Max. length of Min. Slope Slope local slope Radius
Radius
Linked road and this site in the strength in the
main farm road 4 % 3 % 300 m 15 m
2. Secondary family with the second s
2. Secondary farm road 3. Tont: and 4.7.7.8 140 m 10 m
3. Tertiary farm
3. Tertiary farm
140 m 10 m
Typical road cross sections of the link road and the farm
road are shown in PLATE NO. 16 of the main road and the farm
a contraction of the main marked strains

PLATE NO. 16 of the main report.

(2) Design of Related Structures:
Proposed road system has numbers of related structures such as causeways, culverts, bridges and cross drains. The locations of these structures are shown in PLATE NO. 14 of the main report.

a) Causeway: Causeway is proposed at the poir

Causeway is proposed at the point where the link road crosses the Cholutecarriver, located near El Palenque. Design live the Cholutecarriver, located near El Palenque. Design live load is T-20. The causeway is designed so that the maximum clearance between the water surface and the girder bottom is kept at 0.5 m in

dry season, and the structures are submerged in the water

ary season, and the structures are submerged in the water in the rainy scason, because the causeways will be utilized for transporting harvested sugar cane and supplies to and from sugar cane farms in the dry season.

The structures are designed based on the same design criteria mentioned in H5.2, since the structures are related to the

proposed irrigation and drainage systems.

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H5.5 On-Farm Development

H5.5.1 Land Clearance

For-land preparation in the Project area, clearance of bush, stumping, removal of gravels and land grading will be necessitated; The land preparation work will carried out in the following way: 

(1) Bush clearing: The forest area is generally bush land with scattered trees. The bush is not so high and does not exceed 1 m. The bush is cut down using a rotary grass cutter pulled by a tractor, and then burnt after drying on the field.

(2) Tree felling, stumping and removal:

Following the bush clearing, tree felling is carried out by pushing over or digging out with the rake dozer. Root cutting will be necessary before pushing over some large trees. The roots remaining on the ground surface should be uprooted and taken out by scarifying the ground surface. The felled trees and the uprooted roots will be collected on the spot, and burnt after drying. · · · · · ·

(3) Grass clearing:

The grass in the pasture land and bush land is not so high or less than 0.6 m in height. The grass is cut down using a bush cleaner, and then burnt after drying on the field. 

(4) Removal of gravel and land grading:

م الموالي المحمد ال المحمد Following the tree felling, numerous cobble stones and gravel are taken out by scarifying the ground surface with the rake dozer. Remaining small stones are taken out by man power.

After the removal of gravel and stones; minor levelling is required for upland, field. More precise levelling will be required for paddy 

115.5.2.3 On-Farm Facilities ۲<u>،</u> ۱ interaction and the second s ine e

(1) Irrigation and Drainage Facilities=

The construction of irrigation and drainage facilities will cover tertiary canals, collector drains, field ditches and field drains. The capacities and sizes of the sirrigation facilities vary in accordance with the size of farms; irrigation intervals and kinds of crops. However, the bottom width of, the farm ditches will not be smaller than .0.3 meto permit mechanized construction.

white the second and the second area.

-Small embankments of canals will have a height about 0.5 m, crest width of about 0.3 m, and side slopes of 1:1.0. These on-farm facilities are shown in PLATE NO. 20 of the main report.

(2) Initial Plowing

At the final stage of land preparation, the field is plowed up to the depth of about 0.5 m. This work is carried out by using the plow pulled by a tractor. This is the initial plowing, and further plowing and harrowing will be required before planting crops.

H5.6 Irrigation and Drainage Systems in Middle Reach Valleys and San Juan de Flores Area

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H5.6.1 Layout of Irrigation System

"(1) Middle Reach Valleys:

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He live stall a block with the getter and

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The irrigable areas in the Middle Reach Valleys are presently used for pasture-land and small-scale rainfed farms, scattered on the terrace of the Choluteca river. The height of the terrace is approximately 10 m to 40 m above the river bed. The acreage of the 6 sub-areas varies within the range of 90 ha to 540 ha.

The irrigation in these sub-areas, water will be pumped up from the Choluteca river. The pumped water is designed to be stored in the stilling pool temporarily, and then conveyed to the farms through the earth canals. The canal cross section is determined by the Manning's formula. The layout of the irrigation systems in the Middle Reach Valleys is shown in PLATE NO. 15 of the main report.

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 (2) San Juan de Flores Area: The rehabilitation of the existing irrigation systems in the San Juan de Flores area is being implemented by MRN. In addition to the land covered by the existing systems, there extend some lands irrigable by the Choluteca water . These irrigable lands extend in the an area of 230 ha on the left bank of the Choluteca river near the bridge on the road from San Juan de Flores to Talanga, and the elevated land of 110 ha adjoining to the existing sugar cane farm. These lands! totaling 340 ha can be irrigated by water to be pumped up from the ... Choluteca river. The layout of irrigation systems for these lands is shown in PLATE NO. 15 of the main report.

H5.6.2 Design of Pumping Station

Design of the pumping stations is prepared on the basis of the following assumptions and procedures: 

(1) Design discharge: Apple of States of States and States and States

Daily operation hour of the pump is assumed at 12 hours, in view of the actual operation hour of the existing pumping station in this area. The design discharge of the pump is determined on the basis of the proposed operation hour and the peak irrigation water requirementcalculated in accordance with the proposed cropping pattern. The design discharges of the pumps are 0.198 m<sup>3</sup>/min/ha for the Middle Reach Valleys and 0.086 m<sup>3</sup>/min/ha for the San Juan de Flores area, as calculated in Table-H57. The minimum storage capacity of the stilling pool of the pumping station will be 3 times the design discharge of the pump. (2) Numbers and Capacity of Pumps: 2 A state of the second state o

Numbers and capacity of pumps required for irrigation in the

Middle Reach Valleys and San Juan de Plores area have been determined on the basis of conditions and comparison between applicability of ... pumps and construction costs of pumping stations:

(a) \* Same type of pumps will be installed to facilitate repair

(b) Minimum capacity of a pump will be 7.0 m<sup>3</sup>/min, economically. 32.1.... (c) A set of stand-by pump will be installed. - \_ \_ ·

-\_\_\_;H>,45.:--<sup>\*</sup> 

The applicability and suitable efficiency of the pumps will be decided on the basis of the following formula:

Ai = Vi/Vpi  $\leq$  1.0 A<sup>T</sup> =  $\sum D.Vi.Ai/\sum D.Vi$ Where: Ai Applicability and suitable efficiency of pumps

to monthly design discharge.

Vi ... Monthly design discharge.

Vpi : Max. capacity of operating pumps.

Applicability- and -efficiency of pumping

station during the whole year.

D Numbers of days in a month. M. \_

A sample calculation is shown in Table-H58. The results of required capacity of pump and numbers of pumps at each station are shown-in-Table-H57.

THURSDAY AS READED OF CHAPTER SET IS (3) Capacity of Motor :

The capacity of motor is determined in accordance with the following formula:

. . . . . . . .

 $\mathbf{P} = \frac{\mathbf{K} \cdot \mathbf{r} \cdot \mathbf{0} \cdot \mathbf{H}}{\mathbf{p}} \mathbf{x}_{1} \left( \mathbf{1} + \mathbf{R} \right)$ 

Where

Ρ

š

۰.

: Capacity of motor in kW

: Coefficient 0.163: К

: Specific gravity of water r

: Discharge of pump in m<sup>3</sup>/min Q

H : Total head of pump in m

Efficiency of pump p

R : Efficiency of motor

، را تاریخ در تاریخ The results are shown in Table-1157. .

H5.6.3 Drainage Facilities

The drainage requirement: The drainage requirement in the is estimated at 6.3 l/sec/ha in the Middle reach Valleys and at 4.6 l/sec/ha in San Fuan de Flores Area. In calculating the drainage requirement, the design rainfall has been estimated at 156 mm in the Middle Reach Valleys and 114 mm in the San Juan de Flores Area on the basis of maximum daily rainfall as tabulated hereunder.

Maximum Daily Rainfall

Year	1967 1968 1969 1970 1971 1972 1973 1974 1975 1976
Los Encuentros	77 55 67 60 64 61 165 161 64 114
Paso La Ceiba	114 191 70 76, 48 38 76 68 <del>-</del>

The probable rainfall at Los Eucuentros is shown in Fig.-H17. and the average probable rainfall at Los Eucuentros and Choluteca is used as the design rainfall for the Middle Reach Valleys as calculated hereunder.

> Probable Rainfall (mm) (10% chance of recurrence)

Choluteca meteo-station 164

Average (Design rainfall) The probable rainfall with 10% chance of recurrence at Paso la Leibacis used as the design rainfall to the San Juan de Flores Area.

(2) Drainage Systems:
 Drainage system is designed to release excess rain water to the river through numerous collector drains. The design of drainage

canals and related structures will be the same as that of the Choluteca constal plain. The typical layout of the drainage canals is shown in

PLATE NO. 14 of the main report.

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## H6. CONSTRUCTION PLAN

H6.1. 1 Preparatory Works

The preparatory works will be required for the construction of the proposed Choluteca Plain Trrigation System, including i) assignment of consultants for the detail design and supervision of the Project, and ii) aerial photo survey and preparation of maps on a scale of 1/5,000 with one-meter contour intervals.

Aerial photo shooting and ground control survey should be started not later than November in 1978. Mapping for the Western Plain area (360 km<sup>2</sup>) will be started in the midcourse of ground control survey, and should be finished before the commencement of the detail design works. Mapping for the remaining area (190 km<sup>2</sup>) will be carried out when the work is required.

Other preparatory works as i) telecommunication system and ii) building should be completed prior to the tendering for construction of the intake weir, main canal and branch canals

and the second second second

H6.1.2 Survey and besign

The Project is divided into 3 Construction Divisions so that the agricultural development could be implemented smoothly. The divisions are tabulated hereunder and are shown in Fig.-H3.

-	Construction Division	
Division	Net irrigation Area	84 4 749 8 2 1 4 4
1 2 3	3,300 (ha) 9,100 3,600	entiseises is
Total	16.000	

During the dry season from November, 1978 to the middle of May, 1979 the first field survey and detail design on the intake weir and -- II 49 -

the Division 2 will be started as soon as possible on the basis of the map. prepared by IECO in 1968 on a scale of 1/5,000 with one-meter contour intervals. During the first four months, the design work should be concentrated on the building and telecommunication system. is established but but held or they - 4

The second field survey and detail design on the Division 1 will be carried out from the middle of February, 1980 to March 1981, and the third field survey and detail design on the Division 3 will be carried, out from the middle of October, 1980 to December, 1981,

Change and the second of

The field survey and detail design on the land preparation and the on-farm development will be carried out as follows.

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Division	Period	
	Feb. 1980 - March 1981	
	Dec. 1978 - Jan. 1980	
······································	Oct. 1980 - Dec. 1981	

H6.1.3 Tenders and Contracts

The works related to the irrigation and drainage will be contracted on a group or Division basis. For each contract about 5 months will be required from the issuance of tender notice to the award of contract. The contracts will be divided into the followings. .....

	(
Group	Avard
1st 1) Aerial photo survey	1978
Building	1979
-gent spring sy 3) Telecommunication	1979
3rd 4) Construction of intake weir, and Division 2	1980
4th 5) Construction of Division 1	1981
Division 3	1982

H6.2.1 Workable Days

The number of workable days is estimated, on the basis of the daily rainfall records for a period of 10 years obtained at the Choluteca, as well as on the basis of the following assumptions and procedures:

- 1) Construction work can be carried out in case the daily rainfall is less than 5 mm.
- 2) During the dry season from November to April, the construction work will not be carried out on Sundays and holidays.
- 3) During the rainy season from May to October, the construction work may be carried out even on Sundays and holidays.

The number of workable days is calculated as shown in Table-1166.

H6.2.2 Work Quantity and Construction Materials

The work quantity and construction materials have been estimated on the basis of the design for the typical area covered by maps on a scale of 1/5,000 with one-meter contour intervals

H6.2.3 Construction Facilities

(1) Irrigation and Drainage Canals:

Embankment material shall be the excavated materials from canals or adjacent barrow pits. Silt and sand should not be used for embankment. Compaction of the embankment will be done by tamper and tyreroller.

The construction of irrigation and drainage canals will be carried out by using the machineries, in view of the construction period and quality control. Machinery required for the construction of the canals will include dragline, backhoe, tractor shovel, dump truck, bulldozer, motor scraper, tyre roller, motor grader and tamper. Machinery required for the concrete lining of the main canal will be concrete mixer, truck mixer; concrete pump, slopeform and vibrator. · ? - H251 (-

Quality control of earth works and concrete works is required through the laboratory test during the construction period.

(2) El Papalón Intake Weir:

the the construction of the intake weir will be carried out in two

steps by means of coffering a half of the river course. The left side portion of the weiriwill be constructed in the first year and the

"other half of the weir will be constructed in the second year.

Accordingly; the vcoffering with steel piles and unwatering works are needed, for, the construction.

Topha Appendia and Suffree of

Prior to the commencement of the construction, the construction of an access road of about 1.0 km long and crushing plant will be also needed.

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(3) Causeway and Siphon:

"CarConstructions of the causeway and siphon, including access roads . . , of 0.5 kmolong initotal, will be carried out in one dry season. The -we construction will be carried out in two steps by means of coffering

1 a half of the river.

- - - Mager Loore 1. -- . H6.2.4 Construction Machineries

taking The machineries required for the construction of irrigation and drainage facilities for the Western Plain area of 14,370 ha are estimated as shown in Table-H72.

H6.2.5 Construction Schedule นสถุฏีหน้าเรื่อ มีข่าวอาจารีออกสา ชม ค.ศ.

The construction works for the irrigation and drainage facilities have been scheduled as shown in Fig. 5 of the main report. The estimated time required for the construction is 56.5 months, including the preconstruction works.

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## H7. OPERATION AND MAINTENANCE

H: 52\*

H7.1 · Organization and Staff

Construction office, tentatively called on Choluteca Construction Office, will be established under the Project Manager who will be appointed by MRN... The function of Choluteca Construction Office will be land acquisition, approval of construction method; approval of construction schedule, preparation of revised design, proposal of contract amendment, progress check survey, check of quality control, approval of progress payment, progress payment to the contractors and issuance of completion certificate. The organization of Choluteca Construction Office, is shown in Fig. 6 of the main report and the staffing is estimated as shown in Table-H71.

Afthe the implementation of the construction, Choluteca Construction Office will be changed to Choluteca Water Management Office for the operation and maintenance of the project. Choluteca Water Management Office will execute the operation and maintenance of irrigation, drainage and road systems of the project, including measurement of macro and microclimates, soil moisture and distributed discharge. 5 branch offices will be established for the five branch canals, becuase of smooth operation and maintenance. The organization of Choluteca Water Management. Office is shown in Fig. 8 of the main report and the staffing is estimated as shown in Table-H71.

H7.2 Buildings, Quarters and Telecommunication system

Main office. motor pool and the quarters to be constructed at Lujosa for the construction staff will be used for the operation and maintenance of the Project: 5 branch offices and their quarters will be also used for the operation and maintenance.

Telecommunication system connecting the main office to 5 branch offices gate operator at the intake site, dam site and Tegucigalpa will be necessary for the efficient operation and maintenance of the Project. VHF/UHP system is considered appropriate for such communication: - H 53 - H H7.3. Operation and Maintenance of Project Facilities In accordance with the proposed cropping pattern, water will not be taken at the El Papalón intake weir during the months from August to September every year. Therefore, the maintenance of irrigation canals and related structures will be carried out during this period. The maintenance of drainage canals, farm roads and related structures will be carried out during every dry season. H7.4. Machinery: for Operation and Maintenance

Machinery required for the operation and maintenance of facilities should be delivered to the project site at the end of 1979, since the training of mechanics and operators will need training time.

H7.5 Operation and Maintenance Cost

The operation and maintenance cost of the machineries are estimated as shown in Table-H73.

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Table-H1	AVAILABLE METEOROLOGI	CAL RECORD
-^ 、	The state of the s	
<u>Station</u>	Record	Period
Choluteca	Temperature (Daily)	Jan. 1966-Apr.: 1977. (12) year
. ,		Jan. 1970-Dec. 1976 (77 year
		Aug. 1963-Dec. 1975. (13 years
	Wind velocity (Daily)	
- 6	ا چې د مېرې د د مېرې د مېرې	May. 1966-Sep. 1976 (14 years
		Jan. 1970-Jul. 1977 ( 8 years
	•	Jan. 1970-Dec. 1976 ( 74 years
v		the second s
Azucarela		
Choluteca .	Rainfall (Monthly)	1967 - 1976 (10 years
Los Encuentros	Rainfall (Daily)	1967 – 1976 (10 years
EL. 100 m		1901 - 1970 - (10 years
N. 13 <sup>0</sup> 28'		
W. 87 <sup>0</sup> 05'	· · .	
	- <u>^</u> .	
Paso La Ceiba	' Mean, max, min.	Jan. 1972-Dec. 1976 (. 5 years
EL. 670 m	temperature (Monthly)	ار مرتبع که از مراجع این
N. 14º10'	Relative humidity (Monthly)	Jan. 1972-Dec. 1976 ( 5 years
W. 86 <sup>0</sup> 57'	Rainfall (Daily)	1967 - 1976 (10 years)
	A-pan evaporation (Daily)	Jan. 1972-Dec. 1974
<b>*</b> .	۲ کو ۲	Jan Nov. 1971
. <u>-</u>		Nov Dec. 1975 ( 6 years)
×		Jan Sep. 1976
、、	Piche evaporation	Jan. 1971-Sep. 1976 (6 years)
Tegucigalpa	Temperature (Monthly)	
	Relative humidity (Daily)	Jan. 1951-Dec. 1976 (26 years)
· · ·	Rainfall (Monthly)	Jan. 1970-Dec. 1974 (-5 years)
W. 87°13'	Wind velocity (Monthly)	Jan. 1938-Dec. 1972 (35 years)
	Extream max. wind velocity	Jan. 1950-Dec. 1974 (25 years) 1971, 1972

- H155 -	
Station	Period
Cloud cover (Monthly)	Jan. 1970-Dec. 1975 ( 5 years)
Atomospheric pressure (Monthly)	Jan. 1945-Dec. 1975 (31 years) Jan Dec. 1970 ( 1 year )
Piche evaporation (Monthly)	Jan. 1970-Dec. 1976 ( 7 years)
La Venta Relative humidity (Monthly)	Jan. 1972-Dec. 1976 ( 5 years)
EL: 890 m Temperature (Monthly)	Jan. 1972-Dec. 1976 ( 5 years)
N. 87,00 A-pan evaporation (Daily)	Jan. 1972-Oct. 1975
W. 14°19	May 1970 (7 years)
	JanSep., NovDec. 1976

( uuu )	
ESTINATED AVERAGE POTENTIAL EVAPOTRANSPIRATION	
POTENTIAL	
AVERAGE	
ESTIMATED	
Tuble-112	

A-pan       (6 years)       290.3       308.2       314.5       282.6         Modified Blaney       (7 years)       229.1       209.4       212.0       184.8         Cliddle       (7 years)       229.1       209.4       212.0       184.8         Modified Penman       270.3       265.7       267.8       274.0         Hargreaves (6 years)       291.9       281.5       274.5       284.2         Hargreaves(10 years)       305.2       290.3       321.0       317.9         Hargreaves(10 years)       305.2       290.3       321.0       317.9         Table-H3       EvApoRATIC       Table-H3       EvApoRATIC	5 186 5 147 5 147 5 189 7 208	<ul> <li>170.7 200.4 169.4</li> <li>135.5</li> <li>138.3 145.1 135.5</li> <li>14 170.1 233.1 195.3</li> <li>148.9 205.3 160.9</li> <li>17 149.7 234.3 193.8</li> <li>149.7 234.3 193.8</li> <li>CHOLUTECA METEO-STATION</li> </ul>	200.4 145.1 233.1 205.3 234.3 234.3		147.7 126.6 156.3 102.4 117.8 (Cless <sup>2</sup> /	159.7 125.6 151.9 151.9 124.5 135.3	195.3 116.7 204.9 187.0 206.3		2,587.9
d Blaney (7 years) 229.1 209.4 212.0 1 Penman (7 years) 270.3 265.7 267.8 1nsen - ves (6 years) 291.9 281.5 274.5 ves (10 years) 305.2 290.3 321.0 res(10 years) 305.2 290.3 321.0 Table-H3 EVAPO	8 147 0 211 189 189 208 0 208	138.3 170.1 148.9 149.7 149.7	145.1 233.1 205.3 234.3 METEO-ST		126.6 156.3 102.4 117.8 (Class	125.6 151.9 124.5 135.3	116.7 204.9 187.0 206.3		-
<pre>1 Perman</pre>	2110 21189 2018 208	170.1 148.9 149.7 0LUTECA N	233.1 205.3 234.3 METEO-ST		156.3 102.4 117.8 (Class	151.9 124.5 135.3	204.9 187.0 206.3		1,983.7
291.9 281.5 274.5 305.2 290.3 321.0 Table-H3 <u>EVAPO</u>	e 189 1 208 1 AT	148.9 149.7 0LUTECA N	205.3 234.3 METEO-ST		102.4 117.8 (Class	124.5 135.3	187.0 <sup>°</sup> 206.3	266.9	2,658.4
305.2 290.3 32 Table-H3	208 N AT	149.7 OLUTECA N	234.3 METEO-S1		117.8 (Class :	135.3	206.3	•	2,517.9
rable-113 FEB ; M	N AT	OLUTECA N	METEO-S7		(Cless	4°°, 5°		277.0	2,757.3
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259.00 296.2r 307.2	. •	179*4	225.7	127.0	143.6	243.1	264.0	, 259. I	2,679.0
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AT CHOLUTECA	119.3 119.3 243.6 113.9 220.8 133.3 160.9	AUG 251.2 278.7 278.7 258.5 120.0 120.0 127.3 127.3 127.3 127.3 127.3 127.6 146.2	193.8
		JUI. 246.9 265.1 265.1 232.0 145.8 232.0 145.8 232.0 145.8 231.6 186.1 271.0 183.4	234.3
JUN	44.1 59.8 38.8 32.6 64.	942. 941. 118. 935. 53. 74.	149.7
EVAPOTRA EVAPOTRA EVAPOTRA EVAPOTRA	274.7     274.4     199.3     1       297.6     269.3     189.3     1       2989.8     280.8     159.0     1       289.6     258.3     203.1     1       309.6     352.7     223.7     1       250.7     269.7     164.9     1       274.5     284.2     189.9     1	MAY 276.9 382.7 199.2 210.9 199.7 184.9 170.3 225.5 49.7 187.5	208.7
FENT LAL	274.4 269.3 280.8 258.3 352.7 269.7 269.7 284.2	APR 368.7 349.6 346.1 315.1 315.1 308.3 252.2 293.5 299.4 301.3	317.9
method.	274.7274.4199.3. 297.6.269.3 189.3. 289.8.280.8.159.0 274.6 258.3 203.1 309.6 352.7 223.7 250.7 269.7 164.9 274.5 284.2 189.9	MAR 380.1 355.2 379.1 343.6 299.5 295.9 286.2 286.2 286.2 286.2 285.2 285.3 267.5	321.0
rable-H greaves FEB	301.5 277.3 284.7 312.6 275.3 275.3 237.5 281.5	rhod rEB 322.8 309.4 310.8 302.5 267.6 259.3 259.3 259.7 259.3 259.7 250.4	290.3
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SEP OCT NOV DEC Annual Total (	126.6 125.6 116.7 212.7	-	SEP OCT NOV DEC Annual (mm)	211.4 170.1 233.1 195.3 156.3 151.9 204.9 257.6 <sup>7</sup> 2.658.4	
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NUL YAM	147.9 138.3 145.1		NUL YAN	211.4 170.1	
MAR APR	212:0 184.8		MAR APR	267.8 274.0	
JAN', FEB	229.1 209.4 212.0	Modified Penman method.	JÂN <sup>1</sup> FÈB	270;3 265.7 2	- - - -
		D) Nodified I			

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, 1791		1	c	-	335	186	112	378	345	408 ‡	113	1	÷188;1∶
1972	С	0	49	27	326	231	204	131	178	216 .	48 ,	0	1,410)
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Ayorago	0.9	0.2	10.8	25	244.1	304.2	176.7	295	427.3	322.4	83.3	5.1	1.867.1
Proportion (%)	c	0	0.2	1.2	13.0	16.2	9.4	15.7	22.8	17.1	4.3	0.1	100

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	Annual Total	7.1C7	1,074	1,447.2	1,159,1	7.056	- 900 - 5	1,025:9	:774:3	1;422.4	1 052		، " و م	37381	
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CORDS IN CHOLUTECA METEO-STATION (mm)	SEP	206.2	201.3	271.3	163.4	207.6	93.6	85.8	202.5	401.5	40c	,19.4	-	144	
TEO-STA	AUG	139.2	87.0	237.3	225.4	166.5	1.19	233.2	117.6	134.4	159	15.1		111	1 L - 10 - 1 - 1
TECA ME	JUL	70.8	48.8	122.9	323.8	81.6	7.76	107.4	19.2	80.9	901	10		74,	9 2) 1 4
N CHOLU	NUL	156.3	171.0	275.0	0	148.0	168.8	201.6	211.3	101.6	159	15.1		111	:
CORDS 1	YAY	0	324.6	226.0	204.7	92.7	189.3	م 178.3	127.2	248.0	271	16.8		124	, , ,
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( <u>nn</u> )		TOUT NOW	1.75	440 3451	<sup>~~460</sup>	້,235 <sup>(</sup>	2992	196	463	64	288	, 269	17	196.4		
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Y RAINFALL OF RECORDS	, , , , , ,	AUG SEP		<u>ر</u> ا		`354 <sup>-</sup>	293	139	364	140	143	223	14.1	162.9		
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INFALL AND CHO		-NUC	•	ç 480 ÷	364]	<i>`</i> [51 <sup>`</sup>	, <b>1</b> 19	236	237	280	89	152	15.9	183.6		
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e-lf7 AVERAGI		···· NAR	47	0	29,	5	, O	-49	r)	0	11	16		11.5		
olie-117				0	<u>ک</u> ر ک		;	0.	0	c	0	, O ,	0	С		
Table-II		FEB.	0,		( <b>6</b> )	0	:     -  :  :  :	0	• 0	0	1	1	c	0		
			1967	1968	1969	1970	11971	1972	1973	1974	1975	, Average Rainfall	Proportion (%)	Probable Rainfall		

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'Tab1 e-118	AVERAGE MONTHLY MEAN TEMPERATURE, I	Y.III'YOM	MEAN	TEMPE	MAURE,	, RELATIVE
	A LI O I WOIL	AND UNA	VPORAT	LV NOI	V PASO	HUMIDITY AND EVAPORATION AT PASO LA CEIBA

	ocr NOV DEC Annual Total	24.4 23.9 22.5	2 77.0 74.3 75.7	4 111.1 93.0 99.1 1.497.1	84.5 85.0 110.0 1		(E	OCT NOV DEC Annual Total	3 152.4 63.5 76.2 2,158.9	419:0	9 267.7 58:4 12.6 793.7	1 82.2 30.5 44.1 1,028.7	7 171.0 49.1 17.4 848.5	·43.8 *** 27.1 *** 26.0 ************************************	18.6 10.8	218.0 145.1 34.7 16.6 4 2 879.0 145.1	0 187.7 70.7 34.4 1.349.3	「金」ない時代が多くなる。1977年に、大学になり、大学にはないができた。 しんしょう かいしょう しゅうしゅう しゅうしゅう しゅうしゅう しゅうしゅう しゅうしゅう しゅうしゅう しゅうしゅう しゅうしょう	
KELATTVE JA CEIBA	AUG SEP	25.2 25.2	72.8 73.2	128.8 122.4	108.7 91.1	-	CEIBA (m	 AUG SEP	152:4 533:3	383.5 802.6	29.7 217.9	102.8 174.1	2,3 122.7	<b>N</b> -	<b>•</b> ;	6	0.2 273:0		
AVERAGE MONTHLY MEAN TEMPERATURE, RELATIVE HUMIDITY AND EVAPORATION AT PASO LA CEIBA	A UUL	25.1 25	72.0 72	125.5 12	105.8 10		MONTHLY MEAN RAINFALL AT PASO LA CEIBA ( mm)	A LIUL	292.1 15	248.9 38	89.0 2	209.7 10	95.2 192	·59.191.	139.8 121	69.0 127	1.150%4% []2	· · · · · · · · · · · · · · · · · · ·	
iean 'femi 'Ora'f Ion	าบท	25.6	75.3	129.6	104.3		NFALL AT	NUL	431.8	330.2	85.1	160.4	7.9.7	.131.6	133.9	89.5	180.3 <sup>1</sup>	, , , , , , , , , , , , , , , , , , ,	
ONTILIY N AND EVAL	МАУ	27.3	67.8	172.5	176.0		IEAN RALI	МАҮ	127:0	977:9	26.3	178.2	95, 3	134.5		152.0	1231:25	- - -	
MIDITY AIDITY	સત્ર પ્ર	27.6	63.0	189.2	218.0		NTHLY N	પ્રાપ	9,822	0	1.0	34.6	ດຸ	8 4 0 1	37.9	, ° • •	39.1	-	
	MAR	26.4	65.3	184.6	210.3			MAR	38.1	0	0.8	0	ວ	0	o`,	0	2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2		
'l'ab1 0-118	RIH	24.1	69 <b>.</b> 8	130.6	141.8		Phble-Ilg	PEB .	25.1	63.5	0.5	1.6	3,1	다. 11 년 12 년 12 년 12 년 12 년 12 년 12 년 12 년	0.0	·	12.5	* <u>`</u>	
	NAU	23.1	71.8	110.7	121.4		-	N۸L	38.1	12.7	4.7	10.5	18:1						
		(°C) (°C)	Rolative Hum. (%)	á ,	Picho ku. (mm)		* •		1967	1968	, 1969. 2001	1970	1201						

					· · · ·	,, , , ,		•			•
ATION		066-0		1.004	, , 1,00	( 1,012	้าะอา้6	1.020	1.040	1.060	1.070
EFFECTLVE RAINFA I RRIGATION APPLIC		00.07	5 5.00%	80.00 50	85.001	, 90.00 <sup>*</sup>	95.00	100.00	125.00	150.00	175.00
O, RELATE NONTHLY TO NET DEPTH OF	A A A A A A A A A A A A A A A A A A A	0.818	fr 0.826	0.842	• 0.860	0.876	1 0.905	0.930	0.947	0.963	0.977
D NULTIPLICATION PACTORS TO RELATE NONTHLY EFFECTIVE RAINFALL VALUED PROM TABLE-HII TO NET DEPTH OF TRIEGATION APPLICATION			15.50 <sup>1</sup>	35.00	37.50	40.00	45.00	50.00	55.00	60.00	65,00
Table-IIIO NULTIPLICATIO OBTAINED PROM	Pactor Francisco	2 11 11 12 12 12 12 12 12 12 12 12 12 12	0.650	0.676	0.703	0.720	0.728	0.749	0.770	0.790	0.808
		10,00	<u> </u>	12.00	17.50	18.75	00.00	22.50	25.00	27.50	00.00

Note: d is net depth of trrigation application.

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AVERAGE MONTHLY EFFECTIVE RAINFALL AS RELATED TO MEAN MONTHLY RAINFALL AND MEAN MONTHLY CONSUMPTIVE USE (USDA, SCS)

Monthly	· ·					Mean 1	monthly	consumptive		use(mm)				
'''' mean	25	- 50	- , 75	100	.125	.150	175	200	225	250	275	300	325	350 -
(mn) (	2		*			Mean	monthly	ettective	1 1	rainfall(mm	( H		-	
12.5	7.5	8.0	8 7	0.6		10.0	10.5	2	11.7	12.5	12.5	12.5		12.5
25.0	15.0	16.2	17.5	18.0	18.5	19.7	20.5	22.0	24.5	25.0	25.0	25 10 10	51 1 2 2	25.0
37.54 50.0	22.5	0.0 7 7	20 20 20	27.5		29.2	с. С	0 1		37.5	37.5	37.5		37.5
	22		<u>ດ</u> ດີ ເ	- u - u		0.91	40.5 20.0	- 1	0.74	0,07	0.06	0.00		0.00
	41.6		ה ו קיי	‡ [ 0 I	<b>&gt;</b> 0	44.U	0.00	~ 1	~ · ·		07.0			0.10
0.01		40.2	49.7	22.7	0	57.5	60.2	-	6.10	13.1	0.47	0.01		0.02
	1	20.0	50.7	60.2	~	66.0	69.7	~	1.1.1	84,5	.87.5	87.5		c.78
100.0	цt	80.7	63.7	67.7	0	74.2	78.7	0	87.7	95.0	100	100		100
12.5			70.5	75.0	0	82.5	87.2	<u>-</u>	98.0	105	111	112		112
25.0 .		J	75-0	81.5	~	90.5	95.7		108	115	121	125		125
37.5		a t	122	88.7	2	98.7	104		118	126	132	137		137
150.0				95.2	-	106	112		127	136	143	150		150
62.5			i			113	120		135	145~	153	160		162
75.0			a t	160		120	,127		143	154	164	170		175
87.5						126	134		151	161	Ĵ170	179		187
0.00					-	133	140		158	168	- 178 -	188		200
225				a t	197	144	151		171	182	,	•		v
50					•	150	161		183	194	•			:
, 275 , , ~	•				at	240	171	È	194	. 205				•••••• ••••• •••••
00	-	-				, ,	175	• :	203	. 215		•	ية . 	ی دی ای ای ای ای ای ای ای
325- <sup>11</sup> 14 15	-	- 	, <u>,</u>	:	~ <b>^</b>	, at	287		213;	2243, vi	, 			
350.			المرجم ورقم أر		و جار من مرم	ولد ألم مو من مدرور م		ť,		: 232 -		ور - راجع المراجع الم		· · · ·
.375					, , , , , , , , , , , , , , , , , , ,			ج	225	. 240 €				
400 ;	نید رو بر د	د م <sup>ر</sup> د د د م <sup>ر</sup> د د	· · ·		,		د و د '	,	121	247.		به مد بر مو		
1.425					· · · ·				î	010				
	, т С		1		1. 51 		100			NI NI trac				
		<u>َ</u>	-		111	パージント・			~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~					

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Table-1111

Name	Source	Irrigat	le	Cman		Mad
A) OURFACE WAILDU	-					
· ""我们,你们不是我们的吗?""我们就是我们们都是你说,我们们都是你。" "我们们,我们们的你们的你?""我们们,我们们们不是你的。"	·** •				'n	
					4 w	
Table=H12 , PRESE	ENT IRRIGAT	ION SYSTEM	IN C	HOLUTECA	PLAIN	
					•	
and a second second A second secon A second					¥ •	
	- n	05				
	. – °Н	65				

Name	Irrigable Area (ha)	Crops	Methods
1. ACHSA	r 990	Sugar cane	Pump- Gravit
2. Experimental farm	30	Rice sorghum, Beans, etc.	і <b>1</b>
3. Oscar Narvaez	34	Rice, Beans, etc.	
4. Abraham Williams	40	Pasture etc.	11
5. Mr Plores	21	Sorghum, Maize et	
6. David Moran	35	Rice etc.	11
7. Abiloo Martinez	100	Rice etc.	**
8. ACENSA Right bank Left bank	420 360	Cane Cane	88 87
Total	2,030		

-

		3	
B) G	ROUNDW	ATER	 - - -

) GROUND WATER

Nare No.	of Wells	Irrigable Area (ha)	Crops	Methods
1. ACHSA	18	760	Sugar cane	Gravity
2. ACENSA	20	860	17	н
3. Buenavist coop.	9	216	72	11
4. Fuerzas Onidas Coop.	-	42	**	" (P
5. Herrado Coop	-	66	11	11
5. Independence Coop	~~ 	74	**	17
7. Cesar Ortega	2	55	Rice	17
8. Andres Lardizabal	·4	155	13	**
9. Luis Lardizable	-1	34	17	11
0. Roberto Pliva	1	35	18	**
1. Jorge Maradiaga	ī	20	Rice Sorghum Cantaloupe	**
2. Carnery Union	<u> </u>	18	Sugar cane	11
Total		2,335		· <u> </u>

Choluteca river Water source Pump capacity m3/min 27.75 2.86 2.86 2.18 4.63 4.63 ۰. \* OUTLINE OF PRESENT IRRIGATION SYSTEM (OROCUINA AREA) ÷۰-1.19 . • 1 "., Pump station Irrigation Gravity me thod = Š : Ĵ. Rice, Maize Water melon Crops Sorghum Sesame Sorghum Sorghum Sorghum Sesame Sorghum Sesame Sesame Sesame Melon Rice Rice Rice • . . Irrignble Area (ha) 210 8 . . . . 5 18 20 Э С С ч. М Location Apacilagua Las Basas 5. Pro-Coop. El Brasil Choluteea Orocuinu Table-1113 Limon de la cerca Total Las Sabilas La Trinidad 6. Asent. Los Limones 4. Ascht. Son Rafael ' Name of project ъС 1. Lus subilás ي. يۇ بار 2. Asent. 3. Asent. . . . , ,,, , ī . .

sed bion hour area. 8 hr 360 ha	850 ha
Property in the second s	12 hr Total
Table-H14PUNE CAPACITY OF EXISTING PUNPINT STATIONName ofExistinated if the propertion operation hour irrigable areaSugar factoryLocationLocationTo be addition12 hr12 hr13 min12 hr14 Sombra79.6 m3 min12 hr360 ha	990 ha
PUNP CAPAGUTY	12 hr 12 hr
Tuble-H14FunceOfSugarFactoryLaSombra79.6m3min.	68.2 m <sup>3</sup> /min. 45.5 m <sup>3</sup> min.
W	Los Мапд]ся
A), ACENSA	B) AGHSA

Note: /1 Diversion water requirement is 1.16 ('sec'ha.

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		· · · · ·		·			
	Table-1115	ECONOMIC EXISTING	COMPAR PUMPIN	RISON ON NG STATIO	Ŋ		
	、				2 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4		۱
	Pump irrigation	method V	.S. Gre	avity met	hod in		
	ramb triterorou		•	•			
	Net irrigable area (1,270 Right bank of the Cholute		.ъ в	······································			
		•		Pump Irr. method	س ش ۳۰۰۰ سپ ۱	Gravity method	
				(\$)	-	( <b>\$</b> ): -	
A)	Initial construction cost						
	Earth works			-		4,300	2
	Concrete works Stand by sums and Most	0 <b>r</b>		- -			
	Stand by pump and Mort				<u> </u>		
	Total (3/ha)			( - )		308,300 (242.8)	
B)	Operation and Maintenance	cost			r,		
	Operation cost			20,300			
	Maintenance cost			· - `	ີ ມີ ມີ 2 - ເ	2,900	
	Total	<u> </u>		20,300		2.900	ليسمع . مريد مريد المريد
	(\$/ha/year)			(18.5)		(2.7)	, , , , , , , , , , , , , , , , , , ,
				-	، <del>ب</del>		
C)	Replacement cost		r			به بین مین مین مین مین مین مین مین مین مین م	- f = 4", 
	Pump and Mortor						۵، موجوع موجوع
	\$/ha/year			14.8	т., У		4 4 4 4 7 4 7 4 4 64 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
	•			-	-		- میں میں اور
D)	Salvage value				, ,		- ***-**
	-			•	••• ••• • - • •		. – .
•	S/ha/vear			1 5			**
	\$/ha/year		•	1.5		್ಷ ನಿಲ್ಲಿ - ೧೯ ೧೯೯೯ರರ್ - ೧೯ ೧೯೯೯ರ್ - ೧೯೯೮ರಂಗ	· · · · ·

IPARISON OF IRRIGATION METHODS gation method Spray irrigation method	<ul> <li>(henper surprised of the solid of any type of the solid of slow and moderie solid of slow to rapidly permeability rating permeability rating from a solid of slow and moderie meability rating permeability rating from a solid of slow and moderie meability rating permeability rating from a solid of slow and moderie meability rating from when compared with the surface irrigation method boes not flush out the agricul-tural chemicals sprayed on the vithin 0 to 12 % of the ground surface from the form the sprinkler tural chemicals sprayed on the vithin 0 to 12 % of the ground surface from the form a spring of the sprinkler tural chemicals (10 the sprinkler tural chemicals).</li> </ul>	
CONPARISON OF IRRIGATION METHODS celirrigation method	ethod respecting and moderate wand the soils of slow and moderate wind the soils of slow and moderate wind the permeability rating Not affected by the wind during the permeability rating the or fluch out the agricul- tural chemicals sprayed on the tural chemicals sprayed on the crops No water loss out of farms when compared with the sprinkler he n method alfgn- in the e of ranging	
Table-H16       COMPARISON OF IRRIGATION METHODS         Surface irrigation method       Spray irrigation method	A) Advantages For the soils of slow and rating rating Not affected by the wind during the period of irrigation Dirrigation Does not flush out the agricultural chemicals sprayed on the crops No water loss out of farms when compared with the sprinkler irrigation method Able to control the align- ment of furrow run in the areas with the slope of the ground surface ranging within 0 to 3 %	

Furrow irrigation methodBorder strip irrigation methodDisadvantagesSmall scale land levellingLand levelling of farm isin the area with the unevenrequiredBorder strip irrigation methodslope is necessaryRequires much irrigation waterRequires much irrigationRequires much irrigation efficiencywater due to poor irrigationefficiencyWater due to poor irrigationefficiencyrends to cause soil baking, soilfurrow runsoil crust, and erosion in farm andfurrow runRequires labour for oper-period of irrigationRequires labour for oper-period of irrigationthe whole period ofirrigation	Spray irrigation method
Small scale land levelling in the area with the uneven slope is nucessary Requires much irrigation water due to poor irrigation efficiency Tonds to cause soil baking, soil crust, and erosion in farm and furrow run Requires labour for oper- ation and maintenance during the whole period of irrigation	Sprinkler irrigation method
	The installation cost tends to increase when compared with the surface irrigation method Promotes diseases, on the crops I Flushes out the agricultural chemicals Sprays the water out of farm e Tends to decrease the irriga- tion efficiency under the influence of wind
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т – Н 70<sup>°</sup> –

Table-i	117 IR	RIGATI	ON WAI	ER REC	UIREME XOJECT	NT OF AREA)	WESTE	RN P	LAIN	ĄREA		
	JAN -	EB <sub>CUA</sub> I	MAR	VPR 11 1	1AY, .	TUN .	້ມບ	AUG	SEP	OCT	NOV I	DEC
AREA (100 ha)												174 1 97 - 1
	161.3 . 58.2	147.1 53.1	49.7	48.0	23.5 8.4		52.5 19.1	0 0	0 0	0 0	76.4 27.4	163.5 59.0
2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	.113.8 27.8	19.7 4.8	60.4 14.8	37.6	106.1 25.9	0 0	0 0	0 0	0 0	0 0	108.4 26.5	210.9 51.5
3. 1. SOF	113.8 	19.7	65,9	· ' .	1.8 0.1	0 0	0 0	0 0	0 0	0 0	108.4 6.1	210.9 11.8
4	,113.8 6.3	19.7 1.1		151.5 9.2	0 0	0 0	0 0	0 0	0 0	0 0	108.4 6.1	210.9 11.8
5. 8	224.8 12.5	さ 112.6	19.2	45.9 2.6	0 0	0 0	0 0	0 0	0 0	0 0	24.8 1.4	184.2 10.3
6	- 8.0 0.2	0 r	5.5 0.2	45.9 1.3	0 0	0 0	0 0	0 0	0 0	0 0	44.6 1.2	66.7 1.9
7.	140.1	70.4	13.7 0.4	45.9 1.3	0 0	0 0	0 0	0 0	0 0	0 0	0 0	98.8 2.8
8	256.4	207 4	207-0	322.3	166.5 18.6	104.1 11.6	78.5 8.8	0 0	0 0	52.4 5.9		
9.	329.4	230.8 1.6	225.1	220.6 1.5	16.8 0.1	0		0	0 0	0 0	123.2 0.9	218. 1.
10 : (۲۰ میر ۲۰۱۰) ۱۰ : ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰ - ۲۰۰۰	129.9	125.3	122.0	116.5	0 0	0 0.	_	0 0	0 0	0 0		118. 6.
TOTAL AREA		ہ ہے۔ 	· · · · · · · · · · · ·	<b>.</b>							,	· •* • ·
AVERAGE NET		÷ 99.2	2 105.1	153.2	2 53.1	11.6	5 28.6	50	•	5.9		197.
IRRIGATION E IRRIGATION WATER REQ.	FFICIEN	cr 52	2.5 %	~ · ·							. •:7	

Table-H18 IRRIGATION WATER REQUIREMENT OF DIVISION 3 

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JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV. DEC a un parta durant TYPE AREA (100 ha) C. Bart Martin 0 0 76.4 163.5 52.5 0 161.3 147.1 137.5 132.8 23.5 0 1. 0 0 0 0 108.4 210.9 0 113.8 19.7 60.4 154.0 106.1 0 2. 0 0 39.1 76.2 0 0 41.1 7.1 21.8 55.6 38.3 0 13 . . 0 0 108.4 210.9 0 0 12.1 23.4 0 113.8 19.7 65.9 165.0 1.8 0 0 3. 7.3 18.3 0 0. 12.6 2.2 0.2 0 . 4 0 0 108.4 210.9 0 0 12.1 23.4 113.8 19.7 54.9 151.5 0 0 0 0 4. 0 12.6 2.2 6.1 16.8 0 0 0 4 0 0 24.8 184.2 0 0 2.7 20.5 224.8 112.6 19.2 45.9 0 5. 0 0 0 25.0 12.5 2.1 5.1 4 0 0 0 0 0 0 44.6 66.7 0 0 1.2 1.9 6. 8.8 0 5.5 45.9 0 0 0 0 1 0.2 0 0.2 1.3 0 0 0 0 0 0 0 98.8 140.1 70.4 13.7 45.9 7. 0 0 0 0 0 2.7 0 0 0 i 3.9 2.0 0.4 1.3 0 0 0 0 0 52.4 242.3 365.2 8. 256.4 207.4 207.0 322.3 166.5 104.1 78.5 0 0 10.2 47.1 71.0 7 49.9 40.3 40.2 62.7 32.4 20.2 15.3 0 0 0 123.2 218.9 239.4 230.8 225.1 220.6 16.8 9. 0 65.1 0 0 0 0 38.7 118.8 0 0 6.6 129.9 125.3 122.0 116.5 0 2.7 0 0.1 0 10. 0 2 7.2 7.0 6.8 6.5 0 0 TOTAL AREA -36 -AVERAGE NET IRR. REO. · -- 2" 

(mm/month) (mm/month) 152.5 73.3 84.9 167.6 70.9 20.2 15.4 0 0 10.2 116.4 225.7 IRRIGATION EFFICIENCY 52.5 % IRRIGATION WATER REQ. 290.5 139.6 161.7 319.2 135.0 38.5 29.3 0 0. 19.4 221.7 429.9

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			, <b></b> .	H ,73-					
DEC	2.7	L-T-211	154.8 154.8	232.2		186.8	.747.2	981.1	163.5
NON	0		90,3	<sup>6</sup> 90.3	92.1	92.1	368.4	458.7	76.4
OCT .	0		00	0	0	0	<sup>-</sup> 0	0	0
SEP	0			0	0	0	0	0	0
AUG	0		, , , , , , , , , , , , , , , , , , ,	0	0	0	0	0	0
TPE. 1	67.4	• 0 • • • • 0 ( • 4 • • • • • • • • • • • • • • • • •	64.6	64.6	62.3	62.3	249.2	314.8	52.5
T OF T	0		0	0	0	0	0	0	0
DUIRENEN	0		141.3	141.3	C	0	0	141.3	23.5
ATER RE	120.4		201.1	201.1	148.4	0 148.4	593.6	796.5	132.8
ATION W	87.8		183.9 35.7	219.6	115.3	35.7 151.0	604.0	825.0	137.5
r, IRRIG	156.3 33.8		152.0 76.0	242.3 228.0 219	84.5 11	78.8 163.3	653.2	882.6	147.1
NE NE	73.0	1.5	119.7	242.3	55.5	125.5 181.0	724.0	967.8	161.3
SNEPLITRIGATION WATER REQ.	1256.3 (156.3 87.8 (19.5))	017.1. 1.5%		OTAL	<ul> <li>Amm/ mon bay</li> <li>CANE</li> </ul>	TOTAL (mm/month) 181.0 163.3 151.0	'ro'rAL x 4 (nun/month) 724.0 653.2 604.0	OTAL (mm/month)	NET. IRR. WATER REQ. (1/6) (nm/month) 161.3 147.1 13
IGATION WAY	(1) SEED CA	TOTAL	HIN C	TOTAL	CANE CANE	Ŀ	'l'o'l'AL	GRAND T	NET IA REQ. (
							1 1 2		

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	DEC.		210.9	210.9	π <sup>-1</sup> η η - η - η - η - η - η - η - η	الا الا	DEC.		210.9	210.9		DEC		, 21 <u>0</u> .9	210.9	
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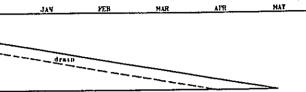
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ENT OF	ากก	78.5		78.5		GATION WATER REQUIREMENT OF TYPE 9	•	JUL	65.1	65.1				າກເ	2.7	2.7	A Contract of Contract
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ATION V	APR	322.3		322.3		NOLIVE		APR	220.6	220.6		NOLTA		APR	116.5	116.5	
NET IRRIGATION WATER REQUIREMENT OF TYPE 8	MAR	207.0		207.0		NET LRRIG	ا ج	MAR	225.1	225.1		NET LRRIG	~	MAR	122.0	122.0	
	FEB	100.9	106.25	207.4	÷			FEB	230.8	230.8	, , , , , , , , , , , , , , , , , , ,	۰.		FEB	125.3	125.3	
Table-H26	NAL '	N	256.4	256.4		Tuble-ll27	-	NAL	23914	239.4		Table-1128	-	JAN FEB	129.9	6	به دوده و میکرد از میکرد از میکرد. در افزاد میل میکرد مروسیسیان کرده میکرد در افزاد میل موجود میکرد میکرد.
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Kc Potents 11 Evapotranapiration	266.9	291.9	281.5	,274.5	284.2	189.9	148.9	205.3	160.9	102, 1	121.5	187.0	266.9	291.9	281.5	2
Consumptione Life	- 2.1	26.3	56.3 -	. 87.8	3 10.7	117.7	116.1	174.5	141,6	88.1	90.9	106.6	109.4	73.0	33.6	
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PFB MAR

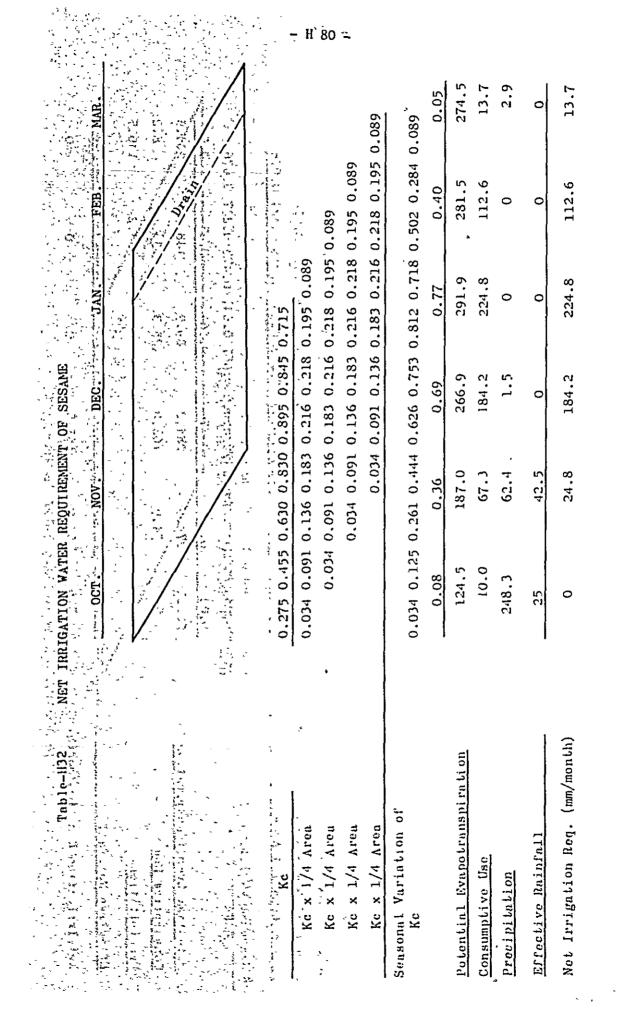
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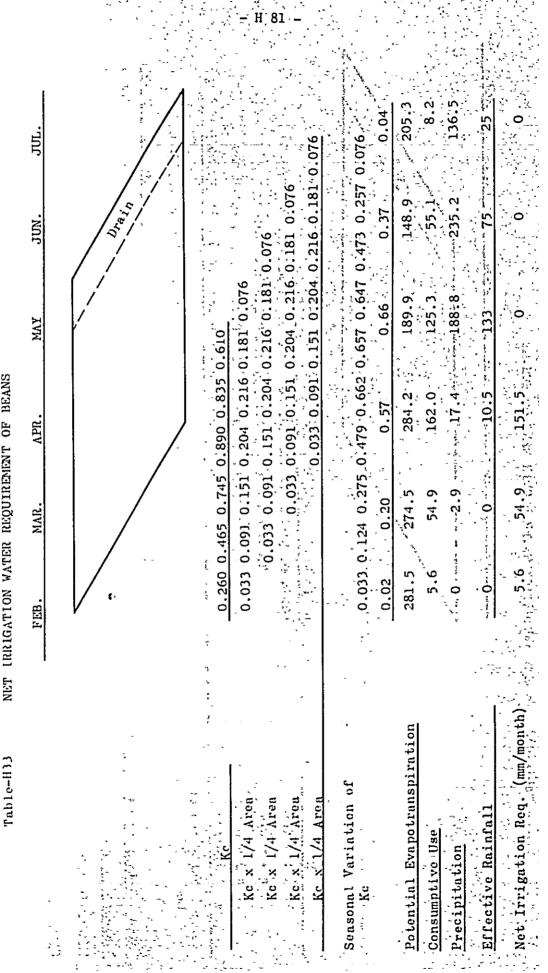
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ke Putentsal Pvapotranspiration	- 0.01	0.04	0.19	7 0.26 0. - 0.29	0.021 0. 9. 96 0.375 0. 0.41	043 0.045 0.04 021 0.043 0.04 0.021 0.04 0.021 0.04 437 0.502 0.57 0.54	8 0,050 0,051 5 0,048 0,050 3 0,045 0,048 1 0,043 0,045 0,021 0,043 0,641 0,694 0,67	0,056 0,059 0.053 0,056 0.050 0,053 0,048 0,050 0,045 0,048 0,729 0,765 0,75 -	0.062 0.065 0.059 0.062 0.056 0.059 0.051 0.056 0.051 0.055 0.050 0.053 0.799 0.832 0 82	0.068 0.071 0.065 0.068 0.062 0.065 0.059 0.065 0.056 0.059 0.862 0.858 0.88	0.074 0.078 0.071 0.074 0.068 0.071 0.065 0.065 0.062 0.065 0.910 0.926 0.92	0.081 0.082 0.078 0.081 0.074 0.078 0.071 0.074 0.068 0.071 0.936 0.940 0.94	0 08] 0.083 0.082 0.083 0.081 0.082 0.078 0.081 0.074 0.078 0.938 0.930 0.94	0.042 0.081 0.083 0.082 0.083 0.083 0.082 0.083 0.081 0.082 0.915 0.865 0.89	0.078 0.075 0.081 0.078 0.082 0.081 0.083 0.082 0.063 0.083 0.783 0.70 0.75	0.072 0.069 0.075 0.072 0.078 0.075 0.081 0.078 0.082 0.081 0.617 0.535 0.58	0.066 0.065 0.069 0.066 0.072 0.069 0.075 0.072 0.078 0.075 0.454 0.376 0.42	0.031 0.063 0.031 0.066 0.063 0.069 0.066 0.072 0.069 0.301 0.229 0.27	0.031 0.063 0.03 0.066 0.06 0.160 0.09 0.13	63
ke utentsal Psapotranspiration unsupptive Use	- <u>0.01</u> 102.4 1.0 331.0	0.09	0.19	7 0.26 0. - 0.29 266.9	0.021 0. 0. 16 0.175 0. 0.41 291.9	043 0.045 0.04 021 0.043 0.04 0.021 0.04 0.021 0.04 0.02 437 0.502 0.57 0.54 281.5	8 0.050 0.051 5 0.048 0.050 3 0.045 0.048 1 0.043 0.045 0.021 0.043 0.641 0.694 0.67 274.5	0.055 0.059 0.053 0.056 0.050 0.053 0.048 0.050 0.045 0.048 0.729 0.765 0.75 -	0.062 0.065 0.059 0.062 0.056 0.059 0.051 0.059 0.051 0.053 0.799 0.812 0 82 189.9	0.068 0.071 0.065 0.068 0.062 0.065 0.059 0.062 0.056 0.059 0.862 0.88 0.88 118.9	0.074 0.078 0.071 0.074 0.068 0.071 0.065 0.068 0.062 0.065 0.910 0.926 0.92 205.3	0.081 0.082 0.078 0.081 0.074 0.078 0.071 0.074 0.068 0.071 0.936 0.940 0.94	0 08] 0.083 0.082 0.083 0.081 0.082 0.078 0.081 0.074 0.078 0.938 0.930 0.94 102.4	0.042 0.081 0.083 0.082 0.083 0.083 0.082 0 083 0.081 0.082 0.915 0.865 0.89 124.5	0.078 0.075 0.081 0.075 0.082 0.081 0.083 0.082 0.083 0.082 0.083 0.082 0.083 0.083 0.083 0.70 0.75 187.0	0.072 0.069 0.075 0.072 0.078 0.075 0.081 0.078 0.082 0.081 0.617 0.535 0.58 266.9	0.066 0.061 0.069 0.064 0.072 0.669 0.075 0.072 0.078 0.075 0.454 0.376 0.42 291.9	0.031 0.063 0.031 0.066 0.063 0.069 0.066 0.072 0.069 0.301 0.229 0.27 281.5	0.031 0.063 0.03 0.066 0.06 0.360 0.09 0.13 274.5	63
ke utential Prapotranspiration unsupplive l'se recipitation	- <u>0.01</u> 102.4 _1.0	0.09 124.5 11.2	0.19 187.0 , 33.5	7 0.26 0. - 0.29 266,9 77.4	0.021 0. 0. 16 0.375 0. 0.41 293.9 119.7	043 0.045 0.04 021 0.043 0.04 0.021 0.04 0.021 0.04 0.02 437 0.502 0.57 0.54 281.5	8 0.050 0.053 5 0.048 0.050 3 0.045 0.048 1 0.043 0.045 0.021 0.043 0.641 0.694 0.67 274.5 183.9	0,056 0,059 0,053 0,056 0,050 0,055 0,048 0,050 0,045 0,048 0,729 0,765 0,75 - 264,2 213,2	0.062 0.065 0.059 0.062 0.056 0.059 0.051 0.053 0.051 0.053 0.799 0.832 0 82 189.9 155.7	0.068 0.071 0.065 0.068 0.062 0.065 0.059 0.062 0.056 0.059 0.862 0.88 0.88 118.9 131.0	0.074 0.078 0.071 0.074 0.068 0.071 0.065 0.068 0.065 0.065 0.92 205.3 188.9	0.081 0.082 0.078 0.081 0.074 0.078 0.071 0.074 0.068 0.071 0.936 0.940 0.94 160.9 151.3	0 08] 0.08] 0.082 0.083 0.081 0.082 0.078 0.081 0.074 0.078 0.938 0.930 0.94 102.4 96.3	0.042 0.081 0.083 0.082 0.083 0.083 0.082 0.083 0.081 0.082 0.915 0.865 0.89 124.5 110.8	0.078 0.075 0.081 0.075 0.082 0.081 0.083 0.082 0.083 0.082 0.083 0.083 0.783 0.70 0.75 187.0 140.3	0.072 0.069 0.075 0.072 0.075 0.072 0.078 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.58 266.9 154.8	0,066 0,061 0,069 0,066 0,072 0,666 0,075 0,072 0,078 0,073 0,454 0,376 0,42 291.9 122.6	0.001 0.063 0.011 0.066 0.063 0.069 0.066 0.072 0.069 0.27 281.5 76.0	0.031 0.063 0.03 0.066 0.06 0.160 0.09 0.13 274.5 35.7	63
Patential Fragmatranspiration Consumptive Page Precipitation Effective Rainfall set	- 0.01 102.4 1.0 331.0	0.09 124.5 11.2 248.3 25.8	0.19 187.0 35.5 62.4 40.9	7 0.26 0. - 0.29 266.9 77.4 1.5 0	0.021 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	043 0.045 0.04 021 0.043 0.04 0.021 0.04 0.021 0.04 0.02 437 0.502 0.57 0.54 281.5 152.0 0 0	8 0.050 0.053 5 0.048 0.050 3 0.045 0.048 1 0.043 0.045 0.021 0.043 0.641 0.694 0.67 274.5 183.9 2.9	0.056 0.059 0.053 0.056 0.050 0.053 0.048 0.050 0.045 0.048 0.729 0.765 0.75 - 264.2 213.2 17.4	0.062 0.065 0.059 0.062 0.056 0.059 0.051 0.056 0.050 0.053 0.799 0.832 0 82 189.9 155.7 188.8 14.4	0.068 0.071 0.065 0.068 0.062 0.065 0.059 0.062 0.059 0.062 0.056 0.059 0.862 0.858 0.88 118.9 131.0 235.2	0.074 0.078 0.071 0.074 0.068 0.071 0.065 0.068 0.062 0.065 0.910 0.926 0.92 205.3 188.9 136.5	0.081 0.082 0.078 0.081 0.074 0.078 0.071 0.078 0.071 0.074 0.068 0.074 0.068 0.074 0.940 0.94 160.9 151.3 228.0	0 043 0.043 0.082 0.083 0.081 0.082 0.078 0.081 0.074 0.078 0.934 0.930 0.94 102.4 96.3 331.0	0.042 0.041 0.033 0.082 0.033 0.083 0.031 0.033 0.082 0 083 0.081 0.092 0.915 0.865 0.89 124.5 110.8 248.3	0.078 0.075 0.081 0.078 0.082 0.081 0.083 0.082 0.063 0.082 0.063 0.082 0.063 0.082 0.075 0.75 187.0 140.3 62.4	0.072 0.069 0.075 0.072 0.078 0.075 0.081 0.075 0.081 0.075 0.082 0.081 0.617 0.535 0.58 266.9 154.8 1.5	0.066 0.661 0.069 0.066 0.072 0.669 0.073 0.075 0.075 0.075 0.454 0.376 0.42 291.9 122.6 0	0.001 0.065 0.011 0.066 0.061 0.069 0.066 0.072 0.069 0.009 0.27 281.5 76.0 0	0.031 0.063 0.03 0.066 0.06 0.160 0.09 0.13 274.5 35.7 2.9	63 1
ke Patentsal Prapotranspiration Consumptive Use Precipitation Effective Rainfall	- 0.01 102.4 1.0 331.0	0.09 124.5 11.2 248.3	0.19 187.0 33.5 62.4 40.9	7 0.26 0. - 0.29 266.9 77.4 1.5	0.021 0. 0. 016 0.375 0. 0.41 291.9 	043 0.045 0.04 021 0.045 0.04 0.021 0.04 0.021 0.04 0.021 0.04 0.02 417 0.502 0.57 0.54 281.5 152.0 0	8 0.050 0.053 5 0.048 0.050 3 0.045 0.048 1 0.013 0.045 0.021 0.043 0.641 0.094 0.67 274.5 183.9 2.9 0	0.056 0.059 0.050 0.056 0.050 0.055 0.048 0.050 0.045 0.048 0.729 0.765 0.75 - 264.2 213.2 17.4 12.1	0.062 0.065 0.059 0.062 0.056 0.059 0.051 0.055 0.050 0.053 0.799 0.832 0 82 189.9 155.7 188.8	0.068 0.071 0.065 0.068 0.062 0.065 0.039 0.062 0.036 0.039 0.862 0.888 0.88 118.9 131.0 235.2 154.5	0.074 0.078 0.071 0.074 0.068 0.061 0.065 0.068 0.062 0.068 0.920 0.926 0.92 205.3 188.9 136.5 114.3	0.081 0.082 0.073 0.081 0.074 0.078 0.071 0.074 0.068 0.071 0.9% 0.9% 0.94 150.9 151.3 228.0 165.8	0 043 0.043 0.082 0.083 0.081 0.042 0.074 0.078 0.074 0.078 0.938 0.930 0.94 102.4 96.3 331.0 103	0.042 0.081 0.033 0.083 0.033 0.083 0.042 0 083 0.042 0 083 0.041 0.085 0.915 0.85 0.89 124.5 110.8 248.3 128.8	0.078 0.075 0.081 0.078 0.082 0.081 0.083 0.082 0.083 0.083 0.083 0.083 0.783 0.70 0.75 187.0 140.3 62.4 50.0	0.072 0.069 0.075 0.072 0.075 0.072 0.078 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.081 0.075 0.58 266.9 154.8 1.5 0	0,066 0.661 0.669 0.666 0.072 0.669 0.075 0.072 0.078 0.075 0.454 0.376 0.454 0.376 0.42 291.9 122.6 0	0.001 0.065 0.011 0.065 0.061 0.069 0.066 0.072 0.066 0.072 0.069 0.301 0.229 0.27 281.5 76.0 0 0	0.011 0.063 0.03 0.066 0.06 0.160 0.09 0.13 274.5 35.7 2.9 0	63



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			-			-		Table-1	DI NE	f IRR10A	TION VATE	R REQUIREMENT	T OF RA	100% CAN	e .				I					
·	<u> </u>	<u></u>	DHC	<u>ہے۔</u> - -	245		<u>HA</u>	<u>R</u>	ATH		HAY		<u> </u>	.nvt	, in		SFP	007	<u></u>	DF.r	Jan	FFR	<u>KAR</u>	AIR
									-		1	-					-							
		e									_		-											
ke		0,505	0.515 0.5	5 0,600	0,610	0.685 0.730	0.775	0,815	0.855 0.9	0.94	5 0.980	0.995 1.00	0 0.99	0 0,965	0.925	0,87%	0,835 0,795	0,750	i					
ho s 1 12 Arem	-		C.021 D.G C.0	1) 0.046 2) (1.043 0.021	0,049 0,046 0,043 0,021	0.032 0.033 0.049 0.033 0.016 0.019 0.015 0.046 0.013 0.046 0.021 0.043 0.021	0.079 0.055 0.052 0.052 0.049 0.016 0.016 0.013 0.021	0.063 0.059 0.055 0.032 0.049 0.049 0.043 0.043 6.021	0.066 0.0 0.063 0.0 0.039 0.0 0.035 0.0 0.052 0.0 0.049 0.0 0.014 0.0 0.013 0.0 0.021 0.0 0.0	70 0.07 64 0.07 63 0.06 53 0.05 52 0.05 49 0.05 40 0.05 46 0.04 13 0.04 21 0.04 6.02	3 0,077 0 0,073 6 0,070 3 0,066 9 0,063 5 0,059 7 0,052 6 0,049 3 0,046 1 0,043	0.080 0.080 0.077 0.08 0.073 0.07 0.076 0.07 0.066 0.07 0.061 0.06 0.055 0.05 0.055 0.05 0.055 0.05 0.045 0.04	2 0.08 0 0.08 7 0.08 7 0.08 3 0.07 0 0.07 3 0.06 9 0.06 5 0.05 2 0.05 9 0.05 9 0.05	1 0.083 2 0.083 0 0.082 7 0.080 3 0.077 0 0.073 5 0.070 3 0.070 9 0.059 2 0.059 2 0.035	0.082 0.083 0.083 0.082 0.080 0.080 0.077 0.073 0.070 0.066 0.063 0.059	0.079 0.082 0.083 0.083 0.082 0.080 0.077 0.073 0.070 0.070 0.066 0.063	0.077 0.072 0.079 0.077 0.082 7.079 0.083 0.082 0.083 0.083 0.082 0.083 0.080 0.082 0.077 0.080 0.077 0.080 0.077 0.077 0.070 0.077	0.080 0.082 0.077 0.080 0.073 0.071	0,031           0,064         0.03           2         0,068         1,06           5         0,075         0,07           0,075         0,07         0,07           0,075         0,07         0,07           3         0,082         0,08           4         0,083         0.08           0,083         0.08         0.08           0,082         0.08         0.08	<ul> <li>0.011</li> <li>0.064</li> <li>0.064</li> <li>0.072</li> <li>0.075</li> &lt;</ul>	4 0.03) 8 0.064 0.0 72 0.068 0.0 75 0.072 0.0 79 0.075 0.0 72 0.075 0.0 72 0.079 0.0 73 0.082 0.0	31 64 0.031 68 0.064 0.031 72 0.068 0.664 73 0.072 0.068 79 0.073 0.072 89 0.110 0.235	0.031 0.064 0.031 0.068 0.064	0.031
nul Verintion of Ac		0,02 9,01	0.034 0.1		0.211	0.266 0.325		42	0.524 0.5		4 0,733 0,71 <sup>1</sup>	0.772 0.80		0,86	0.847		0.922 0.924	0,90	0.76	0.617 05	-1 () 471 0.3 	89 0,310 0,235 0,28	0.163 0.095	0.011
ntfal Evapetran=p'ration	187	.0	266.9	291	.9	281.5	-74.	5	284,2	18	9.9	148,9	20	5.3	160.9	-	102.4	124.5	187 0	266.9	291.4	281.5	274.5	284.2
n b, (A+ ( 2+	· 1	.9	36.7	55.	.5	81.5	115.	3	159.2	13	4.8	117.6	17	6.6	146.4		95.2	112.1	142 1	160-1	125.5	78.8	35.7	5.7
pitation.	63	.4	1.5	0		9	2.	9	17.4	18	8,8	215.2	13	6.5	. 228.0		3,1.0	248.3	62.4	15	0	σ	2.9	17.4
tive Rainfall		.8	0	0		0	0		10.8	13	7.0	128.8	11	4.3	154.5		103	128,8	50	0	0	0	0	15.5
stion Water Reg. (wa/month)	۔ د	,	26.7	55,	.5	84.5	115.	.,	148.4	-	Ó			2.3	. 0		o	0	42.1	160 1	125.5	78.8	35.7	0





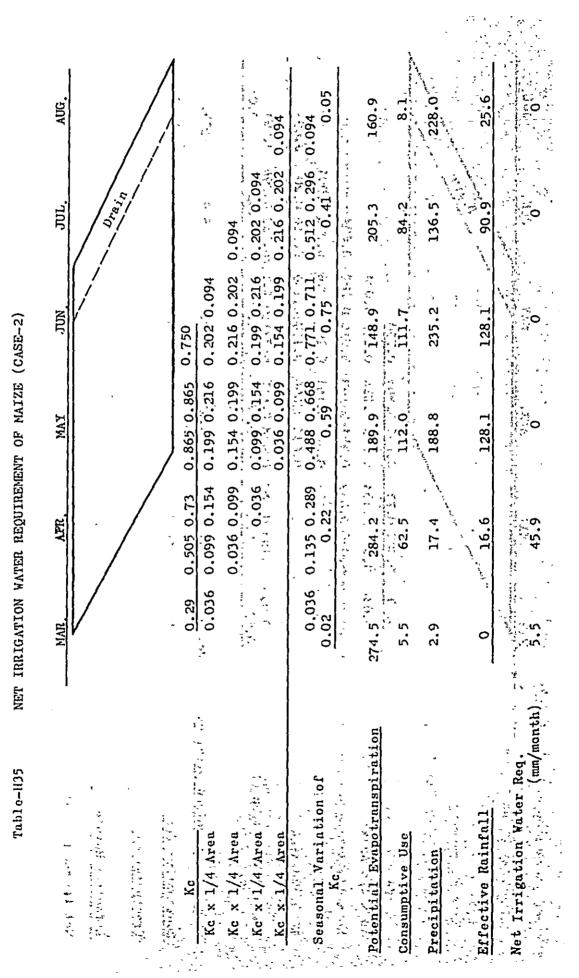


NET IRRIGATION WATER REQUIREMENT OF BEANS

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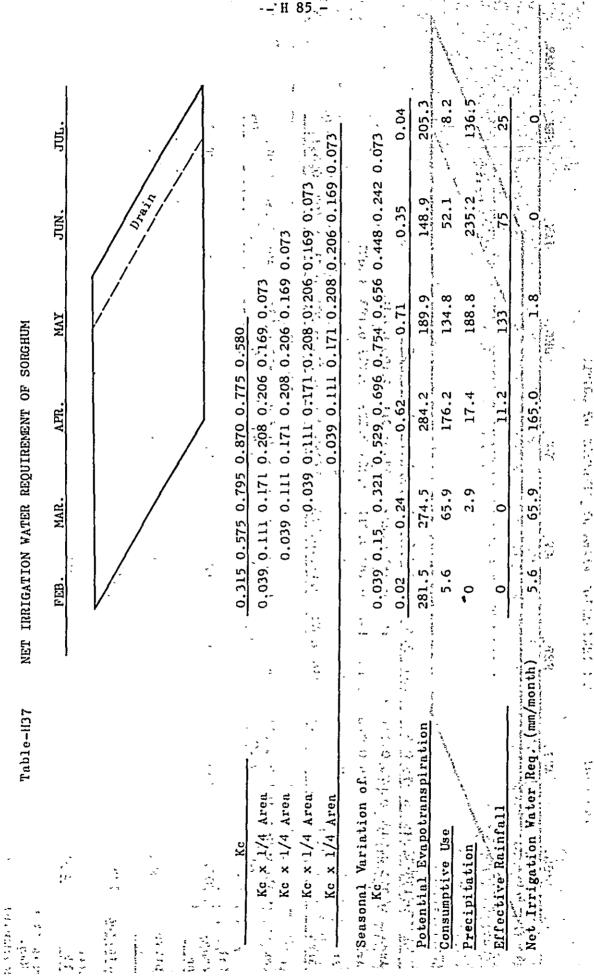
		0.094	0.094 0.05	205.3 10.3	136.5	25.6	` <b>`0</b> '}
	Diality .	0.750 0.202 0.094 0.216 0.202 0.094 0.154 0.199 0.216 0.202	0.512 0.296 0.41	148.9 61.1	235.2	76.9	0
((CASE-1) MAY			0.771 0.711	189.9 142.4	188.8	136.3	106.1
WATER REQUIREMENT OF MAIZE (CASE-1 MAR.		0.199 0.216 0.199 0.216 0.154 0.199 0.099 0.154 0.099	0.488 0.668 0.58	, 284.2 164.8	17.4	10,8	154.0
ATER REQUIREN		0.505 0.73 0.099 0.154 0.036 0.099 0.036	0.135 0.289 0.22	274.5 60.4	. 2.9	0	60,4
IRRIGATION		0.036	0.036 0.02	281.5 5.6	0	0	5.6
Table-II34		$\begin{array}{c} \mathbf{K}^{\mathbf{C}} \\ \mathbf{K}^{\mathbf{C}} \\ \mathbf{K}^{\mathbf{C}} \\ \mathbf{K} \\ \mathbf{K} \\ \mathbf{K} \\ \mathbf{X} \\ 1/4 \\ \mathbf{Area} \\ \mathbf{K} \\ \mathbf{K} \\ \mathbf{K} \\ \mathbf{X} \\ 1/4 \\ \mathbf{Area} \\ \mathbf{K} \\$	Estion of Kc	Potential Evapotranspiration Consumptive Use	<b>Precipitution</b>	Effective Rainfall	Net Irrigation Water Reg. (mm/month)

- H:82 -



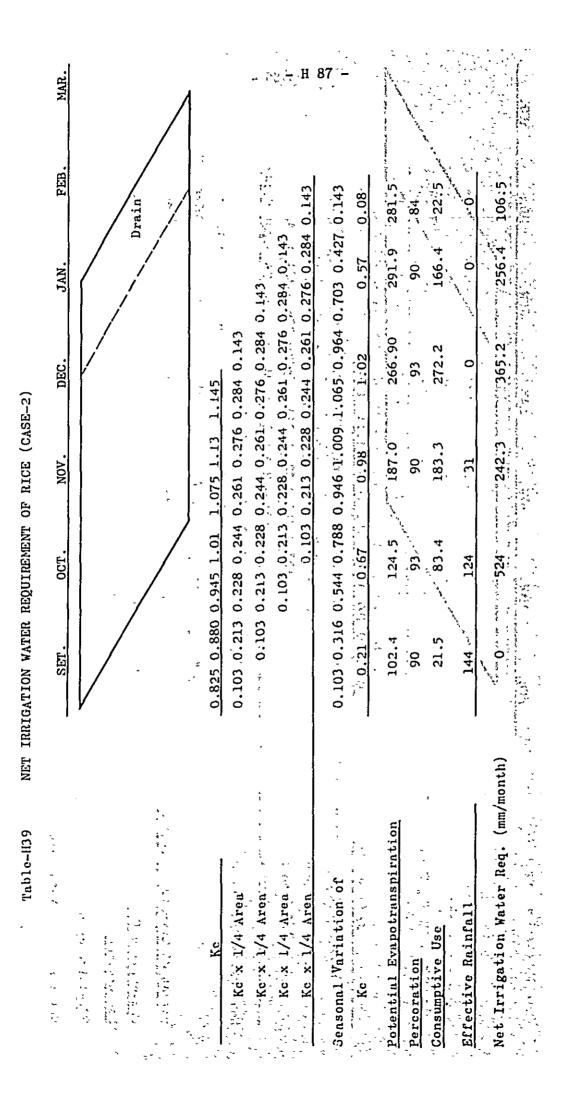
- H 83 -

MAR		مر-	H 84					
Drain	A *****	0.091	0.091 0.05	281,5	14.1	0	0	14.1
JAN	160.0 193	0.211 0.193	0.495 0.284 0.39	291.9	113.8	0	0	113.8
OTTON	0.223 0.211, 0.193 0.091 0.224 0.223 0.211 0.193 0.091 0.224 0.223 0.211 0.193	0.224,0.223	0.851 0.718 0.79	266.9	210.9	1.5	0	210;9
EQUIREMENT OF CO	0.224 0.223 0.211 0.193 0. 0.224 0.223 0.211 0.193 0. 0.211 0.224 0.223 0.211 0.	0.183 0.211	0.841 0.869 0.86	187.0	160.8	62.4	52.4	108,4
ION WATER RI	0.183 0.224 0.183 0.224 0.183 0.211 0.148 0.183	0.112 0.148	0.654 0.766 0.71	124.5	88.4	248.3	103.7	0
		0.046 0.076	0.382 0.519 0.45	102.4	46.1	331.0	51.9	ō
Table-H36	0.017 0.046 0.076 0.112 0.148 0.183 0.017 0.046 0.076 0.112 0.148 0.183 0.017 0.017 0.046 0.076 0.112 0.148	0.017	0.139 0.251 0.20	160.9	32.2	228.0	51.9	o
	ea 0.017 0.046 0.076 0.076 ea 0.017 0.046 0.076 0.118 ea 0.017 0.046 0.076 0.076		u u	205.3	8.2	136.5	25.9	0
	Kcx1/4         Area         0.0175         0.035         0.0375         0.52           Kcx1/4         Area         0.017         0.046         0.076         0.112           Kcx1/4         Area         0.017         0.017         0.046         0.076	Kcx1/4 Area	Seasonal Variation of '0.017,0.063 Kc 0.04	Potential Evapotrans- piration	Consumptive Use	Precipitation	Effective <u>Rainfall</u>	Net Irrigation Water Req. (mm/month)

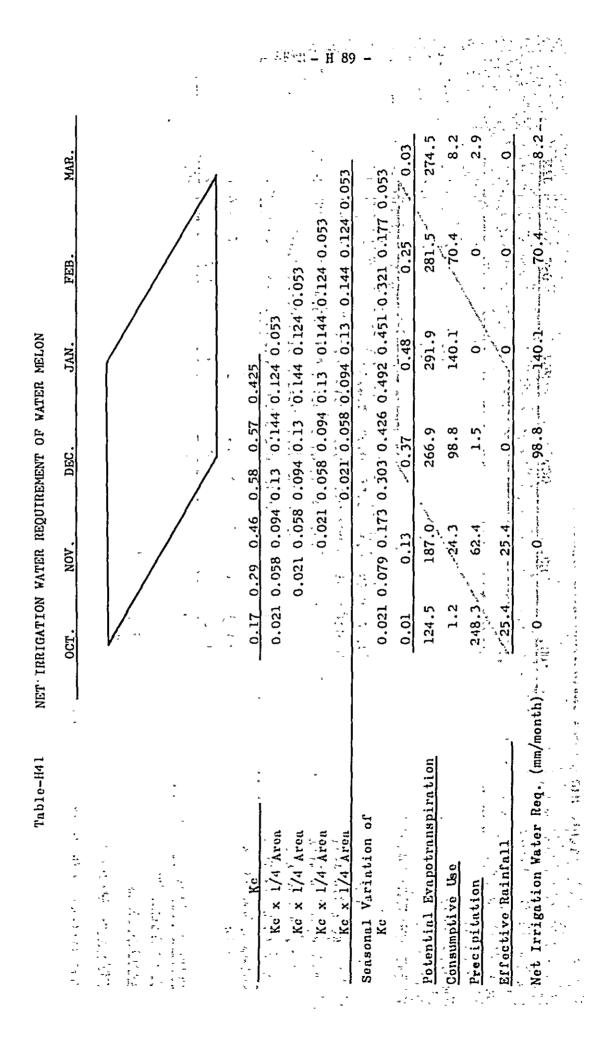


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ER REQUIREMENT OF RICE (CASE-1) MAR. APR. MAY JUN. JUN. AUG.	Draint and a second	.880 0.945 1.01 1.075 1.13 1.14 5	.213 0.228 0.244 0.261 0.276 0.284 0.143 · · · · · ·	.103 0.213 0.228 0.244 0.261 0.276 0.284-0.143	0.103 0.213 0.228 0.244 0.261 0.276 0.284 0.143	0.103 0.213 0.228 0.244 0.261 0.276 0.284 0.143	.316 0.544 0.788 0.946 1.009 1.065 0.964 0.703 0.427 0.143	0.43 0.87 1.04 0.84 0.29	274.5 284.2 189.9 148.9 205.3 ,	118.0 247.3 197.5 125.1 59.5	93.0 90.0 93.0 90.0 93.0	. 4 15 124 111 74	207.0 322.3 166.5 104.1 78.5
NET IRRIGATION NATER		0.825 0.8		0.1			0.103 0.3	0.06	281.5	16.9	84.0	0	100.9
Table-1138, NET IR		Kc Kc	· ···· ·· ··KG'X 1//4 Area		Kc x 1/4 Area	. Kc x 1/4 Aren	Seasonal Variation of Kc		Potential Evapotranspiration	Consumptive Use	Percoration	Effective Rainfall	Net Irrigation Water Req. (mm/month)



NOV. DEC. JAN	24 0.053	0.094'0.13 0.144 0.124 0.053'''	0.058 0.094 0.130 0.144 0.124 0.053	92 0.451 0.321 0.177 0.053	0.48 0.25 0.03	187.0 266.9 291.9	89.8 66.7 8.8	62.4 , 1.5 0	45.2 0 0	44.6 66.7 8.8 .
SAT 0.29	1 0.058 0.094	0.021 0.058 0.094 0.13 0.1	0.021 0.058 0.094 0.1 0.021 0.058 0.0		0.01 0.13 0.37	160.9 102.4 124.5	1.6 13.3 46.1	228.0 . 331.0 248.3	25.4 25.4 50.8	o , o
	Kc x 1/4 Area	Kc x 1/4 Area	Kc x 1/4 Area Kc x 1/4 Area	Seasonal Variation of Kc		Potential Evapotranspiration	Consumptive Use	<u>Precipitution</u>	Effectivo Rainfull	Net Irrigation Water Req. (mm/month)



		0.82		0 266.9	3 218.9	4 1.5	1 0	2 218.9
<b>NON</b>		0.82		187.0	153.3	62.4	50.1	103.2
0 <b>CT</b>	- 1	0.82	-	124:5	102.1	248.3	124	o
SEP		 0:82	-	102:4	84.0	331.0	99.2	o
AUG	· , , , , , , , , , , , , , , , , , , ,	0.82		160.9	131:9	228.0	148.8	o
URE CAL	4 - 4 *	0.82	,	205.3	168.3	136.5	103.2	65.1
OF PÁSTURE	\$ \$ }	0.82		148.9	122.1	235.2	124	0
UIREMENT	ч ×	0.82		189.9	155.7	188.8	138.9	16.8
ATER REQ APR		0.82	,	284.2	233:0	17.4	12.4	220.6
GATION W	-	0.82		274.5	225.1	2.9	0	225.1
NET. IRRIGATION WATER REQUIREMENT FEB MAR APR	۰ *	 0.82		281.5	230.8	o	0	230.8
AN		ڈ نہ سرچہ ہے 0 82		291.9	239.4	o	0	239.4
Table-H42				Potential Evapotranspi- ration	Consumptive Use	ation	e Rainfall	Net Irrigution Water Req. (mm/month)
	ی در د رود رود رود			otentia ration	ໍ່ ທີ່ສູນຫຼື ເ	. Precipitation	Éffective	Net Irriguti

	JAN	PEB	MAR	APR	MAY	NUL	JUL	AUG	SEP	OCT	NON	DEC
	-											
	-	4									-	
	0.445	0.415	0.445	0 445	0.445	0.445	0.445	0.445	0.445	0.445	0.445	0.445
Potential Evapotranspi- ration	291.9	281.5	274.5	284.2	189.9	148.9	205.3	160.9-	102.4	124.5	187.0	266.9
Consumptive Use	129.9	125.3	122.0	126.5	.84.5	. 99	91.4	71.6	45.6	55.4	83.2	118.8
Precipitation	o	0	* (; 2;9	2:9 ***,17.4	188.8	235.2	136.5	228.0	· 228.0 · 331.0 · 248.3 · 5562.4	248.3	62.4	, <b>, , , , , , , , , , , , , , , , , , </b>
Effective Rainfall	, , , , , , , , , , , , , , , , , , ,	.0	0	10,	100	, <del>7</del> 5	88.7	, <b>75</b>		1. <b>15</b>		.0.
			•	9 1 4 1 	· .			igan a . a .	۰۰۰ میں است دار میں ا	, , , , , , , , , , , , , , , , , , ,	۰	344 - 13 - 24 - 14 - 14 - 14 - 14 - 14 - 14 - 14
Trrigation Water Req.	129.9	125.3	122.0	116.5	0	0 : //	2.7	0		0	38.7	118.8

DEC	365.2	.365.2 <u>182.6</u>		0	0	118.8	5.9	182.6		347.8
.NOV	242.3	242:3 121.2			0	47.5	2,4	123.6.		235.4
ocn.	52.4	52.4 26.2			- 0	0	0	26.2		49.9
SEP	0	, , ,		<b>,</b> ,	0	0.	0	0		0
AUG.	0	00			0	0	0	0		0
, nur,	78.5	1, 78.5 1, 39.3			0	23.7	1.2	40.5		1.77
JUN	104.1	104 i i 52 . 1		0 0	0	o	0	52.1		9 <b>9.</b> 2
MAY	166.5	166.5 83.3	0	0	0	0	0	83.3		158.7
A PR.	322.3 <sup>1</sup>	322.3 166. 161.2 83.	148.7	148.7	66.9	116.0	5.8	233.9		445.5
NAR.		207.0 103.5	170.0	170.0	76.5	113.0	5.7	185.7	۶ö	353.7
FEB.	106.5	207.4 53.3	23.4 107.0 170.0	23:4 107:0 170.0	48.2	130.0 125.3	6.3	108.3	52.5 %	206.3
JAN FEB.	259.4	259.4 207.4 207.0	23.4	23:4	10.5	130.0	6.5	146.7 108.3	CY	279.4
				MAIZE	x 0.45	VEGETABLE	x 0.05	NET IRR. WATER REQ. (mm/month)	IRRIGATION EFFICIENCY	IRRIGATION WATER REQ.

,

JUN.				
MAY	lina in	0.076 0.181 0.076	0.257 0.07 0.17 189.9, -	32.3 168.6 50 0
APR.		0.181 0.076 0.216 0.181 0.076 0.204 0.216 0.181 0.076 0.151 0.204 0.216 0.181	).647 0.473 0.56	
IF BEANS MAR1	35 0.610		033 0.124 0.275 0.479 0.662 0.657 0.647 0.473 0.257 0.076 0.0.08 41 0.38 0.38 0.66 0.56 0.17 291.9 1. 1281.5 274.5 1 284.2 1284.9 1	11.5 11.5
O IN	5 0.89 0.835	0.151 0.204 0.216 0.091 0.151 0.204 0.033 0.051 0.151 0.033 0.091	5 0.479 0.6 0.38 1.5	· · · · · · · · · · · · · · · · · · ·
ATION WATER REQUIREME MIDDLE REACH VALLEYS) JAN. FEB.	0.465 0.745	0.091 0.151 0.033 0.091 0.033	0.124`0.275_0. 28_55_0.38 9_55_531.55	
TRRIGATION (MIDDL) JAN.	0.26		0.033 0. 0.08 291.9	23.4 0 23.4
		* • • • • • •	Jiration	(mm/month)
Table-1145	Ko	4 Area	Seasonal Variation of Kc Potential Evapotranspiration	Consumptive Use Precipitation Effective Rainfall Net Irrigation Water Req. (mm/month
		Kc. X 1/	easonal Va 	Consumptive Use Precipitation Effective Rainf Net Irrigation Wate

(- H,93 -

					. *		Ĥ	94 –			1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4				
NOV						-	0.094		0.094	0.05	187.0	9.4	39.3	25 <u>, 6</u>	0
ocr.		nie II.			2 0.094	0.036 0.099 0.154 0.499 0.216 0.202 0.094	0.036 0.099 0.154 0.199 0.216 0.202 0.094	-	0.289 0.488 0.668 0.771 0.711 0.512 0.296 0.094	0.41	124.5	51.0	196.4	76.9	0
MA IZE			0.750	0.154 0.199 0.216 0.202 0.094	0.099 0.154 0.199 0.216 0.202 0.094	0.199 0.216	0.154 0.199		117.0 177.0	0.75	102.4	76.8	277.2	102.5	0
NET JIRRIGATION WATER REQUIREMENT OF MAIZE (MIDDLE REACH VALLEYS)	Constant a		0.865 0.865 0.750	0.199 0.216	0.154 0.199	0.099 0.154	0.036 0.099		0.488 0.668	0.58	160.9	93.3	162.9	102.5	0
IRRIGATION WATER REQUIREN (NIDDLE PRACH VALLEYS JUL			1	0.036 0.099 0.15	0.036 0.095	0.036			0.036 0.135 0.289	0.22	205.3	- 45.2	95.9	51.3	0
TRRIGATI (UIN) NUL			0.29 0.505	•					0.036	0.02	148.9	3.0	183.6	25.6	0
-H46				Ŧ.	Kc x 1/4 Area	Kc x 1/4 Area	" Kc <sup>2</sup> x 1/4 Aron	Seesonal Variation of	Kc		Potential Evapotranspitation	<u>Consumptive Use</u>	<u>Precipitation</u>	<u>Effective</u> Rainfall Not	Irrígation Water Req. (mm/month)

	AVG.	- H 95 € €
	JUL.	Drain Jrain 3 4 0.143 6 0.284 0. 59. 59. 59. 59. 59.
	.NUL	1.14         1.14         0.284       0.143         0.276       0.284         0.276       0.284         0.276       0.284         0.276       0.284         0.244       0.276         0.244       0.276         0.244       0.276         0.244       0.284         0.99       148.9         1.065       0.964         0.84       0.0103         1.065       0.964         0.64       0.0103         0.64       0.04         0.64       0.04         0.64       0.04
(CASE-1)	MAY	1.13 0.276 0.261 0.261 0.244 1.009 19 19 9 9
LENENT OF RICE	APR.	1.01 1.075 1 0.244 0.261 0 0.228 0.244 0 0.213 0.228 0 0.103 0.213 0 284.2 284.2 284.2 90.0
NET IRRIGATION WATER REQUIREMENT (NIDDLE REACH VALLEYS)	NAR.	0.825 0.880 0.945 0.103 0.213 0.228 0.103 0.103 0.213 0.103 0.316 0.544 0.103 0.316 0.544 16.9 118.0 34.0 93.0 84.0 93.0
ET IRRIGATION (MI)	FIB.	0.103 0.316 0.94 0.103 0.213 0.22 0.103 0.316 0.54 0.103 0.316 0.54 0.10 0.103 0.316 0.54 0.10 0.43 0.0 93.0 84.0 93.0
Table-147 N		Kc       0.825       0.880         Kc       x 1/4 Area       0.103       0.213         Kc       x 1/4 Area       0.103       0.316         Seasonál Variation of       0.103       0.316       0.103         Seasonál Variation of       0.103       0.316       0.103       0.316         Potential Evapotranspiration of       0.103       0.316       0.066       0       0         Potential Evapotranspiration 281.5       34.0       84.0       84.0       0       0       0         Ref Irrigentions Water Reg.       100.9       0       0       0       0       0

Contraction of the second s	H`\96 -		
	Drain brain	281.5 84 22.5 22.5 106.5	
	D D D D D D D D D D D D D D D D D D D	291.9 93 166.4 0 259.4	
(CASE-2)	<u>1.145</u> 0.284 0.143 0.276 0.284 0.261 0.276 0.244 0.261 1.065 0.964	266.9 93 272.2 0 365.2	
F. RICE NOV	75-11-13 75-11-13 61-0.276 61-0.261 44-0.261 28-0.244 13-0.228 46-1.009 46-1.009	187.0 90 183.3 31 242.3	
NET IRRIGATION WATER REQUIREMENT O	0.103 0.1030	124.5 93 83.4 124 52.4	
IGATION WATE (NIDDLE')	0.103 0.213 0.228 0.244 0.103 0.213 0.228 0.244 0.103 0.103 0.213 0.228 0.103 0.213 0.278 0.103 0.213 0.278	102.4 90 21.5 144 0	
Table-H48 NET IRR	Kc Sarr I/4 Area 1/4 Area 1/4 Area 1/4 Area 1/4 Area c Variation c	Potential Evapotranspiration Percoration Consumptive Use Effective Rainfall Net Trrigation Water Req.(mm/ month)	

.. \* 0 . 11.5 17.3 168.6 183.6 95.9 162.9 277.2 196.4 39.3. 2.3 291.9 281.5 274.5 284.2 189.9 148.9 205.3 160.9 102.4 124.5 187.0 266.9 130.0 125.3 122.2 126.5 84.5 66.3 91.4 71.6 45.6 55.4 83.2 118.8 47.5 118.8 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 0.445 DEC. 0 1 4 FEAT 0 1 35.7 NOV. 001'. 0 2 7 . . . . SEP 0 (\*\*\*\* 10 \*\*\* 10 \*\*\* 10 \*\*\* 10 \*\*\*\* 10 \*\*\*\* 10 \*\*\*\* 75 \*\*\*\* 50 130.0 125.3 113.0 116.5 7.0 1 3 0 2 23.7 50 0 AUG. 2000 - 12 AZ The Part of the state of a JUL. ---NET IRRIGATION WATER REQUIREMENT OF VEGETABLE (MIDDLE REACH VALLEYS) JUN. . . . . . . . . MAY Navege and and the a second a second and the standard APR. MAIR FEB. JAN. 0 Po teu tiu 1 Evapo trunspi ta tion ì Table-1149 <u>Effective</u> Rainfall' Consumptive Use Precipitation . . . · · · A, • <u>.</u> Ko -0

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<u>ب</u> بر بر									مد العلي: م	- H	98	~									-	
		DEC	1.0	40.6		41.6	0.6	28.7	57.5		86.2	9.9	59.5		69.4	277.6	364.4	60.7			115.6	
-	, , , , , , , , , , , , , , , , , , ,	NON		35.0		35.0:	0.5	0	51.8		51.8	0	52.7		52.7	210.8	263.1	43.9			83.6	
	 	, ocr ;	میں ہو۔ مربقہ ا	62.6	- ' <u>'</u> ,	62.6	· 0.9	` O	80.4		80.4		81.5		81.5	326.0	407.3	6.79			129.3	
		SEP		67.5		67.5	0.9	0	77.3		77.3		76.0		76.0	304.0	382.2	63.7			121.3	
	· · ·	AUG	-	39.1	ی ۲ ۳.	39.1	0.5		46.9		46.9		43.0		43.0	172.0	219.4	36.6			69.7	
EA )		່ານເ	بو سر که اس و او او اس که او اس یک او اس یک	59.3	• •	59.3	0.8		68.1		68.1		60.5		60.5	2-12.0	310.9	51.8			98.7	
WATER REQUIREMENT DE FLORES AREA )		NUL		<b>3.0</b>	• •	3,00	0.04		15.9		15.9		4.3		4.3	17.2	33.1	5.5			10.5	
I WATER N DE FL		NAY		8.9		8.9	. 0.1		131.2		131.2		24.4		24.4	97.6	228.9	38.2			72.8	
IRRIGATION WATER REQUIREMEN ( SAN JUAN DE FLORES AREA	`     	· APR ·		87.0	<b>*</b> .	87.0	1.2		6.141	3.8	145.7		106.0	3.8	109.8	439.2	386.1	7.79			186.1	
) (	, , ,	· NĂR	*	59.1	3.7	62.8	0.9		123.7	24.0	147.7		77.5	24.0	101.5	406.0	554.6	92.4			176.0	
Table-H50	-	FEB		26.1	15.7	41.8	0.6		70.5	35.3	105.8		39.2	36.6	75.8	205.2	409.6	68.3		-r.	130.1	
Tabl		JAN	·	5.9	18.8	21.1	0.3		37.2	38.3	75.5		13.3	39.4	52.7	210.8	286.6	47.8	nth)	52.5 3	91.0 130.1	
		NET IRRIGATION WATER REQ.	SEED CANE			TOTAL	TOTAL x 1:5 %	(mm/month) PLANT CANE			TOTAL	(mm/montl)) <u>HATOON CANE</u>			TOTAL (mm month)	TOTAL x 4	(mm/month) G. TOTAL	NET TRR. WATER REQ.	G. TOTAL × 1/6 (mm/month)	LRRIGATION EFFICIENCY	IRRIGATION WATER REQ.	

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	Table-HS1 NET IRRIGATION VATER REQUIREMENT OF SEED CAME (SAN JUAN DE FLORES AREA) DD2 JAN FFB MAR							
	DEC JAN PEB MAR APR MAY JUL	SPP -	170	101	DEC	JAN	PEB	MAR
K.	0.505 0.545 0.595 0.650 0.710 0.765 0.815 0.875 0.915 0.975 0.995 0.995 0.995 0.895 0.895 0.835 0.785 0.721	5. I.S.						
	0.021 0.044 0.048 0.052 0.057 0.062 0.056 0.071 0.075 0.080 0.082 0.083 0.081 0.077 0.072 0.068 0.066							
Ar x 1/12 Area		8 0.061 0.056	0.036					
•	0.021 0.044 0.048 0.052 0.037 0.062 0.051 0.071 0.080 0.082 0.083 0.081 0.071 0.077 0.080 0.082 0.083 0.081 0.077 0.077 0.080 0.082 0.083 0.081 0.077 0.077	7 0.072 0.061	0.661 0.656	0.076				
2		1 0.077 (1071	n n64 - n n61	0.056 0.000				
-	0.021 0.044 0.045 0.057 0.062 0.066 0.071 0.075 0.080 0.082 0.081 0.082 0.081 0.082 0.081 0.082 0.081 0.081 0.083 0.052 0.062 0.062 0.066 0.071 0.075 0.080 0.081 0.081 0.083 0.052 0.057 0.062 0.066 0.071 0.075 0.080 0.081 0.083	2 0.023 0.031	0.077 0.072	0.061 0.061	0.056 0.076			
:	0.041 0.045 0.052 0.057 0.062 0.066 0.071 0.075 0.06	0 0.082 0.081	0.081 0.077	0.071 0.068		0.036		
-	A 01 0 01 0 01 0 01 0 01 0 01 0 01 0 01							
e #	0.021 0.044 0.052 0.057 0.065 0.065 0.065 0.052 0.057 0.065 0.065 0.065 0.052 0.057 0.065 0.055	5 0.071 0.075 2 0.066 0.071	0.080 0.082	0.08] 0.08] 0.082 0.08]	0.077 0.072	0.068 0.063	0.056 0.026	0.026
Segno al inclation of	0.021 0.065 0.113 0.105 0.222 0.284 0.356 0.421 0.496 0.576 0.658 0.741 0.801 0.814 0.858 0.814 0.858 0.01 - 0.01 0.814 0.858 0.814 0.888 0.01 - 0.01 0.01 0.01 0.01 0.20 0.01 0.01 0.01							
R (ettal Evapoiranspiration	99.1 *** 110.7 ************************************	- 122.4	111,1	93.0	99.1	110.7	130.6	181.6
{ansumptime l'se	1.0	105.1	81.1	53.0	10,6	27.7	13.7	3.7
fre spitation	6.4 \$ 9.7 \$ \$ 2.4 \$ 0.7 \$ 0.4 \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	4),8	27.1	26.0	6,1	9.7	2.4	n
Effective Resofall	0	37.8	15.5	18.0	Ø	8,9	0	f3
	المريش بها الروادية المريشة والمراجع براعم المجرية المعني المريش يترقيه فالمحمد من المريش فلا تتريش فيما ويرده المر							
freightion ester Reg. (am/month)	1.0 57.0 1.0 59.1 1.0 59.1 1.0 59.1 1.0 59.1 1.0 59.1 1.0 59.1 1.0 59.2 50.0 50.0 50.0 50.0 50.0 50.0 50.0 50	47.5	62.6	35.0	\$0.6	18.8	15.7	3.7
	· · · · · · · · · · · · · · · · · · ·							

			ی در داری است می در ور این اور به می در می در این سر در به در در در می در این این می در این او می در در	د. ۱۹۹۵ - ۲۰۰۵ میلید ۱۹۹۵ - ۲۰۰۹ میلید ۱۹۹۵ - ۲۰۰۹ میلید			م میں مربع مربع م م م م م م م		10.00															
	(		م الم الم الم الم الم الم الم الم الم ال				· · · · · · · · · · · · · · · · · · ·	1152 NIST .	IRRIGATION VATI	ER REQUIRE DE FLORES	POINT OF FLANT AREA)	CANE		_				-						
		<u>' SF</u>		2 <sup>1</sup> 2 NOV		DFC	JAN	- <b>FI.B</b> '	MAR	- Al1	<u>t A- H</u>	1	JUN	JUL	Atxg	<u>571</u>	007	NOV	DEX	JAN	<b>PF</b> 8	MAR	APR	MAY
					<u>.</u>								-					······································						
	 	°								ν	· · · · ·	:								dr				
kc		· · · · · ·	0.50 0.525 0.	11 0.585 0	. <u>615 0.65</u> 0	D D.685 (	,720 -0.760	0.795 0.B30	0.87 0.91	0.95	0.98 0.995	1.000 0.9	95 0.980	0.955 0.900	0,880 0,840	0.805 0.775	0.715	5		<u>u</u> 1				
ke x 1/12 Area			0.021 0.013 0.0	H5 0.048 0	050 0.05	3 0.056 ( 0 0.051 (	0.059 0.062 0.056 0.059	0.065 0.068	0.071 0.074	0.078	0.081 0.082	0.08) 0.0	163 0.082 181 0.083	0.081 0.078	0.075 0.072	0.069 0.066	0.063 0.031							
*	· ;			0.021 0	.013 0.01 .013 0.01 .021 - 0.04	8 0.050 ( 5 0.048 ( 3 0.045 (	0.053 (0.056 0.050 (0.053 0.018 (0.050	, 0.059 0.062 0.056 0.059 0.053 0.056	0.065 0.068 0.062 0.065 0.059 0.062	0.068	0.074 0.078 0.071 8.074 0.068 0.071	0.081 0.0 0.075 0.0 0.074 -0.0	182 0,083 181 0,082 178 0,081	0.083 0.082 0.083 0.083 0.082 0.083	0.081 0.078 0.082 0.081 0.083 0.082	0.075 0.072 0.078 0.075 0.081 0.078	0.069 0.066 0.072 0.069 0.075 0.073	0.063 0.031 0.066 0.063	0.031 .0.063 0.031	L				
*	· · · · · ·	(1997) (1997) (1997)			0.02	0.021	0.013 0.015 0.021 0.013	0.048 0.050	) - 0.056 0.059 ) - 0.053 / 0.056 § 2.050' - 0.053 § - 0.018 - 0.050	0.059	0.062 0.065 0.065	0.068 0.0	171 0.074 68 0.071	0.078 0.081 0.078 0.078	0.082 0.081 0.082		0.078 0.075 0.081 0.075 0.082 0.081	0.075 0.072	0.072 0.069	5 0.063 0.031 ; 0.066 0.063	0.011			
	•,							0.021. 0.04 0.02	0.043, 0.043 0.043, 0.043 0.043, 0.045	0.050	0.053 0.056 0.050 0.055	0.059 0.0	62 0.065 059 0.062	0.071 0.074 0.068 0.071 0.065 0.068	0.078 0.081 0.074 0.078 0.071 0.074	0.081 0.082	1 0.083 0.083 2 0.083 0.083 1 0.082 0.083 1 0.082 0.083 3 0.081 0.083	2 0.081 0.078 0 01082 - 0.081 3 0.083 0.083 2 0.083 0.083	0.078 0.075	2 0.069 0.066 5 0.072 0.069 8 0.075 0.072 1 0.078 0.075	0.066 0.063	0.06) 0.011	0.031	
Segmenal Variation of Ac	-	0.0	0.021 0.064 0. 01 0.09	(0) <sup>**</sup> 0.157 <sup>**</sup> 0.19	207 0.26	0.316	0.375 0.437 0:41	0.502 0.570	0.641 0.694	0.729	0.765 . 0.799	0.832 0.8	-					5 0.783 0.70 0.75		5 0.454 0.376 0.42				
Fotential Fragetranspiration	* . *	122	A Mil	93.0			110.7	130.6	184.6	189.	2 172	.5	129.6	125.5	128,8	122,4	u <b>.</b> .ı	93.0	99.1	110.7	130.6	184.6	189.2	
Communitive Ver	*** * *					28.7	45.4		123.7	1° • 141 ·	9 141	.5	114.0	115.5	121.1	115.1	98.9	69.8	57.5	46.5	15.3	21.0	3.8	
Precipitation.		, <b>4</b> 38	.0 27.1	26.0		6.4	9.7	2.4	0	· · · · ·		.45	131.6	59.1	91.7	43,8	27.1	26.0	6.4	9.7	2.4	0	0,8	
Effective Rainfall	• • •	25		`~ * <del>~</del> * <b>21.</b> 1	<u>, , , , , , , , , , , , , , , , , , , </u>	0	8.2	0	<u>. : (</u> ur :	p	10	.)	98.1	17.4	74.2	37.8	18.5	18.0	Ö	8.2	0	0	0	
tet frigation Fater Req.(mm/month				* 0		28.7	·	70.5	vier 129.7 🖑			.2	15.9	68,1	46.9	77.3	80.4	51.8	57.5	38.7	35.3	24,0	3.8	

frrightion Vater Req. (non/month)



- ` ,	NOV		- JAN	FEB	-	Ie-1153 NET	IRRIGATION VI (SAN JUA NAY	TER REQUIREMENT N DE FLORES AR	T OP RATOON () EA)	XE								
	· · · ·	• -	- , -			-,			JIN	<u></u>	5FP	<u></u>	108	DEC	JAN	¥EB	HAR	APH
		· · · · ·		,						·	·							
	۰ ۱ ۱	• • • • • •	-			· · ·									<u>dr</u>	ALD.		
Kr	0.5	505 0.515 0.56	<u>0 600 0,640</u>	0.685 0.730	0 775 0.81	5 0.855 0 90	0.945 0.98		0.990 0.96						·			
Kc x 1/12 Ares	<b>0.</b> 0	0.043 0.040	6 0.049 0.052 9 0.046 0.049 1 0.043 0.046 0.021 0.043	0.055 0.059 0.052 - 0.055 0.049 0.052 0.046 0.049	0.063 0.066 0.059 0.066 0.055 0.055 0.052 0.055	5 0.070 0.073 3 0.066 0.070 9 0.063 0.066 5 0.039 0.063	0.077 0.080 0.071 0.077 0.070 0.077	0.082 0.083 0.080 0.082 0.077 0.080	0.083 0.08 0.083 0.08 0.082 0.08	0.079 0.075 0.082 0.079 0.083 0.082	0.072 0.068	0.064 0.031	0,031 0,064 0.031					
		ت بالم بو	0.021	0.021 0.043	0.046 0.04	9 0.052 0.055 6 0.049 0.052 8 0.046 0.049	0.059 0.06	0.066 0.070 0.063 0.066	0.073 0.07	0.082 0.083 0.083 0.082 0.083 0.082 0.082 0.082	0.081 0.082 0.083 0.082 0.083 0.083	0.079 0.075 0.082 0.079 0.083 0.082	0,072 0.068 0,075 0.072 0,079 0.075	0.064 0.031 0.068 0.064 0.072 0.068	0.031 0.064 0.031	0.031		
		- 4				0.021 0.043 0.021	0.04( 0.04) 0.04) 0.04 0.021 0.04	0.052 0.055	0.059 0.06	0,066 0,070	0.071 0.077 0.070 0.073 0.066 0.070	0.082 0.083 0.086 0.082 0.077 0.080	0.08) 0.082 0.083 0.083 0.082 0.083	0.079 0.075 0.082 0.079 0.083 0.082 0.083 0.081	0.072 0.068 0.075 0.072 0.079 0.075 0.082 0.079	0.064 0.031 0.068 0.064 0.072 0.068 0.073 0.073	0.031 0.064 0.031 0.064 0.031	4 0.031
ALBAR VARIALIUS OF	` 0.0 .01	0.054 0.110 0.10	0,159 0.211 0.19	0.266 0.325	0.388 0.45	0.524 0.597 0.56	0.674 0.73	0.772 0.869 0.79	0.843 0.87	0.897 0.913	0.922 0.924	0,918 0,876	0.799 0.719	0.637 0.554	0.471 0.389	0.310 0.235	0,163 0.095	5 0,037
	93.0		110.7	- 130,6 ,	184,6	189,2	172.5	129.6	125.5	128.8	122,4	0.90	0.76	0.60	0.43	0,28	0.13	0.02
ential Evapotranspiration	0.9	9.9	21.0	39.2	77.5	106,0	122.5	102.4	107.9	117.2	113.8	100.0	70.7	59.5	47.6	36,6	24.0	3.8
cirilation .	26.0	6.4	9.7	2.4	D	0.8	134.5	\$31.6	59.1	91.7	43,8	27.1	26.0	6.4	9-7	2.4	0	U
ective Rainfall	15.5	0	7.7	0	Ö	Q	98.1	98.1	47.4	74.2	37.8	18.5	18.0	o	8.2	D	٥	0
igation Vater Heg. (ma/month)						•												

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	و و و و و و و و و و و		·	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	· * * * * * *	, , , , , , , , , , , , , , , , , , ,	· 455 % 2.
مرز ماند. د اور می در می در مرد می د اور می در می در مرد می در می	Consumptive User', ''	Refective The Section of the Section	"." Net' Irrigation" " Water Requirement [mm/month]	Farm'Irrigation''''' Water Requirement	Water Requirement	The second s	Discharge Discharge X100 m3/month
			WESTERN 1	VESTERN PLAIN AREA) * * * ******************************			and a second of a second
JAN			153.4	236.0	292.2	I4.370	41-99
		• •	2 66	152.6	189.0	14,370	27:16
, , , , , , , , , , , , , , , , , , ,	105.1 · · ·	0	105.1	161.7	200.2	14,370	28.77
ر ب ب ب	165.0	11.8	153.2	235.7	291.8	14,370	· · · 41-93
	153.1	100.0	53•1 5	81.7	101-1	14,370	14,52
-	6.79	86.3	, 11.6	8-11-	53	. 14,370 .	71.5
	92,7	6.1.1	28.6	0.44.	54.5	04, 370	7.83
		83.2	0.		0	14,370	0
	1.94	75.7	0	0	0	14,370	. * 0
	6'06	85.0	5,9 `	9.1	11.2	14,370	1-61
	145.5	46.6	6.86,	152.2	188.4	14.370	27.07
	197.9	0 +	197.9	304.5	0.776	14,370	54.17
	1,411.3	552.7	906.9	1,395.3	1,727.5	1	248.22
et.			(EASTERN 1	EASTERN N.AIN AREA)			
	167.1	0	167.1	1.172	318.3	9,600	30.56
	104.8	0	104.8	161.2	199,6	6,600	19.16
	0.911	0.4	118.6	182.4	225.9	9,600	21.69
	1.101	11.5	179.6	276.3	342.1	9.600	32.84
	155.2	6.09	6.1.9	93.89	123.6	9,600	11.87
	8196	86,0	10.8	16.6	20.6	9,600	1.93
	80.1	54.8	25.3	9.9C	48.2	9,600	4.63
	55.1	55.1	0	c	0	9,600	0
	54,5	59.5	0	0	0	9,600	٥
	94.0	88.5	5.5	8.5	10.5	9,600	1.01
	159.5	48.4	111.1	170.9	211.6	9,600	20.31
	220.2	0 ,	220.2	3.8(0	419.4	9,600	40.26
Total	1.502.4	494.5	1.007.9	1.550.5	010 2		

1

ra <sup>1</sup> 8	consumptive une (mm/month)	itathfall (mm/month)	Water Requirement (mm/month)	¥ater Roquirement (mm/month)	Vater Requirement (mm/month)	Area (ha)	Djscharge x10 <sup>6</sup> m <sup>3</sup> /month
: 	×		(SUGARCANE, PARM IN C	ARM IN CHOLUTERCA COASTAL PLAIN)			
JAK	161.3	0	161.3	248.2	307.2	1,630	5.01
FED	1:2+1, 142:1	0	1.741	226.3	280.2	1,630	4.57
	137:5	0	137.5	211.5	261.9	1,630	4.27
-	146.8	10.3	136.5	210.0	260.0	1,630	34124
; ; ; ; ; ; ;	117.1	128.8	0	0	0	1,630	0
JUN - NUL	100.5	128:8	0	0	0	1,630	, , , , , , , , , , , , , , , , , , ,
<b>ູ່</b> , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , ,	1.701	.42.6	65.5	81.1	1,630 -	1.32
, yuo	123.2 State	154.5	0	0	• <u>,</u> 0 <sup>-</sup>	1,630	, o, , , , , , , , , , , , , , , , , ,
SEP	16.6	103.0	0	0	. 0.	1,630	0,
ocr 👌	<b>C.</b> 86	103.0	, ,	0	` °	, 1,630, <u>,</u>	, o
, , , ,	125.6	47.4	78.2	120.3	148.9	1,630	2.43
	16 <b>3.5</b>	, , , , , , , , , , , , , , , , , , ,		251.5	àil.4	, <b>1</b> ,630,	5.08 J
	······································	782.9			1,650.7		26.92
			(MIDDLE NEACH VALLEYS,	OROPOL1-MOROLICA-OROCUIN	AREAS)		
•							
	146.7	0,	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	225.7		🤆 😴 🖓 1,850 🖓 👘	2.17
· · · ·	108.3	÷.	108.3	166.6	5. 50e.3 ·	, 1,850 (	
, . 	193.2	1.5	. 185.7	285.7	323:7	1,850	6 54 V
	246.4	12.5	233.9			1,850	8.24
	172.8		83.3	128.2	158.7	1.850	2.94
	122.9	70.8	, 52.1 , ,	80.2	99.2	1,850	· · · · · · · · · · · · · · · · · · ·
-	104.0	63.5	40.5	62.3	77.1	······································	1.43
, ,		49.9	<b>O</b>	, , ,	0	1.850 °	0
	· · · · · · · · · · · · · · · · · · ·	120.6			•	1.850	
i joci (	· 126.6	100 4			6.01, 10, 10, 10, 10, 10, 10, 10, 10, 10,	<b>1</b> ,850 <b>1</b> , 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	
NOV THE PARTY		1	,	ن المراقع المراق معالم المراقع ال معالم المراقع ال	· · · · · · · · · · · · · · · · · · ·	1, 950 ···	1.4 <b>1.4 4. 32</b> - 4.3
ι ·	182°G 14, 5	, , , , 0, , , , , , , , , , , , , , ,	۲۰۰۰ ۲۳۵۰ ۲۰۰۰ IB2: 6 ۲۰۰۰ ۲۰۰۰	<u>, * * * , 280 9 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 </u>	Mich 2, 1347, 8 - 24		6.43

SUMMARY OF CALCULATING JIRIGATION VATER REQUIREMENT (2) Table-1154

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		-	-	×			
Consumptive (mm/month		Effective . s . Buinfall . (mm/month)	Nater Requirement	<pre>% Farm Irrigation % Kator Requirement % (mm/month) **</pre>	A the main and the second seco	A striggble's string to the string st	, Demanded Discharge x10 <sup>6</sup> m <sup>3</sup> /montl
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						· · ·
		۰ ۰	SAN JUAN	DE PLORES AREA)			
••10	-	- + 1 - 1 -	41.0		<b>1</b>		1 <b></b>
68.3		0	68.3	105.1	130.1	340	0.44
		0			176.0	340	0 60
1.10. 97.1			r:46	150.3			0.63
105.5		67.3	38.2	58.8	72.8	240 M	0.25
87.5		82.0	5.5	8.5	10.5	340	
91.5		7.95	51.8	79.7,	98.7	340	0.03
98.6	5	. 62.0	36.6	56.3	1.96	340 0+0	0.02
95.5	۰. ۲.	31.8	63.7	98.0	č.121.j	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.40
85.0	0	17.1	67 . a	104.5	129.3	340	0 44 .
, 62.5		18.1	43.9	67.5	83.6	340	0- <u>1</u> 9
60.7	7	0	60.7	4,4	115.6	340	0.39
F 900 1		FILL	674.5	1 017 R	18.4		19 C

•

Table-1154 SUMMARY OF CALCULATING LIGHGATION WATER REQUIREMENT (3)

С. 2012 Г. н. 104 - КОХ / - H 104 -

# Table-H55 PEAK CROP CONSUMPTIVE USE A) Choluteca Coastal Plain Irrigation Area (Decide t Area)

- H 105

	C	Project Area)	Peak Amount	
	(	Crops	mm/month mm/day	Month
1.	Suga r	cane	م من الله من المراجعة المراجع المراجعة المراجعة الم المراجعة المراجعة الم	
	(1)	Sheed cane	130.7	April 1
	(2)	Plant cane	213.2 <b>7.1</b>	April
	(3)	Ratoon cane	176.6	July
2.	Maize		164.8	April .
3.	Cotto	n	210.9	December
4.	Sorgh	um	_ 176.2	April
5.	Beans		162.0 5.4	April <sup>2</sup>
6.	Sesam	e	224.8 7.3	Janua ry
7.	Melon		, 89.8 3.0	November
8.	Water	melon	140.1 4.5	January
9.	Rice		247.3 - March 8.2	April.
10.	Vegeta	ables	126.5	April
11.	Pastu	re	239.4 7.7	January
Mid	ldle Re	ach Valleys		

B) Middle Reach Valleys

	Crops	Peak Amount <u>mm/month</u> <u>mm/day Month</u>
1.	Rice	247:5. 8:3 April
2.	Beans	181.2 5.8 March
3.	Maize	93.3 3.0 August
4.	Vegetables	130.0 4.2 January

## C) San Juan de Flores Area

		Peak	t
	Crops		y <u>Month</u>
Sugar can	e <sup>*</sup>		
(1)	Seed cane	113.3	Augus t
(2)	Plant cane		April
(3)	Ratoon cane 📖	122.5	Nay Star
-			

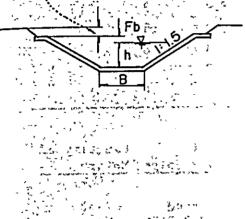
Table-H56 CANAL BOTTOM WIDTH (B)/WATER DEPTH (h) RATIO

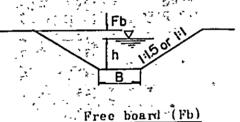
<u>B/h ratio</u> V1. (\*. · 2-

Extra Cembankment 3 .....

- -

3





Discharge (m <sup>3</sup> /sec)	Range of <u>B/h</u>	Representative B/h
Q > 36	1.0-1.5	1.5
36 ≧ Q > 10	1.0-1.2	1.2
10 ≧ Q	1.1-1.5	1.5

Earth Lined Canal & Earth Canal

Concrete Lined Canal

Discharge	Range of	Representative
(m <sup>3</sup> /sec)	<u>B/h</u>	<u>B/h</u>
$\begin{array}{c} Q > 25\\ 25 & \stackrel{>}{\geq} Q > 10\\ 10 & \stackrel{>}{\geq} Q > 5 \end{array}$	2,5-5.0 2.0-4.5 2.0-3.0	4 3 2.5
5 ≧ Q > 2	2.0-2.5	2
2 ≧ Q	1.0-2.0	1.5

N: \* 2 (i) Head reach. main canal. branch canals, and secondary canals ·· · . · .:

Water depth	Free board (Fb)	Extraembankment
(m) (m) (m)	(m)	(m)
Liess than 0.75	· 0.20	0.35
0.75 - 1.00	0.25	0.40
1.00 - 1.50	0.30	0.45
1.50 - 1.75	0.35	0.50
1.75 - 2.00	0.40	0.55
More than 2.6	0.45	0.60

(ii) Tertiary and Distribution canal

Free board for Tertiary and Distribution canals is 0.15 m.

Addingly, the extra embankments on the concrete lined canal are designed.

# Table-1157 OUTLINE OF PUMPING STATION Choluteca Middle Reach Valleys

### A)

sub-area         able area         discharge         head         of pump         of pumps         pumps           Morolica C         210         41.58         17         8.3         16 6         Centrifugal         pump           Morolica D         90         17.82         23         8.9         3          Centrifugal         pump           Morolica D         90         17.82         23         8.9         3 <th>Name of</th> <th></th> <th>Net irrig- Design - Total Capacity Number Type of</th>	Name of		Net irrig- Design - Total Capacity Number Type of
Morolica C       210       41:58       17       8.3       6	sub-area		
Morolica D       90       17.82       23       8.9       3         Orocuina E       150       30.90       23       7.7       5         " F       250       51.50       10       10.3       6         " G       100       20.60       15       10.3       3			$(ha) (m^3/min) (m^3/min) (m^3/min)$
Orocuina E 150 30.90 23 7.7 5 " F 250 51.50 10 10.3 6 " G 100 20.60 15 10.3 3	Morolica	С	210 41.58 17 8.3 1966 Centrifugal pump
"F       250       51.50       10       10.3       6         "G       100       20.60       15       10.3       3	Morolica	D	90 <sup>11</sup> 17.82 <sup>11</sup> 23.23 <sup>1</sup> 8.9 <sup>1</sup> 3.5 <sup>1</sup> 3.5 <sup>1</sup> 3.5 <sup>1</sup>
" G 100 20.60 15 10.3 3	Orocuina	E	150 30.90 23. 7.7. 5
	**	F	250 51.50 10 10.3 6
"H 540 111.24 15 22.3 6 6 19 7 19 7 19 7 19 7 19 7 19 7 19 7	**	G	100 20.60 15 10.3 3.
	13	H	540 111.24 15 22.3 6 6

### 

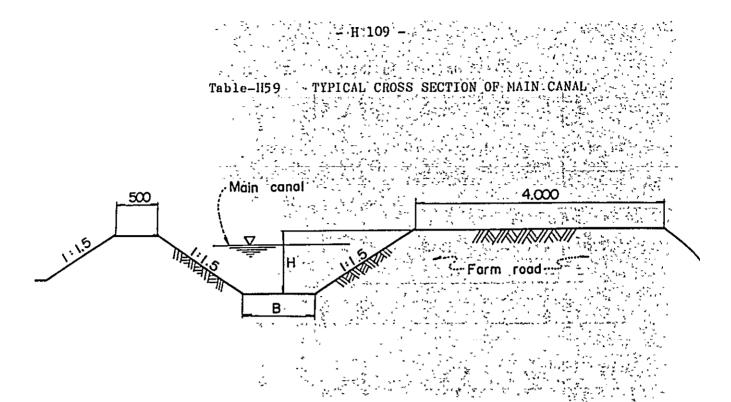
Name of sub-area		Dia. of Delivery pipe	Lêngth of Delivery pip	Type of Capacity of
		(mm)	(m)	
Morolica	C	800	50	Reinforced 37 concrete pipe
Morolica	D	600	100	1
Orocuina	Е	700	100	
**	F	1,000	· 50 -	· · · · · · · · · · · · · · · · · · ·
**	G	600	150	" 45
**	H	1,350	100	Steel pipe 90

and a second and a s The second and a second

B) San Ju	ian de Flores	Area	
Name of sub-area	Net irrig- able area (ha)	Design discharge (m <sup>3</sup> /min)	Total Capacity Number Type of <u>head</u> or pump of pumps pump (m) (m <sup>3</sup> /min)
А	230	19.86	40 6.4 4 Centrifugal pump
В	110	9.48	31 9.4 2 "

<u>sub-area</u>	Delivery pipe (mm)	Delivery pipe Delivery pipe Motor (m)
A	600	100 Reinforced 75
В	. 450	concrete pipe 150

4,	ن وی کی والا وی مرکز کی می مرکز کی مرکز مرکز کی مرکز مرکز مرکز کی مرکز مرکز			۲ <sup>۳</sup> ۵٬۰۰۰ ۳ ۲		- - +	ī.			• •	H	108 1	Ŀ.			
		DVal 7	720.8	· 592.6	1,175,5	1,545.0	461.1	193.2	218.7	۰. ۲. ۱	، ۱	90.4	734.3	1,148.5	(6,880.1)	= 0.882
		(3)/(9)	00 0. 0. 75	0.83	0.96	1.00	0.85	0.56	0.83	I	ł	0.53	0.89	0-95	£ DVai	a <u>EDVal</u>
مع المح المح		Unit Capacity	41.2	200		51.5	20:6		10.3	, , , ,	]	< 10.3	30.9	41.2		
		(4) x(8)	768.8	706-9	942.9	1.545.0	368.9	307.1	173.9	1	ı	5.57	585.8	918.8	(+.166,3)	= 0.819
	lleys (8)	( <u>1)/(1)</u>	0.80	. 66.0	0.77		0.68	0.89	0.66	•	ı	0.43	0.71	0.76	EDVa 1	a = <u>EDVat</u>
CABILITY OP	in Niddle Reach Vall (7)	Unit Capacity 12.9m <sup>3</sup> /min	38.7	25.8	51.6	51.6	25.8	12.9	12.9	1	,	12.9	38.7	51.6		
CALCULATION ON APPLICABILITY OP	£	DVai (4)x(6)	864.9	528.4	912.9	1, 545.0	276.7	231.2	1.29.1	- <i>-</i>	I	54.6	660.0	918.8	(6.151.6)	e 0.789
ALE CALCULAT	10N - Oroculina (6)	( <u>3)/(5)</u>	06.0	0.74	0.77	1.00	ົ 0.51	0.67	0.49	ı	ı	0.32	0.80	0.76	M DYA1	A = <u>2. DV a.</u>
Teble-‼58 SAMTLE (	PUMPINT STATION	Unit Capacity 17.2m3/min	34.4	- 34.4	, 21.6	51.6	34.4	17.2	17.2	1	ı	17.2	34.4	51.6		
Tet		UV (C) (U)	961.0,	· [7]4.0	1.224.5		542.5	0.245.0	263.5	5	0	170.5	825.0	1,209.0	£ DV (7,800.0)	
		250 ha 3	0.16	22.5 S	39.5	51.5	17.5	11.5	. 8:5	0	0	5.5	27.5	0.06	M W	
	(2) (2)	Djscharge m/min/ha	0.124	, o.102	0.158	0.206	0.070	0+0+0	0.034	` 0	٥	0.022	0.110	0.136		
	(1) Xumhur	Dav	10		, E	00	31	30	, 10	11	30	16	8	11		
		Month South Straft	NAN		, MAR	, AIN	YAY .	NN	, JUL	t, AUG	SEP	OCT	NOV	DEC		



A) Middle Reach Valleys

Name of Sub-area	Name of <u>Canal</u>	Net Irrig- able Area (ha)	Design Discharge (m <sup>3</sup> /sec)	$\frac{\mathbf{B}}{(\mathbf{m})} = \frac{\mathbf{H}}{(\mathbf{m})}$
Morolica C	No.1	210	0.693	1.00 0.80
Orocuina E	No.1	150	0.515	1.00 0.80
Orocuina F	No.1	250	0.858	1.00 0.80
Orocuina H	No.1	540	1.854	1.50, .1.50

B) San Juan de Flores Area

Name of Sub-area	Net Irrig- able Area Discharge B
	(ha) $(m^3/sec)$ $(m)$
A	230
В	110 0.158
	and the second

## Table-H60 RESULT OF WATER QUALITY ANALYSES

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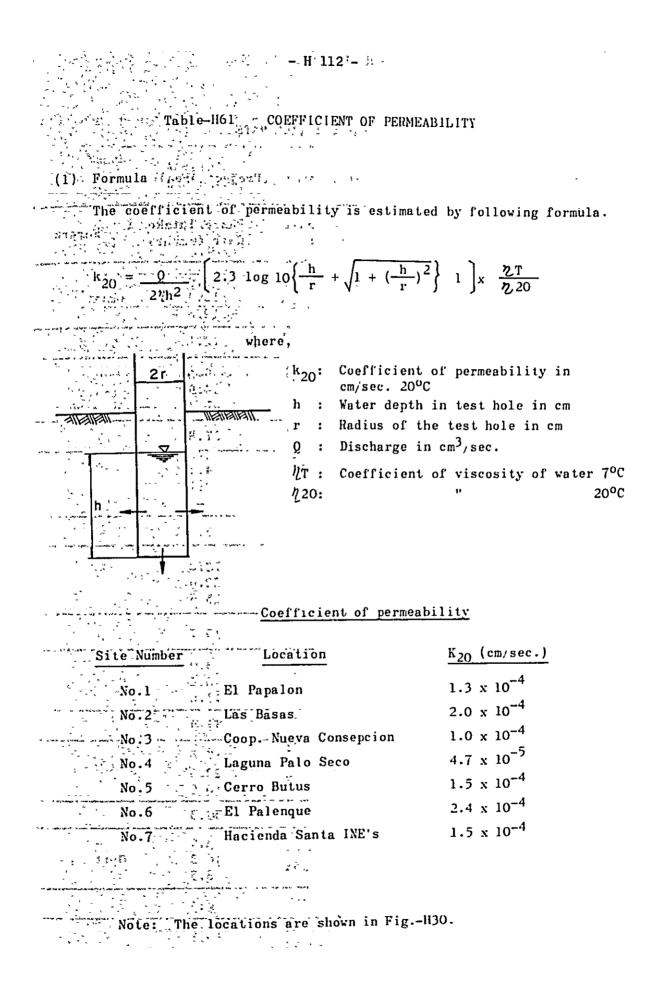
A) Choluteca Coastal Plain	Irrigation	Area (Project Are	9a )
	-	Florit	
Number Location	PH	Electric <u>Conductivity</u>	NaC1
		$\frac{\text{conductivity}}{(v_{\ell} \text{ cm})}$	(ppm)
No. 1. Marcovia	7.6		-
No. 2 La piletas	7.6	280 288	130
No. 3 El palenque	7.6	200	138
No. 4 El Botadero	7.9	1,100	140
No. 5 Zapote	7.4	440	520 210
No. 6 Buena vista	7.5	840	420
No. 7. Paroseco	6.4	2,000	1,000
No. 8 Long	7.35	180	220
No. 9 - Cortijo	7.4	400	180
No: 10 San jose	7.4	700	320
No. 11. Santa julia	7.5	372	170
No: 12	7.6	680	320
No: 13	8.2	15.000	8,800
No. 14	7.4	860	420
No. 15	7.1	570	270
No. 16	7.4	2,400	1,200
No. 17	7.2	360	1,200
No. 18	7.0	2,100	1,000
No. 19	7.2	970	490
No. 20 Sampile	7.2	180	84
No. 21 Gervaceas	6.4	110	50
No. 22 Sampile	6.4	60	28
No. 23	6.4	105	49
No. 24	6.2	58	26
	7.8	480	230
No. 25 El carrizo No. 26 Gervaceas	6.8	420	200
No. 27 Monjaras	0.0 7.0	360	160
NO. 21 Monjaras	7.5	345	140
• • • · · · · · · · · · · · · · · · · ·	6.7	300	140
No. «28		2,200	1.050
No. 29	7.4 7.2	460	215
No. 30		2,450	1,200
No. 31	7.6 6.8	340	165
No. 32 No. 33	0.0 7.2	580	270
No: 34	6.4	165	74
No. 35	7.1	700	320
No. 36	7.5	240	110
No: 37	6.9	140	62
No. 38	7.7	280	140

### •

Note: The locations are shown in Fig.-H30.

H-111. . . 15 grt B) San Juan de Flores Area Electric Site Location Conductivity PH NaC1 Number -\_` . <u>. . . ( ppm</u>) (v/cm) **,**, · . 155 -HE 1310 7.8 No. 1 350 175 8.7 No. 2 280 .143. 7.2 No. 3 295 150 8.4 . . No. 4 · . '· No. 5 Hacienda. La Cóncordia. , 7.6 155. ۰ ر Bridge , . -,,,,, No. 6 . 7.5 140 Paso La Ceiba 290 .

Note; •	The locations	are shown fin	FigH31	
4 <b>-</b> 1			42	
			a second a transformer de la constante de la co La constante de la constante de	



			H 113 -	المهم المراجع ا المراجع المراجع المراجع المراجع المراجع
			l an	
		Table-1162	BASIC INTAKE	RATE
Cholu	teca	Coastal Plain Irr	igation Area	(Project Area)
Numb		Accumulated	Intake Rate	Basic Intake Remar
of Spo		Discharge (mm)	(mm/hr)	Rate (mm/hr)
	1	15.0T0.30	270.0T-0.70	See Start 3: 9 . San Start Start
No.2	2		449.3T-0.61	12.3 Omit
	3	10.2T 22.1T 0.38	503.9T	12.8
Avera	ge	20.8T <sup>0.38</sup>	474.2T-0.62	12.1
	1	38.0T <sup>0.29</sup>	661.2T-0.71	9.0
No.3	2		"463", 3T 0 54	34.9
	3	38.9T	,073.6T <sup>-0.94</sup>	- 47:3 for the strange management
Avera	ge	30.0T <sup>0.43</sup>	774.0T <sup>-0.57</sup>	27.8
	1	22.6T <sup>0.27</sup>	366.1T-0.73	4.3
No.4	2	22.6 <sup>T</sup> 0.22	330.0T <sup>-0.78</sup>	2.7
	3	-		
Avera	ge_	24.6T <sup>0.24</sup>	354.2T <sup>-0.76</sup>	3.4,
	1	5.9T <sup>0.52</sup>	184.1T - 0.48	
No.5	2	8.6T0.55	283.8T_0.56	-22.9
	3	12.41	406.6T	15.6
Avera	ge	9.9T <sup>0.49</sup>	291.1T <sup>-0.51</sup>	15.7
	1	0.32	234.2T-0.68	······································
No.7	2	12.0T <sup>0.42</sup>	402 47	10.2 Omit
	3	12.2T0.42 12.0T0.42 11.2T0.46	309.1T <sup>-0.54</sup>	13.6
Avera	ge	12.3T <sup>0.43</sup>	317.3T-0.57	11.4
	1	36.3T <sup>0.49</sup>	,067.2T-0.51	57.6
No.8	2	30.31 32.2T 30.40 30.6T	773 87 0.00	22.6
	3		. 605.9T	10.9
<u>Avera</u>	ge	31.970.42	803.9T-0.58	
	1	12.1T <sup>0.40</sup>	290.4T <sup>-0.60</sup>	
No.9	2	12.11 30.9T 0.42	686.0T-0.58	16.3 Omit
<del></del>	3	30.9T 10.0T	252.0T <sup>-0.58</sup>	8.5
Avera	ge	11.4T <sup>0.40</sup>	273.6T <sup>-0.60</sup>	8.5
	1	25.6T0.34	522.2T-0.66	10.1
No.10		9.8T 9.1T		33.4 Omit.
<u></u>	3		273.0T	15.8 - Cast 12.5 L
Avera	ge	11.2T <sup>0.56</sup>	376.3T <sup>-0.44</sup>	13.0

	- 114-12		
B) San Juan de Flores Area			
Number of Discharge (mm)	Intake Rate (mm/hr)	Basic Intake Rate (mm/hr)	Remarks
No.11 2 4.3T 0.21 10.2T 0.29 4.3T 0.29 6.1T	189.7T <sup>-0.69</sup> 79.8T <sup>-0.71</sup> 186.7T <sup>-0.49</sup>	3.2 1.1 11.5	Omit
Average 6.1T <sup>0.37</sup>	135.4T <sup>-0.63</sup>	3.2	
No.12 2 3 7.9T	179.4T <sup>-0.54</sup> 123.2T <sup>-0.74</sup>	7.9 - 1.4	No Data
Average 7.4T <sup>0.36</sup>	159.8T <sup>-0.64</sup>	3.5	

Sample Number	L.C. PF. J	14.3	dry soll (g)	P.C. PF.J	PF. J	к.с.	IP.3	gravi ty	(14.3/1.84)			Molsture/10 cm
No.1	161.71 158.07	161.16 157.52	115.96	45.75	45.20 41.20	39.45 35.89	38,98 35,42	1.16 1.16	21.18 19.25	18.27 16.64		21.19 19.30
<b>مع</b> د ۱۰-۵۰ د ۱۰-۵۰	147.87	147.20	104.46 87.98	41.41	42.74 35.68	40.86	40.55	1.04 0.88	22.24	19.32 18.82		20.09 20.33
No.2 1 . 1 .	169:60	. 164.22	C8.001	38.77	96.66	29.63	25.52	1.31	13.87	15.76	 	20.65
(a)	157.46°	151.30	116.00	41.46	35.30	35.74	20,43	1.16	16.54	19.20	÷.	19.20
<b>.</b>	172.24	165.03	1 29 NO	43,24	36.03	33.52	27.93	1.29	15.18	18.34	i Z	22.27
7 <b>4</b> 7	1 1 1 28. 38	152.52	125.66	i 32.92	26,86	26,20	21.38	1.26	, 11:62	14:58.	L	18.37
No.2'	145.20	159.87		02.96	76.16	28.56	24.41	1.29	13.27	15.29		19.72
N		166.92	130.47	12.89	36.45	32.87	27.94	00.1	15.18	17:69	, 7 - 7	23.00
	· · · 164.14	157.70			H.19	, 32, 90 27, 53	27.68	- 57 	15.04	17.86		22.15
1 H H	165.72	159.69	127.64	38,08	20.56	68.62	23.11	1.28	; 13.65 ;	, 10.18		20.71
No.3 ' ' 1	166.08	162.39	123.10	42.98	39.29	. 34.91	31.92	1.23	17.35	17.56	- - - -	21.60
, (a)	E1-121	170.85	126.14	48.29	44.71	, 38.28	35.44	1.26	· 19-26 ·	19.02	1	23.96
<b>.</b>	174.19	-	126.83	47.36	44.01	97.34	34.70	1.27	. 18-86	· 21.22 · 5		26.95
-	174.87.	· 1711:45 - 5	123.58	51.29	47.87	41.50	. 38.74	1.24	50°12	10, 20.45 V.	112	25.36
11 2 C.0X	. 155.57 .	151.74	119.87	1 35.70	31.87	29.78	26.59	1.20	14.45	*;``!`.15.33 *	111 - 57 -	
- (P) 🦾 📜 🤇	175.39	172.10	129.66	15.93	42.44	35.42	32.73	1.30	· · · · 17.79	17.63	,¥ 	22.92
	171.06	169.73	127.32	45.74	42.41	135.93	16.66	1.27	18.10	17.83		22.64
	6 3 m 166.72 '	163.33	· 116.78	, 19.91	46.55	42.76	· 39.86	1:17 A.	ູ່. <b>21.66</b> ໂ	21.10	,,, ' 	24.69
2 G 2 F. VA	1 181 12	181.98		00.05	, 10 C F		18 28				-	1 50 50
•	162.72	162.48			z~ `	11.89	31.69	1.23	17.22	14.67		18.04
	149.59	149.41	111.45			* 34.22	34.06	1.11	18.51	15.71	, F	17.44
, <del>1</del> ,	161.46	163.16	133.21		29.95	22.71	21.48	1.33	12.22	10.49		13.95
No.5 ( 1)	169.54	162.50	133.30	36.24	29.20	, 27, 19	10.11		11.91	15.28	· · ·	20.32
, , , ,	171.43	164.39	129.53	11.90	35.06	32.35	27.07	1.30		17.64	- 1 	22.93
	· · · · 14].47	136.78; 4	[1.70]	, <b>36.3</b> 4	29,65	; JJ.92	27.68	1.07	15.04	· · · · · · · · · · · · · · · · · · ·		20.20
. · F 4	137.65	130.51	106.39	. 31.26	24.12	29,38	22.67	, 06 ,	،	· · · · · · · · · · · · · · · · · · ·		18-08
·	. 150.021	147.01	113.91	35.02	01.10	12.06	26.83	1.16	14.58	. 15.63	- * - 	18.13
ei G	رو.acı 📜	133.67	109.33	29.60	26.34	27,07	24.09	1.09	, 1 <b>3.0</b> 9 .	· 13.98 ·		15.24
	-	138.10	08.701	: 33.52	30,20	, 31-09	28.01	1.08		15.81 ·	1.	17.14
	143.96	139.51	107.48	× 36.48	<b>52.03</b>	33,94	29.80	1.07.	{ · · · 16.20 <sup>†</sup> }	11.74		18.98
No.11 11.02	167.52	157.59	137,66	29.86	19-03	21,69	14.48	1.38	7.87 3	1 13.82	]  ]	19-07 5
<b>.</b>	174.38	163.60	117.88	50.36	25.72	26.47	18.65	1.38		s 16.33	, 2, 1 , , , , , , , , , , , , , , , , , ,	22.54
	150.11	142.77	121.04	29.07	. 21.75	24.02	17.95		- <b>-</b>	14.26	1 June 1	17.25
	01.9910	190.07	155.98	11:12	, 60 <b>.</b> •C ),	: 27.64	21.86	1.56		12.76		24.59
. No. 12 N	179.18	176.74	139.86	39.12	16.88	11.28.11	26. 17	· ' 1 40' ' -	1. 200 1	Ac.11.1	2 2 1 2	. io 29'
·	164.68	160.28	110.82		29.46	25.88	22.52	1.31				17 55 5
<u>, 1</u>	· [12.13]	168.84	44.46	10.05								
						14.00 1		1.20	, '' SL.SI'	. 18.04		22-73 (*

FIRAD CAPACITY, WATER CONTENT AND AVAILABLE NOISTURE OF SOILS

Table-llb3

				े <u>इन्द्र</u> ी।	116 -		
	Sorghum	85 80	80-85		80-81	81	73
	Water Melon		814 Frank		7677	77	69
	Cotton	124 125	12 <u>4</u> 2125**	117 126	117-126	123	104
STURE (mm)	C. r' o ' p ' s Sesame	113	107-113	107 109	107-109	108	76
ILABLE NOISTURE	C Maize	113 S	,,107–113 <sup></sup>	107 109	107-109	108	79
READILY AVAI	Beans	79 74	. 62-42	75 76	75-76	76	68
TOTAL	Sugarcane	, 119. , 113.	• • • • • • • • • • • • • • • • • • • •	113 114	113-114	114	102
Tuble-H64	Pasture	72		74 74	12-12	72	64
	Spot Number	No. 1 No. 3	Range	No. 4 No. 5	Rango	No. 2	No. 6
	Land Capacity	t class		Znd class "		2nd class	3rd class
	Soil	Mollisol "		Moiljisol "		Entisol	Entisol

			• • •	• • • - •	H	117 -			
	Sorghum	5.5	ر بر بر بر بر بر بر بر بر بر بر بر بر بر بر	<u>80-85</u> 14-15	80-81	<u>81</u> 14			
	Melon & Water Melon	3.0		81	25	77	69 		
	Cotton	6.8	-	<u>124–125</u>	<u>117-126</u> <u>17-18</u>	123	104		
۸L	Sesame	5.5	v	<u>107-113</u> <u>19-20</u>	<u>107-109</u>	108	<u> </u>		
TRAFFICE AND AND AND AND AND A	<u>Maize</u>	5.5		<u>107-113</u>	<u>107–109</u> 19	108	71		
	Beans	5.4		<u>74-79</u> 13-14	75-76 13-14	14	<u>68</u>		م بر مرکز میں - مرکز - مرار - مراکز - مراکر - مراکر - مراکز - مراکز - مراکز - مراکز - مراکز - مراکر - مراکز - مراکز - مراکز - مراکن - مراکر - مراکر - مرا - مراکر - مرا - مرار - مرا - مرار - مرا - مرام - مرا - مرار - مران - مرام - مرام - مرام - مرام - مرانم - ممار - ممار - ممار - ممر - مرام - ممار - ممار - مم
	Sugarcane	7.1		<u>113-119</u>	113-114	114	14		
COM-ATONT	Pasture	7.7	2) <b>4</b> 4	72	)	125	64 <sup>1</sup>		
<b>1</b>	Crops	Max. Consumptive use (mm/day)		TRAM (mm) Irr. Interval (days)	n) vul (days	TRAM (mm) Irr. Interval (days)	TRAM (mm) [I'rt', Interval (days)		
			Suil Type & Land Capacity	Mollisol (lst.class)	Millisol (2nd.cluss)	Entisol (2nd cluss)	Entisol (3rd class)		

A Table-H66 WORKABLE DAYS

	JAN	FAB MAR			JUN	JUL	AUG	SEP	OCT	NOV	DEC
1963	िती है। स. अन्ति			8.28 -	-		18	17	20	21	27
1964	a	25.1 27	24	23	15	16	20	15	21	26	26
- 1965 (A	27	24 27	26	21	15	22	-	15	_	-	-
1966	به ۲۵۵ (ب. مربع المربع الم	. 24 . 27	24	19	12	19	24	15	17	26	27
1967 2 1	26	-2425 ·	22	27	14	24	22	16	22	25	26
1968	27		25	16	7	26	23	12	14	24	26
<b>`</b> ,``1969	· · ·	24, 25	23	19	16	20	14	15	16	23	27
¢1970	27	24	25	18	-	17	14	12	20	23	27
1971	26	24 27	26	20	21	25	15	13	16	24	27
1972.	26	25 27	24	17	18	21	22	21	16	24	27
1973			25	20	18	20	18	17	16	26	26
1974	26	24 27	26	19	18	27	21	16	22	25	27
1975	26	24 27	26	19	21	20	21	12	20	20	27
1976	· · · · ·	, <u>-</u>	-	23	16	25	-	-	-	-	27
Average		. 24 27	25	20	16	22	19	15	18	24	27

•

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# Table-H67 LENGTH OF MAIN.BRANCH AND SECONDARY CANALS IN WESTERN PLAIN (PROJECT AREA) Unit: km Main Branch Secondary

	2,53+	· · ·		/		
Upper Main Canal	، « ، « » ، ويوعد المحمد . 	ودید م مردد شیسید . [ ب أ بر ] [ ب أ بر ]	2.8	يدر ويعنون يا يون 	1. 1.	
Secondary canal	R-0-1		· · · · · · ·	۰ . ۵۰۰۰		5.0
Secondary canal	R-0-2	, . 			, " ,	
Secondary canal	R-0-3	_ # x	1	,		8.0
Secondary canal	R-0-4	_ }-			ě.,•	8.0
Left Main Canal, LM	1-1		8.6	· · · ·	* <sup>*</sup>	a destruction of
Secondary canal	R-0-7			• 5		2.3 **
Left Branch Canal	LB-1		··· · · ·		9.0	
Secondary canal	L-1-1 *	'yır 7	· • • • • • • • • • • • • • • • • • • •	. *	ť.,	· · · · · · · · · · · · · · · · · · ·
Secondary canal	L-1-2			د د و ۲۸	\$ 7	2.0
Secondary canal	• *	ν <u>τ</u>	• •		_	2.0
Secondary canal			ه سی ۲۰ به		č :	1. TALUILO (
Secondary canal		- - -	•	, , , .	22	
Left Branch Canal				د • •	2.5	ي ٿي جو
Secondary canal	<b>*</b>				ť	11.5
Secondary canal	• • • • •	ž. 1	1 e 1	•	Σ,	
Secondary canal	L-1a-3	- -	1	<u>ن</u>	-	· · · · · · · · · · · · · · · · · · ·
Right Branch Canal	-	۰ _ ۳-	- <b>-</b>	**	7.0	
Secondary canal	R-1-1			-	"* ≠ *¥7,	-2.8
Secondary canal	-				•	4.5
Secondary canal	-				· .	4.0
Secondary canal			، ۵۰۹×۹۰ مد میں میں میں 		· · · · · · ·	**************************************
Right Main/Canal		1	4.9			
Secondary canal	R-0-5	× .	 -			3.6
Right Branch Cana	1 RB-2-	,			11.8	
Secondary canal	R-2-1		,	, <b>`</b> `	,	3.7
Secondary canal	R-2-2					2.2
Secondary canal			e.			· · · · 1.5
Secondary canal	R-2-4 ∽		<u> </u>			· · · · · · · · · · · · · · · · · · ·
Right Branch Cana	1 RB-3		- -	т.,	9.0	۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰۰ ۲۰۰
Secondary canal	R-3-1	4	4-	- 4	`.	2.4
Right Branch Cana	1 RB-4	· · · · .	·	, <del>1</del>	7.2.	
Secondary canal	R-4-1		 سر سر ا	-		2.2
Secondary canal	R-4-2-		- ¥£ ,	ty -		1.8·2,
			26.3		46 5	RA 8

- H-120 -Table-H68 LENGTH OF MAIN-AND SECONDARY DRAIN IN WESTERN PLAIN (PROJECT AREA) Unit:

		Unit: kr
	Main Drain	Secondary Drain
Right Main Drain RMD-Tatas	15.0	
Secondary Drain RD-1-1		1.5
Right Main Drain RMD-2	21.3	
Secondary Drain RD-2-1		2.5
Secondary Drain RD-2-2		1.2
Right Main Drain RMD-3	7.5	
Secondary Drain RD-3-1		3.5
Secondary Drain RD-3-2		0.5
Secondary Drain RD-3-3		2.5
Secondary Drain RD-3-3a		3.2
Right Main Drain RMD-3a	1.9	
Right Main Drain RMD-4	14.0	
- Secondary Drain RD-4-1		1.6
Secondary Drain RD-4-2		1.0
Right Main Drain RMD-5	9.4	
Right Main Drain RMD-6	8.1	
Right Main Drain RMD-7	6.5	
Right Main Drain RMD-7a	3.9	
Right Main Drain RMD-8	1.2	
Right Main Drain RMD-9	3.1	
Left Main Drain RMD-7	2.0	
Left Main Drain RMD-7b	3.5	
Secondary Drain LD-7b-1		4.0
Secondary Drain LD-7b-la	-	1.0
Left Main Drain LMD-14	3.3	
Left Main Drain LMD-15	6.0	
Left Main Drain LMD-16	1.5	
Left Main Drain LMD-17	1.5	
Left Main Drain LMD-18	5.0	
Left Main Drain LMD-19	2.0	
Left Main Drain LMD-20	1.5	
Total	121.9	22.5

¢,

- H 121 -Table-H69 NUMBER OF RELATED STRUCTURES ON THE WESTERN PLAIN AREA (PROJECT AREA)

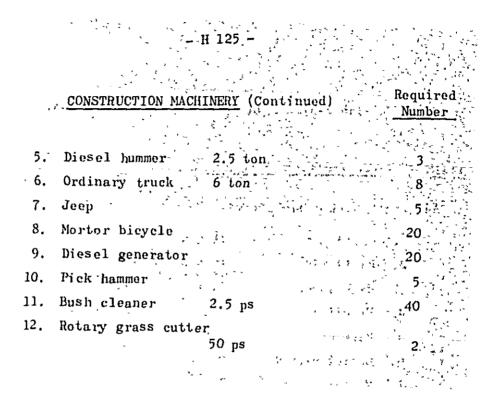
ب من از و این	Structures	Structures	Related
	related to	-related to	structures
	Irrigation Canal	Drainage Canal	on Farm
Name of Related Structures	(Nos)	(Nos)	Erus Linin e
······································	(1105)	State State	
1. Intake Weir	1	ja na servizija	
2. Desilting Basin	1 ,	تېد ۱۳۹۰ ( <u>تې</u> ده کې د ۲۰ ۱۳۹۰ - پې بولو کې تې	
3. Bifurcation Structur	e 1	and the second	· · · · · · · · · · · · · · · · · · ·
4. Turnout	287	· · · · · · · · · · · · · · · · · · ·	
5. Cross Regulator	78	\$# +2 \$* \$2 \$* ** \$* \$25\$ \$*\$	· · · · · · · · · · · · · · · · · · ·
6. Drop	51		
7. Colvert	36		
8. Spillway	28		· · · · · · · · · · · · · · · · · · ·
9. Syphon	1	t the state	
10. Drainage Culvert	-	· 22 ·	
ll. Bridge	-	°	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
12. Cause Way	~		
13. Booster Pump Station	: 1		۲۹۲۲ (۲۹۳۲) ۱۹۹۹ (۲۹۳۲) ۱۹۹۹ (۲۹۹۲)
14. Division Box	×	태고 · · · · · · · · · · · · · · · · · · ·	
Total.	* , ,	-* ;	C. Switz and WEIGHT states and states.

	DRK QUANTITY AND DNSTRUCTION MATER WESTERN PLAIN ARE	
Description	Unit	Quantity
1. Head Works (El Papalon Intak	e Weir)	
Excavation	m3	29.500
Backfill	m <sup>3</sup>	6.600
Concrete	"3	15,300
Reinforcement bar	ton	240
2: Irrigation Canal Excavation	տ <sup>3</sup> 3	133.800
Embankment	m <sup>3</sup> m <sup>3</sup>	1,153,900 153,000
Stripping	m <sup>2</sup> m <sup>3</sup>	27.600
Concrete lining 3. Drainage Canal		
Excavation 4. Link Road & Farm Road	m <sup>3</sup>	970,000
Embankment	m <sup>3</sup>	153.000
Stripping	m3	86.000
Gravèl metalling	m <sup>3</sup>	42.000
5. Related Structures	<sub>m</sub> 3	31.500
: TExcavation	m <sup>2</sup> m <sup>3</sup>	2.400
Embankment	m <sup>2</sup> m <sup>3</sup>	9.800
Backfill	m² m3	12,300
Concrete		570
Reinforcement bar	ton	

1. . . . Table-H71 STAFFING , \* , = <u>,</u> 5 د تر برد دوم مولوند <u>محمد</u> برد مرجد مرجد مرجد برد مرجد 1) Staff Required During Construction Resident Manager 1.2.1 ు శార్ 🗋 🕯 Construction engineer Secretary Construction ' Chief Architects Civil engineer Assistant civil engineer Irrigation engineer 8 .: **16**΄ Assistant irrigation engineer Secretary: \_\_\_\_\_ 12-• • • Mechanical and Electrical Chief Electrical engineer Mechanical engineer Assistant mechanical engineer Skilled labor Secretary A. C. -----Laboratory Material engineer Assistant material engineer II) Staff Required of Operation and Management. Resident Manager Operation and Maintenance Chief Sub-director Civil engineer 1.147 2.50 - **-** -Assistant civil engineer Irrigation engineer \*≥\*\*v ≤ **8**. Assistant irrigation engineer Electrical engineer Driver ie ;÷: **7**. Forman 12 Secretary Repair Shop and Motor Pool Chief ..... Nechanical engineer Assistant mechanical engineer Driver Secretary 1 \_\_\_\_\_ 4 2 1-j

Construction Machin	iery	Required Number
	• e <sup>2</sup>	
A) Earth Moving Machinery		
Bulldozer	21 ton	9
2. Bulldozer	15 ton	5
3. Rake dozer	21 ton	8
UT4. Dragline	0.8 m <sup>3</sup>	3
5. Backhoe	Q.6 m <sup>3</sup>	5
6. Mortor grader	9 ton	8
7. Mortor scraper	11 m <sup>3</sup>	4
8. Tractor shovel	0.6 m <sup>3</sup>	16
9. Tractor shovel	1.0 m <sup>3</sup>	32
10. Dump truck	8 ton	13
11. Tamper	80 kg 4 ps	6
12. Tyre roller	8 ton	8
13. Tractor	6 ton	2
B): Concrete Machinery		
	$(0.3 m^2 x 2 N_{05.})$	5
1. Slop form	(0.3 m x 2 xos.) 3 m <sup>3</sup>	, 9
2. Truck mixer		4
3. Portable butcher	0.6 m <sup>3</sup>	4 2
4. Concrete mixer	3 m <sup>3</sup>	
5. Vibrator	10,000 rpm 0.5 ps	32
na antis in the second seco	$12 \text{ m}^3$ , hr	26
·6: Compressor	14 16 7 11	
C)~_Others		
1. Truck crane	10 ton	4
2. Truck crawler cra		1
3. Belt Conveyer	(35m - 10m)	10
4. Submergible pump	(80 mm)	20
	(4 ps)	

- H 124 -Intipover Table-H72 LIST OF CONSTRUCTION MACHINERY .

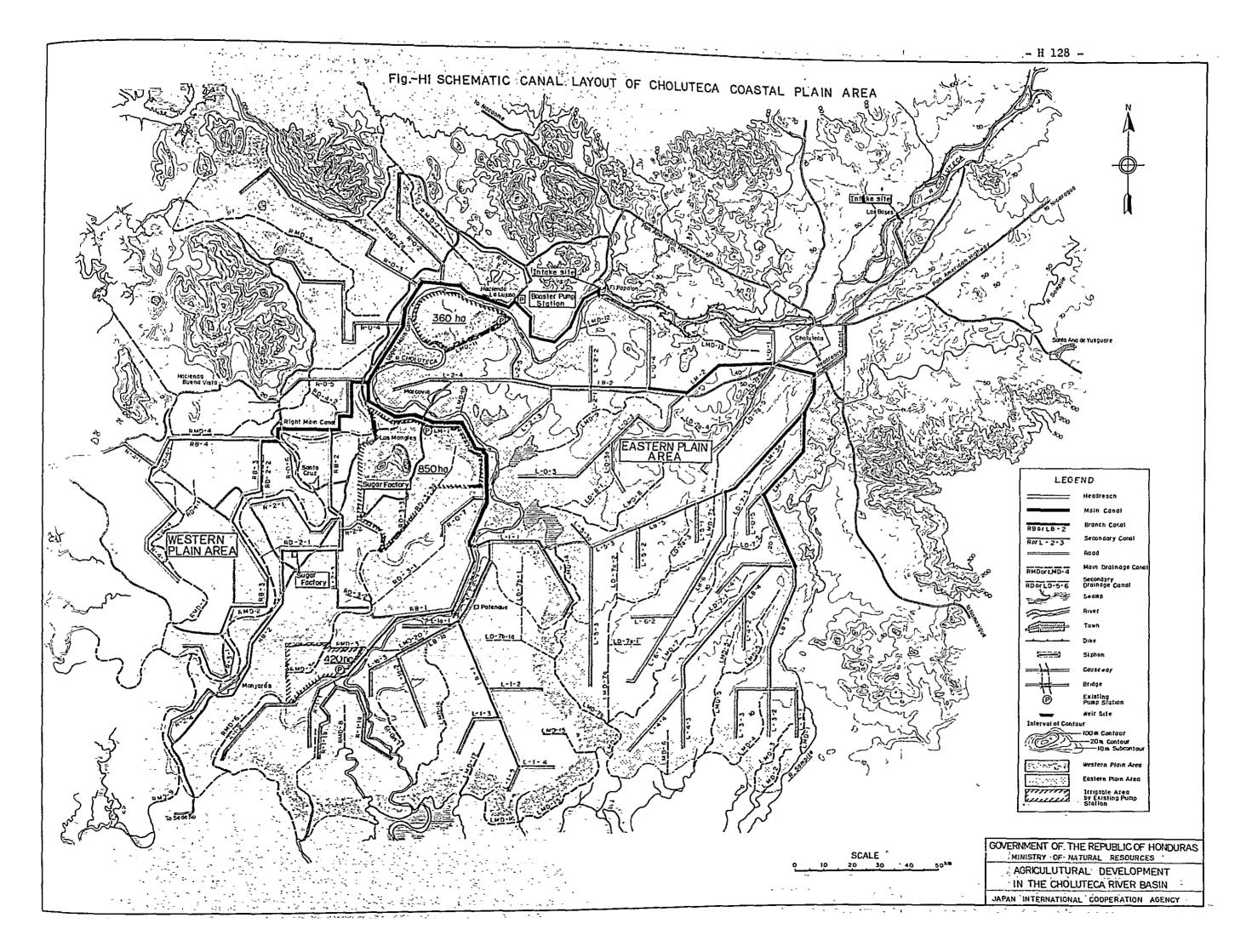


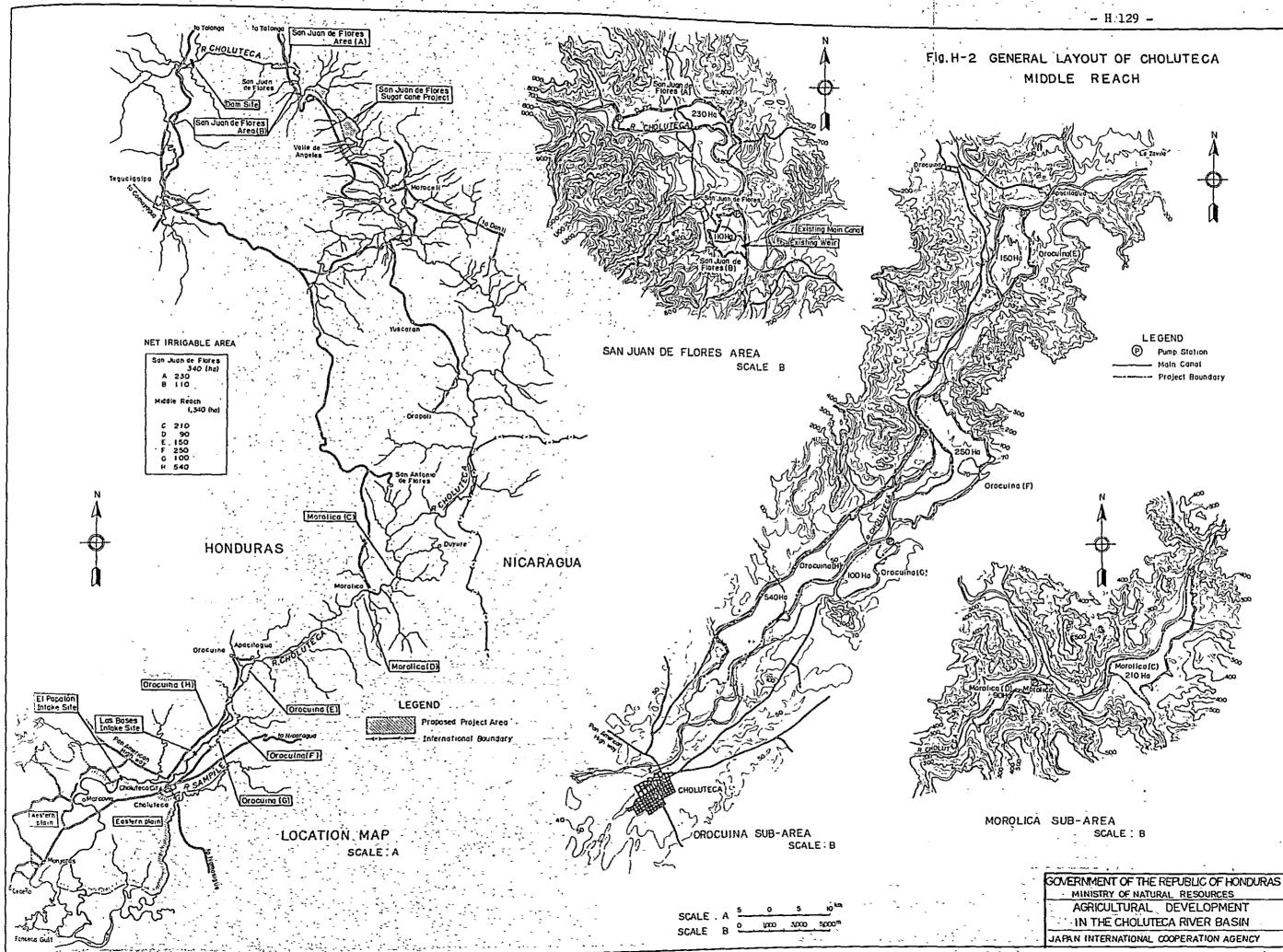
- H 126 -Table-H73 OPERATION AND MAINTENANCE COST

...

	Operat hour p	ion er year		Cost <u>/*</u> per_hour	Cost per vear
	dau v	hours	-		
A) Easth Moring Machinery	uay x	nours			
1. Bulldözer 21, ton	150	6	2	28.22	- 50,800
2. Bulldozer - 15 ton	150	6	1	21.38	19.250
3. Rake dozer	້ 150	6	2	28.35	51.030
4. Dragline 0.8 m <sup>3</sup>	150	6	1	17.53	15.780
5. Back hoe 0.6 m <sup>3</sup>	150	6	1	10.67	9.610
6. Mortor. grader 9. ton	150	6	2	13.50	24,300
7. Mortor scraper 11 m <sup>3</sup>	150	6	1	44.91	40,420
8. Tractor shovel	150	6	-4	5.97	21,500
9. Tractor shovel 1.0 m <sup>3</sup>	150	6	7	8.47	-53.370
10. Dump truck 8 ton	180	6	2	5.72	18,540
11. Tamper 80 kg 4ps	150	6	2	0.89	1,610
12. Tyre roller - 8 ton	150	6	2	8.72	15.700
13Tractor 6 ton	230	6	1	6.22	8,590
Sub-total (1) B) Concrete Machinery	•				330,500
1. Truck mixer 3 m <sup>3</sup>	130	6	2	8.16	13,670
2. Portable butcher. 0:6 m <sup>3</sup>	130	6	1	3.66	2,860
3. Concrete mixer 3 m <sup>3</sup>	130	6	1	14.45	11,280
4. Vibrator 10,000 vpm - 0.5 ps	130	6	7	0.61	3.340
Sub-total (2)		3		-	<u>31,150</u>
C) Others 1. Truck crane 10 ton	100 -	6	1	11.67	7.010
2. Belt conveyer, (35cm-10m)	150	6	2	0.87	1.570
3. Submersible pump (80 mm) 4 ps	110	6	4	1.48	3.910
4. Diesel hummer 2.5 ton	100	6	1	9.91	5,950
5. Ordinary truck 6 ton	300	4	2	1.32	3,170
6. Jeep	300	<b>4</b>	13	2.12	33.080

		- <u>-</u> 1.97.						
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	•			ا با ماند ا ماند محمد ا	2			
Construction <u>Ma</u>	chiner	v Onera v hour	tion per vear	-	Cost/1 Cost per hour per year			
7. Mortor bicycle	8 ( ) <sup>8</sup>		4	26	0.45 14,040			
8. Bush cleaner 2.5ps		230	6	8	0.12, 1.330			
9. Pump and morter	N. 1.8 J							
Contrifugal type 44	m <sup>3</sup> /min	1,100	<u>_</u> 2_,	2	3.74 8,230			
" 45	0	1,260	and the	2	3.74 9,430			
" 70	11	. <mark>,</mark> 920	-:- : j	2	4.74 8,730			
" 85	-	1,130	. Tr.1	2	6.33, 14,310			
Electric charge		,	ž "	LS	17;250			
Sub-total (3)	,	•	ı	`				
		ar u	•	4 ي				
Total Su	b-total	L (1) - (	3) 👘 '	۰,				
	•	•	÷ ,	۴				
Miscellaneous 10%		•	<b>ž</b> -		<u>48,970</u>			
		۰.	· *					
Grand total			P, ",		<u>538,630</u>			
		5	∞1 ¥ ⊶ 4 ∞ ¥					
$0 \& M \cos t$ 538,630(\$) + 15,600(ha) = 34.5 \$/ha.								
			- *	ಟೆ ಇತ	en en la contra de la serie			
		• •		' 1				
$\underline{/1}$ : Operation cost includes the replacement cost of machineries								
		× , 1 .		. • 1				

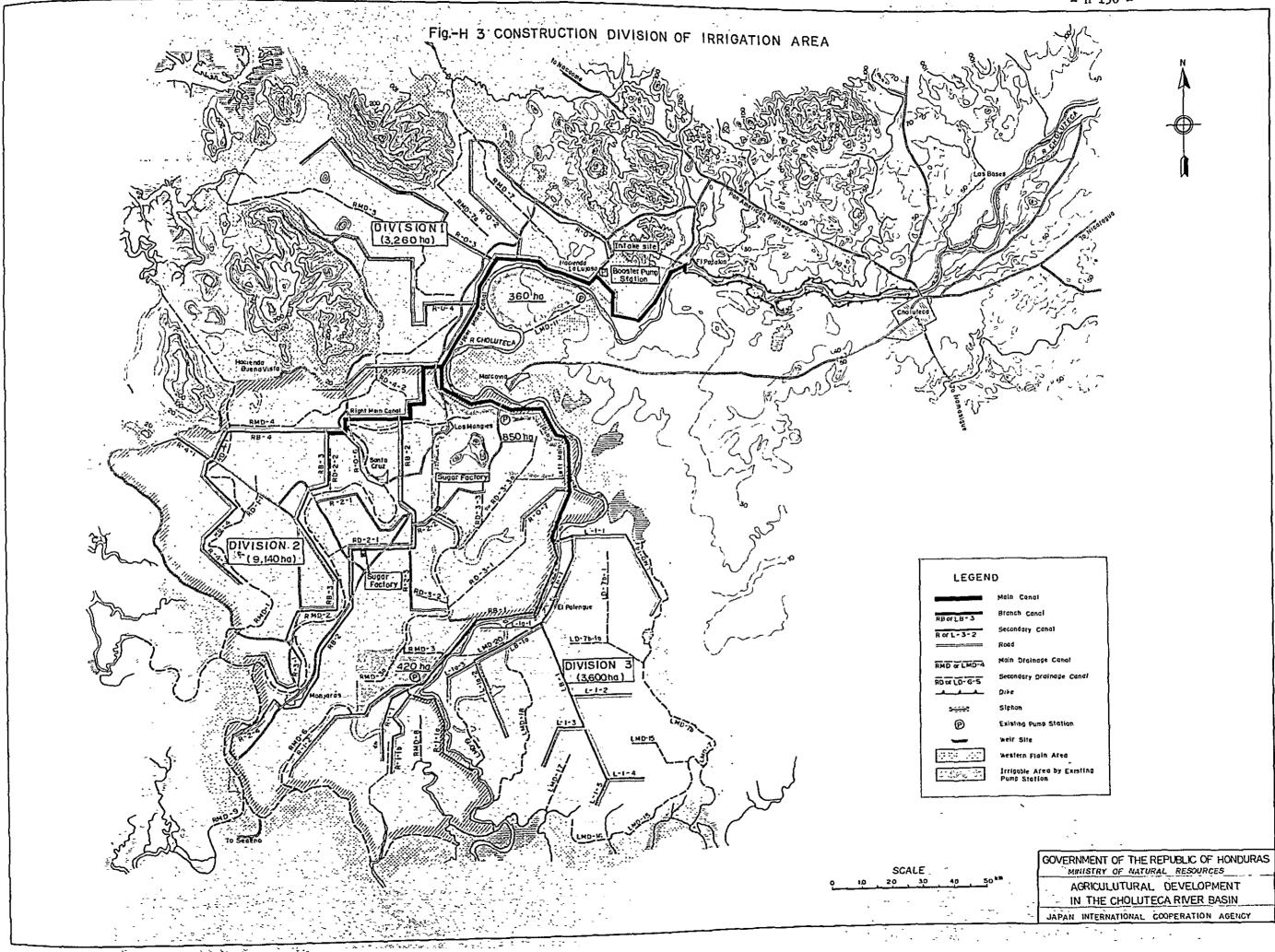




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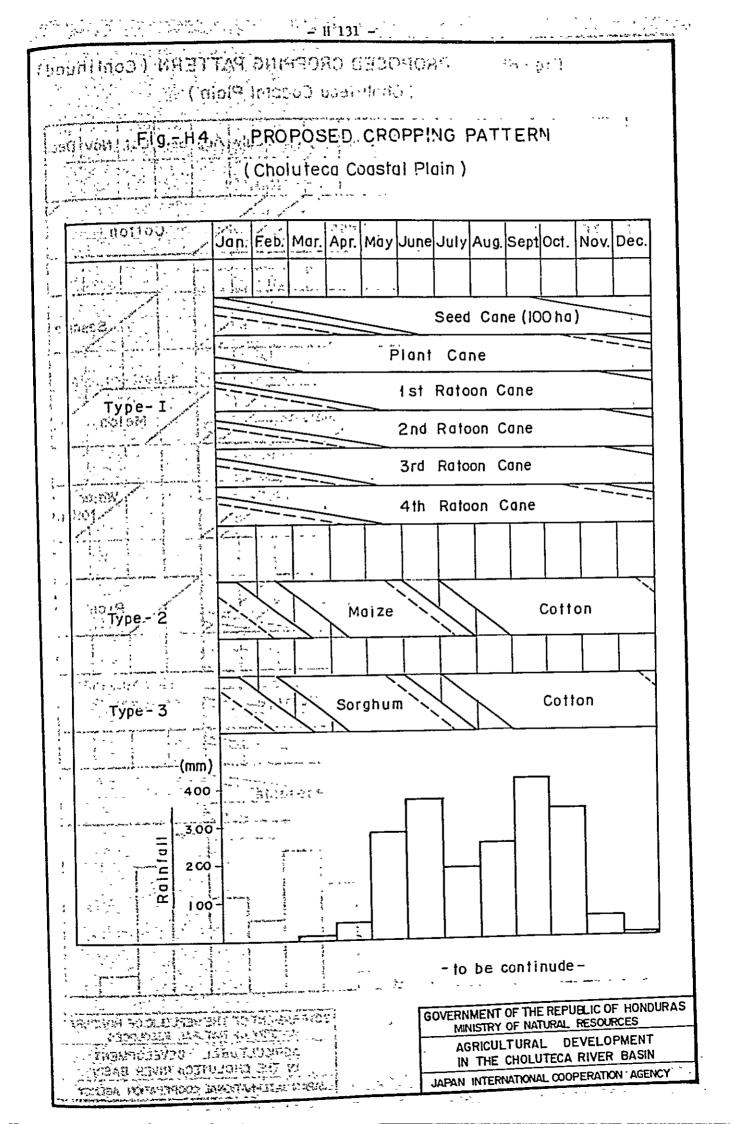
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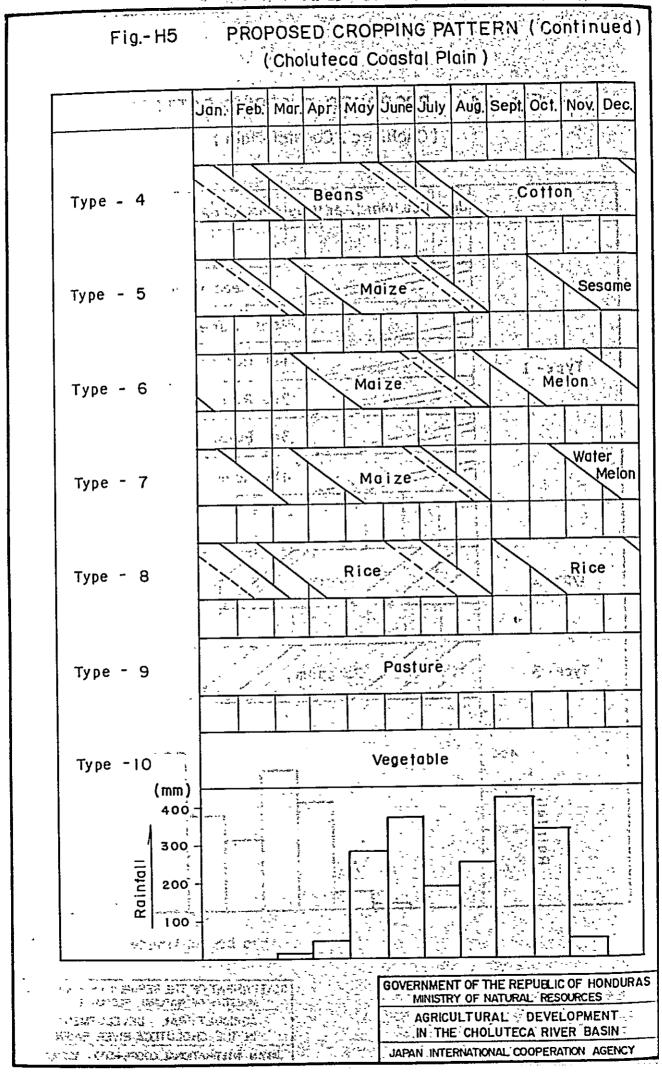
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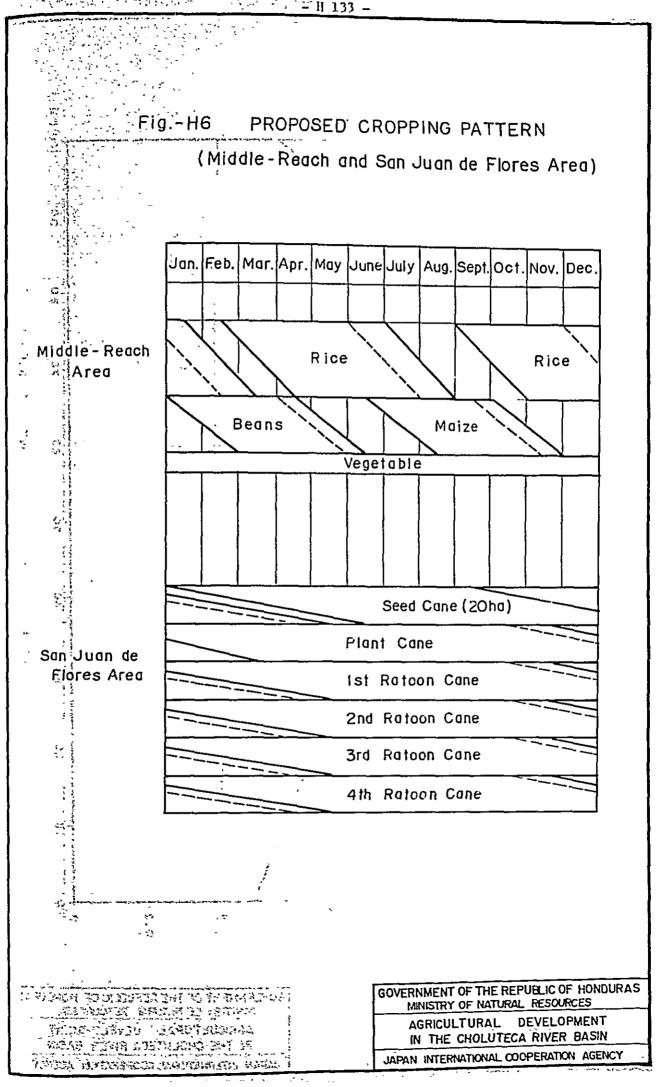


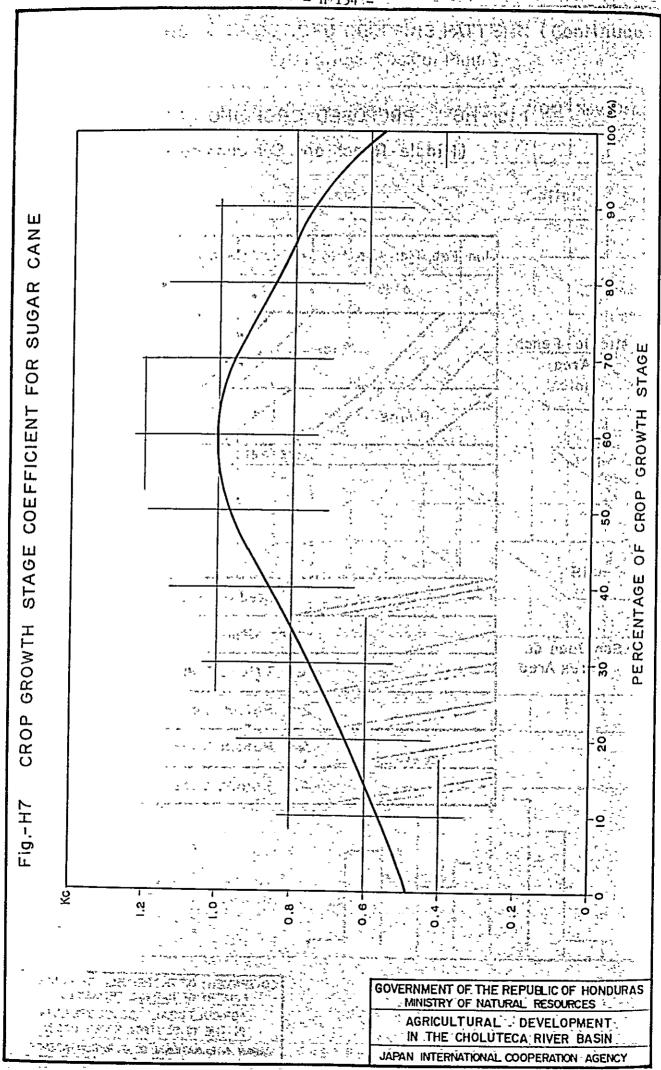
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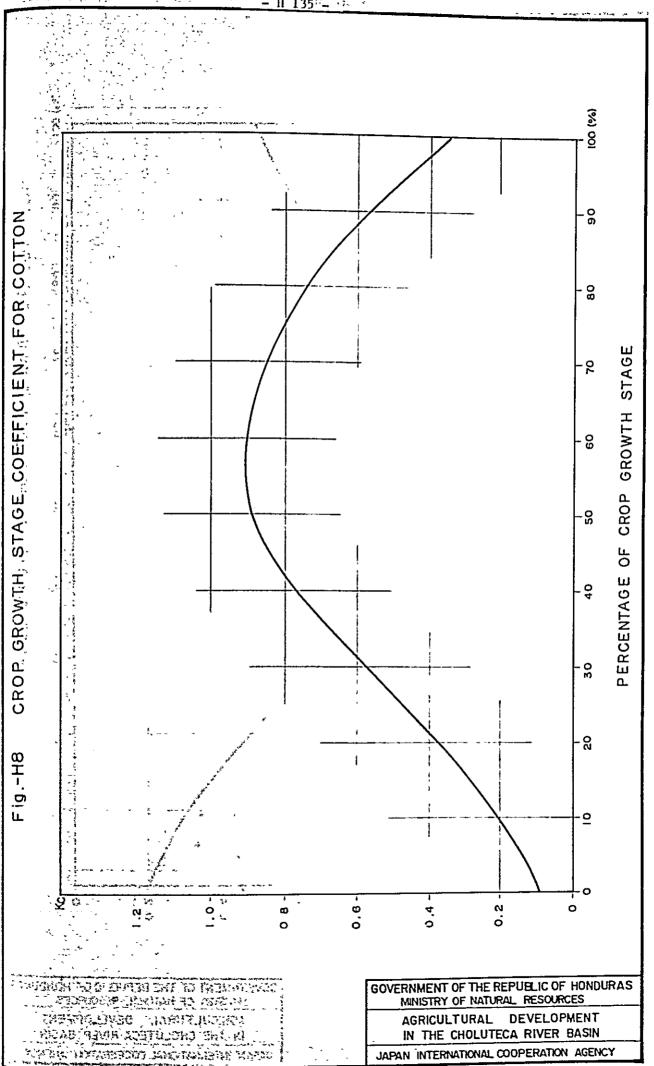


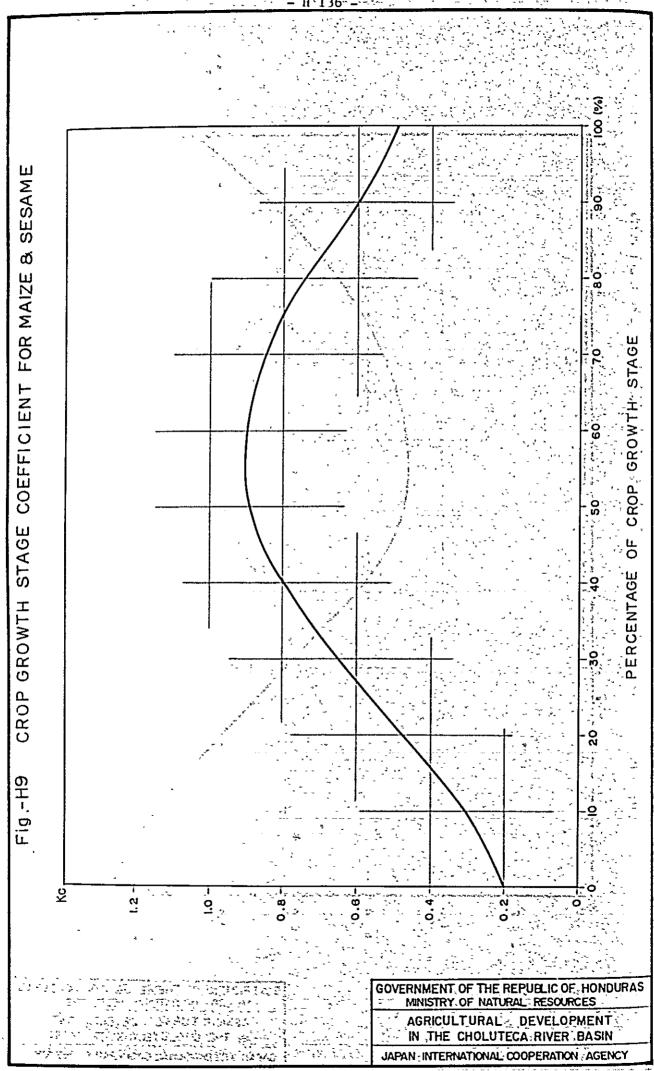




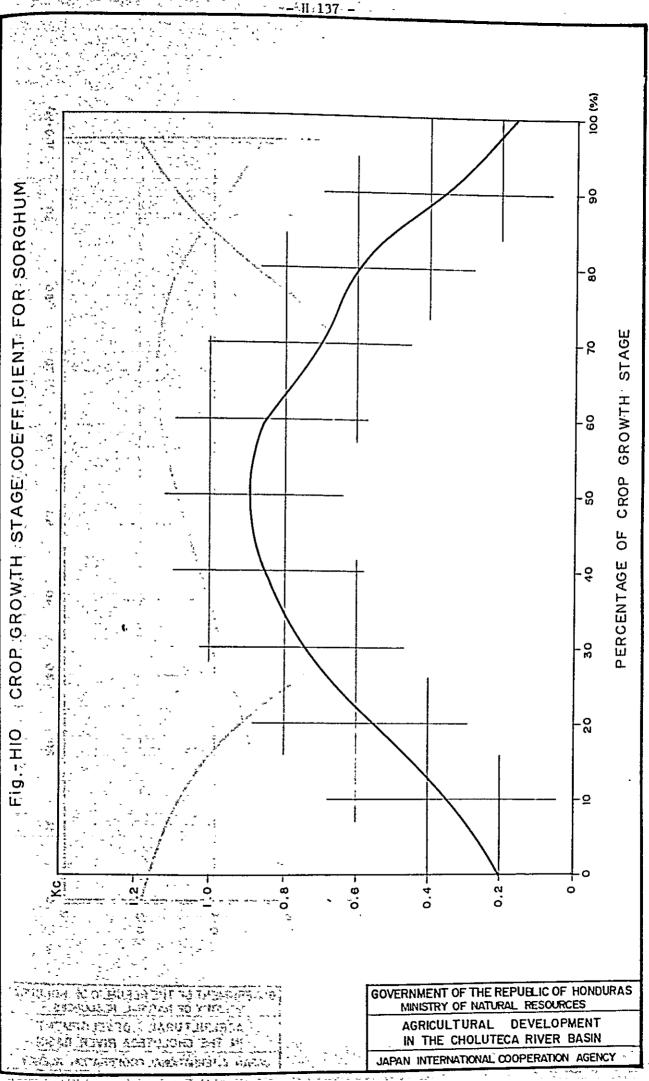




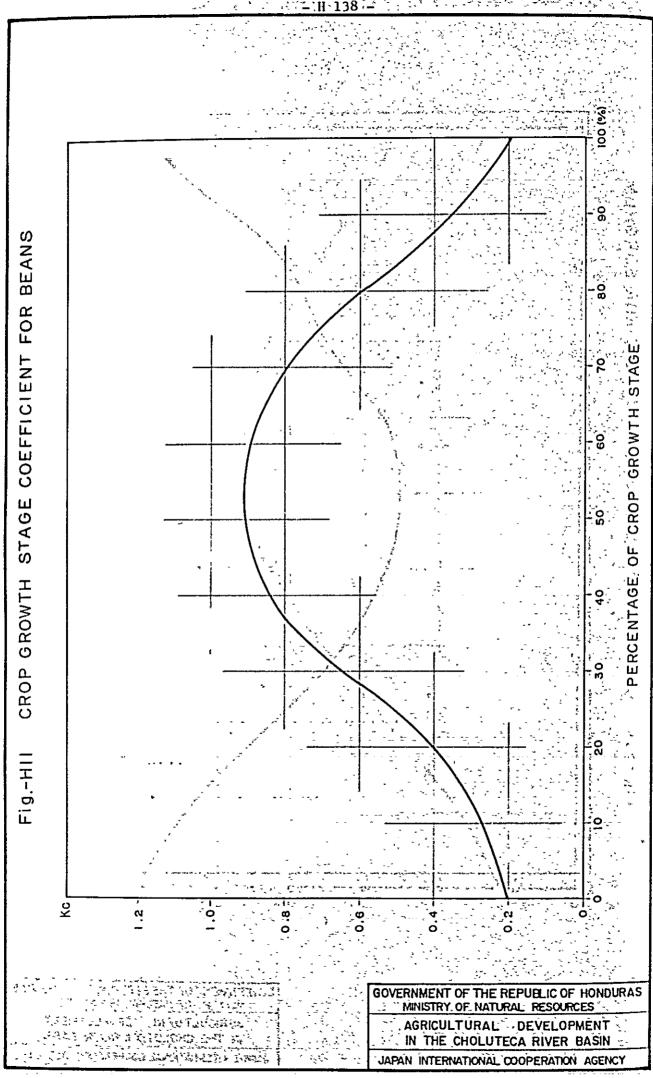


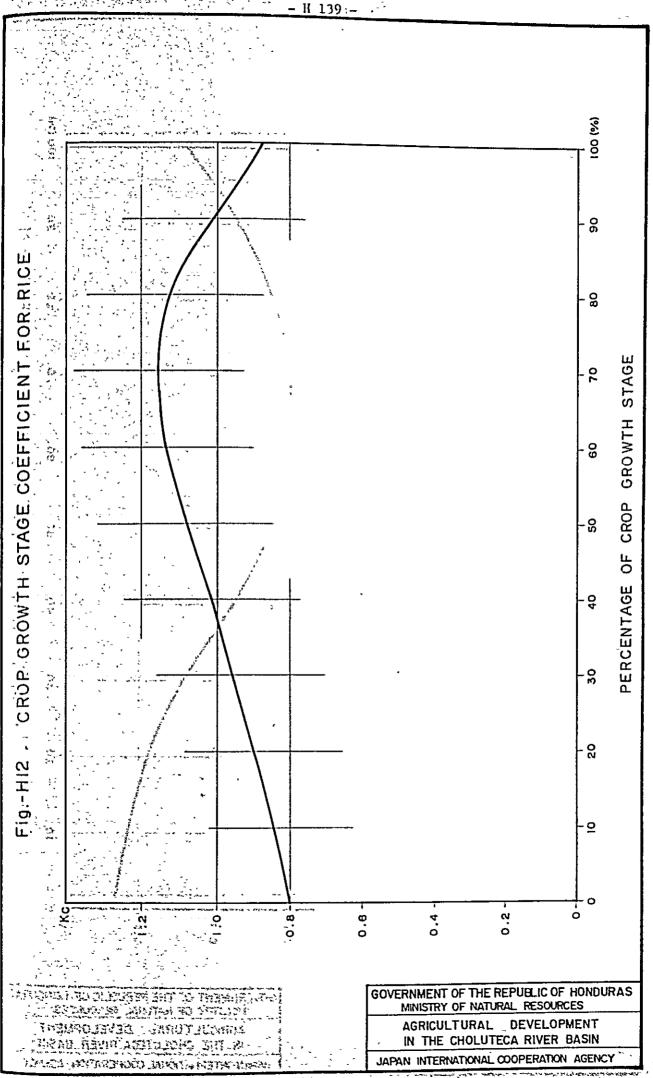


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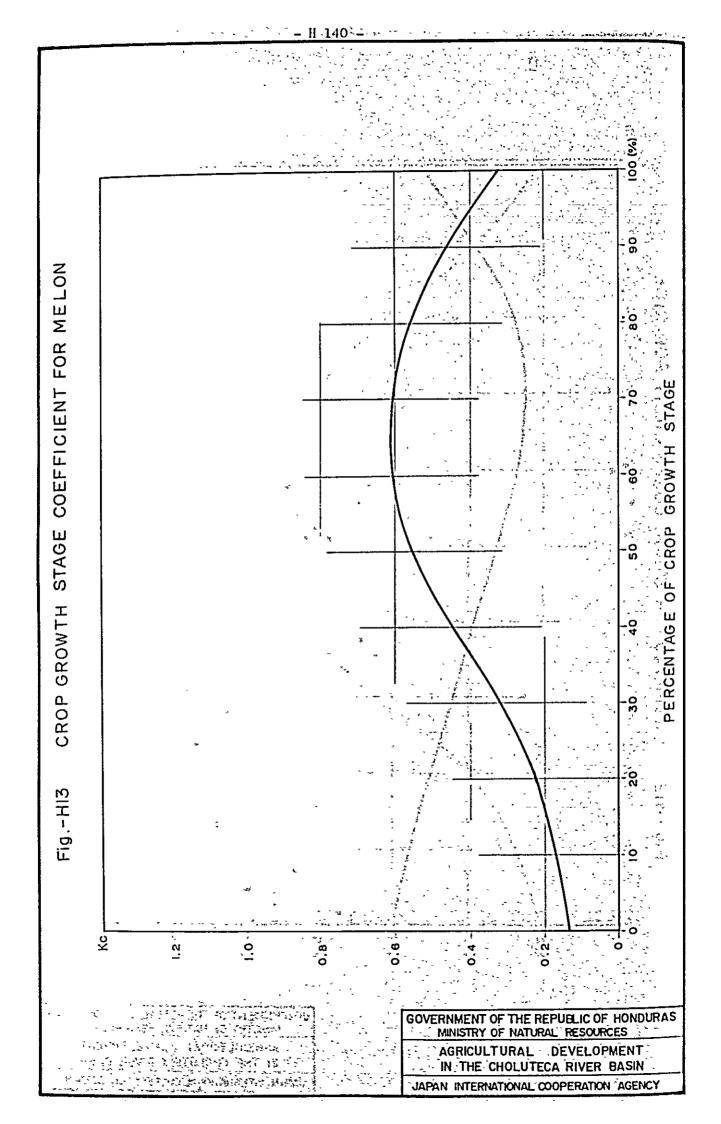


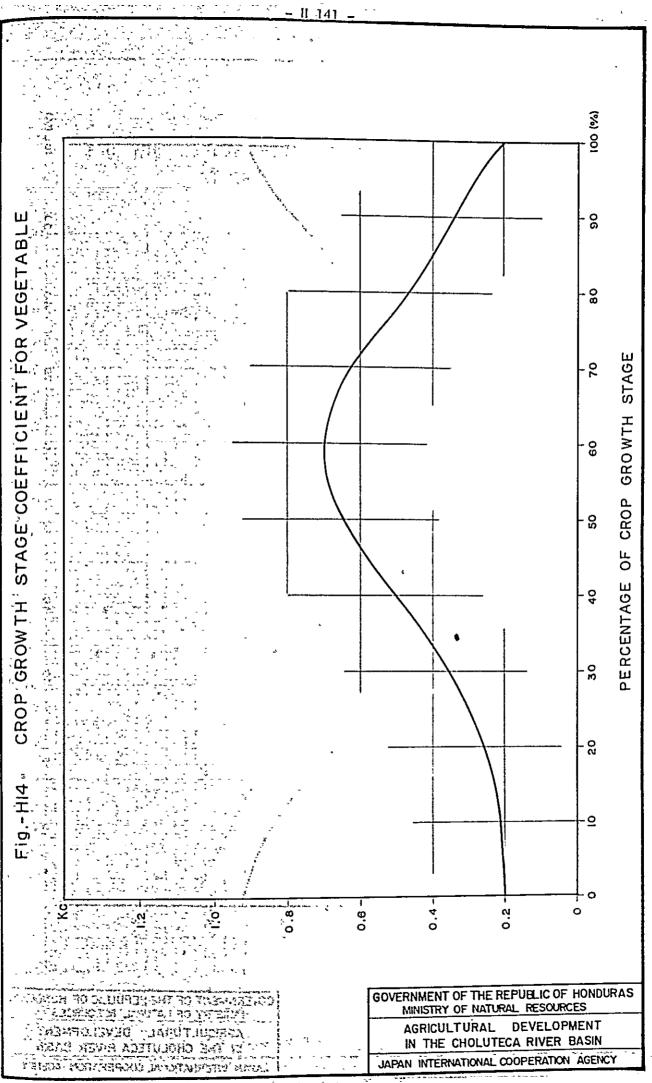
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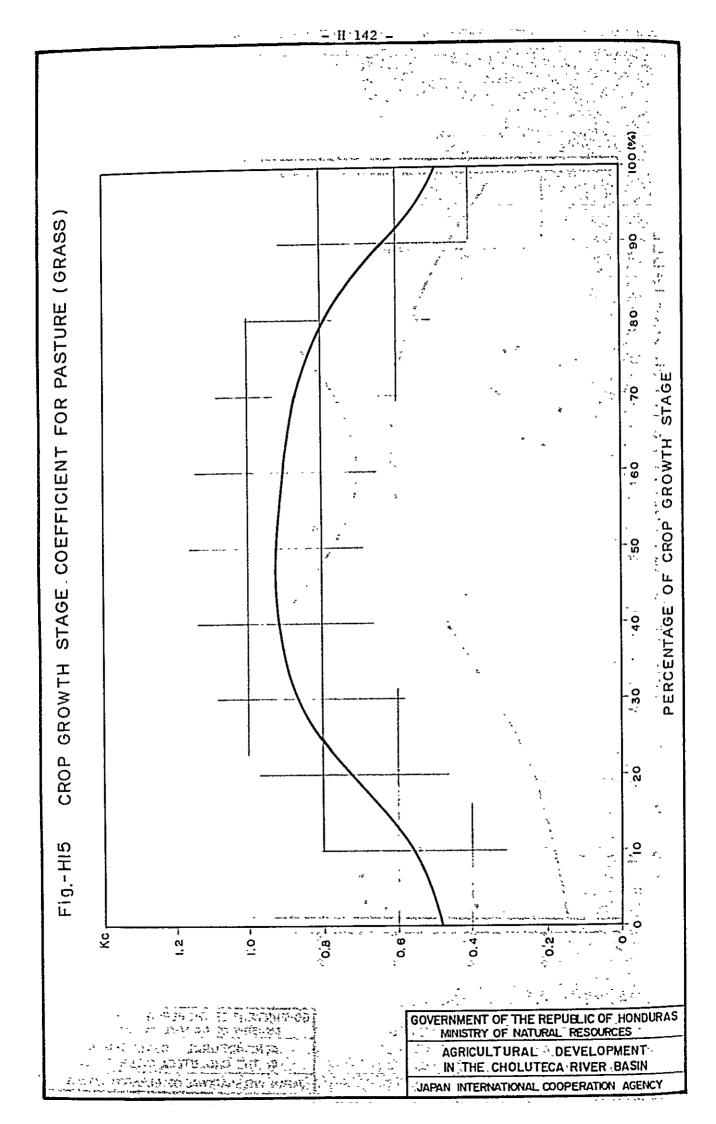


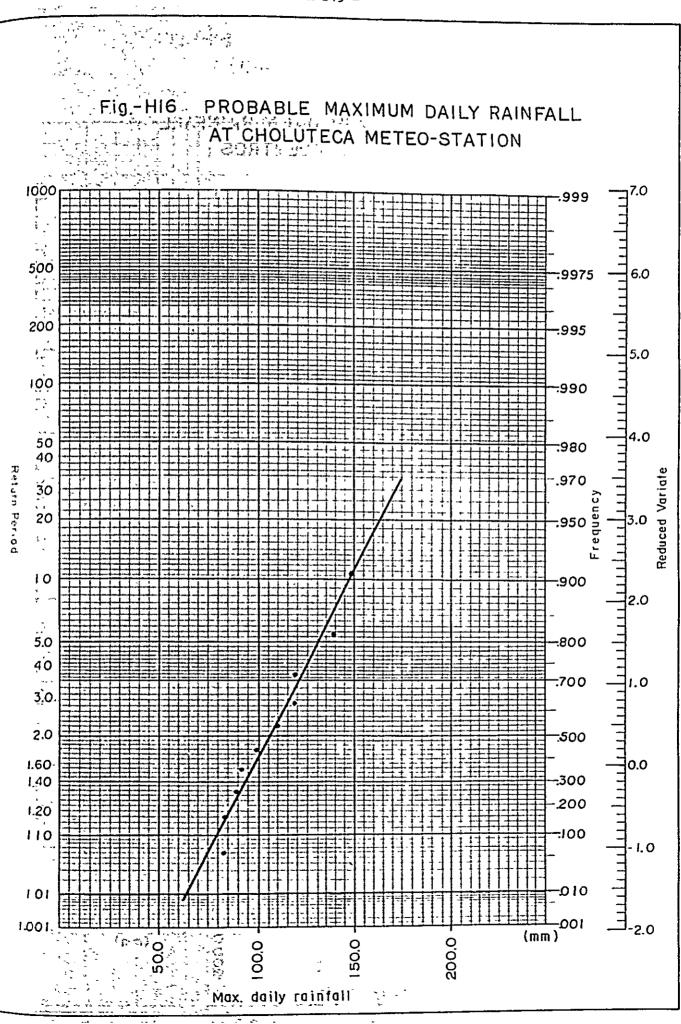


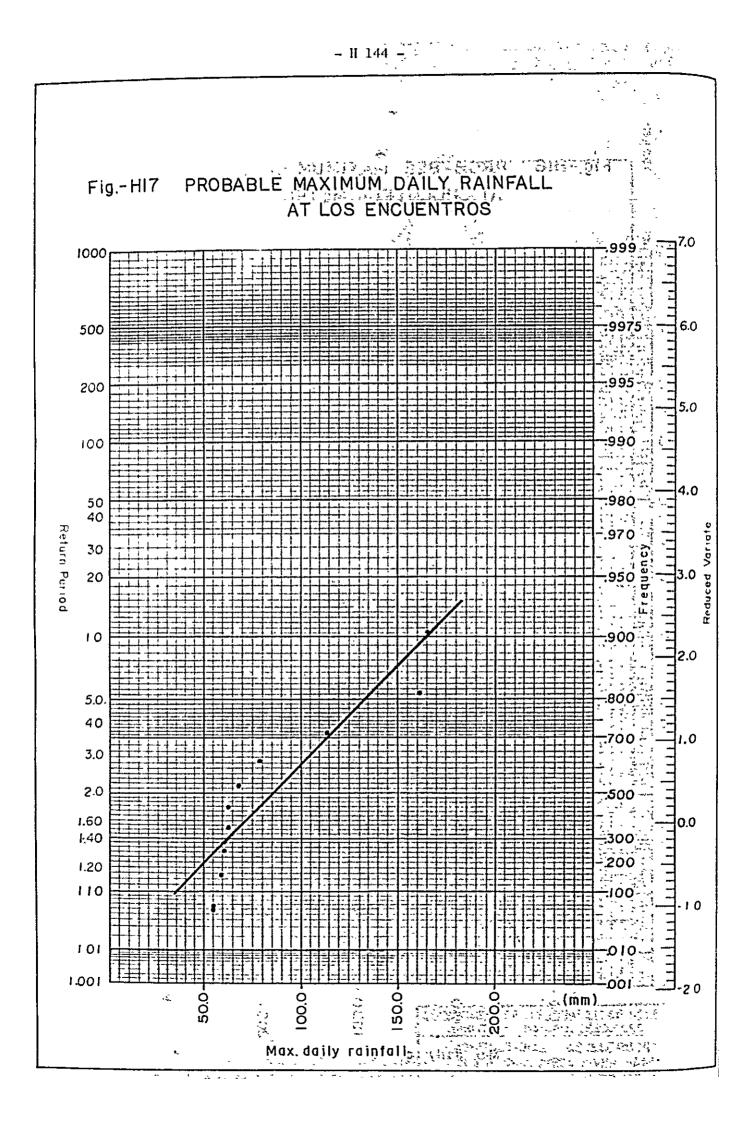
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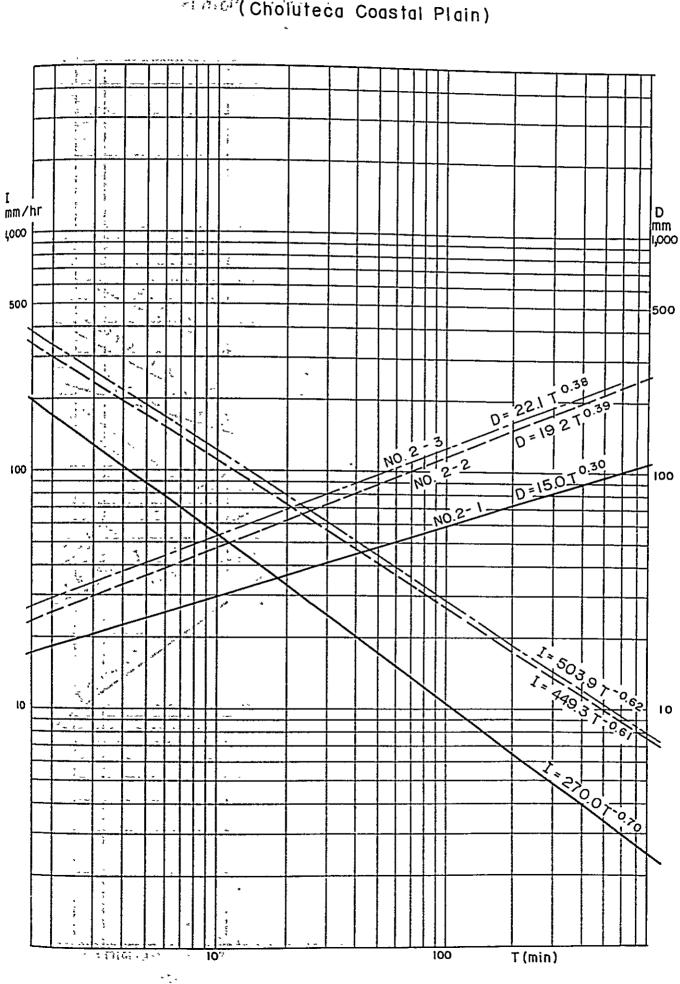


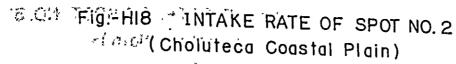












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# - II 1146 -Fig. - HI9 INTAKE RATE OF SPOT NO. 3 (Choluteca Coastal Plain)

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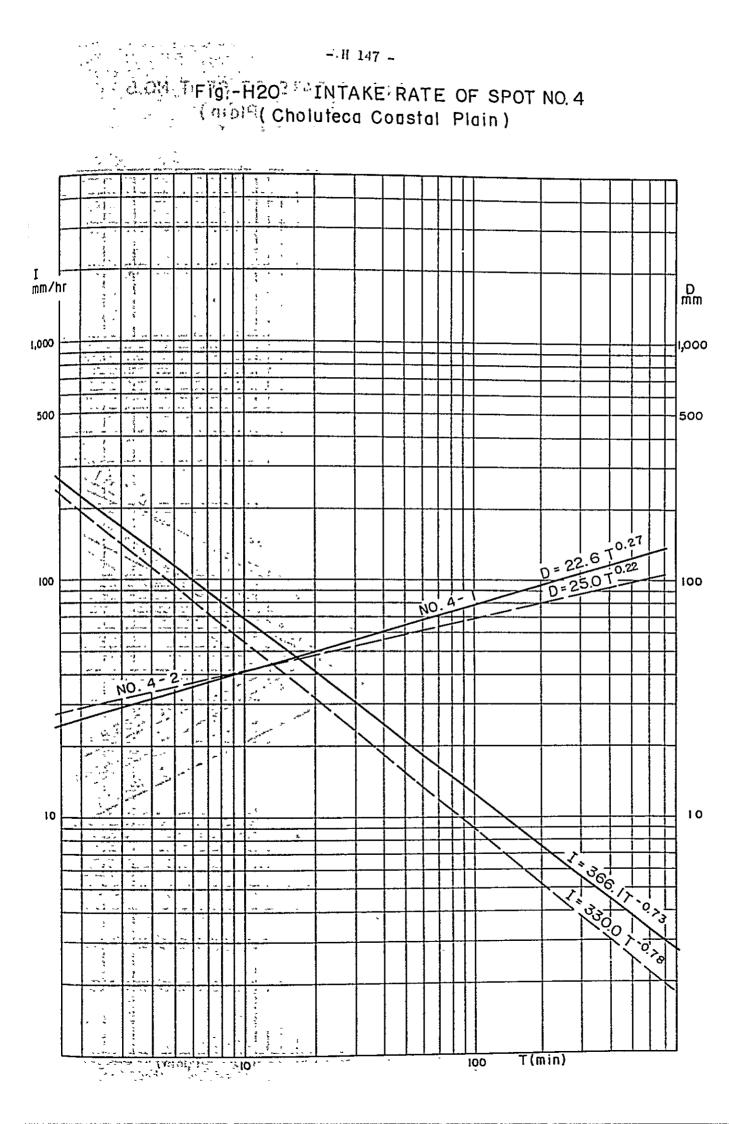
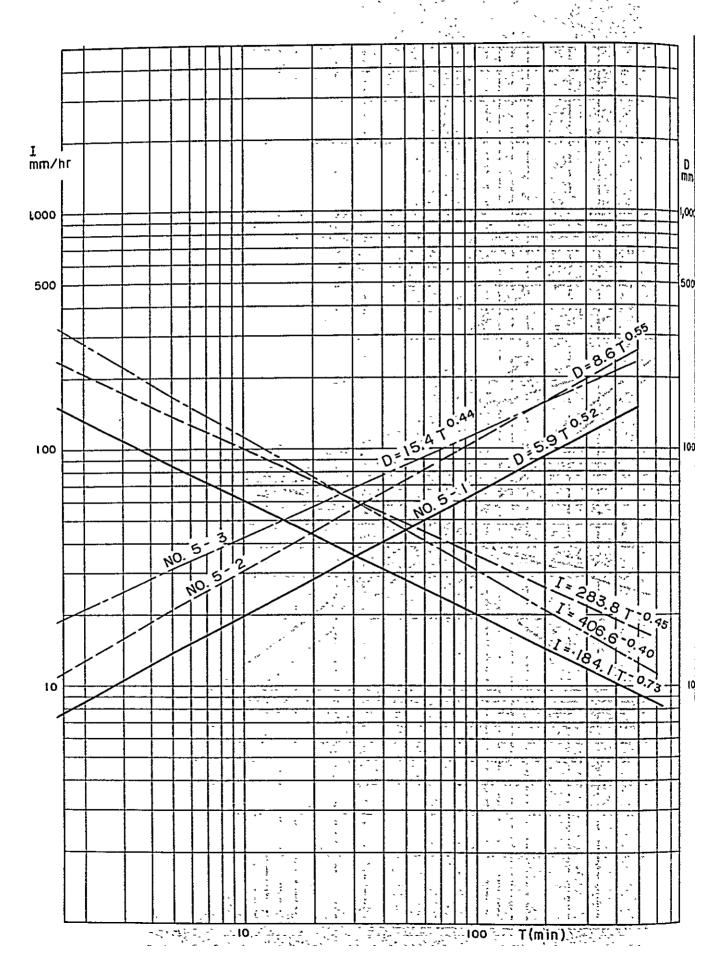
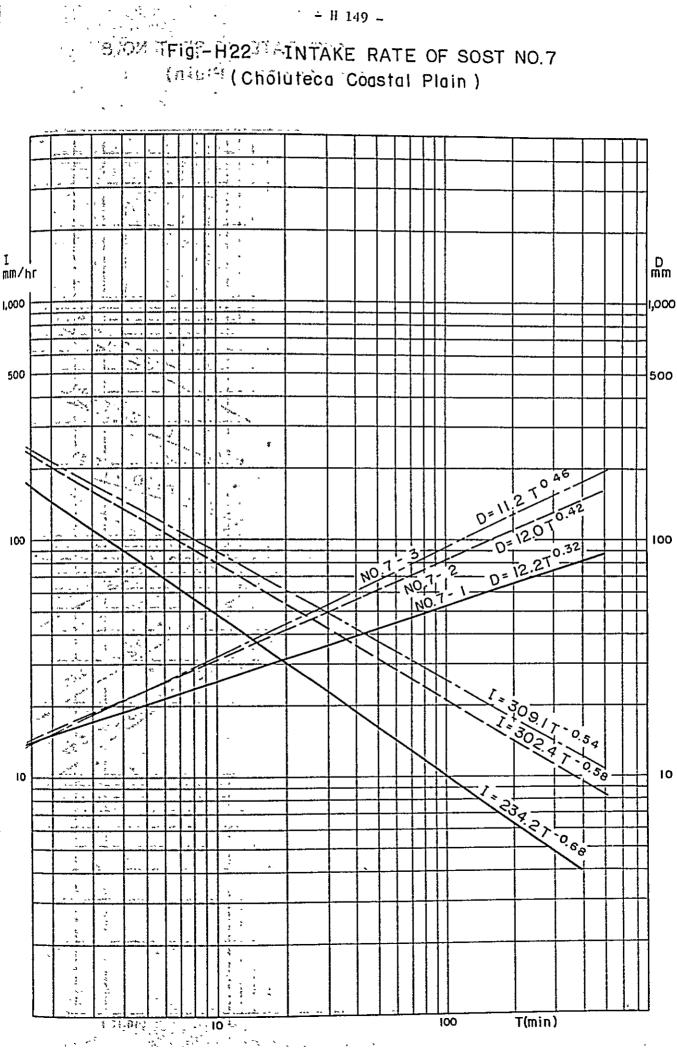


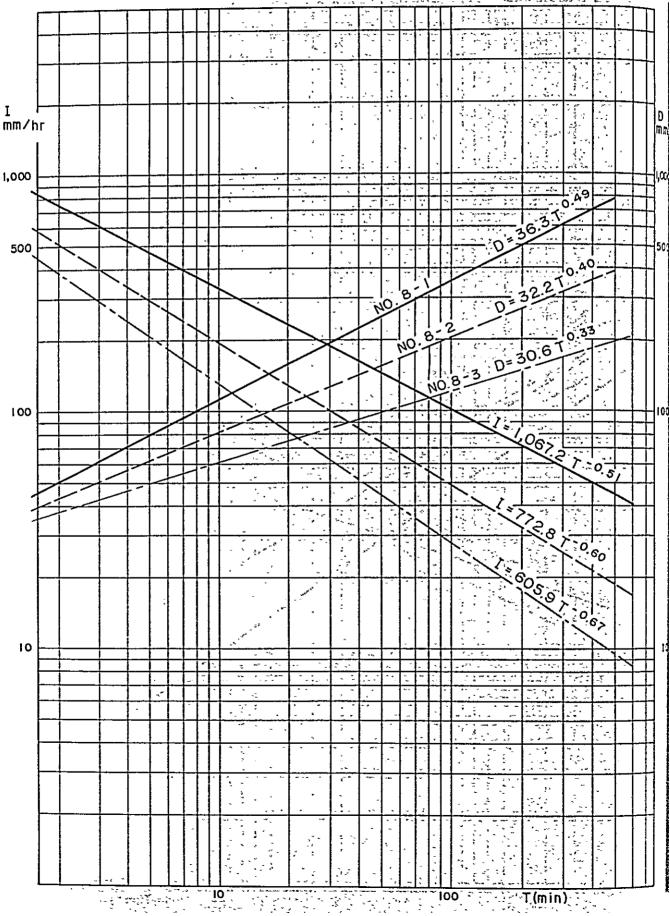
Fig.-H2I= / INTAKE, RATE OF SPOT NO.5 (Choluteca: Coastal Plain)



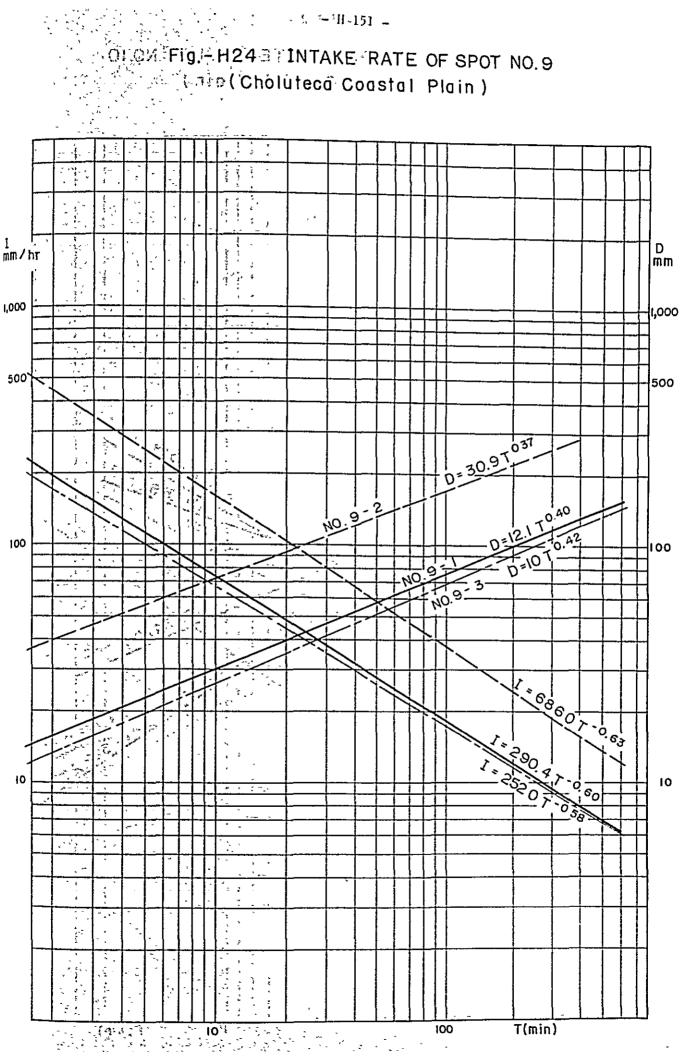


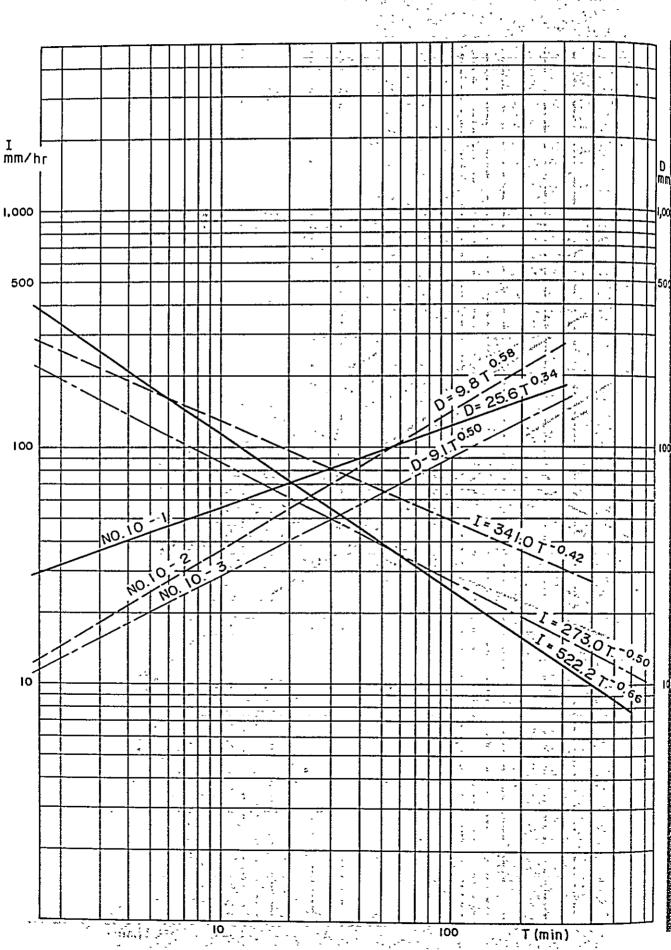
## Fig. - H23 INTAKE, RATE, OF, SPOT NO.8 (Choluteca, Coastal, Plain)

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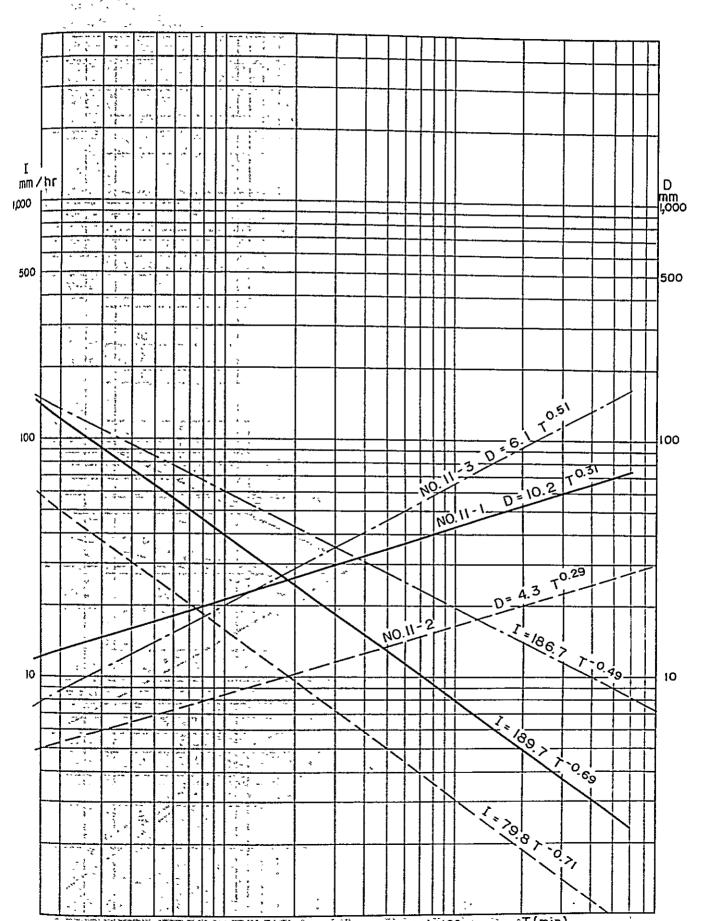
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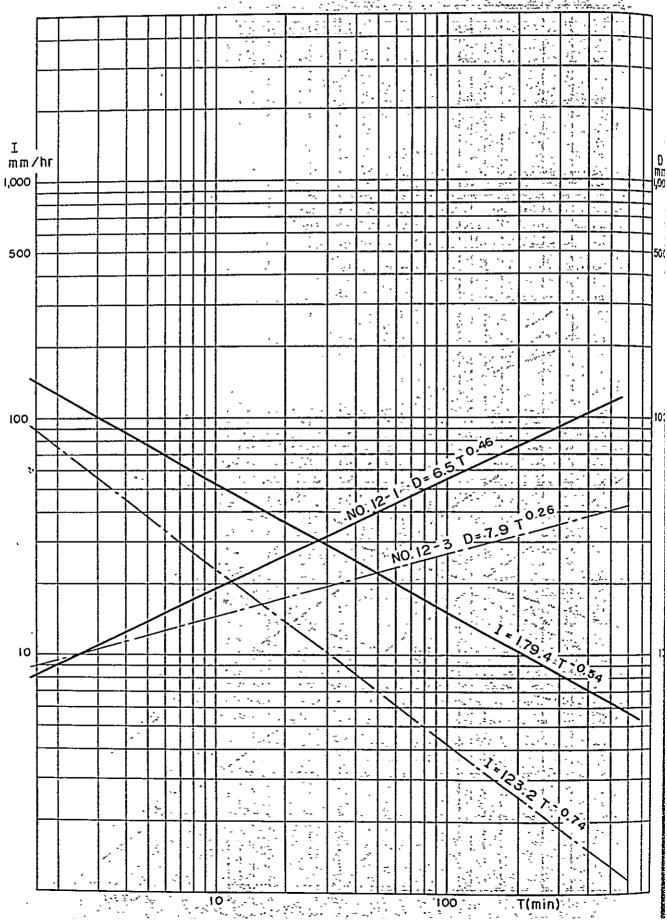
# - II'152 -Fig.-H25 INTAKE RATE OF SPOT NO.10 (Choluteca Coastal Plain)

- II 153 -ELOW Fig.-H26 INTAKE-RATE OF SPOT NO.11 (assolit (San Juan de Flores)

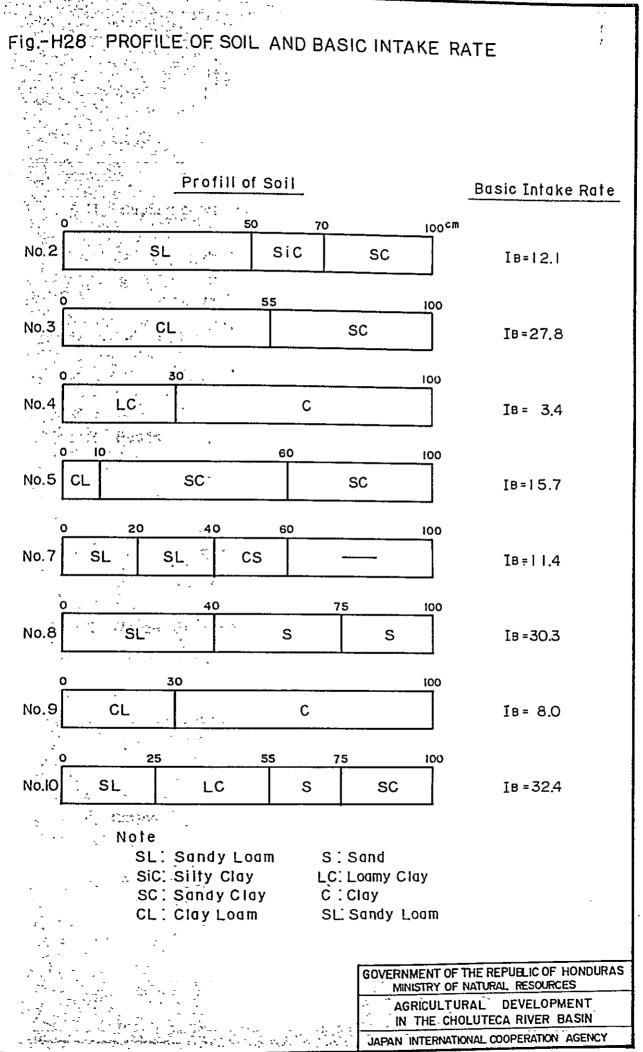


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# Fig. - H27 INTAKE RATE OF SPOT NO. 12 ( San Juan de Flores) (San Juan de Flores)



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## Fig. - H29 SOIL MOISTURE EXTRACTION PATTERN . . . - , . . . . . -,

I. Sugar Cane Root Depth 0.6 - 0.90 m	5. Melon, Water Melon	Root Depth 0.60-0.7
0.225 m 40 %	0.119 m	50 %
0.45 m 30 %	0.38 m	40 %
0.675 m 20 %	0.56 m	8 %
0,90 m (10,%) and 10,%) and 10,%	0.75 m	2 %
		,

### 

2. Beans	Root Depth 0.60 m	6. Sorghum	Root Depth 0.60m
	0.15 m 40 %	0.12	m 30 %
4	0.30 m 30 %	0.24	m 25%
-	0.45 m 20 %	0.36	m 20%
*	0.60 m 10 %	0.48	m 15%
· · · ·		0.60	m 10 %

#### • 7. Pasture Root Depth 0.45-0.75 m 3. Maize, Sesame Root Depth 0.60-0.90 m 0.225 m 42.1% 0.25 m 0.50 0.45 m 28.2 % 0.7 0.675 m 19.1% 0.90 m 10.6 % • •

· · ·			
4. Cotton	Root Depth 0.9-1.20m		]
	0.30 m 50 % 0.60 m 30 %	··	

inter .

- . 15 %

.5 %

0.90 m

1.20 m

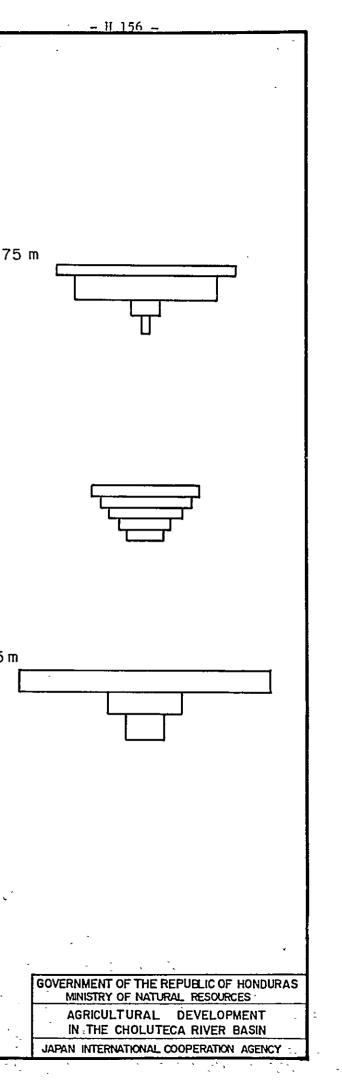
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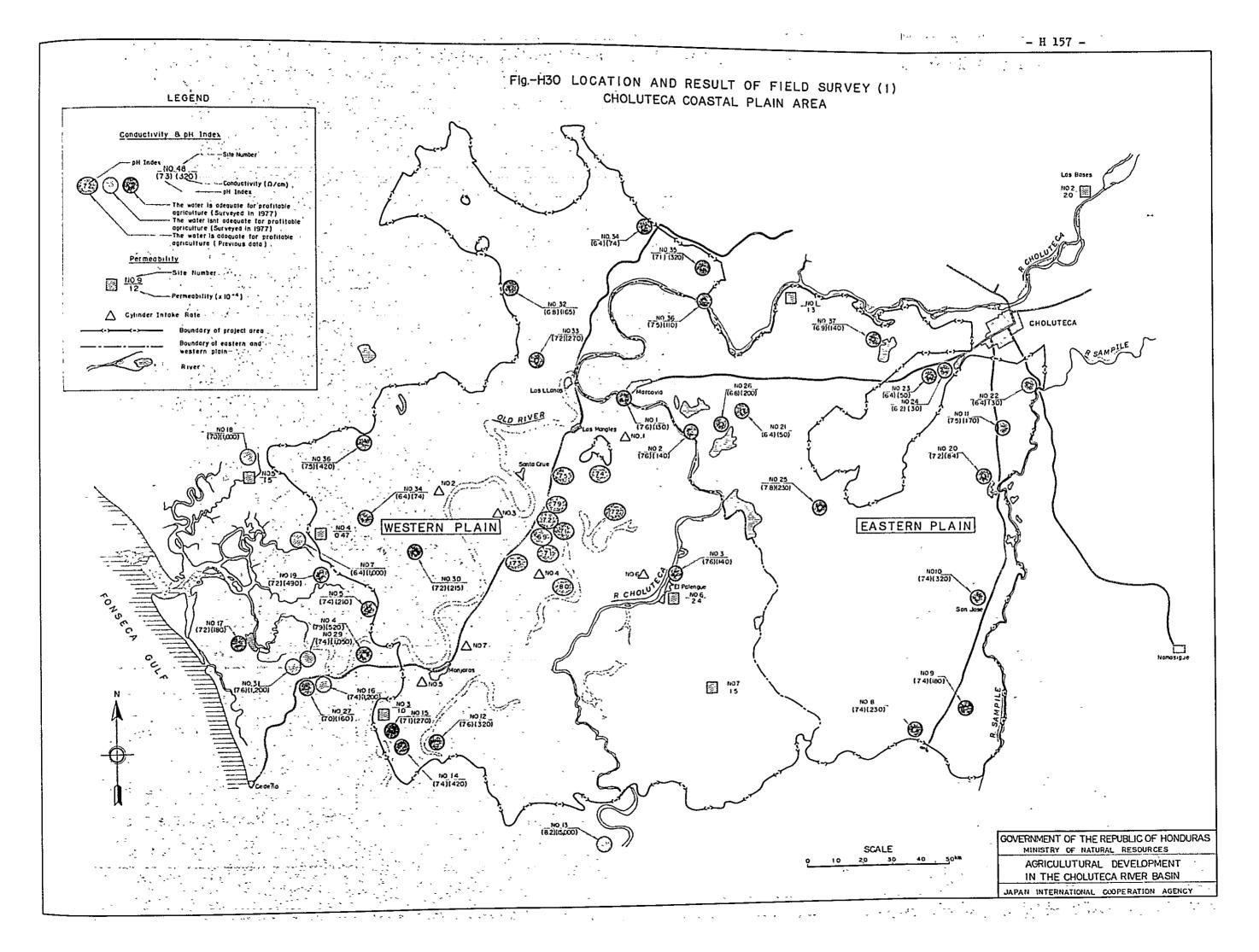
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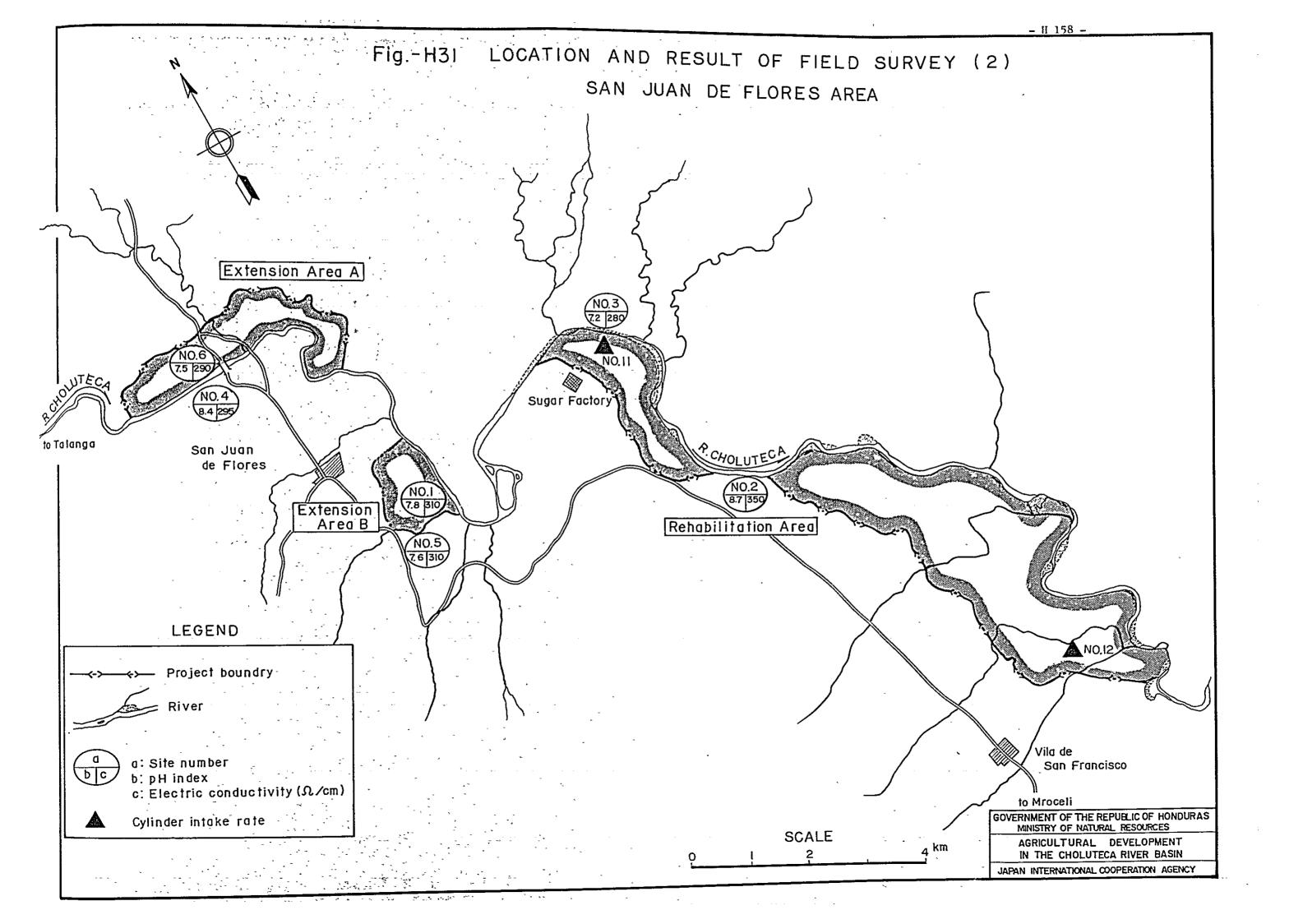
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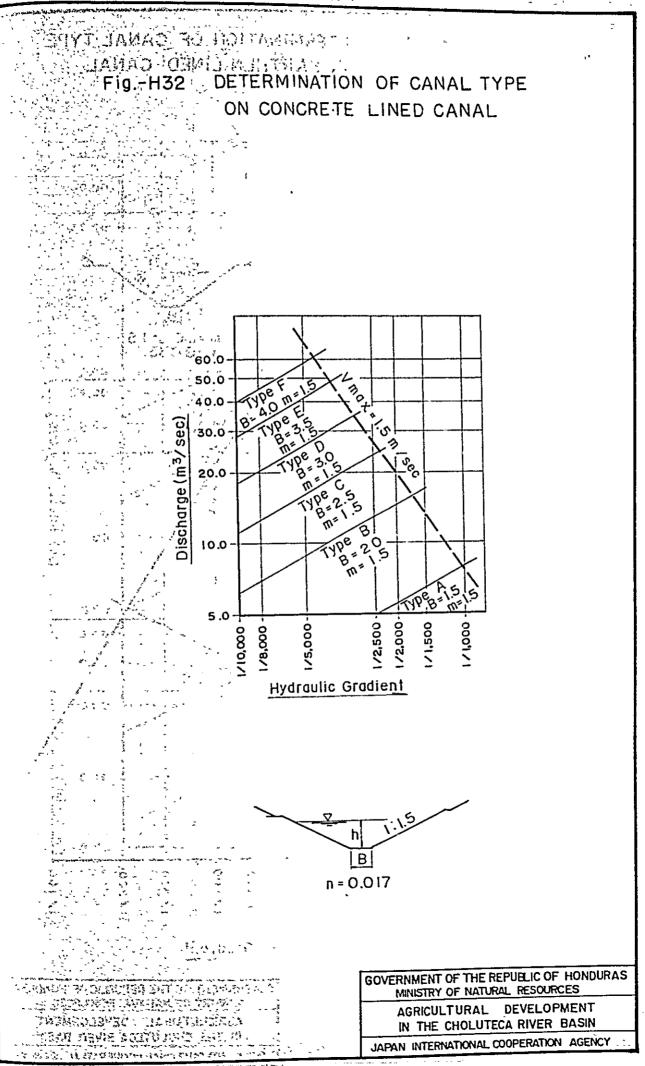
iO m	20 %
'5 m	10%

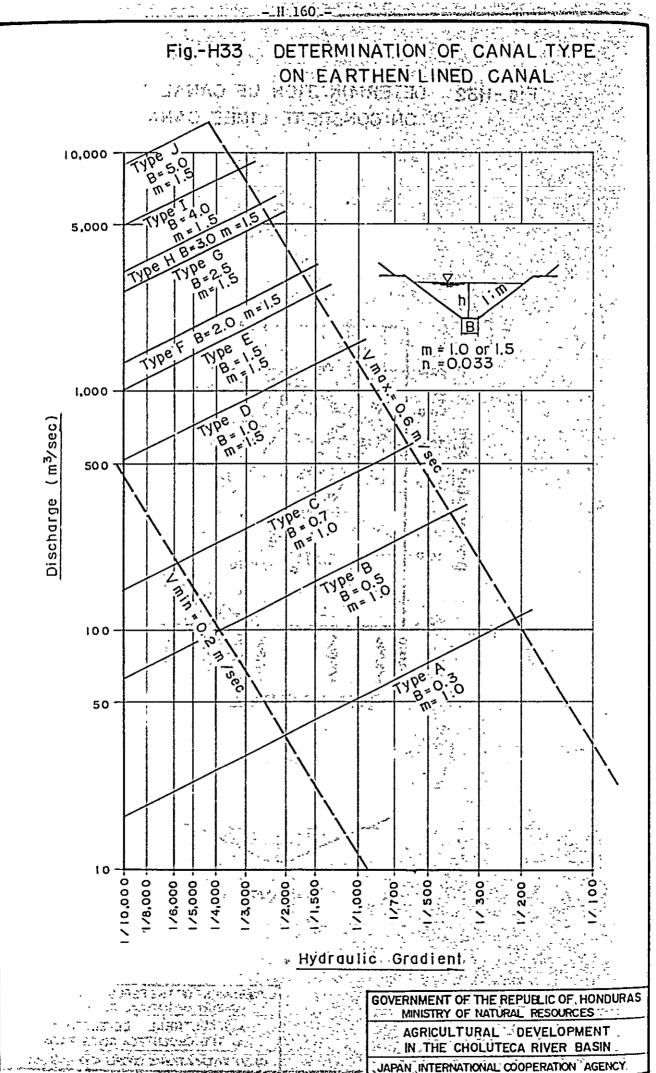
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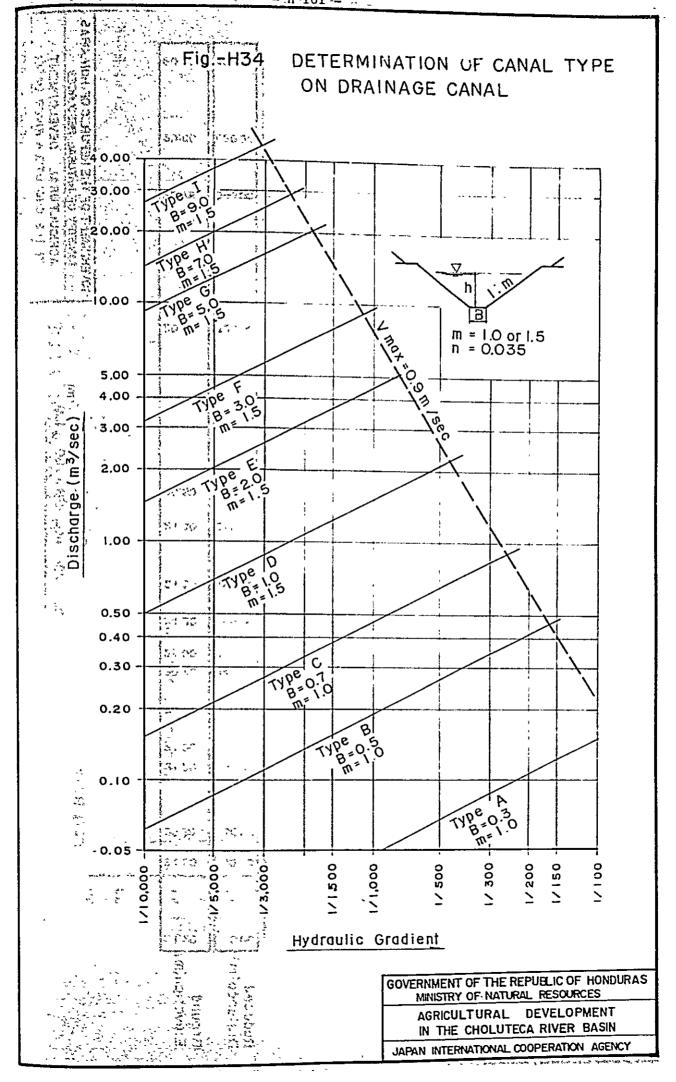


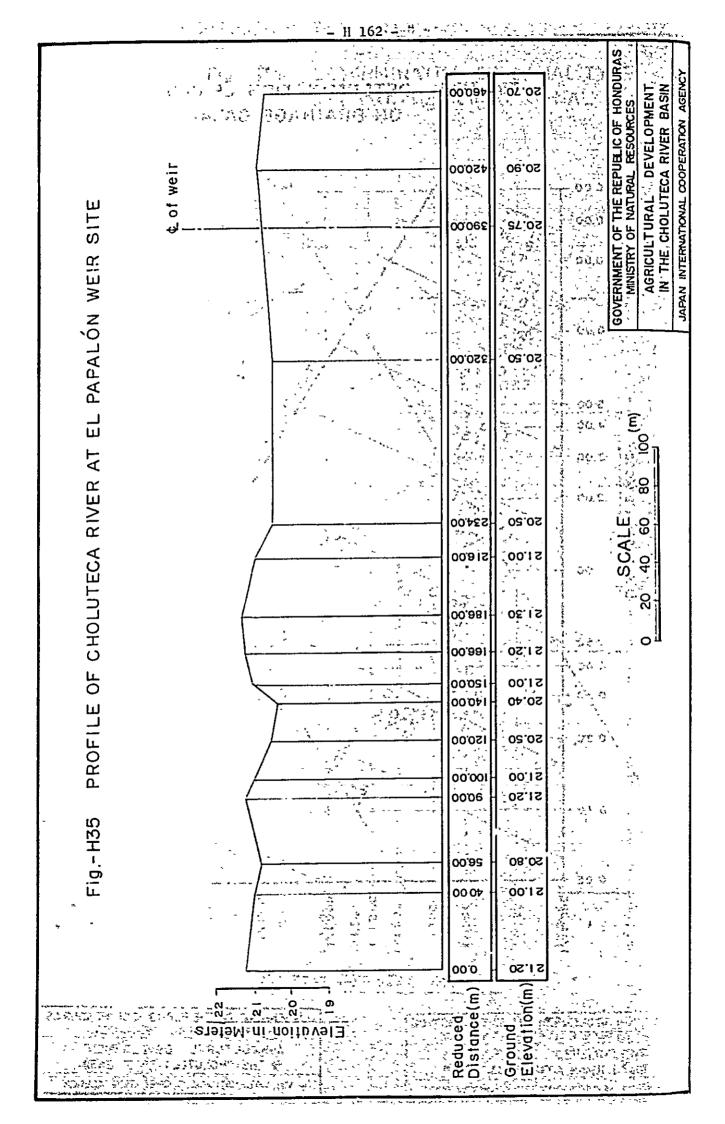


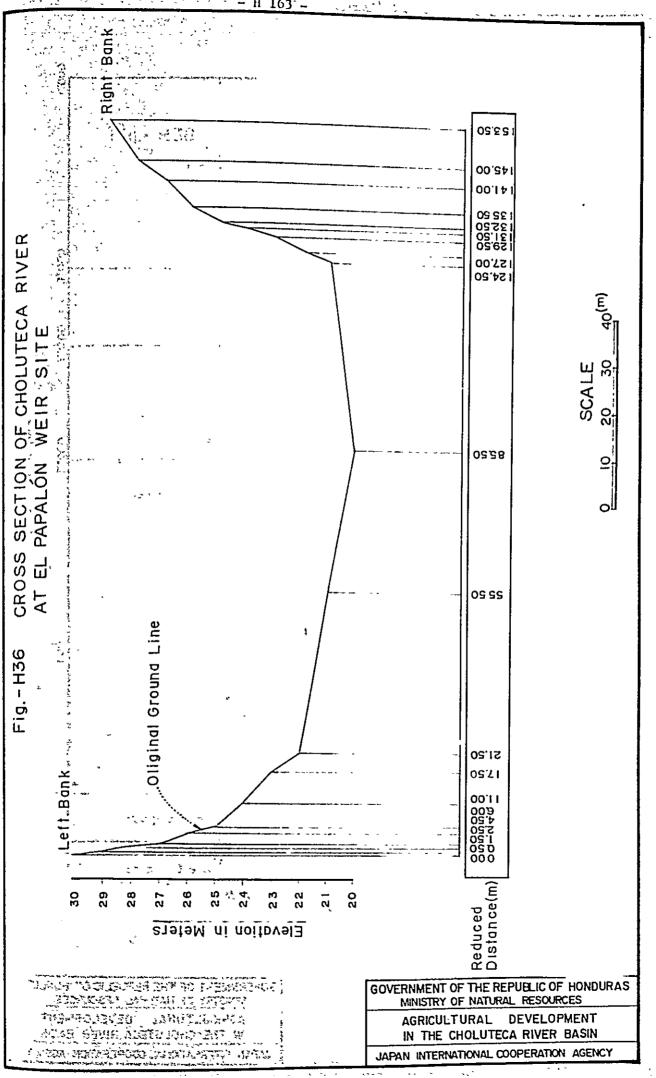


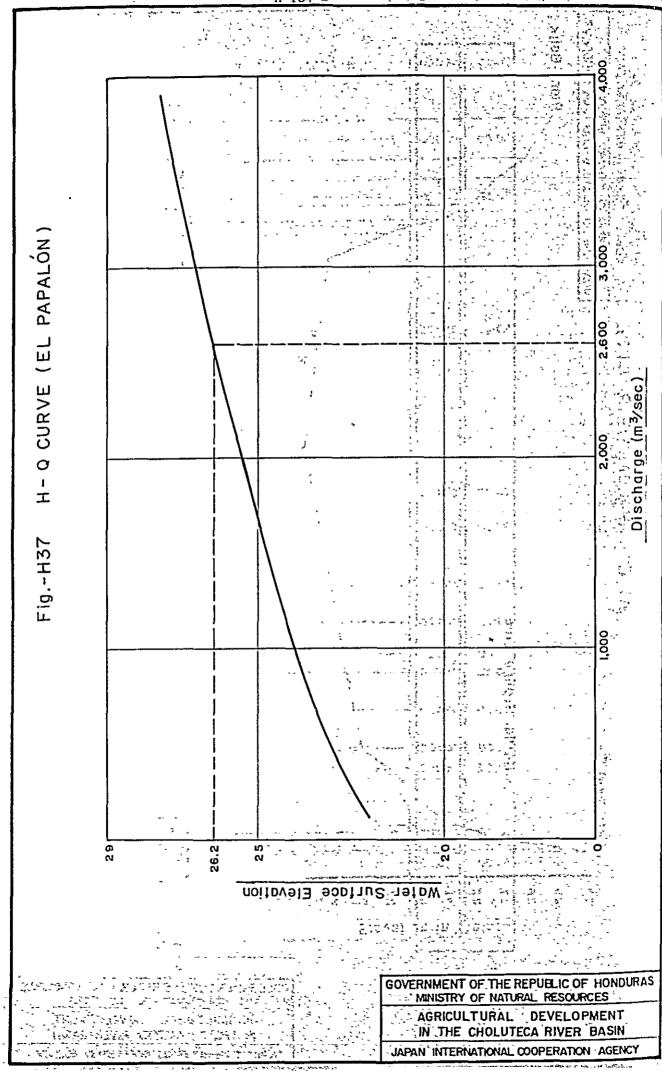
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