The apparent resistivity (ρ) - depth (a) curve

ρ: apparent resistivity (ohm-m)

a : depth (m)

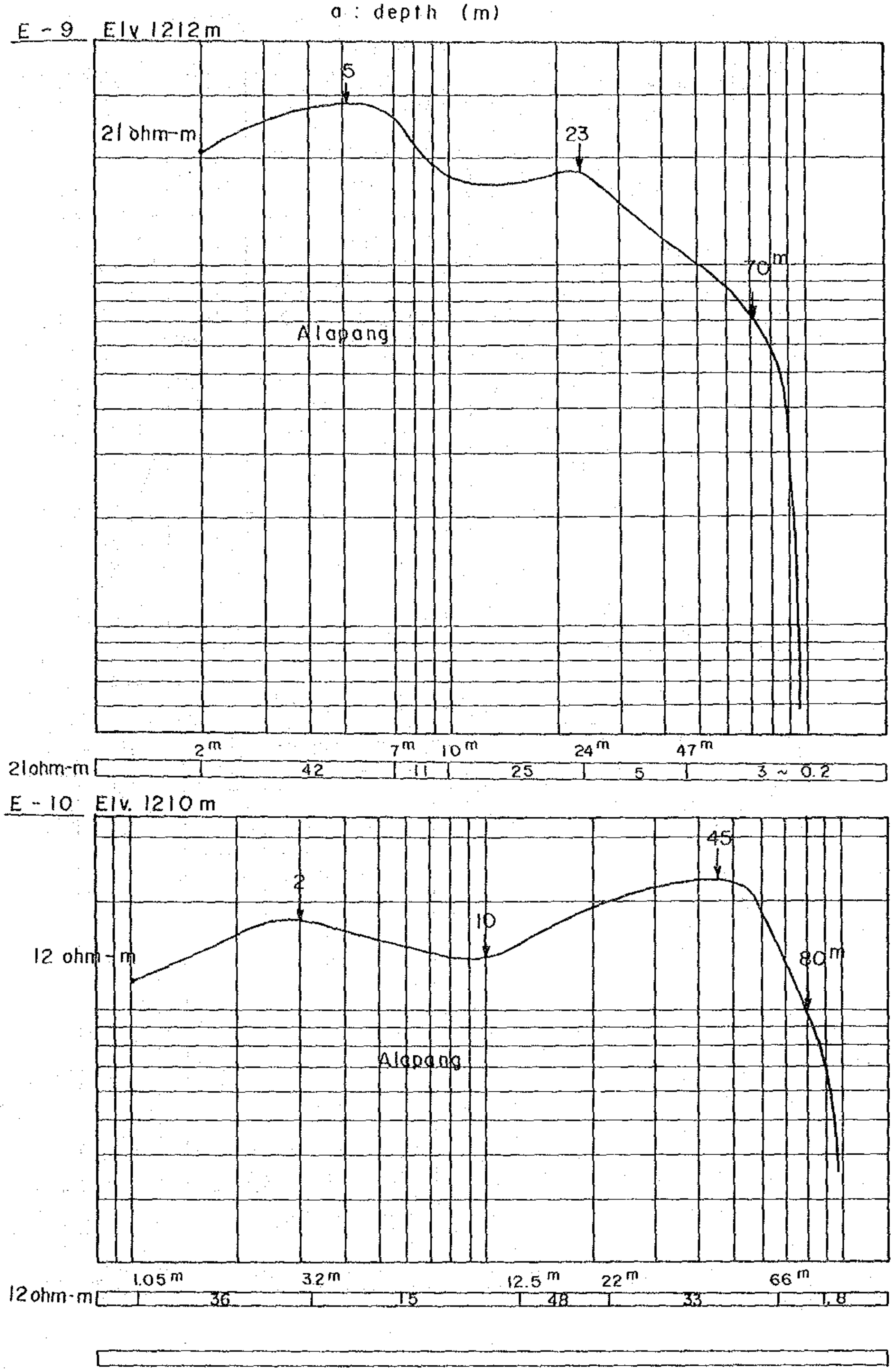


Fig. D.4 Results of the Electrical Resistivity Survey (5/9)

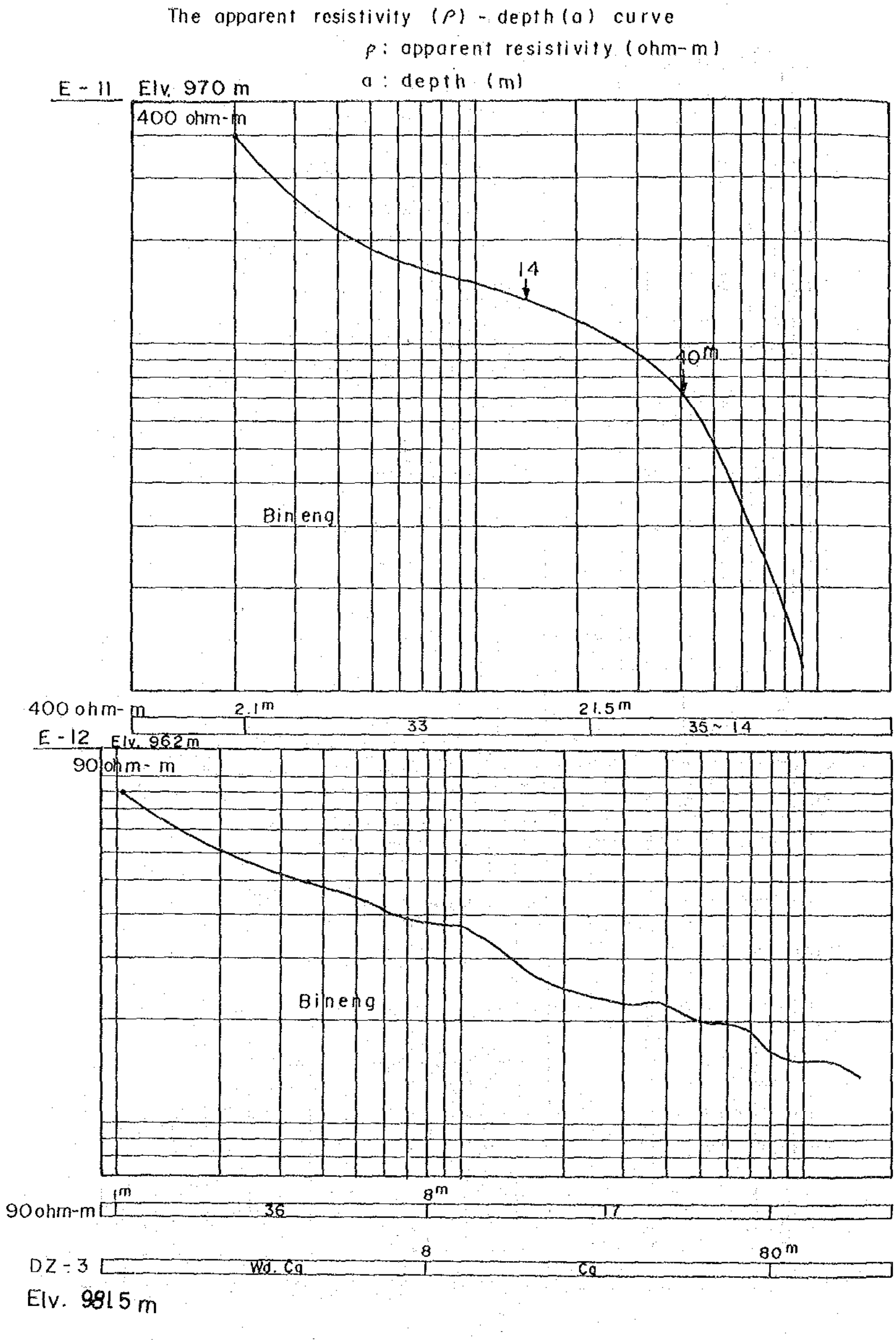


Fig.D.4 Results of the Electrical Resistivity Survey (6/9)

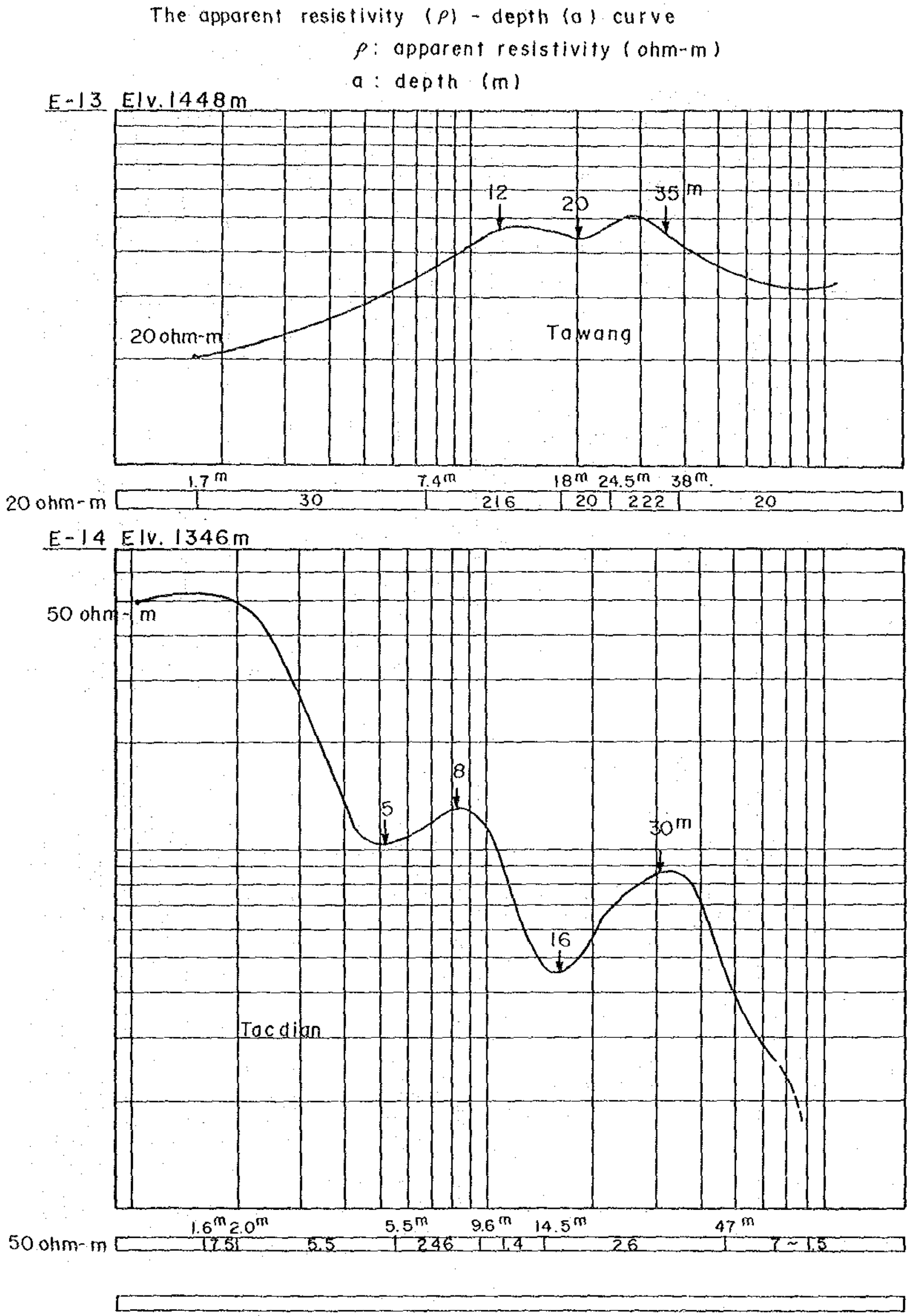


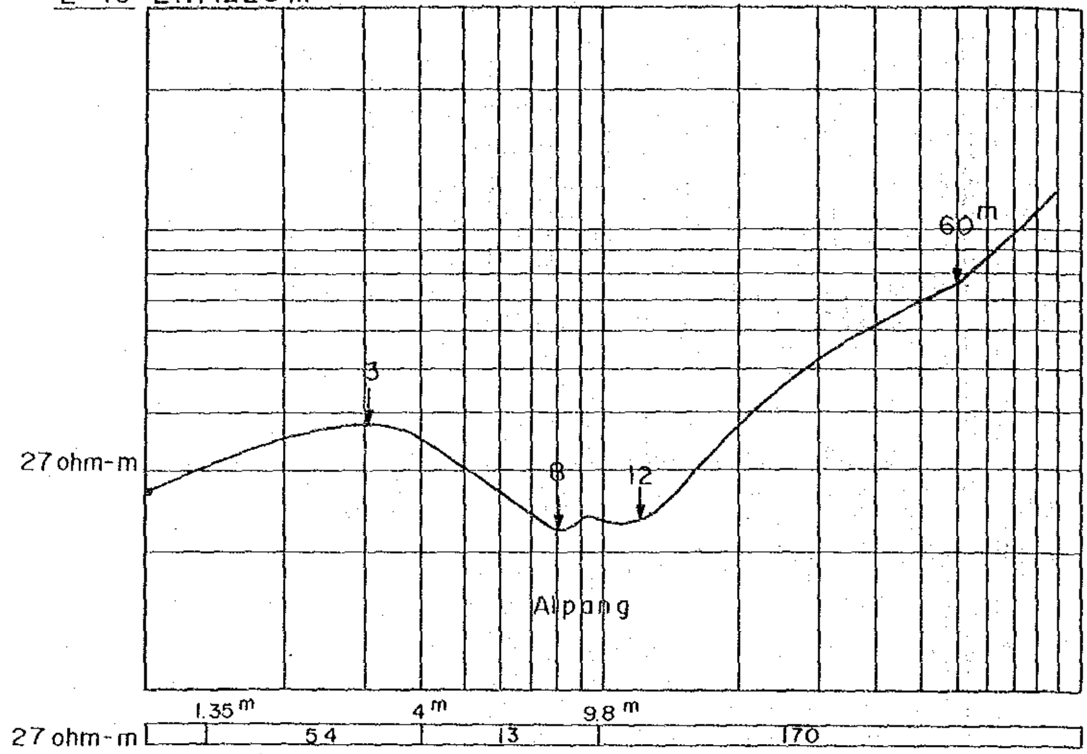
Fig. D.4 Results of the Electrical Resistivity Survey (7/9)

The apparent resistivity (ρ) - depth (a) curve

ρ: apparent resistivity (ohm-m)

a: depth (m)

E-15 Elv. 1223 m



E-16 Elv. 1082 m

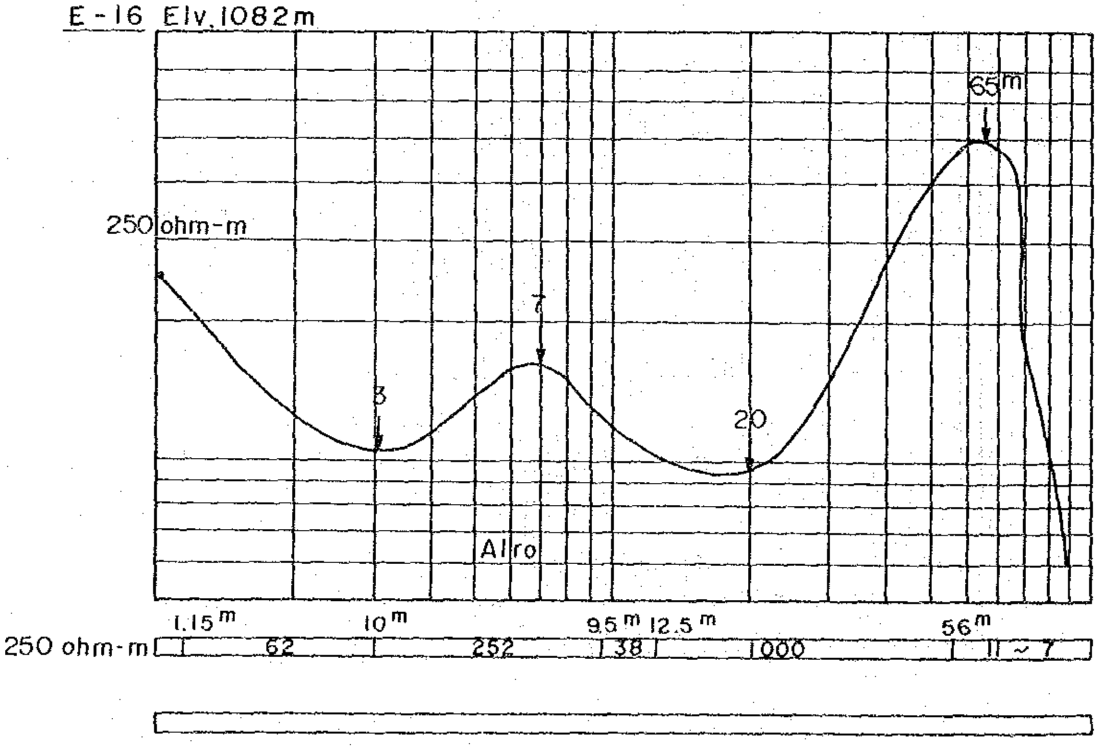
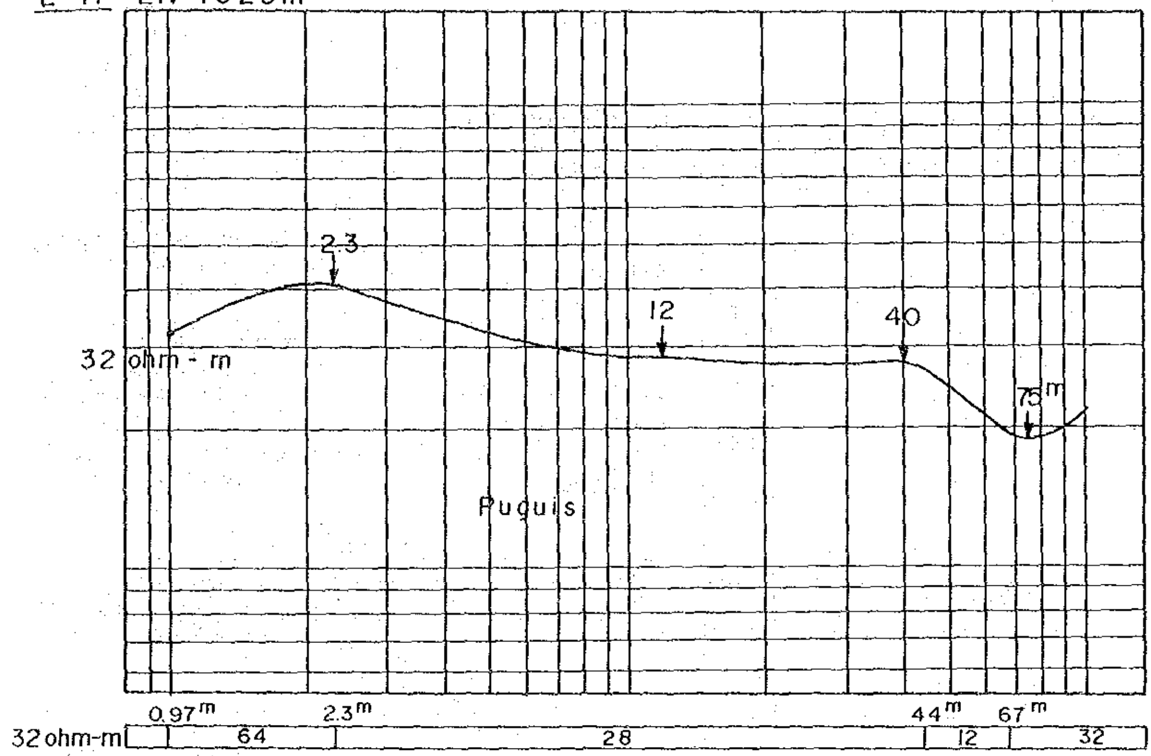


Fig. D. 4 Results of the Electrical Resistivity Survey (8/9)

The apparent resistivity (ρ) - depth (a) curve
ρ: apparent resistivity (ohm-m)
a : depth (m)

E-17 Elv 1329m



E - 18 Elv 1311m

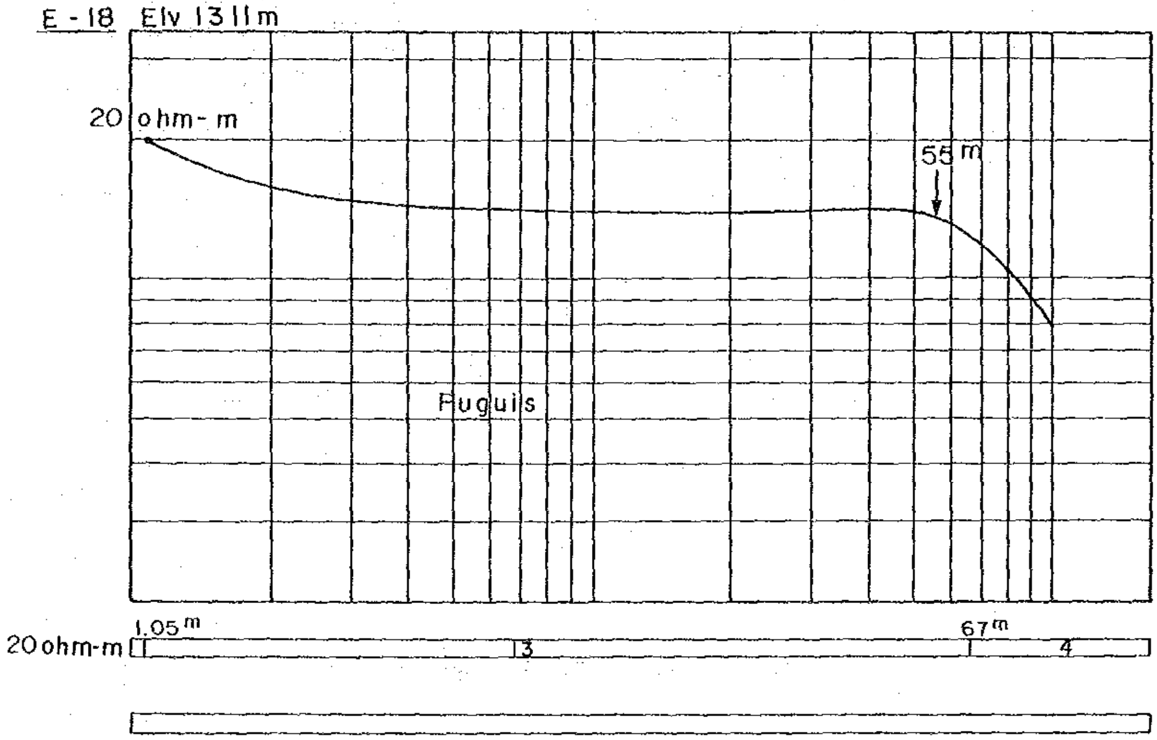


Fig. D. 4 Results of the Electrical Resistivity Survey (9/9)

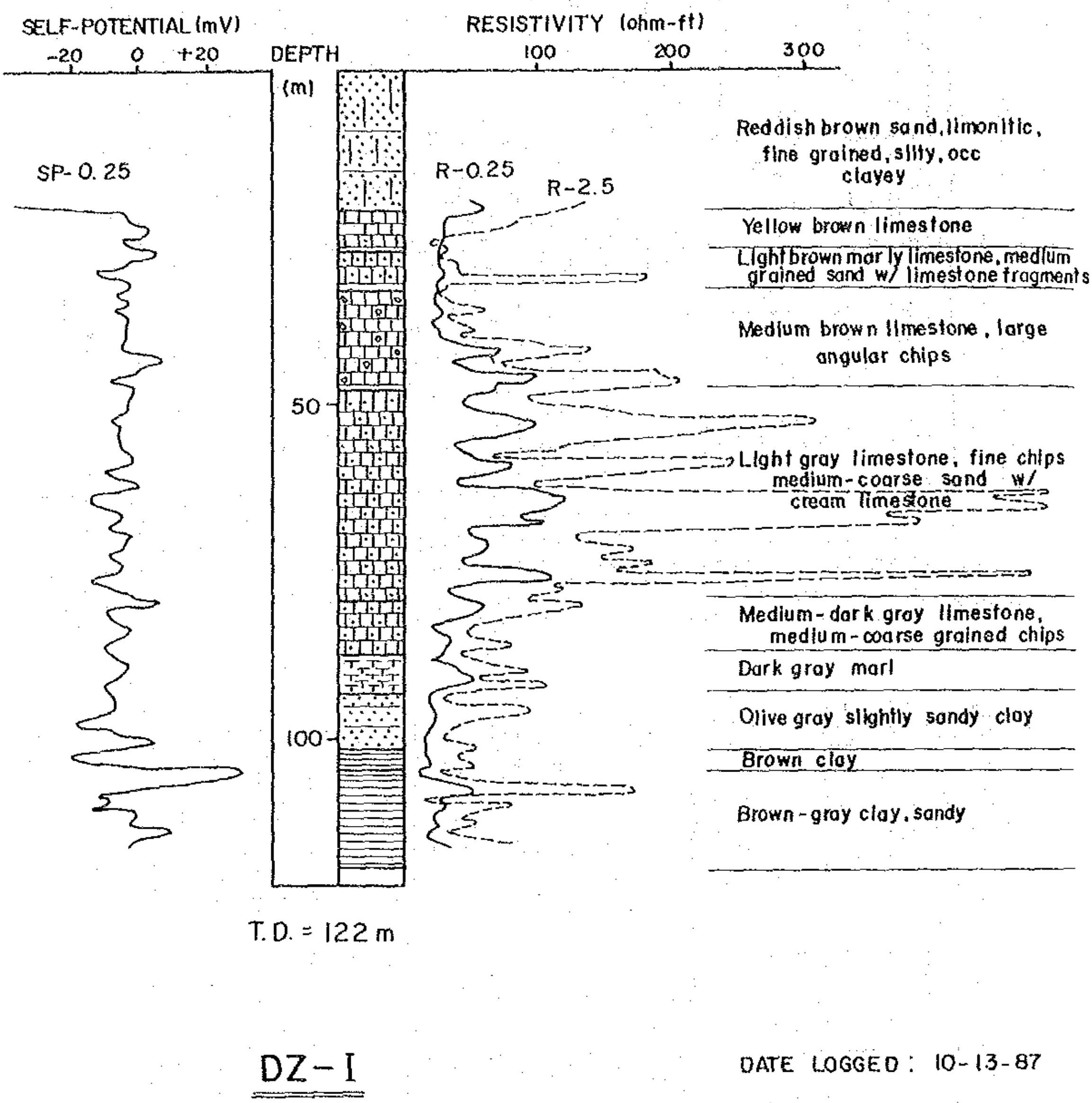


Fig. D.5.1 (1) Electric and Lithologic Log (DZ-I)

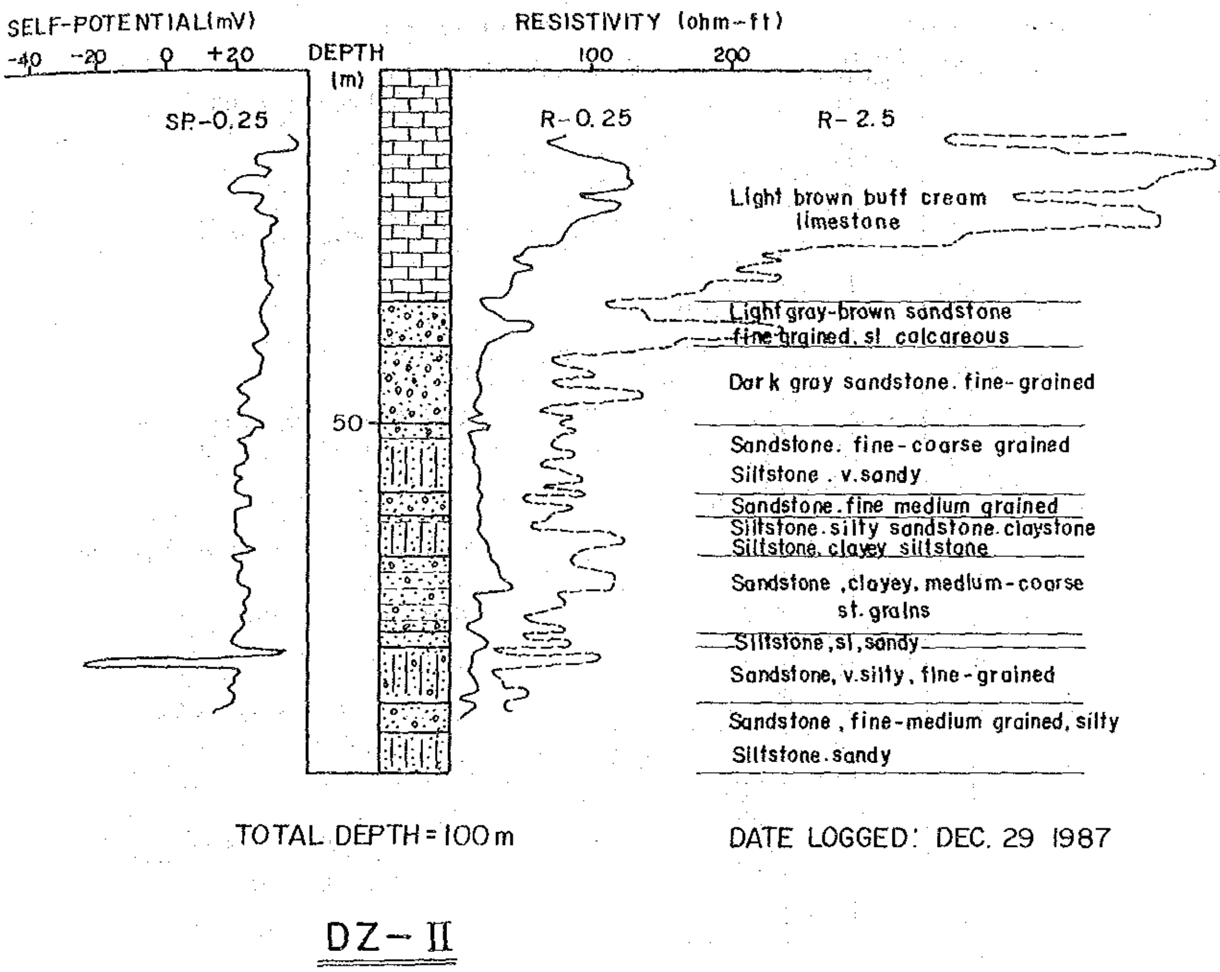


Fig. D.5.1 (2) Electric and Lithologic Log (DZ-II)

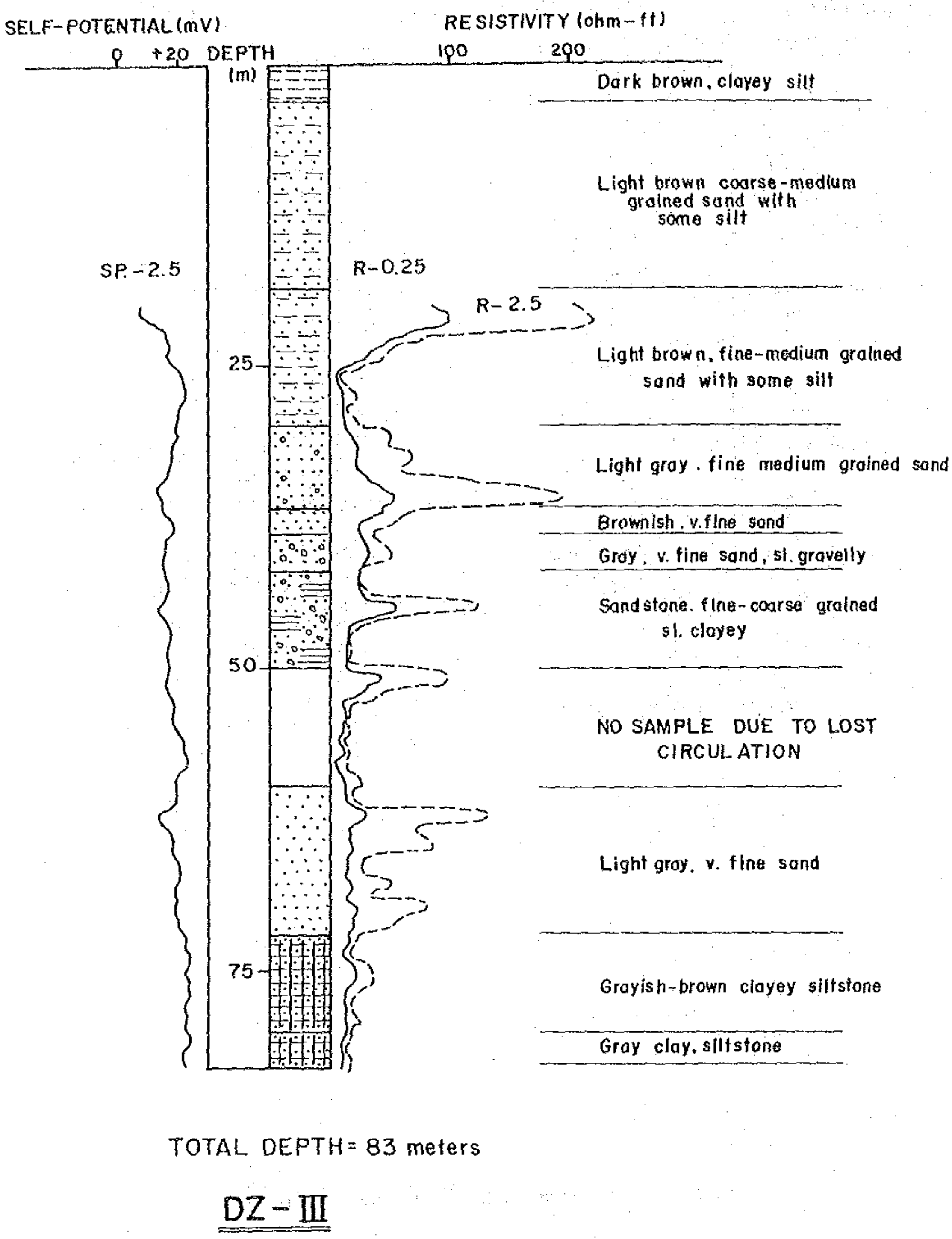


Fig. D.5.1 (3) Electric and Lithologic Log (DZ-III)

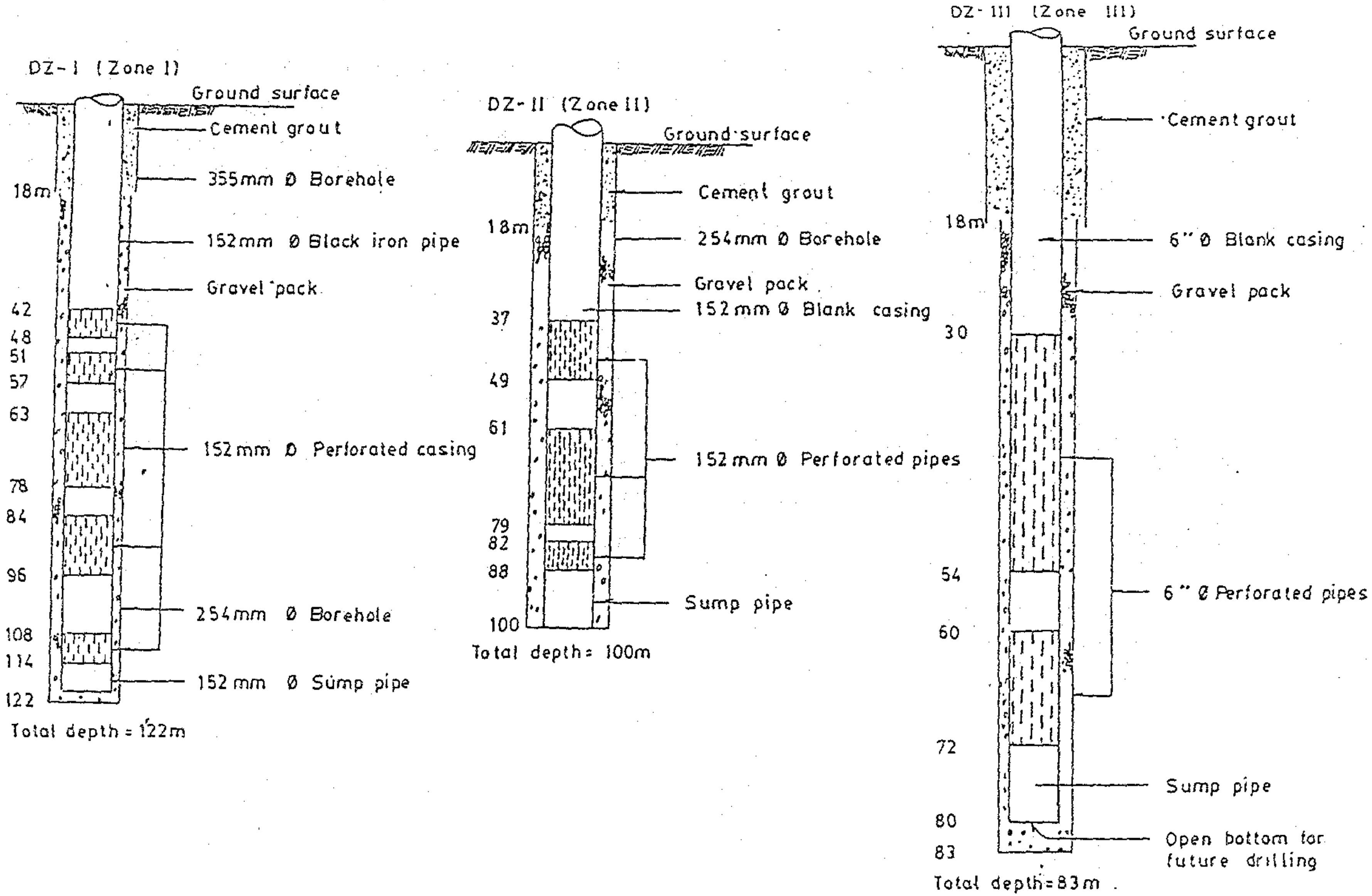


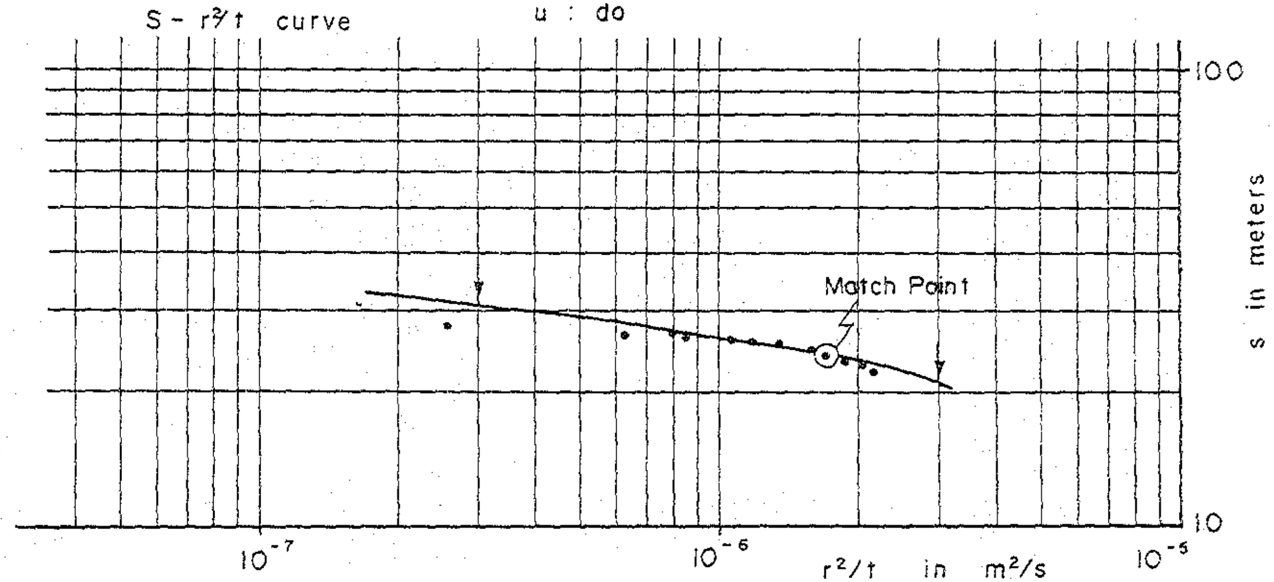
FIG.D5.2 SPECIFICATION OF DEEPWELL FOR PUMPING TEST

Jacob and Couper's method

$\Delta S = 30 - 21 = 9$

$T = \frac{-2.30}{4\pi\Delta S} = 9.0 \times 10^{-5} (m^2/s)$

r : Distance from the center of pumed well
s : Drawdown
e : Time
Q : Pumping guantity (= 4.41583×10^{-3} m /sec)
T : Transmissivity
S : Strage coefficient
W(u) : Well function
u : do



$s = 24.0$ $W(u) = 6.0$ $T = \frac{Q}{4\pi S} W(u) = 8.8 \times 10^{-5} (m^2/s)$

$r^2/t = 1.7 \times 10^{-6}$ $u = 2 \times 10^{-3}$ $S = \frac{4UT}{r^2/t} = 0.41$

DZ - I Theis' graphical method

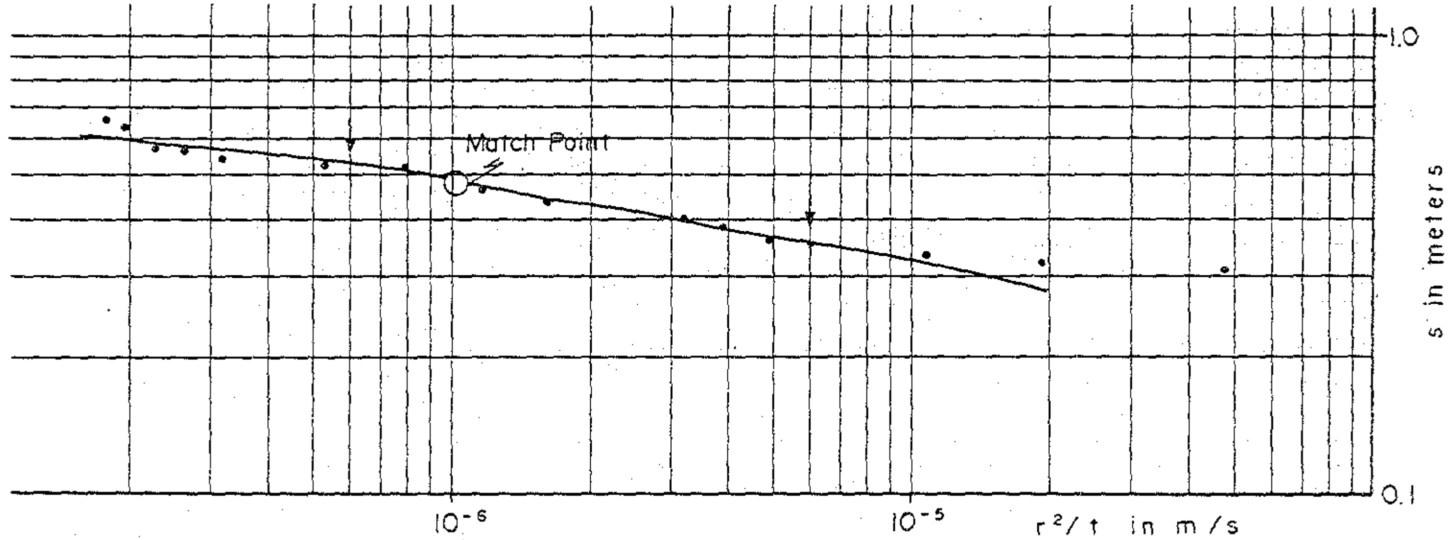
Fig. D.5.3 Analysis of the Pumping Test (1 /12)

Jacob and Couper's method

$\Delta S = 0.52 - 0.35 = 0.17$

$T = \frac{-2.30}{4\pi \Delta S} = 5.1 \times 10^{-3}$ (m^2/s)

S - r²/t curve



$s = 0.47$ $W(u) = 7.0$ $T = \frac{Q}{4\pi s} W(u) = 5.6 \times 10^{-3}$ (m^2/s)

$r^2/t = 1.02 \times 10^{-6}$ $u = 6 \times 10^{-4}$

$Q = 4.73125 \times 10^{-3}$ (m^3/s)

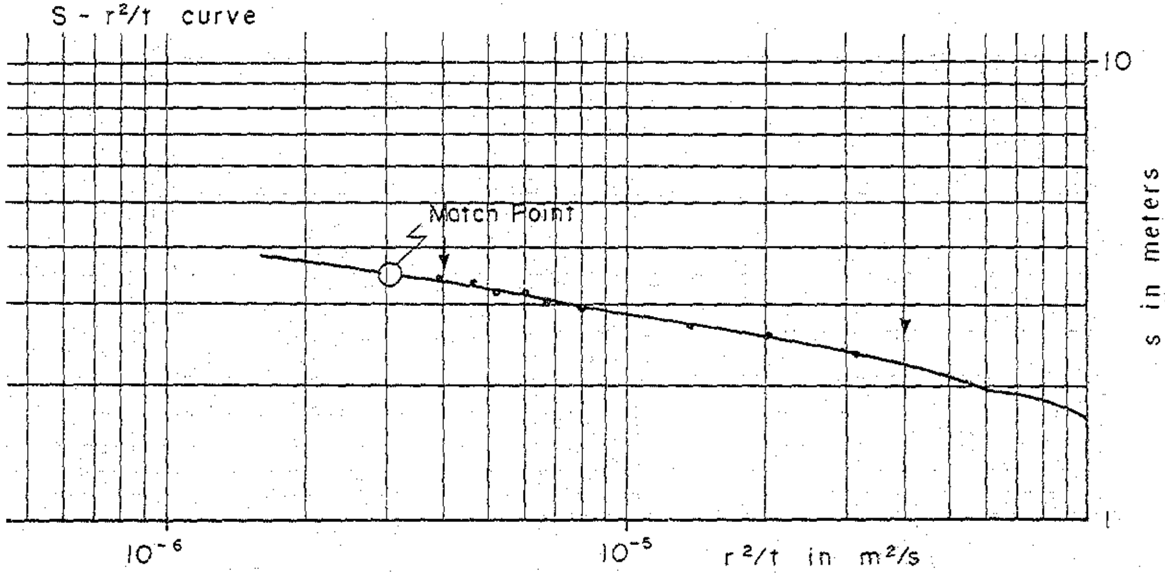
DZ - II Theis' graphical method

Fig.D.5.3 Analysis of the Pumping Test (2/12)

Jacob and Couper's method

$\Delta S = 3.3 - 2.15 = 1.15$

$T = \frac{-2.3 Q}{4\pi \Delta S} = -7.0 \times 10^{-4} (m^2/s)$



$s = 3.4$ $W(u) = 7$ $T = \frac{Q}{4\pi s} W(u) = 7.2 \times 10^{-4} (m^2/s)$

$r^2/t = 3 \times 10^{-6}$ $u = 7 \times 10^{-4}$ $S = \frac{4uT}{r^2/t} = 0.38$

$Q = 4.41583 \times 10^{-3} (m^3/s)$

DZ-Ⅲ Theis' graphical method

Fig. D.5.3 Analysis of the Pumping Test (3/12)

Time - drawdown curve

$r = 0.075(m)$ $S = 25.3$

$t = 4.2 \times 10^{-3}$

$\Delta s = 27 - 20.5 = 6.5$

$F(u) = \frac{S}{\Delta s} = 3.89$

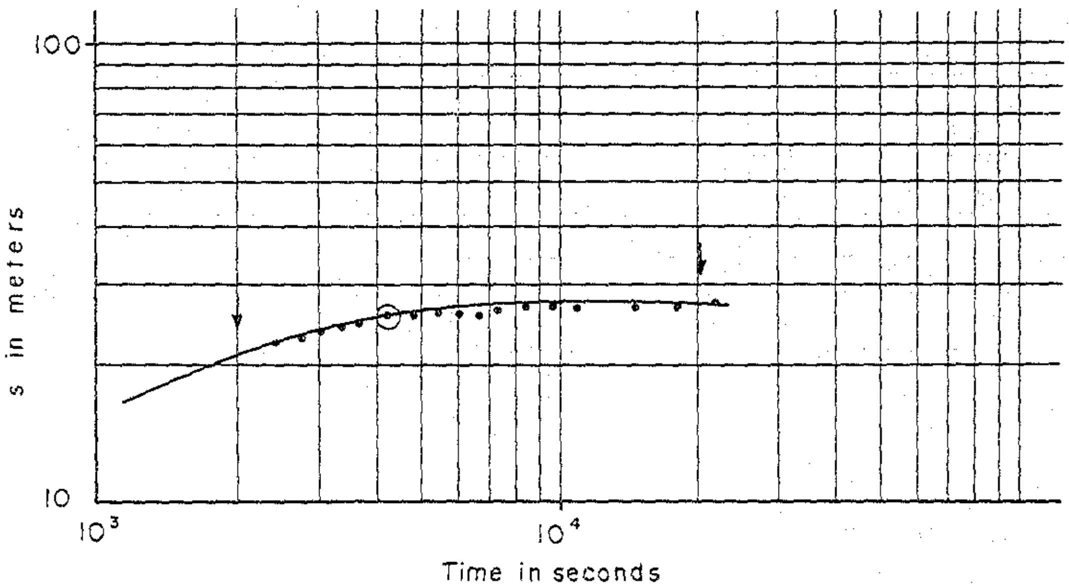
$Q = 4.41583 \times 10^{-3} (m^3/s)$

$u = 2 \times 10^{-4}$

$W(u) = 7.7$

$T = \frac{Q}{4 \pi S} W(u) = 1.1 \times 10^{-4} (m^2/s)$

$S = \frac{4 u T t}{r^2} = 0.06$



DZ - I Chow's method.

Fig. D.5.3 Analysis of the Pumping Test (4/12)

Time - drawdown curve

$r = 0.075\,(m)$ $S = 0.54$

$t = 10^4$

$\Delta s = 0.54 - 0.345 = 0.195$

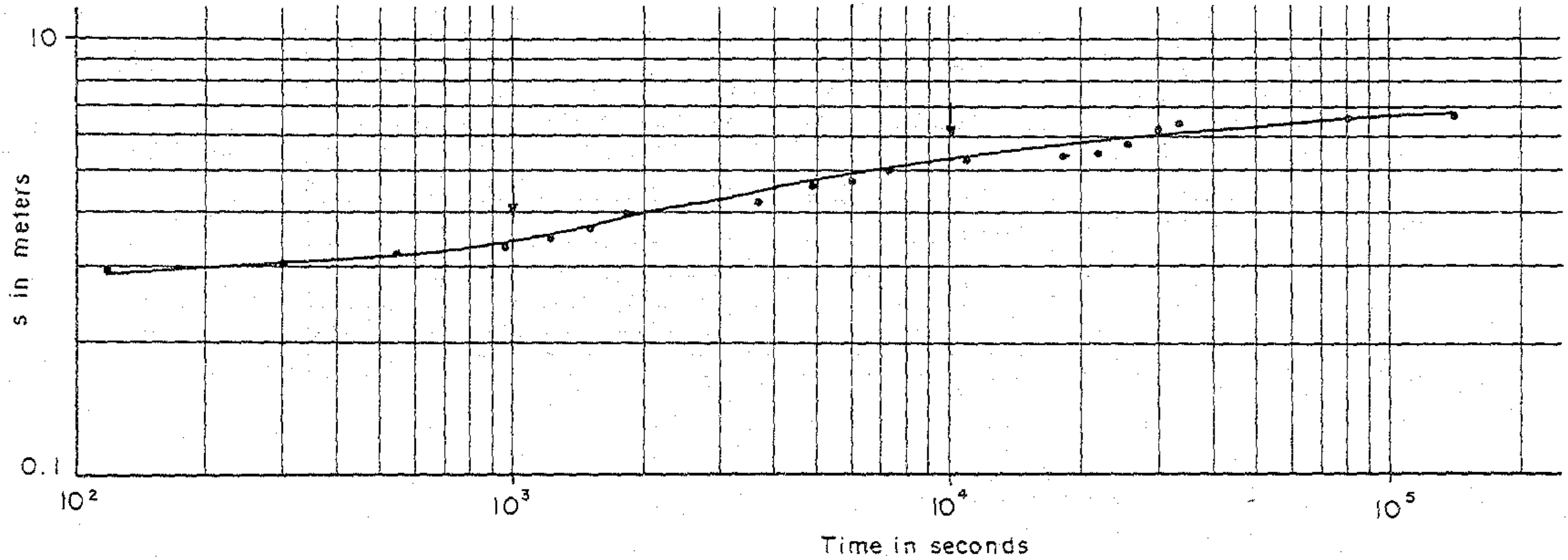
$F(u) = \frac{S}{\Delta s} = 2.27$

$Q = 4.73125 \times 10^{-3}\,(m^3/s)$

$u = 10^{-3}$

$W(u) = 6$

$T = \frac{Q}{4\pi s} W(u) = 4.2 \times 10^{-3}\,(m^2/s)$



DZ - II Chow's method.

Fig. D.5.3 Analysis of the Pumping Test (5/12)

Time - drawdown curve

$r = 0.075\,(m)$ $S = 3.4$

$t = 1500$

$\Delta s = 3.4 - 2.15 = 1.25$

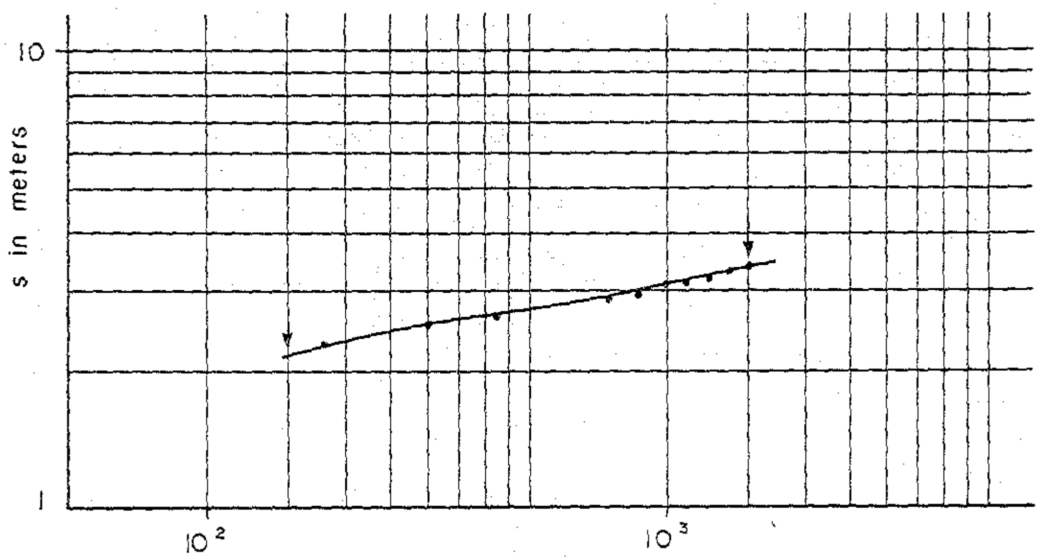
$F(u) = \frac{s}{\Delta s} = 2.72$

$Q = 4.41583 \times 10^{-3}\,(m^3/s)$

$u = 1.8 \times 10^{-3}$

$W(u) = 5.7$

$T = \frac{Q}{4 \pi s} W(u) = 5.9 \times 10^{-4}\,(m^2/s)$



DZ - III Chow's method

Fig. D.5.3 Analysis of the Pumping Test (6/12)

Time - drawdown curve

$Q = 4.41583 \times 10^{-3}\ (m^3/s)$

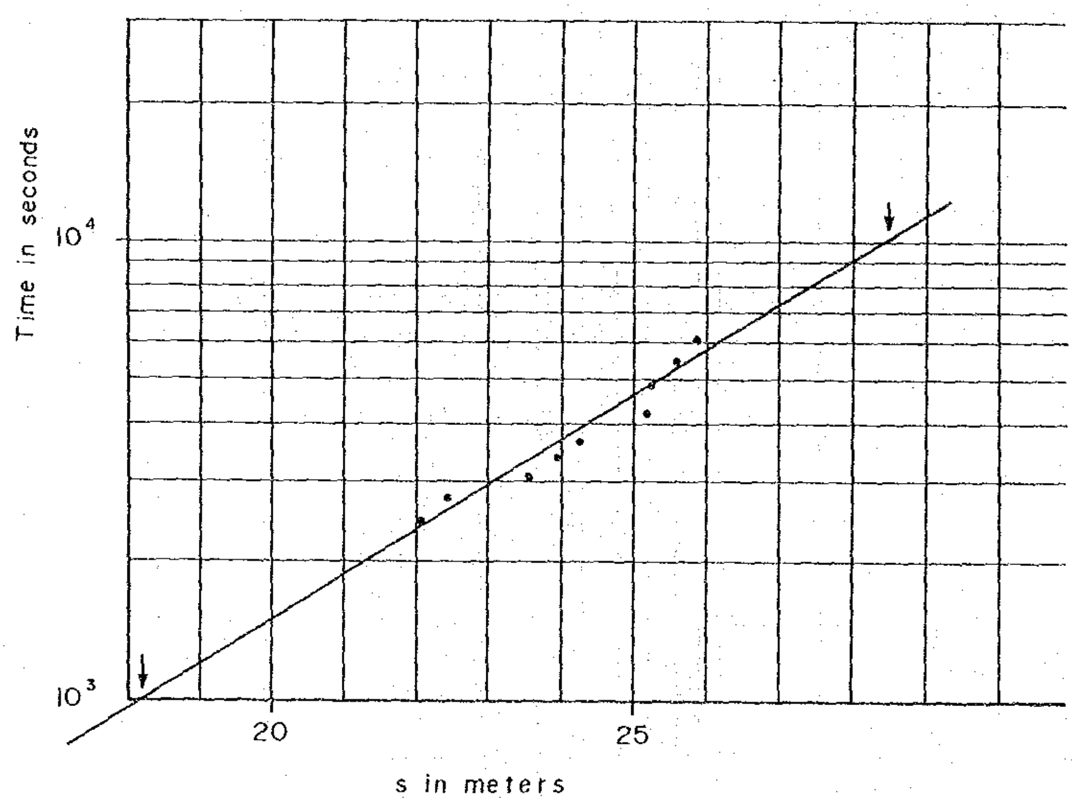
$\Delta S = 28.4 - 18.2 = 10.2$

$T = \frac{2.3Q}{4\pi \Delta S} = 7.9 \times 10^{-5} (m^2/s)$

$t_0 = 15.5$

$S = \frac{2.25\,T\,t_0}{r^2} = 0.49$

$r = 0.075\ (m)$

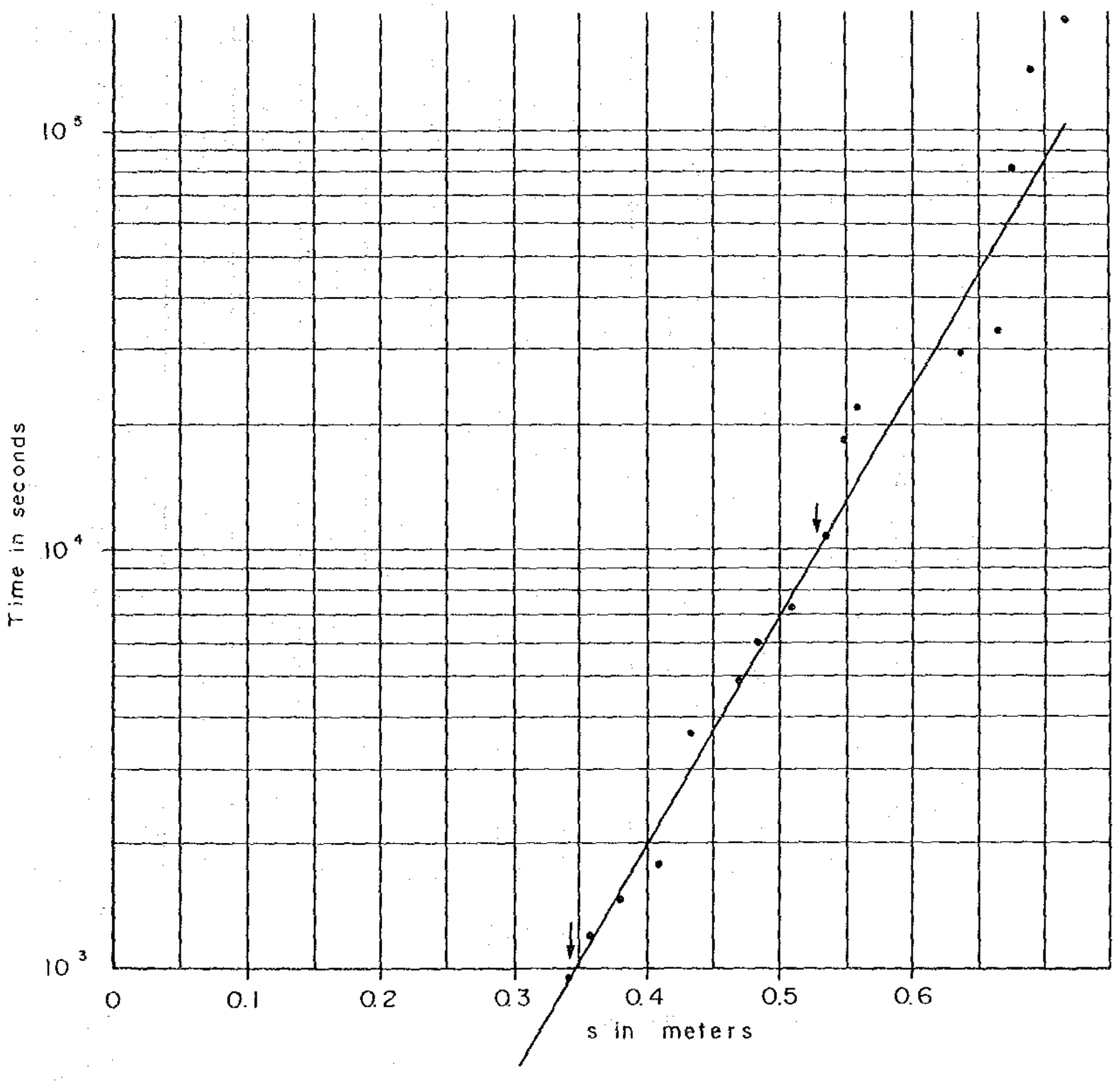


DZ - 1 Jacob's method

Fig. D.5.3 Analysis of the Pumping Test (7/12)

Time - drawdown curve

$Q = 4.73125 \times 10^{-3}\ (m^3/s)$
$\Delta S = 0.53 - 0.345 = 0.185$
$T = \frac{2.3Q}{4\pi \times S} = 4.68 \times 10^{-3}$
to = 12.5



DZ - II Jacob's method

Fig.D.5.3 Analysis of the Pumping Test (8/12)

Time - drawdown curve

$Q = 4.41583 \times 10^{-3}\ (m^3/s)$

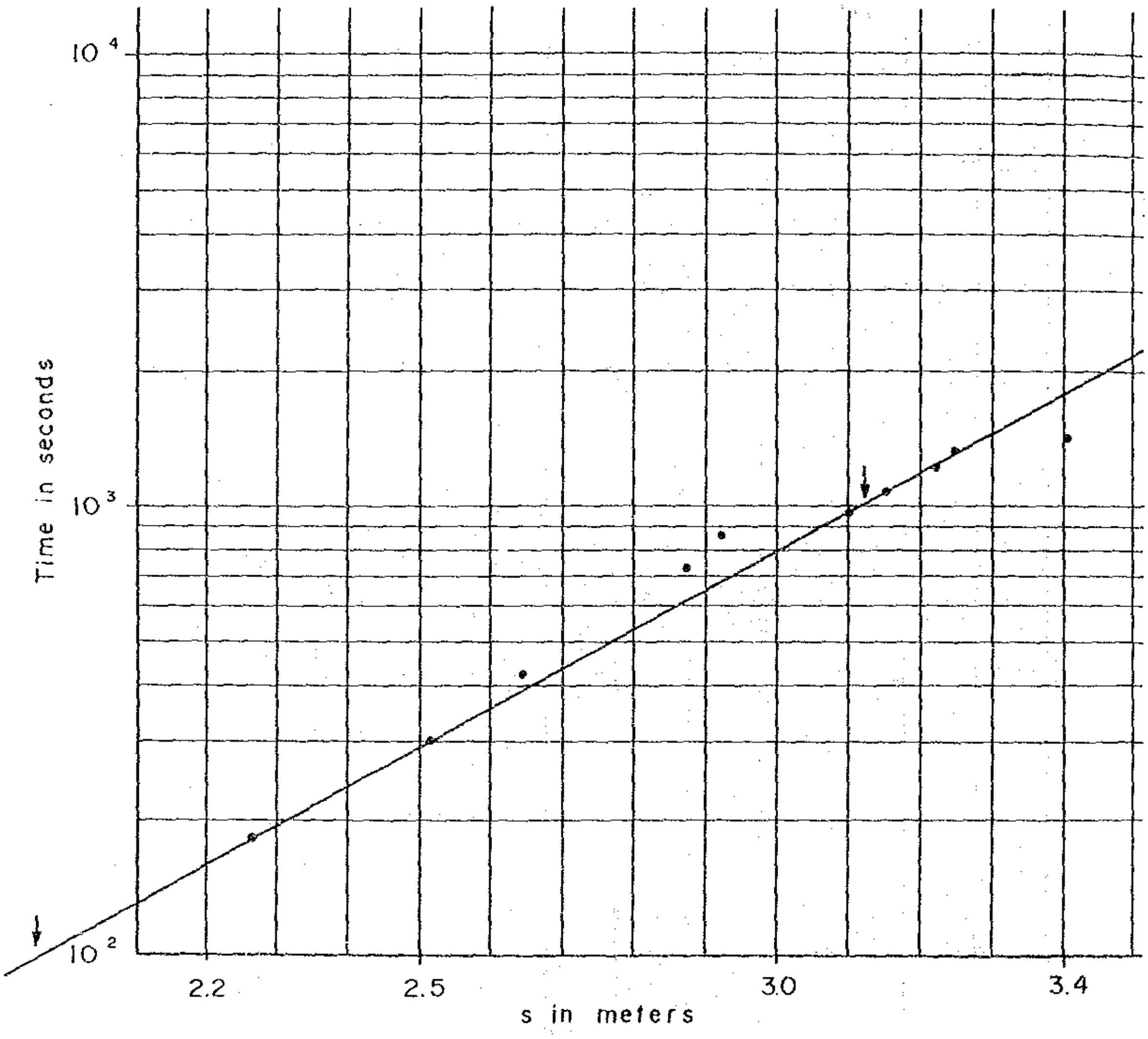
$S = 3.12 - 1.96 = 1.16$

$T = \frac{2.3\,Q}{4\pi\,\Delta S} = 7.0 \times 10^{-4}$

$t_0 = 2.0$

$S = \frac{2.25\,T\,t_0}{r^2} = 0.55$

$r = 0.075\ (m)$



DZ - III Jacob's method

Fig. D.5.3 Analysis of the Pumping Test (9/12)

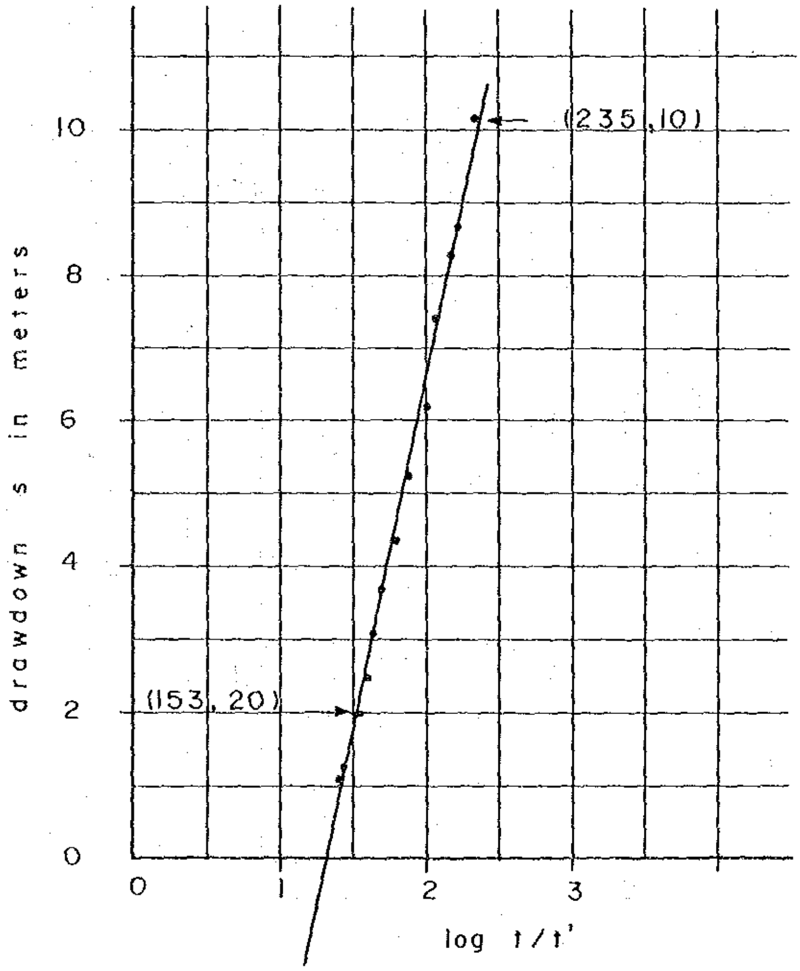
S - log t/t' curve

$Q = 4.41583 \times 10^{-3}$ (m^3/s)

$T = \frac{0.183\ Q \log t/t}{S}$

$= 8.3 \times 10^{-5}$ (m^2/s)

$\frac{\log t/t'}{S} = \frac{0.82}{8}$



DZ - I Recovry

Fig. D.5.3 Analysis of the Pumping Test (10/12)

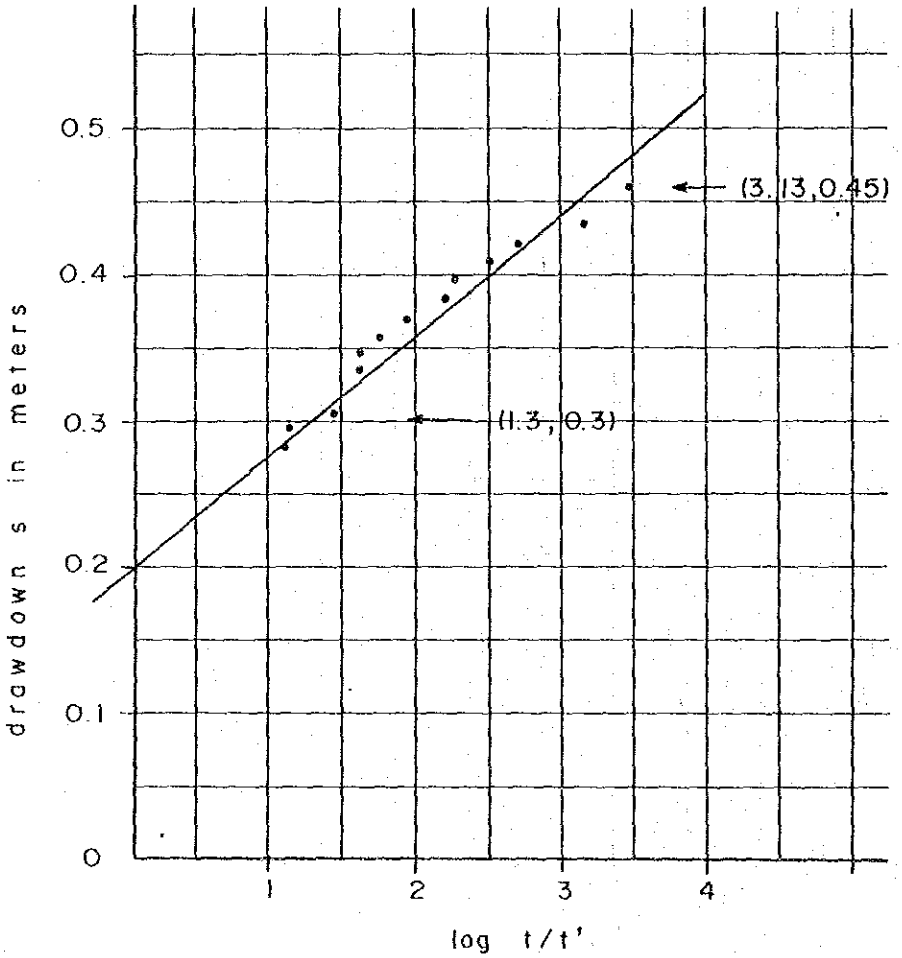
S - log t/t' curve

$Q = 4.73125 \times 10^{-3}$ (m^3/s)

$$T = \frac{0.183 \cdot Q \cdot \log t/t'}{S}$$

$$= 1.1 \times 10^{-2} \ (m^2/s)$$

$$\frac{\log t/t'}{S} = \frac{1.83}{0.15}$$



DZ - II Recovry

Fig. D.5.3 Analysis of the Pumping Test (11/12)

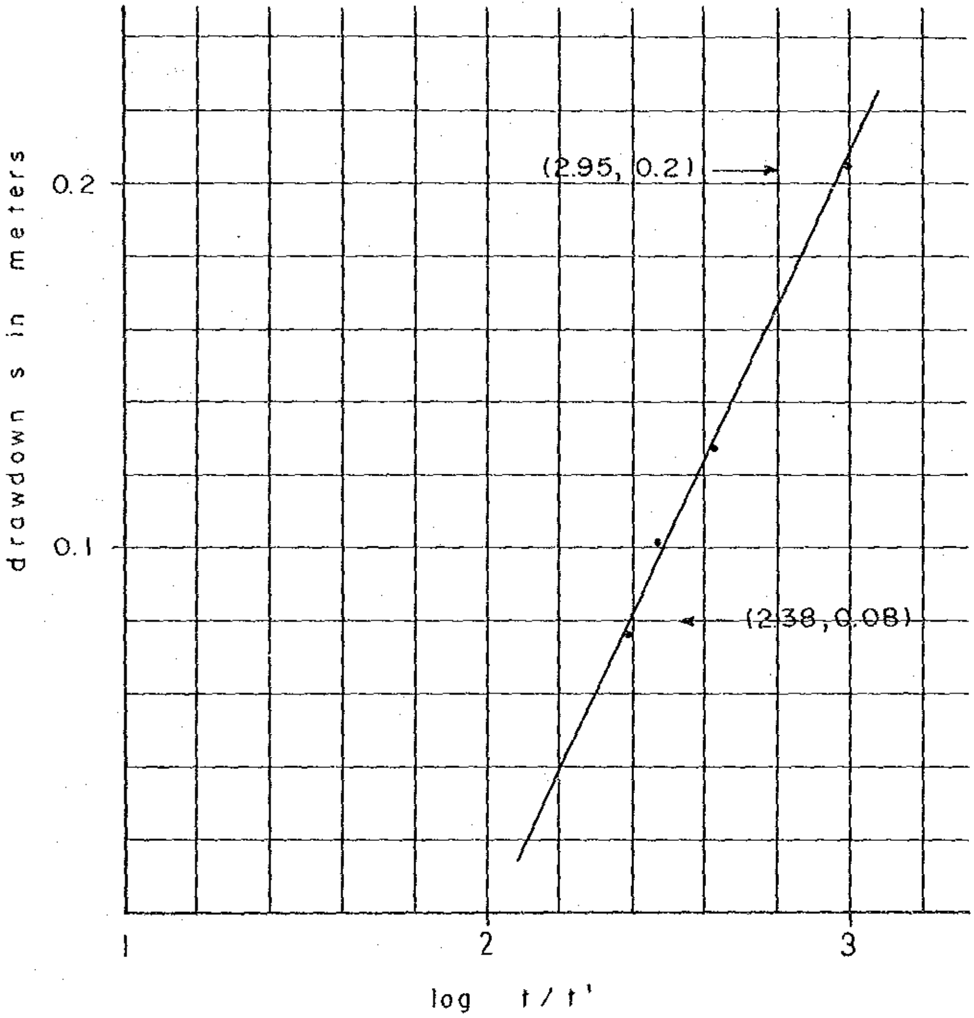
S - log t/t' curve

$Q = 4.41583 \times 10^{-3}$ (m^3/s)

$T = \frac{0.183 \cdot Q \cdot \log\ t/t}{S}$

$= 3.8 \times 10^{-3}$

$\frac{\log\ t/t'}{S} = \frac{0.57}{0.12}$



DZ - III Recovry

Fig. D.5.3 Analysis of the Pumping Test (12/12)

APPENDIX E

WATER QUALITY

APPENDIX E WATER QUALITY

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APPENDIX E WATER QUALITY

1. WATER QUALITY TEST

Water quality of river and spring etc. is an important factor for water resources development. Water quality test is key determinant to identify sound water resources availability.

Sixteen sampling sites were specified in the Project area as shown in Fig. E.1.1, water quality tests were carried out essentially once a month.

1.1 Items of Water Quality Test

Twelve items of water quality test (ECw, pH, COD, NO_2-N, NO_3-N, NH_4-N, Cl, Fe, Cu, Zn, General and colon bacillus), were selected taking matters mentioned below into consideration.

a) to complete test quickly (avoiding change in water quality on the way of conveyance to a long distance laboratory).

b) to examine the availability of river or spring water for irrigation and domestic use.

In addition to the twelve items, BOD, SS and DO were tested occasionally at the authorized laboratory.

1.2 Result of the Test

Result for the test is listed Table E.1.1, and summarized below.

Subject	BOD	COD	T-N	Heavy metals	Bacilli
Balili river	16 - 34	19 - 23	10 - 18	Not detected	Contaminated
	16 - 55	19 - 53	8 - 10		
Bolo creek	19	5 - 15	1 - 3	Not detected	Contaminated
	- do -	- do -	4		
Creeks in	2 - 5	2 - 6	0 - 0.8	Not detected	Contaminated
the Study area	- do -	- do -	- do -		
Springs and	0 - 5	0 - 3	0 - 2	Not detected	Partly
wells	- do -	- do -	- do -		contaminated
Dinog cave	12	1 - 8	-	Not detected	Contaminated
	- do -	- do -	-		

Upper : Wet season
Lower : Dry season

Balili river water had levels over 20 ppm in both of BOD and COD even in the wet season, and over 10 ppm in T-N, so that it can be said that the Balili river is confirmed to have been badly contaminated with sewage.

2. CONSIDERATIONS

According to an authorized water quality guideline listed below, irrigation water had levels above 6 ppm of BOD or COD, and above 5 ppm of T-N, thus constituting a growth impediment for crop plants. As a reference, guidelines of water quality for irrigation in the Philippines is shown in Table E.1.2.

Limited Content of Water Pollution or Crop Growth

Items	Unit	Unaffected Content	Notes
pH	pH	6.0 - 7.0	Acidity - Alkalinity
Cl	ppm	500 - 700	Chloride
EC	mV/cm	Less than 1	Electrical Conductivity
T-N	ppm	Less than 5	Total - Nitrogen
NH4-N	ppm	Less than 3	Ammonia - Nitrogen
ABS	ppm	Less than 3	Alkyl Benzene Sulfanate
COD	ppm	Less than 6	Chemical Oxygen Demand
BOD	ppm	Less than 5 - 8	Biochemical Oxygen Demand
DO	ppm	Less than 5	Dissolved Oxygen
As	ppm	Less than 1	Arsenic
SS	ppm	Less than 100	Suspended Solid

Source : Agricultural pollution handbook in Japan

The Balili river water is judged to be unsuitable as an irrigation and domestic water source on the basis of the results observed even in wet season.

Almost all creek water in the Project area has been contaminated by bacilli. These has therefore been disqualified for domestic use, but is quite harmless for irrigation use. The Bolo creek have recorded above 10 ppm in BOD because of contamination of La Trinidad sewage, having an apprehension of infection for irrigated crop.

As for the Dinog cave, to where the Balili river water seeps out, water quality of the site has somewhat contaminated. In spite of being introduced to the distinguishably polluted Balili river water , the water has purified on the way of seeping at 8 ppm in COD and 12 ppm in BOD. However, the water has bad influence for irrigated crop depend upon its varieties. Moreover, well and spring water tested at a few sampling sites are partly recognized bacilli pollution, which are not qualified as quite good for domestic use.

A water sample of the Balili river was tested for some factors, i.e., BOD, COD, surface active agent and etc., in Japan. The results are shown as follows ;

Unit : ppm

Item	Value
BOD	13
COD	15
T-N	20
Surface active agent	2.2
Arsenic	0.1

: Sampled in Balili river at 8:00, March, 13. 1988

According to the limited contents mentioned previously, the surface active agent and the arsenic are within permissible line. However, the more drought proceed for April, the more the river water will be contaminated.

Table E.1.1 Result of Water Quality Test

1987 August

Determination	Unit	Balili R. (1)	Pico (2)	Ambiong (3)	Balili R. (4)	Poblacion (5)	Bahong (6)	Wangal (7)	Bahong (cave) (8)	Buyagan (9)	Betag (10)	LTWD (pump) (11)	Bineng (12)	Pugis (13)	Boleweng A (14)	Boleweng B (15)	Sadag (16)
Electrical (EC) Conductivity	ms/cm	0.251	0.280	0.098	0.293	0.268	0.410	0.147	0.290	0.366	0.160	0.319					
Acidity (pH) Alkalinity	pH	8.1	7.9	8.1	8.2	7.6	8.1	8.3	7.6	7.7	8.0	7.9					
Chmical (COD) Ox. Demand	ppm	20 -	5	0 - 1	20 -	15	4	0 - 1	1	5	6	—					
Biochemical(BOD) Ox. Demand	ppm																
Suspended (SS) Solid	ppm																
Dissolved (DO) Oxygen	ppm																
Nitrite (NO2-N) Nitrogen	ppm	0.10	0.01	—	0.25	0.06	—	—	—	—	—	—					
Nitrate (NO3-N) Nitrogen	ppm	—	0.1	—	—	—	—	—	—	—	—	—					
Ammonia(NH4-N) Nitrogen	ppm	1.2	0.6	—	8.0	1.2	—	—	—	0.2	2.0	—					
Chloride (Cl)	ppm	0 -	—	—	0 -	—	—	—	20 -	20 - 25	10	25					
Total Iron (Fe)	ppm	—	—	—	—	—	—	—	—	—	0.1	—					
Copper (Cu)	ppm	—	—	—	—	—	—	—	—	—	—	—					
Zinc (Zn)	ppm	—	—	—	—	—	—	—	—	—	1.0	—					
General Bacillus	—	+++	++	+	+++	+	++	++	++	+	+	+					
Colin Bacillus	—	+++	++	+++	+++	+	++	++	++	++	—	+					

+ : Recognized — : Unrecognized

Tested by JICA team

Table E.1.1 Result of Water Quality Test (Cont.)

1987 September

Determination	Unit	Balili R. (1)	Pico (2)	Ambiong (3)	Balili R. (4)	Poblacion (5)	Bahong (6)	Wangal (7)	Bahong (cave) (8)	Buyagan (9)	Betag (10)	LTWD (pump) (11)	Bineng (12)	Pugis (13)	Boleweng A (14)	Boleweng B (15)	Sadag (16)
Electrical (EC) Conductivity	ms/cm	0.246	0.228	0.061	0.280	0.219	0.326	0.106	0.311	0.347	0.289	0.304	0.114	0.126	0.231	0.225	0.154
Acidity (pH) Alkalinity	pH	8.4	8.3	8.2	7.8	7.6	7.7	8.2	7.4	7.7	7.9	7.4	7.9	7.7	7.6	7.4	8.9
Chmical (COD) Ox. Demand	ppm		4	—	7 -		—	—	—	—	—	—		3			
Biochemical(BOD) Ox. Demand	ppm																
Suspended (SS) Solid	ppm																
Dissolved (DO) Oxygen	ppm																
Nitrite (NO2-N) Nitrogen	ppm	0.3	—	—	0.3	0.1	—	—	—	—	—	—	—	—	—	—	—
Nitrate (NO3-N) Nitrogen	ppm	10.0	0.2	—	10.0	2.0	—	—	—	—	—	—	—	—	—	—	—
Ammonia(NH4-N) Nitrogen	ppm	6.0	0.65	0.1	8.0	0.6	—	—	—	—	1.6	0.35	—	—	0.4	—	—
Chloride (Cl)	ppm	+	—	—	+	+	+	+	+	+	+	+	+	+	+	+	+
Total Iron (Fe)	ppm	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Copper (Cu)	ppm	—	—	—	—	—	—	—	—	—		—	—	—	—	—	—
Zinc (Zn)	ppm	—	—	—	—	—	—	—	—	—	0.8	—	—	—	—	—	—
General Bacillus	—	+++	+++	++	+++	+	+++	+++	+++	+++	+	+	+++	+++	+++	++	+++
Colin Bacillus	—	++	+	++	+	+	++	++	+++	+	++	++	+	++	++	++	+++

+ : Recognized — : Unrecognized

Table E.1.1 Result of Water Quality Test (Cont.)

1987 October

Determination	Unit	Balili R. (1)	Pico (2)	Ambiong (3)	Balili R. (4)	Poblacion (5)	Bahong (6)	Wangal (7)	Bahong (cave) (8)	Buyagan (9)	Betag (10)	LTWD (pump) (11)	Bineng (12)	Pugis (13)	Boleweng A (14)	Boleweng B (15)	Sadag (16)
Electrical (EC) Conductivity	ms/cm																
Acidity (pH) Alkalinity	pH	8.45	7.65	7.80	7.65	9.30	8.35	7.35	7.85	7.70	8.20	8.30	8.45	7.60	8.65	8.20	8.05
Chmical (COD) Ox. Demand	ppm	23.32	2.12	5.65	19.08	4.95	0.71	6.36	7.77	1.41	2.12	2.12	4.95	0.71	2.83	2.83	1.41
Biochemical(BOD) Ox. Demand	ppm	15.93	5.66	4.09	34.45	19.07	2.80	3.54	12.22	3.59	1.53	2.00	3.03	4.12	1.62	2.44	4.49
Suspended (SS) Solid	ppm		10.0	10.0				4.0						2.0			
Dissolved (DO) Oxygen	ppm	7.57	7.63	7.68	7.30	7.75	7.59	7.52	7.67	7.48	7.64	7.59	8.07	7.56	7.97	7.98	7.53
Nitrite (NO2-N) Nitrogen	ppm																
Nitrate (NO3-N) Nitrogen	ppm																
Ammonia(NH4-N) Nitrogen	ppm																
Chioride (Cl)	ppm																
Total Iron (Fe)	ppm																
Copper (Cu)	ppm																
Zinc (Zn)	ppm																
General Bacillus	—																
Colin Bacillus	—																

+ : Recognized — : Unrecognized

Tested by BSWP Labolatory

Table E.1.1 Result of Water Quality Test (Cont.)

1987 November

Determination	Unit	Balili R. (1)	Pico (2)	Ambiong (3)	Balili R. (4)	Poblacion (5)	Bahong (6)	Wangal (7)	Bahong (cave) (8)	Buyagan (9)	Betag (10)	LTWD (pump) (11)	Bineng (12)	Pugis (13)	Boleweng A (14)	Boleweng B (15)	Sadag (16)
Electrical (EC) Conductivity	ms/cm	0.389	0.268	0.319	0.396	0.297	0.391	0.167	0.353	0.360	0.303	0.315	0.145	0.166	0.211	0.209	0.168
Acidity (pH) Alkalinity	pH	7.65	7.5	7.6	7.6	7.2	7.7	8.5	7.5	7.4	8.0	7.7	7.7	7.5	7.5	7.5	8.9
Chmical (COD) Ox. Demand	ppm				8.25		8.0						8.0		8.0	7.5	9.0
Biochemical(BOD) Ox. Demand	ppm																
Suspended (SS) Solid	ppm																
Dissolved (DO) Oxygen	ppm																
Nitrite (NO2-N) Nitrogen	ppm	0.225	0.06	0	0.06	0.15	0	0	0	0	0	0	0	0	0	0	0
Nitrate (NO3-N) Nitrogen	ppm	4.6	2.3	0	2.3	2.3	0	0	0	0	0	0	0	0	0	0	0
Ammonia(NH4-N) Nitrogen	ppm	4.0	1.2	0.4	8.0	1.5	0	0	0	0	0.8	0.4	0	0	0	0	0
Chioride (Cl)	ppm	+	+	+	+	+	+	—	+	—	+	+	—	+	+	+	—
Total Iron (Fe)	ppm	0	0	0.2	0.2	0	0	0	0	0	0.2	0	0	0	0	0	0
Copper (Cu)	ppm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc (Zn)	ppm	0	0	0	0	0	0.25	0	0	0	0.25	0	0	0	0	0.25	0
General Bacillus	—		++	+	+++	++	++	+	+++	++	+		+	+++	++	+	++
Colin Bacillus	—		+	+	++	+	+	+	+++	+	+		+	++	+	+	+

+ : Recognized — : Unrecognized

Tested by JICA team

Table E.1.1 Result of Water Quality Test (Cont.)

1987 December

Determination	Unit	Balili R. (1)	Pico (2)	Ambiong (3)	Balili R. (4)	Poblacion (5)	Bahong (6)	Wangal (7)	Bahong (cave) (8)	Buyagan (9)	Betag (10)	LTWD (pump) (11)	Bineng (12)	Pugis (13)	Boleweng A (14)	Boleweng B (15)	Sadag (16)
Electrical (EC) Conductivity	ms/cm		0.170				0.342							0.131	0.180	0.202	0.135
Acidity (pH) Alkalinity	pH		8.3				7.7							7.5	7.4	7.2	9.1
Chmical (COD) Ox. Demand	ppm		5											5			9.4
Biochemical(BOD) Ox. Demand	ppm																
Suspended (SS) Solid	ppm																
Dissolved (DO) Oxygen	ppm																
Nitrite (NO2-N) Nitrogen	ppm		0.10				0.02							0	0	0	0
Nitrate (NO3-N) Nitrogen	ppm		3.5				1.0							0	0	0	0
Ammonia(NH4-N) Nitrogen	ppm		0.1				0							0	0	0	0
Chloride (Cl)	ppm		+++				—							+++	+	+	+
Total Iron (Fe)	ppm		0				0							0	0	0	0
Copper (Cu)	ppm		0				0							0	0	0	0
Zinc (Zn)	ppm		0				0							0	0	0	0
General Bacillus	—		++				+++							+++	+	+	++
Colin Bacillus	—		+				++							++	+	++	+++

+ : Recognized — : Unrecognized

Tested by JICA team

Table E.1.2 Guidelines for Interpretation of Water Quality for Irrigation in the Philippines

Irrigation Problem	No Problem	Degree of Problem: Increasing Problem	Severe Problem
Salinity *2 (affected crop water availability)			
ECw (mmhos/cm)	0.75	0.75 - 3.0	3.0
Permeability (affect infiltration rate into soil)			
ECw (mmhos/cm)	0.5	0.5 - 0.2	0.2
Montmorillonite (2:1 crystal lattice)	6	6 - 9 *3	9
Illite - Vermiculite (2:1 crystal lattice)	8	8 - 16*3	16
Kaolinite - Sesquioxides (1:1 crystal lattice)	16	16 - 24*3	24
Specific on Toxicity (affects sensitive crops)			
Sodium *4 *5 (Adj. SAR) *1	3	3 - 9	9
Chloride *4 *5 (meq/l)	4	4 - 10	10
Boron (mg/l)	0.75	0.75 - 2.0	2.0
Miscellaneous (affect susceptible crops)			
NO_3 - N (mg/l) NH_4 - N (mg/l)	5	5 - 30	30
HCO_3 (meq/l) (ever land sprinkling)	1.5	1.8 - 8.5	8.5
pH	(normal range 6.5 - 8.4)		

*1 Adj. SAR mean adjusted Sodium Adsorption Ratio.

*2 Values presented area for the dominant type of clay material on the soil since structual stability varies between the various clay type (Raling, 1966 and Rhoaden, 1975). Ploblems are less likely to develop if water salinity is high; more likely if water salinity is low.

*3 Use the lower range if ECw 0.4 mmhos/cm. Use the intermediate range if Ecw 0.4 - 1.6 mmhos/cm. Use upper limit of Fcw 1.6 mmhos/cm.

*4 Most tree crop and woody or namentals are sensitive to sodium and chloride (use value shown).Most annual crops are not sensitive.

*5 With sprinkler irrigation or sensitive crops, sodium or chloride is excess of 33 meq under certain condition has resulted to excessive leaf adsorption and crop damage.

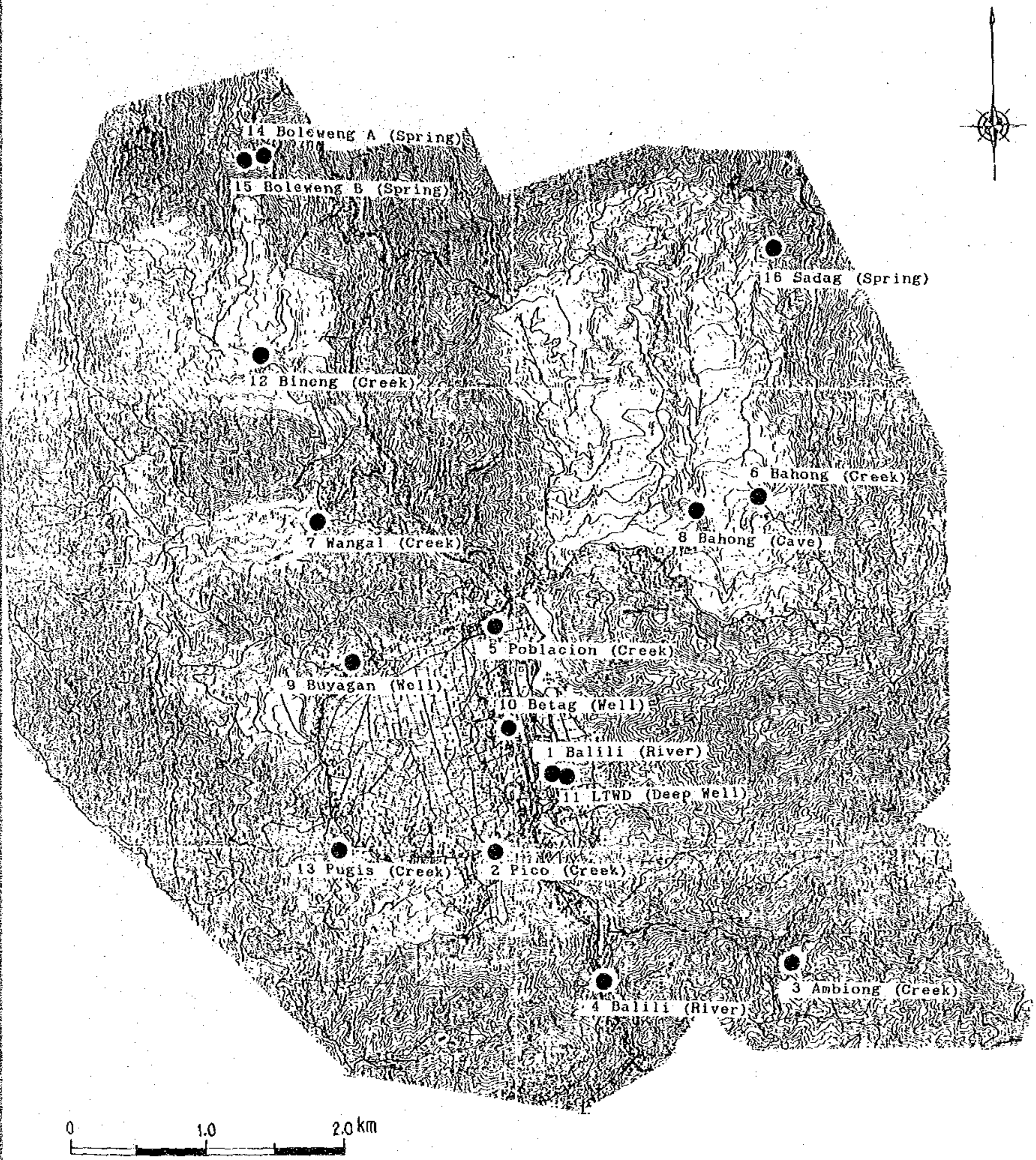

Fig. E.1.1 Location Map of Water Quality Sampling

APPENDIX F

IRRIGATION

APPENDIX F IRRIGATION

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1 PRESENT CONDITIONS

1.1 Present Irrigation Area

1.1.1 Irrigated area

Irrigation practice is required for about six months from November to April owing to small rainfall. Although sufficient water for irrigation has been not always provided especially in the most droughty month, area presented below has some irrigation services.

PRESENT IRRIGATION AREA

Zone	Category	Water Source	Area(ha)	Remarks
Zone I	Upland field	Bodecewcew and Ovulan Spring	22	
	Upland field	Pico Creek	56	Supplemented by the Balili river water (38 ha)
	Upland field	Puguis Spring and Creek	40	
	Upland field	Bayabas Creek(1)	7	
	Upland field	Bayabas Creek (2)	18	Supplemented by the Balili river water
	Upland field	Betag Creek	42	Supplemented by the Balili river water
	Upland field	Bolo Creek	15	Supplemented by the Balili river water
Sub-total			200	
Zone II	Upland field	Dinog Cave	100	Supplemented by the Balili river water
	Upland field	Bahong Creek	18	
	Upland field	Springs in Bahong	30	
	Upland field	Alapang Creek	45	Supplemented by Springs
	Upland field	Peril Creek (1)	26	Partly pumped up
	Paddy field	Peril Creek (2)	1	Supplemented by Spring
Sub-total			220	

Zone III	Upland field	Wangal Creek	5	
	Upland field	Wangal Creek	20	Bineng, irrigated *1 by existing canal
	Upland field	Bineng Creek	4	
	Upland field	Springs	1	
	Paddy field	Wangal Creek	5	Bineng, irrigated by existing canal
	Paddy field	Springs	20	
Sub-total			55	
TOTAL			475	

*1 : in severe drought term, Balili river water has been slightly introduced.

1.1.2 On-Farm condition

In order to grasp the present on-farm condition, two sample sites were decided as typical farm land for upland field and paddy field respectively, which are shown in Fig.F.1.1 and Fig.F.1.2.

Accordingly, land use on the sample sites are listed as follows:

PRESENT ON-FARM CONDITION OF THE SAMPLING SITES

Items	Sample site A	Sample site B
Farm category	upland field	paddy field
Total area (ha)	0.78	0.48
Total cultivated land (ha)	0.60	0.38
Plot nos.	9	7
Average plot area(ha)	0.068	0.022
Other use area (ha)	0.18	0.10
Ratio of cultivated land (%)	77	79

As for upland field, small canal networks are partially provided, although the canal is not systematically aligned and is counted as low density. Irrigation water is conveyed to irrigated area by poly-tubes, then delivered to farmland through those canals.

Very few canals are provided in paddy field. Therefore, irrigation water is generally delivered plot to plot of the field, and thus surplus water is drained into nearest creek or river directly.

1.2 Irrigation Practices

1.2.1 Water source for irrigation

There are three major water sources in the Project area for irrigation especially in the dry season . Those are listed as follows:

- Base flow of stream in the Project area
- Spring water
- the Balili river

Each Zone has no abundant water source, and irrigation practice is scarcely fulfilled in spite of farmers' enormous efforts of utilizing available water therein.

Present condition of water utilization in each Zone is summarized as follows:

a. Zone I

Water use of the Balili river is limited in the dry season and even the wet season because of increasing contamination of the river water. Only about 0.02 cu.m/s of the river water was estimated to be used for irrigation in the dry season, at the result of measures of diverted water in the field survey .

Several springs were found in Puguis and Pico, and 0.03 to 0.04 cu.m/s of discharge from these springs in all was estimated to be utilized for irrigation.

Base stream flow in this area is scarcely expected, but stream water charged by springs in upstream site is used effectively by damming up.

b. Zone II

Dinog cave is the major water source in Zone II. As a result of topographical and geological survey, it was found that the cave was an outlet of natural tunnel connecting with downstream side of the Balili river in Zone I. Therefore, water flow into this cave was estimated to be mixed with Balili river water and other seepage water through the tunnel. In severe dry season, contaminated Balili river water is directly charged to the Dinog cave by damming up. Unless taking positive countermeasure such as damming up at the Balili river, discharge of 0.015 to 0.02 cu.m/s was estimated to be available at this cave for irrigation in consideration of existing conditions concerned with utilization of irrigation facilities and present cropping pattern therein. In addition to this, 0.03 to 0.04 cu.m/s of water from springs studding in this Zone were also estimated to be available for irrigation.

Source of base flow is spring water. Although the amount is small, those are still expected to be used for irrigation.

c. Zone III

Springs at paddy field and water diverted from the Wangal creek through Bineng CIS canal are major water sources in Zone III.

Water discharge from the springs was estimated at 0.02 cu.m/s taking consideration of the actual cropping area of paddy.

There is no other way of diverting by the existing canal to supply irrigation water for upland area in Zone III. Because of incomplete intake facilities at the Wangal creek, it was almost impossible to divert sufficient water from the Wangal creek. In case of severe drought, farmers in this area introduce limited amount of water from the Balili river by temporary tube. Existing irrigation facilities are shown in Fig.F.1.3, Fig.1.4 and Fig.F.1.5 ,respectively.

1.2.2 Irrigation / Watering practices

Most of the field in the Project area, except the limited area irrigated by the sprinkler system in Zone II, were adopted by the furrow irrigation as a surface method.

However, during severe drought season especially from February to April, watering by farmers with can or tube has been applied in order to save water. By the watering, actual irrigated area could be concentrated only around cropped portion so-called garden bed.

Crop water consumption are determined exclusively in accordance with evapotranspiration. Only way for saving water is decreasing of water losses, watering can be attained such purpose by means of decreasing actual irrigated area.

In the Project area, some samples of farm land for garden condition survey, were selected in order to estimate percentage of garden bed which are actually irrigated by the watering.

According to the survey, actual irrigated area by watering was concluded at 65 percent of farm land area.

The watering method is delivering irrigation water to a plot adjacent to an easily accessible ditch or puddle, which can manage at most a plot of about 500 sq.m.

As for actual frequency of watering practice, every day watering is familiar case, because more the irrigation frequency is more the crop production. At least, watering practice of three times a week is required in the dry season when no rainfall can be expected.

However, such watering can not be practiced in severe drought term due to the lack of available water.

1.3 Communal Irrigation System (CIS) and Private Irrigation System

1.3.1 Communal Irrigation System (CIS)

There are five (5) Communal Irrigation Systems in the Project area. Namely, Pico CIS, Bahong CIS, Alapang CIS, Alno CIS, and Bineng CIS. These CISs have been operated under respective irrigation Associations (IAs).

Field investigation for the facilities of CIS was carried out by the Study Team and interviewing IAs was also made. Results are mentioned below and summarized in Table F.1.1.

(1) Pico CIS

Pico CIS has a boulder dam and a simple intake at about 850 meters downstream of the Baguio Sewage Treatment Plant on the Balili river and the irrigation canal extended to Zone I area along the National Road. It was originally the main irrigation water source but is now used as a supplementary water in the dry season due to heavy deterioration of water quality.

Consequently, the main irrigation water source for Pico CIS Area is rainfall and resulted run off discharge coming from the catchment area of the Bayabas Creek (175 ha) and the Pico creek (24 ha), besides the Bodecewcew spring water and Ovulan Spring water which are available throughout a year and are located at the foot of limestone hill in the catchment area of the Bayabas creek

A 200 ha of irrigation area was registered for Pico, Puguis and Betag Barangay and number of farmer/beneficiary was 103, however a rapid development of the residential and commercial area is forcing the decrease of irrigation area. Based on the topographic map of 1/5,000 and supplemented field survey, the irrigation area of Pico CIS is estimated at 200 ha including Puguis area at present, of which 113 ha are irrigated by supplemental water from the Balili river in the dry season.

Other irrigation facilities of Pico CIS are canal including division structures,pipe line and plastic hose.

Purpose of the Pico CIS was the supply water to vegetable, flower and fish culture. Now, fish culture is not found in the area. The Pico CIS was established with SEC but the record and files are missing. O & M of the system has been undertook by the member of CIS using Barangay fund, Cashfund or donations by farmers.

(2) Bahong CIS

Bahong CIS is the biggest CIS in Zone II. It is reported that the potential service area is 250 ha for Bahong, Alapang and Alno Barangays and number of farmer is 300.

Main irrigation water source is rainfall and outflow from the Dinog Cave (so called Bahong Tunnel). It is believed that the outflow is composed of invaded water from the Balili river bed through the Dinog Cave and ground water through cracks of the limestone in the catchment of the Dinog Cave.

Outflow from the Dinog Cave is large in rainy season due to raising of water level at the inlet of the Dinog Cave and high elevation of ground water level, however, it becomes small as progress of the dry weather.

The other irrigation facilities are simple intake installed at the Bahong creek and the Alapang creek downstream of the outlet of the Dinog Cave. The identified intake sites are seven (7) in the Alapang creek and two (2) in the Bahong creek

The main problem of Bahong CIS are:

- Protection of much inflow of floating materials contained with garbage thrown into the Balili river to the Dinog Cave inlet,

- Construction of temporary sand-bag dam so as to divert the Balili river water to the Dinog Cave in the dry season

- Control of irrigation water distribution at the outlet of the Dinog Cave because farmers install numbers of individual pipes or hoses to supply irrigation water for their gardens. The farmers who put their hose or tube in the inner part of the outlet of the Dinog Cave and/or install bigger size of hose/tube are always receive much advantage of water, and

- Deterioration of water quality of outflow at the Dinog Cave which is caused by the Balili river pollution.

Agreement among the member is repair and maintenance of the system and water allocation during the shortage of outflow of the Dinog Cave.

The Balili river water supply area is estimated at 100 ha on the topographic map of 1/5,000 in addition to field survey.

(3) Alapang CIS

It is reported that Alapang CIS has the potential area of 10 ha and number of the member is 20.

Water source is rainfall and its resulted runoff to the Peril creek and springs. Number of intakes is five (5) and conveyance facilities of irrigation water is plastic tubes or pipes. Major crops planted are flowers and vegetables.

(4) Alno CIS

The potential area of 5 ha and 15 beneficiaries are reported. Main water source is rainfall and resulted runoff to the Alno creek. Number of intake is two (2) and water conveyance is by means of pipe/tube. Vegetable is the main crop in the area.

(5) Bineng CIS

Bineng CIS has a boulder dam and simple intake at about 250 meters downstream of the Provincial Road from Capitol to Bineng at the Gayasey on the Wangal river.

Main irrigation canal is extended around 3.5 km.

The structures are earth canal and pipe bridge crossing deep valleys.

Since the irrigation system has been deteriorated under the severe physical conditions and lack of O & M fund, leakage and seepage of water are observed in many places.

It is reported that the designed area of the system was 60 ha and 35 farmers were registered on September 17, 1976 with no. SEC/FSDC 69697. However, the actual irrigated area is about 40 ha at present. The system was constructed as the FSDC project (Farm System Development Corporation) with cost of 248,013 pesos which is 16,840 pesos per one farmer.

This system is operated under the agreement among farmers by-laws Bineng Irrigators Service Association, Inc.

1.3.2 Private irrigation system

Private irrigation system are found in the topographically constrained sites.

In high elevation area where spring water is available or low elevation area where creek water is available in gravity or by means of pumping up, some rich farmers have installed private irrigation systems. Major water conveyance is made utilizing poly-tube or pipe up to their farmland. Usually, farmers provide a small garden basin or a pit for watering purpose.

Such area are found at the following places :

- small spring in Zone I (about 1 ha)
- left hill side of the Peril creek in Zone II (about 8 ha)
- left hill side of the Alno creek in Zone II (about 5 ha)
- lowland pumping area along the Peril creek in Zone II (about 1 ha)

— north-east of Zone III of which elevation is lower than 900 meters (about 4 ha)

Total area is estimated at about 19 ha.

1.4 Intake Rate Survey

Intake rate tests was carried out in six points of several soil classification. As a method of the test, Double Ring was taken and measured integrated infiltration.

1) Integrated infiltration (D)

Exponential regression curve presented below, was adopted to the integrated infiltration data shown in Fig.F.1.6.

$$D = C\,T^{n}$$

D : Integrated infiltration (mm)
T : Time (min)
C, n : Constants

2) Intake rate (I)

Intake rate is a differential function of the integrated infiltration function mentioned above.

The equation is presented below.

$$I = 60\,C\,n\,T^{n-1}$$

I : Intake rate (mm/hr)
T : Time (min)
C, n : Constants

3) Basic intake rate (Ib)

This is the rate which water enters the soil when the charge in rate becomes 10 percent of initial value.

The equation is presented below.

$I_b = 60\ C\ n\ \{600\ (1-n)\}^{n-1}$

Ib : Basic Intake rate (mm/hr)

C, n : Constants

The results of the test are listed below :

Sample site	Integrated infiltration(mm)	Intake rate (mm/hr)	Basic intake rate (mm/hr)
Zone I, pit 5	$D=3.4T^{0.524}$	$I=106.9T^{-0.476}$	7.2
Zone II, pit 2	$D=4.0T^{0.920}$	$I=220.0T^{-0.080}$	162.0
Zone II, pit 6	$D=1.8T^{0.872}$	$I=94.2T^{-0.128}$	54.0
Zone II, pit 9	$D=1.9T^{0.584}$	$I=66.6T^{-0.416}$	6.7
Zone III, pit 5	$D=3.7T^{0.635}$	$I=141.0T^{-0.365}$	19.7
Zone III, pit 7	$D=1.4T^{0.693}$	$I=58.2T^{-0.307}$	11.7

2. DEVELOPMENT PLAN

2.1 General

In line with the basic concept and strategy for agricultural development, irrigation system should be facilitated so as to increase productivity and profitability of agriculture. As inadequate facilities and several constraints for irrigation presented below were found in the Project area, these have to be dissolved in accordance with farmers' intention.

a. Uneven seasonal distribution of rainfall,

b. Shortage of irrigation water during the dry season,

c. Inadequate irrigation facilities.

However, irrigation development plan is always formulated to be economically endorsed.

In this Project, proposed irrigation system shall be made realistic or smoothly implement.

2.2 Beneficial Area

It is considerably uneconomical to take whole agricultural land of the Project area into the beneficial area for irrigation, because some of farm lands stud steep potion of each zone. Beneficial area was demarcated in the Project area excluding remote farms mentioned below.

a. quite isolated farm land which can not be taken into certain farm section.

b. isolated farm land which requires own irrigation facilities on a large scale for supplying irrigation water.

c. high elevated farm land where irrigation water have to be pumped up at more than 50 meters of the total head.

Accordingly, beneficial area for irrigation was concluded as follows :

(Unit : ha)

Land categories	Zone I		Zone II		Zone III		Total	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net
Upland crop field	200	160	240	155	60	40	500	355
Lowland rice field	0	0	0	0	40	30	40	30
Total	200	160	240	155	100	70	540	385

Actual beneficial area excludes land acquisition from the beneficial area presented above.

2.3 Optimization of Development Plan

2.3.1 Developable water source

Developable water sources for beneficial area listed below :

a. Intake weirs

Improvement of intake weirs considerably increases availability of stream flow, and accomplish stable water intake. However, irrigation water for the entire beneficial area will still be insufficient in severe drought term.

b. Ponds

Pond which introduces water of creek or spring and releases water through the intake facilities while drought, is most effective and economic water source on a small and middle scale water demand. Whole developable pond capacity in the Project area was at most about 70,000 cu.m, because of difficulty of land acquisition and steep topographic condition.

As for the alternative plan which requires larger storage capacity to the above, construction of dam reservoir should be taken into consideration.

c. Dam reservoir

Large dam can be constructed only at middle stream of the Wangal creek, which gives 4.0 MCM. capacity at maximum. Nevertheless, the dam is costly itself, and related structures of the same need high investment.

As design water level of the dam will be set at EL. 1,210 m, supplying water for nearly half of the beneficial area must be pumped up.

d. Well

Appropriateness of irrigation water supply by well should be judged by operation cost which imposes farmers, as well as investment cost for the facilities.

According to the comparison of construction cost and agricultural benefit, well with more than 50 meters of the total head was uneconomical for exclusive use of irrigation.

However, supplementary use of well proposed for domestic water supply deserves to introduce, if the well yields sufficient water, and land acquisition for pond construction seems difficult.

2.3.2 Alternative plan

Proposing advantageous cropping pattern from agricultural aspects, it is suggested that water sources should be developed in such a manner so as to adopt surface irrigation method that are consistent with the proposed cropping pattern.

Water source development is basically composed with improvement of intake weirs and construction of ponds or small reservoirs. The construction of ponds inside of each irrigation block was assumed to be permissible to a maximum of about 70,000 cu.m in total because of difficulties of land acquisition and topographic conditions. Despite the fact that dam reservoirs can be constructed in the middle reaches of the Wangal creek in the case of huge irrigation water required, this is assumed to be rather expensive owing to the construction of big dam and long diversion conduits, and the necessity of boosted conveyance of irrigation water by pump to Zone I and a part of Zone II.

In accordance with several conditions mentioned above, three alternatives for irrigation development listed below are proposed. Optimum irrigation plan is to be determined among the alternative plans through economical evaluation.

Alternative A : to aim at enlarging the irrigable area and term by construction of mainly intake facilities. Farm ponds having only regulating capacity are also proposed.

Alternative B : to aim at enlarging the irrigable area and term by construction of intake facilities and irrigation ponds which may have as large as possible reservoir capacity topographically permitted .

Alternative C : to accomplish full development in irrigable area and term. Dam reservoir is required in the Wangal creek as a main water source.

Schematic diagram of major water source for the above irrigation development alternatives are shown in Fig.F.2.1.

Result of the comparison of the alternatives are listed as follows :

Alternative	Net beneficial area (ha) *1	Planted area (ha) *2	Major irrigation facilities
A	382	1,082 (217)	9 intake weirs, and farm ponds for regulating with 10,000 m^3 capacity in all.
B	381	1,155 (217)	8 intake weirs, and 11 nos.ponds with 68,500 m^3 capacity in all.
C	376	1,312 (217)	Concrete dam with 30 m dam height, diversion conduit of 6.8 kms length, lifting pump with $12m^3/min$,180m head.

*1 : These figures excludes land acquisition from the total net beneficial area 385 ha.
*2 : Figures in the parenthesis owe to drainage improvement but irrigation.

2.3.3 Optimum scale of development plan

Economic comparison of the alternatives are shown below, which were evaluated based on the ratio of Benefit by Cost (B/C).

Alternative	Construction cost (103 ₱)	Annual O&M cost (103 ₱)	Incremental benefit (103 ₱)	B/C
A	60,008	1,135	18,124	1.90
B	67,750	1,248	20,854	1.95
C	210,800	2,563	32,120	1.01

*: Above B/C were calculated in discount rate at 10%.

Accordingly, Alternative B was concluded as the most economic alternative with the highest B/C at 1.95 percent.

Actual beneficial area of the optimum plan excluding land acquisition for proposed road and irrigation facilities, is listed as follows:

Land categories	Zone I		Zone II		Zone III		Total	
	Gross	Net	Gross	Net	Gross	Net	Gross	Net
Upland crop field	199	159	235	152	60	40	494	351
Lowland rice field	0	0	0	0	40	30	40	30
Total	199	159	235	152	100	70	534	381

(Unit : ha)

With the optimum plan, about two thirds of farm lands in Zone I and Zone II would be supplied irrigation water for applying surface irrigation practice even in severe drought months i.e., from January to April. All farm lands in Zone III would be accomplished full area and term irrigation with good effect of improvement of existing Bineng CIS irrigation facilities.

2.4 Irrigation Method

Selecting the methods most suitable for applying water is important in order to economize investment for irrigation facilities and expense for operation and maintenance, and to apply water effectively.

Irrigation water can be applied to the uplands in any of the following general ways:

(1) Overhead irrigation
- Watering can
- Hose pipe
- Sprinkler

(2) Furrow irrigation
- Furrows
- Corrugation irrigation

(3) Flooding
- Ordinary flooding
- Boder-strip flooding
- Level-border and basin irrigation
- Contour-ditch irrigation

(4) Drip irrigation ——— Drip or trickle irrigation

According to the results of intake rate survey, average of basic intake rate of respective zones is as follows:

Unit : mm/hr

Zone of Study area	Average of basic intake rate
Zone I	7.2
Zone II	74.2
Zone III	15.7

Guide-line of suitable irrigation method in accordance with basic intake rate of soil had been generally proposed below.

Basic intake rate	Suitable irrigation method
Less than 50 mm/hr	Every method is available
50 - 75 mm/hr	Overhead irrigation, Furrow irrigation
More than 75 mm/hr	Overhead irrigation, Drip irrigation

Source : Field Irrigation in Japan, 1971

As for drip water application, a highly efficient water utilization can be achieved with this method, it usually requires high investments. Water is delivered to the orifices through plastic pipelines which are generally laid on the soil surface or buried. The plastic pipelines have to be installed in high density especially for vegetable cultivation. And, careful filtering of water is also necessary in order to avoid closing at the emitters.

Accordingly, overhead irrigation or furrow irrigation method is adaptable as a suitable irrigation method for whole Project area.

The irrigation method to be adopted will be generally transferred going with water resources development and investment for irrigation facilities to raise agricultural productivity, as agricultural modernization will be proceeded.

Watering → Furrow irrigation → Sprinkler

The introduction of new irrigation methods can be easily realized in the area holding sufficient natural resources of land or water.

However, to introduce new irrigation methods is not always feasible for area where it isn't, like the Study area.

The selection of irrigation method which requires large investment for water resources development, on-farm development and operation and maintenance, should be evaluated in view point of economic, farm management and farmers' intention.

In this Project, two kinds of transfer of irrigation method are within the realm of consideration, which are from watering to furrow and from watering to sprinkler.

Watering → Furrow irrigation

Merit:
- release farmers from heavy labor of watering
- increase the labor productivity
- increase crop variety to be able to introduce

Demerit:
- high investment for water resources development
- require on-farm works like as leveling and ditching in steep or irregular farm
- require intensive water management in order to minimize water losses

Watering → Sprinkler

Merit:
- release farmers from heavy labor of watering
- increase the labor productivity
- improve of production quality
- increase the efficiency of irrigation

Demerit:
- high investment for water resources development and terminal facilities
- require on-farm works
- require the pump to pressurize water for operating sprinkler
- require much intensive water management
- short operated term for a few month of the dry season

It should be considered that high investment for on-farm equipment such as sprinkler and much expense for maintenance and operation pressure the farm economy.

Considering those situations, furrowing was recommended as a standard irrigation method in entire Project area. However, such recommendation does not prevent farmers from independently practicing of other irrigation method so far as supplying water quantity permits.

2.5 Irrigation Water Requirement

2.5.1 Irrigation water requirement for upland crops

(1) Crop water requirement (CWR)

The crop water requirement basically comprises land preparation requirement and field crop requirement. Nursery water requirement is needed depend upon crops in addition to their requirements.

$$CWR = (NW) + LP + FC$$

Where,
- CWR : Crop water requirement (mm/day)
- NW : Nursery water requirement (mm/day)
- LP : Land preparation requirement (mm/day)
- FC : Field crop requirement (mm/day)

(i) Nursery water requirement (NW)

The nursery water requirement is the amount of water needed to irrigate nursery, in the case of strawberry which must be transplanted. Unit water requirement is as same as field crop requirement mentioned in next section.

Area of nursery to be irrigated is 10 percent of transplanted area.

(ii) Land preparation requirement (LP)

The land preparation requirement is the amount of water needed to make satisfactory field condition for seeding of crop.

Generally, land preparation requirement can be formulated as follows:

$$LP = PR / N$$

$$PR = De \times (Fc - Pw) / 100$$

Where, LP : Land preparation requirement (mm / day)
PR : Pre-irrigation requirement (mm)
N : Land preparation period (5 days)
De : Depth of soil to be irrigated for seeding (100 mm)
Fc : Field capacity (% in capacity)
Dm : Depletion of moisture content (% in capacity)

Fc and Dm of respective zones which are average of soil sampling data, are summarized as follows:

unit : % in capacity

Zone of Study area	Fc	Dm
Zone I	38.5	30.3
Zone II	37.3	28.9
Zone III	32.3	26.1

The land preparation requirement calculated by the equation mentioned above is generally smaller than the crop water requirement. In this project, the land preparation requirement is regarded as same as the crop water requirement to give some margin of water losses in term of land preparation.

(iii) Field crop requirement (FC)

The field crop requirement is the amount of water consumed by crops during the period from seeding to harvesting.

$$FC = Kc \times ETo$$

Where, FC : Field crop requirement (mm/day)
Kc : Crop coefficient
ETo : Potential evapotranspiration (mm/day)

The crop coefficient at each growth stage was estimated on the basis of the "crop water requirement" published by FAO in 1971. Those are listed below :

Growth stage at 5 days	Kc values of crops at each growth stage Strawberry	Vegetables	Rose
1	0.62	0.63	1.05
2	0.65	0.69	1.05
3	0.69	0.75	1.05
4	0.72	0.80	1.05
5	0.76	0.86	1.05
6	0.79	0.92	1.05
7	0.83	0.96	1.05
8	0.90	0.96	1.05
9	0.93	0.96	1.05
10	0.95	0.96	1.05
11	0.95	0.92	1.05
12	0.95	0.85	1.05
-	0.95		1.05
-	0.95		1.05
48	0.95		1.05
-			1.05
-			1.05
72			1.05

Potential evapotranspiration was discussed in APPENDIX C comparing ETo estimated by Penman method with open pan-evaporation data. Grounding on the discussion, potential evapotranspiration was estimated with pan-evaporation data as follows:

ETo = Kp x ETpan

Where, Kp : Pan coefficient (1.0)
ETpan : Open pan evaporation

(2) Farm water requirement (FWR)

The farm water requirement is obtained on 5-day basis, deducting the effective rainfall added up effective daily rainfall on 5-day.

FWR = CWR - RE

Where, FWR : Farm water requirement (mm/5-day)
CWR : Crop water requirement (mm/5-day)
RE : Effective rainfall (mm/5-day)

As for effective rainfall during crop growth, daily rainfall of 5 mm or less is considered ineffective.

While daily rainfall exceeding 5 mm is considered 80 percent effective, limited to the total readily available moisture of soil at 40 mm.

(3) Unit diversion water requirement

The diversion water requirement is defined as the amount of farm water requirement plus allowance for irrigation losses.

DWR = FWR / EF / 100

Where, DWR : Diversion water requirement (mm/5-day)
FWR : Farm water requirement (mm/5-day)
EF : Irrigation efficiency (%)

The irrigation efficiency (EF) is normally subdivided into three stages presented below.

i) Field application efficiency (Ea)

ii) Field canal efficiency (Eb)

iii) Conveyance efficiency (Ec)

As the irrigation method, furrowing is recommended.

EF = Ea x (Eb x Ec) = 0.7 x 0.95 = 0.65

2.5.2 Irrigation water requirement for rice

(1) Crop water requirement (CWR)

The crop requirement is defined as the amount of water needed to meet the consumptive demand of crop for optimum growth from seeding to harvesting. It consists nursery, Puddling and field crop requirements as shown below:

CWR = Kn x NU + Kd x PU + Kf x FC

Where, CWR : Crop water requirement (mm/day)
Kn : Area factor of nursery
NU : Nursery requirement (mm/day)
Kd : Area factor of puddling
PU : Puddling requirement (mm/day)
Kf : Area factor of planted main field
FC : Field crop requirement (mm/day)

(i) Nursery requirement (NU)

The nursery requirement is the amount of water needed for nursery preparation and growth of seeding until it is transplanted to original field.

The nursery area takes 3 percent of original field in accordance with present condition.

$$NU = Sn + Kc \times ETo + P$$

Where, NU : Nursery requirement (mm/day)
Sn : Soil saturation requirement
Kc : Crop coefficient (Kc = 1.0)
ETo : Potential Evapotranspiration (mm/day)
P : Percolation loss (3.6 mm/day)

Percolation loss were measured at two sites, and respective results were 7.15 mm/day and almost zero which was estimated in lower paddy field because of return flow from upper paddy field.

Averaged percolation rate 3.6 mm/day is adopted in the project.

Soil saturation requirement of nursery is regard as negligible small in comparison with CWR of original paddy field. Soil saturation requirement of nursery is made include in other factor of nursery requirement.

(ii) Puddling requirement (PU)

The puddling requirement is defined as the amount of water needed to saturate the soil prior to the initial breaking and pond the rice field for transplanting, and the needed evaporation and percolation in the paddy field.

$$PU = (Ls + Sw) / N + Ev + P$$

Where, PU : Puddling requirement (mm/day)
Ls : Land soaking (80 mm)
Sw : Standing water (20 mm)
N : Puddling period (10 days)
Ev : Evaporation (mm / day)
P : Procreation rate (3.6 mm/day)

(iii) Field crop requirement

The field crop requirement is the amount of water consumed by the crop during the period from transplanting to 20 days before harvesting.

FC = Kc x ETo + P

Where, FWR : Field crop requirement (mm/day)
Kc : Crop coefficient
ETo : Potential evapotranspiration (mm/day)
P : Percolation rate (3.6 mm/day)

The crop coefficient at each growth stage of rice is listed below, which is based upon "Crop water requirement" published by FAO in 1971.

Kc growth of rice

Growth stage at 5 days	1	2	3	4	5	6	7	8	9	10
Kc	0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10
Growth stage at 5 days	11	12	13	14	15	16	17	18	19	20
Kc	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18
Growth stage at 5 days	21	22	23	24	25	26				
Kc	1.14	1.11	1.07	1.02	0.98	0.97				

(2) Farm water requirement (FWR)

The farm water requirements was assessed on 5-day basis, deducting the effective rainfall from crop water requirement as follows:

FWR = CWR - RE

Where, FWR : Farm water requirement (mm/5-day)
CWR : Crop water requirement (mm/5-day)
RE : Effective rainfall (mm/5-day)

As for effective rainfall during crop growth, daily rainfall of 5.0 mm or less is considered ineffective. While rainfall exceeding 5.0 mm is considered 80 percent effective, limited to field outlet height of 80 mm due to spill over.

(3) Unit diversion water requirement (DWR)

The diversion water requirement is defined as the amount of farm water requirement plus allowances for application loss, operation loss and conveyance loss, and calculated as follows:

DWR = FWR / EF / 100

Where, DWR : Diversion water requirement (mm/10-day)
FWR : Farm water requirement (mm/10-day)
EF : Irrigation efficiency (%)

On the basis of present condition, Irrigation efficiency is decided as follows:

Item	Efficiency (%)
Application efficiency	95
Conveyance efficiency	90
Overall irrigation efficiency	85

2.6 Water Balance

2.6.1 Water requirement of each zone

Water requirements of each zone in optimized plan were calculated by means of the methodology mentioned previously.

Results of the calculation at five days are shown in Table F.2.1 to Table F.2.25, and water requirements summarized monthly shown below :

Month	Zone I	Zone II	Zone III
Jan.	61.9	51.5	62.4
Feb.	57.3	58.2	81.2
Mar.	54.8	64.4	125.2
Apr.	65.5	65.3	128.9
May	34.4	51.5	106.8
June	33.0	70.4	93.4
July	60.8	70.4	65.9
Aug.	42.8	37.8	73.1
Sep.	44.5	37.5	95.3
Oct.	60.5	51.4	123.7
Nov.	63.5	79.6	124.4
Dec.	63.4	63.0	87.1
Total	642.4	701.0	1,167.4

2.6.2 Irrigation block

As an unit of irrigation water supply system and irrigation practice, irrigation blocks were delineated at a few tens of hectare in each zone, considering present irrigation system and topographic conditions as shown in Fig.F.2.2 to Fig.F.2.4. And, schematic diagrams of the respective irrigation block are shown in Fig.F.2.5 to Fig.F.2.7.

These delineation should be paid attention to smoothly organizing of operating and maintaining of irrigation facilities as constituents of a irrigation block.

With considerations mentioned above, twelve irrigation blocks were obtained as follows:

Irrigation Blocks in Zone I

Irrigation Block No.	Area * (ha)	Major facilities for water supply	Remarks
I - 1	43	Pond	
I - 2	42	Pond	
I - 3	74		Alternate contaminated Balili river water with newly developed water
(I - 3 - 1)	(32)	Pond	
(I - 3 - 2)	(42)	Well	
	159		

* : excluded land acquisition from the total net beneficial area 160 ha.

Irrigation Blocks in Zone II

Irrigation Block No.	Area * (ha)	Major facilities for water supply	Remarks
II - 1	13	Pond	
II - 2	19	Pond	
II - 3	21	Pond	
II - 4	49	Reservoir	Take water from Dinog Cave, and from newly constructed reservoir one together
II - 5	8	Pond	
II - 6	20	Pond	
II - 7	15	Pond	
II - 8	7	Pond	
	152		

* : excluded land acquisition from the total net beneficial area 155 ha.

Irrigation Blocks in Zone III

Irrigation Block No.	Area (ha)	Major facilities for water supply	Remarks
III - 1	70		
(III - 1 - 1)	(60)	Bineng CIS canal	rehabilitate existing Bineng CIS canal and intake structure
(III - 1 - 2)	(10)		rehabilitate existing intake structure

2.6.3 Water sources of the irrigation blocks

Major water source of each irrigation block is stream or small torrent. Some of the stream take into water flown out from spring.

Available water sources in each irrigation blocks are shown as follows :

Irrigation Block	Catchment area of stream (km^2)	Available spring yield (l/sec)	Available drought discharge with spring (l/sec) *2	Other water source
I - 1	1.40	account into the right	16.6 (=1000 l/min)	
I - 2	0.14	- do -	16.6 (=1000 l/min)	
I - 3 - 1	1.60	—	10.0	
I - 3 - 2	—	—	0.0	max. 18 l/sec, proposed three wells
II - 1	0.25	—	1.5	max. 3 l/sec, supplementation by drinking water supply well
II - 2	0.48	1.0	3.5	max. 3 l/sec, supplementation by drinking water supply well
II - 3	1.00	1.0	7.0	
II - 4	0.35	account into the right	17.0	
II - 5	0.16	2.0	3.0	
II - 6	0.43	5.0	8.0	
II - 7	0.33	0.5	2.5	max. 3 l/sec, supplementation by drinking water supply well
II - 8	0.27	0.5	2.0	
III - 1*1	0.90	20.0*3	20.0	

*1 : regard III-1-1 and III-1-2 as one together in water balance calculation.

*2 : droughty discharge from stream itself was estimated by average specific drought at 0.006 $m^3/s/km^2$, and spring yields were appraised about 50 % of observational yields.

*3 : estimate the value so as not to occur a water deficit on water balance calculation put with present cropping pattern.

2.6.4 Water balance calculation

Water balance calculation was carried out in each irrigation block, in order to get results for required pond capacity.

The calculation was executed for eleven years between 1977 to 1987, when rainfall data at the BSU PAGASA station located in the Project area are completely available.

The diversion water requirement in each zone was calculated as follows :

Diversion water requirement in Zone I

Unit : mm

Year	Field Water Requirement	Effective Rainfall	Diversion Water Requirement
1977	642.4	334.8	473.2
1978	642.4	311.5	509.1
1979	642.4	318.5	498.3
1980	644.0	314.8	506.4
1981	642.4	302.3	523.3
1982	642.4	346.1	455.8
1983	642.4	319.2	497.2
1984	644.0	345.1	459.8
1985	642.4	427.2	331.1
1986	642.4	321.2	494.1
1987	642.4	296.4	532.3

Diversion water requirement in Zone II

Unit : mm

Year	Field Water Requirement	Effective Rainfall	Diversion Water Requirement
1977	701.0	378.1	496.8
1978	701.0	350.9	538.6
1979	701.0	350.6	539.1
1980	702.8	344.2	551.7
1981	701.0	348.6	542.1
1982	701.0	373.7	503.6
1983	701.0	356.0	530.8
1984	702.8	390.0	481.2
1985	701.0	480.8	338.7
1986	701.0	361.2	522.8
1987	701.0	338.3	558.0

Diversion water requirement in Zone III

Unit : mm

Year	Field Water Requirement	Effective Rainfall	Diversion Water Requirement
1977	1167.4	668.9	767.0
1978	1167.4	632.6	822.7
1979	1167.4	627.2	831.1
1980	1171.2	642.4	813.5
1981	1167.4	622.3	838.6
1982	1167.4	654.1	789.7
1983	1167.4	620.4	841.5
1984	1171.2	714.0	703.4
1985	1167.4	815.2	541.8
1986	1167.4	609.2	858.8
1987	1167.4	598.7	875.0

Flow chart of the water balance calculation is illustrated in Fig.F.2.8.

The ratio of available intake to runoff is a meaningful factor, which owes completeness of intake structure.

In present, the ratio ranges less than 0.5 owing of temporality of intake facilities. Improvement of intake structure will cause increase of the ratio to 0.9. Accordingly, the ratio is taken at 0.88 in the water balance calculation. Required pond capacity in Zone I, Zone II were resulted in each year, as shown in Table F.2.26.

Among the results of required pond capacity, the value ranked second was taken as a design scale, because the second of eleven years is roughly equated with five year return period. Water balance calculation of each irrigation block in the standard year are shown in Table F.2.27 to Table F.2.39.

Design pond capacity were decided adding evaporation and leakage losses which are 15 percent of the calculated pond capacity.

Design Pond Capacity

Unit : m^3

Irrigation Block No.	Calculated pond capacity	Design pond capacity	Pond name
I - 1	4,926	5,700	Bayabas
I - 2	3,523	4,100	Puguis
I - 3 - 1	6,470	7,500	Buyagan
II - 1	2,864	3,300	Bahong no.1
II - 2	5,545	6,400	Bahong no.2
II - 3	5,002	5,800	Bahong no.3
II - 4	18,927	21,800	Alapang no.1
II - 5	1,912	2,200	Alapang no.2
II - 6	3,409	3,900	Alapang no.3
II - 7	3,058	3,500	Peril
II - 8	3,773	4,300	Alno
Total		68,500	

As for Zone III, improvement of intake structures and Bineng CIS canal, and construction of regulating pond are proposed. Water right of Bineng CIS in accordance with taking water from the Wangal creek has not been established. As existing Bineng CIS canal has an available flowing capacity at 0.1 - 0.2 m^3/s, the Wangal creek water less than 0.2 m^3/s was regarded to be able to divert for beneficial area of Zone III. According to result of the calculation, Zone III will be able to adopt newly proposed cropping pattern owing of only the improvement of structures.

The summary of water balance in the dry season is shown in Table F.2.40. Referred water source availability and present water use in the summary are shown in Table F.2.41 and Table F.2.42 respectively.

2.7 Proposed Irrigation Facilities

2.7.1 Proposed irrigation system

In Zone I, direct intake from the Balili river should be replaced to newly proposed wells, because of proceeding of contamination for the Balili river water. Three wells with 18 l/sec in all, 50 meters lifting head are proposed in Puguis and Stock farm area. The irrigable area by the pumps is 42 hectare which is demarcated as irrigation block III-3-2. Supplementary use of the remaining production from the wells planned for domestic water supply, have been proposed for three blocks of Zone II where have difficulty of land acquisition for enlarging pond capacity. The irrigation blocks, i.e., II-1, II-2 and II-7, can be supplemented by the wells 3 l/sec at most in each. In Zone III, no pond has been planned for a storage, because only improvement of intake weirs on the Wangal creek and existing irrigation canal of Bineng CIS would be effective.

Proposed irrigation system inside of irrigation block is shown in Fig.F.2.9.

Irrigation water drown in by the proposed intake facilities flows into the proposed pond through diversion conduit. Water stored in the pond flows down through lateral conduits, and is divided to several delivery conduits at the division box.

2.7.2 Preliminary design of irrigation facilities

The proposed ponds should be located in higher portion of each irrigation block to smoothly supply water by gravity, and selected nearer sites to the available water source.

In line with the condition said above, the location of the ponds in each Zone are decided as shown in Fig.F.2.2 and Fig.F.2.3, where are limited apace found in each irrigation block for minimizing land acquisition.

The proposed pond has been designed as a small storage dam type constructing on the streams if topographic conditions and stream's form are allowable. Unless allowable,those have been designed intake weir and pond respectively. Design capacity of the ponds were decided on the base of second shortage in eleven years water balance calculation, adding several losses of 15 percent of the base. Earth work of the pond has been designed so that volume of excavation equated to soil volume to be banked as much as possible.

Dimensions of preliminary design for proposed ponds listed as follows :

Pond name	Type	Design Capacity	Full water stage (m)	Water Depth (m)	Water surface area(ha)	Remarks
Bayabas	Pond	5,700	1317.5	4.0	0.12	
Puguis	Small dam reservoir	4,100	1334.0	5.0	0.15	
Buyagan	Pond	7,500	1308.5	2.5	0.43	It may be divided two pond
Bahong no.1	Pond	3,300	1349.0	3.0	0.18	
Bahong no.2	Pond	6,400	1229.5	5.5	0.28	
Bahong no.3	Pond	5,800	1181.0	4.5	0.26	
Alapang no.1	Small dam reservoir	21,800	1204.0	7.0	0.56	
Alapang no.2	Pond	2,200	1055.0	3.5	0.10	
Alapang no.3	Pond	3,900	1023.0	3.0	0.18	
Peril	Pond	3,500	1256.0	5.0	0.15	
Alno	Pond	4,300	1089.0	3.0	0.23	

Proposed intake weirs would be built with concrete on the river or creek. These weirs have been designed as fixed type, no gate would be installed. Afflux at the stream are taken at most 1.0 meter so as not to obstruct smooth flowing especially if flooding. Dimensions of preliminary design for proposed intake weirs are listed as follows :

No.	Length (m)	Intake water Level (m)	Maximum Intake Discharge (m^3/s)	Design * Flood Discharge (m^3/s)	Providing Water to :
1	20	1355	0.03	7.5	Bahong No.1 Pond
2	10	1235	0.07	14.0	Bahong No.2 Pond
3	30	1190	0.07	55.0	Bahong No.3 Pond
4	30	1060	0.07	27.0	Alapang No.2 and 3 Ponds
5	10	1260	0.04	6.5	Peril Pond
6	20	1100	0.05	15.0	Alno Pond
7	20	1240	0.01	114.0	Irrigation Block III-1-2
8	20	945	0.01	25.5	Irrigation Block III-1-1
Bineng CIS	20	1195	0.20	157.0	Bineng CIS Canal to be improved

* : Design flood discharge were peak discharge estimated in 50 year return period.

Proposed diversion conduit are to be designed as 200 - 300 mm diameter steel pipes to introduce water to be extent of filling the pond with water in less than one or two days. The capacity of the lateral conduits has been decided at 1.0 litter/sec/ha of maximum design unit water requirement, multiplying commanded area of each lateral conduit. Proposed water tank is on-farm and terminal facilities for multi-purpose which can apply the surface irrigation method as well as usual practice.

Delivery conduit connecting division box on the lateral canal with each water tank, have enough flowing capacity more than 1.0 litter/sec per one commanded farm area so that the proposed pond may regulate the variation of water demand in every water tank.

Number of proposed facilities of each irrigation block are listed in Table F.2.43, and summarized as follows :

Item	Quantity of proposed facilities
Intake facilities	8 intake weirs
	2 diversions
Diversion conduit	3,000 meters
Pond	11 nos. (68,500 m^3)
Lateral conduit	25,050 meters
Division box	120 nos.
Delivery conduit	29,750 meters
Water tank	595 nos.
Others	3 deep wells in Zone I
	1 regulating pond in Zone III
	Rehabilitation of Bineng CIS canal with intake weir

2.7.3 On-farm development

Proposed water tank mentioned in previous section is a terminal facilities of the irrigation system.

The water tank is reinforced concrete construction with 4 m^3 capacity devising to easily draw water, installed on average 1.0 hectare of farm land each.

A tap would be also provided at the end of delivery conduit so as to apply hose pipe irrigation.

Farmers will be able to irrigate as their like with effective application of the water tank.

In the term of severe drought, effective water management will be accomplished by controlling of sluice valve installed at the division box, in accordance with an agreement for water saving made by farmers themselves.

Small on-farm facilities such as small earth canal will be required in each farm plot for obtaining good effects of the water tank. Such small facilities should be provided by farmers themselves, because those are farmer's property for private use.

Table F.1.1 Inventory of Existing CIS in the Project Area

Name of CIS	Barangay Coverage	Area (ha)	Farmer-Beneficiaries	Water Source of CIS	Cultivated Crop	Irrigation Facilities & Structures
Pico	Pico, Puguis and Betag	200.0	103	Balili river Ovulan spring Bodecewcew spring	Vegetables & Flower Production	Canal, Pipelines Plastic hose
Bahong	Bahong proper Sadag	250.0	300	Balili river Bahong tunnel Bahong creek	Vegetables & Flower Production	Canal, Pipelines Plastic hose
Alapang	Alapang	10.0	20	Rainfed Bahong tunnel	Vegetables & Flower Production	Plastic pipes
Alno	Alno	5.0	15	Alno creek Rainfed		
Bineng	Bineng proper Boleweng	60.0	35	Wangal river	Palay, Vegetables & Flower Production	Pipeline, Flumes & Canal
Total		525.0	473			

Table F.2.1 Total Consumptive Use of Water in Zone I

(Unit : mm/day)

Month		Strawberry	Nursery of Strawberry	Vegetables	Vegetables	Vegetables	Vegetables	Vegetables	Vegetables	Total
	1	0.72					0.83	0.50		2.05
	2	0.72					0.68	0.67		2.06
Jan.	3	0.72					0.52	0.84		2.08
	4	0.72					0.37	0.95		2.04
	5	0.72					0.21	1.01		1.94
	6	0.72					0.07	1.05		1.84
	1	0.86						1.31		2.17
	2	0.86						1.33		2.19
Feb.	3	0.86						1.33		2.19
	4	0.86						1.22		2.08
	5	0.86						0.99		1.86
	6	0.86						0.77		1.63
	1	0.98						0.62	0.09	1.68
	2	0.98						0.36	0.27	1.61
Mar.	3	0.98						0.12	0.47	1.56
	4	0.98							0.68	1.66
	5	0.98							0.91	1.89
	6	0.98							1.15	2.13
	1	0.88							1.17	2.06
	2	0.88							1.24	2.13
Apr.	3	0.88							1.30	2.18
	4	0.88							1.34	2.23
	5	0.88							1.37	2.25
	6	0.88							1.37	2.25
	1	0.68							1.02	1.70
May	2	0.60							0.83	1.43
	3	0.52							0.64	1.16
	4	0.44			0.06				0.45	0.95
	5	0.36			0.19				0.26	0.81
	6	0.28			0.32				0.08	0.69
	1	0.19		0.03	0.44					0.65
June	2	0.11		0.10	0.59					0.79
	3	0.04		0.17	0.74					0.95
	4			0.24	0.91					1.15
	5			0.33	1.08					1.40
	6			0.41	1.24					1.65
	1		0.08	0.42	1.26					1.75
July	2		0.08	0.44	1.40					1.92
	3		0.08	0.46	1.53					2.07
	4		0.08	0.48	1.53					2.09
	5		0.08	0.48	1.43					2.00
	6		0.08	0.48	1.32	0.05				1.94
	1		0.07	0.37	1.01	0.13				1.58
Aug.	2		0.07	0.30	0.91	0.23				1.50
	3		0.07	0.23	0.79	0.33				1.42
	4		0.07	0.17	0.67	0.44				1.34
	5		0.07	0.10	0.55	0.56				1.27
	6		0.07	0.03	0.42	0.68				1.20
	1	0.02			0.34	0.92				1.28
Sept.	2	0.06			0.20	1.06				1.33
	3	0.11			0.06	1.21				1.38
	4	0.16				1.34				1.50
	5	0.21				1.47				1.68
	6	0.26				1.47				1.73
	1	0.34				1.49	0.04			1.88
Oct	2	0.40				1.38	0.14			1.92
	3	0.47				1.25	0.24			1.96
	4	0.51				1.12	0.35			1.98
	5	0.53				0.98	0.47			1.98
	6	0.55				0.83	0.60			1.98
	1	0.61				0.73	0.79			2.13
Nov.	2	0.62				0.56	0.93			2.12
	3	0.64				0.40	1.07			2.11
	4	0.65				0.23	1.22			2.10
	5	0.66				0.07	1.36			2.09
	6	0.66					1.49			2.15
	1	0.69					1.54			2.23
Dec.	2	0.69					1.44			2.13
	3	0.69					1.33			2.02
	4	0.69					1.21	0.06		1.96
	5	0.69					1.08	0.19		1.97
	6	0.69					0.95	0.33		1.97

Table F.2.2 Consumptive Use of Water in Zone I (1)

Crop : Strawberry

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 25 %

MONTH	Sept.						Oct.						Nov.						Dec.						Jan.				
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5
	0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
		0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
			0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
				0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
(Kc)					0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
						0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
							0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
								0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
									0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
										0.62	0.65	0.69	0.72	0.76	0.79	0.83	0.90	0.93	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Average Kc	0.62	0.64	0.65	0.67	0.69	0.71	0.72	0.74	0.76	0.78	0.81	0.84	0.86	0.89	0.91	0.92	0.93	0.94	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Irrigated Area Ratio	0.06	0.17	0.28	0.39	0.50	0.61	0.72	0.83	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET (mm/day)	2.40	2.40	2.40	2.40	2.40	2.40	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.08	0.25	0.44	0.63	0.83	1.03	1.36	1.60	1.86	2.01	2.10	2.18	2.42	2.48	2.54	2.58	2.62	2.64	2.75	2.76	2.76	2.76	2.76	2.76	2.85	2.85	2.85	2.85	2.85
Water Req. (mm/[AT])	0.02	0.06	0.11	0.16	0.21	0.26	0.34	0.40	0.47	0.51	0.53	0.55	0.61	0.62	0.64	0.65	0.66	0.66	0.69	0.69	0.69	0.69	0.69	0.69	0.72	0.72	0.72	0.72	0.72

Table F.2.2 Consumptive Use of Water in Zone I (1) (Cont')

Crop : Strawberry

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 25 %

MONTH	Jan.	Feb.						Mar.						Apr.						May						June		
5 Days	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95									
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95								
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95							
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95						
(Kc)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95					
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95				
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95			
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	
	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Average Kc	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Irrigated Area Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.83	0.72	0.61	0.50	0.39	0.28	0.17	0.06
ET (mm/day)	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00	2.80	2.80	2.80
Water Req. (mm/[AO])	2.85	3.42	3.42	3.42	3.42	3.42	3.42	3.89	3.89	3.89	3.89	3.89	3.89	3.51	3.51	3.51	3.51	3.51	3.51	2.69	2.38	2.06	1.74	1.43	1.11	0.74	0.44	0.15
Water Req. (mm/[AT])	0.72	0.86	0.86	0.86	0.86	0.86	0.86	0.98	0.98	0.98	0.98	0.98	0.98	0.88	0.88	0.88	0.88	0.88	0.88	0.68	0.60	0.52	0.44	0.36	0.28	0.19	0.11	0.04

Table F.2.3 Consumptive Use of Water In Zone I (2)

Crop : Nursery of Starawberry

{AT} : Zone Area
{AO} : Planted Area
{AO}/{AT} : 3 %

MONTH	July						Aug.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6
Average Kc	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Irrigated Area Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET (mm/day)	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10	2.10	2.10	2.10
Water Req. (mm/{AO})	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10	2.10	2.10	2.10
Water Req. (mm/{AT})	0.08	0.08	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07

Table F.2.4 Consumptive Use of Water in Zone I (3)

Crop : Vegetables

{AT} : Zone Area
{AO} : Planted Area
{AO}/{AT} : 21 %

MONTH	June						July						Aug.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
(Kc)	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	2.80	2.80	2.80	2.80	2.80	2.80	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10	2.10	2.10	2.10
Water Req. (mm/{AO})	0.15	0.46	0.81	1.17	1.57	1.99	2.00	2.12	2.22	2.29	2.34	2.33	1.80	1.46	1.13	0.80	0.46	0.15
Water Req. (mm/{AT})	0.03	0.10	0.17	0.24	0.33	0.41	0.42	0.44	0.46	0.48	0.48	0.48	0.37	0.30	0.23	0.17	0.10	0.03

Table F.2.5 Consumptive Use of Water in Zone I (4)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 75 %

MONTH	May			June						July						Aug.						Sept.		
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
(Kc)						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.60	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	3.00	3.00	3.00	2.80	2.80	2.80	2.80	2.80	2.80	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10	2.10	2.10	2.10	2.40	2.40	2.40
Water Req. (mm/[AO])	0.08	0.25	0.43	0.59	0.78	0.99	1.22	1.44	1.66	1.68	1.87	2.05	2.05	1.92	1.77	1.35	1.21	1.06	0.90	0.73	0.57	0.46	0.27	0.09
Water Req. (mm/[AT])	0.06	0.19	0.32	0.44	0.59	0.74	0.91	1.08	1.24	1.26	1.40	1.53	1.53	1.43	1.32	1.01	0.91	0.79	0.67	0.55	0.42	0.34	0.20	0.06

Table F.2.6 Consumptive Use of Water in Zone I (5)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 75 %

MONTH	July	Aug.						Sept.						Oct.						Nov.				
5 Days	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.83										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
(Kc)						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.45	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	2.50	2.10	2.10	2.10	2.10	2.10	2.10	2.40	2.40	2.40	2.40	2.40	2.40	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80
Water Req. (mm/[AO])	0.07	0.17	0.30	0.44	0.59	0.75	0.91	1.23	1.42	1.61	1.80	1.97	1.97	1.99	1.84	1.68	1.50	1.31	1.11	0.98	0.75	0.53	0.31	0.10
Water Req. (mm/[AT])	0.05	0.13	0.23	0.33	0.44	0.56	0.68	0.92	1.06	1.21	1.34	1.47	1.47	1.49	1.38	1.25	1.12	0.98	0.83	0.73	0.56	0.40	0.23	0.07

Table F.2.7 Consumptive Use of Water in Zone I (6)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 65 %

MONTH	Oct.						Nov.						Dec.						Jan.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
(Kc)						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.07	0.21	0.37	0.54	0.73	0.92	1.22	1.44	1.66	1.88	2.10	2.29	2.38	2.22	2.05	1.87	1.67	1.47	1.29	1.05	0.81	0.57	0.33	0.11
Water Req. (mm/[AT])	0.04	0.14	0.24	0.35	0.47	0.60	0.79	0.93	1.08	1.22	1.36	1.49	1.54	1.33	1.22	1.09	0.95	0.84	0.68	0.52	0.37	0.22	0.07	

Table F.2.8 Consumptive Use of Water in Zone I (7)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 40 %

MONTH	Dec.			Jan.						Feb.						Mar.		
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10
Water Req. (mm/[AO])	0.15	0.48	0.83	1.26	1.68	2.13	2.40	2.55	2.66	3.30	3.36	3.36	3.09	2.51	1.94	1.55	0.91	0.29
Water Req. (mm/[AT])	0.06	0.19	0.33	0.50	0.67	0.84	0.93	1.01	1.05	1.31	1.33	1.33	1.22	0.99	0.77	0.62	0.36	0.12

Table F.2.9 Consumptive Use of Water in Zone I (8)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO] / [AT] : 40 %

MONTH	Mar.						Apr.						May					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.43	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.22	0.68	1.18	1.72	2.29	2.91	2.97	3.14	3.28	3.39	3.46	3.45	2.57	2.09	1.61	1.14	0.66	0.21
Water Req. (mm/[AT])	0.09	0.27	0.47	0.68	0.91	1.15	1.17	1.24	1.30	1.34	1.37	1.37	1.02	0.83	0.64	0.45	0.26	0.08

Table F.2.10 Total Consumptive Use of Water in Zone II

(Unit : mm/day)

Month		Rose	Vegetables	Vegetables	Vegetables	Vegetables	Vegetables	Total
	1	1.22			0.26			1.48
	2	1.22			0.34			1.57
Jan.	3	1.22			0.43			1.66
	4	1.22			0.49			1.71
	5	1.22			0.52			1.74
	6	1.22			0.54			1.77
	1	1.47			0.67			2.14
	2	1.47			0.69			2.15
Feb.	3	1.47			0.68			2.15
	4	1.47			0.63			2.10
	5	1.47			0.51			1.98
	6	1.47			0.40			1.86
	1	1.67			0.32	0.04		2.03
Mar.	2	1.67			0.19	0.14		1.99
	3	1.67			0.06	0.24		1.97
	4	1.67				0.35		2.02
	5	1.67				0.47		2.14
	6	1.67				0.59		2.27
	1	1.51				0.60		2.11
Apr.	2	1.51				0.64		2.15
	3	1.51				0.67		2.18
	4	1.51				0.69		2.20
	5	1.51				0.71		2.21
	6	1.51				0.70		2.21
	1	1.22				0.52		1.75
May	2	1.22				0.43		1.65
	3	1.22				0.33		1.55
	4	1.22		0.10		0.23		1.55
	5	1.22		0.30		0.14		1.66
	6	1.22		0.53		0.04		1.79
	1	1.14		0.72				1.86
June	2	1.14		0.96				2.10
	3	1.14		1.22				2.36
	4	1.14		1.37				2.51
	5	1.14		1.45				2.59
	6	1.14		1.52				2.66
	1	1.02		1.40				2.42
July	2	1.02		1.43				2.45
	3	1.02		1.43				2.45
	4	1.02		1.31				2.33
	5	1.02		1.07				2.09
	6	1.02		0.82			0.10	1.95
	1	0.86		0.49			0.18	1.53
Aug.	2	0.86		0.28			0.20	1.34
	3	0.86		0.09			0.21	1.16
	4	0.86					0.23	1.09
	5	0.86					0.25	1.10
	6	0.86					0.26	1.12
	1	0.98					0.30	1.28
Sept.	2	0.98					0.30	1.28
	3	0.98					0.30	1.28
	4	0.98					0.30	1.28
	5	0.98					0.28	1.26
	6	0.98					0.13	1.11
	1	1.06	0.08					1.14
Oct	2	1.06	0.26					1.32
	3	1.06	0.46					1.52
	4	1.06	0.67					1.73
	5	1.06	0.89					1.95
	6	1.06	1.13					2.19
	1	1.14	1.37					2.51
Nov.	2	1.14	1.45					2.59
	3	1.14	1.52					2.66
	4	1.14	1.57					2.71
	5	1.14	1.60					2.74
	6	1.14	1.60					2.74
	1	1.18	1.52					2.70
Dec.	2	1.18	1.24					2.42
	3	1.18	0.95					2.14
	4	1.18	0.67		0.03			1.89
	5	1.18	0.39		0.10			1.67
	6	1.18	0.13		0.17			1.48

Table F.2.11 Consumptive Use of Water in Zone II (1)

Crop : Rose

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 39 %

MONTH	Jan.						Feb.						Mar.						Apr.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Average Kc	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Irrigated Area Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET (mm/day)	3.00	3.00	3.00	3.00	3.00	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70
Water Req. (mm/[AO])	3.15	3.15	3.15	3.15	3.15	3.15	3.78	3.78	3.78	3.78	3.78	3.78	4.31	4.31	4.31	4.31	4.31	4.31	3.88	3.88	3.88	3.88	3.88	3.88
Water Req. (mm/[AT])	1.22	1.22	1.22	1.22	1.22	1.22	1.46	1.46	1.46	1.46	1.46	1.46	1.67	1.67	1.67	1.67	1.67	1.67	1.50	1.50	1.50	1.50	1.50	1.50

Table F.2.11 Consumptive Use of Water in Zone II (1) (Cont')

Crop : Rose

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 39 %

MONTH	May						June						July						Oct.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Average Kc	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Irrigated Area Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET (mm/day)	3.00	3.00	3.00	3.00	3.00	3.00	2.80	2.80	2.80	2.80	2.80	2.80	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10	2.10	2.10	2.10
Water Req. (mm/[AO])	3.15	3.15	3.15	3.15	3.15	3.15	2.94	2.94	2.94	2.94	2.94	2.94	2.63	2.63	2.63	2.63	2.63	2.63	2.20	2.20	2.20	2.20	2.20	2.20
Water Req. (mm/[AT])	1.22	1.22	1.22	1.22	1.22	1.22	1.14	1.14	1.14	1.14	1.14	1.14	1.02	1.02	1.02	1.02	1.02	1.02	0.85	0.85	0.85	0.85	0.85	0.85

Table F.2.11 Consumptive Use of Water in Zone II (1) (Cont')

Crop : Rose

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 39 %

MONTH	Sept.						Oct.						Nov.						Dec.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Average Kc	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Irigated Area Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ET (mm/day)	2.40	2.40	2.40	2.40	2.40	2.40	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
Water Req. (mm/[AO])	2.52	2.52	2.52	2.52	2.52	2.52	2.73	2.73	2.73	2.73	2.73	2.73	2.94	2.94	2.94	2.94	2.94	2.94	3.05	3.05	3.05	3.05	3.05	3.05
Water Req. (mm/[AT])	0.98	0.98	0.98	0.98	0.98	0.98	1.06	1.06	1.06	1.06	1.06	1.06	1.14	1.14	1.14	1.14	1.14	1.14	1.18	1.18	1.18	1.18	1.18	1.18

Table F.2.12 Consumptive Use of Water in Zone II (2)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 61 %

MONTH	Oct.						Nov.						Dec.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
Water Req. (mm/[AO])	0.14	0.43	0.75	1.09	1.45	1.85	2.24	2.38	2.48	2.57	2.62	2.61	2.49	2.02	1.56	1.10	0.64	0.21
Water Req. (mm/[AT])	0.08	0.26	0.46	0.67	0.89	1.13	1.38	1.46	1.52	1.57	1.60	1.60	1.52	1.24	0.96	0.67	0.39	0.13

Table F.2.13 Consumptive Use of Water in Zone II (3)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 13 %

MONTH	July	Aug.						Sept.					
5 Days	6	1	2	3	4	5	6	1	2	3	4	5	6
(Kc)	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.72	0.78	0.83	0.89	0.94	0.96	0.96	0.96	0.94	0.89	0.85
Irrigated Area Ratio	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50
ET (mm/day)	2.50	2.10	2.10	2.10	2.10	2.10	2.10	2.40	2.40	2.40	2.40	2.40	2.40
Water Req. (mm/[AO])	0.79	1.39	1.51	1.63	1.74	1.87	1.93	2.30	2.30	2.30	2.26	2.12	1.02
Water Req. (mm/[AT])	0.10	0.18	0.20	0.21	0.22	0.24	0.25	0.30	0.30	0.30	0.29	0.27	0.13

Table F.2.14 Consumptive Use of Water in Zone II (4)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 20 %

MONTH	Dec.			Jan.						Feb.						Mar.		
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.85	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10
Water Req. (mm/[AO])	0.15	0.48	0.83	1.26	1.68	2.13	2.40	2.55	2.66	3.30	3.36	3.36	3.09	2.51	1.94	1.55	0.91	0.29
Water Req. (mm/[AT])	0.03	0.10	0.17	0.26	0.34	0.43	0.49	0.52	0.54	0.67	0.69	0.68	0.63	0.51	0.40	0.32	0.19	0.06

Table F.2.15 Consumptive Use of Water in Zone II (5)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 20 %

MONTH	Mar.						Apr.						May					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.22	0.68	1.18	1.72	2.29	2.91	2.97	3.14	3.28	3.39	3.46	3.45	2.57	2.09	1.61	1.14	0.66	0.21
Water Req. (mm/[AT])	0.04	0.14	0.24	0.35	0.47	0.59	0.60	0.64	0.67	0.69	0.71	0.70	0.52	0.43	0.33	0.23	0.14	0.04

Table F.2.16 Consumptive Use of Water in Zone II (6)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 61 %

MONTH	May			June						July						Aug.		
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
(Kc)				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.85	0.89	0.92	0.93	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.08	0.25	0.42	0.58	0.75	0.92	1.00	1.00	1.00	1.00	1.00	1.00	0.92	0.75	0.58	0.42	0.25	0.08
ET (mm/day)	3.00	3.00	3.00	2.80	2.80	2.80	2.80	2.80	2.80	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10
Water Req. (mm/[AO])	0.16	0.49	0.86	1.17	1.57	1.99	2.24	2.38	2.48	2.29	2.34	2.33	2.14	1.74	1.35	0.80	0.46	0.15
Water Req. (mm/[AT])	0.10	0.30	0.53	0.72	0.96	1.22	1.37	1.45	1.52	1.40	1.43	1.43	1.31	1.07	0.82	0.49	0.28	0.09

Table F.2.17 Total Consumptive Use of Water in Zone III

(Unit : mm/day)

Month		Rice with Land Preparation	Rice with Land Preparation	Vegetables	Vegetables	Vegetables	Vegetables	Vegetables	Vegetables	Total
Jan.	1	0.05	0.88	0.27			1.15			2.35
	2	0.02	0.65	0.32			1.28			2.27
	3	0.02	0.42	0.34			1.40			2.19
	4	0.02	0.21	0.37			1.40			2.00
	5	0.02		0.39			1.31			1.72
	6	0.02		0.40			1.21			1.63
Feb.	1	0.41		0.49			1.33	0.05		2.28
	2	0.82		0.49			1.19	0.17		2.66
	3	1.05		0.48			1.04	0.30		2.86
	4	1.29		0.42			0.88	0.43		3.02
	5	1.55		0.29			0.72	0.58		3.13
	6	2.36		0.17			0.55	0.73		3.81
Mar.	1	2.18		0.06	0.05		0.44	1.02		3.75
	2	2.08			0.14		0.26	1.20		3.69
	3	1.99			0.25		0.08	1.39		3.71
	4	2.06			0.37			1.57		4.01
	5	2.15			0.44			1.75		4.34
	6	2.22			0.47			1.92		4.61
Apr.	1	2.17			0.45			1.73		4.36
	2	2.23			0.48			1.62		4.32
	3	2.29			0.49			1.50		4.27
	4	2.34			0.50			1.36	0.06	4.26
	5	2.39			0.50			1.22	0.17	4.28
	6	2.43			0.49			1.07	0.30	4.29
May	1	2.23			0.35			0.73	0.36	3.66
	2	2.25			0.24			0.60	0.48	3.57
	3	2.26			0.14			0.46	0.61	3.47
	4	2.26			0.05			0.33	0.74	3.38
	5	2.25						0.19	0.88	3.32
	6	2.23						0.06	1.02	3.30
June	1	2.12	0.11						1.08	3.31
	2	2.07	0.04						1.20	3.30
	3	2.01	0.04						1.31	3.36
	4	1.95	0.04						1.31	3.30
	5	1.64	0.04						1.23	2.90
	6	1.35	0.04						1.13	2.51
July	1	1.01	0.33						0.92	2.26
	2	0.74	0.66						0.82	2.22
	3	0.49	0.98						0.72	2.19
	4	0.24	1.31						0.61	2.16
	5		1.49						0.50	1.99
	6		1.57						0.38	1.96
Aug.	1		1.80						0.23	2.03
	2		1.99						0.13	2.13
	3		2.19						0.04	2.23
	4		2.39							2.39
	5		2.60							2.60
	6		2.70							2.70
Sept.	1		3.15			0.04				3.19
	2		3.06			0.11				3.17
	3		2.96			0.20				3.16
	4		2.85			0.29				3.14
	5		2.72			0.38				3.11
	6		2.79			0.49				3.28
Oct	1		2.95			0.64				3.59
	2		3.00			0.76				3.76
	3		3.04			0.88				3.92
	4		3.08			1.00				4.08
	5		3.10			1.11				4.21
	6		3.11			1.22				4.32
Nov.	1		3.20			1.31				4.51
	2		3.18			1.23				4.40
	3		3.14			1.13				4.27
	4		3.10			1.03	0.04			4.17
	5		2.85			0.92	0.13			3.90
	6		2.60			0.81	0.23			3.63
Dec.	1		2.38			0.71	0.35			3.43
	2		2.12			0.58	0.46			3.16
	3		1.86			0.45	0.59			2.89
	4		1.60	0.03		0.31	0.72			2.67
	5		1.35	0.10		0.18	0.85			2.48
	6		1.10	0.18		0.06	0.98			2.32

Table F.2.18 Consumptive Use of Water in Zone III (I)

Crop : Rice

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 29 %

MONTH	Feb.				Mar.						Apr.						May					
5 Days	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11
		0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14
			0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18
(Kc)				0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20
					0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21
						0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21
							0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21
Average Kc	0.80	0.81	0.83	0.85	0.87	0.89	0.90	0.94	0.98	1.01	1.04	1.07	1.10	1.12	1.14	1.16	1.18	1.19	1.20	1.20	1.19	1.18
Irrigated Area Ratio	0.14	0.29	0.43	0.57	0.71	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Water Req. (mm/[AO])	0.81	1.66	2.55	3.49	4.77	5.85	6.96	7.23	7.51	7.77	7.59	7.80	8.00	8.19	8.35	8.50	7.79	7.86	7.91	7.92	7.87	7.79
Water Req. (mm/[AT])	0.24	0.47	0.73	1.00	1.36	1.67	1.99	2.06	2.15	2.22	2.17	2.23	2.29	2.34	2.39	2.43	2.23	2.25	2.26	2.26	2.25	2.23

Above calculation is in growth stage,
consumptive use of nursery and puddling are calclated separately.

Table F.2.18 Consumptive Use of Water in Zone III (I) (Cont')

Crop : Rice

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 29 %

MONTH	June						July			
5 Days	1	2	3	4	5	6	1	2	3	4
	1.07	1.02	0.98	0.97						
	1.11	1.07	1.02	0.98	0.97					
	1.14	1.11	1.07	1.02	0.98	0.97				
(Kc)	1.18	1.14	1.11	1.07	1.02	0.98	0.97			
	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97		
	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97	
	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97
Average Kc	1.16	1.13	1.10	1.07	1.05	1.03	1.01	0.99	0.98	0.97
Irrigated Area Ratio	1.00	1.00	1.00	1.00	0.86	0.71	0.57	0.43	0.29	0.14
Water Req. (mm/[AO])	7.42	7.23	7.04	6.83	5.75	4.71	3.52	2.59	1.70	0.85
Water Req. (mm/[AT])	2.12	2.07	2.01	1.95	1.64	1.35	1.01	0.74	0.49	0.24

Above calculation is in growth stage,
consumptive use of nursery and puddling are calclated separately.

Table F.2.19 Consumptive Use of Water in Zone III (2)

Crop : Rice

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 43 %

MONTH	July				Aug.						Sept.						Oct.					
5 Days	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11
		0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14
			0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18
				0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20
					0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21
						0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21	1.21
(Kc)							0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20	1.21
								0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19	1.20
									0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17	1.19
										0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15	1.17
											0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13	1.15
												0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10	1.13
													0.80	0.81	0.87	0.91	0.95	0.98	1.01	1.04	1.07	1.10
Average Kc	0.80	0.81	0.83	0.85	0.87	0.89	0.90	0.92	0.94	0.95	0.97	0.99	1.00	1.03	1.06	1.09	1.11	1.13	1.15	1.16	1.17	1.17
Irrigated Area Ratio	0.15	0.31	0.38	0.46	0.54	0.62	0.69	0.77	0.85	0.92	1.00	1.08	1.15	1.08	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Water Req. (mm/[AO])	0.75	1.51	1.94	2.39	2.66	3.11	3.57	4.04	4.52	5.02	5.82	6.36	6.92	6.65	6.36	6.51	6.87	7.00	7.10	7.18	7.23	7.25
Water Req. (mm/[AT])	0.32	0.65	0.83	1.02	1.14	1.33	1.53	1.73	1.94	2.15	2.49	2.73	2.96	2.85	2.72	2.79	2.95	3.00	3.04	3.08	3.10	3.11

Above calculation is in growth stage,
consumptive use of nursery and puddling are calclated separately.

Table F.2.19 Consumptive Use of Water in Zone III (2) (Cont')

Crop : Rice

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 43 %

MONTH	Nov.						Dec.						Jan.			
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4
	1.07	1.02	0.98	0.97												
	1.11	1.07	1.02	0.98	0.97											
	1.14	1.11	1.07	1.02	0.98	0.97										
	1.18	1.14	1.11	1.07	1.02	0.98	0.97									
	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97								
	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97							
(Kc)	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97						
	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97					
	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97				
	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97			
	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97		
	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97	
	1.13	1.15	1.17	1.19	1.20	1.21	1.21	1.21	1.20	1.18	1.14	1.11	1.07	1.02	0.98	0.97
Average Kc	1.17	1.16	1.15	1.13	1.13	1.12	1.11	1.10	1.08	1.07	1.05	1.03	1.01	0.99	0.98	0.97
Irrigated Area Ratio	1.00	1.00	1.00	1.00	0.92	0.85	0.77	0.69	0.62	0.54	0.46	0.38	0.31	0.23	0.15	0.08
Water Req. (mm/[AO])	7.47	7.41	7.33	7.23	6.65	6.06	5.55	4.94	4.34	3.74	3.14	2.57	2.05	1.51	0.99	0.49
Water Req. (mm/[AT])	3.20	3.18	3.14	3.10	2.85	2.60	2.38	2.12	1.86	1.60	1.35	1.10	0.88	0.65	0.42	0.21

Above calculation is in growth stage,
consumptive use of nursery and puddling are calclated separately.

Table F.2.20 Consumptive Use of Water in Zone III (3)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 14 %

MONTH	Dec.			Jan.						Feb.						Mar.
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
(Kc)			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.80	0.86	0.90	0.93	0.95	0.95	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.13	0.38	0.63	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.63	0.38	0.13
ET (mm/day)	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10
Water Req. (mm/[AO])	0.23	0.72	1.25	1.88	2.24	2.41	2.57	2.70	2.80	3.43	3.43	3.35	2.91	2.05	1.19	0.44
Water Req. (mm/[AT])	0.03	0.10	0.18	0.27	0.32	0.34	0.37	0.39	0.40	0.49	0.49	0.48	0.42	0.29	0.17	0.06

Table F.2.21 Consumptive Use of Water in Zone III (4)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 14 %

MONTH	Mar.						Apr.						May			
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
(Kc)			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.95	0.96	0.92	0.85		
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.80	0.86	0.90	0.93	0.95	0.95	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.13	0.38	0.63	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.88	0.63	0.38	0.13
ET (mm/day)	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.32	1.01	1.77	2.57	3.06	3.30	3.17	3.33	3.45	3.52	3.52	3.44	2.42	1.71	1.00	0.32
Water Req. (mm/[AT])	0.05	0.14	0.25	0.37	0.44	0.47	0.45	0.48	0.49	0.50	0.50	0.49	0.35	0.24	0.14	0.05

Table F.2.22 Consumptive Use of Water in Zone III (5)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 57 %

MONTH	Sept.						Oct.						Nov.						Dec.					
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
(Kc)							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.83						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.50	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	2.40	2.40	2.40	2.40	2.40	2.40	2.60	2.60	2.60	2.60	2.60	2.60	2.80	2.80	2.80	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
Water Req. (mm/[AO])	0.06	0.20	0.35	0.50	0.67	0.85	1.13	1.33	1.54	1.75	1.95	2.13	2.29	2.14	1.98	1.80	1.62	1.41	1.24	1.01	0.78	0.55	0.32	0.10
Water Req. (mm/[AT])	0.04	0.11	0.20	0.29	0.38	0.49	0.64	0.76	0.88	1.00	1.11	1.22	1.31	1.23	1.13	1.03	0.92	0.81	0.71	0.58	0.45	0.31	0.18	0.06

Table F.2.23 Consumptive Use of Water in Zone III (6)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 57 %

MONTH	Nov.			Dec.						Jan						Feb.						Mar.		
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
(Kc)							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.95	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	2.80	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90	3.00	3.00	3.00	3.00	3.00	3.00	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10
Water Req. (mm/[AO])	0.07	0.23	0.40	0.61	0.81	1.03	1.26	1.49	1.72	2.02	2.25	2.46	2.46	2.30	2.12	2.32	2.08	1.82	1.54	1.26	0.97	0.78	0.45	0.15
Water Req. (mm/[AT])	0.04	0.13	0.23	0.35	0.46	0.59	0.72	0.85	0.98	1.15	1.28	1.40	1.40	1.31	1.21	1.33	1.19	1.04	0.88	0.72	0.55	0.44	0.26	0.08

Table F.2.24 Consumptive Use of Water in Zone III (7)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 57 %

MONTH			Feb.						Mar.						Apr.						May			
5 Days	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
(Kc)							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	3.60	3.60	3.60	3.60	3.60	3.60	4.10	4.10	4.10	4.10	4.10	4.10	3.70	3.70	3.70	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00
Water Req. (mm/[AO])	0.09	0.30	0.52	0.75	1.01	1.28	1.78	2.10	2.43	2.76	3.07	3.36	3.03	2.83	2.62	2.38	2.14	1.87	1.29	1.05	0.81	0.57	0.33	0.11
Water Req. (mm/[AT])	0.05	0.17	0.30	0.43	0.58	0.73	1.02	1.20	1.39	1.57	1.75	1.92	1.73	1.62	1.50	1.36	1.22	1.07	0.73	0.60	0.46	0.33	0.19	0.06

Table F.2.25 Consumptive Use of Water in Zone III (8)

Crop : Vegetables

[AT] : Zone Area
[AO] : Planted Area
[AO]/[AT] : 57 %

MONTH		Apr.				May						June						July				Aug.	
5 Days	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3
	0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85												
		0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85											
			0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85										
				0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85									
					0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85								
						0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85							
(Kc)							0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85						
								0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85					
									0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85				
										0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85			
											0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85		
												0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85	
													0.63	0.69	0.75	0.80	0.86	0.92	0.96	0.96	0.96	0.96	0.92	0.85
Average Kc	0.63	0.66	0.69	0.72	0.75	0.78	0.80	0.82	0.84	0.85	0.86	0.86	0.86	0.88	0.89	0.91	0.92	0.93	0.94	0.93	0.92	0.91	0.89	0.85
Irrigated Area Ratio	0.04	0.13	0.21	0.29	0.38	0.46	0.54	0.63	0.71	0.79	0.87	0.96	0.96	0.87	0.79	0.71	0.63	0.54	0.46	0.38	0.29	0.21	0.13	0.04
ET (mm/day)	3.70	3.70	3.70	3.00	3.00	3.00	3.00	3.00	3.00	2.80	2.80	2.80	2.80	2.80	2.80	2.50	2.50	2.50	2.50	2.50	2.50	2.10	2.10	2.10
Water Req. (mm/[AO])	0.10	0.31	0.53	0.63	0.84	1.07	1.30	1.54	1.78	1.88	2.10	2.29	2.29	2.14	1.98	1.61	1.44	1.26	1.07	0.87	0.67	0.40	0.23	0.07
Water Req. (mm/[AT])	0.06	0.17	0.30	0.36	0.48	0.61	0.74	0.88	1.02	1.08	1.20	1.31	1.31	1.23	1.13	0.92	0.82	0.72	0.61	0.50	0.38	0.23	0.13	0.04

Table F.2.26 Required Pond Capacity in Water Balance Calculation

Zone I

(Unit : m³)

Year	Irrigation Block		
	I-1	I-2	I-3-1
1977	3321	2657	2340
1978	4926	3523	3134
1979	3218	2557	1134
1980	4454	2854	8121
1981	3047	2389	1616
1982	2543	2336	0
1983	3062	2238	4209
1984	3321	2657	6470
1985	2087	1470	1097
1986	2459	1961	1847
1987	5140	3523	3548

Zone II

(Unit : m³)

Year	Irrigation Block							
	II - 1	II - 2	II - 3	II - 4	II - 5	II - 6	II - 7	II - 8
1977	1927	4606	4585	12279	1148	1045	2503	3244
1978	2374	5545	2556	12798	1552	3091	3058	3661
1979	2180	5307	4373	17874	2092	3694	2958	3635
1980	4204	7255	6275	12551	1073	782	3710	4977
1981	1837	4726	2558	18927	1912	2158	2634	3544
1982	805	2636	889	9587	648	760	1316	1748
1983	2289	5161	5002	14301	1681	3157	2899	3773
1984	2864	4818	4734	23754	1843	3409	2244	3552
1985	933	2304	1354	5768	361	523	1160	1428
1986	2081	4789	2047	11576	1416	2941	2839	2714
1987	2280	5269	2748	14613	1324	1068	2744	3685

Table F.2.27 Water Balance Calculation in Zone I

Irrigation Block : I - 1, Pond Name : BAYABAS, Standard Year : 1978

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
JAN.	1	10.2	0.0	0.0	15.7	6772	7414	6524	0	248
	2	10.3	0.0	0.0	15.8	6813	7171	6311	0	750
	3	10.4	0.0	0.0	16.0	6894	7171	6311	0	1334
	4	10.2	0.0	0.0	15.7	6741	7171	6311	0	1765
	5	9.7	0.0	0.0	14.9	6419	7171	6311	0	1873
	6	11.0	0.0	0.0	17.0	7305	8605	7573	0	1605
FEB.	1	10.8	0.0	0.0	16.7	7173	7171	6311	0	2468
	2	11.0	0.0	0.0	16.9	7254	7171	6311	0	3411
	3	11.0	0.0	0.0	16.9	7247	7171	6311	0	4347
	4	10.4	0.0	0.0	16.0	6890	7171	6311	0	4926
	5	9.3	5.1	2.2	10.8	4656	7171	6311	0	3271
	6	4.9	0.0	0.0	7.5	3231	4303	3786	0	2716
MAR.	1	8.4	0.0	0.0	12.9	5561	7171	6311	0	1966
	2	8.0	0.0	0.0	12.4	5317	7171	6311	0	972
	3	7.8	0.0	0.0	12.0	5167	7171	6311	0	0
	4	8.3	7.6	2.9	8.3	3549	7171	6311	0	0
	5	9.4	0.0	0.0	14.5	6248	7171	6311	0	0
	6	12.8	13.7	6.7	9.3	4013	8605	7573	0	0
APR.	1	10.3	0.3	0.2	15.6	6708	7171	6311	0	398
	2	10.6	0.0	0.0	16.4	7040	7171	6311	0	1127
	3	10.9	0.0	0.0	16.8	7227	7171	6311	0	2043
	4	11.1	4.3	2.2	13.7	5898	7171	6311	0	1631
	5	11.3	26.7	13.8	0.0	0	7208	6343	0	0
	6	11.3	0.8	0.4	16.7	7174	7171	6311	0	864
MAY	1	8.5	5.4	2.6	9.1	3893	7171	6311	0	0
	2	7.1	37.4	15.2	0.0	0	10744	9455	0	0
	3	5.8	0.0	0.0	8.9	3829	7171	6311	0	0
	4	4.7	0.0	0.0	7.3	3135	7171	6311	0	0
	5	4.0	133.5	34.0	0.0	0	46645	41048	0	0
	6	4.1	149.0	34.2	0.0	0	125594	110523	0	0
JUNE	1	3.3	86.5	21.1	0.0	0	98877	87012	0	0
	2	4.0	22.8	6.8	0.0	0	40324	35485	0	0
	3	4.7	80.1	28.4	0.0	0	58113	51140	0	0
	4	5.8	57.9	24.4	0.0	0	50166	44146	0	0
	5	7.0	153.7	76.7	0.0	0	130925	115214	0	0
	6	8.3	5.3	3.1	8.0	3453	51081	44952	0	0
JULY	1	8.8	119.4	79.4	0.0	0	66356	58393	0	0
	2	9.6	42.6	30.5	0.0	0	72584	63874	0	0
	3	10.4	114.1	87.3	0.0	0	106707	93902	0	0
	4	10.4	112.8	86.3	0.0	0	87541	77036	0	0
	5	10.0	25.5	18.2	0.0	0	64441	56708	0	0
	6	11.6	207.1	142.9	0.0	0	186127	163792	0	0
AUG.	1	7.9	99.5	67.3	0.0	0	105740	93051	0	0
	2	7.5	34.5	22.4	0.0	0	69558	61211	0	0
	3	7.1	139.8	86.8	0.0	0	111795	98380	0	0
	4	6.7	20.7	12.3	0.0	0	67622	59507	0	0
	5	6.3	776.0	182.4	0.0	0	607708	534783	0	0
	6	7.2	60.8	32.7	0.0	0	275811	242713	0	0
SEPT.	1	6.4	94.6	48.3	0.0	0	133093	117122	0	0
	2	6.6	93.3	49.7	0.0	0	109880	96695	0	0
	3	6.9	23.6	13.1	0.0	0	77715	68389	0	0
	4	7.5	144.7	87.1	0.0	0	138044	121479	0	0
	5	8.4	57.3	38.6	0.0	0	73023	64260	0	0
	6	8.7	37.8	26.3	0.0	0	63580	55950	0	0
OCT.	1	9.4	45.5	31.4	0.0	0	53614	47180	0	0
	2	9.6	54.9	38.8	0.0	0	44964	39569	0	0
	3	9.8	39.9	28.8	0.0	0	61109	53776	0	0
	4	9.9	14.0	10.2	0.0	0	31184	27442	0	0
	5	9.9	0.0	0.0	15.3	6559	21610	19017	0	0
	6	11.9	120.4	85.9	0.0	0	93310	82113	0	0
NOV.	1	10.6	29.0	20.5	0.0	0	37930	33379	0	0
	2	10.6	0.0	0.0	16.3	7011	23821	20962	0	0
	3	10.6	0.0	0.0	16.2	6981	15589	13718	0	0
	4	10.5	20.8	14.3	0.0	0	14544	12799	0	0
	5	10.4	15.0	10.2	0.4	168	14970	13173	0	0
	6	10.8	0.0	0.0	16.5	7113	11718	10312	0	0
DEC.	1	11.2	0.0	0.0	17.2	7379	10602	9330	0	0
	2	10.7	0.0	0.0	16.4	7052	9539	8395	0	0
	3	10.1	0.0	0.0	15.6	6690	8642	7605	0	0
	4	9.8	72.6	43.2	0.0	0	19824	17445	0	0
	5	9.8	0.0	0.0	15.1	6507	24040	21155	0	0
	6	11.8	0.0	0.0	18.2	7830	12779	11246	0	0
TOTAL		642.4		1669.8	509.1	218896		3285468	0	

Table F.2.28 Water Balance Calculation in Zone I

Irrigation Block : I - 2, Pond Name : PUGUIS, Standard Year : 1978

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement (mm)	Water Requirement (m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	10.2	0.0	0.0	15.7	6614	7171	6311	0	304
	2	10.3	0.0	0.0	15.8	6655	7171	6311	0	648
JAN.	3	10.4	0.0	0.0	16.0	6734	7171	6311	0	1071
	4	10.2	0.0	0.0	15.7	6584	7171	6311	0	1345
	5	9.7	0.0	0.0	14.9	6270	7171	6311	0	1304
	6	11.0	0.0	0.0	17.0	7135	8605	7573	0	866
	1	10.8	0.0	0.0	16.7	7006	7171	6311	0	1562
	2	11.0	0.0	0.0	16.9	7085	7171	6311	0	2336
FEB.	3	11.0	0.0	0.0	16.9	7079	7171	6311	0	3104
	4	10.4	0.0	0.0	16.0	6729	7171	6311	0	3523
	5	9.3	5.1	2.2	10.8	4547	7171	6311	0	1760
	6	4.9	0.0	0.0	7.5	3156	4303	3786	0	1129
	1	8.4	0.0	0.0	12.9	5431	7171	6311	0	250
	2	8.0	0.0	0.0	12.4	5193	7171	6311	0	0
MAR.	3	7.8	0.0	0.0	12.0	5046	7171	6311	0	0
	4	8.3	7.6	2.9	8.3	3466	7171	6311	0	0
	5	9.4	0.0	0.0	14.5	6102	7171	6311	0	0
	6	12.8	13.7	6.7	9.3	3919	8605	7573	0	0
	1	10.3	0.3	0.2	15.6	6552	7171	6311	0	242
	2	10.6	0.0	0.0	16.4	6876	7171	6311	0	807
APR.	3	10.9	0.0	0.0	16.8	7059	7171	6311	0	1555
	4	11.1	4.3	2.2	13.7	5761	7171	6311	0	1006
	5	11.3	26.7	13.8	0.0	0	7171	6311	0	0
	6	11.3	0.8	0.4	16.7	7007	7171	6311	0	697
	1	8.5	5.4	2.6	9.1	3802	7171	6311	0	0
	2	7.1	37.4	15.2	0.0	0	7171	6311	0	0
MAY	3	5.8	0.0	0.0	8.9	3740	7171	6311	0	0
	4	4.7	0.0	0.0	7.3	3062	7171	6311	0	0
	5	4.0	133.5	34.0	0.0	0	8107	7134	0	0
	6	4.1	149.0	34.2	0.0	0	12887	11341	0	0
	1	3.3	86.5	21.1	0.0	0	10062	8855	0	0
	2	4.0	22.8	6.8	0.0	0	7171	6311	0	0
JUNE	3	4.7	80.1	28.4	0.0	0	7388	6501	0	0
	4	5.8	57.9	24.4	0.0	0	7171	6311	0	0
	5	7.0	153.7	76.7	0.0	0	13149	11571	0	0
	6	8.3	5.3	3.1	8.0	3373	7171	6311	0	0
	1	8.8	119.4	79.4	0.0	0	8891	7824	0	0
	2	9.6	42.6	30.5	0.0	0	7570	6662	0	0
JULY	3	10.4	114.1	87.3	0.0	0	10706	9421	0	0
	4	10.4	112.8	86.3	0.0	0	9017	7935	0	0
	5	10.0	25.5	18.2	0.0	0	7352	6470	0	0
	6	11.6	207.1	142.9	0.0	0	18654	16416	0	0
	1	7.9	99.5	67.3	0.0	0	10574	9305	0	0
	2	7.5	34.5	22.4	0.0	0	7512	6610	0	0
AUG.	3	7.1	139.8	86.8	0.0	0	11489	10110	0	0
	4	6.7	20.7	12.3	0.0	0	7427	6536	0	0
	5	6.3	776.0	182.4	0.0	0	60771	53478	0	0
	6	7.2	60.8	32.7	0.0	0	27581	24271	0	0
	1	6.4	94.6	48.3	0.0	0	13309	11712	0	0
	2	6.6	93.3	49.7	0.0	0	10988	9669	0	0
SEPT.	3	6.9	23.6	13.1	0.0	0	8061	7094	0	0
	4	7.5	144.7	87.1	0.0	0	13804	12148	0	0
	5	8.4	57.3	38.6	0.0	0	7496	6596	0	0
	6	8.7	37.8	26.3	0.0	0	7171	6311	0	0
	1	9.4	45.5	31.4	0.0	0	7171	6311	0	0
	2	9.6	54.9	38.8	0.0	0	7171	6311	0	0
OCT.	3	9.8	39.9	28.8	0.0	0	7529	6625	0	0
	4	9.9	14.0	10.2	0.0	0	7171	6311	0	0
	5	9.9	0.0	0.0	15.3	6406	7171	6311	0	96
	6	11.9	120.4	85.9	0.0	0	10854	9552	0	0
	1	10.6	29.0	20.5	0.0	0	7171	6311	0	0
NOV.	2	10.6	0.0	0.0	16.3	6848	7171	6311	0	537
	3	10.6	0.0	0.0	16.2	6818	7171	6311	0	1045
	4	10.5	20.8	14.3	0.0	0	7171	6311	0	0
	5	10.4	15.0	10.2	0.4	164	7171	6311	0	0
	6	10.8	0.0	0.0	16.5	6948	7171	6311	0	637
	1	11.2	0.0	0.0	17.2	7208	7171	6311	0	1534
DEC.	2	10.7	0.0	0.0	16.4	6888	7171	6311	0	2112
	3	10.1	0.0	0.0	15.6	6535	7171	6311	0	2336
	4	9.8	72.6	43.2	0.0	0	7171	6311	0	0
	5	9.8	0.0	0.0	15.1	6356	7171	6311	0	45
	6	11.8	0.0	0.0	18.2	7648	8605	7573	0	120
TOTAL		642.4		1669.8	509.1	213805		578011	0	

Table F.2.29 Water Balance Calculation in Zone I

Irrigation Block : I - 3 - 1, Pond Name : BUYAGAN, Standard Year : 1984

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement (mm)	Water Requirement (m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	10.2	0.0	0.0	15.7	5040	6058	5331	0	0
	2	10.3	0.0	0.0	15.8	5070	5667	4987	0	83
JAN.	3	10.4	0.0	0.0	16.0	5131	5329	4689	0	524
	4	10.2	0.0	0.0	15.7	5017	5164	4545	0	996
	5	9.7	5.4	3.1	10.1	3227	5083	4473	0	0
	6	11.0	13.2	7.1	6.0	1928	5993	5274	0	0
	1	10.8	0.0	0.0	16.7	5338	4907	4318	0	1020
	2	11.0	0.0	0.0	16.9	5398	4828	4249	0	2169
FEB.	3	11.0	0.0	0.0	16.9	5393	4750	4180	0	3383
	4	10.4	0.0	0.0	16.0	5127	4671	4111	0	4400
	5	9.3	0.0	0.0	14.3	4567	4593	4042	0	4925
	6	6.5	0.0	0.0	10.0	3206	2718	2392	0	5739
	1	8.4	4.3	1.5	10.6	3377	4468	3932	0	5183
	2	8.0	0.0	0.0	12.4	3957	4391	3864	0	5276
MAR.	3	7.8	28.5	10.3	0.0	0	5750	5060	0	216
	4	8.3	3.3	1.3	10.8	3458	4242	3733	0	0
	5	9.4	0.0	0.0	14.5	4649	4171	3670	0	979
	6	12.8	6.4	3.1	14.9	4754	4912	4322	0	1410
	1	10.3	0.0	0.0	15.8	5069	4017	3535	0	2945
	2	10.6	0.0	0.0	16.4	5239	3948	3474	0	4709
APR.	3	10.9	0.8	0.4	16.2	5174	3879	3414	0	6470
	4	11.1	82.7	42.9	0.0	0	23021	20259	0	0
	5	11.3	34.5	17.9	0.0	0	31315	27557	0	0
	6	11.3	77.4	40.1	0.0	0	45631	40155	0	0
	1	8.5	59.6	28.6	0.0	0	47630	41915	0	0
	2	7.1	102.8	41.7	0.0	0	72954	64200	0	0
MAY	3	5.8	76.4	25.2	0.0	0	94882	83496	0	0
	4	4.7	63.0	17.6	0.0	0	56135	49398	0	0
	5	4.0	57.4	14.6	0.0	0	65761	57870	0	0
	6	4.1	35.9	8.2	0.0	0	55415	48766	0	0
	1	3.3	21.7	5.3	0.0	0	27549	24243	0	0
	2	4.0	37.5	11.2	0.0	0	30382	26736	0	0
JUNE	3	4.7	40.9	14.5	0.0	0	24926	21935	0	0
	4	5.8	55.1	23.2	0.0	0	50957	44842	0	0
	5	7.0	176.9	88.2	0.0	0	151093	132962	0	0
	6	8.3	51.7	29.8	0.0	0	78411	69002	0	0
	1	8.8	103.9	69.1	0.0	0	114155	100456	0	0
	2	9.6	117.9	84.3	0.0	0	135089	118878	0	0
JULY	3	10.4	27.4	21.0	0.0	0	69047	60761	0	0
	4	10.4	53.5	40.9	0.0	0	55385	48738	0	0
	5	10.0	37.5	26.8	0.0	0	47252	41582	0	0
	6	11.6	38.1	26.3	0.0	0	44027	38744	0	0
	1	7.9	26.9	18.2	0.0	0	38722	34075	0	0
	2	7.5	74.9	48.6	0.0	0	60718	53432	0	0
AUG.	3	7.1	196.9	115.6	0.0	0	132395	116508	0	0
	4	6.7	323.3	148.7	0.0	0	418829	368569	0	0
	5	6.3	41.4	23.4	0.0	0	125347	110305	0	0
	6	7.2	692.3	179.4	0.0	0	708227	623239	0	0
	1	6.4	26.9	13.7	0.0	0	209635	184478	0	0
	2	6.6	32.0	17.0	0.0	0	98450	86636	0	0
SEPT.	3	6.9	57.6	32.0	0.0	0	79786	70212	0	0
	4	7.5	50.2	30.2	0.0	0	77203	67939	0	0
	5	8.4	56.2	37.9	0.0	0	58030	51066	0	0
	6	8.7	67.6	47.1	0.0	0	100000	88000	0	0
	1	9.4	98.4	68.0	0.0	0	90757	79866	0	0
	2	9.6	68.0	48.0	0.0	0	101366	89202	0	0
OCT.	3	9.8	34.3	24.8	0.0	0	65003	57202	0	0
	4	9.9	11.0	8.0	3.0	946	39639	34883	0	0
	5	9.9	11.8	8.5	2.2	699	27587	24277	0	0
	6	11.9	111.9	79.8	0.0	0	81960	72125	0	0
	1	10.6	27.9	19.7	0.0	0	55205	48580	0	0
NOV.	2	10.6	0.0	0.0	16.3	5218	28773	25321	0	0
	3	10.6	0.0	0.0	16.2	5195	18125	15950	0	0
	4	10.5	2.5	1.7	13.5	4325	15968	14052	0	0
	5	10.4	0.0	0.0	16.1	5144	14074	12385	0	0
	6	10.8	0.0	0.0	16.5	5293	12470	10974	0	0
	1	11.2	2.5	1.7	14.5	4633	11140	9803	0	0
DEC.	2	10.7	0.5	0.3	15.9	5087	10061	8854	0	0
	3	10.1	0.0	0.0	15.6	4979	9173	8072	0	0
	4	9.8	0.0	0.0	15.1	4835	8419	7409	0	0
	5	9.8	0.0	0.0	15.1	4843	7772	6839	0	0
	6	11.8	0.0	0.0	18.2	5827	8597	7565	0	0
TOTAL		644.0		1677.0	459.8	147142		3637910	0	

Table F.2.30 Water Balance Calculation in Zone I

Irrigation Block : I - 3 - 2, Standard Year : 1984

Month		Consump-tive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Require-ment(mm)	Water Require-ment(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	10.2	0.0	0.0	15.7	6614	0	0	6614	0
	2	10.3	0.0	0.0	15.8	6655	0	0	6655	0
JAN.	3	10.4	0.0	0.0	16.0	6734	0	0	6734	0
	4	10.2	0.0	0.0	15.7	6584	0	0	6584	0
	5	9.7	5.4	3.1	10.1	4236	0	0	4236	0
	6	11.0	13.2	7.1	6.0	2530	0	0	2530	0
	1	10.8	0.0	0.0	16.7	7006	0	0	7006	0
	2	11.0	0.0	0.0	16.9	7085	0	0	7085	0
FEB.	3	11.0	0.0	0.0	16.9	7079	0	0	7079	0
	4	10.4	0.0	0.0	16.0	6729	0	0	6729	0
	5	9.3	0.0	0.0	14.3	5994	0	0	5994	0
	6	6.5	0.0	0.0	10.0	4208	0	0	4208	0
	1	8.4	4.3	1.5	10.6	4432	0	0	4432	0
	2	8.0	0.0	0.0	12.4	5193	0	0	5193	0
MAR.	3	7.8	28.5	10.3	0.0	0	0	0	0	0
	4	8.3	3.3	1.3	10.8	4539	0	0	4539	0
	5	9.4	0.0	0.0	14.5	6102	0	0	6102	0
	6	12.8	6.4	3.1	14.9	6239	0	0	6239	0
	1	10.3	0.0	0.0	15.8	6653	0	0	6653	0
	2	10.6	0.0	0.0	16.4	6876	0	0	6876	0
APR.	3	10.9	0.8	0.4	16.2	6791	0	0	6791	0
	4	11.1	82.7	42.9	0.0	0	0	0	0	0
	5	11.3	34.5	17.9	0.0	0	0	0	0	0
	6	11.3	77.4	40.1	0.0	0	0	0	0	0
	1	8.5	59.6	28.6	0.0	0	0	0	0	0
MAY	2	7.1	102.8	41.7	0.0	0	0	0	0	0
	3	5.8	76.4	25.2	0.0	0	0	0	0	0
	4	4.7	63.0	17.6	0.0	0	0	0	0	0
	5	4.0	57.4	14.6	0.0	0	0	0	0	0
	6	4.1	35.9	8.2	0.0	0	0	0	0	0
	1	3.3	21.7	5.3	0.0	0	0	0	0	0
JUNE	2	4.0	37.5	11.2	0.0	0	0	0	0	0
	3	4.7	40.9	14.5	0.0	0	0	0	0	0
	4	5.8	55.1	23.2	0.0	0	0	0	0	0
	5	7.0	176.9	88.2	0.0	0	0	0	0	0
	6	8.3	51.7	29.8	0.0	0	0	0	0	0
	1	8.8	103.9	69.1	0.0	0	0	0	0	0
JULY	2	9.6	117.9	84.3	0.0	0	0	0	0	0
	3	10.4	27.4	21.0	0.0	0	0	0	0	0
	4	10.4	53.5	40.9	0.0	0	0	0	0	0
	5	10.0	37.5	26.8	0.0	0	0	0	0	0
	6	11.6	38.1	26.3	0.0	0	0	0	0	0
	1	7.9	26.9	18.2	0.0	0	0	0	0	0
AUG.	2	7.5	74.9	48.6	0.0	0	0	0	0	0
	3	7.1	196.9	115.6	0.0	0	0	0	0	0
	4	6.7	323.3	148.7	0.0	0	0	0	0	0
	5	6.3	41.4	23.4	0.0	0	0	0	0	0
	6	7.2	692.3	179.4	0.0	0	0	0	0	0
	1	6.4	26.9	13.7	0.0	0	0	0	0	0
SEPT.	2	6.6	32.0	17.0	0.0	0	0	0	0	0
	3	6.9	57.6	32.0	0.0	0	0	0	0	0
	4	7.5	50.2	30.2	0.0	0	0	0	0	0
	5	8.4	56.2	37.9	0.0	0	0	0	0	0
	6	8.7	67.6	47.1	0.0	0	0	0	0	0
	1	9.4	98.4	68.0	0.0	0	0	0	0	0
OCT.	2	9.6	68.0	48.0	0.0	0	0	0	0	0
	3	9.8	34.3	24.8	0.0	0	0	0	0	0
	4	9.9	11.0	8.0	3.0	1242	0	0	1241	0
	5	9.9	11.8	8.5	2.2	917	0	0	917	0
	6	11.9	111.9	79.8	0.0	0	0	0	0	0
	1	10.6	27.9	19.7	0.0	0	0	0	0	0
NOV.	2	10.6	0.0	0.0	16.3	6848	0	0	6848	0
	3	10.6	0.0	0.0	16.2	6818	0	0	6818	0
	4	10.5	2.5	1.7	13.5	5677	0	0	5677	0
	5	10.4	0.0	0.0	16.1	6752	0	0	6752	0
	6	10.8	0.0	0.0	16.5	6948	0	0	6948	0
	1	11.2	2.5	1.7	14.5	6080	0	0	6080	0
DEC.	2	10.7	0.5	0.3	15.9	6677	0	0	6677	0
	3	10.1	0.0	0.0	15.6	6535	0	0	6535	0
	4	9.8	0.0	0.0	15.1	6346	0	0	6346	0
	5	9.8	0.0	0.0	15.1	6356	0	0	6356	0
	6	11.8	0.0	0.0	18.2	7648	0	0	7648	0
TOTAL		644.0		1677.0	459.8	193124		0	193124	

Table F.2.31 Water Balance Calculation in Zone II

Irrigation Block : II - 1, Pond Name : BAHONG No.1, Standard Year : 1984

Month		Consump-tive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Require-ment(mm)	Water Require-ment(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	7.4	0.0	0.0	11.4	1479	947	833	646	0
	2	7.8	0.0	0.0	12.0	1565	886	779	786	0
JAN.	3	8.3	0.0	0.0	12.7	1657	833	733	925	0
	4	8.6	0.0	0.0	13.2	1713	807	710	1003	0
	5	8.7	5.4	2.6	9.5	1230	794	699	531	0
	6	10.6	13.2	6.3	6.7	868	936	824	44	0
	1	10.7	0.0	0.0	16.5	2141	767	675	1140	325
	2	10.8	0.0	0.0	16.6	2153	754	664	1140	674
FEB.	3	10.8	0.0	0.0	16.6	2152	742	653	1140	1033
	4	10.5	0.0	0.0	16.1	2097	730	642	1140	1347
	5	9.9	0.0	0.0	15.2	1979	718	632	1140	1554
	6	7.4	0.0	0.0	11.5	1490	554	488	912	1644
	1	10.2	4.3	1.7	13.0	1695	698	614	1080	1644
	2	10.0	0.0	0.0	15.3	1994	686	604	1140	1893
MAR.	3	9.9	28.5	11.2	0.0	0	898	791	0	1103
	4	10.1	3.3	1.3	13.5	1753	663	583	1140	1132
	5	10.7	0.0	0.0	16.5	2139	652	574	1140	1557
	6	13.6	6.4	2.9	16.4	2129	778	684	1369	1633
	1	10.6	0.0	0.0	16.3	2113	648	570	1140	2035
	2	10.7	0.0	0.0	16.5	2148	648	570	1140	2473
APR.	3	10.9	0.8	0.4	16.2	2102	648	570	1140	2864
	4	11.0	82.7	39.2	0.0	0	3607	3174	0	0
	5	11.1	34.5	16.3	0.0	0	4893	4306	0	0
	6	11.1	77.4	36.7	0.0	0	7130	6274	0	0
	1	8.7	59.6	27.4	0.0	0	7442	6549	0	0
	2	8.2	102.8	44.5	0.0	0	11399	10031	0	0
MAY	3	7.8	76.4	31.0	0.0	0	14825	13046	0	0
	4	7.8	63.0	26.4	0.0	0	8771	7719	0	0
	5	8.3	57.4	27.2	0.0	0	10275	9042	0	0
	6	10.8	35.9	19.0	0.0	0	8659	7620	0	0
	1	9.3	21.7	12.9	0.0	0	4305	3788	0	0
	2	10.5	37.5	25.4	0.0	0	4747	4178	0	0
JUNE	3	11.8	40.9	31.1	0.0	0	3895	3427	0	0
	4	12.6	55.1	44.1	0.0	0	7962	7007	0	0
	5	13.0	176.9	141.5	0.0	0	23608	20775	0	0
	6	13.3	51.7	41.4	0.0	0	12252	10782	0	0
	1	12.1	103.9	83.1	0.0	0	17837	15696	0	0
	2	12.2	117.9	94.3	0.0	0	21108	18575	0	0
JULY	3	12.2	27.4	21.9	0.0	0	10789	9494	0	0
	4	11.6	53.5	40.6	0.0	0	8654	7615	0	0
	5	10.4	37.5	25.4	0.0	0	7383	6497	0	0
	6	11.7	38.1	24.7	0.0	0	6879	6054	0	0
	1	7.6	26.9	16.7	0.0	0	6050	5324	0	0
AUG.	2	6.7	74.9	40.3	0.0	0	9487	8349	0	0
	3	5.8	196.9	85.0	0.0	0	20687	18204	0	0
	4	5.4	323.3	104.2	0.0	0	65442	57589	0	0
	5	5.5	41.4	17.2	0.0	0	19585	17235	0	0
	6	6.7	692.3	138.7	0.0	0	110660	97381	0	0
	1	6.4	26.9	11.2	0.0	0	32755	28825	0	0
SEPT.	2	6.4	32.0	13.3	0.0	0	15383	13537	0	0
	3	6.4	57.6	23.9	0.0	0	12467	10971	0	0
	4	6.4	50.2	20.9	0.0	0	12063	10615	0	0
	5	6.3	56.2	23.4	0.0	0	9067	7979	0	0
	6	5.6	67.6	24.5	0.0	0	15625	13750	0	0
	1	5.7	98.4	34.6	0.0	0	14181	12479	0	0
OCT.	2	6.6	68.0	29.4	0.0	0	15838	13938	0	0
	3	7.6	34.3	17.6	0.0	0	10157	8938	0	0
	4	8.6	11.0	6.6	3.2	414	6194	5450	0	0
	5	9.7	11.8	8.0	2.7	351	4311	3793	0	0
	6	13.1	111.9	85.0	0.0	0	12806	11270	0	0
	1	12.6	27.9	22.3	0.0	0	8626	7591	0	0
NOV.	2	13.0	0.0	0.0	20.0	2595	4496	3956	0	0
	3	13.3	0.0	0.0	20.5	2661	2832	2492	169	0
	4	13.6	2.5	2.0	17.8	2312	2495	2196	117	0
	5	13.7	0.0	0.0	21.1	2742	2199	1935	807	0
	6	13.7	0.0	0.0	21.1	2739	1949	1715	1025	0
	1	13.5	2.5	1.9	17.9	2323	1741	1532	791	0
DEC.	2	12.1	0.5	0.3	18.1	2352	1572	1383	968	0
	3	10.7	0.0	0.0	16.4	2137	1433	1261	876	0
	4	9.4	0.0	0.0	14.5	1886	1315	1158	728	0
	5	8.4	0.0	0.0	12.9	1672	1214	1069	604	0
	6	8.9	0.0	0.0	13.6	1773	1343	1182	591	0
TOTAL		702.8		1607.5	481.2	62554		568637	26516	

Table F.2.32 Water Balance Calculation in Zone II

Irrigation Block : II - 2, Pond Name : BAHONG No.2, Standard Year : 1978

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	7.4	0.0	0.0	11.4	2161	2542	2237	0	0
	2	7.8	0.0	0.0	12.0	2287	2352	2069	218	0
JAN.	3	8.3	0.0	0.0	12.7	2422	2189	1926	496	0
	4	8.6	0.0	0.0	13.2	2504	2050	1804	700	0
	5	8.7	0.0	0.0	13.4	2546	1930	1698	848	0
	6	10.6	0.0	0.0	16.3	3096	2223	1956	1140	0
	1	10.7	0.0	0.0	16.5	3129	1819	1601	1140	387
	2	10.8	0.0	0.0	16.6	3147	1789	1574	1140	820
FEB.	3	10.8	0.0	0.0	16.6	3145	1758	1547	1140	1277
	4	10.5	0.0	0.0	16.1	3064	1728	1521	1140	1680
	5	9.9	5.1	2.2	11.8	2248	1698	1494	753	1680
	6	5.6	0.0	0.0	8.6	1633	1005	884	684	1745
	1	10.2	0.0	0.0	15.6	2970	1651	1453	1140	2122
	2	10.0	0.0	0.0	15.3	2914	1622	1427	1140	2468
MAR.	3	9.9	0.0	0.0	15.2	2880	1593	1402	1140	2807
	4	10.1	7.6	3.1	10.8	2052	1564	1376	676	2807
	5	10.7	0.0	0.0	16.5	3126	1536	1352	1140	3440
	6	13.6	13.7	6.3	11.2	2130	1816	1598	532	3440
	1	10.6	0.3	0.1	16.0	3046	1512	1331	1140	4016
	2	10.7	0.0	0.0	16.5	3140	1512	1331	1140	4685
APR.	3	10.9	0.0	0.0	16.7	3182	1512	1331	1140	5396
	4	11.0	4.3	2.0	13.8	2620	1512	1331	1140	5545
	5	11.1	26.7	12.6	0.0	0	1714	1508	0	4037
	6	11.1	0.8	0.4	16.4	3122	1512	1331	1140	4688
	1	8.7	5.4	2.5	9.6	1827	1512	1331	497	4688
	2	8.2	37.4	16.2	0.0	0	3305	2908	0	1779
MAY	3	7.8	0.0	0.0	11.9	2268	1512	1331	938	1779
	4	7.8	0.0	0.0	11.9	2267	1512	1331	936	1779
	5	8.3	133.5	63.2	0.0	0	15949	14035	0	0
	6	10.8	149.0	78.7	0.0	0	43061	37894	0	0
	1	9.3	86.5	51.6	0.0	0	33901	29833	0	0
	2	10.5	22.8	15.5	0.0	0	13825	12166	0	0
JUNE	3	11.8	80.1	60.8	0.0	0	19925	17534	0	0
	4	12.6	57.9	46.3	0.0	0	17200	15136	0	0
	5	13.0	153.7	123.0	0.0	0	44889	39502	0	0
	6	13.3	5.3	4.2	13.9	2650	17514	15412	0	0
	1	12.1	119.4	95.5	0.0	0	22751	20021	0	0
	2	12.2	42.6	34.1	0.0	0	24886	21900	0	0
JULY	3	12.2	114.1	91.3	0.0	0	36585	32195	0	0
	4	11.6	112.8	85.6	0.0	0	30014	26412	0	0
	5	10.4	25.5	17.3	0.0	0	22094	19443	0	0
	6	11.7	207.1	134.3	0.0	0	63815	56157	0	0
	1	7.6	99.5	61.7	0.0	0	36254	31903	0	0
	2	6.7	34.5	18.6	0.0	0	23848	20987	0	0
AUG.	3	5.8	139.8	63.8	0.0	0	38330	33730	0	0
	4	5.4	20.7	8.6	0.0	0	23185	20402	0	0
	5	5.5	776.0	134.1	0.0	0	208357	183354	0	0
	6	6.7	60.8	25.3	0.0	0	94564	83216	0	0
	1	6.4	94.6	39.3	0.0	0	45632	40156	0	0
	2	6.4	93.3	38.8	0.0	0	37673	33152	0	0
SEPT.	3	6.4	23.6	9.8	0.0	0	26645	23448	0	0
	4	6.4	144.7	60.2	0.0	0	47329	41650	0	0
	5	6.3	57.3	23.8	0.0	0	25036	22032	0	0
	6	5.6	37.8	13.7	0.0	0	21799	19183	0	0
	1	5.7	45.5	16.0	0.0	0	18382	16176	0	0
	2	6.6	54.9	23.8	0.0	0	15416	13566	0	0
OCT.	3	7.6	39.9	20.5	0.0	0	20952	18437	0	0
	4	8.6	14.0	8.3	0.4	83	10692	9409	0	0
	5	9.7	0.0	0.0	15.0	2850	7409	6520	0	0
	6	13.1	120.4	91.4	0.0	0	31992	28153	0	0
	1	12.6	29.0	23.2	0.0	0	13005	11444	0	0
	2	13.0	0.0	0.0	20.0	3793	8167	7187	0	0
NOV.	3	13.3	0.0	0.0	20.5	3889	5345	4703	0	0
	4	13.6	20.8	16.6	0.0	0	4987	4388	0	0
	5	13.7	15.0	12.0	2.6	499	5132	4517	0	0
	6	13.7	0.0	0.0	21.1	4004	4018	3535	468	0
	1	13.5	0.0	0.0	20.8	3950	3635	3199	751	0
	2	12.1	0.0	0.0	18.6	3536	3271	2878	658	0
DEC.	3	10.7	0.0	0.0	16.4	3123	2963	2607	515	0
	4	9.4	72.6	38.3	0.0	0	6797	5981	0	0
	5	8.4	0.0	0.0	12.9	2444	8242	7253	0	0
	6	8.9	0.0	0.0	13.6	2592	4381	3856	0	0
TOTAL		701.0		1694.7	538.6	102340		1108643	25637	

Table F.2.33 Water Balance Calculation in Zone II

Irrigation Block : II - 3, Pond Name : BAHONG No.3, Standard Year : 1983

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
JAN.	1	7.4	24.9	10.1	0.0	0	7191	6328	0	0
	2	7.8	0.0	0.0	12.0	2528	5332	4692	0	0
	3	8.3	3.6	1.7	10.2	2142	5098	4486	0	0
	4	8.6	12.3	5.8	4.2	885	4796	4221	0	0
	5	8.7	2.5	1.2	11.6	2431	4530	3986	0	0
	6	10.6	0.0	0.0	16.3	3422	5116	4502	0	0
FEB.	1	10.7	0.0	0.0	16.5	3458	4031	3547	0	0
	2	10.8	0.0	0.0	16.6	3478	3899	3431	0	47
	3	10.8	0.0	0.0	16.6	3477	3835	3375	0	149
	4	10.5	21.5	9.9	0.9	191	4633	4077	0	0
	5	9.9	0.0	0.0	15.2	3197	3710	3265	0	0
	6	5.6	0.0	0.0	8.6	1805	2197	1933	0	0
MAR.	1	10.2	0.0	0.0	15.6	3282	3614	3180	0	102
	2	10.0	15.5	6.1	6.0	1258	3621	3187	0	0
	3	9.9	0.0	0.0	15.2	3183	3495	3076	0	108
	4	10.1	0.0	0.0	15.5	3265	3437	3025	0	348
	5	10.7	0.0	0.0	16.5	3455	3380	2974	0	829
	6	13.6	0.0	0.0	20.9	4391	3981	3503	0	1716
APR.	1	10.6	0.0	0.0	16.3	3413	3255	2864	0	2265
	2	10.7	0.5	0.2	16.2	3394	3199	2815	0	2843
	3	10.9	0.0	0.0	16.7	3517	3144	2766	0	3594
	4	11.0	4.6	2.2	13.6	2850	3089	2718	0	3727
	5	11.1	4.6	2.2	13.7	2871	3037	2672	0	3925
	6	11.1	0.0	0.0	17.0	3573	3024	2661	0	4837
MAY	1	8.7	0.0	0.0	13.4	2822	3024	2661	0	4998
	2	8.2	0.0	0.0	12.7	2665	3024	2661	0	5002
	3	7.8	0.0	0.0	11.9	2507	3024	2661	0	4848
	4	7.8	5.9	2.5	8.1	1706	3024	2661	0	3893
	5	8.3	41.9	19.8	0.0	0	5398	4750	0	0
	6	10.8	109.2	57.7	0.0	0	44198	38894	0	0
JUNE	1	9.3	70.2	41.8	0.0	0	31387	27621	0	0
	2	10.5	51.6	35.0	0.0	0	37821	33282	0	0
	3	11.8	30.5	23.2	0.0	0	25663	22583	0	0
	4	12.6	60.9	48.7	0.0	0	29777	26204	0	0
	5	13.0	21.3	17.0	0.0	0	27980	24622	0	0
	6	13.3	63.4	50.7	0.0	0	34294	30179	0	0
JULY	1	12.1	20.8	16.6	0.0	0	21458	18883	0	0
	2	12.2	29.3	23.4	0.0	0	18107	15934	0	0
	3	12.2	55.8	44.6	0.0	0	18015	15853	0	0
	4	11.6	98.8	75.0	0.0	0	56677	49876	0	0
	5	10.4	18.1	12.3	0.0	0	29525	25982	0	0
	6	11.7	66.2	42.9	0.0	0	36802	32385	0	0
AUG.	1	7.6	108.0	66.9	0.0	0	50925	44814	0	0
	2	6.7	99.4	53.5	0.0	0	74081	65191	0	0
	3	5.8	545.0	199.8	0.0	0	304710	268145	0	0
	4	5.4	54.6	22.7	0.0	0	152418	134128	0	0
	5	5.5	49.6	20.6	0.0	0	65226	57399	0	0
	6	6.7	36.5	15.2	0.0	0	49844	43863	0	0
SEPT.	1	6.4	89.9	37.4	0.0	0	46337	40777	0	0
	2	6.4	25.4	10.6	0.0	0	42724	37597	0	0
	3	6.4	19.5	8.1	0.0	0	26504	23324	0	0
	4	6.4	68.9	28.6	0.0	0	32776	28843	0	0
	5	6.3	113.6	47.2	0.0	0	59713	52548	0	0
	6	5.6	54.7	19.9	0.0	0	60782	53488	0	0
OCT.	1	5.7	18.0	6.3	0.0	0	31739	27931	0	0
	2	6.6	25.4	11.0	0.0	0	19556	17209	0	0
	3	7.6	20.7	10.6	0.0	0	22718	19992	0	0
	4	8.6	25.9	15.4	0.0	0	16297	14342	0	0
	5	9.7	52.7	35.7	0.0	0	31343	27582	0	0
	6	13.1	23.1	17.5	0.0	0	20767	18275	0	0
NOV.	1	12.6	61.0	48.8	0.0	0	29597	26045	0	0
	2	13.0	0.5	0.4	19.3	4063	16592	14601	0	0
	3	13.3	1.0	0.8	19.2	4040	9705	8541	0	0
	4	13.6	41.1	32.9	0.0	0	15245	13416	0	0
	5	13.7	0.8	0.6	20.1	4222	9091	8000	0	0
	6	13.7	2.6	2.1	17.9	3753	7586	6675	0	0
DEC.	1	13.5	0.0	0.0	20.8	4366	6780	5967	0	0
	2	12.1	0.0	0.0	18.6	3908	6060	5332	0	0
	3	10.7	0.0	0.0	16.4	3452	5453	4798	0	0
	4	9.4	0.0	0.0	14.5	3046	4940	4348	0	0
	5	8.4	0.0	0.0	12.9	2701	4507	3966	0	0
	6	8.9	0.8	0.3	13.1	2756	4931	4339	0	0
TOTAL		701.0		1263.9	530.8	111474		1542453	0	

Table F.2.34 Water Balance Calculation in Zone II

Irrigation Block : II - 4, Pond Name : ALAPANG No.1, Standard Year : 1981

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
JAN.	1	7.4	14.8	6.0	2.1	1047	7344	6463	0	0
	2	7.8	3.5	1.5	9.7	4757	7344	6463	0	0
	3	8.3	0.0	0.0	12.7	6247	7344	6463	0	0
	4	8.6	0.0	0.0	13.2	6457	7344	6463	0	0
	5	8.7	0.0	0.0	13.4	6566	7344	6463	0	103
	6	10.6	3.0	1.4	14.1	6914	8813	7755	0	0
FEB.	1	10.7	0.8	0.4	15.9	7783	7344	6463	0	1320
	2	10.8	0.0	0.0	16.6	8116	7344	6463	0	2973
	3	10.8	0.0	0.0	16.6	8112	7344	6463	0	4622
	4	10.5	0.0	0.0	16.1	7902	7344	6463	0	6062
	5	9.9	0.0	0.0	15.2	7461	7344	6463	0	7060
	6	5.6	0.2	0.1	8.5	4151	4406	3878	0	7333
MAR.	1	10.2	0.0	0.0	15.6	7659	7344	6463	0	8529
	2	10.0	0.0	0.0	15.3	7516	7344	6463	0	9582
	3	9.9	0.0	0.0	15.2	7428	7344	6463	0	10547
	4	10.1	0.0	0.0	15.5	7618	7344	6463	0	11702
	5	10.7	0.0	0.0	16.5	8062	7344	6463	0	13301
	6	13.6	0.0	0.0	20.9	10245	8813	7755	0	15791
APR.	1	10.6	0.0	0.0	16.3	7963	7344	6463	0	17292
	2	10.7	0.0	0.0	16.5	8098	7344	6463	0	18927
	3	10.9	7.1	3.4	11.6	5672	7344	6463	0	18136
	4	11.0	4.8	2.3	13.4	6579	7344	6463	0	18252
	5	11.1	69.1	32.7	0.0	0	7344	6463	0	11789
	6	11.1	36.6	17.3	0.0	0	7550	6644	0	5145
MAY	1	8.7	14.5	6.7	3.2	1556	7344	6463	0	238
	2	8.2	44.7	19.4	0.0	0	7344	6463	0	0
	3	7.8	78.5	31.8	0.0	0	11972	10535	0	0
	4	7.8	62.6	26.2	0.0	0	11967	10531	0	0
	5	8.3	28.4	13.5	0.0	0	8358	7355	0	0
	6	10.8	66.0	34.9	0.0	0	11176	9835	0	0
JUNE	1	9.3	47.0	28.0	0.0	0	11348	9986	0	0
	2	10.5	89.4	60.6	0.0	0	12487	10988	0	0
	3	11.8	354.3	242.4	0.0	0	79884	70298	0	0
	4	12.6	141.3	113.0	0.0	0	45838	40337	0	0
	5	13.0	50.5	40.4	0.0	0	25917	22807	0	0
	6	13.3	70.0	56.0	0.0	0	18096	15924	0	0
JULY	1	12.1	125.8	100.6	0.0	0	23054	20288	0	0
	2	12.2	19.8	15.8	0.0	0	17411	15322	0	0
	3	12.2	118.1	94.5	0.0	0	22832	20092	0	0
	4	11.6	171.4	130.1	0.0	0	35461	31206	0	0
	5	10.4	16.3	11.0	0.0	0	22515	19813	0	0
	6	11.7	67.1	43.5	0.0	0	18795	16539	0	0
AUG.	1	7.6	144.1	89.3	0.0	0	25586	22516	0	0
	2	6.7	133.3	71.7	0.0	0	41241	36292	0	0
	3	5.8	95.0	43.4	0.0	0	25588	22517	0	0
	4	5.4	230.2	95.7	0.0	0	47717	41991	0	0
	5	5.5	345.4	112.2	0.0	0	87619	77104	0	0
	6	6.7	170.2	70.8	0.0	0	67899	59751	0	0
SEPT.	1	6.4	1.5	0.6	8.9	4359	21333	18773	0	0
	2	6.4	9.1	3.8	4.0	1977	11732	10324	0	0
	3	6.4	9.6	4.0	3.7	1821	7812	6874	0	0
	4	6.4	533.3	111.2	0.0	0	76047	66922	0	0
	5	6.3	22.0	9.1	0.0	0	59466	52330	0	0
	6	5.6	84.1	30.5	0.0	0	24754	21784	0	0
OCT.	1	5.7	111.4	39.1	0.0	0	31964	28129	0	0
	2	6.6	0.5	0.2	9.8	4820	17520	15417	0	0
	3	7.6	1.8	0.9	10.2	5020	9378	8252	0	0
	4	8.6	0.0	0.0	13.3	6504	7344	6463	0	41
	5	9.7	83.5	56.6	0.0	0	11847	10425	0	0
	6	13.1	77.0	58.5	0.0	0	15002	13202	0	0
NOV.	1	12.6	7.9	6.3	9.6	4712	11997	10557	0	0
	2	13.0	0.0	0.0	20.0	9781	7398	6510	0	3271
	3	13.3	4.1	3.3	15.4	7557	7344	6463	0	4365
	4	13.6	2.5	2.0	17.8	8716	7344	6463	0	6619
	5	13.7	213.0	120.0	0.0	0	31199	27455	0	0
	6	13.7	1.3	1.0	19.5	9541	17698	15574	0	0
DEC.	1	13.5	0.0	0.0	20.8	10187	7777	6844	0	3343
	2	12.1	0.0	0.0	18.6	9120	7344	6463	0	6000
	3	10.7	0.8	0.5	15.7	7694	7344	6463	0	7232
	4	9.4	0.0	0.0	14.5	7108	7344	6463	0	7877
	5	8.4	0.5	0.2	12.5	6124	7344	6463	0	7538
	6	8.9	0.0	0.0	13.6	6684	8813	7755	0	6467
TOTAL		701.0		2064.7	542.1	265632		1132606	0	

Table F.2.35 Water Balance Calculation in Zone II

Irrigation Block : II - 5, Pond Name : ALAPANG No.2, Standard Year : 1981

Month		Consump-tive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Require-ment(mm)	Water Require-ment(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
JAN.	1	7.4	14.8	6.0	2.1	171	1296	1140	0	0
	2	7.8	3.5	1.5	9.7	777	1296	1140	0	0
	3	8.3	0.0	0.0	12.7	1020	1296	1140	0	0
	4	8.6	0.0	0.0	13.2	1054	1296	1140	0	0
	5	8.7	0.0	0.0	13.4	1072	1296	1140	0	0
	6	10.6	3.0	1.4	14.1	1129	1555	1369	0	0
FEB.	1	10.7	0.8	0.4	15.9	1271	1296	1140	0	130
	2	10.8	0.0	0.0	16.6	1325	1296	1140	0	315
	3	10.8	0.0	0.0	16.6	1324	1296	1140	0	499
	4	10.5	0.0	0.0	16.1	1290	1296	1140	0	648
	5	9.9	0.0	0.0	15.2	1218	1296	1140	0	726
	6	5.6	0.2	0.1	8.5	678	778	684	0	719
MAR.	1	10.2	0.0	0.0	15.6	1250	1296	1140	0	829
	2	10.0	0.0	0.0	15.3	1227	1296	1140	0	916
	3	9.9	0.0	0.0	15.2	1213	1296	1140	0	988
	4	10.1	0.0	0.0	15.5	1244	1296	1140	0	1091
	5	10.7	0.0	0.0	16.5	1316	1296	1140	0	1267
	6	13.6	0.0	0.0	20.9	1673	1555	1369	0	1571
APR.	1	10.6	0.0	0.0	16.3	1300	1296	1140	0	1731
	2	10.7	0.0	0.0	16.5	1322	1296	1140	0	1912
	3	10.9	7.1	3.4	11.6	926	1296	1140	0	1698
	4	11.0	4.8	2.3	13.4	1074	1296	1140	0	1631
	5	11.1	69.1	32.7	0.0	0	1773	1560	0	72
	6	11.1	36.6	17.3	0.0	0	2711	2385	0	0
MAY	1	8.7	14.5	6.7	3.2	254	1517	1335	0	0
	2	8.2	44.7	19.4	0.0	0	2343	2062	0	0
	3	7.8	78.5	31.8	0.0	0	5473	4816	0	0
	4	7.8	62.6	26.2	0.0	0	5470	4814	0	0
	5	8.3	28.4	13.5	0.0	0	3734	3286	0	0
	6	10.8	66.0	34.9	0.0	0	5007	4406	0	0
JUNE	1	9.3	47.0	28.0	0.0	0	5187	4565	0	0
	2	10.5	89.4	60.6	0.0	0	5708	5023	0	0
	3	11.8	354.3	242.4	0.0	0	36518	32136	0	0
	4	12.6	141.3	113.0	0.0	0	20955	18440	0	0
	5	13.0	50.5	40.4	0.0	0	11848	10426	0	0
	6	13.3	70.0	56.0	0.0	0	8272	7280	0	0
JULY	1	12.1	125.8	100.6	0.0	0	10539	9274	0	0
	2	12.2	19.8	15.8	0.0	0	7959	7004	0	0
	3	12.2	118.1	94.5	0.0	0	10438	9185	0	0
	4	11.6	171.4	130.1	0.0	0	16211	14265	0	0
	5	10.4	16.3	11.0	0.0	0	10292	9057	0	0
	6	11.7	67.1	43.5	0.0	0	8592	7561	0	0
AUG.	1	7.6	144.1	89.3	0.0	0	11697	10293	0	0
	2	6.7	133.3	71.7	0.0	0	18853	16591	0	0
	3	5.8	95.0	43.4	0.0	0	11697	10294	0	0
	4	5.4	230.2	95.7	0.0	0	21814	19196	0	0
	5	5.5	345.4	112.2	0.0	0	40054	35248	0	0
	6	6.7	170.2	70.8	0.0	0	31039	27315	0	0
SEPT.	1	6.4	1.5	0.6	8.9	712	9752	8582	0	0
	2	6.4	9.1	3.8	4.0	323	5363	4720	0	0
	3	6.4	9.6	4.0	3.7	297	3387	2981	0	0
	4	6.4	533.3	111.2	0.0	0	34610	30457	0	0
	5	6.3	22.0	9.1	0.0	0	27185	23922	0	0
	6	5.6	84.1	30.5	0.0	0	11316	9958	0	0
OCT.	1	5.7	111.4	39.1	0.0	0	14612	12859	0	0
	2	6.6	0.5	0.2	9.8	787	8009	7048	0	0
	3	7.6	1.8	0.9	10.2	820	4287	3772	0	0
	4	8.6	0.0	0.0	13.3	1062	2677	2356	0	0
	5	9.7	83.5	56.6	0.0	0	5030	4426	0	0
	6	13.1	77.0	58.5	0.0	0	6858	6035	0	0
NOV.	1	12.6	7.9	6.3	9.6	769	5484	4826	0	0
	2	13.0	0.0	0.0	20.0	1597	2885	2539	0	0
	3	13.3	4.1	3.3	15.4	1234	1915	1685	0	0
	4	13.6	2.5	2.0	17.8	1423	1687	1484	0	0
	5	13.7	213.0	120.0	0.0	0	13177	11595	0	0
	6	13.7	1.3	1.0	19.5	1558	8090	7120	0	0
DEC.	1	13.5	0.0	0.0	20.8	1663	3277	2884	0	0
	2	12.1	0.0	0.0	18.6	1489	1772	1560	0	0
	3	10.7	0.8	0.5	15.7	1256	1499	1319	0	0
	4	9.4	0.0	0.0	14.5	1160	1341	1180	0	0
	5	8.4	0.5	0.2	12.5	1000	1296	1140	0	0
	6	8.9	0.0	0.0	13.6	1091	1555	1369	0	0
TOTAL		701.0		2064.7	542.1	43369		458726	0	

Table F.2.36 Water Balance Calculation in Zone II

Irrigation Block : II - 6, Pond Name : ALAPANG No.3, Standard Year : 1984

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	7.4	0.0	0.0	11.4	2275	3456	3041	0	0
	2	7.8	0.0	0.0	12.0	2408	3456	3041	0	0
JAN.	3	8.3	0.0	0.0	12.7	2550	3456	3041	0	0
	4	8.6	0.0	0.0	13.2	2635	3456	3041	0	0
	5	8.7	5.4	2.6	9.5	1893	3456	3041	0	0
	6	10.6	13.2	6.3	6.7	1335	4147	3650	0	0
	1	10.7	0.0	0.0	16.5	3293	3456	3041	0	252
	2	10.8	0.0	0.0	16.6	3313	3456	3041	0	523
FEB.	3	10.8	0.0	0.0	16.6	3311	3456	3041	0	793
	4	10.5	0.0	0.0	16.1	3225	3456	3041	0	977
	5	9.9	0.0	0.0	15.2	3045	3456	3041	0	981
	6	7.4	0.0	0.0	11.5	2292	2765	2433	0	840
	1	10.2	4.3	1.7	13.0	2607	3456	3041	0	406
	2	10.0	0.0	0.0	15.3	3068	3456	3041	0	433
MAR.	3	9.9	28.5	11.2	0.0	0	3456	3041	0	0
	4	10.1	3.3	1.3	13.5	2697	3456	3041	0	0
	5	10.7	0.0	0.0	16.5	3291	3456	3041	0	249
	6	13.6	6.4	2.9	16.4	3276	4147	3650	0	0
	1	10.6	0.0	0.0	16.3	3250	3456	3041	0	209
	2	10.7	0.0	0.0	16.5	3305	3456	3041	0	473
APR.	3	10.9	0.8	0.4	16.2	3233	3456	3041	0	665
	4	11.0	82.7	39.2	0.0	0	6672	5871	0	0
	5	11.1	34.5	16.3	0.0	0	8416	7406	0	0
	6	11.1	77.4	36.7	0.0	0	12263	10792	0	0
	1	8.7	59.6	27.4	0.0	0	12801	11265	0	0
	2	8.2	102.8	44.5	0.0	0	19607	17254	0	0
MAY	3	7.8	76.4	31.0	0.0	0	25500	22440	0	0
	4	7.8	63.0	26.4	0.0	0	15086	13276	0	0
	5	8.3	57.4	27.2	0.0	0	17673	15553	0	0
	6	10.8	35.9	19.0	0.0	0	14893	13106	0	0
	1	9.3	21.7	12.9	0.0	0	7404	6515	0	0
	2	10.5	37.5	25.4	0.0	0	8165	7185	0	0
JUNE	3	11.8	40.9	31.1	0.0	0	6699	5895	0	0
	4	12.6	55.1	44.1	0.0	0	13695	12051	0	0
	5	13.0	176.9	141.5	0.0	0	40606	35733	0	0
	6	13.3	51.7	41.4	0.0	0	21073	18544	0	0
	1	12.1	103.9	83.1	0.0	0	30679	26998	0	0
	2	12.2	117.9	94.3	0.0	0	36305	31948	0	0
JULY	3	12.2	27.4	21.9	0.0	0	18556	16330	0	0
	4	11.6	53.5	40.6	0.0	0	14885	13098	0	0
	5	10.4	37.5	25.4	0.0	0	12699	11175	0	0
	6	11.7	38.1	24.7	0.0	0	11832	10412	0	0
	1	7.6	26.9	16.7	0.0	0	10406	9158	0	0
	2	6.7	74.9	40.3	0.0	0	16318	14360	0	0
AUG.	3	5.8	196.9	85.0	0.0	0	35581	31311	0	0
	4	5.4	323.3	104.2	0.0	0	112560	99053	0	0
	5	5.5	41.4	17.2	0.0	0	33687	29645	0	0
	6	6.7	692.3	138.7	0.0	0	190336	167496	0	0
	1	6.4	26.9	11.2	0.0	0	56339	49579	0	0
	2	6.4	32.0	13.3	0.0	0	26458	23283	0	0
SEPT.	3	6.4	57.6	23.9	0.0	0	21442	18869	0	0
	4	6.4	50.2	20.9	0.0	0	20748	18259	0	0
	5	6.3	56.2	23.4	0.0	0	15595	13724	0	0
	6	5.6	67.6	24.5	0.0	0	26875	23650	0	0
	1	5.7	98.4	34.6	0.0	0	24391	21464	0	0
	2	6.6	68.0	29.4	0.0	0	27242	23973	0	0
OCT.	3	7.6	34.3	17.6	0.0	0	17469	15373	0	0
	4	8.6	11.0	6.6	3.2	637	10653	9375	0	0
	5	9.7	11.8	8.0	2.7	539	7414	6524	0	0
	6	13.1	111.9	85.0	0.0	0	22027	19384	0	0
	1	12.6	27.9	22.3	0.0	0	14836	13056	0	0
NOV.	2	13.0	0.0	0.0	20.0	3992	7733	6805	0	0
	3	13.3	0.0	0.0	20.5	4094	4871	4287	0	0
	4	13.6	2.5	2.0	17.8	3558	4291	3776	0	0
	5	13.7	0.0	0.0	21.1	4218	3782	3329	0	890
	6	13.7	0.0	0.0	21.1	4214	3467	3051	0	2053
	1	13.5	2.5	1.9	17.9	3574	3456	3041	0	2586
DEC.	2	12.1	0.5	0.3	18.1	3618	3456	3041	0	3162
	3	10.7	0.0	0.0	16.4	3287	3456	3041	0	3409
	4	9.4	0.0	0.0	14.5	2901	3456	3041	0	3268
	5	8.4	0.0	0.0	12.9	2572	3456	3041	0	2800
	6	8.9	0.0	0.0	13.6	2728	4147	3650	0	1878
TOTAL		702.8		1607.5	481.2	96237		1024961	0	

Table F.2.37 Water Balance Calculation in Zone II

Irrigation Block : II - 7, Pond Name : PERIL, Standard Year : 1978

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
JAN.	1	7.4	0.0	0.0	11.4	1706	1748	1538	168	0
	2	7.8	0.0	0.0	12.0	1806	1617	1423	383	0
	3	8.3	0.0	0.0	12.7	1912	1505	1324	588	0
	4	8.6	0.0	0.0	13.2	1977	1409	1240	737	0
	5	8.7	0.0	0.0	13.4	2010	1327	1167	843	0
	6	10.6	0.0	0.0	16.3	2445	1528	1345	1100	0
FEB.	1	10.7	0.0	0.0	16.5	2470	1251	1101	1140	229
	2	10.8	0.0	0.0	16.6	2484	1230	1082	1140	491
	3	10.8	0.0	0.0	16.6	2483	1209	1064	1140	770
	4	10.5	0.0	0.0	16.1	2419	1188	1046	1140	1003
	5	9.9	5.1	2.2	11.8	1774	1167	1027	747	1003
	6	5.6	0.0	0.0	8.6	1289	691	608	682	1003
MAR.	1	10.2	0.0	0.0	15.6	2345	1135	999	1140	1208
	2	10.0	0.0	0.0	15.3	2301	1115	981	1140	1387
	3	9.9	0.0	0.0	15.2	2274	1095	964	1140	1557
	4	10.1	7.6	3.1	10.8	1620	1081	951	669	1557
	5	10.7	0.0	0.0	16.5	2468	1080	950	1140	1934
	6	13.6	13.7	6.3	11.2	1682	1296	1140	541	1934
APR.	1	10.6	0.3	0.1	16.0	2405	1080	950	1140	2248
	2	10.7	0.0	0.0	16.5	2479	1080	950	1140	2636
	3	10.9	0.0	0.0	16.7	2512	1080	950	1140	3058
	4	11.0	4.3	2.0	13.8	2069	1080	950	1118	3058
	5	11.1	26.7	12.6	0.0	0	1211	1065	0	1992
	6	11.1	0.8	0.4	16.4	2465	1080	950	1140	2366
MAY	1	8.7	5.4	2.5	9.6	1443	1080	950	492	2366
	2	8.2	37.4	16.2	0.0	0	2288	2014	0	352
	3	7.8	0.0	0.0	11.9	1791	1080	950	840	352
	4	7.8	0.0	0.0	11.9	1790	1080	950	839	352
	5	8.3	133.5	63.2	0.0	0	10965	9649	0	0
	6	10.8	149.0	78.7	0.0	0	29604	26052	0	0
JUNE	1	9.3	86.5	51.6	0.0	0	23307	20510	0	0
	2	10.5	22.8	15.5	0.0	0	9505	8364	0	0
	3	11.8	80.1	60.8	0.0	0	13698	12054	0	0
	4	12.6	57.9	46.3	0.0	0	11825	10406	0	0
	5	13.0	153.7	123.0	0.0	0	30861	27158	0	0
	6	13.3	5.3	4.2	13.9	2092	12041	10596	0	0
JULY	1	12.1	119.4	95.5	0.0	0	15641	13764	0	0
	2	12.2	42.6	34.1	0.0	0	17109	15056	0	0
	3	12.2	114.1	91.3	0.0	0	25152	22134	0	0
	4	11.6	112.8	85.6	0.0	0	20635	18159	0	0
	5	10.4	25.5	17.3	0.0	0	15190	13367	0	0
	6	11.7	207.1	134.3	0.0	0	43873	38608	0	0
AUG.	1	7.6	99.5	61.7	0.0	0	24924	21933	0	0
	2	6.7	34.5	18.6	0.0	0	16396	14428	0	0
	3	5.8	139.8	63.8	0.0	0	26352	23189	0	0
	4	5.4	20.7	8.6	0.0	0	15939	14027	0	0
	5	5.5	776.0	134.1	0.0	0	143246	126056	0	0
	6	6.7	60.8	25.3	0.0	0	65013	57211	0	0
SEPT.	1	6.4	94.6	39.3	0.0	0	31372	27607	0	0
	2	6.4	93.3	38.8	0.0	0	25900	22792	0	0
	3	6.4	23.6	9.8	0.0	0	18319	16120	0	0
	4	6.4	144.7	60.2	0.0	0	32539	28634	0	0
	5	6.3	57.3	23.8	0.0	0	17213	15147	0	0
	6	5.6	37.8	13.7	0.0	0	14987	13188	0	0
OCT.	1	5.7	45.5	16.0	0.0	0	12638	11121	0	0
	2	6.6	54.9	23.8	0.0	0	10599	9327	0	0
	3	7.6	39.9	20.5	0.0	0	14404	12676	0	0
	4	8.6	14.0	8.3	0.4	65	7351	6469	0	0
	5	9.7	0.0	0.0	15.0	2250	5094	4483	0	0
	6	13.1	120.4	91.4	0.0	0	21995	19355	0	0
NOV.	1	12.6	29.0	23.2	0.0	0	8941	7868	0	0
	2	13.0	0.0	0.0	20.0	2994	5615	4941	0	0
	3	13.3	0.0	0.0	20.5	3070	3675	3234	0	0
	4	13.6	20.8	16.6	0.0	0	3428	3017	0	0
	5	13.7	15.0	12.0	2.6	394	3529	3105	0	0
	6	13.7	0.0	0.0	21.1	3161	2762	2431	730	0
DEC.	1	13.5	0.0	0.0	20.8	3119	2499	2199	919	0
	2	12.1	0.0	0.0	18.6	2792	2249	1979	813	0
	3	10.7	0.0	0.0	16.4	2465	2037	1793	673	0
	4	9.4	72.6	38.3	0.0	0	4673	4112	0	0
	5	8.4	0.0	0.0	12.9	1929	5667	4987	0	0
	6	8.9	0.0	0.0	13.6	2046	3012	2651	0	0
TOTAL		701.0		1694.7	538.6	80795		762588	26568	

Table F.2.38 Water Balance Calculation in Zone II

Irrigation Block : II - 8, Pond Name : ALNO, Standard Year : 1983

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement(mm)	Water Requirement(m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by Pump (m^3)	Required Capacity (m^3)
	1	7.4	24.9	10.1	0.0	0	1942	1709	0	0
	2	7.8	0.0	0.0	12.0	843	1440	1267	0	0
JAN.	3	8.3	3.6	1.7	10.2	714	1377	1211	0	0
	4	8.6	12.3	5.8	4.2	295	1295	1140	0	0
	5	8.7	2.5	1.2	11.6	810	1223	1076	0	0
	6	10.6	0.0	0.0	16.3	1141	1381	1216	0	0
	1	10.7	0.0	0.0	16.5	1153	1088	958	0	195
	2	10.8	0.0	0.0	16.6	1159	1053	926	0	428
FEB.	3	10.8	0.0	0.0	16.6	1159	1035	911	0	676
	4	10.5	21.5	9.9	0.9	64	1251	1101	0	0
	5	9.9	0.0	0.0	15.2	1066	1002	882	0	184
	6	5.6	0.0	0.0	8.6	602	593	522	0	264
	1	10.2	0.0	0.0	15.6	1094	976	859	0	499
	2	10.0	15.5	6.1	6.0	419	978	860	0	58
MAR.	3	9.9	0.0	0.0	15.2	1061	944	830	0	289
	4	10.1	0.0	0.0	15.5	1088	928	817	0	560
	5	10.7	0.0	0.0	16.5	1152	913	803	0	909
	6	13.6	0.0	0.0	20.9	1464	1075	946	0	1427
	1	10.6	0.0	0.0	16.3	1138	879	773	0	1791
	2	10.7	0.5	0.2	16.2	1131	866	762	0	2161
APR.	3	10.9	0.0	0.0	16.7	1172	864	760	0	2573
	4	11.0	4.6	2.2	13.6	950	864	760	0	2762
	5	11.1	4.6	2.2	13.7	957	864	760	0	2959
	6	11.1	0.0	0.0	17.0	1191	864	760	0	3390
	1	8.7	0.0	0.0	13.4	941	864	760	0	3570
	2	8.2	0.0	0.0	12.7	888	864	760	0	3698
MAY	3	7.8	0.0	0.0	11.9	836	864	760	0	3773
	4	7.8	5.9	2.5	8.1	569	864	760	0	3582
	5	8.3	41.9	19.8	0.0	0	1496	1316	0	2266
	6	10.8	109.2	57.7	0.0	0	11933	10501	0	0
	1	9.3	70.2	41.8	0.0	0	8475	7458	0	0
	2	10.5	51.6	35.0	0.0	0	10212	8986	0	0
JUNE	3	11.8	30.5	23.2	0.0	0	6929	6097	0	0
	4	12.6	60.9	48.7	0.0	0	8040	7075	0	0
	5	13.0	21.3	17.0	0.0	0	7555	6648	0	0
	6	13.3	63.4	50.7	0.0	0	9259	8148	0	0
	1	12.1	20.8	16.6	0.0	0	5794	5098	0	0
JULY	2	12.2	29.3	23.4	0.0	0	4889	4302	0	0
	3	12.2	55.8	44.6	0.0	0	4864	4280	0	0
	4	11.6	98.8	75.0	0.0	0	15303	13467	0	0
	5	10.4	18.1	12.3	0.0	0	7972	7015	0	0
	6	11.7	66.2	42.9	0.0	0	9936	8744	0	0
	1	7.6	108.0	66.9	0.0	0	13750	12100	0	0
AUG.	2	6.7	99.4	53.5	0.0	0	20002	17602	0	0
	3	5.8	545.0	199.8	0.0	0	82272	72399	0	0
	4	5.4	54.6	22.7	0.0	0	41153	36215	0	0
	5	5.5	49.6	20.6	0.0	0	17611	15498	0	0
	6	6.7	36.5	15.2	0.0	0	13458	11843	0	0
	1	6.4	89.9	37.4	0.0	0	12511	11010	0	0
SEPT.	2	6.4	25.4	10.6	0.0	0	11535	10151	0	0
	3	6.4	19.5	8.1	0.0	0	7156	6297	0	0
	4	6.4	68.9	28.6	0.0	0	8849	7788	0	0
	5	6.3	113.6	47.2	0.0	0	16123	14188	0	0
	6	5.6	54.7	19.9	0.0	0	16411	14442	0	0
	1	5.7	18.0	6.3	0.0	0	8570	7541	0	0
OCT.	2	6.6	25.4	11.0	0.0	0	5280	4646	0	0
	3	7.6	20.7	10.6	0.0	0	6134	5398	0	0
	4	8.6	25.9	15.4	0.0	0	4400	3872	0	0
	5	9.7	52.7	35.7	0.0	0	8463	7447	0	0
	6	13.1	23.1	17.5	0.0	0	5607	4934	0	0
	1	12.6	61.0	48.8	0.0	0	7991	7032	0	0
NOV.	2	13.0	0.5	0.4	19.3	1354	4480	3942	0	0
	3	13.3	1.0	0.8	19.2	1347	2620	2306	0	0
	4	13.6	41.1	32.9	0.0	0	4116	3622	0	0
	5	13.7	0.8	0.6	20.1	1407	2454	2160	0	0
	6	13.7	2.6	2.1	17.9	1251	2048	1802	0	0
	1	13.5	0.0	0.0	20.8	1455	1831	1611	0	0
DEC.	2	12.1	0.0	0.0	18.6	1303	1636	1440	0	0
	3	10.7	0.0	0.0	16.4	1151	1472	1296	0	0
	4	9.4	0.0	0.0	14.5	1015	1334	1174	0	0
	5	8.4	0.0	0.0	12.9	900	1217	1071	0	0
	6	8.9	0.8	0.3	13.1	919	1331	1172	0	0
TOTAL		701.0		1263.9	530.8	37158		416785	0	

Table F.2.39 Water Balance Calculation in Zone III

Irrigation Block : III - 1, Standard Year : 1979

Month		Consumptive Use (mm)	Rainfall (mm)	Effective Rainfall (mm)	Water Requirement (mm)	Water Requirement (m^3)	Total Runoff (m^3)	Available Runoff (m^3)	Supplied by WANGAL Cr. (m^3)	Required Capacity (m^3)
	1	11.7	0.0	0.0	15.7	10963	8640	7603	3360	0
	2	11.3	0.0	0.0	15.1	10571	8640	7603	2968	0
JAN.	3	10.9	0.0	0.0	14.6	10218	8640	7603	2615	0
	4	10.0	0.3	0.2	13.1	9167	8640	7603	1564	0
	5	8.6	8.6	4.5	5.5	3821	8640	7603	0	0
	6	9.8	0.0	0.0	13.0	9122	10368	9124	0	0
	1	11.4	0.0	0.0	15.2	10630	8640	7603	3026	0
	2	13.3	0.0	0.0	17.8	12429	8640	7603	4826	0
FEB.	3	14.3	0.3	0.2	18.9	13214	8640	7603	5611	0
	4	15.1	0.0	0.0	20.1	14078	8640	7603	6475	0
	5	15.7	0.0	0.0	20.9	14609	8640	7603	7006	0
	6	11.4	0.0	0.0	15.2	10673	5184	4562	6111	0
	1	18.7	0.0	0.0	25.0	17500	8640	7603	9896	0
	2	18.4	0.0	0.0	24.6	17205	8640	7603	9602	0
MAR.	3	18.6	0.0	0.0	24.8	17329	8640	7603	9726	0
	4	20.0	0.0	0.0	26.7	18701	8640	7603	11097	0
	5	21.7	1.3	1.0	27.6	19339	8640	7603	11736	0
	6	27.7	0.0	0.0	36.9	25813	10368	9124	16689	0
	1	21.8	6.9	5.4	21.8	15294	8640	7603	7691	0
	2	21.6	10.2	7.6	18.7	13107	8640	7603	5504	0
APR.	3	21.4	7.4	5.2	21.5	15079	8640	7603	7476	0
	4	21.3	27.0	18.5	3.7	2602	8640	7603	0	0
	5	21.4	39.9	27.4	0.0	0	10025	8822	0	0
	6	21.5	36.6	25.1	0.0	0	10592	9321	0	0
	1	18.3	15.2	10.2	10.8	7576	8650	7612	0	0
	2	17.8	25.6	16.5	1.8	1290	9821	8642	0	0
MAY	3	17.4	24.3	14.9	3.2	2273	8640	7603	0	0
	4	16.9	190.6	111.6	0.0	0	78595	69163	0	0
	5	16.6	103.1	58.9	0.0	0	62178	54717	0	0
	6	19.8	123.0	70.3	0.0	0	75270	66237	0	0
	1	16.5	40.7	15.1	1.8	1293	44686	39324	0	0
	2	16.5	116.1	47.6	0.0	0	52702	46377	0	0
JUNE	3	16.8	45.5	20.4	0.0	0	41200	36256	0	0
	4	16.5	0.8	0.4	21.5	15054	23270	20477	0	0
	5	14.5	16.8	6.9	10.2	7119	13111	11538	0	0
	6	12.6	30.0	11.2	1.9	1306	14184	12482	0	0
	1	11.3	378.1	74.8	0.0	0	185507	163246	0	0
	2	11.1	66.7	29.1	0.0	0	89517	78775	0	0
JULY	3	10.9	12.1	5.1	7.8	5487	35097	30886	0	0
	4	10.8	6.1	2.4	11.1	7803	19972	17575	0	0
	5	9.9	66.5	23.7	0.0	0	20934	18422	0	0
	6	11.7	98.6	34.0	0.0	0	49242	43333	0	0
	1	10.1	50.6	16.8	0.0	0	44481	39144	0	0
	2	10.6	153.1	49.1	0.0	0	70350	61908	0	0
AUG.	3	11.2	427.5	109.0	0.0	0	231849	204027	0	0
	4	12.0	101.0	32.0	0.0	0	152759	134428	0	0
	5	13.0	90.7	31.1	0.0	0	78650	69212	0	0
	6	16.2	42.2	15.6	0.8	581	51912	45683	0	0
	1	15.9	19.6	8.1	10.4	7300	28022	24659	0	0
	2	15.9	85.3	38.6	0.0	0	38733	34085	0	0
SEPT.	3	15.8	38.9	19.1	0.0	0	39137	34440	0	0
	4	15.7	46.3	23.3	0.0	0	33634	29598	0	0
	5	15.5	30.8	15.8	0.0	0	26479	23301	0	0
	6	16.4	58.4	32.3	0.0	0	32059	28212	0	0
	1	18.0	138.9	82.0	0.0	0	82122	72267	0	0
	2	18.8	6.6	4.1	19.5	13680	30817	27119	0	0
OCT.	3	19.6	2.8	1.9	23.7	16570	17067	15019	1551	0
	4	20.4	12.3	8.7	15.6	10934	11757	10346	588	0
	5	21.1	31.2	23.2	0.0	0	11224	9877	0	0
	6	25.9	5.6	4.4	28.8	20134	11616	10222	9912	0
	1	22.6	1.1	0.9	28.9	20253	8640	7603	12650	0
	2	22.0	4.6	3.4	24.8	17359	8640	7603	9755	0
NOV.	3	21.4	3.3	2.3	25.4	17775	8640	7603	10172	0
	4	20.9	1.0	0.7	26.9	18833	8640	7603	11230	0
	5	19.5	0.0	0.0	26.0	18219	8640	7603	10616	0
	6	18.2	4.3	2.7	20.6	14417	8640	7603	6813	0
	1	17.2	0.0	0.0	22.9	16022	8640	7603	8419	0
	2	15.8	2.5	1.5	19.1	13387	8640	7603	5783	0
DEC.	3	14.5	6.4	3.5	14.6	10189	8640	7603	2586	0
	4	13.3	0.0	0.0	17.8	12445	8640	7603	4842	0
	5	12.4	40.1	21.8	0.0	0	9715	8549	0	0
	6	13.9	0.0	0.0	18.6	13009	10368	9124	3885	0
TOTAL		1167.4		1199.9	831.1	581771		1885330	231782	

Table F.2.40 Summary of Water Balance in Dry Season

Irrigation block	Net * beneficial farm land	Amount of water source	Present water use for irrigation		Water suorce availability with project			Irrigation water requirement with project			Supplementation by well	Dificit		Remarks
			Volume	Mean discharge	Volume	Mean discharge	Minimum discharge	Volume	Mean discharge	Minimum discharge		Total deficit	Required reservoir capacity	
	(ha)	('000 cu.m)	('000 cu.m)	(cu.m / s)	('000 cu.m)	(cu.m / s)	(cu.m / s)	('000 cu.m)	(cu.m / s)	(cu.m / s)	('000 cu.m)	('000 cu.m)	('000 cu.m)	
I - 1	43	** 376 (3,733)	115.5 (123.3)	0.0073	331 (3,285)	0.0210	0.0146	198.0 (218.9)	0.0126	0.0171	-	8.1	4.9	Standard year : 1978
I - 2	42	** 260 (657)	112.9 (120.5)	0.0072	229 (578)	0.0146	0.0146	193.4 (213.8)	0.0123	0.0167	-	9.9	3.5	1978
I - 3	74	** 399 (4,134)	183.2 (183.2)	0.0116										1984
(I - 3 - 1)	(32)				351 (3,638)	0.0223	0.0079	145.5 (147.1)	0.0092	0.0125	-	13.3	5.7	
(I - 3 - 2)	(42)				-	-	-	191.0 (193.1)	0.0121	0.0164	193.1	-	-	
II - 1	13	63 (646)	36.8 (36.8)	0.0023	55 (568)	0.0035	0.0013	61.8 (62.6)	0.0039	0.0063	26.5	3.7	2.9	1984
II - 2	19	112 (1,260)	55.2 (60.4)	0.0035	99 (1,109)	0.0063	0.0031	90.4 (101.8)	0.0057	0.0091	25.7	6.2	5.5	1978
II - 3	21	215 (1,753)	59.7 (64.3)	0.0038	189 (1,543)	0.0120	0.0062	101.8 (111.5)	0.0065	0.0101	-	5.3	5.0	1983
II - 4	49	305 (1,287)	149.4 (160.8)	0.0095	268 (1,133)	0.0170	0.0150	239.6 (265.6)	0.0152	0.0236	-	33.7	18.9	1981
II - 5	8	77 (521)	23.4 (25.2)	0.0015	68 (458)	0.0043	0.0030	39.1 (43.3)	0.0025	0.0038	-	1.9	1.9	1981
II - 6	20	161 (1,165)	59.5 (59.5)	0.0038	142 (1,025)	0.0090	0.0070	95.1 (96.2)	0.0060	0.0098	-	5.3	3.4	1984
II - 7	15	77 (867)	43.6 (47.7)	0.0028	68 (763)	0.0043	0.0022	71.4 (80.4)	0.0045	0.0073	26.6	3.4	3.1	1978
II - 8	7	58 (474)	19.9 (21.4)	0.0013	51 (417)	0.0032	0.0018	33.9 (37.2)	0.0022	0.0034	-	4.9	3.8	1983
III - 1	70	1,282 (14,229)	296.5 (405.8)	0.0188	1,128 (12,522)	0.0715	0.0516	463.4 (581.8)	0.0294	0.0500	-	-	-	1979

* : These figures are excluded land acquisiton such as proposed road and irrigation facilities from original net beneficial area.

** : Besides these, Zone I has taken about 280,000 cu.m from the Balili river in the dry season.

Figures in the parenthesis are through a year.

Table F.2.41 Annual Amount of Water Source Availability

(Unit : '000 cu.m)

YEAR	Irrigation Block													TOTAL
	I - 1	I - 2	I - 3	II - 1	II - 2	II - 3	II - 4	II - 5	II - 6	II - 7	II - 8	III - 1	Wangal Creek	
1977	4,026	700	4,541	710	1,363	2,838	1,201	472	1,269	937	767	2,698	15,610	37,132
	(464)	(260)	(479)	(75)	(144)	(300)	(279)	(64)	(171)	(99)	(81)	(395)	(1,648)	(4,459)
1978	3,733	657	4,195	655	1,260	2,624	1,135	411	1,185	867	709	2,527	14,420	34,378
	(376)	(260)	(372)	(58)	(112)	(233)	(270)	(56)	(148)	(77)	(63)	(352)	(1,278)	(3,655)
1979	3,127	630	3,516	549	1,055	2,198	1,004	372	999	726	594	2,142	12,087	28,999
	(296)	(260)	(280)	(44)	(85)	(176)	(266)	(48)	(129)	(59)	(48)	(317)	(965)	(2,973)
1980	5,172	799	5,821	910	1,750	3,645	1,477	604	1,622	1,204	985	3,433	20,010	47,432
	(1,372)	(341)	(1,484)	(232)	(449)	(933)	(501)	(168)	(452)	(309)	(253)	(982)	(5,101)	(12,577)
1981	4,473	716	5,073	793	1,522	3,171	1,287	521	1,400	1,046	856	2,967	17,439	41,264
	(585)	(269)	(630)	(98)	(189)	(394)	(305)	(77)	(206)	(130)	(106)	(467)	(2,166)	(5,622)
1982	4,470	726	5,076	793	1,523	3,173	1,297	522	1,402	1,047	857	2,975	17,449	41,310
	(436)	(260)	(466)	(73)	(140)	(291)	(276)	(61)	(162)	(96)	(79)	(378)	(1,601)	(4,319)
1983	2,514	588	2,803	438	842	1,753	849	303	814	579	474	1,756	9,635	23,348
	(347)	(260)	(344)	(54)	(103)	(215)	(269)	(53)	(143)	(71)	(58)	(343)	(1,183)	(3,443)
1984	3,685	653	4,134	646	1,243	2,589	1,099	434	1,165	856	700	2,479	14,211	33,894
	(417)	(261)	(399)	(63)	(123)	(254)	(275)	(60)	(161)	(85)	(69)	(378)	(1,373)	(3,918)
1985	4,762	753	5,381	841	1,615	3,364	1,356	555	1,491	1,111	909	3,158	18,497	43,793
	(451)	(260)	(454)	(71)	(137)	(285)	(272)	(62)	(167)	(95)	(77)	(386)	(1,559)	(4,276)
1986	4,626	761	5,228	817	1,569	3,268	1,369	544	1,460	1,079	822	3,106	17,970	42,619
	(300)	(260)	(292)	(46)	(88)	(183)	(266)	(48)	(128)	(61)	(49)	(315)	(1,005)	(3,041)
1987	2,765	607	3,085	482	927	1,929	909	331	890	638	521	1,912	10,604	25,600
	(349)	(260)	(337)	(53)	(102)	(211)	(271)	(54)	(143)	(70)	(57)	(344)	(1,157)	(3,408)

Table F.2.42 Annual Present Water Use

(Unit : cu.m)

YEAR	Irrigation Block I - 1	I - 2	I - 3	II - 1	II - 2	II - 3	II - 4	II - 5	II - 6	II - 7	II - 8	III - 1	TOTAL
1977	109,030	106,550	180,890	36,780	53,750	59,410	144,270	22,630	59,410	42,430	19,800	360,590	1,195,540
	(98,350)	(96,110)	(163,170)	(31,530)	(46,090)	(50,940)	(123,710)	(19,410)	(50,940)	(36,380)	(16,980)	(246,600)	(980,210)
1978	123,330	120,530	204,620	41,320	60,390	66,750	162,100	25,430	66,750	47,680	22,250	368,700	1,309,850
	(115,510)	(112,890)	(191,650)	(37,770)	(55,200)	(61,010)	(148,160)	(23,240)	(61,010)	(43,580)	(20,340)	(291,640)	(1,162,000)
1979	111,410	108,880	184,840	39,110	57,160	63,180	153,440	24,070	63,180	45,130	21,060	405,830	1,277,290
	(107,480)	(105,040)	(178,320)	(36,280)	(53,020)	(58,600)	(142,320)	(22,320)	(58,600)	(41,860)	(19,530)	(296,500)	(1,119,870)
1980	116,940	114,290	194,020	40,250	58,830	65,030	157,920	24,770	65,030	46,450	21,680	361,990	1,267,200
	(113,120)	(110,550)	(187,680)	(36,860)	(53,870)	(59,540)	(144,600)	(22,680)	(59,540)	(42,530)	(19,850)	(281,290)	(1,132,110)
1981	118,320	115,630	196,300	40,980	59,890	66,190	160,750	25,220	66,190	47,280	22,060	401,720	1,320,530
	(114,390)	(111,790)	(189,770)	(38,090)	(55,670)	(61,540)	(149,440)	(23,440)	(61,540)	(43,950)	(20,510)	(301,050)	(1,171,180)
1982	101,360	99,050	168,160	35,830	52,360	57,880	140,560	22,050	57,880	41,340	19,290	369,230	1,164,990
	(95,570)	(93,400)	(158,560)	(31,520)	(46,070)	(50,920)	(123,670)	(19,400)	(50,920)	(36,370)	(16,970)	(265,980)	(989,350)
1983	118,890	116,190	197,250	39,820	58,210	64,330	156,240	24,510	64,330	45,950	21,440	382,500	1,289,660
	(110,820)	(108,300)	(183,860)	(36,980)	(54,050)	(59,740)	(145,090)	(22,760)	(59,740)	(42,670)	(19,910)	(299,130)	(1,143,050)
1984	110,400	107,890	183,160	36,810	53,800	59,460	144,410	22,650	59,460	42,470	19,820	331,160	1,171,490
	(110,400)	(107,890)	(183,160)	(36,810)	(53,800)	(59,460)	(144,410)	(22,650)	(59,460)	(42,470)	(19,820)	(289,280)	(1,129,610)
1985	78,210	76,440	129,760	24,440	35,720	39,480	95,870	15,040	39,480	28,200	13,160	249,340	825,140
	(76,850)	(75,100)	(127,500)	(23,640)	(34,550)	(38,190)	(92,740)	(14,550)	(38,190)	(27,280)	(12,730)	(212,010)	(773,330)
1986	108,840	106,370	180,580	37,640	55,010	60,800	147,650	23,160	60,800	43,430	20,270	401,710	1,246,260
	(103,740)	(101,380)	(172,120)	(34,360)	(50,210)	(55,500)	(134,780)	(21,140)	(55,500)	(39,640)	(18,500)	(293,430)	(1,080,300)
1987	122,000	119,220	202,400	41,460	60,600	66,980	162,660	25,520	66,980	47,840	22,330	407,240	1,345,230
	(116,720)	(114,060)	(193,640)	(39,000)	(57,000)	(63,000)	(153,010)	(24,000)	(63,000)	(45,000)	(21,000)	(314,420)	(1,203,850)

Table F.2.43 Proposed Irrigation Facilities

Irrigation block	Intake facilities	Diversion conduit		Pond	Lateral conduit		Division box	Delivery conduit		Water tank	Others
		m	φ	m^3	m	φ	nos.	m	φ	nos.	
I-1	deversoir	-		5,700	1,800	125	9	3,700	80	74	
I-2	-	-		4,100*1	1,400	125	9	3,600	80	72	
I-3-1	deversoir	-		7,500	900	125	7	2,750	80	55	
I-3-2	-	-		-	2,500	125	8	3,350	80	67	3 deep wells
II-1	20m width	400	200	3,300	550	125	4	1,100	80	22	(well*2) 200 m, φ 80
II-2	10m width	50	200	6,400	900	125	6	1,600	80	32	(well*2) 200 m, φ 80
II-3	30m width	300	200	5,800	1,600	125	6	1,750	80	35	
II-4	-	-		21,800*1	4,100	125	20	4,250	80	85	
II-5	} 30m width	200	200	2,200	600	125	3	700	80	14	
II-6		400	200	3,900	1,600	125	7	1,750	80	35	
II-7	10m width	150	200	3,500	2,600	125	10	1,250	80	25	(well*2) 200 m, φ 80
II-8	20m width	900	200	4,300	1,100	125	3	600	80	12	
III-1-1	20m width	-		-	1,200	125	3	850	80	17	
III-1-2	20m width	600	300	-	4,200	125	25	2,500	80	50	regulating pond (500m^3), rehabilitation of Bineng CIS canal (3500 m) with intake weir
Total		3,000		68,500	25,050		120	29,750		595	

*1 : Dam type

*2 : Joint use with drinking water supply

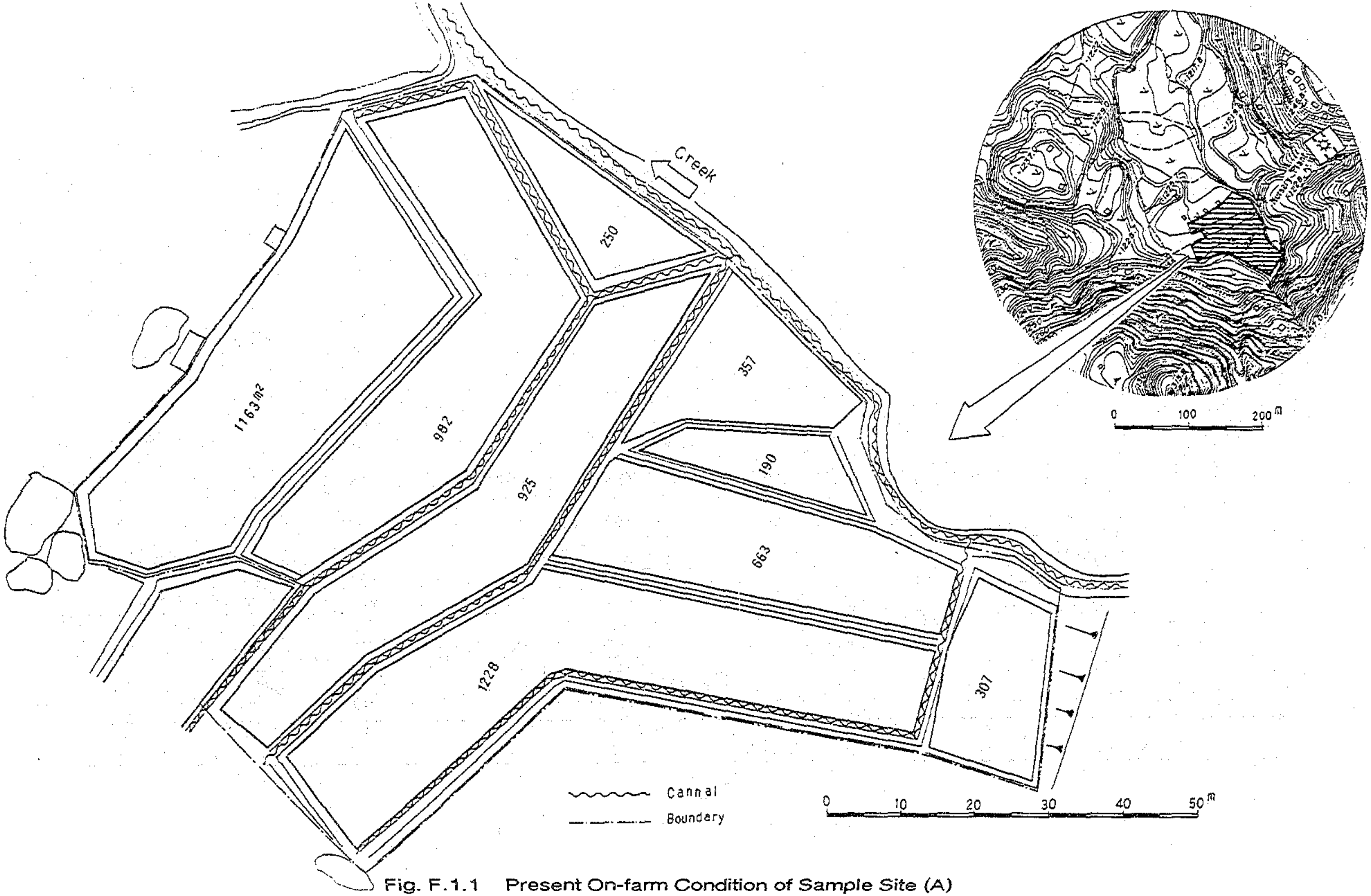

Fig. F.1.1 Present On-farm Condition of Sample Site (A)

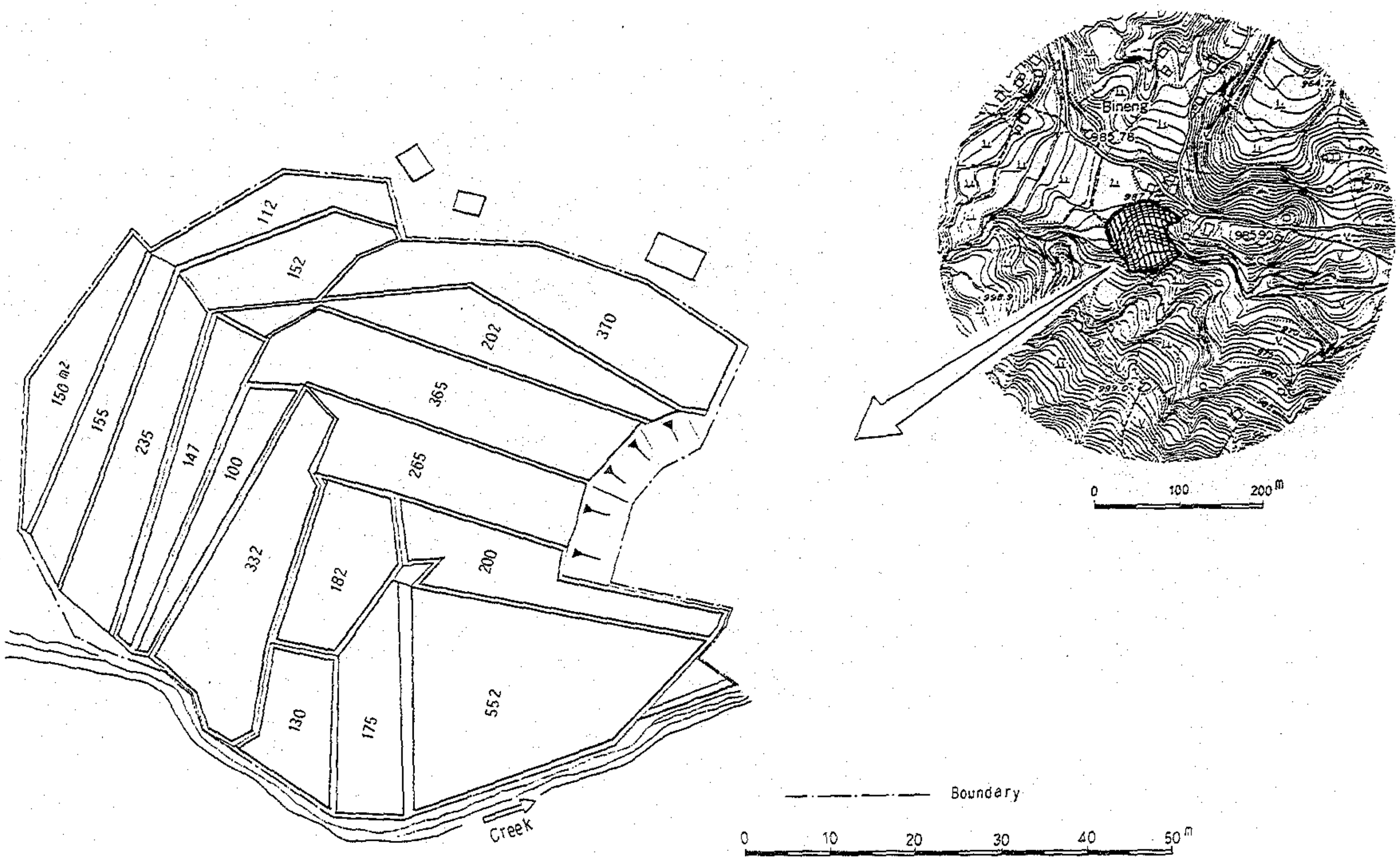

Fig. F.1.2 Present On-farm Condition of Sample Site (B)

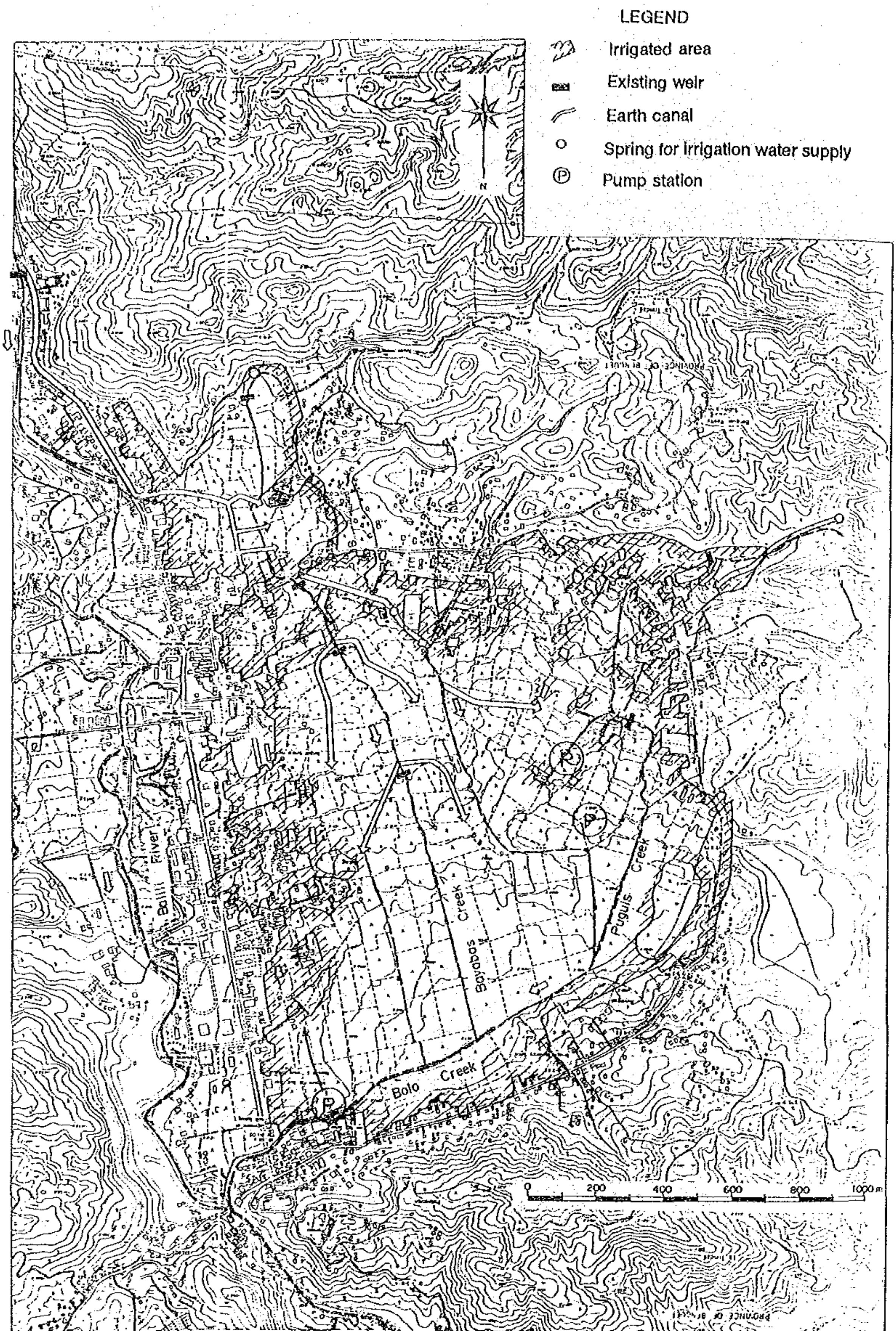

Fig. F.1.3 Existing Irrigation Facilities in Zone I