Summary of Design Conditions

Name of Canal	Code	Command Area (ha)	Design Discharge (l/s)	Required Head (m)
Upper Lobeysa	C1	5	6	150
Lower Lobeysa	C2	27	28	20
Bajo	C9	23	24	20

Since the same benefit can be expected as that of irrigation canal improvement, only the project cost including the O/M cost of each counter measure should be compared.

H.5.2 Comparison of Basic Conditions

(1) Electrical Pump and Diesel Engine Pump

Applying the following conditions, the comparison of the pumping facilities cost including the O/M cost between that of electrical pump and diesel engine pump was studied as shown in the Data Book V.

- Design Discharge : 15 l/s
- Required Head : 20 m

The results are summarized below and the diesel engine pump should be proposed to apply these system.

Summary of Comparison for Pumping Facilities Cost

(unit:1000Nu.)

Type of Pump	Electrical Pump	Diesel Engine Pump	Remark
Pumping Facilities	579	404	
Electrical Distribution Facilities	370	-	
O M Cost	105	251	for 10 years
Total	1,053	655	

(2) Shallow Well System and River Pump System

Based on the same conditions mentioned above, the comparison of system cost including O/M cost between the shallow well and river pump was studied as shown in the Data Book V and the result is summarized below;

Summary of Comparison for the Water Supply System

(unit:1000Nu.)

Type of Systems	Shallow Well	River Pump	Remark
Civil Works	355	220	
Pump Facilities	807	807	for 20 years
O M Cost	502	502	for 20 years
Total	1,665	1,530	

From the result of this comparison, the river pump system should be proposed.

H.5.3 Result of Alternative Study

Based on the design conditions, the river pump system was designed preliminarily as shown in the Data Book V. The project cost was also roughly estimated including the O/M cost.

(1) Upper Lobeysa (C1)

The project cost with the river pump system for the Upper Lobeysa is summarized below;

Summary of Project Cost of River Pump System

(unit:1000Nu.)

Description	Amount	Remark
Civil Works	1,000	for 20 years
Pumping Facilities	4,786	for 20 years
O M Cost	4,018	for 20 years
Sub Total	9,804	for 20 years
(for 1 year)	(490)	
Water Management Cost	40	for 1 year
Total Project Cost	530	for 1 year

Since the net project cost of irrigation canal improvement was estimated as 35 thousand Nu. for 1 year, the improvement of irrigation canal should be proposed for the Upper Lobeysa.

(2) Lower Lobeysa (C2)

The project cost with the river pump system for the Lower Lobeysa is summarized below;

Summary of Project Cost of River Pump System

(unit:1000Nu.)

Description	Amount	Remark
Civil Works	439	for 20 years
Pumping Facilities	1,196	for 20 years
O M Cost	1,004	for 20 years
Sub Total	2,639	for 20 years
(for 1 year)	(132)	
Water Management Cost	81	for 1 year
Total Project Cost	213	for 1 year

As the project cost of irrigation canal improvement was estimated as 132 thousand Nu. for 1 year, the improvement of irrigation canal should be proposed for the Lower Lobeysa.

(3) Bajo (C9)

The project cost with the river pumping system for the Bajo is summarized below;

Summary of Project Cost of River Pump System

(unit:1000Nu.)

Description	Amount	Remark
Civil Works	439	for 20 years
Pumping Facilities	1,196	for 20 years
O M Cost	1,004	for 20 years
Sub Total	2,639	for 20 years
(for 1 year)	(132)	
Water Management Cost	84	for 1 year
Total Project Cost	**216**	**for 1 year**

As the project cost of irrigation canal improvement was estimated as 69 thousand Nu. for 1 year, the improvement of irrigation canal should be proposed for the Bajo.

II.6 Project Implementation Plan

II.6.1 Proposed Irrigation Improvement Plan

(1) For Short Term (Target Year 2002)

Based on the results of the above mentioned studies, the optimum combination of counter measures are summarized below;

- For low flat area
  Establishment of new water management system
  Rehabilitation of the Irrigation canal facilities and enforcement of the protection works
  Applying the double paddy cropping for 40% of present paddy field.

- For high hilly area
  Establishment of new water management system
  Construction of offtake works
  Applying the diversification for 10% of present paddy field

The proposed irrigation improvement projects are summarized as shown below and the priority of the project was given considering the net B/C ratio.

Inventory of the Irrigation Improvement Project

Category of Land	Sub-Area	Name of Canal	Code	Command Area (ha)	Construction Cost (1000 Nu.)	O/M Cost For 1 year (1000 Nu.)	Estimated B/C Ratio	Priority
Low Flat Area	Lobeysa	Upper Lobeysa	C1	61	1,152	21	2.25	②
		Lower Lobeysa	C2	300	3,027	32	2.21	③
	Bajo	Bajo	C9	143	5,016	48	2.80	①
High Hilly Area	Phangyul	Phangyul	C10	91	286	58	1.95	①
		Gomkha	C15	15	47	12	1.53	⑦
	Rubeysa	Nalakha	C18	29	119	15	1.57	⑥
		Rutekha	C19	49	207	19	1.88	③
		Maphekha	C20	27	148	9	1.59	⑤
		Naykoyuwa	C21	24	119	7	1.74	④
		Rumina	C22	28	95	5	1.91	⑦
Total				758	10,216	216		

(2) For Long Term (Target Year 2007)

Based on the short term project, following projects were proposed.

- For low flat area
  Improvement of water management
  Applying the double paddy cropping for 100% of the present paddy field considering the rising up of food self sufficiency in Bhutan.
- For high hilly area
  Improvement of water management
  Research on the optimum diversification crop

It is not necessary to construct any kind of structure for these projects. The project cost should be required only for the research, which was estimated approximately as 500 thousand Nu./year.

II.6.2 Proposed Implementation Plan

(1) Proposed Implementation Schedule

Based on the priority of the project, the implementation schedule of the irrigation improvement plan was proposed as shown below considering the target year and total construction cost.

Proposed Implementation Schedule

Category of Land	Sub-Area	Name of Canal	Code	Priority	Year 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Low Flat Area	Lobeysa	Upper Lobeysa	C1	②											
		Lower Lobeysa	C2	③											
	Bajo	Bajo	C9	①											
High Hilly Area	Phangyul	Phangyul	C10	①											
		Genikha	C15	②											
	Rubeysa	Nalikha	C18	⑤											
		Rutekha	C19	③											
		Maphekha	C20	④											
		Naykoyuwa	C21	①											
		Rumina	C22	②											
	Research the Optimum Diversification Crop														

(2) Annual Disbursement Schedule

Based on the implementation schedule, the annual disbursement schedule of the project and O/M cost were estimated and summarized as shown below;

Proposed Disbursement Schedule for the Irrigation Improvement Project

(unit: 1000 Nu.)

Category of Land	Sub-Area	Name of Canal	Code	Year 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Low Flat Area	Lobeysa	Upper Lobeysa	C1				230	922						
		Lower Lobeysa	C2		605	908	1,514							
	Bajo	Bajo	C9	2,257	1,756	1,003								
High Hilly Area	Phangyul	Phangyul	C10	257	29									
		Genikha	C15					47						
	Rubeysa	Nalikha	C18				71	48						
		Rutekha	C19		41	166								
		Maphekha	C20			15	133							
		Naykoyuwa	C21			83	36							
		Rumina	C22		95									
Research for the Optimum Diversification Crop						487	487	487	487	487	487	487	487	487
Annual Total				2,515	2,526	2,662	2,471	1,503	487	487	487	487	487	487

Proposed O/M Cost for the Irrigation Improvement Project

(unit : 1000 Nu.)

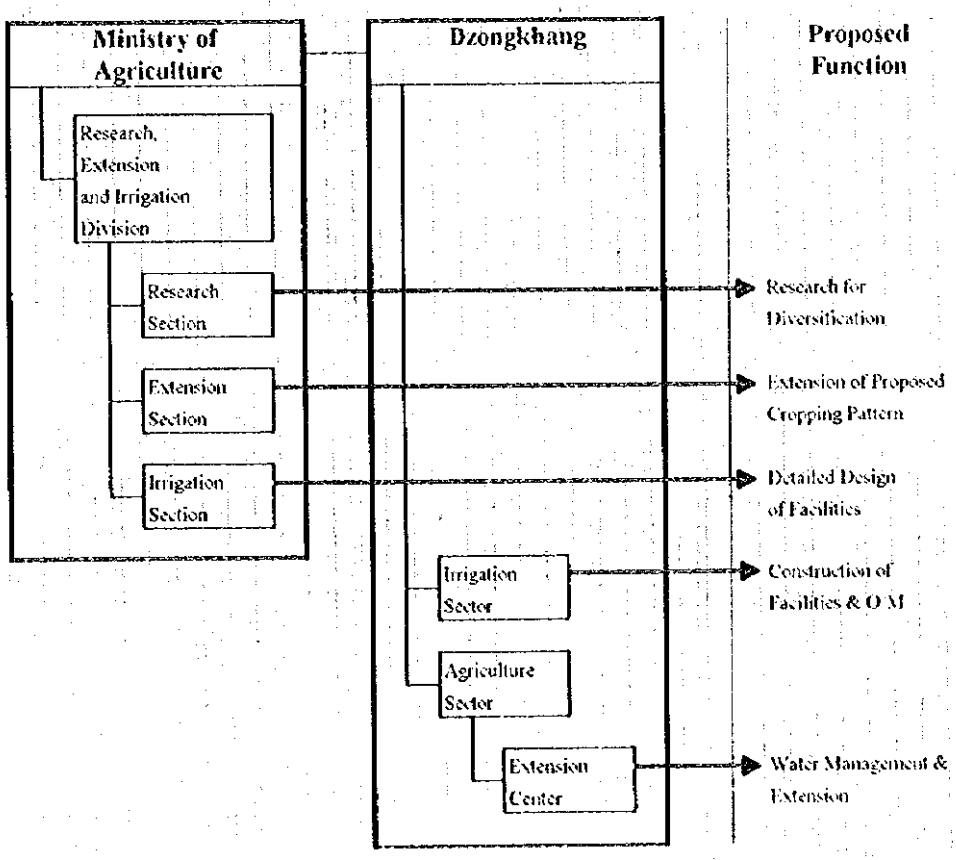
Category of Land	Sub-Area	Name of Canal	Code	Year										
				1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Low Flat Area	Lobeysa	Upper Lobeysa	C1						21	21	21	21	21	21
		Lower Lobeysa	C2					32	32	32	32	32	32	32
	Bajo	Bajo	C9				48	48	48	48	48	48	48	48
High Hilly Area	Phangyul	Phangyul	C10			58	58	58	58	58	58	58	58	58
		Gemkha	C15						12	12	12	12	12	12
	Rubeysa	Nalakha	C18						15	15	15	15	15	15
		Rutekha	C19				10	10	10	10	10	10	10	10
		Maphekha	C20					9	9	9	9	9	9	9
		Naykoyuwa	C21					7	7	7	7	7	7	7
		Rumina	C22			5	5	5	5	5	5	5	5	5
Annual Total						62	120	168	216	216	216	216	216	216

(3) Proposed Organizations for the Project

Considering the characteristics and annual cost for the project, the project can be implemented by present organizations and it is not necessary to establish any kind of new organization.

The function of present organizations should be proposed as shown below;

Present Organization and Proposed Function for the Project



H.7 Drainage Improvement

H.7.1 Present Problems Identified

(1) General Characteristic of Drainage in the Study Area

At present, there are no systematic drainage canals under irrigation schemes in the Study Area. Farmers usually drain surplus water of the paddy field to lower terraced field or natural water course(gullies). The damage for crop caused by poor drainage was not found in the Study Area except at some wet lands in Phangyul.

As for direct runoff drainage from heavy rain, though the rainfall is drained to main rivers or tributaries, through irrigation canals, side ditches and road culvert, the land sliding is often found in the hazard area and the gully erosion is also found at some of agricultural lands during the rainy season.

(2) Present Problems

1) Land Sliding

Considering the topographic, geological and meteorological conditions of 10 irrigation schemes, the land sliding does not occur in every year. From the result of field investigations and information of Dzongkhang office, it takes 10 ~ 20 days for the renovation of canal after occurrence of the land sliding. Though it depends upon the scale of disaster and season, the effect on the crop yield is not expected so much in an average year.

In the study, the vulnerable conditions of 10 irrigation schemes was investigated as shown in the geological hazard map in the Appendix F and the possibility of land disaster was studied as the vulnerability index. The result is summarized below;

Summary of Vulnerability Index

Name of Canal	Code	Over than 60		55 ~ 60		50 ~ 55		Total Length of Canal (m)	Mean Vulnerability Index
		Number of site	Total Length (m)	Number of site	Total Length (m)	Number of site	Total Length (m)		
Upper Lobeysa	C1	-	-	-	-	4	700	7,100	39.83
Lower Lobeysa	C2	1	130	1	240	3	650	8,160	39.90
Bajo	C9	11	2,650	8	2,120	5	1,330	14,950	46.76
Phangyul	C10	3	870	5	1,020	6	1,940	16,240	41.45
Genkha	C15	-	-	1	170	-	-	3,500	44.53
Nalakha	C18	1	270	2	750	-	-	3,700	48.12
Rutekha	C19	-	-	-	-	-	-	2,260	36.16
Maphekha	C20	-	-	-	-	-	-	2,140	36.28
Naykoyuwa	C21	-	-	-	-	-	-	1,760	30.80
Rumina	C22	-	-	-	-	-	-	1,100	36.60

2) Gully Erosion of Agricultural Land

The gully erosion was observed at the agricultural land where the main drainage tributaries are connected. It can be expected that some portion of agricultural land has been eroded every year, however, there is no information/data about the amount of land lost by gully erosion. The main drainage tributaries in the Sub-study area are shown in Fig. H.7.1. Any damage caused by the peak discharge of the tributaries has not been informed. The gully erosion only occurs at the connecting part of the agricultural land with main tributaries and it was considered that this problem is caused by the direct runoff of rainfall from the agricultural land.

3) Poor Drainage at High Hilly Area

There is some poor drainage area in the high hilly area caused by the spring water. Some terraced lands which are located at the down part by the spring has been not used. At present, the amount of these areas is quite a few and this should not be the big problem for the agricultural activities. However, considering the effective land use for the agricultural development, there is some possibility of land development, for even a few ha of land, with drainage improvement.

H.7.2 Proposed Counter Measures

(1) Basic Idea for Land Sliding

The necessary structures of the protection works for enforcement of the irrigation canals were suggested as shown in the Data Book V. These structures were designed with a consideration for the protection of irrigation canal and not for the prevention of land sliding. In the Study, the vulnerability at the hazard area was investigated and cost/benefit of the rehabilitation with enforcement of canal were roughly analyzed.

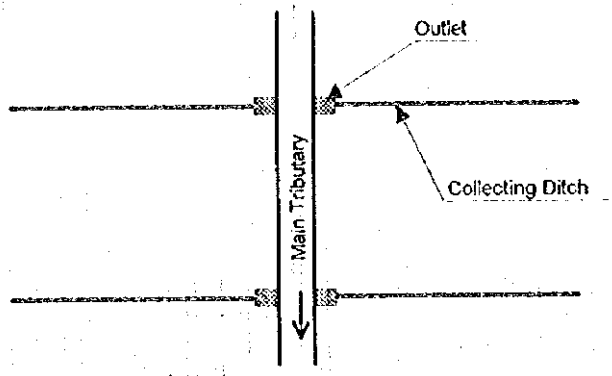
Basically, the suggested structures can be one of the prevention works but further studies should be required for the proper counter measure if perfect prevention of the land sliding is considered. From the result of field investigation, it can be said that the cost of prevention work should become quite high and the benefit of counter measure cannot be counted.

Based on the vulnerability index, the selection of the proper canal route will be one of the countermeasure for the land sliding for the planning of irrigation improvement.

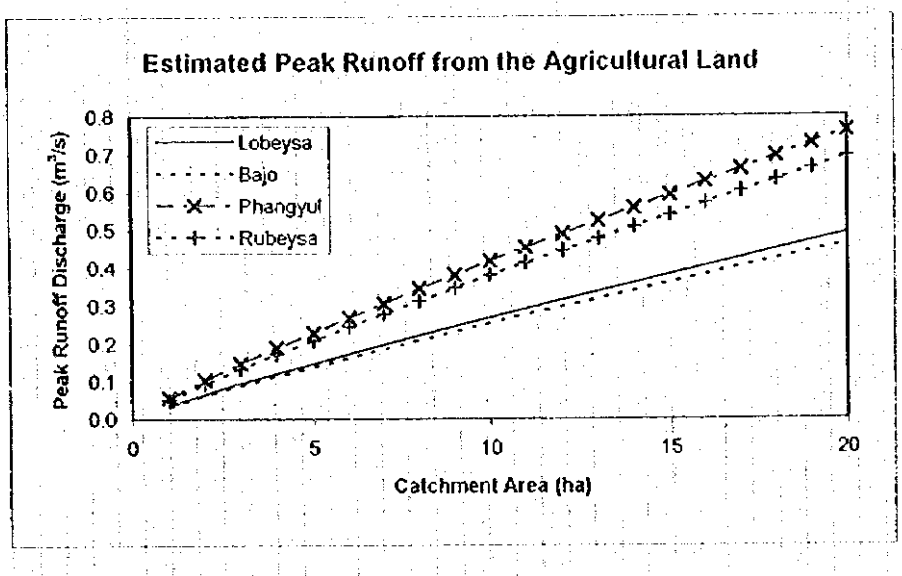
(2) Counter Measure for Gully Erosion

The installation of collecting ditch and outlet was proposed as the counter measure for gully erosion as shown below;

General Idea of the Counter Measure



Based on the result of the Hydrological study, the annual maximum direct runoff discharge from the rainfall for 5 year return period was estimated applying the rational formula and the result is summarized as shown below;



Considering the location of existing tributaries and based on the estimated runoff discharge, the collecting ditch and outlet were designed preliminarily as shown in the Data Book V and construction cost was estimated. The results are summarized below;

Summary of Construction Cost for Drainage System

Sub-Area	Total Drainage Area (ha)	Construction Cost (1000Nu)
Lobeysa	300	528
Bajo	118	182
Phangyul	67	186
Rubeysa	138	278
Total	623	1,176

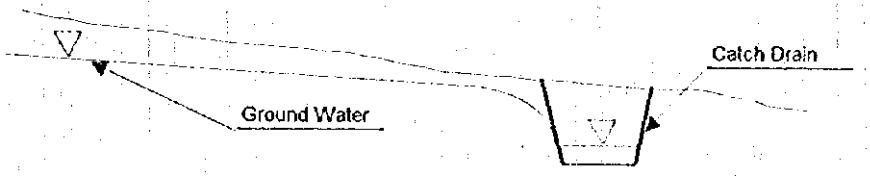
The drainage system for the prevention of gully erosion is supposed to be constructed using only approximately 1.2 million Nu; however, it is necessary to consider decrease of the agricultural production caused by the land clearance for

the construction. Therefore, further analysis should be required for the consideration of economical feasibility before implementation of the construction.

(3) Counter Measure for Poor Drainage Area

The installation of catch drain was proposed as a counter measure for poor drainage area at the high hilly area as shown below;

General Idea of Catch Drain



For installation of catch drain, only excavation work is required and the scale of the drain section should not be more than 40 X 40 cm. Considering the phenomenon of the experimental facility at Phangyul, it was expected that the dump area will be able to be used for more or less one year after installation of the catch drain. However, benefited area is quite a few.

II.8 Recommendation

For further detailed study and implementation of the irrigation improvement plan, the following considerations are recommended.

- To improve and reinforce of basic information and data

  For establishment of irrigation improvement plan, some of the basic factors such as rainfall, river runoff discharge, soil condition, etc. were estimated especially for high hilly area. Considering more detailed study, it is necessary to improve and reinforce the following basic information and data at the project site;

  - Meteo-hydrological data
  - Geological and hydrogeological data
  - Farming conditions such as soil, unit yield and production cost
  - Economical conditions such as farm gate price and marketing system
  - Social conditions such as population
  - Other basic information

- To design irrigation facilities considering the site condition

  At present, 2.2 l/s/ha of the design discharge has been applied for the irrigation facilities at every where in Bhutan. However, the agricultural land is distributed from approximately 500 ~ 2,500 m altitude and water requirement should be varied depending upon the site conditions. In some cases, same water requirement has been applied even where there is not sufficient water at the intake site. Therefore, it

is necessary to decide the capacity of the irrigation facilities based on the meteo-hydrological condition, cropping pattern, soil conditions, etc. at site.

- To acquire the understanding and cooperation of farmers

  From the result of the Case Study, it can be said that the most effective counter measure for the irrigation improvement should be improvement of the water management system. For the establishment of new water management system, it is necessary to get the understanding and cooperation of farmers.

- To improve the supporting system

  The improvement of the farmers financial condition is one of the main purpose of the irrigation improvement plan. Considering the smooth implementation and achieving the benefit with project effectively, it is necessary to support the farmers financially as well as technically.

APPENDIX H
TABLES

Table H.2.1 List of Irrigation Canals in and around the Study Area

Code	Name of Canal	Canal Length (Km)	Command Area (ha)	Number of Benefited Household	Government Assistance		Water Source
					IFAD-I	IFAD-III	
C 1	Upper Lobeysa	7.1	61	117	○	○	Tabe Rongchhu
C 2	Lower Lobeysa	8.1	300	123	○		Tabe Rongchhu
C 3	Rinchengang	9.0	65	38	○		Nabe Rongchhu
C 4	Omte	3.5	21	25			Limti Chhu
C 5	Tata	2.0	22	24			Limti Chhu
C 6	Sichu	3.8	52	24			Limti Chhu
C 7	Gigu	1.6	41	34			Limti Chhu
C 8	Towgee	3.5	26	43			Limti Chhu
C 9	Bajo	15.0	143	52		○	Pe Chhu
C10	Phangyul	16.0	91	42	○		Lachu
C11	Komathang	4.0	7	40		●	Komathang Chhu
C12	Chungsekha	6.9	200	50	○		Komathang Chhu
C13	Lower kashi	2.4	20	37		○	Komathang Chhu
C14	Jagatokha	4.3	16	39		○	Komathang Chhu
C15	Genkha	3.5	15	23			Uship
C16	Balakha	4.0	40	50	○	○	Mochuna
C17	Themakha	3.1	40	35	○	○	Mochuna
C18	Nalakha	3.9	29	10		○	Mochuna
C19	Rutekha	2.2	40	60			Takarong Chhu
C20	Maphekha	2.2	27	44		●	Takarong Chhu
C21	Naykoyuwa	1.7	24	18			Takarong Chhu
C22	Rumina	1.1	28	35			Takarong Chhu

Note: ● - Planned to renovate from fiscal year 1994/95.

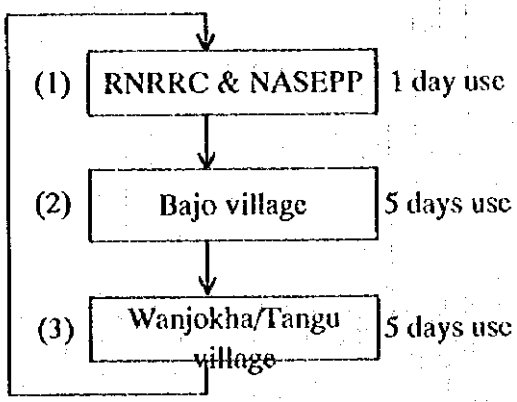
Table H.2.2 Water Management and O/M of canals (sheet 1/4)

Name of Canal	**Upper Lobeysa**
Water Users Association	Exists
Number of water guards	1 person
Payment to water guard	5 N/0.1ha or 1.5 kg/0.1 ha
Canal maintenance	Major maintenance work is done one time per year before paddy plantation
Water allocation	There are 3 major irrigation blocks (villages), rotation of one day/night (24 hours) for each irrigation block (1) Chang block — 24 hours (2) Bab block — 24 hours (3) Wang block — 24 hours

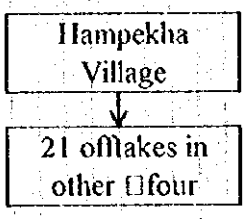
Name of Canal	**Lower Lobeysa**
Water Users Association	Does not exist (planned to be formed)
Number of water guards	4 person (There are 4 offtake)
Payment to water guard	no payment (water guard is changes yearly)
Canal maintenance	Major maintenance work is done one time per year before paddy plantation
Water allocation	rotation of one day/night (24 hours) for each irrigation block (1) end block of canal — 24 hours (2) Jikha block — 24 hours (3) Bab block — 24 hours (4) Chang block

Table H.2.2 Water Management and O/M of canals (sheet 2/4)

Name of Canal	Bajo
Water Users Association	Does not exist
Number of water guards	2 persons (1person each from Bajo and Wangjokha/Tangu villages)
Payment to water guard	20 ~25 kg/ha of rice
Canal maintenance	Major maintenance work is done one time per year before paddy plantation
Water allocation	one day/night (24 hours) for 1 inlet or 1 acre of rotation



Name of Canal	**Phangyul**
Water Users Association	formed in 1993
Number of water guards	6 persons (1 water guard leader and 1 person each from Phangyul, Kumchi, Gemkha, Chungsekha, Hampekha
Payment to water guard	no payment
Canal maintenance	2 times per year (before and after the paddy cultivation)
Water allocation	A. Transplanting period



B. after transplanting

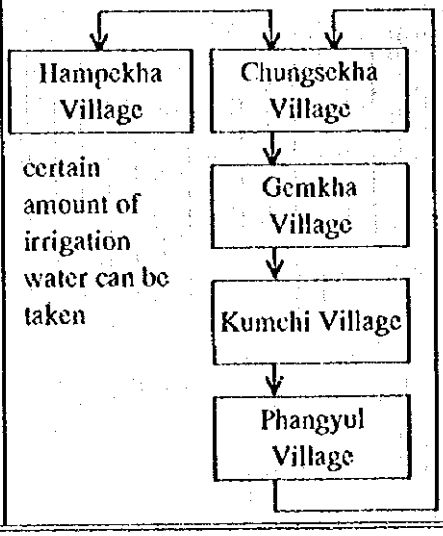


Table H.2.2 Water Management and O/M of canals (sheet 3/4)

Name of Canal	**Gemkha**
Water Users Association	Does not exist
Number of water guards	1 person
Payment to water guard	no payment (water guard not responsible for maintenance wo
Canal maintenance	2 times per year (before and after the paddy cultivation)
Water allocation	24 hours per farmer household; rotation on 26 day interval. (according to interview survey, there are 26 benefited households under the Gemkha irrigation canal scheme)

Name of Canal	**Nalakha**
Water Users Association	Does not exist
Number of water guards	water guard does not assigned
Payment to water guard	no payment (one year rotation among beneficiaries)
Canal maintenance	---
Water allocation	---

Name of Canal	**Rutekha**
Water Users Association	Does not exist
Number of water guards	water guard does not assigned
Payment to water guard	no payment
Canal maintenance	2 times per year (before and after the paddy cultivation)
Water allocation	rotation --- 24 hours for 2 households (total households : 70)

Name of Canal	**Maphekha**
Water Users Association	Does not exist
Number of water guards	one person
Payment to water guard	no payment
Canal maintenance	2 times per year
Water allocation	rotation --- 24 hours for 2 households (total households : 52)

Table H.2.2 Water Management and O/M of canals (sheet 4/4)

Name of Canal	**Rumina**
Water Users Association	Does not exist
Number of water guards	water guard is turnwise during paddy plantation period by benefited households
Payment to water guard	no payment
Canal maintenance	2 times per year
Water allocation	rotation of 24 hours per household (total benefited households : 35)

Table H.2.3 Estimated Rainfall and Effective Rainfall in the Study Area (1/2)

(1) Rainfall (mm)

Return Period 1/2

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	10.9	10.6	14.4	37.3	58.4	135.3	162.4	133.0	91.5	43.8	3.6	5.3	706.6
Lobeysa	10.4	12.4	14.6	39.3	60.9	141.4	171.8	147.5	98.4	42.7	3.4	5.1	747.8
Rubeysa	8.2	26.7	17.2	57.5	85.0	198.6	256.4	265.2	158.0	39.4	2.1	4.0	1118.4
Phangyul	7.6	30.7	17.9	62.5	91.7	214.3	279.9	298.4	174.6	38.3	1.7	3.7	1221.4

Return Period 1/5

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	9.1	8.8	12.0	31.0	48.6	112.6	135.1	110.7	76.1	36.4	3.0	4.4	587.8
Lobeysa	8.7	10.3	12.2	32.7	50.8	117.8	143.1	122.9	82.0	35.6	2.8	4.3	623.2
Rubeysa	6.9	22.4	14.5	48.4	71.6	167.1	215.8	223.3	133.0	33.2	1.8	3.4	941.5
Phangyul	6.4	25.9	15.1	52.7	77.3	180.7	236.0	251.6	147.2	32.3	1.5	3.1	1029.9

Return Period 1/10

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	8.3	8.1	11.0	28.5	44.6	103.3	124.0	101.6	69.9	33.4	2.8	4.1	539.6
Lobeysa	8.0	9.5	11.2	30.0	46.6	108.2	131.4	112.8	75.3	32.7	2.6	3.9	572.1
Rubeysa	6.4	20.6	13.3	44.4	65.7	153.5	198.2	205.0	122.1	30.5	1.6	3.1	864.5
Phangyul	5.9	23.8	13.9	48.4	71.0	166.0	216.8	231.0	135.2	29.6	1.3	2.9	945.8

Return Period 1/20

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	7.8	7.6	10.3	26.7	41.8	96.8	116.1	95.1	65.4	31.3	2.6	3.8	505.2
Lobeysa	7.5	8.9	10.4	28.1	43.6	101.3	123.0	105.6	70.5	30.6	2.4	3.7	535.5
Rubeysa	6.0	19.3	12.5	41.5	61.4	143.4	185.1	191.5	114.1	28.4	1.5	2.9	807.6
Phangyul	5.5	22.2	13.0	45.2	66.3	155.0	202.4	215.8	126.3	27.7	1.3	2.7	883.2

Return Period 1/5 (Exceedance)

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	14.7	14.2	19.4	50.2	78.7	182.4	218.8	179.3	123.3	59.0	4.9	7.2	952.4
Lobeysa	13.9	16.6	19.5	52.4	81.3	188.7	229.2	196.9	131.4	57.0	4.5	6.8	998.1
Rubeysa	10.4	33.6	21.7	72.4	107.1	250.2	323.1	334.3	199.1	49.7	2.7	5.1	1409.5
Phangyul	9.4	38.3	22.4	78.0	114.4	267.4	349.2	372.2	217.9	47.7	2.2	4.6	1523.7

Return Period 1/10 (Exceedannce)

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	17.5	17.0	23.1	59.8	93.7	217.1	260.5	213.4	146.8	70.3	5.8	8.6	1133.6
Lobeysa	16.5	19.6	23.0	62.0	96.2	223.3	271.2	232.9	155.5	67.4	5.4	8.1	1181.0
Rubeysa	11.8	38.3	24.8	82.6	122.2	285.3	368.4	381.1	227.0	56.6	3.0	5.8	1607.0
Phangyul	10.7	43.4	25.3	88.3	129.5	302.8	395.4	421.5	246.7	54.0	2.4	5.2	1725.4

Return Period 1/20 (Exceedance)

Sub-area	Jan.	Feb.	Mar	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec	Annual
Bajo	20.5	19.9	27.1	70.1	109.8	254.5	305.3	250.2	172.1	82.4	6.8	10.0	1328.7
Lobeysa	19.2	22.8	26.9	72.3	112.1	260.4	316.3	271.6	181.3	78.6	6.2	9.4	1377.1
Rubeysa	13.4	43.2	27.9	93.1	137.8	321.7	415.4	429.8	256.0	63.8	3.4	6.6	1812.1
Phangyul	12.0	48.6	28.4	98.9	145.1	339.2	443.0	472.2	276.4	60.5	2.7	5.9	1932.9

Table H.2.3 Estimated Rainfall and Effective Rainfall in the Study Area (2/2)

(2) Effective Rainfall (mm)

Return Period 1/2													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	10.2	9.9	13.2	30.2	44.1	85.5	97.4	84.4	63.8	34.5	3.5	5.2	481.9
Lobeysa	9.8	11.5	13.3	31.5	45.7	88.2	101.2	90.9	67.3	33.8	3.3	4.9	501.6
Rubeysa	7.8	22.5	15.5	43.5	60.3	110.6	124.4	125.8	95.5	31.6	2.1	4.0	643.4
Phangyul	7.2	25.5	16.0	46.8	63.9	115.2	127.6	129.2	102.4	30.9	1.7	3.6	669.9
Return Period 1/5													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	8.6	8.3	11.1	25.7	37.5	74.6	85.4	73.7	55.3	29.6	3.0	4.3	417.2
Lobeysa	8.3	9.7	11.3	27.0	38.9	77.2	89.0	79.7	58.6	29.0	2.8	4.1	435.6
Rubeysa	6.7	19.4	13.3	37.4	52.5	99.4	115.6	117.5	84.4	27.3	1.8	3.3	578.4
Phangyul	6.1	21.9	13.8	40.3	55.9	104.6	120.5	123.5	90.8	26.7	1.4	3.1	608.6
Return Period 1/10													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	7.9	7.7	10.3	23.9	35.0	69.9	80.2	69.0	51.4	27.5	2.7	4.0	389.5
Lobeysa	7.6	8.9	10.4	25.0	36.3	72.4	83.7	74.8	54.8	26.9	2.5	3.8	407.2
Rubeysa	6.1	18.1	12.3	34.9	48.8	93.5	110.4	112.5	79.3	25.3	1.6	3.1	546.0
Phangyul	5.7	20.4	12.7	37.4	52.1	98.9	115.8	119.3	85.4	24.7	1.3	2.8	576.7
Return Period 1/20													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	7.4	7.2	9.7	22.5	33.2	66.5	76.4	65.7	48.6	26.0	2.5	3.7	369.5
Lobeysa	7.1	8.4	9.8	23.6	34.4	68.8	79.7	71.1	51.8	25.4	2.4	3.6	386.1
Rubeysa	5.7	17.0	11.5	33.0	46.0	89.1	106.2	108.3	75.4	23.9	1.5	2.9	520.6
Phangyul	5.3	19.2	12.0	35.4	49.2	94.2	111.7	115.5	81.2	23.3	1.2	2.6	550.9
Return Period 1/5 (Exceedance)													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	13.4	13.0	17.2	38.6	56.8	105.2	116.3	104.1	79.8	44.5	4.7	6.9	600.6
Lobeysa	12.8	14.9	17.2	40.0	58.2	107.4	118.9	110.0	83.7	43.1	4.4	6.5	617.2
Rubeysa	9.7	27.6	18.9	53.0	71.9	123.3	130.0	129.9	110.7	38.2	2.6	4.9	720.8
Phangyul	8.9	30.9	19.4	56.3	75.5	126.1	129.2	127.1	116.1	37.0	2.1	4.5	733.1
Return Period 1/10 (Exceedance)													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	15.7	15.2	19.9	45.0	64.9	115.9	125.0	114.9	90.6	51.7	5.6	8.1	672.6
Lobeysa	14.9	17.3	19.9	46.4	66.2	117.5	126.6	119.8	94.4	49.9	5.2	7.7	685.6
Rubeysa	11.0	30.9	21.1	58.9	79.3	128.2	127.5	125.9	118.4	42.9	3.0	5.6	752.7
Phangyul	10.0	34.3	21.5	62.1	82.8	129.5	123.6	118.2	122.6	41.2	2.4	5.1	753.2
Return Period 1/20 (Exceedance)													
Sub-Area	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Bajo	18.0	17.5	22.9	51.6	73.2	124.0	129.6	123.3	101.4	58.8	6.5	9.4	736.3
Lobeysa	17.0	19.7	22.7	52.9	74.4	125.0	129.9	126.6	104.8	56.7	6.0	8.9	744.7
Rubeysa	12.3	34.1	23.5	64.6	86.6	130.0	119.6	116.1	124.3	47.6	3.4	6.3	768.4
Phangyul	11.1	37.5	23.8	67.6	89.8	129.7	112.4	102.7	127.2	45.5	2.7	5.7	755.7

Table H.2.4 Unit Water Requirement (1/7)

Return Period 1/2

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy										Wheat		
Bajo	0.900	0.900	1.384	1.384	1.830	1.386	0.852	0.405		3.288	2.898	2.049	1.797	0.886	0.971	0.916	1.019	0.918	0.309	0.467	0.734	0.865	0.955
Lobeysa	0.907	0.907	1.359	1.359	1.828	1.384	0.831	0.384		3.273	2.873	2.024	1.761	0.850	0.912	0.857	0.986	0.886	0.315	0.471	0.738	0.869	0.959
Rubeysa	0.938	0.938	1.181	1.181	1.793	1.349	0.639	0.192		2.955	2.512	1.713	1.459	0.602	0.559	0.508	0.687	0.593	0.315	0.491	0.757	0.885	0.975
Phangyul	0.948	0.948	1.133	1.133	1.784	1.341	0.586	0.139		2.925	2.473	1.674	1.432	0.574	0.530	0.478	0.628	0.533	0.322	0.497	0.763	0.890	0.980
Cp2	Mustard									Paddy										Mustard		
Bajo	0.900	0.900	1.182	1.046	0.499					3.288	2.898	2.049	1.797	0.886	0.971	0.916	1.019	0.918	0.309	0.306	0.490	0.727	0.865
Lobeysa	0.907	0.907	1.156	1.021	0.497					3.273	2.873	2.024	1.761	0.850	0.912	0.857	0.986	0.886	0.315	0.310	0.493	0.731	0.869
Rubeysa	0.938	0.938	0.979	0.844	0.462					2.955	2.512	1.713	1.459	0.602	0.559	0.508	0.687	0.593	0.315	0.330	0.513	0.747	0.885
Phangyul	0.948	0.948	0.930	0.795	0.453					2.925	2.473	1.674	1.432	0.574	0.530	0.478	0.628	0.533	0.322	0.336	0.519	0.752	0.890
Cp3	Mustard			Paddy							Paddy										Mustard	
Bajo	0.900	0.669	0.378	1.823	1.793	2.443	2.571	1.660	1.524	1.714	1.325	1.014	0.775	1.026	1.882	1.882	1.070	1.070	0.921	0.855	0.622	0.467	0.865	0.531
Lobeysa	0.907	0.675	0.352	1.808	1.792	2.442	2.558	1.648	1.509	1.699	1.300	0.989	0.739	0.991	1.823	1.823	1.037	1.037	0.927	0.862	0.624	0.471	0.869	0.533
Rubeysa	0.938	0.707	0.175	1.607	1.668	2.280	2.306	1.448	1.295	1.474	1.033	0.739	0.497	0.734	1.417	1.417	0.735	0.735	0.891	0.830	0.598	0.491	0.885	0.542
Phangyul	0.948	0.717	0.127	1.582	1.663	2.275	2.277	1.420	1.265	1.443	0.993	0.700	0.470	0.706	1.387	1.387	0.676	0.676	0.898	0.836	0.601	0.497	0.890	0.545
Cp4										Paddy														
Bajo										3.288	2.898	2.049	1.797	0.886	0.971	0.916	1.019	0.918	0.309				
Lobeysa										3.273	2.873	2.024	1.761	0.850	0.912	0.857	0.986	0.886	0.315				
Rubeysa										2.955	2.512	1.713	1.459	0.602	0.559	0.508	0.687	0.593	0.315				
Phangyul										2.925	2.473	1.674	1.432	0.574	0.530	0.478	0.628	0.533	0.322				
Cp5	Vegetable(winter)									Vegetable(summer)											Vegetable(win.)		
Bajo	0.807	0.948	1.448	1.384	1.563	1.563	1.521	0.405		0.619	0.606	0.934	0.795	0.795	0.845	0.559	0.746	0.566			0.306	0.457	0.727
Lobeysa	0.813	0.955	1.423	1.359	1.561	1.561	1.499	0.384		0.593	0.562	0.890	0.732	0.732	0.741	0.455	0.689	0.509			0.310	0.461	0.731
Rubeysa	0.845	0.986	1.245	1.181	1.526	1.526	1.308	0.192		0.359	0.203	0.531	0.361	0.361	0.181		0.237	0.057			0.330	0.477	0.747
Phangyul	0.855	0.996	1.197	1.133	1.517	1.517	1.255	0.139		0.301	0.129	0.457	0.308	0.308	0.125		0.125				0.336	0.482	0.752

Table H.2.4 Unit Water Requirement (2/7)

Return Period 1/5

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy											Wheat			
Bajo	0.926	0.926	1.409	1.409	1.863	1.419	0.924	0.477		3.347	2.997	2.148	1.906	0.995	1.069	1.014	1.096	0.996	0.353		0.477	0.743	0.879	0.969
Lobeysa	0.931	0.931	1.387	1.387	1.860	1.417	0.904	0.457		3.335	2.973	2.124	1.873	0.962	1.014	0.960	1.065	0.965	0.359		0.479	0.746	0.882	0.972
Rubeysa	0.957	0.957	1.231	1.231	1.828	1.385	0.736	0.289		3.022	2.608	1.809	1.535	0.678	0.630	0.579	0.782	0.687	0.352		0.496	0.763	0.895	0.985
Phangyul	0.966	0.966	1.191	1.191	1.820	1.377	0.690	0.243		2.993	2.563	1.764	1.493	0.636	0.578	0.527	0.727	0.633	0.358		0.501	0.768	0.899	0.989
Cp2	Mustard									Paddy											Mustard			
Bajo	0.926	0.926	1.207	1.072	0.532					3.347	2.997	2.148	1.906	0.995	1.069	1.014	1.096	0.996	0.353		0.316	0.499	0.741	0.879
Lobeysa	0.931	0.931	1.185	1.050	0.529					3.335	2.973	2.124	1.873	0.962	1.014	0.960	1.065	0.965	0.359		0.319	0.502	0.744	0.882
Rubeysa	0.957	0.957	1.028	0.893	0.497					3.022	2.608	1.809	1.535	0.678	0.630	0.579	0.782	0.687	0.352		0.335	0.518	0.756	0.895
Phangyul	0.966	0.966	0.988	0.853	0.489					2.993	2.563	1.764	1.493	0.636	0.578	0.527	0.727	0.633	0.358		0.340	0.523	0.761	0.899
Cp3	Mustard			Paddy										Paddy								Mustard		
Bajo	0.926	0.695	0.403	1.837	1.811	2.462	2.611	1.700	1.584	1.773	1.424	1.113	0.884	1.135	1.980	1.980	1.147	1.147	0.966	0.900	0.627	0.477	0.879	0.538
Lobeysa	0.931	0.700	0.381	1.825	1.810	2.461	2.600	1.689	1.571	1.761	1.401	1.089	0.851	1.102	1.925	1.925	1.116	1.116	0.971	0.905	0.629	0.479	0.882	0.540
Rubeysa	0.957	0.726	0.225	1.634	1.687	2.299	2.358	1.500	1.362	1.541	1.129	0.835	0.573	0.810	1.488	1.488	0.830	0.830	0.929	0.867	0.600	0.496	0.895	0.547
Phangyul	0.966	0.734	0.184	1.612	1.682	2.295	2.333	1.476	1.333	1.511	1.083	0.790	0.531	0.768	1.436	1.436	0.775	0.775	0.934	0.872	0.603	0.501	0.899	0.549
Cp4										Paddy														
Bajo										3.347	2.997	2.148	1.906	0.995	1.069	1.014	1.096	0.996	0.353					
Lobeysa										3.335	2.973	2.124	1.873	0.962	1.014	0.960	1.065	0.965	0.359					
Rubeysa										3.022	2.608	1.809	1.535	0.678	0.630	0.579	0.782	0.687	0.352					
Phangyul										2.993	2.563	1.764	1.493	0.636	0.578	0.527	0.727	0.633	0.358					
Cp5	Vegetable(winter)									Vegetable(summer)											Vegetable(win.)			
Bajo	0.833	0.974	1.474	1.409	1.596	1.596	1.592	0.477		0.724	0.781	1.109	0.987	0.987	1.018	0.732	0.883	0.703				0.316	0.471	0.741
Lobeysa	0.838	0.980	1.452	1.387	1.593	1.593	1.572	0.457		0.702	0.739	1.067	0.929	0.929	0.922	0.636	0.829	0.649				0.319	0.474	0.744
Rubeysa	0.864	1.005	1.295	1.231	1.562	1.562	1.405	0.289		0.484	0.383	0.711	0.502	0.502	0.314	0.028	0.415	0.234				0.335	0.486	0.756
Phangyul	0.872	1.014	1.255	1.191	1.554	1.554	1.359	0.243		0.429	0.299	0.626	0.424	0.424	0.216		0.312	0.132				0.340	0.491	0.761

Table H.2.4 Unit Water Requirement (3/7)

Return Period 1/10

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy											Wheat			
Bajo	0.937	0.937	1.420	1.420	1.876	1.432	0.954	0.507		3.370	3.040	2.191	1.953	1.043	1.112	1.057	1.131	1.031	0.373		0.480	0.747	0.884	0.974
Lobeysa	0.942	0.942	1.399	1.399	1.874	1.430	0.935	0.488		3.359	3.017	2.168	1.921	1.010	1.059	1.004	1.101	1.000	0.378		0.483	0.750	0.887	0.977
Rubeysa	0.966	0.966	1.253	1.253	1.844	1.401	0.776	0.329		3.054	2.659	1.859	1.579	0.721	0.673	0.621	0.826	0.732	0.369		0.498	0.765	0.899	0.989
Phangyul	0.973	0.973	1.215	1.215	1.837	1.393	0.736	0.289		3.025	2.612	1.813	1.533	0.676	0.614	0.563	0.773	0.679	0.374		0.503	0.770	0.903	0.993
Cp2	Mustard									Paddy											Mustard			
Bajo	0.937	0.937	1.217	1.082	0.545					3.370	3.040	2.191	1.953	1.043	1.112	1.057	1.131	1.031	0.373		0.320	0.503	0.746	0.884
Lobeysa	0.942	0.942	1.197	1.062	0.543					3.359	3.017	2.168	1.921	1.010	1.059	1.004	1.101	1.000	0.378		0.322	0.506	0.749	0.887
Rubeysa	0.966	0.966	1.050	0.915	0.513					3.054	2.659	1.859	1.579	0.721	0.673	0.621	0.826	0.732	0.369		0.337	0.521	0.761	0.899
Phangyul	0.973	0.973	1.013	0.878	0.506					3.025	2.612	1.813	1.533	0.676	0.614	0.563	0.773	0.679	0.374		0.342	0.525	0.765	0.903
Cp3	Mustard				Paddy									Paddy							Mustard			
Bajo	0.937	0.705	0.413	1.843	1.819	2.470	2.628	1.717	1.606	1.796	1.468	1.156	0.931	1.183	2.023	2.023	1.182	1.182	0.985	0.919	0.629	0.480	0.884	0.541
Lobeysa	0.942	0.710	0.393	1.831	1.818	2.468	2.618	1.707	1.595	1.784	1.445	1.133	0.899	1.151	1.970	1.970	1.152	1.152	0.990	0.924	0.631	0.483	0.887	0.543
Rubeysa	0.966	0.734	0.246	1.646	1.695	2.307	2.379	1.522	1.394	1.572	1.179	0.886	0.617	0.854	1.530	1.530	0.874	0.874	0.945	0.884	0.602	0.498	0.899	0.549
Phangyul	0.973	0.742	0.209	1.626	1.691	2.303	2.357	1.500	1.365	1.544	1.133	0.839	0.571	0.808	1.472	1.472	0.821	0.821	0.950	0.889	0.604	0.503	0.903	0.552
Cp4										Paddy														
Bajo										3.370	3.040	2.191	1.953	1.043	1.112	1.057	1.131	1.031	0.373					
Lobeysa										3.359	3.017	2.168	1.921	1.010	1.059	1.004	1.101	1.000	0.378					
Rubeysa										3.054	2.659	1.859	1.579	0.721	0.673	0.621	0.826	0.732	0.369					
Phangyul										3.025	2.612	1.813	1.533	0.676	0.614	0.563	0.773	0.679	0.374					
Cp5	Vegetable(winter)									Vegetable(summer)											Vegetable(win.)			
Bajo	0.844	0.985	1.484	1.420	1.609	1.609	1.622	0.507		0.764	0.857	1.185	1.071	1.071	1.094	0.808	0.944	0.764				0.320	0.476	0.746
Lobeysa	0.849	0.990	1.464	1.399	1.607	1.607	1.604	0.488		0.744	0.817	1.145	1.015	1.015	1.001	0.714	0.891	0.711				0.322	0.479	0.749
Rubeysa	0.872	1.014	1.317	1.253	1.578	1.578	1.445	0.329		0.543	0.477	0.805	0.584	0.584	0.394	0.107	0.497	0.317				0.337	0.491	0.761
Phangyul	0.880	1.022	1.280	1.215	1.570	1.570	1.404	0.289		0.490	0.391	0.719	0.498	0.498	0.284		0.398	0.218				0.342	0.495	0.765

Table H.2.4 Unit Water Requirement (4/7)

Return Period 1/20

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct	Nov		Dec	
Cp1	Wheat									Paddy									Wheat			
Bajo	0.945	0.945	1.427	1.427	1.886	1.442	0.976	0.529		3.387	3.071	2.222	1.988	1.077	1.142	1.087	1.157	1.056	0.386	0.483	0.750	0.888	0.978
Lobeysa	0.949	0.949	1.408	1.408	1.884	1.440	0.958	0.511		3.376	3.050	2.201	1.958	1.047	1.092	1.038	1.127	1.027	0.391	0.486	0.752	0.891	0.981
Rubeysa	0.972	0.972	1.269	1.269	1.856	1.413	0.807	0.360		3.078	2.696	1.897	1.616	0.758	0.709	0.657	0.859	0.765	0.382	0.500	0.767	0.902	0.992
Phangyul	0.979	0.979	1.234	1.234	1.849	1.405	0.768	0.321		3.051	2.653	1.854	1.568	0.710	0.647	0.596	0.809	0.715	0.387	0.504	0.771	0.906	0.996
Cp2	Mustard									Paddy									Mustard				
Bajo	0.945	0.945	1.225	1.090	0.555					3.387	3.071	2.222	1.988	1.077	1.142	1.087	1.157	1.056	0.386	0.322	0.506	0.750	0.888
Lobeysa	0.949	0.949	1.206	1.070	0.553					3.376	3.050	2.201	1.958	1.047	1.092	1.038	1.127	1.027	0.391	0.325	0.508	0.753	0.891
Rubeysa	0.972	0.972	1.067	0.932	0.525					3.078	2.696	1.897	1.616	0.758	0.709	0.657	0.859	0.765	0.382	0.339	0.522	0.764	0.902
Phangyul	0.979	0.979	1.031	0.896	0.518					3.051	2.653	1.854	1.568	0.710	0.647	0.596	0.809	0.715	0.387	0.343	0.527	0.768	0.906
Cp3	Mustard				Paddy								Paddy							Mustard			
Bajo	0.945	0.713	0.421	1.847	1.825	2.475	2.641	1.730	1.623	1.813	1.499	1.187	0.966	1.217	2.053	2.053	1.208	1.208	0.999	0.933	0.631	0.483	0.888	0.544
Lobeysa	0.949	0.718	0.402	1.836	1.824	2.474	2.631	1.720	1.612	1.802	1.478	1.166	0.936	1.187	2.003	2.003	1.178	1.178	1.004	0.938	0.632	0.486	0.891	0.545
Rubeysa	0.972	0.740	0.263	1.654	1.702	2.314	2.395	1.538	1.418	1.596	1.217	0.923	0.654	0.890	1.566	1.566	0.907	0.907	0.958	0.896	0.603	0.500	0.902	0.551
Phangyul	0.979	0.748	0.228	1.635	1.698	2.310	2.375	1.517	1.391	1.569	1.173	0.880	0.606	0.842	1.504	1.504	0.857	0.857	0.963	0.901	0.605	0.504	0.906	0.553
Cp4										Paddy													
Bajo										3.387	3.071	2.222	1.988	1.077	1.142	1.087	1.157	1.056	0.386				
Lobeysa										3.376	3.050	2.201	1.958	1.047	1.092	1.038	1.127	1.027	0.391				
Rubeysa										3.078	2.696	1.897	1.616	0.758	0.709	0.657	0.859	0.765	0.382				
Phangyul										3.051	2.653	1.854	1.568	0.710	0.647	0.596	0.809	0.715	0.387				
Cp5	Vegetable(winter)									Vegetable(summer)										Vegetable(win.)			
Bajo	0.851	0.993	1.491	1.427	1.619	1.619	1.644	0.529		0.794	0.912	1.240	1.132	1.132	1.147	0.861	0.990	0.810				0.322	0.480	0.750
Lobeysa	0.856	0.998	1.472	1.408	1.617	1.617	1.627	0.511		0.775	0.875	1.203	1.079	1.079	1.060	0.774	0.938	0.758				0.325	0.483	0.753
Rubeysa	0.879	1.020	1.334	1.269	1.590	1.590	1.475	0.360		0.588	0.548	0.876	0.653	0.653	0.461	0.175	0.560	0.380				0.339	0.494	0.764
Phangyul	0.886	1.027	1.298	1.234	1.582	1.582	1.437	0.321		0.537	0.467	0.794	0.564	0.564	0.345	0.059	0.466	0.286				0.343	0.498	0.768

Table H.2.4 Unit Water Requirement (5/7)

Return Period 1/5 (Exceedance)

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy										Wheat		
Bajo	0.848	0.848	1.334	1.334	1.765	1.322	0.717	0.271		3.172	2.718	1.869	1.624	0.713	0.791	0.737	0.872	0.772	0.218	0.448	0.715	0.838	0.928
Lobevsa	0.859	0.859	1.303	1.303	1.765	1.321	0.694	0.247		3.159	2.698	1.849	1.600	0.689	0.738	0.683	0.837	0.737	0.230	0.453	0.720	0.843	0.933
Rubevsa	0.908	0.908	1.099	1.099	1.738	1.294	0.485	0.038		2.856	2.403	1.604	1.411	0.554	0.524	0.473	0.556	0.462	0.259	0.482	0.749	0.869	0.959
Phangvul	0.921	0.921	1.047	1.047	1.730	1.286	0.432			2.825	2.379	1.580	1.418	0.561	0.548	0.496	0.510	0.416	0.269	0.490	0.757	0.876	0.966
Cp2	Mustard									Paddy										Mustard		
Bajo	0.848	0.848	1.131	0.996	0.434					3.172	2.718	1.869	1.624	0.713	0.791	0.737	0.872	0.772	0.218	0.287	0.470	0.699	0.838
Lobevsa	0.859	0.859	1.101	0.966	0.434					3.159	2.698	1.849	1.600	0.689	0.738	0.683	0.837	0.737	0.230	0.293	0.476	0.705	0.843
Rubevsa	0.908	0.908	0.897	0.762	0.407					2.856	2.403	1.604	1.411	0.554	0.524	0.473	0.556	0.462	0.259	0.321	0.504	0.731	0.869
Phangvul	0.921	0.921	0.844	0.709	0.399					2.825	2.379	1.580	1.418	0.561	0.548	0.496	0.510	0.416	0.269	0.329	0.512	0.738	0.876
Cp3	Mustard		Paddy										Paddy							Mustard		
Bajo	0.848	0.617	0.328	1.794	1.757	2.407	2.494	1.583	1.409	1.598	1.146	0.834	0.602	0.853	1.702	1.702	0.923	0.923	0.830	0.764	0.611	0.448	0.838	0.515
Lobevsa	0.859	0.627	0.297	1.777	1.756	2.407	2.481	1.570	1.395	1.585	1.126	0.815	0.578	0.830	1.649	1.649	0.888	0.888	0.842	0.777	0.614	0.453	0.843	0.519
Rubevsa	0.908	0.676	0.093	1.564	1.638	2.251	2.224	1.366	1.196	1.375	0.923	0.630	0.449	0.686	1.381	1.381	0.604	0.604	0.855	0.773	0.593	0.482	0.869	0.533
Phangvul	0.921	0.690	0.040	1.536	1.634	2.246	2.195	1.338	1.165	1.343	0.900	0.606	0.456	0.693	1.405	1.405	0.558	0.558	0.845	0.784	0.597	0.490	0.876	0.537
Cp4										Paddy														
Bajo										3.172	2.718	1.869	1.624	0.713	0.791	0.737	0.872	0.772	0.218				
Lobevsa										3.159	2.698	1.849	1.600	0.689	0.738	0.683	0.837	0.737	0.230				
Rubevsa										2.856	2.403	1.604	1.411	0.554	0.524	0.473	0.556	0.462	0.259				
Phangvul										2.825	2.379	1.580	1.418	0.561	0.548	0.496	0.510	0.416	0.269				
Cp5	Vegetable(winter)									Vegetable(Summer)											Vegetable(win.)		
Bajo	0.755	0.897	1.398	1.334	1.499	1.499	1.386	0.271		0.415	0.289	0.617	0.490	0.490	0.529	0.242	0.488	0.308			0.287	0.429	0.699
Lobevsa	0.765	0.907	1.368	1.303	1.498	1.498	1.362	0.247		0.392	0.254	0.582	0.448	0.448	0.434	0.148	0.426	0.246			0.293	0.435	0.705
Rubevsa	0.814	0.956	1.164	1.099	1.471	1.471	1.154	0.038		0.173		0.326	0.270	0.270	0.115						0.321	0.461	0.731
Phangvul	0.828	0.969	1.111	1.047	1.463	1.463	1.101			0.114		0.282	0.283	0.283	0.159						0.329	0.468	0.738

Table H.2.4 Unit Water Requirement (6/7)

Return Period 1/10 (Exceedance)

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy										Wheat		
Bajo	0.812	0.812	1.298	1.298	1.721	1.278	0.614	0.167		3.098	2.621	1.772	1.545	0.634	0.693	0.639	0.774	0.674	0.152		0.434	0.701	0.818	0.908
Lobevsa	0.825	0.825	1.265	1.265	1.722	1.279	0.591	0.144		3.086	2.606	1.757	1.531	0.620	0.649	0.594	0.740	0.640	0.169		0.441	0.708	0.825	0.915
Rubevsa	0.887	0.887	1.047	1.047	1.702	1.259	0.390			2.792	2.361	1.562	1.432	0.575	0.558	0.506	0.491	0.396	0.219		0.476	0.743	0.858	0.948
Phangvul	0.903	0.903	0.993	0.993	1.696	1.252	0.340			2.763	2.350	1.551	1.466	0.608	0.624	0.573	0.454	0.360	0.234		0.485	0.752	0.867	0.957
Cp2	Mustard									Paddy										Mustard		
Bajo	0.812	0.812	1.096	0.961	0.390					3.098	2.621	1.772	1.545	0.634	0.693	0.639	0.774	0.674	0.152		0.273	0.456	0.680	0.818
Lobevsa	0.825	0.825	1.063	0.928	0.391					3.086	2.606	1.757	1.531	0.620	0.649	0.594	0.740	0.640	0.169		0.280	0.463	0.687	0.825
Rubevsa	0.887	0.887	0.844	0.709	0.371					2.792	2.361	1.562	1.432	0.575	0.558	0.506	0.491	0.396	0.219		0.315	0.499	0.720	0.858
Phangvul	0.903	0.903	0.790	0.655	0.365					2.763	2.350	1.551	1.466	0.608	0.624	0.573	0.454	0.360	0.234		0.325	0.508	0.728	0.867
Cp3	Mustard		Cotton										Paddy							Mustard		
Bajo	0.812	0.581	0.292	1.774	1.731	2.382	2.436	1.525	1.334	1.524	1.049	0.737	0.523	0.774	1.604	1.604	0.825	0.825	0.764	0.699	0.603	0.434	0.818	0.504
Lobevsa	0.825	0.594	0.259	1.755	1.732	2.382	2.423	1.512	1.323	1.512	1.034	0.722	0.508	0.760	1.560	1.560	0.791	0.791	0.781	0.715	0.607	0.441	0.825	0.508
Rubevsa	0.887	0.656	0.040	1.536	1.620	2.232	2.173	1.316	1.133	1.311	0.882	0.588	0.470	0.707	1.415	1.415	0.539	0.539	0.795	0.733	0.590	0.476	0.858	0.527
Phangvul	0.903	0.672		1.507	1.616	2.228	2.146	1.289	1.103	1.281	0.871	0.577	0.504	0.740	1.482	1.482	0.502	0.502	0.810	0.748	0.595	0.485	0.867	0.532
Cp4										Paddy														
Bajo										3.098	2.621	1.772	1.545	0.634	0.693	0.639	0.774	0.674	0.152					
Lobevsa										3.086	2.606	1.757	1.531	0.620	0.649	0.594	0.740	0.640	0.169					
Rubevsa										2.792	2.361	1.562	1.432	0.575	0.558	0.506	0.491	0.396	0.219					
Phangvul										2.763	2.350	1.551	1.466	0.608	0.624	0.573	0.454	0.360	0.234					
Cp5	Vegetable(winter)									Vegetable(summer)										Vegetable(win.)		
Bajo	0.719	0.860	1.363	1.298	1.454	1.454	1.283	0.167		0.284	0.117	0.445	0.350	0.350	0.355	0.069	0.315	0.135				0.273	0.409	0.680
Lobevsa	0.732	0.873	1.330	1.265	1.456	1.456	1.260	0.144		0.264	0.092	0.420	0.325	0.325	0.277		0.254	0.074				0.280	0.417	0.687
Rubevsa	0.794	0.935	1.111	1.047	1.436	1.436	1.059			0.053		0.248	0.310	0.310	0.178							0.315	0.450	0.720
Phangvul	0.810	0.952	1.057	0.993	1.429	1.429	1.008					0.227	0.372	0.372	0.303	0.017						0.325	0.458	0.728

Table H.2.4 Unit Water Requirement (7/7)

Return Period 1/20 (Exceedance)

(unit:l/s/ha)

	Jan		Feb		Mar		Apr		May	Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Cp1	Wheat									Paddy										Wheat		
Bajo	0.775	0.775	1.262	1.262	1.674	1.230	0.508	0.061		3.022	2.547	1.698	1.503	0.592	0.617	0.562	0.676	0.576	0.087	0.419	0.686	0.797	0.887
Lobeysa	0.791	0.791	1.226	1.226	1.677	1.233	0.486	0.039		3.011	2.538	1.689	1.500	0.589	0.586	0.532	0.645	0.545	0.107	0.427	0.694	0.806	0.896
Rubeysa	0.867	0.867	0.994	0.994	1.664	1.220	0.299			2.730	2.346	1.547	1.500	0.643	0.642	0.591	0.440	0.346	0.178	0.470	0.737	0.847	0.937
Phangyul	0.886	0.886	0.940	0.940	1.659	1.215	0.251			2.702	2.348	1.549	1.562	0.705	0.757	0.706	0.415	0.321	0.196	0.481	0.748	0.857	0.947
Cp2	Mustard									Paddy										Mustard		
Bajo	0.775	0.775	1.059	0.924	0.343					3.022	2.547	1.698	1.503	0.592	0.617	0.562	0.676	0.576	0.087	0.258	0.442	0.659	0.797
Lobeysa	0.791	0.791	1.024	0.889	0.346					3.011	2.538	1.689	1.500	0.589	0.586	0.532	0.645	0.545	0.107	0.267	0.450	0.668	0.806
Rubeysa	0.867	0.867	0.792	0.657	0.333					2.730	2.346	1.547	1.500	0.643	0.642	0.591	0.440	0.346	0.178	0.309	0.493	0.709	0.847
Phangyul	0.886	0.886	0.737	0.602	0.328					2.702	2.348	1.549	1.562	0.705	0.757	0.706	0.415	0.321	0.196	0.320	0.503	0.719	0.857
Cp3	Mustard			Paddy											Paddy						Mustard	
Bajo	0.775	0.543	0.256	1.754	1.705	2.355	2.376	1.465	1.259	1.448	0.974	0.663	0.481	0.733	1.528	1.528	0.727	0.727	0.699	0.634	0.595	0.419	0.797	0.493
Lobeysa	0.791	0.559	0.220	1.733	1.706	2.357	2.363	1.452	1.248	1.437	0.965	0.654	0.478	0.729	1.497	1.497	0.696	0.696	0.719	0.653	0.599	0.427	0.806	0.498
Rubeysa	0.867	0.635		1.508	1.599	2.211	2.124	1.267	1.070	1.248	0.866	0.573	0.539	0.775	1.500	1.500	0.488	0.488	0.754	0.693	0.587	0.470	0.847	0.521
Phangyul	0.886	0.654		1.478	1.596	2.208	2.099	1.242	1.042	1.220	0.868	0.575	0.600	0.837	1.614	1.614	0.463	0.463	0.773	0.711	0.592	0.481	0.857	0.526
Cp4										Paddy														
Bajo										3.022	2.547	1.698	1.503	0.592	0.617	0.562	0.676	0.576	0.087					
Lobeysa										3.011	2.538	1.689	1.500	0.589	0.586	0.532	0.645	0.545	0.107					
Rubeysa										2.730	2.346	1.547	1.500	0.643	0.642	0.591	0.440	0.346	0.178					
Phangyul										2.702	2.348	1.549	1.562	0.705	0.757	0.706	0.415	0.321	0.196					
Cp5	Vegetable(winter)									Vegetable(summer)											Vegetable(win.)			
Bajo	0.681	0.823	1.326	1.262	1.407	1.407	1.177	0.061		0.150		0.314	0.277	0.277	0.221		0.142				0.258	0.388	0.659	
Lobeysa	0.697	0.839	1.291	1.226	1.410	1.410	1.155	0.039		0.132		0.299	0.271	0.271	0.167		0.086				0.267	0.398	0.668	
Rubeysa	0.773	0.915	1.059	0.994	1.397	1.397	0.967					0.219	0.437	0.437	0.336	0.050					0.309	0.439	0.709	
Phangyul	0.792	0.934	1.004	0.940	1.392	1.392	0.920					0.223	0.553	0.553	0.551	0.265					0.320	0.449	0.719	

Tbale H.2.5 Present Diversion Water Requirements (1/7)

Return Period 1/2

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	94.5	94.5	145.3	145.3	192.2	145.5	89.5	42.5	345.2	304.3	215.1	188.7	93.0	102.0	96.2	107.0	96.4	32.4	49.0	77.1	90.8	100.3
CP2	30	27.0	27.0	35.5	31.4	15.0				98.6	86.9	61.5	53.9	26.6	29.1	27.5	30.6	27.5	9.3	9.2	14.7	21.8	26.0
CP3	0																						
CP4	150									493.2	434.7	307.4	269.6	132.9	145.7	137.4	152.9	137.7	46.4				
CP5	15	12.1	14.2	21.7	20.8	23.4	23.4	22.8	6.1	9.3	9.1	14.0	11.9	11.9	12.7	8.4	11.2	8.5			4.6	6.9	10.9
Total	300	133.6	135.7	202.5	197.5	230.6	169.0	112.3	48.6	946.4	835.0	598.0	524.1	264.4	289.4	269.4	301.6	270.1	88.1	58.2	96.4	119.5	137.1

Lobcysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	37.2	37.2	55.7	55.7	74.9	56.7	34.1	15.7	134.2	117.8	83.0	72.2	34.9	37.4	35.1	40.4	36.3	12.9	19.3	30.3	35.6	39.3
CP2	12	10.9	10.9	13.9	12.3	6.0				39.3	34.5	24.3	21.1	10.2	10.9	10.3	11.8	10.6	3.8	3.7	5.9	8.8	10.4
CP3	0																						
CP4	59									193.1	169.5	119.4	103.9	50.2	53.8	50.6	58.2	52.3	18.6				
CP5	6	4.9	5.7	8.5	8.2	9.4	9.4	9.0	2.3	3.6	3.4	5.3	4.4	4.4	4.4	2.7	4.1	3.1			1.9	2.8	4.4
Total	118	52.9	53.8	78.1	76.1	90.3	66.1	43.1	18.0	370.1	325.1	232.0	201.6	99.6	106.6	98.7	114.6	102.3	35.3	23.0	38.0	47.2	54.1

Rubcysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	21.6	21.6	27.2	27.2	41.2	31.0	14.7	4.4	68.0	57.8	39.4	33.6	13.8	12.9	11.7	15.8	13.6	7.2	11.3	17.4	20.4	22.4
CP2	7	6.6	6.6	6.9	5.9	3.2				20.7	17.6	12.0	10.2	4.2	3.9	3.6	4.8	4.2	2.2	2.3	3.6	5.2	6.2
CP3	0																						
CP4	34									100.5	85.4	58.2	49.6	20.5	19.0	17.3	23.4	20.2	10.7				
CP5	3	2.5	3.0	3.7	3.5	4.6	4.6	3.9	0.6	1.1	0.6	1.6	1.1	1.1	0.5		0.7	0.2			1.0	1.4	2.2
Total	67	30.7	31.1	37.8	36.6	49.1	35.6	18.6	5.0	190.2	161.4	111.2	94.5	39.6	36.3	32.5	44.7	38.1	20.2	13.6	22.0	27.0	30.9

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	45.5	45.5	54.4	54.4	85.6	64.4	28.1	6.7	140.4	118.7	80.4	68.7	27.6	25.4	22.9	30.1	25.6	15.5	23.9	36.6	42.7	47.0
CP2	14	13.3	13.3	13.0	11.1	6.3				41.0	34.6	23.4	20.0	8.0	7.4	6.7	8.8	7.5	4.5	4.7	7.3	10.5	12.5
CP3	0																						
CP4	69									201.8	170.6	115.5	98.8	39.6	36.6	33.0	43.3	36.8	22.2				
CP5	7	6.0	7.0	8.4	7.9	10.6	10.6	8.8	1.0	2.1	0.9	3.2	2.2	2.2	0.9		0.9				2.4	3.4	5.3
Total	138	64.8	65.7	75.8	73.4	102.6	75.0	36.9	7.6	385.3	324.9	222.5	189.7	77.4	70.3	62.6	83.1	69.8	42.2	28.6	46.2	56.6	64.8

Tbale H.2.5 Present Diversion Water Requirements (2/7)

Return Period 1/5

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	97.2	97.2	147.9	147.9	195.6	149.0	97.0	50.1	351.4	314.7	225.5	200.1	104.5	112.2	106.5	115.1	104.6	37.1	50.1	78.0	92.3	101.7
CP2	30	27.8	27.8	36.2	32.2	16.0				100.4	89.9	64.4	57.2	29.9	32.1	30.4	32.9	29.9	10.6	9.5	15.0	22.2	26.4
CP3	0																						
CP4	150									502.1	449.6	322.2	285.9	149.3	160.4	152.1	164.4	149.4	53.0				
CP5	15	12.5	14.6	22.1	21.1	23.9	23.9	23.9	7.2	10.9	11.7	16.6	14.8	14.8	15.3	11.0	13.2	10.5			4.7	7.1	11.1
Total	300	137.5	139.6	206.3	201.2	235.5	172.9	120.9	57.2	964.8	865.9	628.8	558.0	298.4	319.9	300.0	325.6	294.4	100.6	59.6	97.7	121.6	139.2

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	38.2	38.2	56.9	56.9	76.3	58.1	37.1	18.7	136.7	121.9	87.1	76.8	39.4	41.6	39.4	43.7	39.6	14.7	19.6	30.6	36.2	39.9
CP2	12	11.2	11.2	14.2	12.6	6.3				40.0	35.7	25.5	22.5	11.5	12.2	11.5	12.8	11.6	4.3	3.8	6.0	8.9	10.6
CP3	0																						
CP4	59									196.8	175.4	125.3	110.5	56.8	59.8	56.6	62.8	56.9	21.2				
CP5	6	5.0	5.9	8.7	8.3	9.6	9.6	9.4	2.7	4.2	4.4	6.4	5.6	5.6	5.5	3.8	5.0	3.9			1.9	2.8	4.5
Total	118	54.4	55.2	79.8	77.8	92.2	67.7	46.5	21.5	377.7	337.4	244.3	215.4	113.3	119.1	111.3	124.3	112.0	40.2	23.5	38.5	47.9	54.9

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	22.0	22.0	28.3	28.3	42.0	31.9	16.9	6.6	69.5	60.0	41.6	35.3	15.6	14.5	13.3	18.0	15.8	8.1	11.4	17.5	20.6	22.7
CP2	7	6.7	6.7	7.2	6.3	3.5				21.2	18.3	12.7	10.7	4.7	4.4	4.1	5.5	4.8	2.5	2.3	3.6	5.3	6.3
CP3	0																						
CP4	34									102.7	88.7	61.5	52.2	23.1	21.4	19.7	26.6	23.4	12.0				
CP5	3	2.6	3.0	3.9	3.7	4.7	4.7	4.2	0.9	1.5	1.1	2.1	1.5	1.5	0.9	0.1	1.2	0.7			1.0	1.5	2.3
Total	67	31.3	31.7	39.4	38.3	50.2	36.5	21.1	7.5	194.9	168.1	117.9	99.7	44.9	41.3	37.1	51.3	44.7	22.5	13.8	22.2	27.3	31.2

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	46.4	46.4	57.2	57.2	87.4	66.1	33.1	11.7	143.7	123.0	84.7	71.7	30.5	27.7	25.3	34.9	30.4	17.2	24.0	36.9	43.2	47.5
CP2	14	13.5	13.5	13.8	11.9	6.8				41.9	35.9	24.7	20.9	8.9	8.1	7.4	10.2	8.9	5.0	4.8	7.3	10.7	12.6
CP3	0																						
CP4	69									206.5	176.8	121.7	103.0	43.9	39.9	36.4	50.2	43.7	24.7				
CP5	7	6.1	7.1	8.8	8.3	10.9	10.9	9.5	1.7	3.0	2.1	4.4	3.0	3.0	1.5		2.2	0.9			2.4	3.4	5.3
Total	138	66.0	67.0	79.8	77.4	105.1	77.0	42.6	13.4	395.1	337.8	235.5	198.6	86.3	77.2	69.0	97.4	83.8	46.9	28.8	46.6	57.2	65.4

Tbale H.2.5 Present Diversion Water Requirements (3/7)

Return Period 1/10

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	98.4	98.4	149.1	149.1	197.0	150.4	100.2	53.2	353.9	319.2	230.1	205.1	109.5	116.8	111.0	118.8	108.3	39.2	50.4	78.4	92.8	102.3
CP2	30	28.1	28.1	36.5	32.5	16.4				101.1	91.2	65.7	58.6	31.3	33.4	31.7	33.9	30.9	11.2	9.6	15.1	22.4	26.5
CP3	0																						
CP4	150									505.5	456.0	328.7	293.0	156.5	166.8	158.6	169.7	154.7	56.0				
CP5	15	12.7	14.8	22.3	21.3	24.1	24.1	24.3	7.6	11.5	12.9	17.8	16.1	16.1	16.4	12.1	14.2	11.5			4.8	7.1	11.2
Total	300	139.2	141.3	207.9	202.9	237.5	174.5	124.5	60.8	971.9	879.3	642.2	572.7	313.3	333.3	313.4	336.5	305.3	106.3	60.0	98.3	122.3	140.0

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	38.6	38.6	57.4	57.4	76.8	58.6	38.3	20.0	137.7	123.7	88.9	78.8	41.4	43.4	41.2	45.1	41.0	15.5	19.8	30.8	36.4	40.1
CP2	12	11.3	11.3	14.4	12.7	6.5				40.3	36.2	26.0	23.1	12.1	12.7	12.0	13.2	12.0	4.5	3.9	6.1	9.0	10.6
CP3	0																						
CP4	59									198.2	178.0	127.9	113.3	59.6	62.5	59.2	65.0	59.0	22.3				
CP5	6	5.1	5.9	8.8	8.4	9.6	9.6	9.6	2.9	4.5	4.9	6.9	6.1	6.1	6.0	4.3	5.3	4.3			1.9	2.9	4.5
Total	118	55.0	55.9	80.5	78.5	93.0	68.3	48.0	22.9	380.7	342.8	249.7	221.2	119.2	124.6	116.7	128.7	116.3	42.3	23.7	38.8	48.2	55.2

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	22.2	22.2	28.8	28.8	42.4	32.2	17.8	7.6	70.2	61.2	42.8	36.3	16.6	15.5	14.3	19.0	16.8	8.5	11.5	17.6	20.7	22.7
CP2	7	6.8	6.8	7.3	6.4	3.6				21.4	18.6	13.0	11.1	5.0	4.7	4.3	5.8	5.1	2.6	2.4	3.6	5.3	6.3
CP3	0																						
CP4	34									103.8	90.4	63.2	53.7	24.5	22.9	21.1	28.1	24.9	12.5				
CP5	3	2.6	3.0	4.0	3.8	4.7	4.7	4.3	1.0	1.6	1.4	2.4	1.8	1.8	1.2	0.3	1.5	1.0			1.0	1.5	2.3
Total	67	31.6	32.0	40.1	39.0	50.7	37.0	22.2	8.6	197.1	171.6	121.4	102.8	47.9	44.3	40.1	54.4	47.8	23.6	13.8	22.3	27.5	31.3

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	46.7	46.7	58.3	58.3	88.2	66.9	35.3	13.9	145.2	125.4	87.0	73.6	32.4	29.5	27.0	37.1	32.6	18.0	24.1	37.0	43.3	47.7
CP2	14	13.6	13.6	14.2	12.3	7.1				42.4	36.6	25.4	21.5	9.5	8.6	7.9	10.8	9.5	5.2	4.8	7.3	10.7	12.6
CP3	0																						
CP4	69									208.7	180.2	125.1	105.8	46.6	42.4	38.8	53.3	46.9	25.8				
CP5	7	6.2	7.2	9.0	8.5	11.0	11.0	9.8	2.0	3.4	2.7	5.0	3.5	3.5	2.0		2.8	1.5			2.4	3.5	5.4
Total	138	66.5	67.5	81.5	79.1	106.3	77.9	45.2	15.9	399.7	344.9	242.5	204.3	92.0	82.4	73.8	104.0	90.5	49.0	28.9	46.7	57.5	65.7

Tbale H.2.5 Present Diversion Water Requirements (4/7)

Return Period 1/20

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	99.2	99.2	149.8	149.8	198.0	151.4	102.5	55.5	355.6	322.5	233.3	208.7	113.1	119.9	114.1	121.5	110.9	40.5	50.7	78.8	93.2	102.7
CP2	30	28.4	28.4	36.8	32.7	16.7				101.6	92.1	66.7	59.6	32.3	34.3	32.6	34.7	31.7	11.6	9.7	15.2	22.5	26.6
CP3	0																						
CP4	150									508.1	460.7	333.3	298.2	161.6	171.3	163.1	173.6	158.4	57.9				
CP5	15	12.8	14.9	22.4	21.4	24.3	24.3	24.7	7.9	11.9	13.7	18.6	17.0	17.0	17.2	12.9	14.9	12.2			4.8	7.2	11.3
Total	300	140.3	142.5	209.0	203.9	239.0	175.7	127.1	63.5	977.2	888.9	651.9	583.6	323.9	342.7	322.7	344.6	313.1	110.0	60.4	98.8	122.9	140.6

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	38.9	38.9	57.7	57.7	77.2	59.0	39.3	21.0	138.4	125.1	90.2	80.3	42.9	44.8	42.6	46.2	42.1	16.0	19.9	30.8	36.5	40.2
CP2	12	11.4	11.4	14.5	12.8	6.6				40.5	36.6	26.4	23.5	12.6	13.1	12.5	13.5	12.3	4.7	3.9	6.1	9.0	10.7
CP3	0																						
CP4	59									199.2	180.0	129.9	115.5	61.8	64.4	61.2	66.5	60.6	23.1				
CP5	6	5.1	6.0	8.8	8.4	9.7	9.7	9.8	3.1	4.7	5.3	7.2	6.5	6.5	6.4	4.6	5.6	4.5			2.0	2.9	4.5
Total	118	55.4	56.3	81.0	79.0	93.6	68.7	49.0	24.0	382.8	346.9	253.7	225.8	123.7	128.7	120.9	131.9	119.6	43.8	23.8	38.9	48.5	55.4

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	22.4	22.4	29.2	29.2	42.7	32.5	18.6	8.3	70.8	62.0	43.6	37.2	17.4	16.3	15.1	19.8	17.6	8.8	11.5	17.6	20.7	22.8
CP2	7	6.8	6.8	7.5	6.5	3.7				21.5	18.9	13.3	11.3	5.3	5.0	4.6	6.0	5.4	2.7	2.4	3.7	5.3	6.3
CP3	0																						
CP4	34									104.7	91.7	64.5	54.9	25.8	24.1	22.3	29.2	26.0	13.0				
CP5	3	2.6	3.1	4.0	3.8	4.8	4.8	4.4	1.1	1.8	1.6	2.6	2.0	2.0	1.4	0.5	1.7	1.1			1.0	1.5	2.3
Total	67	31.8	32.2	40.7	39.5	51.1	37.3	23.0	9.4	198.8	174.2	124.0	105.4	50.5	46.8	42.6	56.7	50.1	24.4	13.9	22.3	27.6	31.4

Phanggyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	47.0	47.0	59.2	59.2	88.8	67.4	36.9	15.4	146.4	127.3	89.0	75.3	34.1	31.1	28.6	38.8	34.3	18.6	24.2	37.0	43.5	47.8
CP2	14	13.7	13.7	14.4	12.5	7.3				42.7	37.1	26.0	22.0	9.9	9.1	8.3	11.3	10.0	5.4	4.8	7.4	10.8	12.7
CP3	0																						
CP4	69									210.5	183.1	127.9	108.2	49.0	44.6	41.1	55.8	49.3	26.7				
CP5	7	6.2	7.2	9.1	8.6	11.1	11.1	10.1	2.2	3.8	3.3	5.6	3.9	3.9	2.4	0.4	3.3	2.0			2.4	3.5	5.4
Total	138	66.9	67.9	82.8	80.4	107.1	78.5	46.9	17.7	403.4	350.8	248.4	209.4	97.0	87.2	78.5	109.2	95.7	50.7	29.0	46.8	57.7	65.9

Tbale H.2.5 Present Diversion Water Requirements (5/7)

Return Period 1/5 (Exceedance)

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	89.0	89.0	140.1	140.1	185.3	138.8	75.3	28.5	333.1	285.4	196.2	170.5	74.9	83.1	77.4	91.6	81.1	22.9	47.0	75.1	88.0	97.4
CP2	30	25.4	25.4	33.9	29.9	13.0				95.2	81.5	56.1	48.7	21.4	23.7	22.1	26.2	23.2	6.5	8.6	14.1	21.0	25.1
CP3	0																						
CP4	150									475.8	407.7	280.4	243.6	107.0	118.7	110.6	130.8	115.8	32.7				
CP5	15	11.3	13.5	21.0	20.0	22.5	22.5	20.8	4.1	6.2	4.3	9.3	7.4	7.4	7.9	3.6	7.3	4.6			4.3	6.4	10.5
Total	300	125.8	127.9	195.0	190.0	220.8	161.3	96.1	32.5	910.2	779.0	541.9	470.2	210.6	233.4	213.7	255.8	224.6	62.1	55.7	93.5	115.4	133.1

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	35.2	35.2	53.4	53.4	72.4	54.2	28.5	10.1	129.5	110.6	75.8	65.6	28.2	30.3	28.0	34.3	30.2	9.4	18.6	29.5	34.6	38.3
CP2	12	10.3	10.3	13.2	11.6	5.2				37.9	32.4	22.2	19.2	8.3	8.9	8.2	10.0	8.8	2.8	3.5	5.7	8.5	10.1
CP3	0																						
CP4	59									186.4	159.2	109.1	94.4	40.7	43.5	40.3	49.4	43.5	13.6				
CP5	6	4.6	5.4	8.2	7.8	9.0	9.0	8.2	1.5	2.4	1.5	3.5	2.7	2.7	2.6	0.9	2.6	1.5			1.8	2.6	4.2
Total	118	50.1	51.0	74.8	72.8	86.6	63.1	36.6	11.6	356.2	303.7	210.6	181.9	79.9	85.3	77.4	96.3	84.0	25.8	22.1	37.0	45.6	52.6

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	20.9	20.9	25.3	25.3	40.0	29.8	11.2	0.9	65.7	55.3	36.9	32.5	12.7	12.1	10.9	12.8	10.6	6.0	11.1	17.2	20.0	22.1
CP2	7	6.4	6.4	6.3	5.3	2.8				20.0	16.8	11.2	9.9	3.9	3.7	3.3	3.9	3.2	1.8	2.2	3.5	5.1	6.1
CP3	0																						
CP4	34									97.1	81.7	54.5	48.0	18.8	17.8	16.1	18.9	15.7	8.8				
CP5	3	2.4	2.9	3.5	3.3	4.4	4.4	3.5	0.1	0.5		1.0	0.8	0.8	0.3						1.0	1.4	2.2
Total	67	29.7	30.1	35.0	33.9	47.2	34.2	14.6	1.0	183.3	153.8	103.6	91.1	36.3	33.9	30.3	35.6	29.6	16.6	13.3	21.7	26.5	30.3

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	44.2	44.2	50.3	50.3	83.0	61.7	20.7		135.6	114.2	75.8	68.1	26.9	26.3	23.8	24.5	20.0	12.9	23.5	36.3	42.0	46.4
CP2	14	12.9	12.9	11.8	9.9	5.6				39.6	33.3	22.1	19.9	7.9	7.7	6.9	7.1	5.8	3.8	4.6	7.2	10.3	12.3
CP3	0																						
CP4	69									194.9	164.2	109.0	97.8	38.7	37.8	34.2	35.2	28.7	18.6				
CP5	7	5.8	6.8	7.8	7.3	10.2	10.2	7.7		0.8		2.0	2.0	2.0	1.1						2.3	3.3	5.2
Total	138	62.9	63.9	69.8	67.5	98.9	72.0	28.4		370.9	311.6	209.0	187.7	75.5	72.9	65.0	66.8	54.5	35.2	28.1	45.8	55.7	63.8

Tbale H.2.5 Present Diversion Water Requirements (6/7)

Return Period 1/10 (Exceedance)

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	85.3	85.3	136.3	136.3	180.7	134.2	64.5	17.5	325.3	275.2	186.1	162.2	66.6	72.8	67.1	81.3	70.8	16.0	45.6	73.6	85.9	95.3
CP2	30	24.4	24.4	32.9	28.8	11.7				92.9	78.6	53.2	46.4	19.0	20.8	19.2	23.2	20.2	4.6	8.2	13.7	20.4	24.5
CP3	0																						
CP4	150									464.7	393.2	265.8	231.8	95.1	104.0	95.9	116.1	101.1	22.8				
CP5	15	10.8	12.9	20.4	19.5	21.8	21.8	19.2	2.5	4.3	1.8	6.7	5.3	5.3	5.3	1.0	4.7	2.0			4.1	6.1	10.2
Total	300	120.4	122.5	189.6	184.6	214.2	156.0	83.7	20.0	887.2	748.7	511.7	445.6	185.9	202.8	183.2	225.3	194.1	43.3	53.8	91.4	112.4	130.1

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	33.8	33.8	51.9	51.9	70.6	52.4	24.2	5.9	126.5	106.8	72.0	62.8	25.4	26.6	24.4	30.3	26.2	6.9	18.1	29.0	33.8	37.5
CP2	12	9.9	9.9	12.8	11.1	4.7				37.0	31.3	21.1	18.4	7.4	7.8	7.1	8.9	7.7	2.0	3.4	5.6	8.2	9.9
CP3	0																						
CP4	59									182.1	153.8	103.7	90.3	36.6	38.3	35.0	45.7	37.8	10.0				
CP5	6	4.4	5.2	8.0	7.6	8.7	8.7	7.6	0.9	1.6	0.6	2.5	2.0	2.0	1.7		1.5	0.4			1.7	2.5	4.1
Total	118	48.1	49.0	72.6	70.6	84.0	61.2	31.8	6.8	347.2	292.4	199.3	173.4	71.4	74.4	66.5	84.4	72.1	18.9	21.4	36.3	44.6	51.5

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	20.4	20.4	24.1	24.1	39.1	29.0	9.0		64.2	54.3	35.9	32.9	13.2	12.8	11.6	11.3	9.1	5.0	10.9	17.1	19.7	21.8
CP2	7	6.2	6.2	5.9	5.0	2.6				19.5	16.5	10.9	10.0	4.0	3.9	3.5	3.4	2.8	1.5	2.2	3.5	5.0	6.0
CP3	0																						
CP4	34									94.9	80.3	53.1	48.7	19.6	19.0	17.2	16.7	13.5	7.4				
CP5	3	2.4	2.8	3.3	3.1	4.3	4.3	3.2		0.2		0.7	0.9	0.9	0.5						0.9	1.4	2.2
Total	67	29.0	29.4	33.3	32.2	46.1	33.3	12.1		178.8	151.1	100.7	92.6	37.7	36.2	32.4	31.4	25.3	14.0	13.2	21.5	26.1	30.0

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	43.3	43.3	47.7	47.7	81.4	60.1	16.3		132.6	112.8	74.4	70.4	29.2	30.0	27.5	21.8	17.3	11.2	23.3	36.1	41.6	45.9
CP2	14	12.6	12.6	11.1	9.2	5.1				38.7	32.9	21.7	20.5	8.5	8.7	8.0	6.4	5.0	3.3	4.6	7.1	10.2	12.1
CP3	0																						
CP4	69									190.6	162.2	107.0	101.2	42.0	43.1	39.5	31.3	24.8	16.1				
CP5	7	5.7	6.7	7.4	7.0	10.0	10.0	7.1				1.6	2.6	2.6	2.1	0.1					2.3	3.2	5.1
Total	138	61.7	62.7	66.1	63.8	96.5	70.1	23.4		362.0	307.9	204.8	194.7	82.3	83.9	75.2	59.5	47.2	30.7	27.8	45.5	55.0	63.2

Tbale H.2.5 Present Diversion Water Requirements (7/7)

Return Period 1/20 (Exceedance)

Bajo (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	105	81.4	81.4	132.5	132.5	175.8	129.2	53.3	6.4	317.3	267.4	178.3	157.8	62.2	64.8	59.0	71.0	60.5	9.1	44.0	72.0	83.7	93.1
CP2	30	23.3	23.3	31.8	27.7	10.3				90.7	76.4	50.9	45.1	17.8	18.5	16.9	20.3	17.3	2.6	7.7	13.3	19.8	23.9
CP3	0																						
CP4	150									453.3	382.1	254.7	225.5	88.8	92.6	84.3	101.4	86.4	13.1				
CP5	15	10.2	12.3	19.9	18.9	21.1	21.1	17.7	0.9	2.3		4.7	4.2	4.2	3.3		2.1				3.9	5.8	9.9
Total	300	114.8	117.0	184.2	179.2	207.2	150.3	71.0	7.3	863.5	725.9	488.6	432.5	172.9	179.2	160.2	194.8	164.2	24.8	51.7	89.2	109.3	126.9

Lobeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	41	32.4	32.4	50.3	50.3	68.8	50.6	19.9	1.6	123.5	104.1	69.2	61.5	24.1	24.0	21.8	26.4	22.3	4.4	17.5	28.5	33.0	36.7
CP2	12	9.5	9.5	12.3	10.7	4.2				36.1	30.5	20.3	18.0	7.1	7.0	6.4	7.7	6.5	1.3	3.2	5.4	8.0	9.7
CP3	0																						
CP4	59									177.6	149.7	99.7	88.5	34.8	34.6	31.4	38.1	32.2	6.3				
CP5	6	4.2	5.0	7.7	7.4	8.5	8.5	6.9	0.2	0.8		1.8	1.6	1.6	1.0		0.5				1.6	2.4	4.0
Total	118	46.1	47.0	70.3	68.3	81.4	59.0	26.9	1.8	338.0	284.3	191.0	169.6	67.6	66.6	59.6	72.8	61.0	12.0	20.7	35.5	43.5	50.4

Rubeysa (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	23	19.9	19.9	22.9	22.9	38.3	28.1	6.9		62.8	54.0	35.6	34.5	14.8	14.8	13.6	10.1	8.0	4.1	10.8	17.0	19.5	21.6
CP2	7	6.1	6.1	5.5	4.6	2.3				19.1	16.4	10.8	10.5	4.5	4.5	4.1	3.1	2.4	1.2	2.2	3.5	5.0	5.9
CP3	0																						
CP4	34									92.8	79.8	52.6	51.0	21.9	21.8	20.1	15.0	11.8	6.1				
CP5	3	2.3	2.7	3.2	3.0	4.2	4.2	2.9				0.7	1.3	1.3	1.0	0.2					0.9	1.3	2.1
Total	67	28.3	28.8	31.6	30.4	44.8	32.3	9.8		174.7	150.1	99.7	97.3	42.5	42.1	38.0	28.2	22.1	11.4	13.0	21.3	25.8	29.6

Phangyul (unit : l/s)

C.Pattern	Area(ha)	Jan.		Feb.		Mar.		Apr.		May	Jun.		Jul.		Aug.		Sep.		Oct.	Nov.		Dec.	
CP1	48	42.5	42.5	45.1	45.1	79.6	58.3	12.0		129.7	112.7	74.4	75.0	33.8	36.3	33.9	19.9	15.4	9.4	23.1	35.9	41.1	45.5
CP2	14	12.4	12.4	10.3	8.4	4.6				37.8	32.9	21.7	21.9	9.9	10.6	9.9	5.8	4.5	2.7	4.5	7.0	10.1	12.0
CP3	0																						
CP4	69									186.4	162.0	106.9	107.8	48.6	52.2	48.7	28.6	22.1	13.5				
CP5	7	5.5	6.5	7.0	6.6	9.7	9.7	6.4				1.6	3.9	3.9	3.9	1.9					2.2	3.1	5.0
Total	138	60.5	61.5	62.5	60.1	94.0	68.1	18.5		354.0	307.6	204.5	208.5	96.2	103.0	94.3	54.4	42.1	25.7	27.6	45.2	54.3	62.5

Table H.2.6 List of Irrigation Scheme in the Sub-Area

Group	Code	Name of Canal	Canal Length (km)	Command Area (ha)	No. of Benefitted Household	Sub-Area	Water Source			Mean Discharge (m^3/s)	Estimated Capacity (m^3/s)
							River	Catchment Area (km^2)	Altitude (m)		
A	C1	Upper Lobeysa	7.1	61	117	Lobeysa	Taberong Chhu	119.4	1400	6.574	0.174
	C2	Lower Lobeysa	8.1	300	123	"		119.4	1380	6.574	0.858
B	C9	Bajo	15	143	52	Bajo	Pe Chhu	145.7	1420	8.022	0.378
C	C10	Phangyul	16	91	42	Phangyul	Lachhu	2.23	2330	0.123	0.240
D	C15	Gemkha	3.5	15	23	"	Uship	0.84	1750	0.046	0.040
E	C18	Nalakha	3.9	29	10	Rubeysa	Mochuna	8.78	1440	0.483	0.077
F	C19	Rutekha	2.2	40	60	"	Takarong Chhu	3.03	1880	0.167	0.106
	C20	Maphekha	2.2	27	44	"		6.23	1760	0.343	0.071
	C21	Navkovuwa	1.7	24	18	"		2.95	1920	0.162	0.063
	C22	Rumina	1.1	28	35	"		6.80	1560	0.374	0.074

Table H.2.7 Estimated River Discharge at Intake Site

(Unit : m^3/s)

Group	Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A	C1												
	C2	2.602	2.500	2.327	3.231	4.034	8.028	12.455	16.755	13.577	6.067	4.286	3.029
B	C9	3.175	3.051	2.840	3.943	4.922	9.797	15.196	20.446	16.568	7.403	5.230	3.696
C	C10	0.048	0.047	0.043	0.060	0.075	0.150	0.232	0.312	0.253	0.113	0.080	0.056
D	C15	0.018	0.017	0.016	0.023	0.028	0.056	0.087	0.117	0.095	0.042	0.030	0.021
E	C18	0.191	0.184	0.171	0.237	0.296	0.590	0.915	1.231	0.998	0.446	0.315	0.223
F	C19												
	C20												
	C21												
	C22	0.148	0.142	0.133	0.184	0.230	0.457	0.709	0.954	0.773	0.346	0.244	0.172

Table H.2.8 Irrigation Water Balance at Intake Site

(unit : m^3/s)

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
A	C1,C2	Upper Lobeysa, Lower Lobeysa						361				Taberong Chhu				119.4									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		2.081	2.081	2.000	2.000	1.862	1.862	2.585	2.585	3.227	3.227	6.423	6.423	9.963	9.963	13.404	13.404	10.862	10.862	4.853	4.853	3.429	3.429	2.423	2.423
Water Requirement		0.165	0.167	0.243	0.237	0.281	0.206	0.132	0.055	0.000	1.133	0.995	0.710	0.616	0.304	0.326	0.302	0.350	0.313	0.108	0.000	0.071	0.117	0.145	0.166
Shortage of Water																									
Insufficiency																									

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
B	C9	Bajo						143				Pe Chhu				145.7									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		2.540	2.540	2.440	2.440	2.272	2.272	3.154	3.154	3.938	3.938	7.837	7.837	12.157	12.157	16.357	16.357	13.254	13.254	5.922	5.922	4.184	4.184	2.957	2.957
Water Requirement		0.065	0.066	0.098	0.095	0.111	0.082	0.054	0.023	0.000	0.451	0.398	0.286	0.251	0.127	0.139	0.129	0.144	0.129	0.042	0.000	0.028	0.046	0.057	0.066
Shortage of Water																									
Insufficiency																									

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
C	C10	Phangyul						91				Lachhu				2.23									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		0.039	0.039	0.037	0.037	0.035	0.035	0.048	0.048	0.060	0.060	0.120	0.120	0.186	0.186	0.250	0.250	0.202	0.202	0.090	0.090	0.064	0.064	0.045	0.045
Water Requirement		0.043	0.043	0.050	0.048	0.067	0.049	0.024	0.005	0.000	0.256	0.216	0.148	0.127	0.052	0.048	0.043	0.056	0.047	0.028	0.000	0.019	0.030	0.037	0.042
Shortage of Water		-0.004	-0.004	-0.012	-0.011	-0.033	-0.014				-0.196	-0.097	-0.029												
Insufficiency		-9.0%	-10.2%	-24.9%	-22.4%	-48.5%	-29.1%				-76.5%	-44.7%	-19.3%												

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
D	C15	Gemkha						15				Uship				0.84									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		0.015	0.015	0.014	0.014	0.013	0.013	0.018	0.018	0.023	0.023	0.056	0.056	0.116	0.116	0.187	0.187	0.152	0.152	0.042	0.042	0.024	0.024	0.017	0.017
Water Requirement		0.007	0.007	0.008	0.008	0.011	0.008	0.004	0.001	0.000	0.042	0.036	0.024	0.021	0.009	0.008	0.007	0.009	0.008	0.005	0.000	0.003	0.005	0.006	0.007
Shortage of Water											-0.020														
Insufficiency											-46.6%														

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
E	C18	Nalakha						29				Mochuna				8.78									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		0.153	0.153	0.147	0.147	0.137	0.137	0.190	0.190	0.237	0.237	0.472	0.472	0.732	0.732	0.985	0.985	0.798	0.798	0.357	0.357	0.252	0.252	0.178	0.178
Water Requirement		0.014	0.014	0.017	0.016	0.022	0.016	0.008	0.002	0.000	0.082	0.070	0.048	0.041	0.017	0.016	0.014	0.020	0.017	0.009	0.000	0.006	0.010	0.012	0.014
Shortage of Water																									
Insufficiency																									

Group	Code	Name of Canal						Total Command Area (ha)				Name of River				Catchment Area (km^2)									
F	C19~22	Ruteka, Mapheka, Navkoyuka, Rumina						119				Takarong Chhu				6.8									
		Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Available River Discharge		0.119	0.119	0.114	0.114	0.106	0.106	0.147	0.147	0.184	0.184	0.366	0.366	0.567	0.567	0.763	0.763	0.619	0.619	0.276	0.276	0.195	0.195	0.138	0.138
Water Requirement		0.056	0.057	0.069	0.067	0.090	0.066	0.035	0.010	0.000	0.337	0.286	0.198	0.168	0.072	0.066	0.059	0.080	0.069	0.036	0.000	0.024	0.040	0.049	0.056
Shortage of Water											-0.153														
Insufficiency											-45.4%														

Table H.2.9 Sufficiency of Water Source and Canal Capacity

Canal Group	Code No.	Command Area (ha)	Max. Water Requirement (May m3/s)	River Discharge (May m3/s)	Shortage of Water (m3/s)	Sufficiency at intake site (%)	Canal Capacity (m3/s)	Shortage of Water (m3/s)	Sufficiency at intake site (%)	Estimated Cropping Rate (%)	Estimated Planting Area (ha)
A	C1	61	0.191				0.174	-0.017	-9%	95%	57.83
	C2	300	0.942				0.858	-0.084	-9%	96%	289.30
	sub - total	361	1.133	3.227	-	-	1.032	-0.101	-9%	96%	347.13
B	C9	143	0.451	3.938	-	-	0.378	-0.073	-16%	90%	129.02
C	C10	91	0.256	0.075	-0.181	-71%	0.240	-0.016	-6%	58%	52.42
D	C15	15	0.042	0.023	-0.019	-46%	0.040	-0.002	-6%	72%	10.84
E	C18	29	0.082	0.237	-	-	0.077	-0.005	-7%	96%	27.85
F	C19	40	0.113				0.106	-0.008	-7%		
	C20	27	0.076				0.071	-0.005	-7%		
	C21	24	0.068				0.063	-0.005	-7%		
	C22	28	0.079				0.074	-0.005	-7%		
	sub - total	119	0.337	0.184	-0.153	-45%	0.314	-0.023	-7%	73%	86.55
Total		758	2.301							86%	653.81

Table H.2.10 Water Balance at Offtake Point of Phangyul Canal

(1) Case of Water Sufficiency 100 %

Group : C		Code : C10		Name of Canal : Phangyul			
Offtake No.	Command Area (ha)	Water Requirement (l/sec)	Available Water for 1 day (l/sec)	Water Balance (l/sec)	Water Sufficiency (%)	Estimated Cropping (%)	Estimated Planting Area (ha)
No.1	0.36	1.025	1.025	0.000	0.00%	100.00%	0.36
No.2	0.93	2.609	2.609	0.000	0.00%	100.00%	0.93
No.3	1.32	3.725	3.725	0.000	0.00%	100.00%	1.32
No.4	4.12	11.596	27.587	15.991	137.90%	100.00%	4.12
No.5	1.02	2.882	27.587	24.705	857.22%	100.00%	1.02
No.6	8.72	24.537	27.587	3.050	12.43%	100.00%	8.72
No.7	14.66	41.259	27.587	-13.672	-33.14%	80.12%	11.74
No.8	20.15	56.717	27.587	-29.130	-51.36%	69.18%	13.94
No.9	2.10	5.923	27.587	21.664	365.73%	100.00%	2.10
No.10	24.32	68.461	27.587	-40.874	-59.70%	64.18%	15.61
No.11	4.12	11.608	27.587	15.979	137.66%	100.00%	4.12
No.12	8.99	25.300	27.587	2.287	9.04%	100.00%	8.99
Total	90.82	255.641	255.641	0.000	100.00%	80.36%	72.98
Estimated Cropping Rate without Management Loss				100.00%			
Estimated Cropping Rate with Management Loss				80.36%			
Estimated Management Loss				19.64%			

(2) Case of Water Sufficiency 29.4 %

Group : C		Code : C10		Name of Canal : Phangyul			
Offtake No.	Command Area (ha)	Water Requirement (l/sec)	Available Water for 1 day (l/sec)	Water Balance (l/sec)	Water Sufficiency (%)	Estimated Cropping (%)	Estimated Planting Area (ha)
No.1	0.36	1.025	1.025	0.000	0.00%	100.00%	0.36
No.2	0.93	2.609	2.609	0.000	0.00%	100.00%	0.93
No.3	1.32	3.725	3.725	0.000	0.00%	100.00%	1.32
No.4	4.12	11.596	7.516	-4.081	-35.19%	78.89%	3.25
No.5	1.02	2.882	7.516	4.634	160.78%	100.00%	1.02
No.6	8.72	24.537	7.516	-17.021	-69.37%	58.38%	5.09
No.7	14.66	41.259	7.516	-33.743	-81.78%	50.93%	7.47
No.8	20.15	56.717	7.516	-49.201	-86.75%	47.95%	9.66
No.9	2.10	5.923	7.516	1.592	26.88%	100.00%	2.10
No.10	24.32	68.461	7.516	-60.945	-89.02%	46.59%	11.33
No.11	4.12	11.608	7.516	-4.092	-35.25%	78.85%	3.25
No.12	8.99	25.300	7.516	-17.784	-70.29%	57.82%	5.20
Total	90.82	255.641	75.000	-180.641	29.34%	56.14%	50.99
Estimated Cropping Rate without Management Loss				57.60%			
Estimated Cropping Rate with Management Loss				56.14%			
Estimated Management Loss				1.46%			

Table H.2.11 Summary of Estimated Water Management Loss

Canal Grope		A		B	C	D	E	F	Total
Code No.		C1	C2	C9	C10	C15	C18	C19-C22	
Command Area (ha)		61	300	143	91	15	29	119	758
Max. Water Requirement (May m3/s)		0.191	0.942	0.451	0.256	0.042	0.082	0.337	2.301
Case 1	Amount of Available Water at Intake Site	0.191	0.942	0.451	0.256	0.042	0.082	0.337	2.301
	Sufficiency of Irrigation Water	100%	100%	100%	100%	100%	100%	100%	100%
	Estimated Cropping Rate without Management Loss	100%	100%	100%	100%	100%	100%	100%	100%
	Estimated Cropping Rate with Management Loss	87%	91%	89%	80%	89%	75%	79%	86%
	Estimated Management Loss	13%	9%	11%	20%	11%	25%	21%	14%
	Estimated Cropping Area (ha)	53.2	273.5	126.8	73.1	13.4	21.7	93.8	655.5
Case 2	Amount of Available Water at Intake Site	0.175	0.858	0.378	0.075	0.023	0.077	0.184	1.769
	Sufficiency of Irrigation Water	91%	91%	84%	29%	55%	93%	55%	77%
	Estimated Cropping Rate without Management Loss	95%	96%	90%	58%	72%	96%	73%	86%
	Estimated Cropping Rate with Management Loss	85%	89%	83%	56%	70%	73%	65%	79%
	Estimated Management Loss	10%	7%	7%	1%	2%	23%	8%	7%
	Estimated Cropping Area (ha)	51.7	267.6	119.2	51.1	10.5	21.2	77.8	599.1

Table H.3.1 Summary of Study Case

No.	Case Code	A Water Management	B Canal Capacity	C Water Resource	D Crop Diversification	E Double Paddy Cropping	Remark
1	O	(Present Condition)					
2	A	●					
3	B		●				
4	C			●			
5	D-1				●		5% Diversification
6	D-2				●		10% Diversification
7	D-3				●		15% Diversification
8	D-4				●		20% Diversification
9	AB	●	●				
10	AC	●		●			
11	AD-1	●			●		5% Diversification
12	AD-2						10% Diversification
13	AD-3						15% Diversification
14	AD-4						20% Diversification
15	BC		●	●			
16	BD-1		●		●		5% Diversification
17	BD-2		●		●		10% Diversification
18	BD-3		●		●		15% Diversification
19	BD-4		●		●		20% Diversification
20	CD-2			●	●		5% Diversification
21	CD-3			●	●		10% Diversification
22	CD-4			●	●		15% Diversification
23	CD-5			●	●		20% Diversification
24	ABC	●	●	●			
25	ABD-1	●	●		●		5% Diversification
26	ABD-2	●	●		●		10% Diversification
27	ABD-3	●	●		●		15% Diversification
28	ABD-4	●	●		●		20% Diversification
29	ACD-1	●		●	●		5% Diversification
30	ACD-2	●		●	●		10% Diversification
31	ACD-3	●		●	●		15% Diversification
32	ACD-4	●		●	●		20% Diversification
33	BCD-1		●	●	●		5% Diversification
34	BCD-2		●	●	●		10% Diversification
35	BCD-3		●	●	●		15% Diversification
36	BCD-4		●	●	●		20% Diversification
37	ABCD-2	●	●	●	●		10% Diversification for Phangyul
38	ABE-1	●	●	●		●	20% Double Cropping for Bajo
39	ABE-2	●	●	●		●	40% Double Cropping for Bajo
40	ABE-3	●	●	●		●	60% Double Cropping for Bajo
41	ABE-4	●	●	●		●	100% Double Cropping for Bajo

Note ● : With Improvement Plan

Table H.3.2 Unit Construction Cost for Irrigation Improvement Plan

Work Item	Unit	Cost (Nu.)	Code
1 Earthwork			
Excavation, manual	m3	30.61	E-1
Excavation, machine	m3	45.92	E-2
Backfill, manual	m3	15.38	E-3
Backfill, machine	m3	23.07	E-4
Embankment, manual	m3	34.56	E-5
Embankment, machine	m3	51.84	E-6
Earth lining	m2	8.75	E-7
Gravel surfacing	m2	367.96	E-8
Gravel foundation	m3	206.60	E-9
Sand fill	m3	61.22	E-10
2 Concrete Works			
Reinforced concrete (1:2:4)	m3	1,330.73	C-1
In-situ precast concrete (1:2:4)	m3	2,358.20	C-2
Foundation concrete (1:3:6)	m3	994.38	C-3
Plain concrete	m3	1,483.75	C-4
Concrete mortar for plastering	m2	56.45	C-5
Wet masonry	m3	917.08	C-6
Cement Masonry (1:4)	m3	818.54	C-7
Dry masonry	m3	313.39	C-8
Form, type-1	m2	54.83	C-9
Form, type-2	m2	43.86	C-10
3 Metal Works			
Steel Flume for Aqueduct (t=4)	m2	55.13	M-1
4 Timber Works			
Wooden plunk for stop log (t=50)	m2	231.33	T-1
Timber beams	m3	4,512.18	T-2
Wooden cross tai (t=20)	m3	4,626.63	T-3
5 Other Works			
Gabion	m3	561.76	
Concrete pipe placing (D=1,200)	m	1,685.09	P-1
Concrete pipe placing (D=900)	m	1,136.04	P-2
Concrete pipe placing (D=700)	m	859.78	P-3
Concrete pipe placing (D=500)	m	540.00	P-4
Concrete pipe placing (D=400)	m	436.03	P-5
Concrete pipe placing (D=300)	m	306.49	P-6

Table H.3.3 Caliculation of Water Management Improvement

Canal C9	Bajo		Return Period 1/2											
May Second			without Water Management Improvement						with Water Management Improvement					
Offtake No.	Command Area (ha)	Water Requirement (l/s)	Interval (Day)	Irrigation Water (l/s)	+/-	Insufficiency	Cropping Area (ha)	Crop Reduction Coefficient	Interval (Day)	Irrigation Water (l/s)	+/-	Insufficiency	Cropping Area (ha)	Crop Reduction Coefficient
No.1	0.40	1.272	-	1.272	0.000	0.00%	0.40	100%	-	1.272	0.000	0.00%	0.40	100%
No.2	0.81	2.576	-	2.576	0.000	0.00%	0.81	100%	-	2.576	0.000	0.00%	0.81	100%
No.3	0.49	1.558	-	1.558	0.000	0.00%	0.49	100%	-	1.558	0.000	0.00%	0.49	100%
No.4	0.53	1.686	-	1.686	0.000	0.00%	0.53	100%	-	1.686	0.000	0.00%	0.53	100%
No.5	0.61	1.940	-	1.940	0.000	0.00%	0.61	100%	-	1.940	0.000	0.00%	0.61	100%
No.6	24.67	78.461	1	40.943	-37.518	-47.82%	18.77	94%	1.50	61.415	-17.046	-21.73%	21.99	97%
No.7	26.30	83.645	1	40.943	-42.702	-51.05%	19.59	93%	1.50	61.415	-22.230	-26.58%	22.81	97%
No.8	7.10	22.581	1	40.943	18.362	0.00%	7.10	100%	0.50	20.472	-2.109	-9.34%	6.77	99%
No.9	15.80	50.251	1	40.943	-9.308	-18.52%	14.34	98%	1.00	40.943	-9.308	-18.52%	14.34	98%
No.10	10.00	31.804	1	40.943	9.139	0.00%	10.00	100%	0.50	20.472	-11.333	-35.63%	8.22	95%
No.11	6.50	20.673	1	40.943	20.270	0.00%	6.50	100%	0.50	20.472	-0.201	-0.97%	6.47	100%
No.12	16.80	53.431	1	40.943	-12.488	-23.37%	14.84	97%	1.00	40.943	-12.488	-23.37%	14.84	97%
No.13	19.70	62.654	1	40.943	-21.711	-34.65%	16.29	96%	1.50	61.415	-1.240	-1.98%	19.51	100%
No.14	13.20	41.982	1	40.943	-1.038	-2.47%	13.04	100%	1.00	40.943	-1.038	-2.47%	13.04	100%
Total	142.91	454.514	9	377.520	-76.994	-16.94%	123.30	95%	9.00	377.520	-76.994	-16.94%	130.81	98%
			Without Management Loss				With Management Loss (Present Condition)			with Water Management Improvement				
Expected Cropping Area			91.53%				86.27%			91.53%				
Expected Cropping Loss			98.15%				94.51%			95.81%				

Table H.3.4 Summary of Case Study Result (1/3)

Canal Code	Name of Canal	Command Area (ha)	Canal Length (km)
C9	Bajo Canal	143	15

Case	Improvement Item	Irrigation Efficiency		Maximum W.R. (l/s)	Canal Capacity (l/s)	Production Ratio		Net Production Value (1000 Nu.)	Expected (1000 Nu)		B/C Ratio
		Paddy	Upland			Summer	Winter		Benefit	Net Cost	
Case O	Present Condition	0.36	0.24	452	378	77%	100%	1,340			
Case A	only Management	0.36	0.24	452	378	87%	100%	1,454	114	63	1.81
Case B	only Canal	0.65	0.43	251	261	87%	100%	1,454	114	60	1.90
Case AB	Canal & Management	0.65	0.43	251	261	97%	100%	1,568	228	97	2.34
Case D-1	only 5% Diversification	0.36	0.24	434	378	79%	100%	1,349	9	22	0.42
Case AD-1	Management & 5% Div.	0.36	0.24	434	378	90%	100%	1,472	133	85	1.57
Case BD-1	Canal & 5% Diversification	0.65	0.43	241	250	89%	100%	1,461	122	79	1.55
Case ABD-1	Canal, Management & 5%	0.65	0.43	241	250	99%	100%	1,574	234	114	2.05
Case D-2	only 10% Diversification	0.36	0.24	416	378	81%	100%	1,357	18	22	0.81
Case AD-2	Management & 10% Div.	0.36	0.24	416	378	92%	100%	1,479	139	82	1.71
Case BD-2	Canal & 10% Diversification	0.65	0.43	231	240	90%	100%	1,457	117	76	1.55
Case ABD-2	Canal, Management & 10%	0.65	0.43	231	240	99%	100%	1,556	217	114	1.90
Case D-3	only 15% Diversification	0.36	0.24	397	378	83%	100%	1,271	-69	22	-3.18
Case AD-3	Management & 15% Div.	0.36	0.24	397	378	94%	100%	1,378	39	85	0.46
Case BD-3	Canal & 15% Diversification	0.65	0.43	220	235	87%	100%	1,310	-30	74	-0.40
Case ABD-3	Canal, Management & 15%	0.65	0.43	220	235	98%	100%	1,417	78	106	0.73
Case D-4	only 20% Diversification	0.36	0.24	379	378	85%	100%	1,244	-96	22	-4.45
Case AD-4	Management & 20% Div.	0.36	0.24	379	378	96%	100%	1,345	5	75	0.07
Case BD-4	Canal & 20% Diversification	0.65	0.43	210	221	93%	100%	1,317	-22	73	-0.31
Case ABD-4	Canal, Management & 20%	0.65	0.43	210	221	100%	100%	1,382	42	104	0.40

Table H.3.4 Summary of Case Study Result (2/3)

Canal Code	Name of Canal	Command Area (ha)	Canal Length (km)
C10	Phangyul	91	16

Case	Improvement Item	Irrigation Efficiency		Maximum W.R. (l/s)	Canal Capacity (l/s)	Production Ratio		Net Output	Expected (1000 Nu)		B/C Ratio
		Paddy	Upland			Summer	Winter		Benefit	Cost	
Case O	Present Condition	0.36	0.24	255	240	38%	51%	421			
Case A	only Management	0.36	0.24	255	240	42%	71%	508	86	52	1.67
Case B	only Canal	0.65	0.43	142	149	51%	76%	587	166	150	1.11
Case AB	Canal & Management	0.65	0.43	142	149	57%	98%	694	272	187	1.46
Case C	only Water source	0.36	0.24	255	240	46%	69%	531	110	164	0.67
Case AC	Management & Water source	0.36	0.24	255	240	53%	95%	656	235	223	1.05
Case BC	Canal & Water source	0.65	0.43	142	149	59%	95%	699	278	314	0.89
Case ABC	Management, Canal & W.S	0.65	0.43	142	149	72%	100%	808	387	351	1.10
Case D-1	only 5% Diversification	0.36	0.24	243	240	39%	51%	424	3	20	0.15
Case AD-1	Management & 5% Div.	0.36	0.24	243	240	43%	72%	513	92	72	1.28
Case BD-1	Canal & 5% Diversification	0.65	0.43	135	143	52%	77%	591	170	162	1.05
Case ABD-1	Canal, Management & 5%	0.65	0.43	135	143	59%	98%	702	280	218	1.28
Case D-2	only 10% Diversification	0.36	0.24	232	240	39%	51%	420	-1	20	-0.07
Case AD-2	Management & 10% Div.	0.36	0.24	232	240	49%	76%	562	141	72	1.96
Case BD-2	Canal & 10% Diversification	0.65	0.43	129	136	53%	77%	593	171	155	1.11
Case ABD-2	Canal, Management & 10%	0.65	0.43	129	136	60%	98%	702	281	208	1.35
Case D-3	only 15% Diversification	0.36	0.24	220	240	40%	51%	394	-28	20	-1.37
Case AD-3	Management & 15% Div.	0.36	0.24	220	240	46%	72%	491	70	72	0.97
Case BD-3	Canal & 15% Diversification	0.65	0.43	122	130	53%	77%	549	127	150	0.85
Case ABD-3	Canal, Management & 15%	0.65	0.43	122	130	63%	99%	674	252	202	1.25
Case D-4	only 20% Diversification	0.36	0.24	209	240	41%	51%	385	-36	20	-1.77
Case AD-4	Management & 20% Div.	0.36	0.24	209	240	47%	72%	481	60	64	0.93
Case BD-4	Canal & 20% Diversification	0.65	0.43	116	124	56%	77%	548	126	147	0.86
Case ABD-4	Canal, Management & 20%	0.65	0.43	116	124	63%	99%	652	230	197	1.17
Case CD-2	Water source & 10% Div.	0.36	0.24	232	240	49%	70%	544	123	184	0.67
Case ACD-2	Management, W.S & 10% Div	0.36	0.24	232	240	62%	95%	707	286	243	1.18
Case BCD-2	Canal, W. source & 10% Div.	0.65	0.43	129	136	56%	96%	668	247	334	0.74
Case ABCD-2	W.M., Canal, W.S & 10% Div.	0.65	0.43	129	136	76%	100%	820	399	371	1.07

Table H.3.4 Summary of Case Study Result (3/3)

Canal Code	Name of Canal	Command Area (ha)	Canal Length (km)
C9	Bajo Canal	143	15

Case E Applying Double Paddy Cropping

Case	Improvement Item	Irrigation Efficiency		Maximum W.R. (l/s)	Canal Capacity (l/s)	Estimated Production Ratio					Net Production Value (1000 Nu.)	Expected (1000 Nu)		B/C Ratio	Paddy Product. (t)
		Paddy	Upland			Summer	Winter	1st Paddy	2nd Paddy	Winter		Benefit	Net Cost		
Case O	Present Condition	0.36	0.24	452	378	77%	100%	-	-	-	1,340				338
Case A	only Management	0.36	0.24	452	378	87%	100%	-	-	-	1,454	114	63	1.81	381
Case B	only Canal	0.65	0.43	251	261	87%	100%	-	-	-	1,454	114	60	1.90	381
Case AB	Canal & Management	0.65	0.43	251	261	97%	100%	-	-	-	1,568	228	97	2.34	425
Case E-1	only 20% Double Paddy C.	0.36	0.24	434	378	82%	100%	92%	100%	100%	1,408	68	33	2.09	441
Case AE-1	Management & 20% D.P.C	0.36	0.24	434	378	92%	100%	95%	100%	100%	1,502	162	66	2.44	480
Case BE-1	Canal & 20% D.P.C.	0.65	0.43	234	240	87%	100%	95%	100%	100%	1,454	114	57	1.99	461
Case ABE-1	Canal, Management & 20%	0.65	0.43	234	240	97%	100%	98%	100%	100%	1,550	210	81	2.59	501
Case E-2	only 40% Double Paddy C.	0.36	0.24	416	378	87%	100%	95%	100%	100%	1,458	118	55	2.16	522
Case AE-2	Management & 40% D.P.C	0.36	0.24	416	378	97%	100%	98%	100%	100%	1,532	192	69	2.79	555
Case BE-2	Canal & 40% D.P.C.	0.65	0.43	210	210	87%	100%	95%	100%	100%	1,458	118	53	2.21	522
Case ABE-2	Canal, Management & 40%	0.65	0.43	210	210	97%	100%	98%	100%	100%	1,532	192	69	2.81	555
Case E-3	only 60% Double Paddy C.	0.36	0.24	397	378	92%	98%	95%	100%	100%	1,476	136	66	2.08	591
Case AE-3	Management & 60% D.P.C	0.36	0.24	397	378	100%	100%	100%	100%	100%	1,528	188	69	2.70	617
Case BE-3	Canal & 60% D.P.C.	0.65	0.43	186	190	87%	95%	89%	99%	100%	1,436	96	43	2.25	568
Case ABE-3	Canal, Management & 60%	0.65	0.43	186	190	97%	100%	98%	100%	100%	1,514	174	65	2.69	610
Case E-4	only 100% Double Paddy C.	0.36	0.24	379	378	98%	93%	91%	99%	100%	1,396	56	77	0.74	665
Case AE-4	Management & 100% D.P.C	0.36	0.24	379	378	100%	99%	98%	100%	100%	1,424	84	71	1.19	695
Case BE-4	Canal & 100% D.P.C.	0.65	0.43	205	210	97%	92%	90%	98%	100%	1,392	52	53	0.97	660
Case ABE-4	Canal, Management & 100%	0.65	0.43	205	210	100%	99%	97%	100%	100%	1,422	82	69	1.18	692