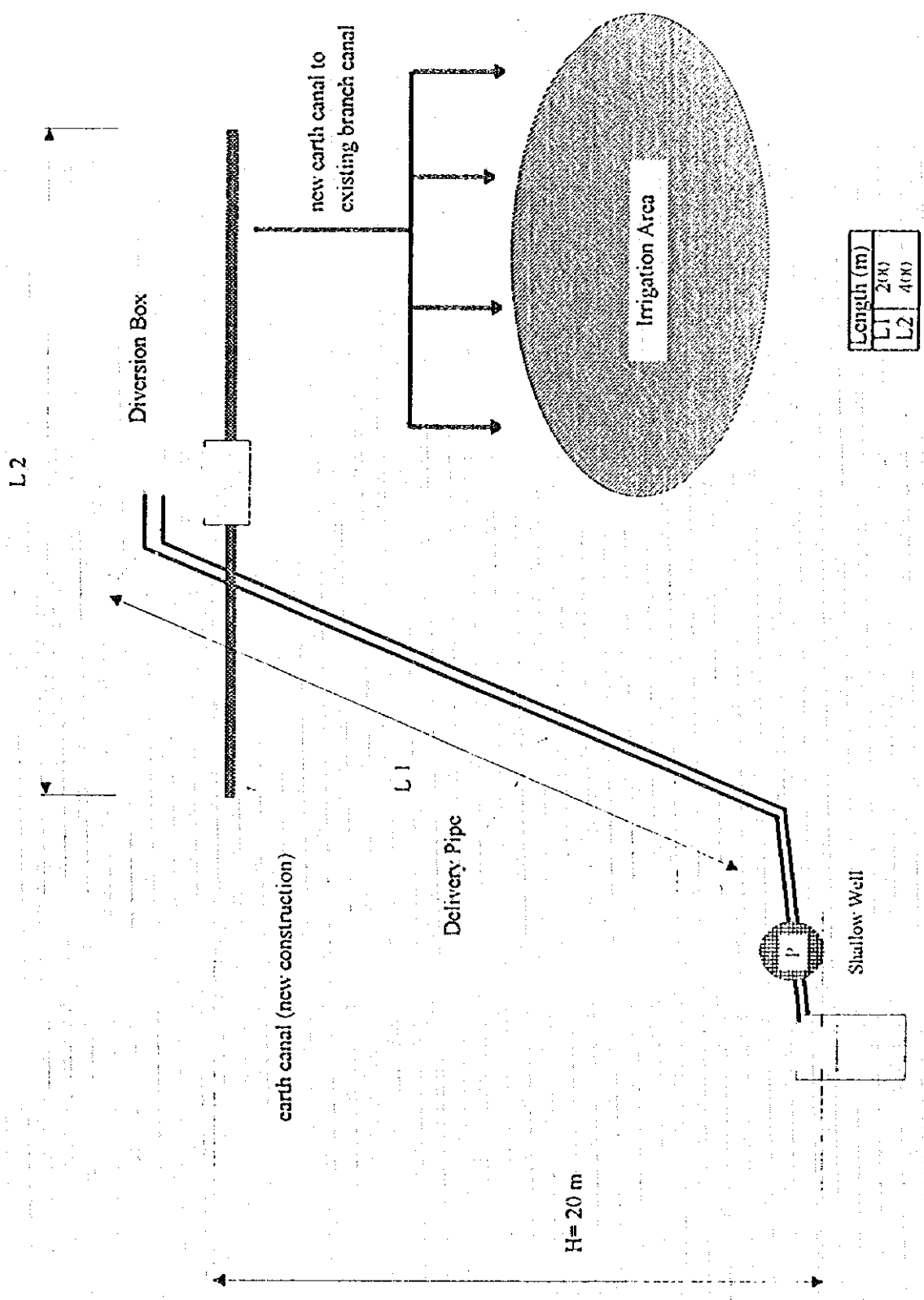


# (11) Preliminary Design of Shallow Well System General Idea of Shallow Well System

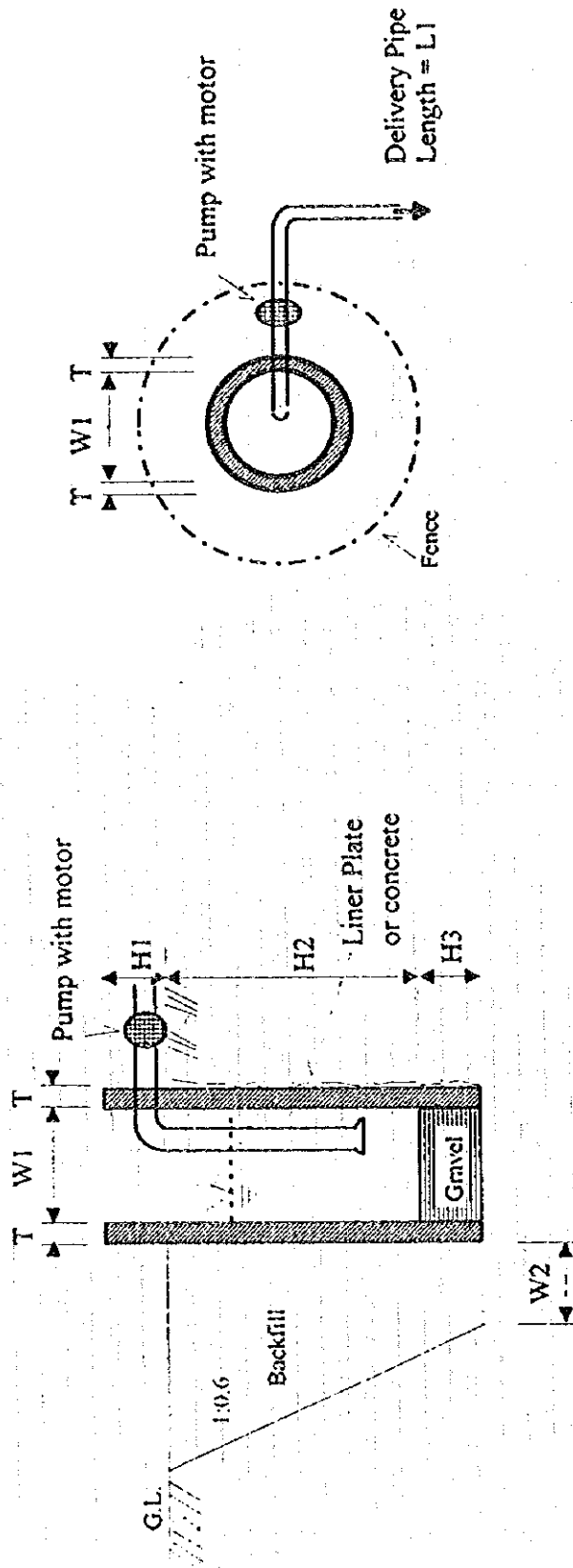


# Structure of Shallow Well System (1/2)

## Shallow Well

Section

Plan



Dimensions (m)

Shallow Wells							
	W1	W2	H1	H2	H3	Pumping Capacity (l/s)	Material of side wall
Type 1	3.50	1.00	1.00	6.00	1.00	6	Liner Plate d=3.5 m
Type 2	1.00	1.00	1.00	6.00	1.00	6	Concrete pipe d=1.0 m
Length of Delivery Pipe	L1			200			



## BQ of Shallow Well System (1/2)

### Shallow Well Type 1

Description	Unit	Quantity	Equations
<b>Civil Works</b>			
Excavation (machine)	m <sup>3</sup>	614.0	$3.14 * ((W1/2 - W2)^2 - (W1/2 - W2 - 0.6 * (H2 - H3))^2) * (H2 - H3)$ (Shallow well)
Excavation (manual)	m <sup>3</sup>	1.6	$A5 * A6 * (H11 + H12 + H13)$ (Diversion Box)
Total	m <sup>3</sup>	1.6	
Wet Masonry	m <sup>3</sup>	1.5	$A5 * A6 * H14 - (A2^2 - A3) * (A2^2 - A3) * (H10 - H11) + 2 * A1 * A3 * A10$ (Diversion Box)
Backfill (machine)	m <sup>3</sup>	538.7	$3.14 * ((W1/2 - W2)^2 - (W1/2 - W2 - 0.6 * (H2 - H3))^2) * (H2 - H3)$ $- (W1/2 - T)^2 * 3.14 * (H2 - H3)$ (Shallow well)
Gravel foundation	m <sup>3</sup>	9.6	$3.14 * (W1/2)^2 * H3$ (Shallow well)
	m <sup>3</sup>	0.3	$A5 * A6 * H13$ (Diversion Box)
Total	m <sup>3</sup>	9.9	
Gravel surfacing	m <sup>2</sup>	1.0	$(HC1 * 2 + HC3) * HC4$ (Diversion Box)
Delivery pipe works	m	200.0	L1
Earth canal construction	m	400.0	L2
Rental fee for Crane	day	6.0	preparation 3days, operation 3days
Liner Plate Unit	Unit	1.0	d = 3.5 m height = 8 m
<b>Power supply facility (for electric pump)</b>			
Electric facility	unit	1.0	distribution line 100m, sub-station, miscellaneous works
<b>Pumping facilities</b>			
Pump facility	Unit	1.0	Volute Pump with motor discharge 15 l/sec. total head 20 m

## BQ of Shallow Well System (2/2)

### Shallow Well Type 2

Description	Unit	Quantity	Equations
<b>Civil Works</b>			
Excavation (machine)	m <sup>3</sup>	381.8	$3.14 * ((W1/2 - W2) * 2 - (W1/2 - W2 - 0.6 * (H2 - H3)) * 2) * (H2 - H3)$ (Shallow well)
Excavation (manual)	m <sup>3</sup>	1.6	$A5 * A6 * (H11 + H12 + H13)$ (Diversion Box)
Total	m <sup>3</sup>	1.6	
Concrete pipe placing	m	8.0	$H1 + H2 + H3$ (Shallow well)
Wet Masonry	m <sup>3</sup>	1.5	$A5 * A6 * H14 - (A2 * 2 - A3) * (A2 * 2 - A3) * (H10 - H11) - 2 * A1 * A3 * A10$ (Diversion Box)
Backfill (machine)	m <sup>3</sup>	371.0	$3.14 * ((W1/2 - W2) * 2 - (W1/2 - W2 - 0.6 * (H2 - H3)) * 2) * (H2 - H3)$ $- (W1/2 - T) * 2 * 3.14 * (H2 - H3)$ (Shallow well)
Gravel foundation	m <sup>3</sup>	0.8	$3.14 * (W1/2)^2 * H3$ (Shallow well)
	m <sup>3</sup>	0.3	$A5 * A6 * H13$ (Diversion Box)
Total	m <sup>3</sup>	1.1	
Gravel surfacing	m <sup>2</sup>	1.0	$(HC1 * 2 + HC3) * HC4$ (Diversion Box)
Delivery pipe works	m	200.0	L1
Earth canal construction	m	400.0	L2
Rental fee for Crane	day	6.0	preparation 3days. operation 3days
<b>Power supply facility (for electric pump)</b>			
Electric facility	unit	1.0	distribution line 100m. sub-station. miscellaneous works
<b>Pumping facilities</b>			
Pump facility	Unit	1.0	Volute Pump with motor discharge 15 l/sec. total head 20 m

## Cost Estimation of Shallow Well System (1/4)

(1) Type 1-E, Liner Plate d= 3.5m, with electric motor pump, 15 liter/sec					
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Civil Works</b>					
Excavation (machine)	m3	614.0	116.40	71,465	
Excavation (manual)	m3	1.6	30.61	50	
Wet Masonry	m3	1.5	917.08	1,379	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m		1,685.09	0	
Backfill (machine)	m3	538.7	81.5		
Backfill (manual)	m3		15.38	0	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96		
Gravel foundation	m3	9.9	206.60	2,043	
Earth Canal construction	m	400.0	24.00	9,600	
Temporary Drain Work	day	15.0	1909.00	28,635	
Liner Plate	Unit	1.0	558,000.00	558,000	
Delivery pipe works	m	200.0	327.16	65,432	d= 100 mm
Others	L.S			147,321	20% of direct cost
Transportation	L.S			110,491	15% of direct cost
Temporary works for civil work	L.S	1.00		49,721	5 % of Civil work cost
Rental fee for Crane	day	6.0	8,000.00	48,000	liner plate inst.
<b>Sub-total</b>	(Civil works & Temporary works etc.)			1,092,136	for 20 years
<b>(for 1 year)</b>				(54,607)	for 1 year
<b>Electric distribution facilities</b>					
Electric facility	unit	1.0	268,000	268,000	
Others	L.S			53,600	20% of direct cost
Transportation	L.S			40,200	15% of direct cost
<b>Sub-total</b>				361,800	for 20 years
<b>(for 1 year)</b>				(18,090)	for 1 year
<b>Pumping facilities</b>					
Pump facility (electric)	set	1.0	429,000.00	429,000	
Installation	L.S			85,800	20% of direct cost
Transportation	L.S			64,350	15% of direct cost
<b>Sub-total</b>				579,150	for 10 years
<b>(for 1 year)</b>				(57,915)	for 1 year
<b>Total (construction cost)</b>				2,033,086	

## Cost Estimation of Shallow Well System (2/4)

(2) Type 2-E, Concrete pipe d= 1.0m, with electric motor pump, 15 liter/sec					
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Civil Works</b>					
Excavation (machine)	m3	381.8	116.40	44,441	
Excavation (manual)	m3	1.6	30.61	190	
Wet Masonry	m3	1.5	917.08	46	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m	8.0	1685.09	13,481	
Concrete pipe	m	8.0	3,000	24,000	
Backfill (machine)	m3	371.0	81.5	30,238	
Backfill (manual)	m3		15.38	0	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96	368	
Gravel foundation	m3	1.1	206.6	218	
Earth Canal	m	400.0	24	9,600	
Temporary Drain Work	day	15.0	1909.00	28,635	
Delivery pipe works	m	200.0	327.16	65,432	d= 100 mm
Others	L.S			43,330	20% of direct cost
Transportation	L.S			32,497	15% of direct cost
Temporary works for civil work	L.S	1.00		14,624	5 % of Civil work cost
Rental fee for Crane	day	6.0	8,000.00	48,000	concrete pipe inst.
Sub-total	(Civil works & Temporary works, etc.)			355,100	for 20 years
(for 1 year)				(17,755)	for 1 year
<b>Electric distribution facilities</b>					
Electric facility	unit	1.0	268,000	268,000	
Others	L.S			53,600	20% of direct cost
Transportation	L.S			40,200	15% of direct cost
Sub-total				361,800	for 20 years
(for 1 year)				(18,090)	for 1 year
<b>Pumping facilities</b>					
Pump facility (electric)	set	1.0	429,000.00	429,000	
Installation	L.S			85,800	20% of direct cost
Transportation	L.S			64,350	15% of direct cost
Sub-total				579,150	for 10 years
(for 1 year)				(57,915)	for 1 year
<b>Total</b>				1,296,050	

### Cost Estimation of Shallow Well System (3/4)

(3) Type 2-D, Liner Plate d= 3.5m, with diesel motor pump, 15 liter/sec					
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Civil Works</b>					
Excavation (machine)	m3	614.0	116.40	71,465	
Excavation (manual)	m3	1.6	30.61	50	
Wet Masonry	m3	1.5	917.08	1,379	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m		1,685.09	0	
Backfill (machine)	m3	538.7	81.50		
Backfill (manual)	m3		15.38	0	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96		
Gravel foundation	m3	9.9	206.60	2,043	
Earth Canal construction	m	400.0	24.00	9,600	
Temporary Drain Work	day	15.0	1909.00	28,635	
Liner Plate	Unit	1.0	558,000.00	558,000	
Delivery pipe works	m	200.0	327.16	65,432	d= 100 mm
Others	L.S			147,321	20% of direct cost
Transportation	L.S			110,491	15% of direct cost
Temporary works for civil work	L.S	1.00		49,721	5 % of Civil work cost
Rental fee for Crane	day	6.0	8,000.00	48,000	liner plate inst.
Sub-total	(Civil works & Temporary works, etc.)			1,092,136	for 20 years
(for 1 year)				(54,607)	for 1 year
<b>Pumping facilities</b>					
Pump facility (diesel)	set	1.0	299,000.00	299,000	
Installation	L.S			59,800	20% of direct cost
Transportation	L.S			44,850	15% of direct cost
Sub-total				403,650	
(for 1 year)				(40,365)	for 1 year
<b>Total</b>				<b>1,495,786</b>	



### Cost Estimation of Shallow Well System (4/4)

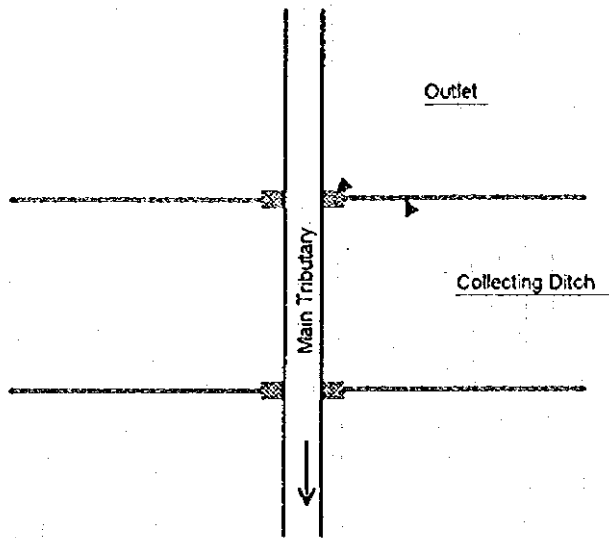
(4) Type 3-D, Concrete pipe d= 1.0m, with diesel motor pump, 15 liter/sec					
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Civil Works</b>					
Excavation (machine)	m3	381.8	116.40	44,441	
Excavation (manual)	m3	1.6	30.61	190	
Wet Masonry	m3	1.5	917.08	46	
Dry Masonry	m3		313.39	0	
Concrete pipe placing	m	8.0	1,685.09	13,481	
Concrete pipe	m	8.0	3,000	24,000	
Backfill (machine)	m3	371.0	81.50	30,238	
Backfill (manual)	m3		15.38	0	
Sand fill	m3		264.44	0	
Gravel surfacing	m2	1.0	367.96	368	
Gravel foundation	m3	1.1	206.60	218	
Earth Canal	m	400.0	24.00	9,600	
Temporary Drain Work	day	15.0	1,909.00	28,635	
Delivery pipe works	m	200.0	327.16	65,432	d= 100 mm
Others	L.S			43,330	20% of direct cost
Transportation	L.S			32,497	15% of direct cost
Temporary works for civil work	L.S	1.00		14,624	5 % of Civil work cost
Rental fee for Crane	day	6.0	8,000.00	48,000	concrete pipe inst.
Sub-total	(Civil works & Temporary works, etc.)			355,100	for 20 years
(for 1 year)				(17,755)	for 1 year
<b>Pumping facilities</b>					
Pump facility (diesel)	set	1.0	299,000.00	299,000	
Installation	L.S			59,800	20% of direct cost
Transportation	L.S			44,850	15% of direct cost
Sub-total				403,650	for 10 years
(for 1 year)				(40,365)	for 1 year
<b>Total</b>				<b>758,750</b>	

## O/M Cost of Shallow Well System

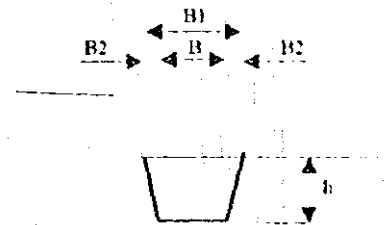
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Annual O/M Cost for Shallow Well System with Electric Pump</b>					
Electric charge ( $Q = 11 \text{ kWh} \times 24 \text{ hrs} \times 30 \text{ days}$ )	kWh	7,920.0	0.5	3,960	for 1 month use year
Spare parts cost etc. ( $A = 5\% \times \text{Pump price}$ )		0.05	130,000	6,500	for 1 year/pump
Technical support (1 person for a Sub-area)		1.0	1,200	1,200	for 1 year/ Sub-area
<b>Annual O/M Cost for Shallow Well System with Diesel Pump</b>					
Diesel consumption ( $Q = 11 \text{ kWh} \times 24 \text{ hrs} \times 30 \text{ days} \times 0.3 \text{ liter/kWh}$ )	liter	2,376	7.83	18,604	for 1 month use year
Spare parts cost etc. ( $A = 5\% \times \text{Pump price}$ )		0.05	130,000	6,500	for 1 year/pump
Technical support (1 person for a Sub-area)		1.0	1,200	1,200	for 1 year/ Sub-area

## (12) Preliminary Design of Drainage System General Idea and Structures

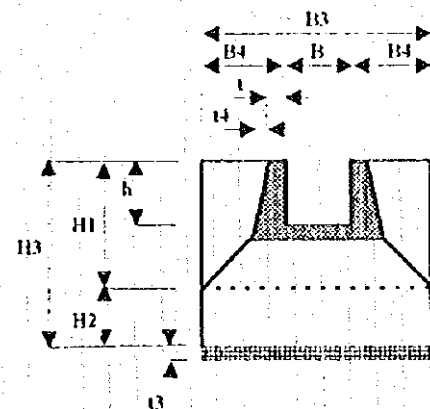
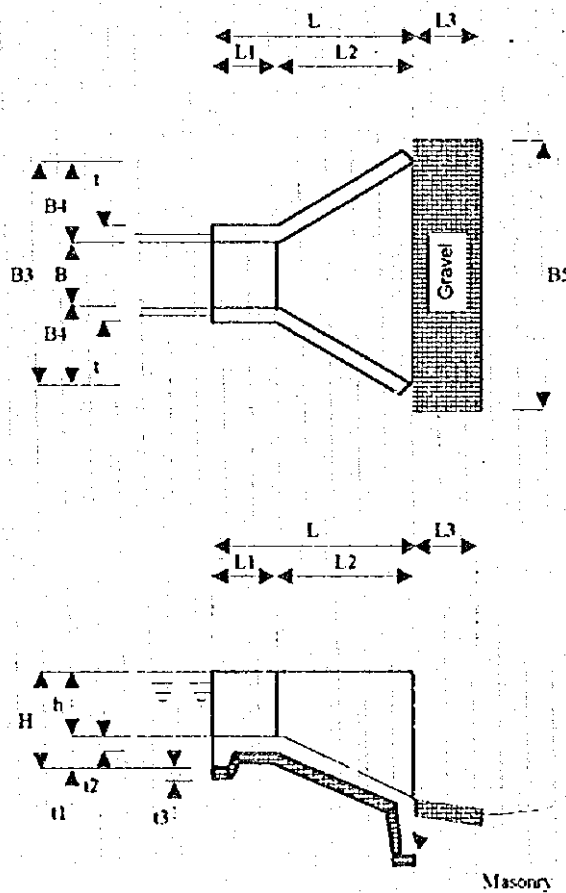
### General Idea of Drainage Improvement



### Section of Collecting Ditch



### Structure of Outlet



# BQ of Drainage System (1/4)

Drainage System	Type	D1	Maximum Design Discharge				270 l/s		
Dimensions (m)									
B	B1	B2	B3	B4	B5	H	H1	H2	H3
0.50	0.70	0.10	5.30	2.40	5.50	1.10	3.00	0.60	3.60
h	L	L1	L2	L3	t	t1	t2	t3	t4
0.60	3.00	0.60	2.40	0.60	0.30	0.50	0.30	0.15	0.10
Item	Unit	Quantity	Equation						
Collecting Ditch (for 1m)									
Excavation	m <sup>3</sup>	0.360	(B1+B)/2*h						
Outlet (for 1unit)									
Excavation	m <sup>3</sup>	0.858	L1*H*(B+t <sup>2</sup> +t <sup>2</sup> )						
	m <sup>3</sup>	4.080	((B+t <sup>2</sup> +t <sup>2</sup> )+B1*H1)/2*L2						
	m <sup>3</sup>	0.495	L3*B5*t3						
	m <sup>3</sup>	1.305	((B+t <sup>2</sup> +t <sup>2</sup> )*L1+((B+t <sup>2</sup> +t <sup>2</sup> )+B3)/2*L2)*t3						
Total	m <sup>3</sup>	6.738							
Backfill	m <sup>3</sup>	0.027	t4*(h+t2)/2*L1						
	m <sup>3</sup>	0.670	(t4*(h+t2)/2+t4*(H1+t2)/2)*(L2 <sup>2</sup> +(B4-t) <sup>2</sup> ) <sup>1/2</sup>						
Total	m <sup>3</sup>	0.697							
Wet Masonry	m <sup>3</sup>	0.216	((B+t <sup>2</sup> +t4)/2*(h+t1)-B*h)*L1						
	m <sup>3</sup>	25.056	((B+t <sup>2</sup> +t4)*(h+t2)+(B3+t <sup>2</sup> +t4)*(H1+t2))/2*L2						
	m <sup>3</sup>	-19.440	-(B*h+B3*H1)/2*L2						
	m <sup>3</sup>	0.636	H2*(t+t4)/2*B3						
	m <sup>3</sup>	0.032	(t1-t2)*(t+t4)/2*(B+t)						
Total	m <sup>3</sup>	6.500							
Gravel	m <sup>3</sup>	0.495	L3*B5*t3						
	m <sup>3</sup>	1.305	((B+t <sup>2</sup> +t3 <sup>2</sup> )*L1+((B+t <sup>2</sup> +t4 <sup>2</sup> )+B3)/2*L2)*t3						
Total	m <sup>3</sup>	1.800							

# BQ of Drainage System (2/4)

Drainage System	Type	D2	Maximum Design Discharge			200 l/s			
Dimensions (m)									
B	B1	B2	B3	B4	B5	H	H1	H2	H3
0.40	0.60	0.10	4.40	2.00	4.60	1.10	2.50	0.50	3.00
h	L	L1	L2	L3	t	t1	t2	t3	t4
0.60	2.50	0.50	2.00	0.60	0.30	0.50	0.30	0.15	0.10
Item	Unit	Quantity	Equation						
Collecting Ditch (for 1m)									
Excavation	m <sup>3</sup>	0.300	(B1+B)/2*h						
Outlet (for 1unit)									
Excavation	m <sup>3</sup>	0.660	L1*H*(B+t*2+t4*2)						
	m <sup>3</sup>	2.700	((B+t*2+t4*2)+B1*H1)/2*L2						
	m <sup>3</sup>	0.414	L3*B5*t3						
	m <sup>3</sup>	0.930	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	4.704							
Backfill	m <sup>3</sup>	0.023	t4*(h+t2)/2*L1						
	m <sup>3</sup>	0.486	(t4*(h+t2)/2+t4*(H1+t2)/2)*(L2 <sup>2</sup> +(B4-t) <sup>2</sup> ) <sup>0.5</sup>						
Total	m <sup>3</sup>	0.508							
Wet Masonry	m <sup>3</sup>	0.183	((B+t*2+t4)/2*(h+t1)-B*h)*L1						
	m <sup>3</sup>	15.270	((B+t*2+t4)*(h+t2)+(B3+t*2+t4)*(H1+t2))/2*L2						
	m <sup>3</sup>	-11.240	-(B*h+B3*H1)/2*L2						
	m <sup>3</sup>	0.440	H2*(t+t4)/2*B3						
	m <sup>3</sup>	0.028	(t1-t2)*(t+t4)/2*(B+t)						
Total	m <sup>3</sup>	4.681							
Gravel	m <sup>3</sup>	0.414	L3*B5*t3						
	m <sup>3</sup>	0.930	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	1.344							

### BQ of Drainage System (3/4)

Drainage System	Type	D3	Maximum Design Discharge				110 l/s		
Dimensions (m)									
B	B1	B2	B3	B4	B5	H	H1	H2	H3
0.30	0.50	0.10	3.50	1.60	3.70	1.20	2.00	0.40	2.40
h	L	L1	L2	L3	t	t1	t2	t3	t4
0.70	2.00	0.40	1.60	0.60	0.30	0.50	0.30	0.15	0.10
Item	Unit	Quantity	Equation						
Collecting Ditch (for 1m)									
Excavation	m <sup>3</sup>	0.280	(B1+B)/2*h						
Outlet (for 1unit)									
Excavation	m <sup>3</sup>	0.528	L1*H*(B+t*2+t4*2)						
	m <sup>3</sup>	1.680	((B+t*2+t4*2)+B1*H1)/2*L2						
	m <sup>3</sup>	0.333	L3*B5*t3						
	m <sup>3</sup>	0.618	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	3.159							
Backfill	m <sup>3</sup>	0.020	t4*(h+t2)/2*L1						
	m <sup>3</sup>	0.340	(t4*(h+t2)/2+t4*(H1+t2)/2)*(L2 <sup>2</sup> +(B4-t) <sup>2</sup> ) <sup>0.5</sup>						
Total	m <sup>3</sup>	0.360							
Wet Masonry	m <sup>3</sup>	0.156	((B+t*2+t4)/2*(h+t1)-B*h)*L1						
	m <sup>3</sup>	8.528	((B+t*2+t4)*(h+t2)+(B3+t*2+t4)*(H1+t2))/2*L2						
	m <sup>3</sup>	-5.768	-(B*h+B3*H1)/2*L2						
	m <sup>3</sup>	0.280	H2*(t+t4)/2*B3						
	m <sup>3</sup>	0.024	(t1-t2)*(t+t4)/2*(B+t)						
Total	m <sup>3</sup>	3.220							
Gravel	m <sup>3</sup>	0.333	L3*B5*t3						
	m <sup>3</sup>	0.618	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	0.951							

# BQ of Drainage System (4/4)

Drainage System	Type	D4	Maximum Design Discharge				SS l/s		
Dimensions (m)									
B	B1	B2	B3	B4	B5	H	H1	H2	H3
0.30	0.50	0.10	2.70	1.20	2.90	0.80	1.50	0.30	1.80
h	L	L1	L2	L3	t	t1	t2	t3	t4
0.30	1.50	0.30	1.20	0.60	0.30	0.50	0.30	0.15	0.10
Item	Unit	Quantity	Equation						
Collecting Ditch (for 1m)									
Excavation	m <sup>3</sup>	0.120	(B1+B)/2*h						
Outlet (for 1unit)									
Excavation	m <sup>3</sup>	0.264	L1*H*(B+t*2+t4*2)						
	m <sup>3</sup>	1.110	((B+t*2+t4*2)+B1*H1)/2*L2						
	m <sup>3</sup>	0.261	L3*B5*t3						
	m <sup>3</sup>	0.392	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	2.027							
Backfill	m <sup>3</sup>	0.009	t4*(h+t2)/2*L1						
	m <sup>3</sup>	0.180	(t4*(h+t2)/2+t4*(H1+t2)/2)*(L2 <sup>2</sup> +(B4-t) <sup>2</sup> ) <sup>0.5</sup>						
Total	m <sup>3</sup>	0.189							
Wet Masonry	m <sup>3</sup>	0.093	((B+t*2+t4)/2*(h+t1)-B*h)*L1						
	m <sup>3</sup>	4.032	((B+t*2+t4)*(h+t2)+(B3+t*2+t4)*(H1+t2))/2*L2						
	m <sup>3</sup>	-2.484	-(B*h+B3*H1)/2*L2						
	m <sup>3</sup>	0.162	H2*(t+t4)/2*B3						
	m <sup>3</sup>	0.024	(t1-t2)*(t+t4)/2*(B+t)						
Total	m <sup>3</sup>	1.827							
Gravel	m <sup>3</sup>	0.261	L3*B5*t3						
	m <sup>3</sup>	0.392	((B+t*2+t4*2)*L1+((B+t*2+t4*2)+B3)/2*L2)*t3						
Total	m <sup>3</sup>	0.653							

## Unit Construction Cost of Drainage Facilities

Drainage System		D1	Maximum Design Discharge		270	l/s
Description	Unit	Quantity	Unit Price	Amount	Remark	
<b>Collecting Ditch (for 1m)</b>						
Excavation	m <sup>3</sup>	0.360	30.61	11.02	E-1	
Others	L S			2.20		
Total				13.22	for 1m	
<b>Outlet (for 1unit)</b>						
Excavation	m <sup>3</sup>	6.738	30.61	206	E-1	
Backfill	m <sup>3</sup>	0.697	15.38	11	E-3	
Wet Masonry	m <sup>3</sup>	6.500	917.08	5,961	C-6	
Gravel	m <sup>3</sup>	1.800	206.60	372	E-9	
Others	L S			1,315		
Transportation	L S			1,184		
Total				9,075		
Drainage System		D2	Maximum Design Discharge		200	l/s
Description	Unit	Quantity	Unit Price	Amount	Remark	
<b>Collecting Ditch (for 1m)</b>						
Excavation	m <sup>3</sup>	0.300	30.61	9.18	E-1	
Others	L S			1.84		
Total				11.02	for 1m	
<b>Outlet (for 1unit)</b>						
Excavation	m <sup>3</sup>	4.704	30.61	144	E-1	
Backfill	m <sup>3</sup>	0.508	15.38	8	E-3	
Wet Masonry	m <sup>3</sup>	4.681	917.08	4,292	C-6	
Gravel	m <sup>3</sup>	1.344	206.60	278	E-9	
Others	L S			949		
Transportation	L S			854		
Total				6,547		
Drainage System		D3	Maximum Design Discharge		110	l/s
Description	Unit	Quantity	Unit Price	Amount	Remark	
<b>Collecting Ditch (for 1m)</b>						
Excavation	m <sup>3</sup>	0.280	30.61	8.57	E-1	
Others	L S			1.71		
Total				10.28	for 1m	
<b>Outlet (for 1unit)</b>						
Excavation	m <sup>3</sup>	3.159	30.61	97	E-1	
Backfill	m <sup>3</sup>	0.360	15.38	6	E-3	
Wet Masonry	m <sup>3</sup>	3.220	917.08	2,953	C-6	
Gravel	m <sup>3</sup>	0.951	206.60	196	E-9	
Others	L S			654		
Transportation	L S			589		
Total				4,516		
Drainage System		D4	Maximum Design Discharge		55	l/s
Description	Unit	Quantity	Unit Price	Amount	Remark	
<b>Collecting Ditch (for 1m)</b>						
Excavation	m <sup>3</sup>	0.120	30.61	3.67	E-1	
Others	L S			0.73		
Total				4.41	for 1m	
<b>Outlet (for 1unit)</b>						
Excavation	m <sup>3</sup>	2.027	30.61	62	E-1	
Backfill	m <sup>3</sup>	0.189	15.38	3	E-3	
Wet Masonry	m <sup>3</sup>	1.827	917.08	1,676	C-6	
Gravel	m <sup>3</sup>	0.653	206.60	135	E-9	
Others	L S			377		
Transportation	L S			339		
Total				2,600		



## 4. COST ESTIMATION FOR THE IMPROVEMENT PLAN



THE NATIONAL ARCHIVES  
COLLECTIONS DIVISION  
1000



**(1) Project Cost Estimation for Improvement of Water Management (1/2)**

<b>Canal Code</b> <b>C1</b>	<b>Name</b> <b>Upper Lobeysa</b>		<b>Command Area (ha)</b> <b>61</b>	<b>Canal Length (km)</b> <b>7.1</b>	<b>Design Discharge (l/s)</b> <b>180</b>
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	32	7,403	236,911	Type 5
O/M Cost	km	7.1	36,000	255,600	for 20 years
Miscellaneous	L.S.			98,502	for 20 years
<b>Total</b>				<b>591,013</b>	
<b>for 1 years</b>				<b>29,551</b>	
<b>Canal Code</b> <b>C2</b>	<b>Name</b> <b>Lower Lobeysa</b>		<b>Command Area (ha)</b> <b>300</b>	<b>Canal Length (km)</b> <b>8.1</b>	<b>Design Discharge (l/s)</b> <b>860</b>
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	52	16,703	868,565	Type 1
O/M Cost	km	8.1	36,000	291,600	for 20 years
Miscellaneous	L.S.			232,033	for 20 years
<b>Total</b>				<b>1,392,198</b>	
<b>for 1 years</b>				<b>69,610</b>	
<b>Canal Code</b> <b>C9</b>	<b>Name</b> <b>Bajo Canal</b>		<b>Command Area (ha)</b> <b>143</b>	<b>Canal Length (km)</b> <b>15</b>	<b>Design Discharge (l/s)</b> <b>380</b>
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	35	14,532	508,637	Type 3
O/M Cost	km	15	36,000	540,000	for 20 years
Miscellaneous	L.S.			209,727	for 20 years
<b>Total</b>				<b>1,258,364</b>	
<b>for 1 years</b>				<b>62,918</b>	
<b>Canal Code</b> <b>C10</b>	<b>Name</b> <b>Phangul</b>		<b>Command Area (ha)</b> <b>91</b>	<b>Canal Length (km)</b> <b>16</b>	<b>Design Discharge (l/s)</b> <b>240</b>
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	32	8,924	285,578	Type 4
O/M Cost	km	16	36,000	576,000	for 20 years
Miscellaneous	L.S.			172,316	for 20 years
<b>Total</b>				<b>1,033,894</b>	
<b>for 1 years</b>				<b>51,695</b>	
<b>Canal Code</b> <b>C15</b>	<b>Name</b> <b>Gemka</b>		<b>Command Area (ha)</b> <b>15</b>	<b>Canal Length (km)</b> <b>3.5</b>	<b>Design Discharge (l/s)</b> <b>40</b>
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	12	3,893	46,710	Type 7
O/M Cost	km	3.5	36,000	126,000	for 20 years
Miscellaneous	L.S.			34,542	for 20 years
<b>Total</b>				<b>207,252</b>	
<b>for 1 years</b>				<b>10,363</b>	

**(1) Project Cost Estimation for Improvement of Water Management (2/2)**

<b>Canal Code</b> C18	<b>Name</b> Nalakha		<b>Command Area (ha)</b> 29	<b>Canal Length (km)</b> 3.9	<b>Design Discharge (l/s)</b> 80
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	20	5,939	118,778	Type 6
O/M Cost	km	3.9	36,000	140,400	for 20 years
Miscellaneous	L.S.			51,836	for 20 years
<b>Total</b>				<b>311,014</b>	
<b>for 1 years</b>				<b>15,551</b>	
<b>Canal Code</b> C19	<b>Name</b> Rutekha		<b>Command Area (ha)</b> 40	<b>Canal Length (km)</b> 2.2	<b>Design Discharge (l/s)</b> 110
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	28	7,403	207,297	Type 5
O/M Cost	km	2.2	36,000	79,200	for 20 years
Miscellaneous	L.S.			57,299	for 20 years
<b>Total</b>				<b>343,796</b>	
<b>for 1 years</b>				<b>17,190</b>	
<b>Canal Code</b> C20	<b>Name</b> Maphekha		<b>Command Area (ha)</b> 27	<b>Canal Length (km)</b> 2.2	<b>Design Discharge (l/s)</b> 70
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	25	5,939	148,473	Type 6
O/M Cost	km	2.2	36,000	79,200	for 20 years
Miscellaneous	L.S.			45,535	for 20 years
<b>Total</b>				<b>273,207</b>	
<b>for 1 years</b>				<b>13,660</b>	
<b>Canal Code</b> C21	<b>Name</b> Naykoyuwa		<b>Command Area (ha)</b> 24	<b>Canal Length (km)</b> 1.7	<b>Design Discharge (l/s)</b> 65
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	20	5,939	118,778	Type 6
O/M Cost	km	1.7	36,000	61,200	for 20 years
Miscellaneous	L.S.			35,996	for 20 years
<b>Total</b>				<b>215,974</b>	
<b>for 1 years</b>				<b>10,799</b>	
<b>Canal Code</b> C22	<b>Name</b> Maphekha		<b>Command Area (ha)</b> 28	<b>Canal Length (km)</b> 1.1	<b>Design Discharge (l/s)</b> 75
<b>Description</b>	<b>unit</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>Amount</b>	<b>Remark</b>
Diversion Works	unit	16	5,939	95,023	Type 6
O/M Cost	km	1.1	36,000	39,600	for 20 years
Miscellaneous	L.S.			26,925	for 20 years
<b>Total</b>				<b>161,547</b>	
<b>for 1 years</b>				<b>8,077</b>	

## (2) Cost Estimation of Canal Improvement Plan (1/5)

Canal Code C1	Name Upper Lobeyssa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 110	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M3	m	245.00	1,117.99	273,907	
Earth Lining Canal Type S3	m	6,855.00	50.30	344,821	
Chute Type C5	m (high)	8.80	2,044.60	17,988	
Chute Type C6	m (high)	66.41	1,926.52	127,937	
Offtake Works Type O5	unit	32.00	7,403.47	236,911	
Sub Total				1,001,564	
<b>Protection Works</b>					
Protection Work Type PA4	m	7.00	7,998.44	55,989	
Protection Work Type PB4	m	25.00	2,545.30	63,633	
Protection Work Type PC4	m	25.00	6,715.60	167,890	
Protection Work Type PD4	m	133.20	1,347.38	179,471	
Steel Flume Aqueduct Type SFA4	m	3.60	4,949.40	17,818	
Pipe Canal Type PPC3	m	5.00	1,460.09	7,300	
Sub Total				492,101	
<b>Total Construction Cost</b>				1,493,665	
<b>OM Cost</b>	L.S.			29,873	for 20 years
<b>Total Project Cost</b>				1,523,538	for 20 years
(for 1 year)				(76,177)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.50	62,939.39	31,281	V.index=39.8
OM	km	7.10	1,800.00	12,780	
<b>Total</b>				44,061	
<b>Net Cost for Canal Improvement</b>				32,116	for 1 year

Canal Code C2	Name Lower Lobeyssa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 540	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M1	m	871.00	1,874.86	1,633,006	
Earth Lining Canal Type S1	m	7,229.00	86.18	622,995	
Chute Type C1	m (high)	99.55	2,976.54	296,319	
Chute Type C3	m (high)	40.97	2,471.24	101,257	
Offtake Works Type O1	unit	52.00	16,703.18	868,565	
Sub Total				3,522,142	
<b>Protection Works</b>					
Protection Work Type PA1	m	21.50	9,413.03	202,380	
Protection Work Type PB1	m	23.10	3,959.89	91,473	
Protection Work Type PC1	m	23.10	7,476.15	172,699	
Protection Work Type PD1	m	149.40	2,141.68	319,968	
Steel Flume Aqueduct Type SFA1	m	5.80	9,780.60	56,727	
Pipe Canal Type PPC	m	9.62	2,828.14	27,207	
Sub Total				870,454	
<b>Total Construction Cost</b>				4,392,596	
<b>OM Cost</b>	L.S.			87,852	for 20 years
<b>Total Project Cost</b>				4,480,448	for 20 years
(for 1 year)				(224,022)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.58	62,939.39	36,706	V.index=39.9
OM	km	8.10	1,800.00	14,580	
<b>Total</b>				51,286	
<b>Net Cost for Canal Improvement</b>				172,736	for 1 year

## (2) Cost Estimation of Canal Improvement Plan (2/5)

Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (ls) 260	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M2	m	614.00	1,403.29	861,621	
Earth Lining Canal Type S2	m	14,386.00	57.70	830,098	
Chute Type C2	m (height)	18.00	2,555.94	46,007	
Chute Type C4	m (height)	162.00	2,193.29	355,313	
Offtake Works Type 4	unit	35.00	11,118.22	389,138	
Sub Total				2,482,177	
<b>Protection Works</b>					
Protection Work Type PA2	m	235.90	8,616.00	2,032,515	
Protection Work Type PB2	m	39.90	3,162.86	126,198	
Protection Work Type PC2	m	39.90	7,083.65	282,638	
Protection Work Type PD2	m	176.70	1,728.93	305,502	
Steel Flume Aqueduct Type SFA2	m	39.24	7,602.77	298,333	
Pipe Canal Type PPC2	m	82.18	1,907.79	156,782	
Sub Total				3,201,968	
<b>Total Construction Cost</b>				5,684,145	
<b>OM Cost</b>				113,683	for 20 years
<b>Total Project Cost</b>				5,797,828	for 20 years
<b>(for 1 year)</b>				(289,891)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	3.23	62,939.39	202,980	V.index=46.8
OM	km	15.00	1,800.00	27,000	
<b>Total</b>				229,980	
<b>Net Cost for Canal Improvement</b>				59,912	for 1 year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (ls) 150	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M3	m	1,230.00	1,117.99	1,375,124	
Earth Lining Canal Type S5	m	8,325.00	44.10	367,170	
Earth Lining Canal Type S8	m	5,889.00	49.64	292,353	
Chute Type C5	m (high)	36.76	2,044.60	75,159	
Chute Type C10	m (high)	244.63	2,061.90	504,403	
Offtake Works Type 5	unit	35.00	9,223.49	322,822	
Sub Total				2,937,031	
<b>Protection Works</b>					
Protection Work Type PA3	m	102.20	10,216.00	1,044,075	
Protection Work Type PB3	m	72.30	3,423.00	247,483	
Protection Work Type PC3	m	72.30	8,474.00	612,670	
Protection Work Type PD3	m	227.20	1,795.00	407,824	
Steel Flume Aqueduct Type SFA3	m	23.66	6,346.00	150,146	
Pipe Canal Type PPC3	m	42.06	1,819.00	76,507	
Sub Total				2,538,706	
<b>Total Construction Cost</b>				5,475,737	
<b>OM Cost</b>				109,515	for 20 years
<b>Total Project Cost</b>				5,585,252	for 20 years
<b>(for 1 year)</b>				(279,263)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	1.60	62,939.39	100,703	V.index=41.3
OM	km	16.00	1,800.00	28,800	
<b>Total</b>				129,503	
<b>Net Cost for Canal Improvement</b>				149,760	for 1 year

## (2) Cost Estimation of Canal Improvement Plan (3/5)

Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 26	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M7	m	296.00	810.97	240.047	
Earth Lining Canal Type S9	m	3,204.00	26.87	86.087	
Chute Type C9	m (high)	7.39	1,827.30	13.496	
Chute Type C12	m (high)	15.72	1,728.08	27.161	
Offtake Works Type 08	unit	12.00	3,178.45	38.141	
Sub Total				404.931	
<b>Protection Works</b>					
Protection Work Type PA8	m	5.10	7,473.67	38.116	
Protection Work Type PB8	m	17.90	2,020.53	36.167	
Protection Work Type PC8	m	17.90	6,414.33	114.817	
Protection Work Type PD8	m	102.10	1,032.62	105.430	
Steel Flume Aqueduct Type SFA7	m	4.60	3,865.80	17.783	
Pipe Canal Type PPC6	m	5.28	569.68	3.008	
Sub Total				315.320	
Total Construction Cost				720.252	
OM Cost	L.S.			14.405	for 20 years
Total Project Cost				734.657	for 20 years
(for 1 year)				(36.733)	for 1 year
Present OM Cost					for 1 year
Renovation	km	0.46	62,939.39	28.637	V index=44.5
OM	km	3.50	1,800.00	6.300	
Total				34.937	
Net Cost for Canal Improvement				1.795	for 1 year

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 48	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M6	m	335.00	910.01	304.852	
Earth Lining Canal Type S7	m	3,565.00	28.92	103.103	
Chute Type C8	m (high)	1.67	1,997.09	3.345	
Chute Type C9	m (high)	10.64	1,827.30	19.451	
Offtake Works Type 07	unit	20.00	3,892.50	77.850	
Sub Total				508.601	
<b>Protection Works</b>					
Protection Work Type PA7	m	38.70	7,664.44	296.614	
Protection Work Type PB7	m	15.10	2,211.30	33.391	
Protection Work Type PC7	m	15.10	6,500.29	98.154	
Protection Work Type PD7	m	90.70	1,125.32	102.067	
Steel Flume Aqueduct Type SFA6	m	9.68	3,865.80	37.421	
Pipe Canal Type PPC5	m	15.92	788.10	12.546	
Sub Total				580.193	
Total Construction Cost				1,088.794	
OM Cost	L.S.			21.776	for 20 years
Total Project Cost				1,110.570	for 20 years
(for 1 year)				(55.528)	for 1 year
Present OM Cost					for 1 year
Renovation	km	0.70	62,939.39	44.183	V index=44.5
OM	km	3.90	1,800.00	7.020	
Total				51.203	
Net Cost for Canal Improvement				4.325	for 1 year

## (2) Cost Estimation of Canal Improvement Plan (4/5)

Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 65	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M4	m	269.00	949.24	255,346	
Earth Lining Canal Type S6	m	1,931.00	36.30	70,098	
Chute Type C6	m (high)	16.88	1,926.52	32,513	
Chute Type C8	m (high)	47.42	1,997.09	94,707	
Offtake Works Type O6	unit	28.00	5,938.91	166,289	
Sub Total				618,952	
<b>Protection Works</b>					
Protection Work Type PA5	m	-	7,733.12	0	
Protection Work Type PB5	m	1.50	2,279.98	3,420	
Protection Work Type PC5	m	1.50	6,564.75	9,847	
Protection Work Type PD5	m	35.80	1,189.79	42,594	
Steel Flume Aqueduct Type SFA4	m	0.30	4,949.40	1,485	
Pipe Canal Type PPC4	m	0.30	958.99	288	
Sub Total				57,634	
<b>Total Construction Cost</b>				676,586	
<b>OM Cost</b>	L.S.			13,532	for 20 years
<b>Total Project Cost</b>				690,118	for 20 years
(for 1 year)				(34,506)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.02	62,939.39	1,385	V index=36.16
OM	km	2.20	1,800.00	3,960	
<b>Total</b>				5,345	
<b>Net Cost for Canal Improvement</b>				29,161	for 1 year

Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 45	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M4	m	257.00	949.24	243,955	
Earth Lining Canal Type S7	m	1,913.00	28.92	56,193	
Chute Type C6	m (high)	38.43	1,926.52	74,041	
Chute Type C8	m (high)	91.85	1,997.09	183,437	
Offtake Works Type O6	unit	25.00	5,938.91	148,473	
Sub Total				706,098	
<b>Protection Works</b>					
Protection Work Type PA5	m	-	7,733.12	0	
Protection Work Type PB5	m	2.10	2,279.98	4,788	
Protection Work Type PC5	m	2.10	6,564.75	13,786	
Protection Work Type PD5	m	34.60	1,189.79	41,167	
Steel Flume Aqueduct Type SFA5	m	0.42	4,811.62	2,021	
Pipe Canal Type PPC5	m	0.42	788.10	331	
Sub Total				62,092	
<b>Total Construction Cost</b>				768,191	
<b>OM Cost</b>	L.S.			15,364	for 20 years
<b>Total Project Cost</b>				783,554	for 20 years
(for 1 year)				(39,178)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.02	62,939.39	1,385	V index=36.28
OM	km	2.20	1,800.00	3,960	
<b>Total</b>				5,345	
<b>Net Cost for Canal Improvement</b>				33,833	for 1 year



## (2) Cost Estimation of Canal Improvement Plan (5/5)

Canal Code C21	Name Naykovuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M6	m	209.00	910.01	190.191	
Earth Lining Canal Type S7	m	1,491.00	28.92	43.121	
Chute Type C8	m (high)	17.10	1,997.09	34.141	
Chute Type C9	m (high)	58.01	1,827.30	106.004	
Offtake Works Type O7	unit	20.00	3,892.50	77.850	
Sub Total				451.307	
<b>Protection Works</b>					
Protection Work Type PA5	m	-	7,733.12	0	
Protection Work Type PB5	m	-	2,279.98	0	
Protection Work Type PC5	m	-	6,564.75	0	
Protection Work Type PD7	m	6.60	1,125.32	7.427	
Steel Flume Aqueduct Type SFA5	m	-	4,811.62	0	
Pipe Canal Type PPC5	m	-	788.10	0	
Sub Total				7.427	
<b>Total Construction Cost</b>				458.734	
<b>OM Cost</b>	L.S.			9.175	for 20 years
<b>Total Project Cost</b>				467.909	for 20 years
(for 1 year)				(23.395)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.01	62,939.39	535	V index=30.8
OM	km	1.70	1,800.00	3,060	
<b>Total</b>				3,595	
<b>Net Cost for Canal Improvement</b>				19.800	for 1 year

Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 50	
Description	Unit	Quantity	Unit Price	Amount	Remarks
<b>Canal Works</b>					
Masonry Canal Type M4	m	124.00	949.24	117.706	
Earth Lining Canal Type S7	m	976.00	28.92	28.227	
Chute Type C8	m (high)	29.17	1,997.09	58.251	
Chute Type C9	m (high)	197.25	1,827.30	360.427	
Offtake Works Type O7	unit	16.00	3,892.50	62.280	
Sub Total				626.891	
<b>Protection Works</b>					
Protection Work Type PA5	m	-	7,733.12	0	
Protection Work Type PB5	m	-	2,279.98	0	
Protection Work Type PC5	m	-	6,564.75	0	
Protection Work Type PD7	m	14.20	1,125.32	15.980	
Steel Flume Aqueduct Type SFA5	m	-	4,811.62	0	
Pipe Canal Type PPC5	m	-	788.10	0	
Sub Total				15.980	
<b>Total Construction Cost</b>				642.871	
<b>OM Cost</b>	L.S.			12.857	for 20 years
<b>Total Project Cost</b>				655.728	for 20 years
(for 1 year)				(32.786)	for 1 year
<b>Present OM Cost</b>					for 1 year
Renovation	km	0.01	62,939.39	345	V index=36.6
OM	km	1.10	1,800.00	1,980	
<b>Total</b>				2,326	
<b>Net Cost for Canal Improvement</b>				30.460	for 1 year

**(3) Project Cost for Improvement of  
New Water Source for Phanguyl Canal (Nu.)**

Description	Unit	Quantity	Unit Price	Amount	Remarks
Intake Works	Unit	1	106,395	106,395	
Canal Type. M7	m	900	1,010	909,000	
Canal Type. S9	m	1,350	33	44,550	
Others	LS			317,983	
Protection Works	LS			964,550	
Sub-Total				2,342,478	
O/M Cost	LS			936,991	for 20 years
Total Project Cost				3,279,470	for 20 years
(for 1 year)				(163,973)	for 1 year

#### (4) Cost Estimation For Diversification (1/2)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	7.10	18,000	127,800	for 20 years
Miscellaneous	L.S.			76,680	for 20 years
Sub Total				204,480	
(for 1 years)				10,224	
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	8.10	18,000	145,800	for 20 years
Miscellaneous	L.S.			87,480	for 20 years
Sub Total				233,280	
(for 1 years)				11,664	
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	15.00	18,000	270,000	for 20 years
Miscellaneous	L.S.			162,000	for 20 years
Sub Total				432,000	
(for 1 years)				21,600	
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	16.00	18,000	288,000	for 20 years
Miscellaneous	L.S.			115,200	for 20 years
Sub Total				403,200	
(for 1 years)				20,160	
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.50	18,000	63,000	for 20 years
Miscellaneous	L.S.			25,200	for 20 years
Sub Total				88,200	
(for 1 years)				4,410	

#### (4) Cost Estimation For Diversification (2/2)

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.90	18,000	70,200	for 20 years
Miscellaneous	L.S.			28,080	for 20 years
Sub Total				98,280	
(for 1 years)				4,914	
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	18,000	39,600	for 20 years
Miscellaneous	L.S.			15,840	for 20 years
Sub Total				55,440	
(for 1 years)				2,772	
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	18,000	39,600	for 20 years
Miscellaneous	L.S.			15,840	for 20 years
Sub Total				55,440	
(for 1 years)				2,772	
Canal Code C21	Name Navkovuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.70	18,000	30,600	for 20 years
Miscellaneous	L.S.			12,240	for 20 years
Sub Total				42,840	
(for 1 years)				2,142	
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s)	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.10	18,000	19,800	for 20 years
Miscellaneous	L.S.			7,920	for 20 years
Sub Total				27,720	
(for 1 years)				1,386	

**(5) Cost Estimation for Applying Double Paddy Cropping (1/8)  
(20%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 177	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	7.10	27,000	191,700	for 20 years
Miscellaneous	L.S.			115,020	for 20 years
Sub Total				306,720	
(for 1 years)				15,336	
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 871	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	8.10	27,000	218,700	for 20 years
Miscellaneous	L.S.			131,220	for 20 years
Sub Total				349,920	
(for 1 years)				17,496	
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 421	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	15.00	27,000	405,000	for 20 years
Miscellaneous	L.S.			247,050	for 20 years
Sub Total				652,050	
(for 1 years)				32,603	
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 236	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	16.00	27,000	432,000	for 20 years
Miscellaneous	L.S.			172,800	for 20 years
Sub Total				604,800	
(for 1 years)				30,240	
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 41	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.50	27,000	94,500	for 20 years
Miscellaneous	L.S.			37,800	for 20 years
Sub Total				132,300	
(for 1 years)				6,615	

**(5) Cost Estimation for Applying Double Paddy Cropping (2/8)  
(20%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 77	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.90	27,000	105,300	for 20 years
Miscellaneous	L.S.			42,120	for 20 years
Sub Total				147,420	
(for 1 years)				7,371	
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 105	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	27,000	59,400	for 20 years
Miscellaneous	L.S.			23,760	for 20 years
Sub Total				83,160	
(for 1 years)				4,158	
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 71	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	27,000	59,400	for 20 years
Miscellaneous	L.S.			23,760	for 20 years
Sub Total				83,160	
(for 1 years)				4,158	
Canal Code C21	Name Navkoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 61	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.70	27,000	45,900	for 20 years
Miscellaneous	L.S.			18,360	for 20 years
Sub Total				64,260	
(for 1 years)				3,213	
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 74	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.10	27,000	29,700	for 20 years
Miscellaneous	L.S.			11,880	for 20 years
Sub Total				41,580	
(for 1 years)				2,079	

**(5) Cost Estimation for Double Paddy Cropping (3/8)  
(40%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 159	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	7.10	45,000	319,500	for 20 years
Miscellaneous	L.S.			191,700	for 20 years
Sub Total				511,200	
(for 1 years)				25,560	
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 782	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	8.10	45,000	364,500	for 20 years
Miscellaneous	L.S.			218,700	for 20 years
Sub Total				583,200	
(for 1 years)				29,160	
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 377	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	15.00	45,000	675,000	for 20 years
Miscellaneous	L.S.			418,500	for 20 years
Sub Total				1,093,500	
(for 1 years)				54,675	
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 211	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	16.00	45,000	720,000	for 20 years
Miscellaneous	L.S.			288,000	for 20 years
Sub Total				1,008,000	
(for 1 years)				50,400	
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.50	45,000	157,500	for 20 years
Miscellaneous	L.S.			63,000	for 20 years
Sub Total				220,500	
(for 1 years)				11,025	

**(6) Cost Estimation for Double Paddy Cropping (4/8)  
(40%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 69	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.90	45,000	175,500	for 20 years
Miscellaneous	L.S.			70,200	for 20 years
Sub Total				245,700	
(for 1 years)				12,285	
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 93	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	45,000	99,000	for 20 years
Miscellaneous	L.S.			39,600	for 20 years
Sub Total				138,600	
(for 1 years)				6,930	
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 64	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	45,000	99,000	for 20 years
Miscellaneous	L.S.			39,600	for 20 years
Sub Total				138,600	
(for 1 years)				6,930	
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 54	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.70	45,000	76,500	for 20 years
Miscellaneous	L.S.			30,600	for 20 years
Sub Total				107,100	
(for 1 years)				5,355	
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 66	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.10	45,000	49,500	for 20 years
Miscellaneous	L.S.			19,800	for 20 years
Sub Total				69,300	
(for 1 years)				3,465	



**(5) Cost Estimation for Double Paddy Cropping (5/8)**  
**(60%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 141	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	7.10	54,000	383,400	for 20 years
Miscellaneous	L.S.			230,040	for 20 years
Sub Total				613,440	
(for 1 years)				30,672	
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 692	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	8.10	54,000	437,400	for 20 years
Miscellaneous	L.S.			262,440	for 20 years
Sub Total				699,840	
(for 1 years)				34,992	
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 334	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	15.00	54,000	810,000	for 20 years
Miscellaneous	L.S.			502,200	for 20 years
Sub Total				1,312,200	
(for 1 years)				65,610	
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 185	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	16.00	54,000	864,000	for 20 years
Miscellaneous	L.S.			345,600	for 20 years
Sub Total				1,209,600	
(for 1 years)				60,480	
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 32	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.50	54,000	189,000	for 20 years
Miscellaneous	L.S.			75,600	for 20 years
Sub Total				264,600	
(for 1 years)				13,230	

**(5) Cost Estimation for Double Paddy Cropping (6/8)**  
**(60%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 60	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.90	54,000	210,600	for 20 years
Miscellaneous	L.S.			84,240	for 20 years
Sub Total				294,840	
(for 1 years)				14,742	
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 82	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	54,000	118,800	for 20 years
Miscellaneous	L.S.			47,520	for 20 years
Sub Total				166,320	
(for 1 years)				8,316	
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 56	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	54,000	118,800	for 20 years
Miscellaneous	L.S.			47,520	for 20 years
Sub Total				166,320	
(for 1 years)				8,316	
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 47	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.70	54,000	91,800	for 20 years
Miscellaneous	L.S.			36,720	for 20 years
Sub Total				128,520	
(for 1 years)				6,426	
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 58	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.10	54,000	59,400	for 20 years
Miscellaneous	L.S.			23,760	for 20 years
Sub Total				83,160	
(for 1 years)				4,158	

**(5) Cost Estimation for Double Paddy Cropping (7/8)  
(100%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 156	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	7.10	63,000	447,300	for 20 years
Miscellaneous	L.S.			268,380	for 20 years
Sub Total				715,680	
(for 1 years)				35,784	
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 764	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	8.10	63,000	510,300	for 20 years
Miscellaneous	L.S.			306,180	for 20 years
Sub Total				816,480	
(for 1 years)				40,824	
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 370	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	15.00	63,000	945,000	for 20 years
Miscellaneous	L.S.			385,900	for 20 years
Sub Total				1,330,900	
(for 1 years)				76,545	
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 208	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	16.00	63,000	1,008,000	for 20 years
Miscellaneous	L.S.			403,200	for 20 years
Sub Total				1,411,200	
(for 1 years)				70,560	
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.50	63,000	220,500	for 20 years
Miscellaneous	L.S.			88,200	for 20 years
Sub Total				308,700	
(for 1 years)				15,435	

**(5) Cost Estimation for Double Paddy Cropping (8/8)**  
**(100%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 66	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	3.90	63,000	245,700	for 20 years
Miscellaneous	L.S.			98,280	for 20 years
Sub Total				343,980	
(for 1 years)				17,199	
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 92	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	63,000	138,600	for 20 years
Miscellaneous	L.S.			55,440	for 20 years
Sub Total				194,040	
(for 1 years)				9,702	
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 63	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	2.20	63,000	138,600	for 20 years
Miscellaneous	L.S.			55,440	for 20 years
Sub Total				194,040	
(for 1 years)				9,702	
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 53	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.70	63,000	107,100	for 20 years
Miscellaneous	L.S.			42,840	for 20 years
Sub Total				149,940	
(for 1 years)				7,497	
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 65	
Description	Unit	Quantity	Unit Price	Amount	Remarks
O/M Cost	km	1.10	63,000	69,300	for 20 years
Miscellaneous	L.S.			27,720	for 20 years
Sub Total				97,020	
(for 1 years)				4,851	

**(6) Cost Estimation for Combination of Improvement Plan  
(Case AB 1/2)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 110	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				32.116	for 1 year
Water Management Cost					
OM Cost	km	7.1	1.800	12.780	
Miscellaneous	L.S.			4.925	
Sub Total				17.705	
Net Cost for Case AB				49.821	for 1 year

Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 540	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				172.736	for 1 year
Water Management Cost					
OM Cost	km	8.1	1.800	14.580	
Miscellaneous	L.S.			11.602	
Sub Total				26.182	
Net Cost for Case AB				198.918	for 1 year

Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 260	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				59.912	for 1 year
Water Management Cost					
OM Cost	km	15	1.800	27.000	
Miscellaneous	L.S.			10.486	
Sub Total				37.486	
Net Cost for Case AB				97.398	for 1 year

Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 150	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				149.760	for 1 year
Water Management Cost					
OM Cost	km	16	1.800	28.800	
Miscellaneous	L.S.			8.616	
Sub Total				37.416	
Net Cost for Case AB				187.175	for 1 year

Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 26	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				4.325	for 1 year
Water Management Cost					
OM Cost	km	3.5	1.800	6.300	
Miscellaneous	L.S.			1.727	
Sub Total				8.027	
Net Cost for Case AB				12.352	for 1 year

**(6) Cost Estimation for Combination of Improvement Plan  
(Case AB 2/2)**

Canal Code C18	Name Nalakhha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 48	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				4.325	for 1 year
Water Management Cost					
OM Cost	km	3.9	1.800	7.020	
Miscellaneous	L.S.			2.592	
Sub Total				9.612	
Net Cost for Case AB				13.937	for 1 year
Canal Code C19	Name Rutckha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 65	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				29.161	for 1 year
Water Management Cost					
OM Cost	km	2.2	1.800	3.960	
Miscellaneous	L.S.			2.865	
Sub Total				6.825	
Net Cost for Case AB				35.986	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 45	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				33.833	for 1 year
Water Management Cost					
OM Cost	km	2.2	1.800	3.960	
Miscellaneous	L.S.			2.277	
Sub Total				6.237	
Net Cost for Case AB				40.070	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				19.800	for 1 year
Water Management Cost					
OM Cost	km	1.7	1.800	3.060	
Miscellaneous	L.S.			1.800	
Sub Total				4.860	
Net Cost for Case AB				24.660	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 50	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				30.460	for 1 year
Water Management Cost					
OM Cost	km	1.1	1.800	1.980	
Miscellaneous	L.S.			1.346	
Sub Total				3.326	
Net Cost for Case AB				33.786	for 1 year

**Cost Estimation for Combination of Improvement Plan  
(Case AC, AB, ABC)**

Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 18.2
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Case AC	Design Discharge (l/s)		240		
Description	unit	Quantity	Unit Price	Amount	Remark
Net Project Cost for Water Management Improvement	km	18.2	3,231	58,803	for one year
Net Project Cost for Water Source Improvement	L.S.			163,973	for one year
Ney Project Cost for Case AC				222,776	for one year

Case BC	Design Discharge (l/s)		150		
Description	unit	Quantity	Unit Price	Amount	Remark
Net Project Cost for Canal Improvement	L.S.			149,760	for one year
Net Project Cost for Water Source Improvement	L.S.			163,973	for one year
Ney Project Cost for Case AC				313,733	for one year

Case ABC	Design Discharge (l/s)		150		
Description	unit	Quantity	Unit Price	Amount	Remark
Net Project Cost for Water Management Improvement	L.S.			37,416	for one year
Net Project Cost for Canal Improvement	L.S.			149,760	for one year
Net Project Cost for Water Source Improvement	L.S.			163,973	for one year
Ney Project Cost for Case AC				351,149	for one year

**Cost Estimation for Combination of Improvement Plan  
(Case AD 1/2)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			29.551	for one years
Net Project Cost for Diversification	L.S.			10.224	for one years
Net Project Cost for Case AD				39.775	for one years
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			69.610	for one years
Net Project Cost for Diversification	L.S.			11.664	for one years
Net Project Cost for Case AD				81.274	for one years
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			62.918	for one years
Net Project Cost for Diversification	L.S.			21.600	for one years
Net Project Cost for Case AD				84.518	for one years
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			51.695	for one years
Net Project Cost for Diversification	L.S.			20.160	for one years
Net Project Cost for Case AD				71.855	for one years
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			10.363	for one years
Net Project Cost for Diversification	L.S.			4.410	for one years
Net Project Cost for Case AD				14.773	for one years



**Cost Estimation for Combination of Improvement Plan  
(Case AD 2/2)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			15,551	for one years
Net Project Cost for Diversification	L.S.			4,914	for one years
Net Project Cost for Case AD				20,465	for one years
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			17,190	for one years
Net Project Cost for Diversification	L.S.			2,772	for one years
Net Project Cost for Case AD				19,962	for one years
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			13,660	for one years
Net Project Cost for Diversification	L.S.			2,772	for one years
Net Project Cost for Case AD				16,432	for one years
Canal Code C21	Name Naykovuwa	Command Area (ha) 24	Canal Length (km) 1.7		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			10,799	for one years
Net Project Cost for Diversification	L.S.			2,142	for one years
Net Project Cost for Case AD				12,941	for one years
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1		
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Project Cost for Water Management	L.S.			8,077	for one years
Net Project Cost for Diversification	L.S.			1,386	for one years
Net Project Cost for Case AD				9,463	for one years

**Cost Estimation for Combination of Improvement Plan (Case BD 1/8)**  
**(5%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 105	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			30,510	for one year
Net Cost for Diversification	L.S.			10,224	for one year
Net Project Cost for Case BD-1	L.S.			40,734	for one year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 513	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			164,099	for one year
Net Cost for Diversification	L.S.			11,664	for one year
Net Project Cost for Case BD-1	L.S.			175,763	for one year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 248	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			56,916	for one year
Net Cost for Diversification	L.S.			21,600	for one year
Net Project Cost for Case BD-1	L.S.			78,516	for one year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 139	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			142,272	for one year
Net Cost for Diversification	L.S.			20,160	for one year
Net Project Cost for Case BD-1	L.S.			162,432	for one year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 24	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			4,109	for one year
Net Cost for Diversification	L.S.			4,410	for one year
Net Project Cost for Case BD-1	L.S.			8,519	for one year

# Cost Estimation for Combination of Improvement Plan (Case BD 2/8)

(5%)

Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)	
C18	Nalakha	29	3.9	45	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			4.109	for one year
Net Cost for Diversification	L.S.			4.914	for one year
Net Project Cost for Case BD-1	L.S.			9.023	for one year
Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)	
C19	Rutekha	40	2.2	62	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			27.703	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-1	L.S.			30.475	for one year
Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)	
C20	Maphekha	27	2.2	42	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			32.141	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-1	L.S.			34.913	for one year
Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)	
C21	Naykovuwa	24	1.7	36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			18.810	for one year
Net Cost for Diversification	L.S.			2.142	for one year
Net Project Cost for Case BD-1	L.S.			20.952	for one year
Canal Code	Name	Command Area (ha)	Canal Length (km)	Design Discharge (l/s)	
C22	Rumina	28	1.1	44	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			28.937	for one year
Net Cost for Diversification	L.S.			1,386	for one year
Net Project Cost for Case BD-1	L.S.			30,323	for one year

**Cost Estimation for Combination of Improvement Plan (Case BD 3/8)**  
**(10%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 100	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			28.904	for one year
Net Cost for Diversification	L.S.			10.224	for one year
Net Project Cost for Case BD-2	L.S.			39.128	for one year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 492	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			155.463	for one year
Net Cost for Diversification	L.S.			11.664	for one year
Net Project Cost for Case BD-2	L.S.			167.127	for one year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 238	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			53.921	for one year
Net Cost for Diversification	L.S.			21.600	for one year
Net Project Cost for Case BD-2	L.S.			75.521	for one year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 133	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			134.784	for one year
Net Cost for Diversification	L.S.			20.160	for one year
Net Project Cost for Case BD-2	L.S.			154.944	for one year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 23	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3.893	for one year
Net Cost for Diversification	L.S.			4.410	for one year
Net Project Cost for Case BD-2	L.S.			8.303	for one year

**Cost Estimation for Combination of Improvement Plan (Case BD 4/8)**  
**(10%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 43	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3.893	for one year
Net Cost for Diversification	L.S.			4.914	for one year
Net Project Cost for Case BD-2	L.S.			8.807	for one year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 59	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			26.245	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-2	L.S.			29.017	for one year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			30.450	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-2	L.S.			33.222	for one year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 34	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			17.820	for one year
Net Cost for Diversification	L.S.			2.142	for one year
Net Project Cost for Case BD-2	L.S.			19.962	for one year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 42	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			27.414	for one year
Net Cost for Diversification	L.S.			1.386	for one year
Net Project Cost for Case BD-2	L.S.			28.800	for one year

**Cost Estimation for Combination of Improvement Plan (Case BD 5/8)**  
**(15%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 96	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			27.941	for one year
Net Cost for Diversification	L.S.			10.224	for one year
Net Project Cost for Case BD-1	L.S.			38.165	for one year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 471	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			150.280	for one year
Net Cost for Diversification	L.S.			11.664	for one year
Net Project Cost for Case BD-1	L.S.			161.944	for one year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 228	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			52.123	for one year
Net Cost for Diversification	L.S.			21.600	for one year
Net Project Cost for Case BD-1	L.S.			73.723	for one year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 127	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			130.291	for one year
Net Cost for Diversification	L.S.			20.160	for one year
Net Project Cost for Case BD-1	L.S.			150.451	for one year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 22	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3.763	for one year
Net Cost for Diversification	L.S.			4.410	for one year
Net Project Cost for Case BD-1	L.S.			8.173	for one year

**Cost Estimation for Combination of Improvement Plan (Case BD 6/8)**  
**(15%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 41	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3.763	for one year
Net Cost for Diversification	L.S.			4.914	for one year
Net Project Cost for Case BD-1	L.S.			8.677	for one year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 56	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			25.370	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-1	L.S.			28.142	for one year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			29.435	for one year
Net Cost for Diversification	L.S.			2.772	for one year
Net Project Cost for Case BD-1	L.S.			32.207	for one year
Canal Code C21	Name Naykovuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 33	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			17.226	for one year
Net Cost for Diversification	L.S.			2.142	for one year
Net Project Cost for Case BD-1	L.S.			19.368	for one year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			26.500	for one year
Net Cost for Diversification	L.S.			1.386	for one year
Net Project Cost for Case BD-1	L.S.			27.886	for one year

**Cost Estimation for Combination of Improvement Plan (Case BD 7/8)**  
**(20%)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 92	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			27,299	for one year
Net Cost for Diversification	L.S.			10,224	for one year
Net Project Cost for Case BD-1	L.S.			37,523	for one year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 451	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			146,826	for one year
Net Cost for Diversification	L.S.			11,664	for one year
Net Project Cost for Case BD-1	L.S.			158,490	for one year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 218	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			50,925	for one year
Net Cost for Diversification	L.S.			21,600	for one year
Net Project Cost for Case BD-1	L.S.			72,525	for one year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 121	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			127,296	for one year
Net Cost for Diversification	L.S.			20,160	for one year
Net Project Cost for Case BD-1	L.S.			147,456	for one year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 21	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3,676	for one year
Net Cost for Diversification	L.S.			4,410	for one year
Net Project Cost for Case BD-1	L.S.			8,086	for one year



**Cost Estimation for Combination of Improvement Plan (Case BD 8/8)**  
**(20%)**

Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 39	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			3,676	for one year
Net Cost for Diversification	L.S.			4,914	for one year
Net Project Cost for Case BD-1	L.S.			8,590	for one year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 54	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			24,787	for one year
Net Cost for Diversification	L.S.			2,772	for one year
Net Project Cost for Case BD-1	L.S.			27,559	for one year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 37	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			28,758	for one year
Net Cost for Diversification	L.S.			2,772	for one year
Net Project Cost for Case BD-1	L.S.			31,530	for one year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 31	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			16,830	for one year
Net Cost for Diversification	L.S.			2,142	for one year
Net Project Cost for Case BD-1	L.S.			18,972	for one year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement	L.S.			25,891	for one year
Net Cost for Diversification	L.S.			1,386	for one year
Net Project Cost for Case BD-1	L.S.			27,277	for one year

### Cost Estimation for Combination of Improvement Plan (Case AE 1/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 177	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				29,551	
Additional Net Cost for Double Paddy Cropping				1,534	
Net Project Cost for Case AE-1				31,084	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 871	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				69,610	
Additional Net Cost for Double Paddy Cropping				1,750	
Net Project Cost for Case AE-1				71,360	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 421	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				62,918	
Additional Net Cost for Double Paddy Cropping				3,260	
Net Project Cost for Case AE-1				66,178	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 236	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				51,695	
Additional Net Cost for Double Paddy Cropping				3,024	
Net Project Cost for Case AE-1				54,719	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 41	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,363	
Additional Net Cost for Double Paddy Cropping				662	
Net Project Cost for Case AE-1				11,024	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 77	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				15,551	
Additional Net Cost for Double Paddy Cropping				737	
Net Project Cost for Case AE-1				16,288	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 105	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				17,190	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case AE-1				17,606	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 71	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				13,660	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case AE-1				14,076	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 61	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,799	
Additional Net Cost for Double Paddy Cropping				321	
Net Project Cost for Case AE-1				11,120	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 50	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				8,077	
Additional Net Cost for Double Paddy Cropping				208	
Net Project Cost for Case AE-1				8,285	for 1 year

### Cost Estimation for Combination of Improvement Plan (Case AE 2/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 159	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				29,551	
Additional Net Cost for Double Paddy Cropping				2,556	
Net Project Cost for Case AE-2				32,107	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 782	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				69,610	
Additional Net Cost for Double Paddy Cropping				2,916	
Net Project Cost for Case AE-2				72,526	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 377	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				62,918	
Additional Net Cost for Double Paddy Cropping				5,468	
Net Project Cost for Case AE-2				68,386	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 211	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				51,695	
Additional Net Cost for Double Paddy Cropping				5,040	
Net Project Cost for Case AE-2				56,735	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,363	
Additional Net Cost for Double Paddy Cropping				1,103	
Net Project Cost for Case AE-2				11,465	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 69	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				15,551	
Additional Net Cost for Double Paddy Cropping				1,229	
Net Project Cost for Case AE-2				16,779	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 93	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				17,190	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case AE-2				17,883	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 64	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				13,660	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case AE-2				14,353	for 1 year
Canal Code C21	Name Navkoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 54	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,799	
Additional Net Cost for Double Paddy Cropping				536	
Net Project Cost for Case AE-2				11,334	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 66	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				8,077	
Additional Net Cost for Double Paddy Cropping				347	
Net Project Cost for Case AE-2				8,424	for 1 year

### Cost Estimation for Combination of Improvement Plan (Case AE 3/4)

Canal Code C1	Name Upper Lobeyssa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 141	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				29,551	
Additional Net Cost for Double Paddy Cropping				3,067	
Net Project Cost for Case AE-3				32,618	for 1 year
Canal Code C2	Name Lower Lobeyssa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 692	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				69,610	
Additional Net Cost for Double Paddy Cropping				3,499	
Net Project Cost for Case AE-3				73,109	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 334	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				62,918	
Additional Net Cost for Double Paddy Cropping				6,561	
Net Project Cost for Case AE-3				69,479	for 1 year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 185	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				51,695	
Additional Net Cost for Double Paddy Cropping				6,048	
Net Project Cost for Case AE-3				57,743	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 32	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,363	
Additional Net Cost for Double Paddy Cropping				1,323	
Net Project Cost for Case AE-3				11,686	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 60	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				15,551	
Additional Net Cost for Double Paddy Cropping				1,474	
Net Project Cost for Case AE-3				17,025	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 82	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				17,190	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case AE-3				18,021	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 56	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				13,660	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case AE-3				14,492	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 47	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,799	
Additional Net Cost for Double Paddy Cropping				643	
Net Project Cost for Case AE-3				11,441	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 58	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				8,077	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case AE-3				8,493	for 1 year

### Cost Estimation for Combination of Improvement Plan (Case AE 4/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 152	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				29,551	
Additional Net Cost for Double Paddy Cropping				3,578	
Net Project Cost for Case AE-4				33,129	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 764	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				69,610	
Additional Net Cost for Double Paddy Cropping				4,082	
Net Project Cost for Case AE-4				73,692	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 369	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				62,918	
Additional Net Cost for Double Paddy Cropping				7,655	
Net Project Cost for Case AE-4				70,573	for 1 year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 208	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				51,695	
Additional Net Cost for Double Paddy Cropping				7,056	
Net Project Cost for Case AE-4				58,751	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,363	
Additional Net Cost for Double Paddy Cropping				1,544	
Net Project Cost for Case AE-4				11,906	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 66	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				15,551	
Additional Net Cost for Double Paddy Cropping				1,720	
Net Project Cost for Case AE-4				17,271	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 92	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				17,190	
Additional Net Cost for Double Paddy Cropping				970	
Net Project Cost for Case AE-4				18,160	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 63	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				13,660	
Additional Net Cost for Double Paddy Cropping				970	
Net Project Cost for Case AE-4				14,631	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 53	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				10,799	
Additional Net Cost for Double Paddy Cropping				750	
Net Project Cost for Case AE-4				11,548	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 65	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Water Management				8,077	
Additional Net Cost for Double Paddy Cropping				485	
Net Project Cost for Case AE-4				8,562	for 1 year

### Cost Estimation for Combination of Improvement Plan (Case BE 1/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 99	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				28,904	
Additional Net Cost for Double Paddy Cropping				1,534	
Net Project Cost for Case BE-1				30,438	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 484	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				155,463	
Additional Net Cost for Double Paddy Cropping				1,750	
Net Project Cost for Case BE-1				157,212	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 234	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				53,921	
Additional Net Cost for Double Paddy Cropping				3,260	
Net Project Cost for Case BE-1				57,181	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 131	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				134,784	
Additional Net Cost for Double Paddy Cropping				3,024	
Net Project Cost for Case BE-1				137,808	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 23	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,893	
Additional Net Cost for Double Paddy Cropping				662	
Net Project Cost for Case BE-1				4,554	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 43	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,893	
Additional Net Cost for Double Paddy Cropping				737	
Net Project Cost for Case BE-1				4,630	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 58	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				26,245	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case BE-1				26,661	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				30,450	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case BE-1				30,866	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 34	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				17,820	
Additional Net Cost for Double Paddy Cropping				321	
Net Project Cost for Case BE-1				18,141	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 41	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				27,414	
Additional Net Cost for Double Paddy Cropping				208	
Net Project Cost for Case BE-1				27,622	for 1 year

# Cost Estimation for Combination of Improvement Plan (Case BE 2/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 88	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				25,693	
Additional Net Cost for Double Paddy Cropping				2,556	
Net Project Cost for Case BE-2				28,249	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 434	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				138,189	
Additional Net Cost for Double Paddy Cropping				2,916	
Net Project Cost for Case BE-2				141,105	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 210	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				47,929	
Additional Net Cost for Double Paddy Cropping				5,468	
Net Project Cost for Case BE-2				53,397	for 1 year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 117	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				119,808	
Additional Net Cost for Double Paddy Cropping				5,040	
Net Project Cost for Case BE-2				124,848	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 20	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,460	
Additional Net Cost for Double Paddy Cropping				1,103	
Net Project Cost for Case BE-2				4,563	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,460	
Additional Net Cost for Double Paddy Cropping				1,229	
Net Project Cost for Case BE-2				4,689	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 52	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				23,329	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case BE-2				24,022	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 35	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				27,066	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case BE-2				27,759	for 1 year
Canal Code C21	Name Navkoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 30	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				15,840	
Additional Net Cost for Double Paddy Cropping				536	
Net Project Cost for Case BE-2				16,376	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 37	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				24,368	
Additional Net Cost for Double Paddy Cropping				347	
Net Project Cost for Case BE-2				24,715	for 1 year

### Cost Estimation for Combination of Improvement Plan (Case BE 3/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 78	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				19,270	
Additional Net Cost for Double Paddy Cropping				3,067	
Net Project Cost for Case BE-3				22,337	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 384	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				103,642	
Additional Net Cost for Double Paddy Cropping				3,499	
Net Project Cost for Case BE-3				107,141	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 186	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				35,947	
Additional Net Cost for Double Paddy Cropping				6,561	
Net Project Cost for Case BE-3				42,508	for 1 year
Canal Code C10	Name Phangvul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 103	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				89,856	
Additional Net Cost for Double Paddy Cropping				6,048	
Net Project Cost for Case BE-3				95,904	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 18	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				2,595	
Additional Net Cost for Double Paddy Cropping				1,323	
Net Project Cost for Case BE-3				3,918	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 34	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				2,595	
Additional Net Cost for Double Paddy Cropping				1,474	
Net Project Cost for Case BE-3				4,069	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 46	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				17,497	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case BE-3				18,328	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 31	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				20,300	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case BE-3				21,131	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 26	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				11,880	
Additional Net Cost for Double Paddy Cropping				643	
Net Project Cost for Case BE-3				12,523	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 32	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				18,276	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case BE-3				18,692	for 1 year



### Cost Estimation for Combination of Improvement Plan (Case BE 4/4)

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 86	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				25,693	
Additional Net Cost for Double Paddy Cropping				2,556	
Net Project Cost for Case BE-4				28,249	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 424	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				138,189	
Additional Net Cost for Double Paddy Cropping				2,916	
Net Project Cost for Case BE-4				141,105	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 205	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				47,929	
Additional Net Cost for Double Paddy Cropping				5,468	
Net Project Cost for Case BE-4				53,397	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 116	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				119,808	
Additional Net Cost for Double Paddy Cropping				5,040	
Net Project Cost for Case BE-4				124,848	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 20	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,460	
Additional Net Cost for Double Paddy Cropping				1,103	
Net Project Cost for Case BE-4				4,563	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				3,460	
Additional Net Cost for Double Paddy Cropping				1,229	
Net Project Cost for Case BE-4				4,689	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 51	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				23,329	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case BE-4				24,022	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 35	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				27,066	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case BE-4				27,759	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 30	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				15,840	
Additional Net Cost for Double Paddy Cropping				536	
Net Project Cost for Case BE-4				16,376	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement				24,368	
Additional Net Cost for Double Paddy Cropping				347	
Net Project Cost for Case BE-4				24,715	for 1 year

**Cost Estimation for Combination of Improvement Plan  
(Case ABE 1/4)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 99	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				39,857	
Additional Net Cost for Double Paddy Cropping				1,534	
Net Project Cost for Case ABE-1				41,391	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 484	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				159,134	
Additional Net Cost for Double Paddy Cropping				1,750	
Net Project Cost for Case ABE-1				160,884	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 234	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				77,919	
Additional Net Cost for Double Paddy Cropping				3,260	
Net Project Cost for Case ABE-1				81,179	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 131	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				149,740	
Additional Net Cost for Double Paddy Cropping				3,024	
Net Project Cost for Case ABE-1				152,764	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 23	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				9,882	
Additional Net Cost for Double Paddy Cropping				662	
Net Project Cost for Case ABE-1				10,543	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 43	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				11,149	
Additional Net Cost for Double Paddy Cropping				737	
Net Project Cost for Case ABE-1				11,887	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 58	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				28,789	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case ABE-1				29,205	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 40	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				32,056	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case ABE-1				32,472	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 34	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				19,728	
Additional Net Cost for Double Paddy Cropping				321	
Net Project Cost for Case ABE-1				20,049	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 41	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				27,029	
Additional Net Cost for Double Paddy Cropping				208	
Net Project Cost for Case ABE-1				27,237	for 1 year

**Cost Estimation for Combination of Improvement Plan  
(Case ABE 2/4)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 88	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				32,384	
Additional Net Cost for Double Paddy Cropping				2,556	
Net Project Cost for Case ABE-2				34,940	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 434	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				129,297	
Additional Net Cost for Double Paddy Cropping				2,916	
Net Project Cost for Case ABE-2				132,213	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 210	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				63,309	
Additional Net Cost for Double Paddy Cropping				5,468	
Net Project Cost for Case ABE-2				68,776	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 117	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				121,664	
Additional Net Cost for Double Paddy Cropping				5,040	
Net Project Cost for Case ABE-2				126,704	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 20	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				8,029	
Additional Net Cost for Double Paddy Cropping				1,103	
Net Project Cost for Case ABE-2				9,131	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				9,059	
Additional Net Cost for Double Paddy Cropping				1,229	
Net Project Cost for Case ABE-2				10,287	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 52	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				23,391	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case ABE-2				24,084	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 35	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				26,045	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case ABE-2				26,738	for 1 year
Canal Code C21	Name Navkoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 30	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				16,029	
Additional Net Cost for Double Paddy Cropping				536	
Net Project Cost for Case ABE-2				16,565	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 37	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				21,961	
Additional Net Cost for Double Paddy Cropping				347	
Net Project Cost for Case ABE-2				22,308	for 1 year

**Cost Estimation for Combination of Improvement Plan  
(Case ABE 3/4)**

Canal Code C1	Name Upper Lobeyssa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 78	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				29,893	
Additional Net Cost for Double Paddy Cropping				3,067	
Net Project Cost for Case ABE-3				32,960	for 1 year
Canal Code C2	Name Lower Lobeyssa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 384	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				119,351	
Additional Net Cost for Double Paddy Cropping				3,499	
Net Project Cost for Case ABE-3				122,850	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 186	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				58,439	
Additional Net Cost for Double Paddy Cropping				6,561	
Net Project Cost for Case ABE-3				65,000	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 103	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				112,305	
Additional Net Cost for Double Paddy Cropping				6,048	
Net Project Cost for Case ABE-3				118,353	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 18	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				7,411	
Additional Net Cost for Double Paddy Cropping				1,323	
Net Project Cost for Case ABE-3				8,734	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 34	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				8,362	
Additional Net Cost for Double Paddy Cropping				1,474	
Net Project Cost for Case ABE-3				9,836	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 46	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				21,592	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case ABE-3				22,423	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 31	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				24,042	
Additional Net Cost for Double Paddy Cropping				832	
Net Project Cost for Case ABE-3				24,873	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 26	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				14,796	
Additional Net Cost for Double Paddy Cropping				643	
Net Project Cost for Case ABE-3				15,439	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 32	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				20,272	
Additional Net Cost for Double Paddy Cropping				416	
Net Project Cost for Case ABE-3				20,688	for 1 year

**Cost Estimation for Combination of Improvement Plan  
(Case ABE 4/4)**

Canal Code C1	Name Upper Lobeysa	Command Area (ha) 61	Canal Length (km) 7.1	Design Discharge (l/s) 86	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				32,384	
Additional Net Cost for Double Paddy Cropping				2,556	
Net Project Cost for Case ABE-4				34,940	for 1 year
Canal Code C2	Name Lower Lobeysa	Command Area (ha) 300	Canal Length (km) 8.1	Design Discharge (l/s) 424	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				129,297	
Additional Net Cost for Double Paddy Cropping				2,916	
Net Project Cost for Case ABE-4				132,213	for 1 year
Canal Code C9	Name Bajo Canal	Command Area (ha) 143	Canal Length (km) 15	Design Discharge (l/s) 205	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				63,309	
Additional Net Cost for Double Paddy Cropping				5,468	
Net Project Cost for Case ABE-4				68,776	for 1 year
Canal Code C10	Name Phangyul	Command Area (ha) 91	Canal Length (km) 16	Design Discharge (l/s) 116	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				121,664	
Additional Net Cost for Double Paddy Cropping				5,040	
Net Project Cost for Case ABE-4				126,704	for 1 year
Canal Code C15	Name Gemka	Command Area (ha) 15	Canal Length (km) 3.5	Design Discharge (l/s) 20	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				8,029	
Additional Net Cost for Double Paddy Cropping				1,103	
Net Project Cost for Case ABE-4				9,131	for 1 year
Canal Code C18	Name Nalakha	Command Area (ha) 29	Canal Length (km) 3.9	Design Discharge (l/s) 38	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				9,059	
Additional Net Cost for Double Paddy Cropping				1,229	
Net Project Cost for Case ABE-4				10,287	for 1 year
Canal Code C19	Name Rutekha	Command Area (ha) 40	Canal Length (km) 2.2	Design Discharge (l/s) 51	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				23,391	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case ABE-4				24,084	for 1 year
Canal Code C20	Name Maphekha	Command Area (ha) 27	Canal Length (km) 2.2	Design Discharge (l/s) 35	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				26,045	
Additional Net Cost for Double Paddy Cropping				693	
Net Project Cost for Case ABE-4				26,738	for 1 year
Canal Code C21	Name Naykoyuwa	Command Area (ha) 24	Canal Length (km) 1.7	Design Discharge (l/s) 30	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				16,029	
Additional Net Cost for Double Paddy Cropping				536	
Net Project Cost for Case ABE-4				16,565	for 1 year
Canal Code C22	Name Rumina	Command Area (ha) 28	Canal Length (km) 1.1	Design Discharge (l/s) 36	
Description	Unit	Quantity	Unit Price	Amount	Remarks
Net Cost for Canal Improvement and Water Management				21,961	
Additional Net Cost for Double Paddy Cropping				347	
Net Project Cost for Case ABE-4				22,308	for 1 year

**(7) Project Cost Estimation for River Pump System (unit : Nu.)**

Name of Canal	Code	Command Area (ha)		Design Discharge (l/s)	Required Head (m)
Upper Lobeysa	C1	5		6	150
Description	unit	Quantity	Unit Price	Amount	Remark
Civil Works					
River Pump System	set	1	219,472	219,472	
Water Tank Works	Unit	7	111,571	780,995	
Sub-total (for 1 year)				1,000,467 (50,023)	for 20 years
Pumping Facilities (for 1 year)	set	8	299,000	2,392,000 (239,200)	for 10 years
O/M cost	for 1 set	8	25,112	200,896	for 1 year
Total Cost of Water Supply System				490,119	for 1 year
Water Management Cost				39,775	for 1 year
Total Project Cost				529,894	for 1 year
Name of Canal	Code	Command Area (ha)		Design Discharge (l/s)	Required Head (m)
Lower Lobeysa	C2	27		28	20
Description	unit	Quantity	Unit Price	Amount	Remark
Civil Works					
River Pump System (for 1 year)	set	2	219,472	438,944 (21,947)	for 20 years
Pumping Facilities (for 1 year)	set	2	299,000	598,000 (59,800)	for 10 years
O/M cost	for 1 set	2	25,112	50,224	for 1 year
Total Cost of Water Supply System				134,971	for 1 year
Water Management Cost				81,274	for 1 year
Total Project Cost				213,245	for 1 year
Name of Canal	Code	Command Area (ha)		Design Discharge (l/s)	Required Head (m)
Bajo	C9	23		13	20
Description	unit	Quantity	Unit Price	Amount	Remark
Civil Works					
River Pump System (for 1 year)	set	1	219,472	219,472 (10,974)	for 20 years
Pumping Facilities (for 1 year)	set	1	299,000	299,000 (29,900)	for 10 years
O/M cost	for 1 set	1	25,112	25,112	for 1 year
Total Cost of Water Supply System				65,986	for 1 year
Water Management Cost				84,518	for 1 year
Total Project Cost				150,504	for 1 year

# **(8) Construction Cost of the Drainage System (1/2)**

Lobeysa		Drainage Area		300	ha
Description	Unit	Quantity	Unit Price	Amount	Remark
Drainage System Type D1					
Collecting Ditch	m	500	13.22	6.612	
Outlet	L.S			9.075	
Others	L.S			1.569	
Total				17.256	for 10 ha
Drainage System Type D2					
Collecting Ditch	m	300	11.02	3.306	
Outlet	L.S			6.547	
Others	L.S			985	
Total				10.838	for 7 ha
Drainage System Type D3					
Collecting Ditch	m	200	10.28	2.057	
Outlet	L.S			4.516	
Others	L.S			657	
Total				7.230	for 3.5 ha
Drainage System Type D1					
Collecting Ditch	m	100	4.41	441	
Outlet	L.S			2.600	
Others	L.S			304	
Total				3.345	for 1.5 ha
Drainage Construction Cost					
Type D1	Set	20	17.256	345.116	
Type D2	Set	7	10.838	75.864	
Type D3	Set	7	7.230	50.610	
Type D4	Set	17	3.345	56.863	
Total				528.453	

Bajo		Drainage Area		118	ha
Description	Unit	Quantity	Unit Price	Amount	Remark
Drainage System Type D1					
Collecting Ditch	m	400	13.22	5.289	
Outlet	L.S			9.075	
Others	L.S			1.436	
Total				15.801	for 11 ha
Drainage System Type D2					
Collecting Ditch	m	300	11.02	3.306	
Outlet	L.S			6.547	
Others	L.S			985	
Total				10.838	for 8 ha
Drainage System Type D3					
Collecting Ditch	m	200	10.28	2.057	
Outlet	L.S			4.516	
Others	L.S			657	
Total				7.230	for 4 ha
Drainage System Type D1					
Collecting Ditch	m	100	4.41	441	
Outlet	L.S			2.600	
Others	L.S			304	
Total				3.345	for 1.5 ha
Drainage Construction Cost					
Type D1	Set	9	15.801	142.211	
Type D2	Set	0	10.838	0	
Type D3	Set	0	7.230	0	
Type D4	Set	12	3.345	40.138	
Total				182.349	

### (8) Construction Cost of the Drainage System (2/2)

Phangul		Drainage Area		6	ha
Description	Unit	Quantity	Unit Price	Amount	Remark
Drainage System Type D1					
Collecting Ditch	m	250	13.22	3,306	
Outlet	L.S			9,075	
Others	L.S			1,238	
Total				13,619	for 6 ha
Drainage System Type D2					
Collecting Ditch	m	150	11.02	1,653	
Outlet	L.S			6,547	
Others	L.S			820	
Total				9,019	for 4.5 ha
Drainage System Type D3					
Collecting Ditch	m	100	10.28	1,028	
Outlet	L.S			4,516	
Others	L.S			554	
Total				6,099	for 2.2 ha
Drainage System Type D1					
Collecting Ditch	m	50	4.41	220	
Outlet	L.S			2,600	
Others	L.S			282	
Total				3,102	for 1 ha
Drainage Construction Cost					
Type D1	Set	0	13,619	0	
Type D2	Set	0	9,019	0	
Type D3	Set	27	6,099	164,664	
Type D4	Set	7	3,102	21,717	
Total				186,381	

Rubeysa		Drainage Area		138	ha
Description	Unit	Quantity	Unit Price	Amount	Remark
Drainage System Type D1					
Collecting Ditch	m	250	13.22	3,306	
Outlet	L.S			9,075	
Others	L.S			1,238	
Total				13,619	for 6.5 ha
Drainage System Type D2					
Collecting Ditch	m	150	11.02	1,653	
Outlet	L.S			6,547	
Others	L.S			820	
Total				9,019	for 5 ha
Drainage System Type D3					
Collecting Ditch	m	100	10.28	1,028	
Outlet	L.S			4,516	
Others	L.S			554	
Total				6,099	for 2.5 ha
Drainage System Type D1					
Collecting Ditch	m	50	4.41	220	
Outlet	L.S			2,600	
Others	L.S			282	
Total				3,102	for 1 ha
Drainage Construction Cost					
Type D1	Set	0	13,619	0	
Type D2	Set	20	9,019	180,390	
Type D3	Set	12	6,099	73,184	
Type D4	Set	8	3,102	24,820	
Total				278,393	



VI. DATA FOR DOMESTIC WATER  
SUPPLY PLAN

## **VI. DATA FOR DOMESTIC WATER SUPPLY PLAN**

- 1. Calculation of Conveyance Pipeline  
from Pe Chhu to Water Distribution Station**
- 2. Schematic Diagram of Development Schemes for Rural Water Supply Plan**
- 3. Unit Construction Cost of Rural Water Supply Plan**

## CALCULATION OF CONVEYANCE PIPELINE FROM PE CHHU TO WATER DISTRIBUTION STATION

### 1. Design Conditions

- Design discharge : 1,700 m<sup>3</sup>/day (20 l/sec)
- Design water level : Grit Chamber LWL: 1,428.0 m, HWL :1,430.5 m
- Raw water receiving tank : 1,344.0 m
- Total distance : 8.4 km
- Diameter : 8 inch
- Type of piping materials : Ductile iron pipe

The longitudinal profile of the planned conveyance pipeline is attached to the next page.

### 2. Formula of Hydraulic Calculation

The Hazen-William's formula is applied to predict head losses as a function of velocity in pipes.

This formula is

$$I = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.58}$$

where I : Energy gradient = h/L

h : Energy head loss (m)

L : Pipe length = 8,336 m

C : Coefficient of velocity = 130

D : Pipe diameter = 0.2 m

Q : Flow rate = 0.0197 m<sup>3</sup> / sec

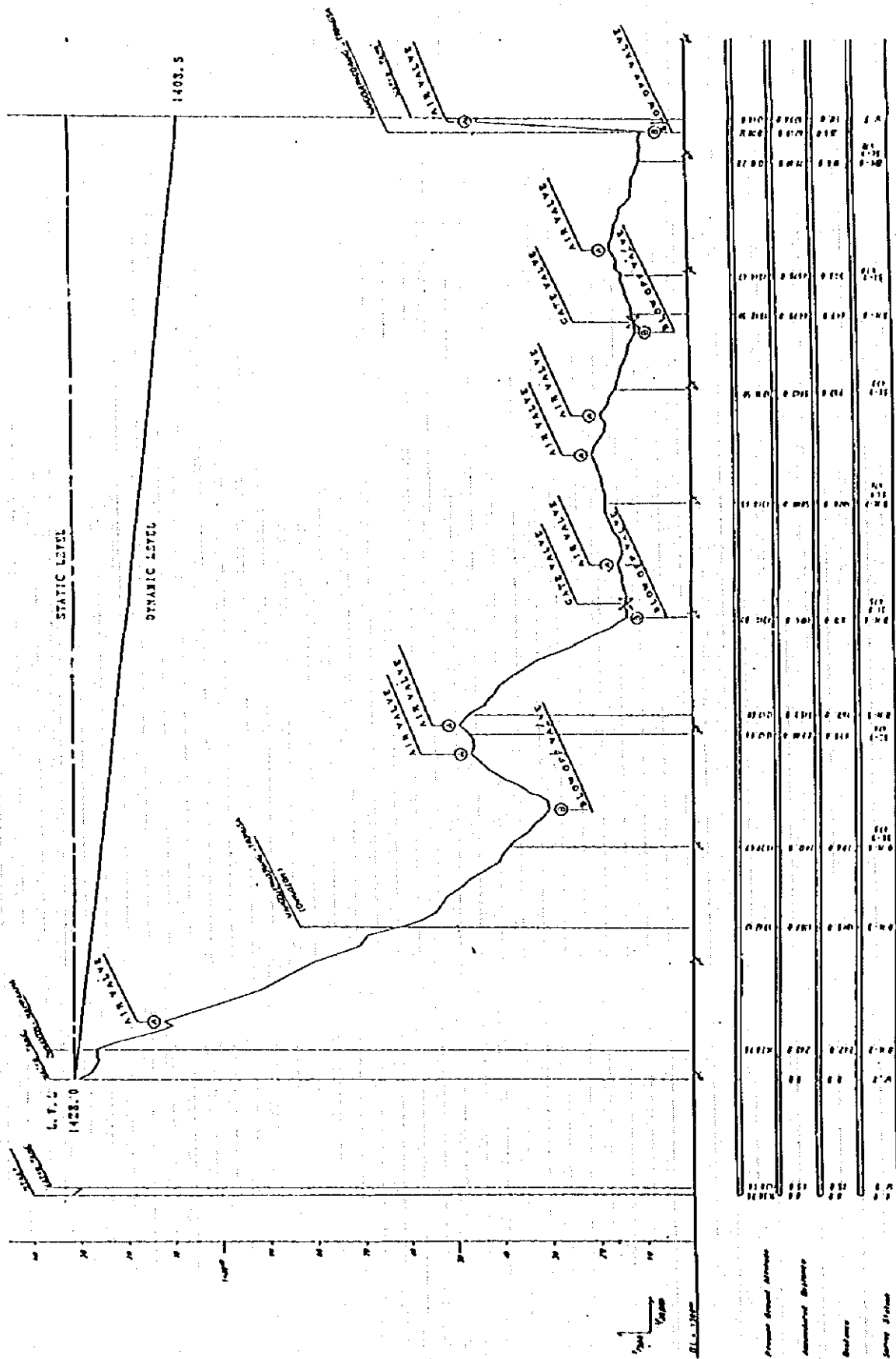
### 3. Results of Hydraulic Calculation

For hydraulic engineering, it is very important to estimate the head loss in steady condition. As the results of above hydraulic calculation, the energy head loss is calculated as 19.4 m (h).

The flow velocity of pipe is also calculated at 0.63 m/sec as the result of above hydraulic calculation. The design velocity of pipes must be determined within the limits of two factors; the minimum allowable velocity and the maximum allowable velocity.

The minimum design velocity should be more than 0.3 m/sec and the maximum design velocity should be 3.0 m/sec for the mortared lining ductile iron pipe according to the domestic water supply design manual.

As the result of hydraulic calculation, 8 inch diameter of ductile iron pipe is judged to be applied for the construction of new conveyance pipeline.



HYDRAULIC PROFILE OF CONVEYANCE PIPELINE

