FIGURE N-1. FINANCIAL AGRICULTURAL BENEFIT FREQUENCY CURVE(1/2)
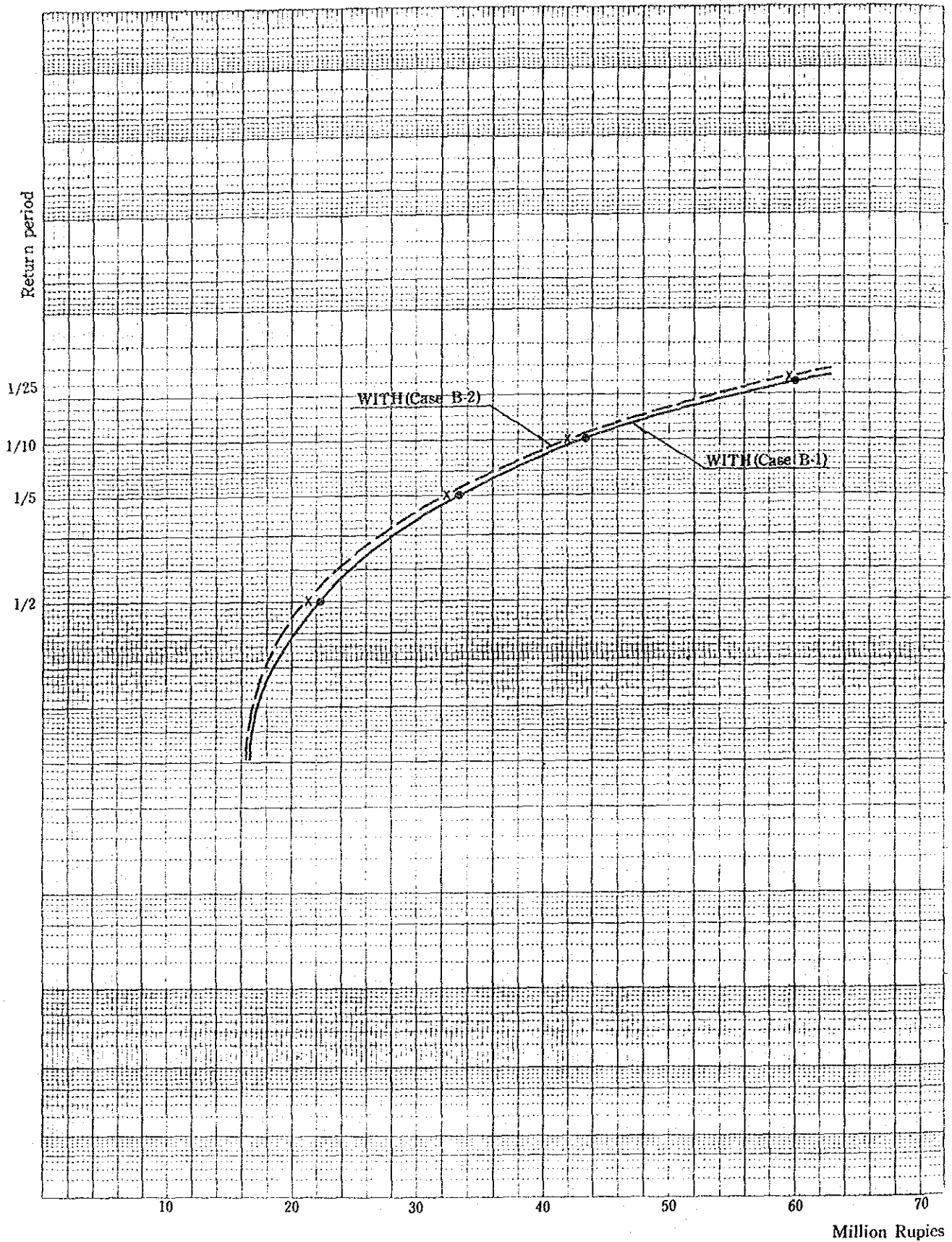
Return period

1/25

1/10

1/5

1/2

WITH (Case B-2)

WITH (Case B-1)

Million Rupies

FIGURE N-1. FINANCIAL AGRICULTURAL BENEFIT FREQUENCY CURVE(2/2)

CHAPTER II.   NET RETURN OF AGRICULTURAL BENEFITS (ECONOMIC)

Tables N-5 to N-8 show the calculation process of the net return value in agricultural yield by accounting price. Figure N-2 shows the plotting positions on the normal probability paper using these figures in order to estimate the annual average agricultural benefits.

TABLE N-5.   PRESENT AND PROPOSED CROP YIELDS, UNIT PRICE, PRODUCTION COST,
            GROSS VALUE AND NET RETURN (1/3)
            (ACCOUNTING PRICE)

Crops	Yield	Unit Price	Gross Value	Seeds	Ferti-lizers	Culti-vation	Harvest-ing	Total Cost	Net Return
	Kgs	Rs./Kg	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Present Situation									
Jowar	1,000	3.20	3,200	80	0	90	342	512	2,688
	4,000	0.24	960					0	960
Bajra	900	3.60	3,240	100	0	90	342	532	2,708
	3,600	0.24	864					0	864
K.Fodders	9,000	0.24	2,160	60	0	90	277	427	1,733
Wheat	1,200	4.13	4,956	320	0	90	342	752	4,204
	1,800	0.24	432					0	432
Gram	890	4.40	3,916	288	0	90	312	690	3,226
Oilseed	770	3.60	2,772	60	0	90	312	462	2,310
R.Fodders	7,000	0.24	1,680	60	0	90	187	337	1,343

TABLE N-5. PRESENT AND PROPOSED CROP YIELDS, UNIT PRICE, PRODUCTION COST,
GROSS VALUE AND NET RETURN (2/3)
(ACCOUNTING PRICE)

Crops	Yield	Unit Price	Gross Value	Seeds	Ferti-lizers	Culti-vation	Harvest-ing	Total Cost	Net Return
	Kgs	Rs./Kg	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Future Situation	(Return Period 2-Year)								
Jowar	1,020	3.20	3,264	82	0	93	350	525	2,739
	4,080	0.24	979					0	979
Bajra	920	3.60	3,312	102	0	93	350	545	2,767
	3,680	0.24	883					0	883
K.Fodders	9,180	0.24	2,203	62	0	93	283	438	1,765
Wheat	1,220	4.13	5,039	326	0	93	319	738	4,301
	1,830	0.24	439					0	439
Gram	910	4.40	4,004	294	0	93	319	706	3,298
Oilseed	790	3.60	2,844	62	0	93	313	468	2,376
R.Fodders	7,140	0.24	1,714	62	0	93	192	347	1,367
Future Situation	(Return Period 5-Year)								
Jowar	1,050	3.20	3,360	84	0	99	360	543	2,817
	4,200	0.24	1,008					0	1,008
Bajra	950	3.60	3,420	105	0	99	360	564	2,856
	3,800	0.24	912					0	912
K.Fodders	9,460	0.24	2,270	63	0	99	292	454	1,816
Wheat	1,260	4.13	5,204	336	0	99	360	795	4,409
	1,890	0.24	454					0	454
Gram	940	4.40	4,136	302	0	99	329	730	3,406
Oilseed	810	3.60	2,916	63	0	99	329	491	2,425
R.Fodders	7,360	0.24	1,766	63	0	99	197	359	1,407

TABLE N-5. PRESENT AND PROPOSED CROP YIELDS, UNIT PRICE, PRODUCTION COST,
GROSS VALUE AND NET RETURN (3/3)
(ACCOUNTING PRICE)

Crops	Yield	Unit Price	Gross Value	Seeds	Ferti-lizers	Culti-vation	Harvest-ing	Total Cost	Net Return
	Kgs	Rs./Kg	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Future Situation	(Return Period 10-Year)								
Jowar	1,110	3.20	3,552	88	0	109	379	576	2,976
	4,440	0.24	1,066					0	1,066
Bajra	990	3.60	3,564	110	0	109	379	598	2,966
	3,960	0.24	950					0	950
K.Fodders	9,940	0.24	2,386	66	0	109	307	482	1,904
Wheat	1,330	4.13	5,493	354	0	109	379	842	4,651
	1,995	0.24	479					0	479
Gram	980	4.40	4,312	318	0	109	345	772	3,540
Oilseed	850	3.60	3,060	66	0	109	345	520	2,540
R.Fodders	7,730	0.24	1,855	66	0	109	207	382	1,473
Future Situation	(Return Period 25-Year)								
Jowar	1,280	3.20	4,096	102	0	147	439	688	3,408
	5,120	0.24	1,229					0	1,229
Bajra	1,150	3.60	4,140	128	0	147	439	714	3,426
	4,600	0.24	1,104					0	1,104
K.Fodders	11,540	0.24	2,770	77	0	147	356	580	2,190
Wheat	1,540	4.13	6,360	410	0	147	439	996	5,364
	2,310	0.24	554					0	554
Gram	1,140	4.40	5,016	370	0	147	401	918	4,098
Oilseed	990	3.60	3,564	77	0	147	401	625	2,939
R.Fodders	8,980	0.24	2,155	77	0	147	241	465	1,690

TABLE N-6. NET RETURN IN CASE A (RETURN PERIOD 2-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern (hectares)	(%)	Net Return (Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,122	85.0	3,648	11,389
(a)	Bajra	459	12.5	3,572	1,640
	K.Fodders	92	2.5	1,733	159
	Subtotal	3,672	100.0		13,188
	(Rabi)				
	Wheat	140	67.9	4,636	649
	Gram	48	23.4	3,226	155
	Oilseed	18	8.6	2,310	42
	R.Fodders	0	0.1	1,343	0
	Subtotal	206	100.0		846
	Total (T)	3,878			14,034
	CCA (C)	13,348	T/C=	0.29	
With	(Kharif)				
Project	Jowar	4,257	85.0	3,718	15,828
(b)	Bajra	626	12.5	3,650	2,285
	K.Fodders	125	2.5	1,765	221
	Subtotal	5,009	100.0		18,334
	(Rabi)				
	Wheat	570	67.9	4,740	2,702
	Gram	196	23.4	3,298	646
	Oilseed	72	8.6	2,376	171
	R.Fodders	1	0.1	1,367	1
	Subtotal	839	100.0		3,520
	Total (T)	5,848			21,854
	CCA (C)	13,348	T/C=	0.44	
(b)-(a)	(Kharif)				
	Jowar	1,136			4,439
	Bajra	167			646
	K.Fodders	33			62
	Subtotal	1,336			5,146
	(Rabi)				
	Wheat	430			2,053
	Gram	148			491
	Oilseed	54			129
	R.Fodders	1			1
	Subtotal	634			2,674
	Total	1,970			7,820

Note) CCA; Cultivable Command Area

TABLE N-6.   NET RETURN IN CASE A (RETURN PERIOD 5-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,642	85.0	3,648	13,286
(a)	Bajra	536	12.5	3,572	1,915
	K.Fodders	107	2.5	1,733	185
	Subtotal	4,285	100.0		15,386
	(Rabi)				
	Wheat	163	67.9	4,636	756
	Gram	56	23.4	3,226	181
	Oilseed	21	8.6	2,310	49
	R.Fodders	0	0.1	1,343	0
	Subtotal	240	100.0		986
	Total (T)	4,525			16,370
	CCA (C)	13,348	T/C=	0.34	
With	(Kharif)				
Project	Jowar	6,136	85.0	3,825	23,470
(b)	Bajra	902	12.5	3,768	3,399
	K.Fodders	180	2.5	1,816	327
	Subtotal	7,219	100.0		27,196
	(Rabi)				
	Wheat	821	67.9	4,863	3,993
	Gram	283	23.4	3,406	964
	Oilseed	104	8.6	2,425	252
	R.Fodders	1	0.1	1,407	1
	Subtotal	1,208	100.0		5,210
	Total (T)	8,427			32,406
	CCA (C)	13,348	T/C=	0.63	
(b)-(a)	(Kharif)				
	Jowar	2,493			10,184
	Bajra	367			1,484
	K.Fodders	73			142
	Subtotal	2,933			11,810
	(Rabi)				
	Wheat	658			3,237
	Gram	227			783
	Oilseed	83			203
	R.Fodders	1			1
	Subtotal	969			4,224
	Total	3,902			16,036

TABLE N-6. NET RETURN IN CASE A (RETURN PERIOD 10-YEAR)
(ACCOUNTING PRICE)

Crop		Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	**(Kharif)**				
Project	Jowar	3,918	85.0	3,648	14,293
(a)	Bajra	576	12.5	3,572	2,057
	K.Fodders	115	2.5	1,733	199
	Subtotal	4,610	100.0		16,549
	(Rabi)				
	Wheat	175	67.9	4,636	811
	Gram	60	23.4	3,226	194
	Oilseed	22	8.6	2,310	51
	R.Fodders	0	0.1	1,343	0
	Subtotal	258	100.0		1,056
	Total (T)	4,868			17,605
	CCA (C)	13,348	T/C=	0.36	
With	**(Kharif)**				
Project	Jowar	7,531	85.0	4,042	30,440
(b)	Bajra	1,107	12.5	3,916	4,335
	K.Fodders	221	2.5	1,904	421
	Subtotal	8,860	100.0		35,196
	(Rabi)				
	Wheat	1,007	67.9	5,130	5,166
	Gram	347	23.4	3,540	1,228
	Oilseed	128	8.6	2,540	325
	R.Fodders	1	0.1	1,473	1
	Subtotal	1,483	100.0		6,720
	Total (T)	10,343			41,916
	CCA (C)	13,348	T/C=	0.77	
(b)-(a)	**(Kharif)**				
	Jowar	3,612			16,147
	Bajra	531			2,278
	K.Fodders	106			222
	Subtotal	4,250			18,647
	(Rabi)				
	Wheat	832			4,355
	Gram	287			1,034
	Oilseed	105			274
	R.Fodders	1			1
	Subtotal	1,225			5,664
	Total	5,475			24,311

TABLE N-6.　NET RETURN IN CASE A (RETURN PERIOD 25-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	4,216	85.0	3,648	15,380
(a)	Bajra	620	12.5	3,572	2,215
	K.Fodders	124	2.5	1,733	215
	Subtotal	4,959	100.0		17,810
	(Rabi)				
	Wheat	188	67.9	4,636	872
	Gram	65	23.4	3,226	210
	Oilseed	24	8.6	2,310	55
	R.Fodders	0	0.1	1,343	0
	Subtotal	278	100.0		1,137
	Total (T)	5,237			18,947
	CCA (C)	13,348	T/C=	0.39	
With	(Kharif)				
Project	Jowar	8,906	85.0	4,637	41,297
(b)	Bajra	1,310	12.5	4,530	5,934
	K.Fodders	262	2.5	2,267	594
	Subtotal	10,477	100.0		47,825
	(Rabi)				
	Wheat	1,263	67.9	5,918	7,474
	Gram	435	23.4	4,098	1,783
	Oilseed	160	8.6	2,939	470
	R.Fodders	2	0.1	1,690	3
	Subtotal	1,861	100.0		9,730
	Total (T)	12,338			57,555
	CCA (C)	13,348	T/C=	0.92	
(b)-(a)	(Kharif)				
	Jowar	4,690			25,917
	Bajra	690			3,719
	K.Fodders	138			379
	Subtotal	5,518			30,015
	(Rabi)				
	Wheat	1,075			6,602
	Gram	370			1,573
	Oilseed	136			415
	R.Fodders	2			3
	Subtotal	1,583			8,594
	Total	7,101			38,609

TABLE N-7.   NET RETURN IN CASE B-1 (RETURN PERIOD 2-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,122	85.0	3,648	11,389
(a)	Bajra	459	12.5	3,572	1,640
	K.Fodders	92	2.5	1,733	159
	Subtotal	3,672	100.0		13,188
	(Rabi)				
	Wheat	140	67.9	4,636	649
	Gram	48	23.4	3,226	155
	Oilseed	18	8.6	2,310	42
	R.Fodders	0	0.1	1,343	0
	Subtotal	206	100.0		846
	Total (T)	3,878			14,034
	CCA (C)	13,348	T/C=	0.29	
With	(Kharif)				
Project	Jowar	3,867	85.0	3,718	14,378
(b)	Bajra	569	12.5	3,650	2,077
	K.Fodders	114	2.5	1,765	201
	Subtotal	4,549	100.0		16,656
	(Rabi)				
	Wheat	549	67.9	4,740	2,602
	Gram	189	23.4	3,298	623
	Oilseed	70	8.6	2,376	166
	R.Fodders	1	0.1	1,367	1
	Subtotal	809	100.0		3,392
	Total (T)	5,358			20,048
	CCA (C)	13,348	T/C=	0.40	
(b)-(a)	(Kharif)				
	Jowar	745			2,989
	Bajra	110			437
	K.Fodders	22			42
	Subtotal	876			3,468
	(Rabi)				
	Wheat	410			1,953
	Gram	141			468
	Oilseed	52			124
	R.Fodders	1			1
	Subtotal	604			2,546
	Total	1,480			6,014

Note) CCA; Cultivable Command Area.

TABLE N-7. NET RETURN IN CASE B-1 (RETURN PERIOD 5-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,642	85.0	3,648	13,286
(a)	Bajra	536	12.5	3,572	1,915
	K.Fodders	107	2.5	1,733	185
	Subtotal	4,285	100.0		15,386
	(Rabi)				
	Wheat	163	67.9	4,636	756
	Gram	56	23.4	3,226	181
	Oilseed	21	8.6	2,310	49
	R.Fodders	0	0.1	1,343	0
	Subtotal	240	100.0		986
	Total (T)	4,525			16,372
	CCA (C)	13,348	T/C=	0.34	
With	(Kharif)				
Project	Jowar	5,664	85.0	3,825	21,665
(b)	Bajra	833	12.5	3,768	3,139
	K.Fodders	167	2.5	1,816	303
	Subtotal	6,663	100.0		25,107
	(Rabi)				
	Wheat	805	67.9	4,863	3,915
	Gram	277	23.4	3,406	943
	Oilseed	102	8.6	2,425	247
	R.Fodders	1	0.1	1,407	1
	Subtotal	1,185	100.0		5,106
	Total (T)	7,848			30,213
	CCA (C)	13,348	T/C=	0.59	
(b)-(a)	(Kharif)				
	Jowar	2,021			8,379
	Bajra	297			1,224
	K.Fodders	59			118
	Subtotal	2,378			9,721
	(Rabi)				
	Wheat	642			3,159
	Gram	221			762
	Oilseed	81			198
	R.Fodders	1			1
	Subtotal	945			4,120
	Total	3,323			13,841

TABLE N-7. NET RETURN IN CASE B-1 (RETURN PERIOD 10-YEAR)
(ACCOUNTING PRICE)

Crop		Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,918	85.0	3,648	14,293
(a)	Bajra	576	12.5	3,572	2,057
	K.Fodders	115	2.5	1,733	199
	Subtotal	4,610	100.0		16,549
	(Rabi)				
	Wheat	175	67.9	4,636	811
	Gram	60	23.4	3,226	194
	Oilseed	22	8.6	2,310	51
	R.Fodders	0	0.1	1,343	0
	Subtotal	258	100.0		1,056
	Total (T)	4,868			17,605
	CCA (C)	13,348	T/C=	0.36	
With	(Kharif)				
Project	Jowar	7,023	85.0	4,042	28,387
(b)	Bajra	1,033	12.5	3,916	4,045
	K.Fodders	207	2.5	1,904	394
	Subtotal	8,262	100.0		32,826
	(Rabi)				
	Wheat	998	67.9	5,130	5,120
	Gram	344	23.4	3,540	1,218
	Oilseed	126	8.6	2,540	320
	R.Fodders	1	0.1	1,473	1
	Subtotal	1,470	100.0		6,659
	Total (T)	9,732			39,485
	CCA (C)	13,348	T/C=	0.73	
(b)-(a)	(Kharif)				
	Jowar	3,105			14,094
	Bajra	457			1,988
	K.Fodders	91			195
	Subtotal	3,652			16,277
	(Rabi)				
	Wheat	823			4,309
	Gram	283			1,024
	Oilseed	104			269
	R.Fodders	1			1
	Subtotal	1,212			5,603
	Total	4,864			21,880

TABLE N-7.   NET RETURN IN CASE B-1 (RETURN PERIOD 25-YEAR))
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	4,216	85.0	3,648	15,380
(a)	Bajra	620	12.5	3,572	2,215
	K.Fodders	124	2.5	1,733	215
	Subtotal	4,959	100.0		17,810
	(Rabi)				
	Wheat	188	67.9	4,636	872
	Gram	65	23.4	3,226	210
	Oilseed	24	8.6	2,310	55
	R.Fodders	0	0.1	1,343	0
	Subtotal	278	100.0		1,137
	Total (T)	5,237			18,947
	CCA (C)	13,348	T/C=	0.39	
With	(Kharif)				
Project	Jowar	8,476	85.0	4,637	39,303
(b)	Bajra	1,247	12.5	4,530	5,649
	K.Fodders	249	2.5	2,267	564
	Subtotal	9,972	100.0		45,516
	(Rabi)				
	Wheat	1,267	67.9	5,918	7,498
	Gram	437	23.4	4,098	1,791
	Oilseed	160	8.6	2,939	470
	R.Fodders	2	0.1	1,690	3
	Subtotal	1,866	100.0		9,762
	Total (T)	11,838			55,278
	CCA (C)	13,348	T/C=	0.89	
(b)-(a)	(Kharif)				
	Jowar	4,261			23,923
	Bajra	627			3,434
	K.Fodders	125			349
	Subtotal	5,013			27,706
	(Rabi)				
	Wheat	1,078			6,626
	Gram	372			1,581
	Oilseed	137			415
	R.Fodders	2			3
	Subtotal	1,588			8,625
	Total	6,601			36,331

TABLE N-8.   NET RETURN IN CASE B-2 (RETURN PERIOD 2-YEAR)
(ACCOUNTING PRICE)

Crop		Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,122	85.0	3,648	11,389
(a)	Bajra	459	12.5	3,572	1,640
	K.Fodders	92	2.5	1,733	159
	Subtotal	3,672	100.0		13,188
	(Rabi)				
	Wheat	140	67.9	4,636	649
	Gram	48	23.4	3,226	155
	Oilseed	18	8.6	2,310	42
	R.Fodders	0	0.1	1,343	0
	Subtotal	206	100.0		846
	Total (T)	3,878			14,034
	CCA (C)	13,348	T/C=	0.29	
With	(Kharif)				
Project	Jowar	3,652	85.0	3,718	13,578
(b)	Bajra	537	12.5	3,650	1,960
	K.Fodders	107	2.5	1,765	189
	Subtotal	4,296	100.0		15,727
	(Rabi)				
	Wheat	581	67.9	4,740	2,754
	Gram	200	23.4	3,298	660
	Oilseed	74	8.6	2,376	176
	R.Fodders	1	0.1	1,367	1
	Subtotal	856	100.0		3,591
	Total (T)	5,152			19,318
	CCA (C)	13,348	T/C=	0.39	
(b)-(a)	(Kharif)				
	Jowar	530			2,189
	Bajra	78			320
	K.Fodders	16			30
	Subtotal	624			2,539
	(Rabi)				
	Wheat	441			2,105
	Gram	152			505
	Oilseed	56			134
	R.Fodders	1			1
	Subtotal	650			2,744
	Total	1,274			5,284

Note)   CCA; Cultivable Command Area.

TABLE N-8.   NET RETURN IN CASE B-2 (RETURN PERIOD 5-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,642	85.0	3,648	13,286
(a)	Bajra	536	12.5	3,572	1,915
	K.Fodders	107	2.5	1,733	185
	Subtotal	4,285	100.0		15,386
	(Rabi)				
	Wheat	163	67.9	4,636	756
	Gram	56	23.4	3,226	181
	Oilseed	21	8.6	2,310	49
	R.Fodders	0	0.1	1,343	0
	Subtotal	240	100.0		986
	Total (T)	4,525			16,372
	CCA (C)	13,348	T/C=	0.34	
With	(Kharif)				
Project	Jowar	5,388	85.0	3,825	20,609
(b)	Bajra	792	12.5	3,768	2,984
	K.Fodders	158	2.5	1,816	287
	Subtotal	6,338	100.0		23,880
	(Rabi)				
	Wheat	857	67.9	4,863	4,168
	Gram	295	23.4	3,406	1,005
	Oilseed	109	8.6	2,425	264
	R.Fodders	1	0.1	1,407	1
	Subtotal	1,263	100.0		5,438
	Total (T)	7,601			29,318
	CCA (C)	13,348	T/C=	0.57	
(b)-(a)	(Kharif)				
	Jowar	1,745			7,323
	Bajra	257			1,069
	K.Fodders	51			102
	Subtotal	2,053			8,494
	(Rabi)				
	Wheat	694			3,412
	Gram	239			824
	Oilseed	88			215
	R.Fodders	1			1
	Subtotal	1,023			4,452
	Total	3,076			12,946

TABLE N-8.　NET RETURN IN CASE B-2 (RETURN PERIOD 10-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	3,918	85.0	3,648	14,293
(a)	Bajra	576	12.5	3,572	2,057
	K.Fodders	115	2.5	1,733	199
	Subtotal	4,610	100.0		16,549
	(Rabi)				
	Wheat	175	67.9	4,636	811
	Gram	60	23.4	3,226	194
	Oilseed	22	8.6	2,310	51
	R.Fodders	0	0.1	1,343	0
	Subtotal	258	100.0		1,056
	Total (T)	4,868			17,605
	CCA (C)	13,348	T/C=	0.36	
With	(Kharif)				
Project	Jowar	6,712	85.0	4,042	27,130
(b)	Bajra	987	12.5	3,916	3,865
	K.Fodders	197	2.5	1,904	375
	Subtotal	7,896	100.0		31,370
	(Rabi)				
	Wheat	1,069	67.9	5,130	5,484
	Gram	368	23.4	3,540	1,303
	Oilseed	135	8.6	2,540	343
	R.Fodders	2	0.1	1,473	3
	Subtotal	1,574	100.0		7,133
	Total (T)	9,470			38,503
	CCA (C)	13,348	T/C=	0.71	
(b)-(a)	(Kharif)				
	Jowar	2,793			12,837
	Bajra	411			1,808
	K.Fodders	82			176
	Subtotal	3,286			14,821
	(Rabi)				
	Wheat	894			4,673
	Gram	308			1,109
	Oilseed	113			292
	R.Fodders	1			3
	Subtotal	1,316			6,077
	Total	4,602			20,898

TABLE N-8.   NET RETURN IN CASE B-2 (RETURN PERIOD 25-YEAR)
(ACCOUNTING PRICE)

	Crop	Cropping Pattern		Net Return	
		(hectares)	(%)	(Rs/ha)	'000 Rs.
Without	(Kharif)				
Project	Jowar	4,216	85.0	3,648	15,380
(a)	Bajra	620	12.5	3,572	2,215
	K.Fodders	124	2.5	1,733	215
	Subtotal	4,959	100.0		17,810
	(Rabi)				
	Wheat	188	67.9	4,636	872
	Gram	65	23.4	3,226	210
	Oilseed	24	8.6	2,310	55
	R.Fodders	0	0.1	1,343	0
	Subtotal	278	100.0		1,137
	Total (T)	5,237			18,947
	CCA (C)	13,348	T/C=	0.39	
With	(Kharif)				
Project	Jowar	8,242	85.0	4,637	38,218
(b)	Bajra	1,212	12.5	4,530	5,490
	K.Fodders	242	2.5	2,267	549
	Subtotal	9,696	100.0		44,257
	(Rabi)				
	Wheat	1,365	67.9	5,918	8,078
	Gram	470	23.4	4,098	1,926
	Oilseed	173	8.6	2,939	508
	R.Fodders	2	0.1	1,690	3
	Subtotal	2,010	100.0		10,515
	Total (T)	11,706			54,772
	CCA (C)	13,348	T/C=	0.88	
(b)-(a)	(Kharif)				
	Jowar	4,026			22,838
	Bajra	592			3,275
	K.Fodders	118			334
	Subtotal	4,737			26,448
	(Rabi)				
	Wheat	1,176			7,206
	Gram	405			1,716
	Oilseed	149			453
	R.Fodders	2			3
	Subtotal	1,732			9,379
	Total	6,469			35,825
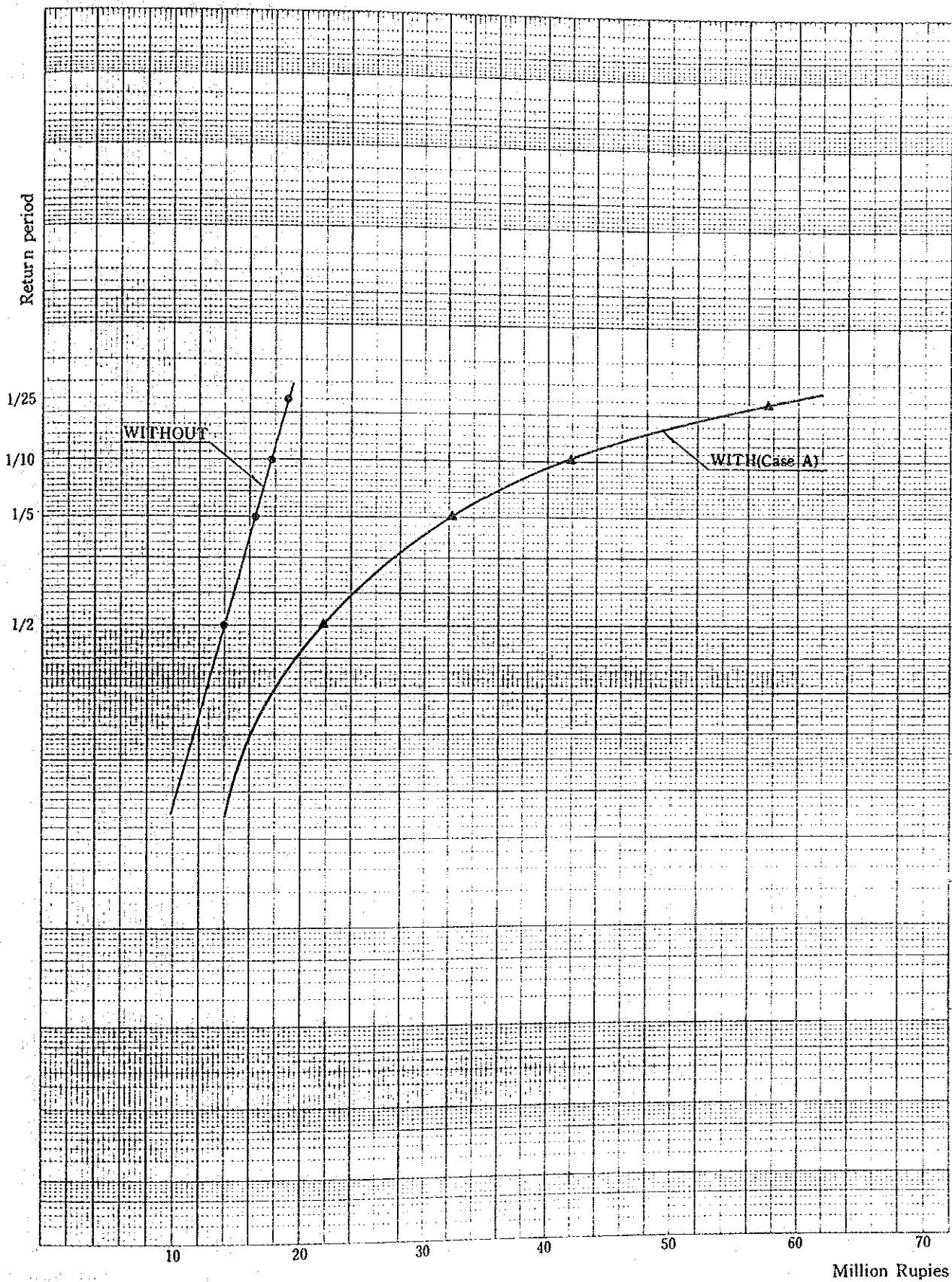
FIGURE N-2. ECONOMIC AGRICULTURAL BENEFIT FREQUENCY CURVE (1/2)
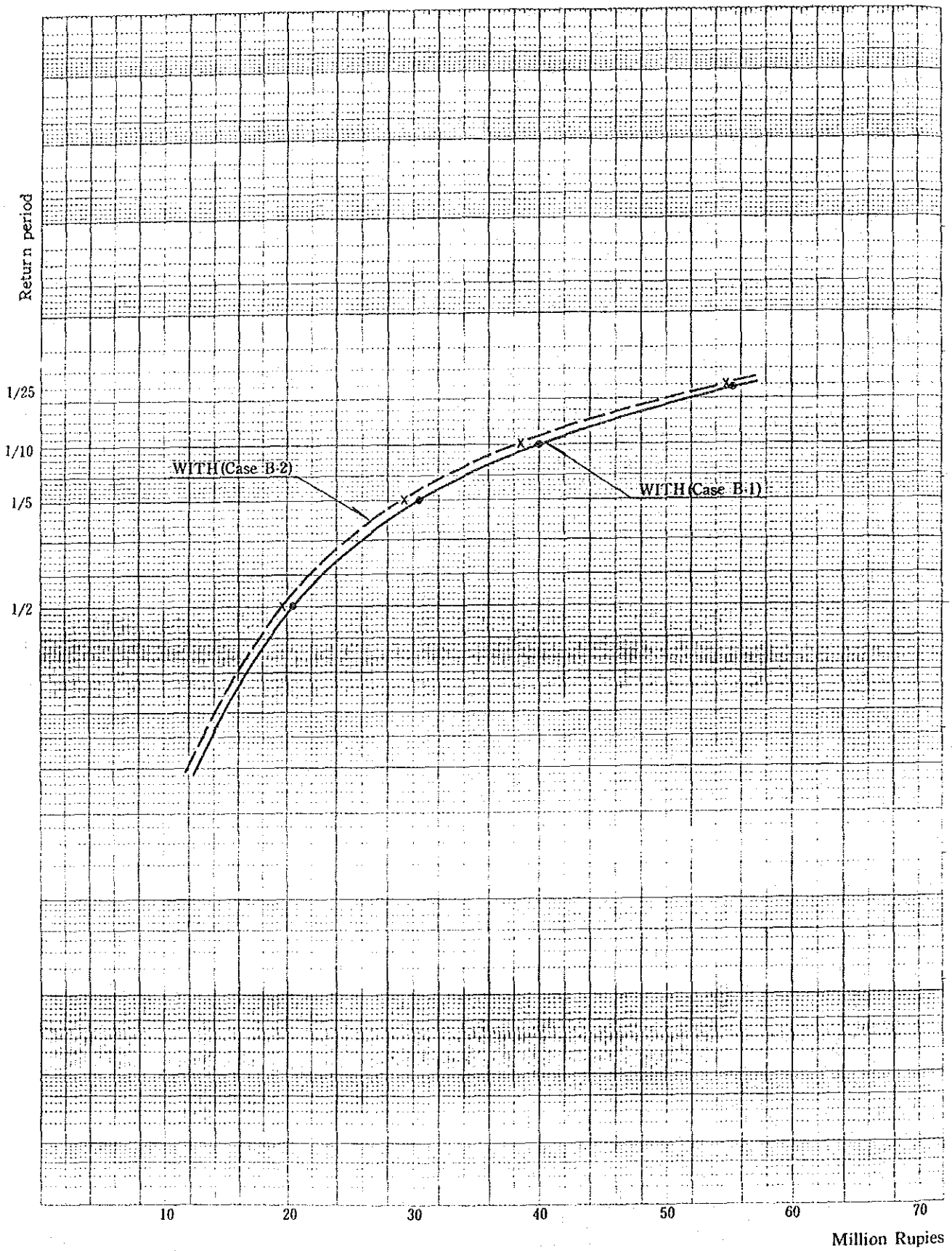
FIGURE N-2. ECONOMIC AGRICULTURAL BENEFIT FREQUENCY CURVE (2/2)

CHAPTER III.   BASIC ANIMAL PRODUCTION MODEL

To estimate inclemental animal production resulting from the improvement of watershed management, the animal production models shown in Table N-9 were refered to as a basic concept.

In this Study, the average percentage of the total figures in each section in this table was refered to the animal production model in the watershed area. But "Flock off-take plus flock increase" was converted to "Flock off-take" only to keep the total animal heads under the rearing limit.

TABLE N-9.　BASIC PRODUCTION MODEL (SHEEP FLOCK)

Flock composition	Percentage mortality	Opening inventory	Additions due to births	Losses due to all causes	Off-take during year	Closing inventory number
Breeding ewes	7	5,000	0	350	700	3,950
0-1 year	20	0	2,250	450	0	1,800
1-2 years	6	1,800	0	108	92	1,600
Sub-total		6,800	2,250	908	792	7,350
Stud rams	6	200	0	12	36	152
0-1 year	20	0	2,250	450	150	1,650
1-2 years	6	1,650	0	100	250	1,300
2-3 years	6	1,300	0	78	1,174	48
Sub-total		3,150	2,250	640	1,610	3,150
Grand total		9,950	4,500	1,548	2,402	10,500

TABLE N-9.　BASIC PRODUCTION MODEL (GOATS FLOCK)

Flock composition	Percentage mortality	Opening inventory	Additions due to births	Losses due to all causes	Off-take during year	Closing inventory number
Breeding does	8	5,000	0	400	850	3,750
0-1 year	25	0	4,125	1,031	269	2,825
1-2 years	7	2,825	0	198	777	1,850
Sub-total		7,825	4,125	1,629	1,896	8,425
Stud bucks	7	200	0	14	36	150
0-1 year	25	0	4,125	931	2,889	305
1-2 years	7	205	0	14	141	50
Sub-total		405	4,125	959	3,066	505
Grand total		8,230	8,250	2,588	4,962	8,930

Production coefficients :	Sheep	Goats
1　Ram to ewe ratio (Buck to doe ratio) :	1-20	1-25
2　Kid drop :	90 %	165 %
3　Effective kidding rate :	72 %	124 %
4　Ewe (doe) replacement rate :	21 %	25 %
5　Ram (buck)replacement rate :	24 %	25%
6　Age at first breeding :	18 months	8-12 months
7　Flock off-take :	23 %	57.8 %
8　Flock inventory change :	+5.5 %	+8.5 %
9　Flock off-take plus flock increase :	29 %	66.3 %

Source : Goats and sheep production in the tropics

CHAPTER IV.   CONVERSION FACTORS

In this study, the National Parameters, such as Accounting Rate of Interest, Standard Conversion Factor, and Sector Conversion Factors are determined considering the economical conditions of the D.G. Khan districts and the limitation of the available data.

3.1   Accounting Rate of Interest (ARI)

The ARI of 9% is applied in this study from the viewpoints of the same reasons denoted in the project evaluation by market price.

3.2   Standard Conversion Factor (SCF)

The SCF is calculated based on the amounts of import and export, custom duties and subsidies of Pakistan, as follows (refer to Table N-10):

$$SCF = (M+X) / (M (1+t) + X (1+s)) = 0.8$$

Where,   M :   Amount of import (major 9 items in 10-year average),
X :   Amount of export (major 10 items in 10-year average),
t :   Weighting average ratio (%) of custom duties
(major 9 import items),
s :   Weighting average ratio (%) of subsidies
(major 10 export items).

3.3   Sector Conversion Factors

(1)   Construction
The following construction cost is estimated by using market prices, and includes sales tax (12.5%) which is a transfer item in the evaluation. Therefore, it is necessary to exclude this item from the cost, as follows:

Construction Cost (Market Price)

(million Rs.)

Item	CASE A	CASE B-1	CASE B-2
1. Direct Construction Cost	14.88	50.87	68.80
2. Material Cost	28.12	44.53	54.09
3. Machinery Cost	17.39	25.26	29.97
4. Contingency	6.57	12.83	16.18
5. Engineering Fee	7.22	9.87	12.46
6. Overhead Cost (Machinery & Others)	5.22	7.59	9.00
Total	79.40	150.95	190.50

Construction Cost (Excluding Tax)

(million Rs.)

Item	CASE A	CASE B-1	CASE B-2
1. Direct Construction Cost	13.02	44.51	60.20
2. Material Cost	24.61	38.96	47.33
3. Machinery Cost	15.22	22.10	26.22
4. Contingency	5.75	11.23	14.16
5. Engineering Fee	6.32	8.64	10.90
6. Overhead Cost (Machinery & Others)	4.57	6.64	7.88
Total	69.48	132.08	166.69

Based on the above table, the contents of direct construction cost are classified as follows:

Itemization of Direct Construction Cost

(million Rs.)

Item	CASE A		CASE B-1		CASE B-2	
	Cost	%	Cost	%	Cost	%
1. Earth Work	2.96	22.7	5.47	12.3	6.92	11.5
2. Masonry	8.52	65.4	20.07	45.1	26.43	43.9
3. Concrete Work	0.26	2.0	0.31	0.7	0.24	0.4
4. Others	1.29	9.9	18.65	41.9	26.61	44.2
Total	13.02	100	44.51	100	60.20	100

a.   Earth work

The conversion factor of earth work is estimated at 0.61 which is derived from applying the following conversion factors to each cost component of the earth work (refer to Table N-11):

Labor Wages: SCF (0.8) is applied for skilled labor, because the market is judged to be competitive. As for unskilled labor, 0.4 as the medium value of SCF is applied because of the underemployment conditions in the districts,

Operation Cost: Import tariff of 0.5 (50%) for fuel and lubricant oil is adopted, which are the major contents of this cost,

Overhead Cost: SCF (0.8) is applied because material costs, profit and management expenses are included in this cost.

b.   Cement and masonry work

The conversion factor of 0.75 is computed by the same method above mentioned (refer to Table N-12).

c.   Direct construction cost

The conversion factor of direct construction cost is calculated for each alternative plan by using the determined conversion factors. The results are; 0.72 for Case A, 0.75 for Case B-1 and 0.76 for Case B-2 (refer to Table N-13).

d.   Material cost

The construction materials, except for vetiver grass seeds, are to be procured in Pakistan, and the share of the seeds in the whole material cost is small. Based on these conditions, SCF (0.8) is adopted for this cost.

e.   Operation cost of equipment

The operation cost of equipment counts as the lease charge of equipments, which consist of imported construction machinery and imported vehicles. The conversion factor of this item is determined as 0.6, considering the SCF (0.8) and the import tariffs of 20% (construction machinery) and 60% (vehicles).

f.   Contingency and overhead cost

SCF (0.8) is applied.

g. Engineering fee

The medium value of 0.9 between SCF (0.8) and 1.0 is adopted considering the possibility of participation of foreign consulting firms.

(2) O/M Cost

The cost components of the O/M cost is summarized as follows:

Composition of O/M Cost

Item	Share (%)
Unskilled labor	6
Skilled Labor	18
Material Cost	24
Driving Cost	29
Other Overhead Cost	23
Total	100

Based on this table and the determined conversion factors, the conversion factor of the O/M cost is computed at 0.69, as follows (refer to Table N-14 for accounting O/M cost):

Conversion Factor of O/M Cost

Item	Share (%) : (1)	CF : (2)	(1) x (2)
Unskilled Labor	6	0.4	0.024
Skilled Labor	18	0.8	0.144
Material Cost	24	0.8	0.192
Driving Cost	29	0.5	0.145
Other Overhead Cost	23	0.8	0.184
O/M Cost			FC = 0.69

(3) Major Farm Inputs and Outputs

a. Wheat price

The conversion factor of wheat price is determined on the basis of its import price because wheat is the only import substitution commodity among the farm outputs produced in the Project Area. The average import price (CIF Price) of wheat during the

last five years was Rs.337/kg. The transportation fee of wheat from Port Karachi to D.G. Khan is Rs.800/ton. And the average harbor dues at Port Karachi are about Rs.150/ton.

By applying the conversion factors of 0.79 (described later) and SCF (0.8) for transportation fee and harbor dues respectively, these accounting costs are calculated as follows:

Rs.800 x 0.79 + Rs.150 x 0.8 = Rs.752/ton (Rs.0.75/kg)

Based on these figures, the border price (accounting price) of wheat at the project site becomes Rs.4.12 (Rs.3.37 + Rs.0.75). Therefore, the conversion factor of wheat price is decided as 1.18 (Rs.4.12/Rs.3.5).

b.   Transportation fee for trucks

The conversion factor of the transportation fee for trucks is estimated at 0.79 based on the unit cost components (Rs./ton-km), as follows:

Conversion Factor of Transportation Fee for Trucks

Item	Share : (1)		CIF	Tax	Others	CF : (2)	(1) x (2)
Fuel & Tire	0.30	%	50	10	40	0.82	0.246
		CF	1.0	0	0.8		
Depreciation	0.20	%	60	20	20	0.76	0.152
		CF	1.0	0	0.8		
Maintenance	0.25	%	70	20	10	0.78	0.195
		CF	1.0	0	0.8		
Other Overhead	0.25					0.80	0.200
Transportation Fee for Trucks							FC=0.79

c.   Other farm crops and stock farm products

The SCF (0.8) is adopted because these outputs are marketed by domestic transaction.

d.   Seeds

For the wheat seeds, the conversion factor of wheat should be applied. However, the SCF (0.8) is adopted to the all kinds of seeds because of its relatively low cost.

e.   Farm labor

The conversion factor of 0.5 is applied for farm labor considering the underemployment conditions in the rural areas and the conversion factor of 0.4 for unskilled construction labor.

f.   Reduction amount of flood damage

The SCF (0.8) is adopted as the conversion factor of the reduction amount of flood damage because of the complicated components.

TABLE N-10. MAJOR IMPORTS & EXPORTS AND CUSTUM DUTIES, SUBSIDIES

Import
(unit: million Rs)

Item	CIF Value	%	Custum Duties (%)	Weighting Average Ratio (%)
Petroleum & Products	22,500	23.8	50	11.90
Machinery (non-electrical)	23,500	24.8	20	4.96
Chemicals	12,600	13.3	20	2.66
Transport Equipments	9,660	10.2	60	6.12
Edible Oils	7,540	8.0	50	4.00
Iron, Steel & Products	6,190	6.5	50	3.25
Chemical Fertilizers	4,060	4.3	0	0
Drugs & Medicines	3,390	3.6	50	1.80
Grains	5,160	5.5	40	2.20
Total	94,600	100.0		36.89

Export
(unit: million Rs)

Item	FOB Value	%	Subsidy (%)	Weighting Average Ratio (%)
Cotton Yarn	14,900	21.0	5	1.05
Ready Made Germent	11,800	16.7	10	1.67
Cotton Clothes	10,120	14.3	15	2.15
Raw Cotton	11,200	15.8	0	0
Rice	6,100	8.6	0	0
Synthetic Textiles	4,160	5.9	10	0.59
Leather	5,200	7.3	15	1.10
Carpets & Rugs	4,250	6.0	15	0.90
Sports Goods	1,780	2.5	15	0.38
Surgicul Instruments	1,320	1.9	15	0.29
Total	70,830	100.0		8.13

TABLE N-11. CONVERSION FACTOR OF EARTH WORK (1/2)

Item	Share (%)
Unskilled Labor	3
Skilled Labor	15
Operation Cost	59
Overhead Cost	12
Total	100

TABLE N-11. CONVERSION FACTOR OF EARTH WORK (2/2)

Item	Share (1)	CF (2)	(1) x (2)
Unskilled Labor	0.03	0.4	0.012
Skilled Labor	0.15	0.8	0.120
Operation Cost	0.59	0.5	0.295
Overhead Cost	0.23	0.8	0.184
Eeath Work	1.00		CF = 0.61

TABLE N-12. CONVERSION FACTOR OF CEMENT & MASONRY WORK (1/2)

Item	Share (1)	CF (2)	(1) x (2)
Material Cost	0.42	0.8	0.336
Machinery Cost	0.05	0.8	0.040
Unskilled Labor	0.10	0.4	0.040
Skilled Labor	0.20	0.8	0.160
Overhead Cost	0.23	0.8	0.184
Cement & Masonry	1.00		CF = 0.76

Remark: Material Cost : SCF
            Machinery Cost : Custom Duties 20 %
            Unskilled & Skilled Labor : Above-mentioned
            Overhead Cost : SCF

TABLE N-12. CONVERSION FACTOR OF CEMENT & MASONRY WORK (2/2)

Item	Share (1)	CF (2)	(1) x (2)
Cement or Masonry	0.47	0.76	0.357
Unskilled Labor	0.09	0.40	0.036
Skilled Labor	0.21	0.80	0.168
Overhead Cost	0.23	0.80	0.184
Masonry & Concrete Work			CF = 0.75

TABLE N-13. CONVERSION FACTOR OF DIRECT CONSTRUCTION COST

Item	Share % (1)	CF (2)	(1) x (2)
(1) CASE A			
Earth Work	22.7	0.61	0.138
Masonry	65.4	0.75	0.491
Concrete Work	2.0	0.75	0.015
Others	9.9	0.80	0.079
(Direct Construction Cost)			CF = 0.72
(2) CASE B - 1			
Earth Work	12.3	0.61	0.075
Masonry	45.1	0.75	0.338
Concrete Work	0.7	0.75	0.005
Others	41.9	0.80	0.335
(Direct Construction Cost)			CF = 0.75
(3) CASE B - 2			
Earth Work	11.5	0.61	0.070
Masonry	43.9	0.75	0.329
Concrete Work	0.4	0.75	0.003
Others	44.2	0.80	0.354
(Direct Construction Cost)			CF = 0.76

Remark: Others: SCF : 0.80

TABLE N-14. OPERATION & MAINTENANCE COST IN ACCOUNTING PRICE   (unit: million Rs)

Item	Case A			Case B-1			Case B-2		
	MP	CF	AP	MP	CF	AP	MP	CF	AP
Distribution Structure	0.78	0.69	0.54	0.78	0.69	0.54	0.78	0.69	0.54
Dispersion Structure	0.53	0.69	0.37	0.53	0.69	0.37	0.53	0.69	0.37
Road	0.37	0.69	0.25	0.37	0.69	0.25	0.37	0.69	0.25
sub total	1.68		1.16	1.68		1.16	1.68		1.16
Watershed Management	0		0	0.23	0.69	0.16	0.23	0.69	0.16
Total	1.68		1.16	1.91		1.32	1.91		1.32

ANNEX O.   DRAWINGS

LIST OF DRAWINGS

C OF DISPERSION STRUCTURE-II
(S-No.3+40.0)

C OF DISPERSION STRUCTURE-I
(M-No.1+730.00)

CHHABRI BRANCH

320.00
(SEPARATING DIKE)

1,480.00
(LEFT DIKE)

CHHABRI-SUCHANI BRANCH

325.00

700.00
(RIGHT DIKE)

SUCHANI BRANCH

2,290.00
(SEPARATING DIKE)

500.00
(LEFT DIKE)

VIDORE
HILL TORRENT

329.00

390.00
(SEPARATING DIKE)

340.00 (RIGHT DIKE)

PHULLAR BRANCH

0 100 200 300 400 500m

SCALE

O - 1

C OF DISPERSION STRUCTURE-I
(M-No.1+730.0)

210.00

290.00

CHHABRI SUCHANI BRANCH

VIDORE HILL TORRENT

5.00 10.00

EL.214.80

50.00

340.00

PHULLAR BRANCH

70.00

EL.214.80

EL.218.60

270.00

6.00

329.00

5.00 6.00

100.00

200.00

6.00

0 100 200m

SCALE

O - 2

TYPICAL SECTION OF WEIR

SCALE
0   5.000   10.000mm

TYPICAL SECTION OF DIKE

SCALE
0   5.000   10.000mm

PROFILE OF DISPERSION STRUCTURE

SCALE
0   50.000   100.000mm

ISLAMIC REPUBLIC OF PAKISTAN
GOVERNMENT OF PUNJAB

FEASIBILITY STUDY ON DEVELOPMENT OF IRRIGATION
BASED UPON FLOOD FLOWS OF D.G. KHAN HILL TORRENTS

TITLE OF DRAWING VIDORE HILL TORRENT
DISPERSION STRUCTURE-I
PROFILE & TYPICAL SECTION

O – 3

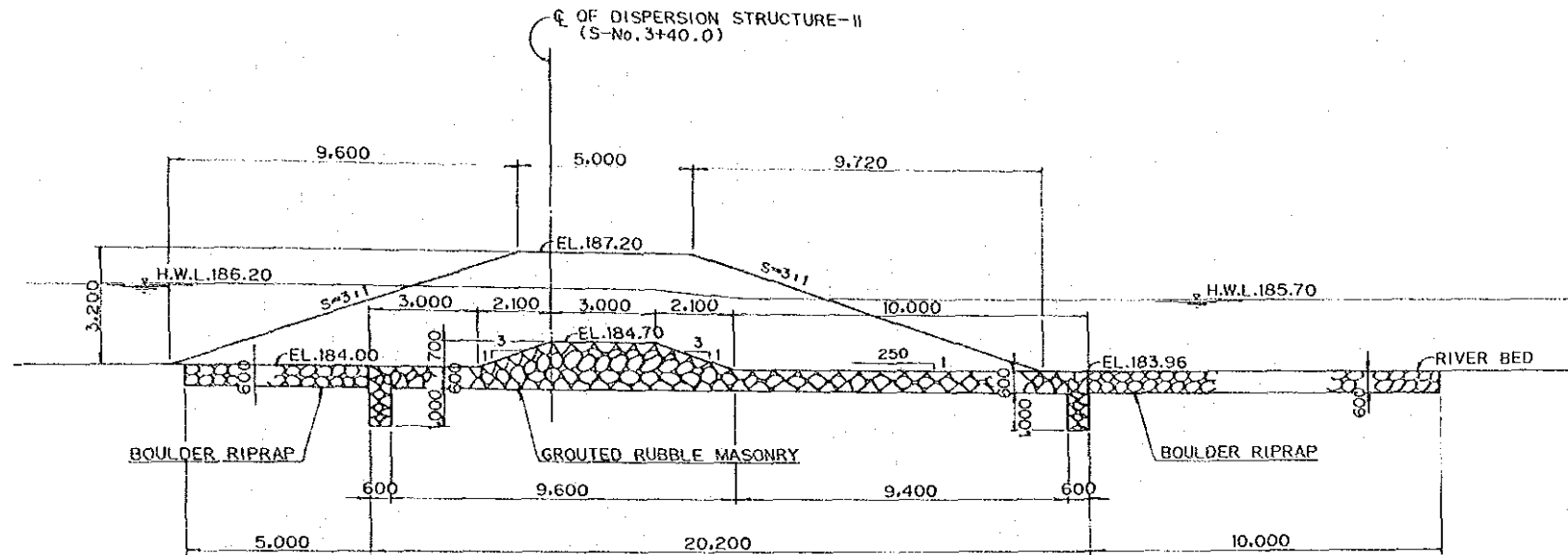JAPAN INTERNATIONAL COOPERATION AGENCY | DWG. NO. 3

CHHABRI BRANCH

CHHABRI-SUCHANI BRANCH

SUCHANI BRANCH

135.00

2,290.00

345.00

770.00

450.00

5.00

5.00 10.00

5.00

150.00

325.00 5.00

5.00 5.00

150.00

250.00

5.00

0

100 200 300m

SCALE

O – 4

Ç OF DISPERSION STRUCTURE-II
(S-No. 3+40.0)

9,600   5,000   9,720

EL.187.20

H.W.L.186.20   S=311   S=311   10.000   H.W.L.185.70

3,200   3,000   2,100   3,000   2,100

EL.184.70

EL.184.00   250   EL.183.96   RIVER BED

BOULDER RIPRAP   GROUTED RUBBLE MASONRY   BOULDER RIPRAP

600   9,600   9,400   600

5,000   20,200   10,000

TYPICAL SECTION OF WEIR

0   5.000   10.000mm

SCALE

3.000~7,400   5,000

H.W.L.   S=211

EMBANKMENT

S=211   ORIGINAL G.L.

STONE PITCHING

TYPICAL SECTION OF DIKE

0   5.000   10.000mm

SCALE

EL.195.00

EL.190.00

325.000

5,000   150.000
(CHHABRI BRANCH)   5,000
5,000 5,000   150.000
(SUCHANI BRANCH)   5,000

EL.187.20   EL.187.20   EL.187.20

EL.185.00   H.W.L.186.20   3,200   2,500   H.W.L.186.20

EL.184.70   EL.184.70

EL.184.00   EL.184.00

EL.182.40   EL.182.40

335.000

EL.180.00

EL.175.00

PROFILE OF DISPERSION STRUCTURE

0   50.000   100.000mm

SCALE

EL.170.00

EL.165.00

EL.160.00

EL.155.00

EL.150.00

EL.150.00

EL.145.00

INTAKE
STA.0

W.S.

ORIGINAL GROUND SURFACE

W.S.

END POINT
STA.4+660.00

W.S.

TYPE-A

3.000 17.400 3.000
2:1   2:1 W.S. 2:1
3.200 11.000 3.200

TYPE-B

3.000 15.600 3.000
W.S.
2.800 10.000 2.800

TYPE-C

3.000 11.900 3.000
W.S.
1.950 8.000 1.950

TYPE-D

3.000 10.300 3.000
W.S.
1.650 7.000 1.650

CANAL TYPE	TYPE-A				TYPE-B				TYPE-C				TYPE-D				
DISCHARGE (cms)	Q=23.16cms L=1,000m				Q=18.05cms L=1,200m				Q=12.42cms L=1,200m				Q=6.24cms L=1,260m				
SLOPE OF CANAL BOTTOM	S=1:390				S=1:300				S=1:280				S=1:400				
WATER SURFACE ELEVATION (m)	167.30	166.79	166.27	165.76	167.09	164.74	163.87	163.21	162.54	161.87	161.21	160.54	159.73	159.01	158.30	157.58	156.87	156.15	155.45	154.95	154.45	153.95	153.45	152.95 152.80
BOTTOM OF CANAL ELEVATION (m)	166.00	165.49	164.97	164.46	165.79	163.44	162.77	162.11	161.44	160.77	160.11	159.44	158.73	158.01	157.30	156.58	155.87	155.15	154.65	154.15	153.65	153.15	152.65	152.15 152.00
ORIGINAL CANAL BOTTOM (m)	166.00	165.49	164.94	164.40	163.88	163.45	163.19	162.32	161.06	160.84	159.75	159.43	159.42	157.77	157.40	156.29	156.04	155.16	154.21	153.63	154.70	153.94	152.82	152.21 152.04
DISTANCE (m)	0	200	400	500	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000	3,200	3,400	3,600	3,800	4,000	4,200	4,400	4,600 4,660
STATION	STA.0	+200	+400	+600	+800	STA.1	+200	+400	+600	+800	STA.2	+200	+400	+600	+800	STA.3	+200	+400	+600	+800	STA.4	+200	+400	+600 +660

PART III.   SUPPLEMENT

ANNEX P. COMMENTS FROM IRRIGATION AND POWER DEPARTMENT, AND TEAM'S VIEW

ANNEX P. COMMENTS FROM IRRIGATION AND POWER DEPARTMENT, AND TEAM'S VIEW

CHAPTER I.   COMMENTS FROM IRRIGATION AND POWER DEPARTMENT

From

        The Chief Engineer,
        Drainage and Flood,
        Irrigation & Power Deptt:
        Lahore-54600.

To
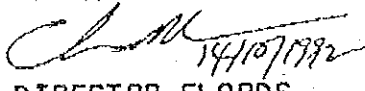
        The Japan International Cooperation
        Agency(JICA),
        Islamabad.

No.D&F/92/ _6383_ /35/79/F.R.92   Dated.14.10.1992.

SUBJECT: DRAFT FEASIBILITY STUDY ON DEVELOPMENT OF
          IRRIGATION BASED UPON FLOOD FLOWS OF D.G.KHAN
          HILL TORRENT - JULY 1992.

        Kindly find enclosed herewith comments/views

on the above mentioned subjected study for your consideration

and further necessary action at your end.

                                  14/10/1992

D.A./As above.   DIRECTOR FLOODS
             For Chief Engineer,Drainage & Flood
                Irrigation and Power Department
                      Lahore.

    C.C.

     1. Secretary, Govt: of the Punjab, Irr: & Power
        Department, Lahore with reference to Chief Engineer,
        Irrigation Multan letter No. ST/154, dt. 14.10.1992
        for information.

     2. Chief Engineer, Irrigation Multan Zone with reference
        to his No.ST/154, dated 14.10.1992.

FEASIBILITY STUDY ON DEVELOPMENT OF IRRIGATION BASED UPON FLOOD FLOWS OF D.G.KHAN HILL TORRENTS.

The subject report has been perused and the following comments are offered for consideration by the Japan International Cooperation Agency while compiling final feasibility study report:-

1. In general we are in agreement with the development strategy suggested in the draft report subject to reconsideration of points givenherein after.

2. The E.I.R.R. as per economic evaluation for the suggested implementation plan for case B1 and B2, as appearing on page 3 of the summary to the report is quite low and is likely to be viewed un-favourably by the project approving authorities. This needs to be reviewed. It is observed that the damage protential of the Hill Torrents has not been properly up-dated on current values and at the same time efforts should be made to keep the project cost on the lower side. The possible areas on reduction in cost could be, the provision of contingency at a lower percentage than 10% adopted in the project estimate, the reduction in foreign exchange componant by utilizing various local available sources and the economical design of structures. The proposed roads may also be adopted as single lane due to scanty traffic within the project area.

3. The recommended development plan B2 envisages the implementation period as ten years which is considered to be a long period. It is suggested that this may be reduced to seven years and the water shed conservation measures may also be started simultaneously with the structural improvement covered in case (A). This will improve the E.I.R.R. of the project.

4. If a similar study had been undertaken by M/S NESPAK Consultants for the flood Management of Kaha Hill Torrent. The E.I.R.R. has been worked out as 21.32 % in case of that project. It would be worthwhile to compare both the studies while finalizing the feasibility study under hand.

5. The proposed diversion structures, include grouted Rubble masonery in crest portion. This is likely to induce an element of rigidity in the structure. The Department has been trying various dispersion structures on the Hill Torrents over the past years. It has been experienced that due to excessive boulder movement the flexible structures with stone in Gabbions or wire-crates have with-stood successful This as-pect may be examined as the same is likely to have a significant effect on the cost of the project.

6. The rains in the catchment area of Vidore Hill Torrent are very scanty. The Malchesis or creepers may also be tried in the Management of soilmoisture alongwith grasses proposed in the report.

7. The development cost per acre has been worked out over Rs. 50,000/- per acre. In ese of Dajal Branch and Kaha Hill Torrent project it ranged from Rs. 4,000/- to Rs. 1500/- respectively. This needs to be reviewed to bring the cost per acre on the lower side by increasing the Non-Haqooq areas.

8. The Irrigation & Power Department has its own Land Reclamation Directorate and Forestry wing which can be effectively used for the water-shed Management and soil conservation componant of the project. This aspect may be included in the feasibility study.

9. The proposed dispersion structure No. 1 deprives
    Haqooq areas of Suchani Branch Upstream of structure
    No. 2 which needs to be examined. Further more there are
    about 100 Nos. off-taking channels on the three branches
    of Vidore Hill Torrent. It is not clear in the project
    whether control points will be constructed at their
    respective diversion sites.

10. The utilization of estimated run of over pachad area
    in case B2 is about 40%. The balance water will
    ultimately flood the canal irrigated areas beyond D.G.
    Khan canal and Dajal Branch as experienced during the
    floods of 1992. There is therefore, need to include
    protective measures as well in the irrigated areas
    to-wards left side of the canal. The share of each
    branch can also be enhanced by developing Non-Haqooq
    areas to increase the utilization of the flood flows
    before they reach canal irrigated areas.

11. The slopes of the proposed diversion channels are very
    steep which have been banked without protections against
    the erosion. This needs to be looked inot and adequately
    protected against parallel flow.

12. There are quite a few typographical errors in the draft
    report which may be corrected.

CHAPTER II.   TEAM'S VIEW

THE ANSWERS TO THE COMMENTS RECEIVED ROM I.P.D.

We, the Study Team, herewith present the following answers to your comments.

Answer to the comment 1.

We hereby express our gratitude for your kind approval on our development plan, and we would like to hereinafter present our answers to each of your comments.

Answer to the comment 2.

Both Cases B1 and B2 are of measures not only for the flood control to improve the present situation but also for playing an important role as fundamental measures in the initial stage in order to obtain the programmed and stable agricultural productivity in Pachad area in the future.

Therefore, we consider that it is quite difficult to expect its high economic effect and EIIR as gained in the other ordinary F/S Studies.

The effect of flood protection is of having been worked out based on the latest data offered by the section in charge in the Department. And we believe that we had no other way to further increase the effect at the time of the field study.

The adapted rate of contingency is the reasonable and appropriate value popularly employed in the ordinary project planning.

As use of imported materials is suppressed to minimum, further deduction of the project const is difficult by means of decrease in the above-mentioned factors.

The maintenance roads have been planned to be with 3.0 m in effective width, 7.3 m in overall width and asphalt-paved single lane. However, the plan is now modified into gravel pavement at some parts in the total routes.

Answer to the comment 3.

The construction period for the Project plan B2 has been set a t 10 years according to the following reasons.

* The education and extension of work technology to the farmers are essential because the watershed conservation measures are to be implemented with the farmers' participation to the works.
* The livestock gradually increases in number in accordance with the expansion of pasture.

The Project is therefore quite difficult to be completed within a short period, and 10 years are at least required.

The structural improvement works covered in Pachad area is to be commenced simultaneously with the watershed conservation measures as you have pointed out.

Answer to the comment 4.

It is not the appropriate idea to compare the EIRR of this project with that of Kaha Hill Torrent project because none of drastic measure is made for watershed conservation plan in Kaha Hill Torrent project.

Apart from the above-mentioned reason, the economic effect in Kaha Hill Torrent is naturally larger than that in Vidore Hill Torrent because the flood damage caused in Kaha Hill Torrent is much larger than that in Vidore Hill Torrent.

Answer to the comment 5.

Generally speaking, the strength and durability of the river structures decreases in the order of concrete, grouted rubble masonry, dry masonry and earthen structures.

In case they have to be constructed in severe conditions such as with steep river bed gradient or of flash floods with boulders, the design of strong and durable structures is the fundamental needs for the planning.

For construction of the diversion weir in such severe conditions, strong protection works not limited to the weir body but to upstream and downstream beds and dikes are accordingly necessitated. It may be said that reasons of their destruction in the past are in most cases insufficient protection for the beds and dikes.

Deliberate design and complete construction of those structures are therefore required.

On the other hand, gabion works are generally applied to the rivers of mild flows in the downstream and sometimes applied in the severe rivers as temporary structure.

Gabion can flexibly works to the slight scouring and often understood as of long life span due to their appearance in the river. However, once the due functions are lost, the gabions are same as being destroyed.

In the Vidore river, for instance, the escape structure at 500 m upstream from Dispersion Structure II was constructed with gabions but a portion has already been washed away and lost the total functions. Flow conditions for construction of Dispersion Structures I and II under the Project are as severe as $1/110$-$1/230$ of the bed gradient, 2.5-3.0 m/s of the flow velocity and $1,795$ cu.m/s of the design flood, and therefore it may be anticipated that gabion works will quickly be lost. Gabion is preferably applied to the mild flows below 2.0 m/s in the middle or downstream reaches of the river.

Consequently, the Study Team considers that revision of the grouted rubble masonry into the gabion works is not appropriate.

Notwithstanding the above, by taking the Department's requirement for higher EIRR into account for the project formulation, the EIRR calculation in case of the revision is herewith attached for your information though not agreeable by the Study Team.

Answer to the comment 6.

We agree with you on your comment and the employment of such additional measures are expected in the Project implementation.

Answer to the comment 7.

The project cost as per acre is estimated at about 9,900 Rs for case B2 including the cost of watershed conservation measures. The cost of case A in Pachad area becomes about 3,700 Rs/acre. These project costs are not so high as you have pointed out.

The above-mentioned unit costs become 9,400 Rs/acre and 3,200 Rs/acre respectively, if revising the asphalt pavement into the gravel pavement.

Since the modification or alteration of current water right are not allowed, Nonhaqooq area can not be included in the beneficial area of the Project.

Answer to the comment 8.

An additional description is presented in the Main Report (7.1.2) in conformity with the comment.

Answer to the comment 9.

As presented in the Irrigation system Diagram (page F-20, Fig. 6.2, Main Report), Chhabri-Suchani and Phullar Branches are diverted by Dispersion Structure I, and Chhabri and Phullar Branches are by Dispersion Structure II.

Accordingly, Phullar Branch diverted by the Structure I does not serve for Haqooq area which is upstream part of Suchani Branch.

The three branches of Vidore Hill Torrent have about 100 secondary canals, and diversion of water to the canals are planned for operation by farmers in the same manners of constructing Ghandah as conventionally practiced.

And, when it comes to the stage of programmed irrigation practices in the future, some labor-saving flow regulating structures may be planned.

Answer to the comment 10.

In Case B2, volumes of annual runoff, irrigation water and flood utilization rate are as follows (page 6-8, Main Report).

		Annual Runoff (MCM)	Irrigation Water (MCM)	Rate of Flood Utilization (%)
Annual Mean		122.14	88.35	72
R. Period	1/2	104.61	77.28	74
- do -	1/5	160.01	114.02	76
- do -	1/10	190.39	142.05	76
- do -	1/25	254.07	175.59	69

In the above table, the remainder of the annual runoff from the irrigation water is the ineffective release of water which mostly occurs in Rabi season (page 6-5, Main Report). Accordingly, arrivals of flood water into the canal-irrigated areas and their flood damage thereby may by judged almost unlikely as mentioned in the Report. (page 6-5, Main Report)

Meanwhile, use of flood water for Nonhaqooq area through the branches are not planned since it requires the readjustment of water right.

Answer to the comment 11.

Diversion channels from Chhabri, Suchani and Phullar Branch Canals to the service areas (PT-38, Table 6-8, Main Report) are planned for channel widening because of their insufficient capacities. Bed gradients of the channels are as same as their present gradient and therefore no measure against the channel erosion is considered.

CHAPTER III. ATTACHMENT TABLES FOR ANSWER TO THE COMMENT 5

3.1 Summary of Project Cost and Economic Evaluation

(1) Project Cost

(Unit: '000 Rs)

Currency	Case A	Case B-1	Case B-2
Foreign	29,920	48,830	62,127
Local	65,980	162,070	239,873
Total	95,900	210,900	302,000

(2) Operation and maintenance

(Unit: Rs/Yr)

	Case A	Case B-1	Case B-2
1. Dispersion Structures	779,900	779,900	779,900
2. Canals and Channels	531,100	531,100	531,100
3. Roads	370,900	370,900	370,900
Sub total	1,681,900	1,681,900	1,681,900
4. Watershed Conservation	0	223,400	223,400
Total	1,681,900	1,905,300	1,905,300

(3) Financial Evaluation

Case A   :   I.R.R.   ;   15.9 %

N.P.V.   ;   Rs.43.78 mil.

B/C ratio   ;   1.56

Case B-1 :   I.R.R.   ;   8.8 %

N.P.V.   ;   Rs.-2.15 mil.

B/C ratio   ;   0.98

Case B-2 :   I.R.R.   ;   7.7 %

N.P.V.   ;   Rs.-14.87 mil.

B/C ratio ; 0.90

(4) Construction cost in economic price

Case A   Rs.46.28 mil.
Case B-1   Rs.94.15 mil.
Case B-2   Rs.121.08 mil.

(5) Operation and maintenance cost in economic price

Case A   Rs.1.16 mil.
Case B-1   Rs.1.32 mil.
Case B-2   Rs.1.32 mil.

(6) Salvage values in economic price

Case A   Rs.14.27 mil. x   0.8 (CF) = Rs.11.41 mil.
Case B-1   Rs.59.00 mil. x   0.8 (CF) = Rs.47.20 mil.
Case B-2   Rs.82.05 mil. x   0.8 (CF) = Rs.65.64 mil.

(7) Economic Evaluation

Case A   :   E.I.R.R. ;   22.14 %
              N.P.V.   ;   Rs.58.03 mil.
              B/C   ;   2.13

Case B-1 :   E.I.R.R. ;   12.56 %
              N.P.V.   ;   Rs.26.91 mil.
              B/C   ;   1.30

Case B-2 :   E.I.R.R. ;   11.00 %
              N.P.V.   ;   Rs.16.66 mil.
              B/C   ;   1.16

(8) Sensitivity Analysis on Cost (5 % increase in construction cost)

Case A   :   N.P.V.   ;   Rs.55.97 mil.   (by 9% discount rate)
               B/C   ;   2.05   (by 9% discount rate)

Case B-1   :   E.I.R.R. ;   11.17%
               N.P.V.   ;   Rs.22.96 mil.   (by 9% discount rate)
               B/C   ;   1.24   (by 9% discount rate)

Case B-2   :   E.I.R.R. ;   9.83%
               N.P.V.   ;   Rs.12.03 mil.   (by 9% discount rate)
               B/C   ;   1.11   (by 9% discount rate)

(9) Sensitivity Analysis on Benefit

i)   5% decrease in agricultural production benefit

Case A   :   N.P.V.   ;   Rs.52.63 mil.   (by 9% discount rate)
               B/C   ;   2.03   (by 9% discount rate)

Case B-1   :   E.I.R.R. ;   11.36%
               N.P.V.   ;   Rs.21.30 mil.   (by 9% discount rate)
               B/C   ;   1.24   (by 9% discount rate)

Case B-2   :   E.I.R.R. ;   10.04%
               N.P.V.   ;   Rs.10.97 mil.   (by 9% discount rate)
               B/C   ;   1.11   (by 9% discount rate)

ii) 10% decrease in agricultural production benefit

Case A   :   N.P.V.   ;   Rs.47.22 mil.   (by 9% discount rate)
               B/C   ;   1.92   (by 9% discount rate)

Case B-1   :   E.I.R.R. ;   10.93%
               N.P.V.   ;   Rs.15.69 mil.   (by 9% discount rate)
               B/C   ;   1.17   (by 9% discount rate)

Case B-2 : E.I.R.R. ; 9.66%

N.P.V. ; Rs.5.27 mil. (by 9% discount rate)

B/C ; 1.05 (by 9% discount rate)

(10) Appraisal of Development Plans

Case	Content	Return Period (years)	Cost ('000Rs.)	EIRR (%)
Case A	Installation of flood dispersion and Irrigation facilities in pachad area	2	95,900	22.14
Case B-1	Case A + Watershed conservation works	5	210,900	12.56
Case B-2	Case A + Watershed conservation works	10	302,000	11.00

3.2 Attachment Tables

TABLE 6.9 CONSTRUCTION UNIT COST

Description	Unit	Rate (Rs)	F.C. (Rs)	L.C. (Rs)
1. For Irrigation				
Excavation (Labour)	cu.m	22.1	0.0	22.1
Excavation (Back hoe)	cu.m	56.5	43.7	12.8
Excavation (Bulldozer)	cu.m	70.5	54.0	16.5
Backfill (Labour)	cu.m	18.8	2.1	16.7
Embankment (Bulldozer)	cu.m	44.4	34.5	9.9
Dressing Slope	sq.m	1.6	0.0	1.6
Plain Concrete	cu.m	1,158.9	421.8	737.1
Reinforcement Concrete	cu.m	2,399.7	873.4	1,526.3
Dry Rubble Masonry	cu.m	562.4	0.0	562.4
Dry Rubble Masonry	cu.m	1,158.8	224.9	933.9
Stone Pitching (Top layer)	cu.m	454.5	0.0	454.5
Stone Pitching (Spawl fitting)	cu.m	142.9	0.0	142.9
Boulder Riprap	cu.m	353.4	88.2	265.2
Gabion Riprap	cu.m	589.9	242.8	347.1
Asphaltic Concrete Wearing	sq.m	85.0	30.0	55.0
Asphaltic Concrete Binding	sq.m	145.0	50.0	95.0
Ballast	sq.m	85.0	30.0	55.0
Base Course	cu.m	180.0	20.0	160.0
Sub-Base Course	cu.m	155.0	15.0	140.0
2. For Watershed Management				
Bund Type A	unit	14,697.0	6,294.0	8,403.0
Bund Type B	unit	19,403.0	6,707.0	12,696.0
Bund Type C	unit	17,305.0	5,207.0	12,098.0
Seedbed	ha	7,160.0	0.0	7,160.0
Planting Zone II or V	km	15,080.0	700.0	14,380.0
Planting Zone III	km	15,200.0	800.0	14,400.0
Planting Zone IV	km	15,150.0	760.0	14,390.0
Gully Plugging	unit	3,608.0	5.0	3,603.0
Pond	unit	762,554.0	190,136.0	572,418.0
Water Point	unit	815,147.0	629,990.0	185,157.0
Seeding	ha	147.5	40.0	107.5

TABLE 6.10   SUMMARY OF PROJECT COST (CASE A)

(Unit: '000 Rs)

Item	Total	Foreign	Local
1. Dispersion Structure			
1.1 Dispersion Structure I	11,221	3,342	7,879
1.2 Dispersion Structure II	23,762	5,167	18,595
1.3 Separating Dike	9,456	2,268	7,188
2. Distribution Structure			
2.1 Chhabri Branch	4,188	3,154	1,034
2.2 Suchani Branch	4,756	3,581	1,175
3.3 Phllar Branch	3,700	2,798	902
3. Road	7,397	2,619	4,778
Sub-Total	64,480	22,929	41,551
4. Engineering Fee	6,420	4,188	2,232
Total (1-4)	70,900	27,117	43,783
5. Price Escalation	25,000	2,803	22,197
Grand Total	95,900	29,920	65,980

Note: 10 % of contingency is included in items 1-5 above.

TABLE 6.11   SUMMARY OF PROJECT COST (CASE B-1)

(Unit: '000 Rs)

Item	Total	Foreign	Local
1. Dispersion Structure			
1.1 Dispersion Structure I	11,221	3,342	7,879
1.2 Dispersion Structure II	23,762	5,167	18,595
1.3 Separating Dike	9,456	2,268	7,188
2. Distribution Structure			
2.1 Chhabri Branch	4,188	3,154	1,034
2.2 Suchani Branch	4,756	3,581	1,175
3.3 Phllar Branch	3,700	2,798	902
3. Road	7,397	2,619	4,778
Sub-Total	64,480	22,929	41,551
4. Watershed Management			
4.1 Bund	30,519	11,595	18,924
4.2 Vetiver Grass	22,467	435	22,032
4.3 Gully Pluging	7,859	12	7,847
4.4 Pond	5,033	1,255	3,778
4.5 Water Point	1,061	815	246
4.6 Grass Seeding	1,960	532	1,428
Sub-Total	68,899	14,644	54,255
5. Engineering Fee	9,321	6,043	3,278
Total (1-5)	142,700	43,616	99,084
5. Price Escalation	68,200	5,214	62,986
Grand Total	210,900	48,830	162,070

Note: 10 % of contingency is included in items 1-5 above.

TABLE 6.12   SUMMARY OF PROJECT COST (CASE B-2)

(Unit: '000 Rs)

Item	Total	Foreign	Local
1. Dispersion Structure			
1.1 Dispersion Structure I	11,221	3,342	7,879
1.2 Dispersion Structure II	23,762	5,167	18,595
1.3 Separating Dike	9,456	2,268	7,188
2. Distribution Structure			
2.1 Chhabri Branch	4,188	3,154	1,034
2.2 Suchani Branch	4,756	3,581	1,175
3.3 Phllar Branch	3,700	2,798	902
3. Road	7,397	2,619	4,778
Sub-Total	64,480	22,929	41,551
4. Watershed Management			
4.1 Bund	46,568	17,162	29,406
4.2 Vetiver Grass	31,589	600	30,989
4.3 Gully Pluging	14,289	22	14,267
4.4 Pond	5,033	1,255	3,778
4.5 Water Point	4,385	3,370	1,015
4.6 Grass Seeding	4,002	1,087	2,915
Sub-Total	105,866	23,496	82,370
5. Engineering Fee	11,954	7,785	4,169
Total (1-5)	182,300	54,210	128,090
5. Price Escalation	119,700	7,917	111,783
Grand Total	302,000	62,127	239,873

Note: 10 % of contingency is included in items 1-5 above.

TABLE 7.1   BREAKDOWN OF ANNUAL O/M COST

Description	Qty's	Unit	Rate (Rs)	Amount ('000 Rs)
1. Dispersion & Separating				
1.1 Dispersion Structure				
(1) Dry Rubble Masonry	230	cu.m	1,158.8	266.5
(2) Boulder Riprap	135	cu.m	353.4	47.7
(3) Gabion Riprap	135	cu.m	589.9	79.6
(4) Stone Pitching (Top)	480	cu.m	454.5	218.2
(5) Stone Pitching (Spawl)	240	cu.m	142.9	34.3
1.2 Separating Dike				
(1) Embankment	640	cu.m	44.4	28.4
(2) Stone Pitching (Top)	200	cu.m	454.5	90.9
(3) Stone Pitching (Spawl)	100	cu.m	142.9	14.3
Sub-Total				779.9
2. Distribution Structure				
2.1 Excavation	9,400	cu.m	56.5	531.1
Sub-Total				531.1
3. Road				
3.1 Asphaltic Con. Wearing	400	sq.m	85.0	34.0
3.2 Asphaltic Con. Binding	533	sq.m	145.0	77.3
3.3 Gravelling	2,440	sq.m	85.0	207.4
3.4 Base Course	290	cu.m	180.0	52.2
Sub-Total				370.9
(Case A Annual O/M Cost)				(1,681.9)
4. Watershed Management				
4.1 Pond	1,080	cu.m	70.5	76.1
4.2 Water Point	2,090	cu.m	70.5	147.3
Sub-Total				223.4
Total (Case B-1, Case B-2 Annual O/M Cost)				(1,905.3)

Note: This table shows the annual O/M cost in Case B-1 and Case B-2 (1,905.3 thousand Rs).
    In Case A, the annual O/M cost consists of items 1, 2 and 3 in the above table
    (1,681.9 thousand Rs).

TABLE 8.6　　SALVAGE VALUE (IRRIGATION AREA) (1/3)

(used year: 25 years)

item	Construction Cost (million Rs.)	Life year	Salvage Ratio (%)	Salvage Value (million Rs.)
1.Disresion Structure				
Earth Works	10.34	80	70	7.24
Masonry Works	26.16	30	15	3.93
Concrete Works	3.20	50	50	1.60
other Works	4.74	-	-	
2.Distribution Structure				
Earth Works	12.64	20	0	0
3.Road				
Earth Works	2.15	80	70	1.50
Pavement Works	5.25	10	0	0
Total	64.48			14.27

TABLE 8.6　　SALVAGE VALUE (WATERSHED AREA, CASE B-1) (2/3)

(used year: 25 years)

item	Construction Cost (million Rs.)	Life year	Salvage Ratio (%)	Salvage Value (million Rs.)
Watershed Management				
Burd	10.83	80	70	7.59
Masonry	19.69	30	15	2.95
Vetiver Gross	22.47	∞	100	22.47
Gully Pluging	7.86	80	70	5.50
Pond	5.03	80	70	3.52
Water Point	1.06	80	70	0.74
Grass Seeding	1.96	∞	100	1.96
Total	68.90			44.73

TABLE 8.6　　SALVAGE VALUE (WATERSHED AREA, CASE B-2) (3/3)

(used year: 25 years)

item	Construction Cost (million Rs.)	Life year	Salvage Ratio (%)	Salvage Value (million Rs.)
Watershed Management				
Burd	15.67	80	70	10.97
Masonry	30.90	30	15	4.64
Vetiver Gross	31.59	∞	100	31.59
Gully Pluging	14.29	80	70	10.00
Pond	5.03	80	70	3.52
Water Point	4.39	80	70	3.07
Grass Seeding	4.00	∞	100	4.00
Total	105.87			67.79

TABLE 8.7   CASH FLOW IN MARKET PRICE (CASE A) (1/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits				Total Benefits	Net Benefit Value
				(1)	(2)	(3)	(4)		
1	48.07		48.07						Δ 48.07
2	22.83	0.53	23.36						Δ 23.36
3		1.68	1.68	4.58	9.94	0		14.52	12.84
4		1.68	1.68	4.58	9.94	0		14.52	12.84
5		1.68	1.68	4.58	9.94	0		14.52	12.84
6		1.68	1.68	4.58	9.94	0		14.52	12.84
7		1.68	1.68	4.58	9.94	0		14.52	12.84
8		1.68	1.68	4.58	9.94	0		14.52	12.84
9		1.68	1.68	4.58	9.94	0		14.52	12.84
10		1.68	1.68	4.58	9.94	0		14.52	12.84
11		1.68	1.68	4.58	9.94	0		14.52	12.84
12		1.68	1.68	4.58	9.94	0		14.52	12.84
13		1.68	1.68	4.58	9.94	0		14.52	12.84
14		1.68	1.68	4.58	9.94	0		14.52	12.84
15		1.68	1.68	4.58	9.94	0		14.52	12.84
16		1.68	1.68	4.58	9.94	0		14.52	12.84
17		1.68	1.68	4.58	9.94	0		14.52	12.84
18		1.68	1.68	4.58	9.94	0		14.52	12.84
19		1.68	1.68	4.58	9.94	0		14.52	12.84
20		1.68	1.68	4.58	9.94	0		14.52	12.84
21		1.68	1.68	4.58	9.94	0		14.52	12.84
22		1.68	1.68	4.58	9.94	0		14.52	12.84
23		1.68	1.68	4.58	9.94	0		14.52	12.84
24		1.68	1.68	4.58	9.94	0		14.52	12.84
25		1.68	1.68	4.58	9.94	0		14.52	12.84
26		1.68	1.68	4.58	9.94	0		14.52	12.84
27		1.68	1.68	4.58	9.94	0	14.27	28.79	27.11

F.I.R.R = 15.9 %

Source :   Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.7　　CASH FLOW IN MARKET PRICE (CASE B-1) (2/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits (1)	(2)	(3)	(4)	Total Benefits	Net Benefit Value
1	60.65		60.65						Δ 60.65
2	34.82	0.53	35.35						Δ 35.35
3	16.92	1.68	18.60	4.88	9.94			14.82	Δ 3.78
4	16.92	1.68	18.60	5.03	9.44			14.47	Δ 4.13
5	13.39	1.68	15.07	5.18	8.94			14.12	Δ 0.95
6		1.91	1.91	5.33	8.43			13.76	11.85
7		1.91	1.91	5.33	8.43			13.76	11.85
8		1.91	1.91	5.33	8.43			13.76	11.85
9		1.91	1.91	5.33	8.43	2.50		16.26	14.35
10		1.91	1.91	5.33	8.43	2.50		16.26	14.35
11		1.91	1.91	5.33	8.43	2.50		16.26	14.35
12		1.91	1.91	5.33	8.43	2.50		16.26	14.35
13		1.91	1.91	5.33	8.43	2.50		16.26	14.35
14		1.91	1.91	5.33	8.43	2.50		16.26	14.35
15		1.91	1.91	5.33	8.43	2.50		16.26	14.35
16		1.91	1.91	5.33	8.43	2.50		16.26	14.35
17		1.91	1.91	5.33	8.43	2.50		16.26	14.35
18		1.91	1.91	5.33	8.43	2.50		16.26	14.35
19		1.91	1.91	5.33	8.43	2.50		16.26	14.35
20		1.91	1.91	5.33	8.43	2.50		16.26	14.35
21		1.91	1.91	5.33	8.43	2.50		16.26	14.35
22		1.91	1.91	5.33	8.43	2.50		16.26	14.35
23		1.91	1.91	5.33	8.43	2.50		16.26	14.35
24		1.91	1.91	5.33	8.43	2.50		16.26	14.35
25		1.91	1.91	5.33	8.43	2.50		16.26	14.35
26		1.91	1.91	5.33	8.43	2.50		16.26	14.35
27		1.91	1.91	5.33	8.43	2.50	59.00	75.26	73.55

F.I.R.R = 8.8 %

Source :　　Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.7   CASH FLOW IN MARKET PRICE (CASE B-2) (3/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits				Total Benefits	Net Benefit Value
				(1)	(2)	(3)	(4)		
1	61.20		61.20						Δ 61.20
2	33.92	0.53	34.45						Δ 34.45
3	12.18	1.68	13.86	4.73	9.94			14.67	0.81
4	13.43	1.68	15.11	4.82	9.66			14.48	Δ 0.63
5	13.43	1.68	15.11	4.91	9.38			14.29	Δ 0.82
6	13.70	1.91	15.61	5.00	9.10			14.10	Δ 1.51
7	11.59	1.91	13.50	5.09	8.82			13.91	0.41
8	8.21	1.91	9.53	5.18	8.54			13.72	4.19
9	8.21	1.91	9.53	5.27	8.26			13.53	4.00
10	8.21	1.91	9.53	5.36	7.98			13.34	3.81
11		1.91	1.91	5.45	7.71	4.75		17.91	16.00
12		1.91	1.91	5.45	7.71	4.75		17.91	16.00
13		1.91	1.91	5.45	7.71	4.75		17.91	16.00
14		1.91	1.91	5.45	7.71	4.75		17.91	16.00
15		1.91	1.91	5.45	7.71	4.75		17.91	16.00
16		1.91	1.91	5.45	7.71	4.75		17.91	16.00
17		1.91	1.91	5.45	7.71	4.75		17.91	16.00
18		1.91	1.91	5.45	7.71	4.75		17.91	16.00
19		1.91	1.91	5.45	7.71	4.75		17.91	16.00
20		1.91	1.91	5.45	7.71	4.75		17.91	16.00
21		1.91	1.91	5.45	7.71	4.75		17.91	16.00
22		1.91	1.91	5.45	7.71	4.75		17.91	16.00
23		1.91	1.91	5.45	7.71	4.75		17.91	16.00
24		1.91	1.91	5.45	7.71	4.75		17.91	16.00
25		1.91	1.91	5.45	7.71	4.75		17.91	16.00
26		1.91	1.91	5.45	7.71	4.75		17.91	16.00
27		1.91	1.91	5.45	7.71	4.75	82.05	99.96	98.05

F.I.R.R = 7.7 %

Source :   Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.8   CONSTRUCTION COST IN ACCOUNTING PRICE

(Unit: million Rs.)

Item	Case A			Case B-1			Case B-2		
	MP	CF	AP	MP	CF	AP	MP	CF	AP
Direct Construction Cost	10.98	0.72	7.91	42.47	0.75	31.84	58.17	0.76	44.21
Material Cost	20.52	0.80	16.42	34.88	0.80	27.90	43.24	0.80	34.59
Machinery Cost	15.23	0.60	9.14	22.11	0.60	13.27	26.23	0.60	15.74
Contingency	5.13	0.80	4.10	10.61	0.80	8.48	13.54	0.80	10.83
Engineering Fee	5.62	0.90	5.06	8.16	0.90	7.34	10.46	0.90	9.41
Overhead Cost	4.56	0.80	3.65	6.63	0.80	5.31	7.87	0.80	6.30
Total	62.04		46.28	124.86		94.14	159.51		121.08

TABLE 8.9   DISBURSEMENT SCHEDULE FOR PROJECT COST(CASE A) (1/3)

(Unit: million Rs.)

Item/year	1	2	Total
Direct Construction Cost	4.99	2.92	7.91
Material Cost	9.65	6.77	16.42
Machinery Cost	6.97	2.17	9.14
Contingency	2.67	1.43	4.10
Engineering Fee	4.16	0.90	5.06
Overhead Cost	2.79	0.86	3.65
Total	31.23	15.05	46.28

TABLE 8.9   DISBURSEMENT SCHEDULE FOR PROJECT COST(CASE B-1) (2/3)

(Unit: million Rs.)

Item/year	1	2	3	4	5	Total
Direct Construction Cost	10.35	7.67	5.00	5.00	3.82	31.84
Material Cost	12.28	9.32	2.25	2.25	1.80	27.90
Machinery Cost	7.55	2.88	1.01	1.01	0.82	13.27
Contingency	3.61	2.28	0.93	0.93	0.73	8.48
Engineering Fee	5.68	1.00	0.22	0.22	0.22	7.34
Overhead Cost	3.01	1.14	0.41	0.41	0.34	5.31
Total	42.48	24.29	9.82	9.82	7.73	94.14

TABLE 8.9   DISBURSEMENT SCHEDULE FOR PROJECT COST(CASE B-2) (3/3)

(Unit: million Rs.)

Item/year	1	2	3	4	5	6	7	8	9	10	Total
Direct Construction Cost	10.77	7.87	3.85	3.97	3.97	3.94	3.45	2.13	2.13	2.13	44.21
Material Cost	12.84	9.33	1.55	1.94	1.94	2.07	1.59	1.11	1.11	1.11	34.59
Machinery Cost	7.53	2.76	0.72	0.80	0.80	0.83	0.72	0.53	0.53	0.52	15.74
Contingency	3.70	2.27	0.69	0.76	0.76	0.77	0.65	0.41	0.41	0.41	10.83
Engineering Fee	6.11	1.30	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	9.41
Overhead Cost	3.02	1.10	0.29	0.33	0.33	0.34	0.29	0.20	0.20	0.20	6.30
Total	43.97	24.63	7.35	8.05	8.05	8.20	6.95	4.63	4.63	4.62	121.08

TABLE 8.12   CASH FLOW IN ACCOUNTING PRICE (CASE A) (1/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits (1)	(2)	(3)	(4)	Total Benefits	Net Benefit Value
1	31.23		31.23						Δ 31.23
2	15.05	0.37	15.42						Δ 15.42
3		1.16	1.16	3.66	9.42	0		13.08	11.92
4		1.16	1.16	3.66	9.42	0		13.08	11.92
5		1.16	1.16	3.66	9.42	0		13.08	11.92
6		1.16	1.16	3.66	9.42	0		13.08	11.92
7		1.16	1.16	3.66	9.42	0		13.08	11.92
8		1.16	1.16	3.66	9.42	0		13.08	11.92
9		1.16	1.16	3.66	9.42	0		13.08	11.92
10		1.16	1.16	3.66	9.42	0		13.08	11.92
11		1.16	1.16	3.66	9.42	0		13.08	11.92
12		1.16	1.16	3.66	9.42	0		13.08	11.92
13		1.16	1.16	3.66	9.42	0		13.08	11.92
14		1.16	1.16	3.66	9.42	0		13.08	11.92
15		1.16	1.16	3.66	9.42	0		13.08	11.92
16		1.16	1.16	3.66	9.42	0		13.08	11.92
17		1.16	1.16	3.66	9.42	0		13.08	11.92
18		1.16	1.16	3.66	9.42	0		13.08	11.92
19		1.16	1.16	3.66	9.42	0		13.08	11.92
20		1.16	1.16	3.66	9.42	0		13.08	11.92
21		1.16	1.16	3.66	9.42	0		13.08	11.92
22		1.16	1.16	3.66	9.42	0		13.08	11.92
23		1.16	1.16	3.66	9.42	0		13.08	11.92
24		1.16	1.16	3.66	9.42	0		13.08	11.92
25		1.16	1.16	3.66	9.42	0		13.08	11.92
26		1.16	1.16	3.66	9.42	0		13.08	11.92
27		1.16	1.16	3.66	9.42	0	11.41	24.49	23.33

E.I.R.R = 22.14 %

Source :   Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.12   CASH FLOW IN ACCOUNTING PRICE (CASE B-1) (2/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits (1)	(2)	(3)	(4)	Total Benefits	Net Benefit Value
1	42.48		42.48						Δ 42.48
2	24.29	0.37	24.66						Δ 24.66
3	9.82	1.16	10.98	3.90	9.24			13.32	2.34
4	9.82	1.16	10.98	4.02	8.96			12.98	2.00
5	7.73	1.16	8.89	4.14	8.50			12.64	3.75
6		1.32	1.32	4.26	8.04			12.30	10.98
7		1.32	1.32	4.26	8.04			12.30	10.98
8		1.32	1.32	4.26	8.04			12.30	10.98
9		1.32	1.32	4.26	8.04	2.00		14.30	12.98
10		1.32	1.32	4.26	8.04	2.00		14.30	12.98
11		1.32	1.32	4.26	8.04	2.00		14.30	12.98
12		1.32	1.32	4.26	8.04	2.00		14.30	12.98
13		1.32	1.32	4.26	8.04	2.00		14.30	12.98
14		1.32	1.32	4.26	8.04	2.00		14.30	12.98
15		1.32	1.32	4.26	8.04	2.00		14.30	12.98
16		1.32	1.32	4.26	8.04	2.00		14.30	12.98
17		1.32	1.32	4.26	8.04	2.00		14.30	12.98
18		1.32	1.32	4.26	8.04	2.00		14.30	12.98
19		1.32	1.32	4.26	8.04	2.00		14.30	12.98
20		1.32	1.32	4.26	8.04	2.00		14.30	12.98
21		1.32	1.32	4.26	8.04	2.00		14.30	12.98
22		1.32	1.32	4.26	8.04	2.00		14.30	12.98
23		1.32	1.32	4.26	8.04	2.00		14.30	12.98
24		1.32	1.32	4.26	8.04	2.00		14.30	12.98
25		1.32	1.32	4.26	8.04	2.00		14.30	12.98
26		1.32	1.32	4.26	8.04	2.00		14.30	12.98
27		1.32	1.32	4.26	8.04	2.00	47.20	61.50	60.18

E.I.R.R = 12.56 %

Source :   Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.12   CASH FLOW IN ACCOUNTING PRICE (CASE B-2) (3/3)

(Unit : million Rs.)

Year	Project Cost	O.M. Cost	Total cost	Benefits				Table Benefits	Net Benefit Value
				(1)	(2)	(3)	(4)		
1	43.97		43.97						Δ 43.97
2	24.63	0.37	25.00						Δ 25.00
3	7.35	1.16	8.51	3.78	9.42			13.20	4.69
4	8.05	1.16	9.21	3.86	9.14			13.00	3.79
5	8.05	1.16	9.21	3.93	8.86			12.79	3.58
6	8.20	1.32	9.52	4.00	8.58			12.58	3.06
7	6.95	1.32	8.27	4.07	8.30			12.37	4.10
8	4.63	1.32	5.95	4.14	8.02			12.16	6.21
9	4.63	1.32	5.95	4.22	7.74			11.96	6.01
10	4.62	1.32	5.94	4.29	7.46			11.75	5.81
11		1.32	1.32	4.36	7.18	3.80		15.34	14.02
12		1.32	1.32	4.36	7.18	3.80		15.34	14.02
13		1.32	1.32	4.36	7.18	3.80		15.34	14.02
14		1.32	1.32	4.36	7.18	3.80		15.34	14.02
15		1.32	1.32	4.36	7.18	3.80		15.34	14.02
16		1.32	1.32	4.36	7.18	3.80		15.34	14.02
17		1.32	1.32	4.36	7.18	3.80		15.34	14.02
18		1.32	1.32	4.36	7.18	3.80		15.34	14.02
19		1.32	1.32	4.36	7.18	3.80		15.34	14.02
20		1.32	1.32	4.36	7.18	3.80		15.34	14.02
21		1.32	1.32	4.36	7.18	3.80		15.34	14.02
22		1.32	1.32	4.36	7.18	3.80		15.34	14.02
23		1.32	1.32	4.36	7.18	3.80		15.34	14.02
24		1.32	1.32	4.36	7.18	3.80		15.34	14.02
25		1.32	1.32	4.36	7.18	3.80		15.34	14.02
26		1.32	1.32	4.36	7.18	3.80		15.34	14.02
27		1.32	1.32	4.36	7.18	3.80	65.64	80.98	79.66

E.I.R.R = 11.01 %

Source :   Benefit (1) : Flood Control Benefit

(2) : Agricultural Benefit

(3) : Livestock Benefit

(4) : Solvage Value

TABLE 8.13   CASH FLOW ANALYSIS (ACCOUNTING PRICE) (CASE A) (1/3)

I.R.R = 22.136 %   (Unit: million Rs.)

Year	Original Value		Present Value		N.P.V
	Cost	Benefit	Cost	Benefit	
1	31.23	0.00	25.57	0.00	-25.57
2	15.42	0.00	10.34	0.00	-10.34
3	1.16	13.08	0.64	7.18	6.54
4	1.16	13.08	0.52	5.88	5.36
5	1.16	13.08	0.43	4.81	4.39
6	1.16	13.08	0.35	3.94	3.59
7	1.16	13.08	0.29	3.23	2.94
8	1.16	13.08	0.23	2.64	2.41
9	1.16	13.08	0.19	2.16	1.97
10	1.16	13.08	0.16	1.77	1.61
11	1.16	13.08	0.13	1.45	1.32
12	1.16	13.08	0.11	1.19	1.08
13	1.16	13.08	0.09	0.97	0.89
14	1.16	13.08	0.07	0.80	0.73
15	1.16	13.08	0.06	0.65	0.59
16	1.16	13.08	0.05	0.53	0.49
17	1.16	13.08	0.04	0.44	0.40
18	1.16	13.08	0.03	0.36	0.33
19	1.16	13.08	0.03	0.29	0.27
20	1.16	13.08	0.02	0.24	0.22
21	1.16	13.08	0.02	0.20	0.18
22	1.16	13.08	0.01	0.16	0.15
23	1.16	13.08	0.01	0.13	0.12
24	1.16	13.08	0.01	0.11	0.10
25	1.16	13.08	0.01	0.09	0.08
26	1.16	13.08	0.01	0.07	0.07
27	1.16	24.49	0.01	0.11	0.10
Total	75.65	338.41	39.40	39.40	0.00

(B/C = 1.000)

TABLE 8.13   CASH FLOW ANALYSIS (ACCOUNTING PRICE) (CASE B-1) (2/3)

I.R.R = 12.564 % (Unit: million Rs.)

Year	Original Value		Present Value		N.P.V
	Cost	Benefit	Cost	Benefit	
1	42.48	0.00	37.74	0.00	-37.74
2	24.66	0.00	19.46	0.00	-19.46
3	10.98	13.32	7.70	9.34	1.64
4	10.98	12.98	6.84	8.08	1.25
5	8.89	12.64	4.92	6.99	2.08
6	1.32	12.30	0.65	6.05	5.40
7	1.32	12.30	0.58	5.37	4.80
8	1.32	12.30	0.51	4.77	4.26
9	1.32	14.30	0.45	4.93	4.47
10	1.32	14.30	0.40	4.38	3.97
11	1.32	14.30	0.36	3.89	3.53
12	1.32	14.30	0.32	3.46	3.14
13	1.32	14.30	0.28	3.07	2.79
14	1.32	14.30	0.25	2.73	2.48
15	1.32	14.30	0.22	2.42	2.20
16	1.32	14.30	0.20	2.15	1.95
17	1.32	14.30	0.18	1.91	1.74
18	1.32	14.30	0.16	1.70	1.54
19	1.32	14.30	0.14	1.51	1.37
20	1.32	14.30	0.12	1.34	1.22
21	1.32	14.30	0.11	1.19	1.08
22	1.32	14.30	0.10	1.06	0.96
23	1.32	14.30	0.09	0.94	0.85
24	1.32	14.30	0.08	0.84	0.76
25	1.32	14.30	0.07	0.74	0.67
26	1.32	14.30	0.06	0.66	0.60
27	1.32	61.50	0.05	2.52	2.46
Total	127.03	394.74	85.04	82.04	0.00

(B/C = 1.000)

TABLE 8.13   CASH FLOW ANALYSIS (ACCOUNTING PRICE) (CASE B-2) (3/3)

I.R.R = 11.006 % (Unit: million Rs.)

Year	Original Value		Present Value		N.P.V
	Cost	Benefit	Cost	Benefit	
1	43.97	0.00	39.61	0.00	-39.61
2	25.00	0.00	20.29	0.00	-20.29
3	8.51	13.20	6.22	9.65	3.43
4	9.21	13.00	6.07	8.56	2.50
5	9.21	12.79	5.46	7.59	2.12
6	9.52	12.58	5.09	6.72	1.64
7	8.27	12.37	3.98	5.96	1.97
8	5.95	12.16	2.58	5.27	2.69
9	5.95	11.96	2.32	4.67	2.35
10	5.94	11.75	2.09	4.14	2.05
11	1.32	15.34	0.42	4.86	4.45
12	1.32	15.34	0.38	4.38	4.00
13	1.32	15.34	0.34	3.95	3.61
14	1.32	15.34	0.31	3.56	3.25
15	1.32	15.34	0.28	3.20	2.93
16	1.32	15.34	0.25	2.89	2.64
17	1.32	15.34	0.22	2.60	2.38
18	1.32	15.34	0.20	2.34	2.14
19	1.32	15.34	0.18	2.11	1.93
20	1.32	15.34	0.16	1.90	1.74
21	1.32	15.34	0.15	1.71	1.56
22	1.32	15.34	0.13	1.54	1.41
23	1.32	15.34	0.12	1.39	1.27
24	1.32	15.34	0.11	1.25	1.14
25	1.32	15.34	0.10	1.13	1.03
26	1.32	15.34	0.09	1.02	0.93
27	1.32	80.98	0.08	4.83	4.75
Total	153.97	426.23	97.22	97.22	0.00

(B/C = 1.000)

TABLE M-1. BREAKDOWN OF DISPERSION STRUCTURE - I

No.	Description		Unit	Qty's	Total		F.C		L.C	
					Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)
1.	Weir									
	Excavation	(Back hoe)	cu.m	1,800	56.5	101.7	43.7	78.7	12.8	23.0
	Excavation	(Bulldozer)	"	17,200	70.5	1,212.6	54.0	928.8	16.5	283.8
	Backfill	(Labour)	"	1,700	18.9	32.1	2.1	3.6	16.8	28.5
	Gabion Riprap		"	1,460	589.9	861.3	242.8	354.5	347.1	506.8
	Dry Rubble Masonry		"	4,610	562.4	2,592.7	0	0	562.4	2,592.7
	Boulder Riprap		"	2,700	353.4	954.2	88.2	238.1	265.2	716.1
	Sub-Total					5,754.6		1,603.7		4,150.9
2.	Left Dike									
	Excavation	(Back hoe)	cu.m	1,300	56.5	73.5	43.7	56.8	12.8	16.7
	Backfill	(Labour)	"	700	18.9	13.2	2.1	1.5	16.8	11.7
	Embankment	(Bulldozer)	"	13,800	44.4	612.7	34.5	476.1	9.9	136.6
	Plain Concrete		"	110	1,158.9	127.5	421.8	46.4	737.1	81.1
	Stone Pitching	(Top)	"	1,470	454.5	668.1	0	0	454.5	668.1
	Stone Pitching	(Spawl)	"	730	142.9	104.3	0	0	142.9	104.3
	Sub-Total					1,599.3		580.8		1,018.5
3.	Right Dike									
	Excavation	(Back hoe)	cu.m	900	56.5	50.9	43.7	39.3	12.8	11.6
	Backfill	(Labour)	"	500	18.9	9.5	2.1	1.1	16.8	8.4
	Embankment	(Bulldozer)	"	10,500	44.4	466.2	34.5	362.3	9.9	103.9
	Plain Concrete		"	80	1,158.9	92.7	421.8	33.7	737.1	59.0
	Stone Pitching	(Top)	"	1,060	454.5	481.8	0	0	454.5	481.8
	Stone Pitching	(Spawl)	"	530	142.9	75.7	0	0	142.9	75.7
	Sub-Total					1,176.8		436.4		740.4
4.	Separating Dike									
	Excavation	(Back hoe)	cu.m	2,000	56.5	113.0	43.7	87.4	12.8	25.6
	Backfill	(Labour)	"	1,100	18.9	20.8	2.1	2.3	16.8	18.5
	Embankment	(Bulldozer)	"	7,300	44.4	324.1	34.5	251.9	9.9	72.2
	Plain Concrete		"	180	1,158.9	208.6	421.8	75.9	737.1	132.7
	Stone Pitching	(Top)	"	1,910	454.5	868.1	0	0	454.5	868.1
	Stone Pitching	(Spawl)	"	950	142.9	135.8	0	0	142.9	135.8
	Sub-Total					1,670.4		417.5		1,252.9
	Total					10,201.1		3,038.4		7,162.7
5.	Contingency					1,020.1		303.8		716.3
	Grand Total					11,221.2		3,342.2		7,879.0

TABLE M-2. BREAKDOWN OF DISPERSION STRUCTURE - II

No.	Description		Qty's	Unit	Total Rate (Rs)	Total Amount ('000 Rs)	F.C Rate (Rs)	F.C Amount ('000 Rs)	L.C Rate (Rs)	L.C Amount ('000 Rs)
1.	Weir									
	Excavation	(Back hoe)	1,700	cu.m	56.5	96.1	43.7	74.3	12.8	21.8
	Excavation	(Bulldozer)	11,900	"	70.5	839.0	54	642.6	16.5	196.4
	Backfill	(Labour)	1,500	"	18.9	28.4	2.1	3.2	16.8	25.2
	Dry Rubber Masonry		7,160	"	562.4	4,026.8	0	0	562.4	4,026.8
	Boulder Riprap		1,200	"	589.9	707.9	242.8	291.4	347.1	416.5
	Sub-Total					5,698.2		1,011.5		4,686.7
2.	Left Dike									
	Excavation	(Back hoe)	7,400	cu.m	56.5	418.1	43.7	323.4	12.8	94.7
	Backfill	(Labour)	4,100	"	18.9	77.5	2.1	8.6	16.8	68.9
	Embankment	(Bulldozer)	41,200	"	44.4	1,829.3	34.5	1,421.4	9.9	407.9
	Plain Concrete		670	"	1,158.9	776.5	421.8	282.6	737.1	493.9
	Stone Pitching	(Top)	10,370	"	454.5	4,713.2	0	0	454.5	4,713.2
	Stone Pitching	(Spawl)	5,190	"	142.9	741.7	0	0	142.9	741.7
	Sub-Total					8,556.3		2,036.0		6,520.3
3.	Right Dike									
	Excavation	(Back hoe)	3,500	cu.m	56.5	197.8	43.7	153.0	12.8	44.8
	Backfill	(Labour)	2,000	"	18.9	37.8	2.1	4.2	16.8	33.6
	Embankment	(Bulldozer)	11,500	"	44.4	510.6	34.5	396.8	9.9	113.8
	Plain Concrete		320	"	1,158.9	370.8	421.8	135.0	737.1	235.8
	Stone Pitching	(Top)	4,550	"	454.5	2,068.0	0	0	454.5	2,068.0
	Stone Pitching	(Spawl)	2,270	"	142.9	324.4	0	0	142.9	324.4
	Sub-Total					3,509.4		689.0		2,820.4
4.	Separating Dike									
	Excavation	(Back hoe)	4,100	cu.m	56.5	231.7	43.7	179.2	12.8	52.5
	Backfill	(Labour)	2,300	"	18.9	43.5	2.1	4.8	16.8	38.7
	Embankment	(Bulldozer)	18,000	"	44.4	799.2	34.5	621.0	9.9	178.2
	Plain Concrete		370	"	1,158.9	428.8	421.8	156.1	737.1	272.7
	Stone Pitching	(Top)	4,440	"	454.5	2,018.0	0	0	454.5	2,018.0
	Stone Pitching	(Spawl)	2,220	"	142.9	317.2	0	0	142.9	317.2
	Sub-Total					3,838.4		961.1		2,877.3
	Total					21,602.3		4,697.6		16,904.7
5.	Contingency					2,160.2		469.7		1,690.5
	Grand Total					23,762.5		5,167.3		18,595.2

TABLE M-3.　BREAKDOWN OF SEPARATING DIKE

No.	Description		Qty's	Unit	Total		F.C		L.C	
					Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)
1.	Earth Work									
	Excavation	(Back hoe)	11,500	cu.m	56.5	649.8	43.7	502.6	12.8	147.2
	Backfill	(Labour)	6,400	"	18.9	121.0	2.1	13.5	16.8	107.5
	Embankment	(Bulldozer)	32,200	"	44.4	1,429.7	34.5	1,110.9	9.9	318.8
	Sub-Total					2,200.5		1,627.0		573.5
2.	Concrete Work									
	Plain Concrete		1,030	cu.m	1,158.9	1,193.7	421.8	434.5	737.1	759.2
	Sub-Total					1,193.7		434.5		759.2
3.	Stone Masonry									
	Stone Pitching	(Top)	9,890	cu.m	454.5	4,495.0	0	0	454.5	4,495.0
	Stone Pitching	(Spawl)	4,950	"	142.9	707.4	0	0	142.9	707.4
	Sub-Total					5,202.4		0		5,202.4
	Total					8,596.6		2,061.5		6,535.1
4.	Contingency					859.7		206.2		653.5
	Grand Total					9,456.3		2,267.7		7,188.6

TABLE M-4.   BREAKDOWN OF DISTRIBUTION STRUCTURE

No.	Description		Qty's	Unit	Total		F.C		L.C	
					Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)
1.	Chhabri Branch Canals		9.94	km						
	Excavation	(Back hoe)	46,900	cu.m	56.5	2,649.8	43.7	2,049.5	12.8	600.3
	Embankment	(Bulldozer)	23,700	"	44.4	1,052.3	34.5	817.7	9.9	234.6
	Dressing Slope		65,500	sq.m	1.6	104.8	0	0.0	1.6	104.8
	Sub-Total					3,806.9		2,867.2		939.7
2.	Suchani Branch Canals		11.88	km						
	Excavation	(Back hoe)	45,600	cu.m	56.5	2,576.4	43.7	1,992.7	12.8	583.7
	Embankment	(Bulldozer)	36,600	"	44.4	1,625.0	34.5	1,262.7	9.9	362.3
	Dressing Slope		76,200	sq.m	1.6	121.9	0	0.0	1.6	121.9
	Sub-Total					4,323.3		3,255.4		1,067.9
3.	Phullar Branch Canals		7.15	km						
	Excavation	(Back hoe)	48,900	cu.m	56.5	2,762.8	43.7	2136.9	12.8	625.9
	Embankment	(Bulldozer)	11,800	"	44.4	523.9	34.5	407.1	9.9	116.8
	Dressing Slope		48,300	sq.m	1.6	77.3	0	0	1.6	77.3
	Sub-Total					3,364.0		2,544.0		820.0
	Total					11,494.2		8,666.6		2,827.6
4.	Contingency					1,149.4		866.7		282.8
	Grand Total					12,643.6		9,533.3		3,110.4

TABLE M-5. BREAKDOWN OF ROAD

No.	Description	Qty's	Unit	Total Rate (Rs)	Total Amount ('000 Rs)	F.C Rate (Rs)	F.C Amount ('000 Rs)	L.C Rate (Rs)	L.C Amount ('000 Rs)
1.	V-1 Road	13.00	km						
	Embankment (Bulldozer)	39,200	cm.m	44.4	1,740.5	34.5	1,352.4	9.9	388.1
	Dressing Slope	29,100	sq.m	1.6	46.6	0	0	1.6	46.6
	Asphaltic Con. Wearing	6,000	"	85.0	510.0	30.0	180.0	55	330.0
	Asphaltic Con. Binding	8,000	"	145.0	1,160.0	50.0	400.0	95	760.0
	Base Course	7,500	cu.m	180.0	1,350.0	20.0	150.0	160	1,200.0
	Sub-Base Course	10,000	"	155.0	1,550.0	15.0	150.0	140	1,400.0
	Sub-Total				6,357.1		2,232.4		4,124.7
2.	V-2 Road	1.20	km						
	Embankment (Bulldozer)	3,700	cu.m	44.4	164.3	34.5	127.7	9.9	36.6
	Dressing Slope	2,700	sq.m	1.6	4.3	0	0	1.6	4.3
	Base Course	500	cu.m	180.0	90.0	20.0	10.0	160	80.0
	Sub-Base Course	700	"	155.0	108.5	15.0	10.5	140	98.0
	Sub-Total				367.1		148.2		218.9
	Total	14.20	km		6,724.2		2,380.6		4,343.6
3.	Contingency				672.4		238.1		434.4
	Grand Total				7,396.6		2,618.7		4,778.0

TABLE M-6. BREAKDOWN OF WATERSHED MANAGEMENT (CASE B - 1)

No.	Description	Qty's	Unit	Total		F.C		L.C	
				Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)	Rate (Rs)	Amount ('000 Rs)
1.	Bund								
1.1	Bund								
	Type A	860	place	16,166.0	13,902.8	6,923.0	5,953.8	9,243.0	7,949.0
	Type B	98	"	14,936.0	1,463.8	5872.0	575.5	9,064.0	888.3
	Type C	1,200	"	12,628.0	15,153.6	4222.0	5,066.4	8,406.0	10,087.2
	Sub-Total				30,520.2		11,595.7		18,924.5
2.	Vetiver Grass								
2.1	Seedbed	7.8	ha	7,876.0	61.4	0	0	7,876.0	61.4
2.2	Planting								
	Zone II	1325.0	km	11,418.0	15,128.9	187.0	247.8	11,231.0	14,881.1
	Zone III	630.0	"	11,550.0	7,276.5	297.0	187.1	11,253.0	7,089.4
	Sub-Total				22,466.8		434.9		22,031.9
3.	Gully Pluging	1,980	place	3,969.0	7,858.6	6.0	11.9	3,963.0	7,846.7
4.	Pond	6	"	838,809.0	5,032.9	209,150.0	1,254.9	629,659.0	3,778.0
5.	Water Point	15	"	70,727.0	1,060.9	54,348.0	815.2	16,379.0	245.7
6.	Grass Seeding	12,100	ha	162.0	1,960.2	44.0	532.4	118.0	1,427.8
	Total				68,899.6		14,645.0		54,254.6

TABLE M-7. BREAKDOWN OF WATERSHED MANAGEMENT (CASE B - 2)

No.	Description	Qty's	Unit	Total Rate (Rs)	Total Amount ('000 Rs)	F.C Rate (Rs)	F.C Amount ('000 Rs)	L.C Rate (Rs)	L.C Amount ('000 Rs)
1.	Bund								
1.1	Bund								
	Type A	860	place	16,166.0	13,902.8	6,923.0	5,953.8	9,243.0	7,949.0
	Type B	327	"	14,936.0	4,884.0	5872.0	1,920.1	9,064.0	2,963.9
	Type C	1,200	"	12,628.0	27,781.6	4222.0	9,288.4	8,406.0	18,493.2
	Sub-Total				46,568.4		17,162.3		29,406.1
2.	Vetiver Grass								
2.1	Seedbed	11.0	ha	7,876.0	86.4	0	0	7,876.0	86.4
2.2	Planting								
	Zone II	1325.0	km	11,418.0	15,128.9	187.0	247.8	11,231.0	14,881.1
	Zone III	630.0	"	11,550.0	7,276.5	297.0	187.1	11,253.0	7,089.4
	Zone IV	252.0	"	11,495.0	2,896.7	253.0	63.8	11,242.0	2,832.9
	Zone V	543.0	"	11,418.0	6,200.0	187.0	101.5	11,231.0	6,098.5
	Sub-Total				31,588.5		600.2		30,988.3
3.	Gully Pluging	3,600	place	3,969.0	14,288.4	6.0	21.6	3,963.0	14,266.8
4.	Pond	6	"	838,809.0	5,032.9	209,150.0	1,254.9	629,659.0	3,778.0
5.	Water Point	62	"	70,727.0	4,385.1	54,348.0	3,369.6	16,379.0	1,015.5
6.	Grass Seeding	24,700	ha	162.0	4,001.4	44	1,086.8	118.0	2,914.6
	Total				105,864.7		23,495.4		82,369.3

TABLE M-8. DISBURSEMENT SCHEDULE FOR THE PROJECT COST (CASE A)

(unit: '000 Rs)

| Description | Project Cost Grand Total | | | Project Year | | | | | | | | | |
	Total	F.C	L.C	1994 F.C	1994 L.C	1995 F.C	1995 L.C	1996 F.C	1996 L.C	1997 F.C	1997 L.C	1998 F.C	1998 L.C
1. Dispersion Structure													
1.1 Dispersion Structure I	11,221	3,342	7,879							2,005	4,727	1,337	3,152
1.2 Dispersion Structure II	23,762	5,167	18,595							3,100	11,157	2,067	7,438
1.3 Separating Dike	9,456	2,268	7,188							1,134	3,594	1,134	3,594
2. Distribution Structure													
2.1 Chhabri Branch	4,188	3,154	1,034							3,154	1,034		
2.2 Suchani Branch	4,756	3,581	1,175							3,581	1,175		
2.3 Phullar Branch	3,700	2,798	902							2,798	902		
3. Road	7,397	2,619	4,778	1,047	447	1,047	447	698	446	1,571	2,867	1,048	1,911
4. Engineering Fee	6,420	4,188	2,232	1,047	447	1,047	447	698	446	698	446	698	446
Sub-Total (1-4)	70,900	27,117	43,783	1,047	447	1,047	447	698	446	18,041	25,902	6,284	16,541
5. Price Escalation	25,000	2,803	22,197	42	74	63	117	57	162	1,857	12,143	784	9,701
Total	95,900	29,920	65,980	1,089	521	1,110	564	755	608	19,898	38,045	7,068	26,242

TABLE M-9.　DISBURSEMENT SCHEDULE FOR THE PROJECT COST (CASE B-1)

(unit: '000 Rs)

| Description | Project Cost Grand Total | | | Project Year | | | | | | | | | | | | | | | |
	Total	F.C	L.C	1994 F.C	1994 L.C	1995 F.C	1995 L.C	1996 F.C	1996 L.C	1997 F.C	1997 L.C	1998 F.C	1998 L.C	1999 F.C	1999 L.C	2000 F.C	2000 L.C	2001 F.C	2001 L.C
1. Dispersion Structure																			
1.1 Dispersion Structure I	11,221	3,342	7,879							2,005	4,727	1,337	3,152						
1.2 Dispersion Structure II	23,762	5,167	18,595							3,100	11,157	2,067	7,438						
1.3 Separating Dike	9,456	2,268	7,188							1,134	3,594	1,134	3,594						
2. Distribution Structure																			
2.1 Chhabri Branch	4,188	3,154	1,034							3,154	1,034								
2.2 Suchani Branch	4,756	3,581	1,175							3,581	1,175								
2.3 Phullar Branch	3,700	2,798	902							2,798	902								
3. Road	7,397	2,619	4,778							1,571	2,867	1,048	1,911						
Sub-Total (1-3)	64,480	22,929	41,551							17,343	25,456	5,586	16,095						
4. Watershed Management																			
4.1 Zone II	35,399	7,047	28,352							2,114	8,506	1,409	5,670	1,409	5,670	1,409	5,670	706	2,836
4.2 Zone III	33,500	7,597	25,903									1,084	3,700	2,171	7,401	2,171	7,401	2,171	7,401
Sub-Total	68,899	14,644	54,255							2,114	8,506	2,493	9,370	3,580	13,071	3,580	13,071	2,877	10,237
5. Engineering Fee	9,321	6,043	3,278	1,511	823	1,511	823	1,007	823	1,007	272	1,007	272		272		272		272
Total (1-5)	142,700	43,616	99,084	1,511	823	1,511	823	1,007	823	20,464	34,234	9,086	25,737	3,580	13,343	3,580	13,343	2,877	10,509
6. Price Escalation	68,200	5,214	62,986	60	137	92	214	83	98	2,126	16,070	1,145	15,100	532	9,524	615	11,348	561	10,495
Grand Total	210,900	48,830	162,070	1,571	960	1,603	1,037	1,090	370	22,590	50,304	10,231	40,837	4,112	22,867	4,195	24,691	3,438	21,004

TABLE M-10. DISBURSEMENT SCHEDULE FOR THE PROJECT COST (CASE B-2) (1/2)

| Description | Project Cost Grand Total | | | Project Year | | | | | | | | | | | |
	Total	F.C	L.C	1994 F.C	1994 L.C	1995 F.C	1995 L.C	1996 F.C	1996 L.C	1997 F.C	1997 L.C	1998 F.C	1998 L.C	1999 F.C	1999 L.C
1. Dispersion Structure															
1.1 Dispersion Structure I	11,221	3,342	7,879							2,005	4,727	1,337	3,152		
1.2 Dispersion Structure II	23,762	5,167	18,595							3,100	11,157	2,067	7,438		
1.3 Separating Dike	9,456	2,268	7,188							1,134	3,594	1,134	3,594		
2. Distribution Structure															
2.1 Chhabri Branch	4,188	3,154	1,034							3,154	1,034				
2.2 Suchani Branch	4,756	3,581	1,175							3,581	1,175				
2.3 Phullar Branch	3,700	2,798	902							2,798	902				
3. Road	7,397	2,619	4,778							1,571	2,867	1,048	1,911		
Sub-Total (1-3)	64,480	22,929	41,551							17,343	25,456	5,586	16,095		
4. Watershed Management															
4.1 Zone II	28,319	5,637	22,682							2,114	8,506	2,114	8,506	1,409	5,670
4.2 Zone III	4,784	1,084	3,700											1,084	3,700
4.3 Zone IV	11,422	2,379	9,043												
4.4 Zone V	25,545	6,473	19,072												
Sub-Total	105,866	23,496	82,370							2,114	8,506	2,114	8,506	2,493	9,370
5. Engineering Fee	11,954	7,785	4,169	1,947	322	1,947	322	1,297	322	1,297	322	1,297	321		320
Total (1-5)	182,300	54,210	128,090	1,947	322	1,947	322	1,297	322	20,754	34,284	8,997	24,922	2,493	9,690
6. Price Escalation	119,700	7,917	111,783	79	57	119	84	107	116	2,160	16,088	1,135	14,624	371	6,918
Grand Total	302,000	62,127	239,873	2,026	379	2,066	406	1,404	438	22,914	50,372	10,132	39,546	2,864	16,608

TABLE M-10. DISBURSEMENT SCHEDULE FOR THE PROJECT COST (CASE B-2) (2/2)

Description	2000 F.C	2000 L.C	2001 F.C	2001 L.C	2002 F.C	2002 L.C	2003 F.C	2003 L.C	2004 F.C	2004 L.C	2005 F.C	2005 L.C	2006 F.C	2006 L.C
Project Year														
1. Dispersion Structure														
1.1 Dispersion Structure I														
1.2 Dispersion Structure II														
1.3 Separating Dike														
2. Distribution Structure														
2.1 Chhabri Branch														
2.2 Suchani Branch														
2.3 Phullar Branch														
3. Road														
Sub-Total (1-3)														
4. Watershed Management														
4.1 Zone II	705	2,835	705	2,835										
4.2 Zone III	2,171	7,401	2,171	7,401										
4.3 Zone IV					2,171	7,401	1,586	6,029						
4.4 Zone V					793	3,014	926	2,725						
Sub-Total	2,876	10,236	2,876	10,236	2,964	10,415	2,512	8,754	1,849	5,449	1,849	5,449	1,849	5,449
5. Engineering Fee		320		320		320		320		320		320		320
Total (1-5)	2,876	10,556	2,876	10,556	2,964	10,735	2,512	9,074	1,849	5,769	1,849	5,769	1,849	5,769
6. Price Escalation	494	8,981	562	10,544	649	12,441	611	12,083	496	8,756	543	9,920	592	11,174
Grand Total	3,370	19,537	3,438	21,100	3,613	23,176	3,123	21,157	2,345	14,525	2,392	15,689	2,441	16,943

Construction Cost (Market Price)

(million Rs.)

Item	CASE A	CASE B-1	CASE B-2
1. Direct Construction Cost	12.55	48.54	66.48
2. Material Cost	23.45	39.86	49.42
3. Machinery Cost	17.40	25.27	29.98
4. Contingency	5.86	12.12	15.47
5. Engineering Fee	6.42	9.32	11.95
6. Overhead Cost (Machinery & Others)	5.22	7.59	9.00
Total	70.90	142.70	182.30

Construction Cost (Excluding Tax)

(million Rs.)

Item	CASE A	CASE B-1	CASE B-2
1. Direct Construction Cost	10.98	42.47	58.17
2. Material Cost	20.52	34.88	43.24
3. Machinery Cost	15.23	22.11	26.23
4. Contingency	5.13	10.61	13.54
5. Engineering Fee	5.62	8.16	10.46
6. Overhead Cost (Machinery & Others)	4.57	6.64	7.88
Total	62.04	124.86	159.51

Based on the above table, the contents of direct construction cost are classified as follows:

Itemization of Direct Construction Cost

(million Rs.)

Item	CASE A		CASE B-1		CASE B-2	
	Cost	%	Cost	%	Cost	%
1. Earth Work	2.49	22.7	5.22	12.3	6.69	11.5
2. Masonry	7.18	65.4	19.15	45.1	25.54	43.9
3. Concrete Work	0.22	2.0	0.30	0.7	0.23	0.4
4. Others	1.09	9.9	17.79	41.9	25.71	44.2
Total	10.98	100	42.47	100	58.17	100

TABLE N-12.　CONVERSION FACTOR OF CEMENT & MASONRY WORK (1/2)

Item	Share (1)	CF (2)	(1) x (2)
Material Cost	0.42	0.8	0.336
Machinery Cost	0.05	0.8	0.040
Unskilled Labor	0.10	0.4	0.040
Skilled Labor	0.20	0.8	0.160
Overhead Cost	0.23	0.8	0.184
Cement & Masonry	1.00		CF = 0.76

Remark:　　　　　Material Cost : SCF
　　　　　　　　Machinery Cost : Custom Duties 20 %
　　　　　　　　Unskilled & Skilled Labor : Above-mentioned
　　　　　　　　Overhead Cost : SCF

TABLE N-12.　CONVERSION FACTOR OF CEMENT & MASONRY WORK (2/2)

Item	Share (1)	CF (2)	(1) x (2)
Cement or Masonry	0.47	0.76	0.357
Unskilled Labor	0.09	0.40	0.036
Skilled Labor	0.21	0.80	0.168
Overhead Cost	0.23	0.80	0.184
Masonry & Concrete Work			CF = 0.75

TABLE N-13.　CONVERSION FACTOR OF DIRECT CONSTRUCTION COST

Item	Share % (1)	CF (2)	(1) x (2)
(1) CASE A			
Earth Work	22.7	0.61	0.138
Masonry	65.4	0.75	0.491
Concrete Work	2.0	0.75	0.015
Others	9.9	0.80	0.079
(Direct Construction Cost)			CF = 0.72
(2) CASE B - 1			
Earth Work	12.3	0.61	0.075
Masonry	45.1	0.75	0.338
Concrete Work	0.7	0.75	0.005
Others	41.9	0.80	0.335
(Direct Construction Cost)			CF = 0.75
(3) CASE B - 2			
Earth Work	11.5	0.61	0.070
Masonry	43.9	0.75	0.329
Concrete Work	0.4	0.75	0.003
Others	44.2	0.80	0.354
(Direct Construction Cost)			CF = 0.76

Remark: Others: SCF : 0.80

TABLE N-14.　OPERATION & MAINTENANCE COST IN ACCOUNTING PRICE　　　　　　(unit: million Rs)

Item	Case A			Case B-1			Case B-2		
	MP	CF	AP	MP	CF	AP	MP	CF	AP
Distribution Structure	0.78	0.69	0.54	0.78	0.69	0.54	0.78	0.69	0.54
Dispersion Structure	0.53	0.69	0.37	0.53	0.69	0.37	0.53	0.69	0.37
Road	0.37	0.69	0.25	0.37	0.69	0.25	0.37	0.69	0.25
sub total	1.68		1.16	1.68		1.16	1.68		1.16
Watershed Management	0		0	0.23	0.69	0.16	0.23	0.69	0.16
Total	1.68		1.16	1.91		1.32	1.91		1.32