Description	No.	Unit Price	Total Amount 000K	Construction Equipment for the 1st Phase Implementation		Construction Equipment for the 2nd Phase Implementation	
				No.	Amount (000K)	No.	Amount (000K)
Grouting Pump 10 PS	24	34	850	16	544	9	306
Grouting mixer 220ℓ x 2	25	23	575	16	368	9	207
Vibrator 4.5 PS	10	5	50	4	20	6	30
Rammer 100 kg	11	8	88	4	32	7	56
Water truck 5500 ℓ	10	140	1,400	4	560	6	840
Vibrating roller	4	36	144	1	36	3	108
Fuel truck 8 t	3	160	480	1	160	2	320
Compressor 105 PS	1	120	120	0.5	60	0.5	60
" 46 PS	2	47	94	1	47	1	47
Dieselgenerator 125 KVA	1	140	140	0.5	70	0.5	70
Pump ϕ 100 mm	6	17	102	2	34	4	68
Soil compactor 0.5 t	4	33	132	4	132	-	-
Oyno ϕ 150 mm	4	15	60	2	30	2	30
Belt conveyor	6	6	36	2	12	4	24
Concrete conveyor	6	37	222	2	74	4	148
Mixing plant	2	450	990	1	450	1	450
Pot mixer 2 PS	2	5	10	1	5	1	5
Sub-total			105,238		55,361		49,877
Spare parts			22,312		11,737		10,575
Total			127,550		67,098		60,452
Transportation & others			1,270		672		598
Grand Total			128,820		67,770		61,050

Table 4F-5

Construction Equipments

Description	No.	Unit Price	Total Amount 000K	Main Dam No.	Main Dam Amount 000K	Diversion Dam No.	Diversion Dam Amount 000K	General irrigation No.	General irrigation Amount 000K
Bulldozer 18ton	5	494	2,470	-	-	-	-	5	2,470
" 21	23	[illegible]	14,950	17	11,050	6	3,900	-	-
" 32	10	1,120	11,200	7	7,840	3	3,360	-	-
Motor scraper 11m^3	15	1,560	23,400	11	17,160	4	6,240	-	-
Scrape-dozer 6.4m^3	18	[illegible]	16,200	9	8,100	9	8,100	-	-
Wheel Loader 2lm^3	7	450	3,150	5	2,250	2	900	-	-
Backhoe	3	500	1,500	1	500	-	0	2	1,000
Dragline 0.6m^3	2	660	1,320	1	660	1	660	-	-
Froted Loader 1.8m^3	3	420	1,260	2	840	1	420	-	-
Dumptruck 11ton	50	240	12,000	42	10,080	8	1,920	-	-
Tamping roller 17.5t	3	890	2,670	2	1,780	1	890	-	-
Crawller crane 16t	2	700	1,400	1	700	1	700	-	-
Moter-Grader 3.1m	1	331	331	-	-	-	-	1	331
" 3.7m	2	370	740	1	370	1	370	-	-
Agitator truck 3.2m^3	4	200	800	2	400	2	400	-	-
" 1.6m^3	2	130	260	1	130	1	130	-	-
Tire roller 30t	17	290	4,930	12	3,480	5	1,450	-	-
Crawller drill	1	200	200	0.5	100	0.5	100	-	-
Borring machine 7.5pll	17	62	1,054	9	558	8	496	-	-

Description	No.	Unit Price	Total Amount 000K	Main Dam No.	Main Dam Amount 000K	Diversion Dam No.	Diversion Dam Amount 000K	General Irrigation No.	General Irrigation Amount 000K
Grouting Pump 10PS	25	34	850	9	306	16	544	-	-
Grouting mixer 200ℓx2	25	23	575	9	207	16	368	-	-
Vibrator 4.5PS	10	5	50	6	30	4	20		
Rammer 100kg	11	8	88	7	56	4	32		
Water truck 5500ℓ	10	140	1,400	6	840	4	560		
Vibrating roller	4	36	144	3	108	1	36		
Fuel truck 8t	3	160	480	2	320	1	160		
Compressor 105PS	1	120	120	0.5	60	0.5	60		
" 46PS	2	47	94	1	47	1	47		
Dieselgenerator 125KVA	1	140	140	0.5	70	0.5	70		
Pump ø100mm	6	17	102	4	68	2	34		
Soil compactor 0.5t	4	33	132	-	-	-	-	4	132
Pump ø150mm	4	15	60	2	30	2	30		
Belt conveyor	6	6	36	4	24	2	12		
Concrete conveyor	6	37	222	4	148	2	74		
Mixing plant	2	450	900	1	450	1	450		
Pot mixer 2PS	2	5	10	1	5	1	5		
Sub-total			105,238		68,767		32,538		3,933
Spear parts and transportation			23,582		15,409		7,291		882
Total			128,820		84,176		39,829		4,815

(Machinary charge 127,550)
(Inland transportation 1,270)

Table 4F-6 Disbursement Schedule

Unit: 1,000 Kyats

Description	Total FC	Total LC	1980/81 FC	1980/81 LC	1981/82 FC	1981/82 LC	1982/83 FC	1982/83 LC	1983/84 FC	1983/84 LC	1984/85 FC	1984/85 LC	1985/86 FC	1985/86 LC	1986/87 FC	1986/87 LC	1987/88 FC	1987/88 LC
I. Pilot Scheme																		
11. Civil Works	9,310	6,510	1,862	1,302	3,724	2,604	3,724	2,604										
12. Construction Equipment	3,100	60	620	12	1,240	24	1,240	24										
13. Agricultural Development	4,100	1,020	820	204	1,640	408	1,640	408										
14. Operation & Maintenance	470	1,400	94	280	188	560	188	560										
15. Project Facilities	590	4,240	118	848	236	1,696	236	1,696										
16. Expert Services	4,200	800	840	160	1,680	320	1,680	320										
17. Consulting Services	3,280	380	656	76	1,312	152	1,312	152										
Sub-total	25,050	14,410	5,010	2,882	10,020	5,764	10,020	5,764										
18. Contingency	2,500	1,440	500	288	1,000	576	1,000	576										
Total	27,550	15,850	5,510	3,170	11,020	6,340	11,020	6,340										
II. Final Design																		
21. Irrigation & Drainage	3,187	369			3,187	369												
22. Hydro Power	854	98			854	98												
Total	4,041	467			4,041	467												
III. First Phase Implementation																		
31. Civil Works	14,810	38,375																
31-1. Preparation	-	4,439					-	3,550		889								
31-2. Diversion Dam	5,974	15,053					300	750	1,200	3,010	9,907	4,510	1,800	4,510	874	2,273		
31-3. Irrigation & Drainage	8,066	15,159					810	1,530	2,460	5,520	1,630	3,060	1,630	3,060	1,536	1,989		
31-4. On-farm	507	3,155					50	310	150	950	100	630	100	630	107	635		
31-5. Pre-Engineering	263	569					105	230	55	80	50	100	28	100	25	59		
32. Compensation	-	-																
33. Construction Equipment	67,098	672					47,000	470	20,098	202								
34. Agriculture Development	-	970												650		320		
35. Operation & Maintenance	1,600	-											800		800			
36. Project Facilities	200	1,648					200	1,648										
37. Project Administration	-	6,800						1,680		1,680		1,680		880		880		
38. Consulting Services	2,136	246					456	46	420	50	420	50	420	50	420	50		
Sub-total	85,844	48,711					48,921	10,214	24,383	12,381	4,000	10,030	4,778	9,880	3,762	6,206		
39. Cintingency	12,877	7,306					7,338	1,532	3,657	1,857	600	1,505	716	1,482	566	930		
Total	98,721	56,017					56,259	11,746	28,040	14,238	4,600	11,535	5,494	11,362	4,328	7,136		

Description	Total FC	Total LC	1980/81 LC	1980/81 LC	1981/82 FC	1981/82 LC	1982/83 FC	1982/83 LC	1983/84 FC	1983/84 LC	1984/85 FC	1984/85 LC	1985/86 FC	1985/86 LC	1986/87 FC	1986/87 LC	1987/88 FC	1987/88 LC
IV. Second Phase Implementation																		
A. Irrigation																		
41. Civil Works	20,855	69,869																
41-1. Preparation	-	4,438								2,661		1,777						
41-2. Main Dam	11,802	46,275							590	2,310	2,360	9,250	3,540	13,900	3,540	13,900	1,772	6,915
41-3. Paukkaung Area	215	273											105	130	110	143		
41-4. Irrigation & Drainage	8,067	15,159							810	600	1,604	3,060	1,535	2,930	1,624	3,088	2,458	4,581
41-5. On-farm	508	3,154							50	310	100	630	100	630	63	625	195	959
41-6. Pre-engineering	363	570							50	150	55	130	77	130	28	60	53	100
42. Compensation	-	1,445											-	400	-	400	-	645
43. Construction Equipment	60,452	598							60,452	598								
44. Agriculture Development	-	980														330		650
45. Operation & Maintenance	-	700												200		200		300
46. Project Facilities	200	1,652							200	1,652								
47. Project Administration	-	10,040								1,690		1,690		2,490		2,490		1,680
48. Consulting Services	2,336	271							496	71	460	50	460	50	460	50	460	50
Sub-total	83,843	85,555							62,648	10,042	4,615	16,587	5,817	20,860	5,855	22,186	4,908	15,880
49. Contingency	13,059	12,889							9,347	1,506	692	2,488	873	3,129	878	3,328	1,219	2,438
Total	96,902	98,444							72,045	11,548	5,307	19,075	6,690	23,989	6,733	25,514	6,127	18,318
B. Hydro Power																		
51. Civil Works	17,573	2,735											3,517	543	7,028	1,096	7,028	1,096
52. Administration	-	2,437											-	485	-	976	-	976
53. Consulting Services	1,208	139											248	29	480	55	480	55
Sub-total	18,781	5,311											3,765	1,057	7,508	2,127	7,508	2,127
54. Contingency	2,935	551											587	110	1,171	221	1,177	220
Total	21,716	5,862											4,352	1,167	8,679	2,348	8,685	2,347
Total of Second Phase	118,618	104,306							72,045	11,548	5,307	19,075	11,042	25,156	15,412	27,862	14,812	20,665
Grand Total	248,930	176,640	5,510	3,170	15,061	6,807	67,279	18,086	100,085	25,786	9,907	30,610	16,536	36,518	19,740	34,908	14,812	20,665
Total of Price Escalation	82,160	58,960																
Grand Total of Project Cost	331,090	235,600																

Note: No. Price escalation is included. FC: Foreign Currency LC: Local Currency

CHAPTER V. PROJECT IMPLEMENTATION AND OPERATION

Fig. 5-1 Organization of Ministry of Planning and Finance

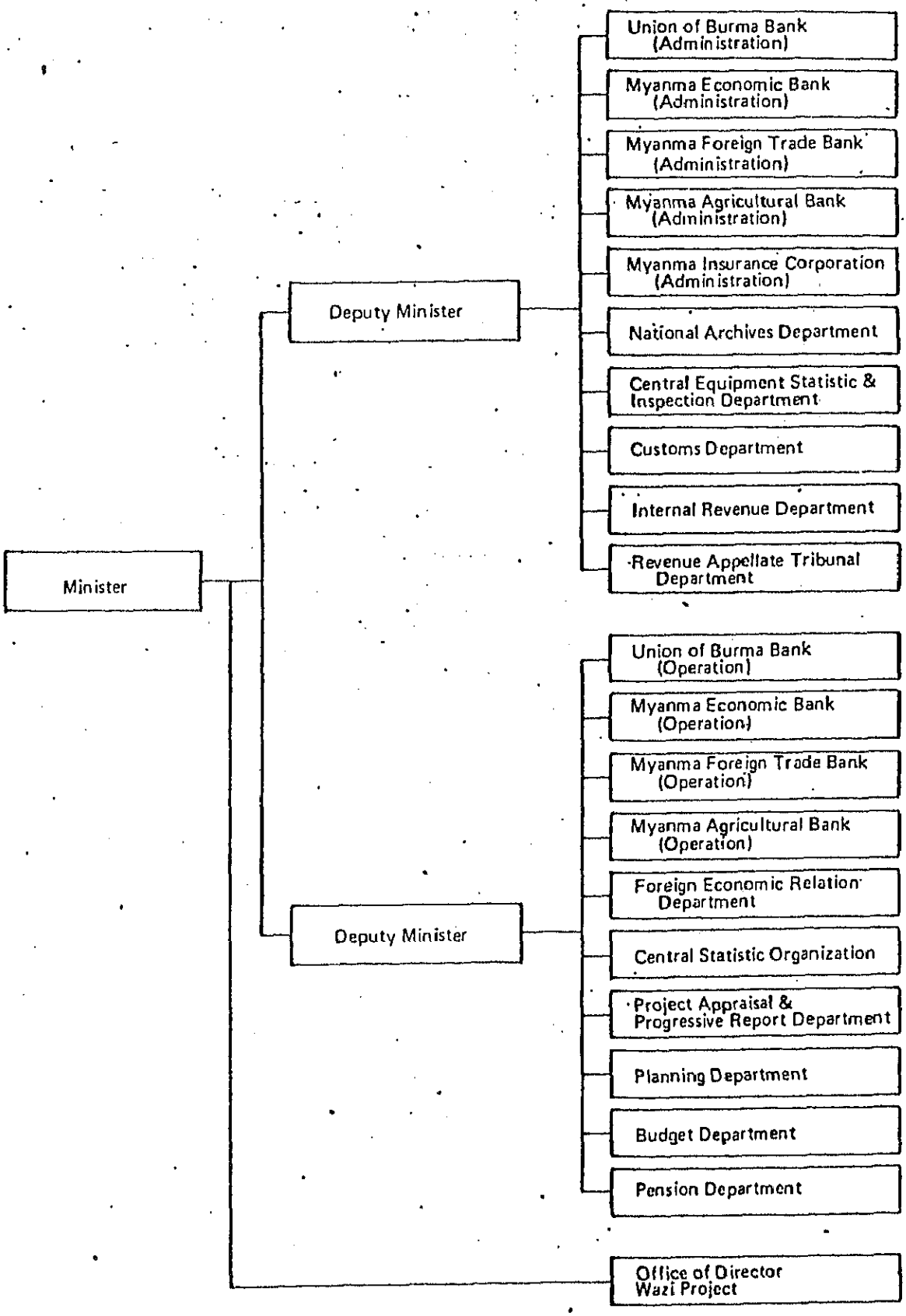


Fig. 5-2 Organization of Foreign Economic Relation Department

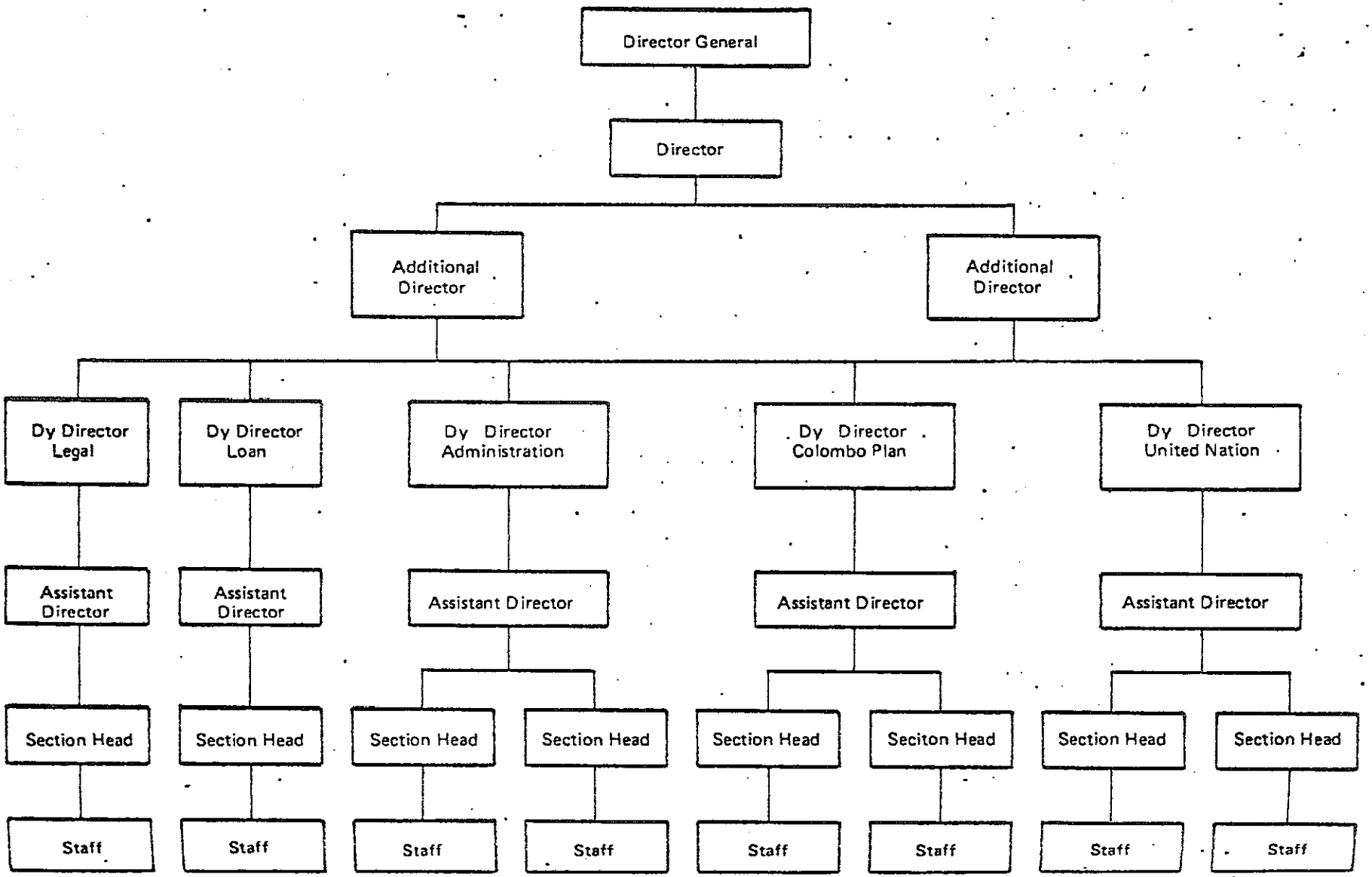


Fig. 5-3 Organization of Ministry of Agriculture and Forests

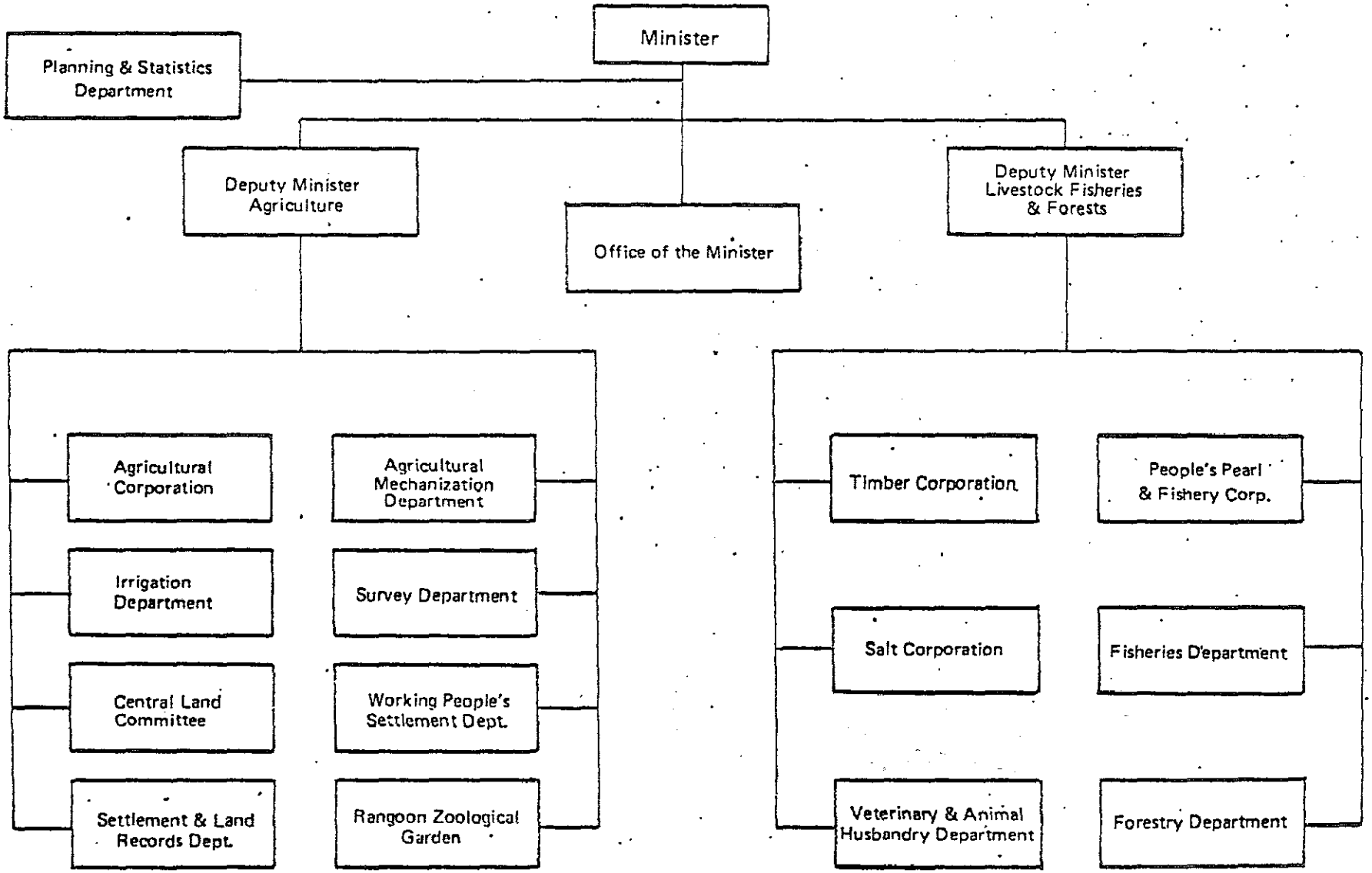
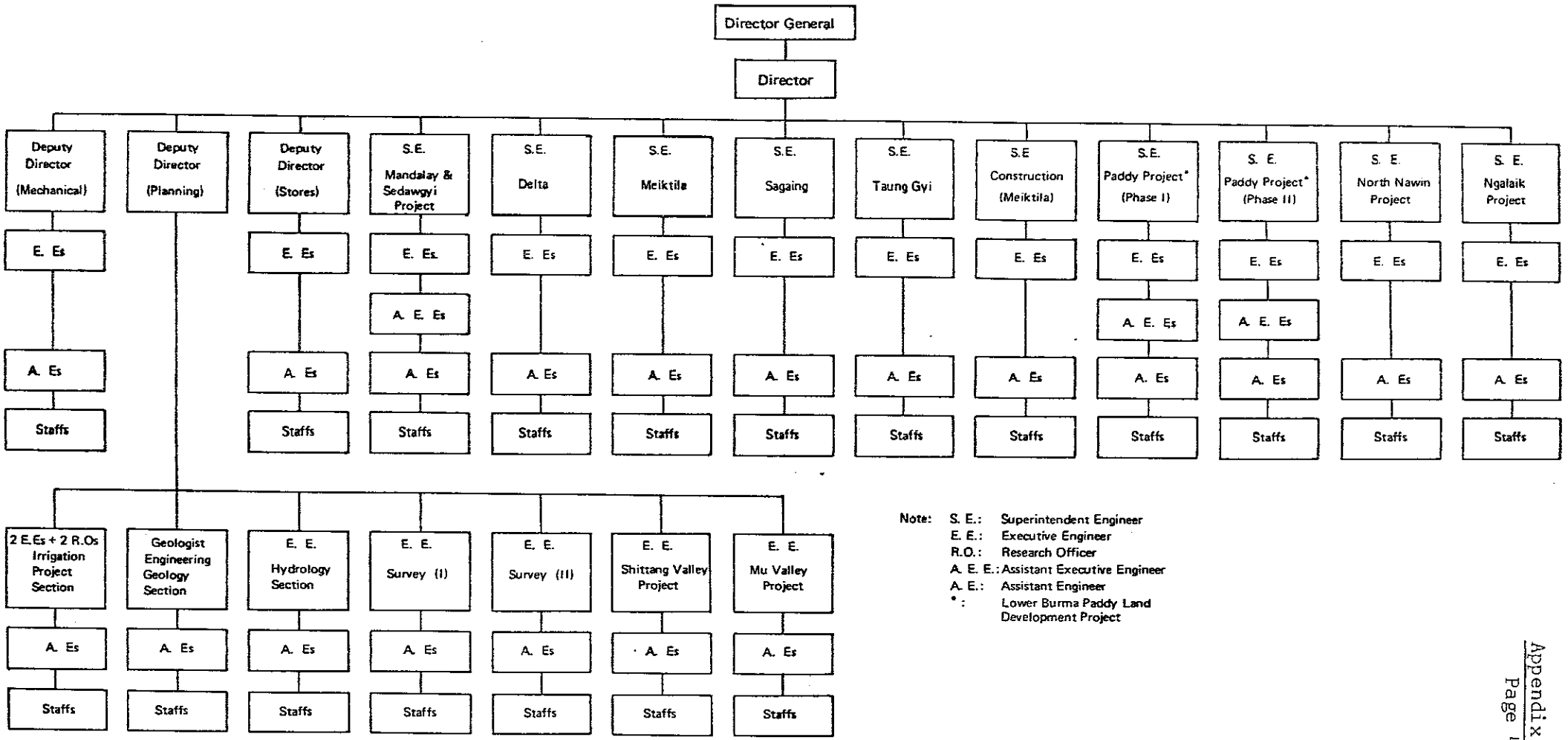


Fig.5-4 ORGANIZATION OF IRRIGATION DEPARTMENT



Note: S. E.: Superintendent Engineer
E. E.: Executive Engineer
R.O.: Research Officer
A. E. E.: Assistant Executive Engineer
A. E.: Assistant Engineer
*: Lower Burma Paddy Land Development Project

Fig. 5-5 Organization of Agriculture Corporation

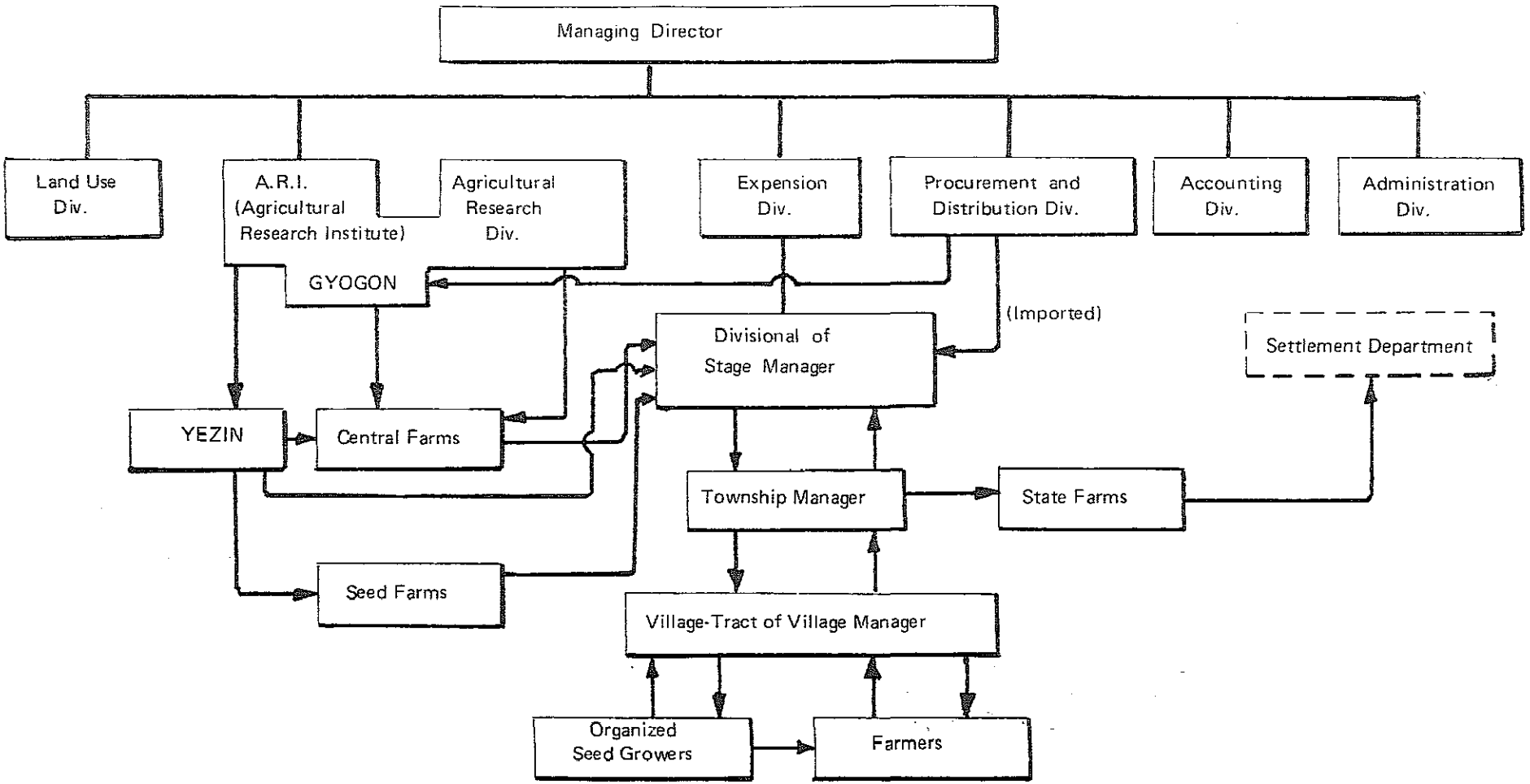
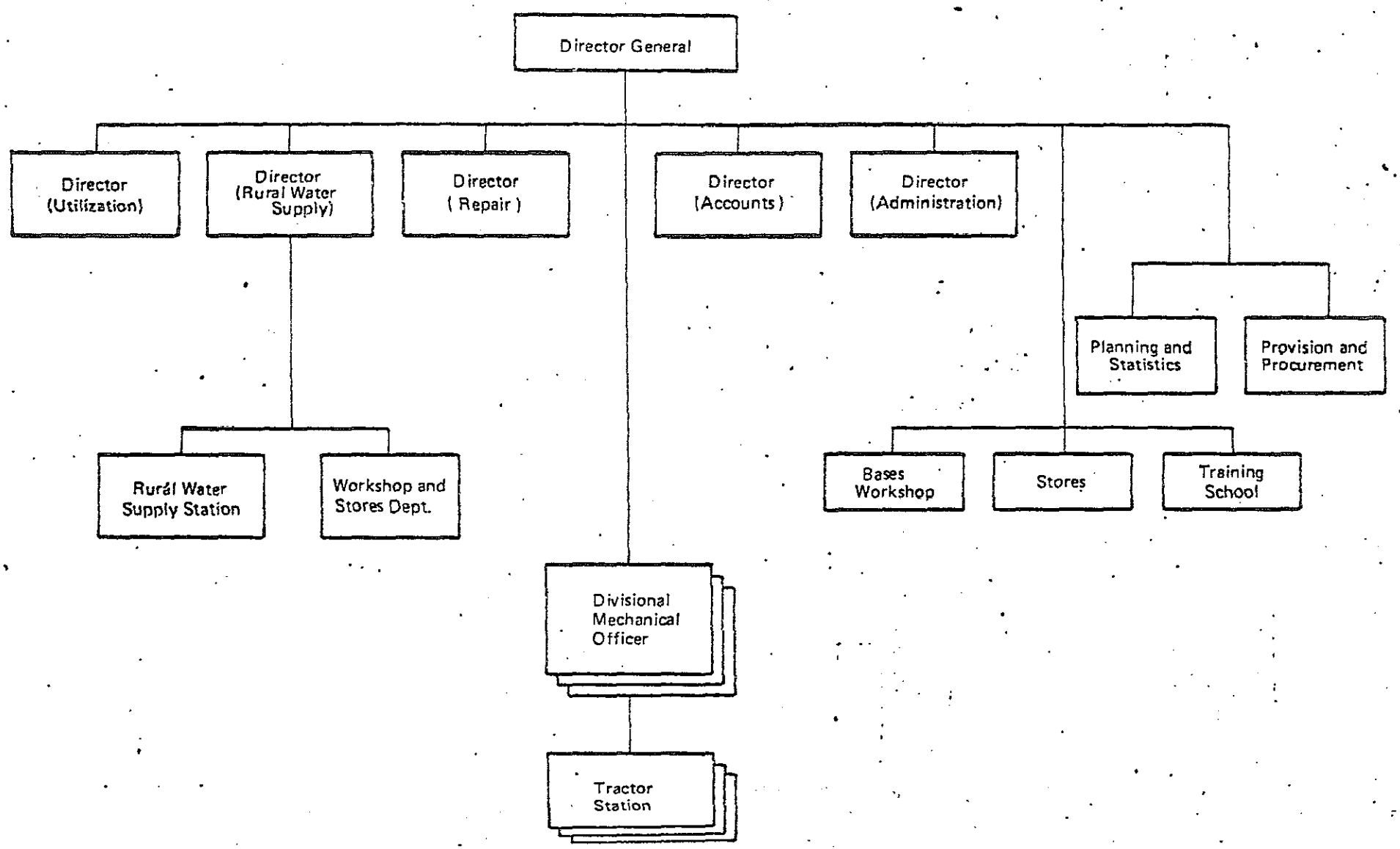


Fig. 5-6 Organization of Agricultural Mechanization Department



CHAPTER VI. PROJECT JUSTIFICATION

6B-1 Study on Prices of Agricultural Products, Input Materials and Wages, etc.

As known well, in principle, normal current farm gate prices should be applied in the project analysis. In financial analysis, however, normal current farm gate prices derived from on-going local market prices will be applied, whereas in economic analysis, world market prices should be referred in case of internationally traded commodities, and local market prices will be referred in case of domestically traded commodities. In this case, for imported commodities, c.i.f. prices will be referred, whereas for exported commodities, f.o.b. prices will be referred. And as regards wages, on going current market wages will be employed in financial analysis, whereas in economic analysis, opportunity cost of labor should be applied for unskilled common labor. Furthermore, subsidies should be included and taxes should not be included in economic prices, whereas subsidies should not be included and taxes should be included in financial prices.

A. Financial Prices Concerned.

In this country, most of important commodities are controlled by the government. But at the same time, open markets are also prevailing. Therefore in many cases there are found duplicate structure in price formation. In applying on going local market prices, therfore, careful attension should be paid in this point.

(1) Financial Price of Paddy

Predominant variety of paddy cultivated in the area is E mata group and its quality is almost ordinary grade (3rd grade). Therefore its price is 955 Ks./100 baskets at the level of the governmental depot (government buying center). But the actual price received by farmers at the depots is estimated at 932 Ks/100 baskets due to its usual moisture contents of 16 - 17%. And the distance from farm gates to the depots is around 0.5 miles on an average. 1 cart loads of paddy is useally 25 baskets. 10 Ks. will be charged

for 2 times of carting per day. Therefore transportation cost can be estimated at 20 Ks./100 baskets, and or at 15 Ks./60 bkt. As such, the financial farm gate price can be estimated at 912 Ks./100 baskets. (i.e. 9.12 Ks/basket)

(2) Financial Price of Groundnuts

As mentioned in para 9-D-Chapter III, cooperative society has adopted quota system for this crop, although it is not the government controlled commodity. Actual quote is alloted at the rate of 10 basket per acre for winter crop, although it is not alloted for monsoon crop. In other words, 10 baskets out of 30 baskets which is regarded as the average yield of winter crop is procured by the village tract cooperatives at the price of 40 Ks./basket, and another 20 baskets out of winter crop and monsoon crop, the average yield of which is 20 baskets/acre can be sent to open markets at the price of 50 Ks./basket. Therefore actual local market price can be estimated at Ks. 48/basket. (=$\{40$ Ks. x 10 + 50 Ks. x 40$\} \div$ 50). On the other hand, the distance from farm gates to village tract cooperatives and or open markets is around 1 mile on an average. So, the transportation cost can be estimated at 1 Ks./basket. Accordingly, the financial farm gate price can be estimated at 47 Ks./basket.

(3) Financial Price of Sesame

In case of sesame also, quota system has been adopted by the cooperative society. But in case of sesame, actual quota is alloted at the rate of 1 basket per acre only for monsoon crop, the average yield of which is regarded as 4.5 baskets per acre. Namely, another 3.5 baskets of monsoon crop and the whole yield of winter crop which is estimated at 3.5 baskets per acre can be sent to open markets. And cooperative price is 100 Ks./basket and open market price is 170 Ks./basket on an average, although its price fluctuates from 120 Ks./basket to 200 Ks./basket in the markets. Therefore local merkat price of sesame can be estimated at 161 Ks./basket (= $\{100$ Ks. + 170 Ks. x 7$\} \div$ 8). On the other hand, 1 cart will be required each

season for transportation from farm gates to village tract cooperatives and or open markets, the distance of which is around 1 mile on an average. So, transportation cost can be estimated at 2.5 Ks./basket. Accordingly, financial farm gate price can be estimated at 158.5 Ks./basket.

(4) Financial Price of Gram

As regards gram, any quota system has not been so far adopted. But actually, the cooperative society is making their efforts to collect this crop for the purpose of its smooth marketing. And about a half of farmers' production (i.e. 4 baskets/acre) are collected by the cooperatives at the rate of 50 Ks./basket. For this transportation, 1 cart will be required. And as for another 4 baskets/acre, middle men come to farm gates to collect them at the rate of 80 Ks/basket on an average, although its price varies from 70 Ks./basket to 150 Ks./basket in the open markets. From the above, the financial farm gate price of gram can be estimated at 64 Ks./basket = {(50 Ks. x 4 - 10 Ks.) + (80 Ks. X 4)} ÷ 8.

(5) Financial Price of Sunflower

This crop is a new crop introduced just recently. Accordingly, farmers are trying to grow it on their small plots, although the government is keen to promote its cultivation. Accordingly, this crop can not be so far found in the open markets in the project area. But AC township office collects its seeds at the rate of 6 baskets/acre for the purpose of seed multiplication at the price of 64 Ks./basket, and another 4 baskets/acre will be sent to the oil mill for the purpose of farmers' home consumption. As such, the selling price is realized only in AC township office. So, 64 Ks./basket can be regarded as the local market price of sunflower seeds. So, taking into account the transportation cost from farm gate to AC township office, the financial farm gate price can be estimated at 63 Ks./basket.

(6) Financial Price of Maize

In the project area, maize is cultivated only for the eating purpose and it is sold in form of corn-cob, the farm gate price of which is 0.1 Ks./corn-cob on an average.

(7) Financial Price of Short Staple Cotton (Wagyi)

This crop is a government controlled commodity and the quota system has been adopted by the government at the rate of 60 percent of the total production. And the price is Ks.4.5/viss at the depot on an average in the area, although government price is 6 Ks./viss in case of 1st grade and 4 Ks./viss in case of 2nd grade. On the other hand, transportation cost from farm gates to TIC depots is estimated at 0.4 Ks./viss, because cotton is so bulky that 48 viss (quota per acre) requires 1 cart, the cost of which is around 20 Ks. in this case, although even in case of 100 viss, 1 cart may be enough. So, the financial farm gate price will be Ks.4.1/viss.

(8) Financial Price of Long Staple Cotton

In case of long staple cotton, the whole products should be sent to the government depots at the price of 7 Ks./viss. And transportation cost will be Ks.0.2/viss in this case. So, the financial farm gate price can be setimated at 6.8 Ks./viss.

(9) Financial Price of Jaggery

In the project area, sugar cane is cultivated mainly for the purpose of jaggery production. Therefore suger cane should be eveluated in terms of jaggery. And the farm fate price is regarded as 5 Ks./viss, although its price varies from 5 Ks./viss to 8 Ks./viss in the open markets.

(10) Financial Price of Fertilizers

In this country, fertilizers are controlled by the government.

Namely, all fertilizers are procured and distributed by AC (Agricultural Corporation). And fixed prices are applied at the level of Township AC office. But it is difficult for farmers to buy fertilizers at Township AC office directly because of distance and necessary quantity. So, usually village tract cooperatives transport the necessary quantities from Township office to cooperative offices by adding some service charges. As such, the price will be as follows at each level:

	Township AC level	Village Tract Coop. level	Farm Gate level	(Remarks)
Urea	9 Ks./bag	11 Ks./bag	12 Ks./bag	(56 lb/bag)
TSP	62 Ks./bag	66 Ks./bag	67 Ks./bag	(112 lb/bag)
Potash	29.9 Ks./bag	33 Ks./bag	34 Ks./bag	(112 lb/bag)

(11) Financial Prices of Agricultural Chemicals

Procurement, distribution and prices of agricultural chemicals are also controlled by the government. But in case of agricultural chemicals, most farmers buy them at Township AC office derectly, because its treatment is rather difficult for cooperatives and the required quantities for the individual farmer are not so much compared with fertilizers that the transportation cost from Township AC office to farm fates is negligible. Therefore their farm gate prices are as follows:

Lindane P.065	Ks. 70.30/50 kgs
Lindane P.135	Ks. 12.00/25 kgs
Lindane L.20	Ks. 38.00/litre
Endrin 19.5, EC	Ks. 73.00/gal
D.D.T. 25%, EC	Ks. 37.20/gal
D.D.T. 75%, WPD	Ks. 317.10/25 kgs
Aldrin 2.5%	Ks. 100.00/50 kgs
Malathion 90%, EC	Ks. 152.00/gal

Thimet 10, G	Ks. 14.90/kgs
Sevin	Ks. 161.75/25 kgs
Aretan - 6	Ks. 11.65/lb.

B. Economic Prices Concerned.

As mentioned in the beginning of this Appendix, economic prices of domestically traded commodities will be the same as their financial prices studied in the preview paras. But in case of internationally traded commodities, their economic prices will be derived from their world market prices as follows:

(1) Economic Price of Paddy derived from IBRD Projection Price

a. IBRD projection price, 1990, in 1978 constant dollars (per m.ton) (5% broken, milled rice, f.o.b. Bangkok) $437.6
b. converted in 1979 constant dollars. (x 1.086) [1/] $475.2
c. Burma is an exporting country, but this price should be revised downwards to account for low quality of the rice locally produced in the area. So, it should be assumed at $332.64
(minus 30%, because domesticalley consumed rice is mostly 35% broken)
This price can be assumed as the f.o.b. price of Burmese rice (35% broken, milled rice, f.o.b. Rangoon)
d. converted to Burmese Kyat (1$ = 13 Ks. [2/]) ..... Ks. 4,324.32
e. handling charge at harbor (29 Ks./m.ton) ..... Ks. 29
f. harvor storage (1 week)(5 KS./100 baskets) ..... Ks. 1.4
g. transportation costs
Rangoon harvor (80% by railway, 20% by truck) ..... Ks. 76
(inc. loading & unloading)
h. price of milled rice at mills in the area ..... Ks. 4,218
i. conversion price to paddy at mills in the area (x 0.675)[3/] ..... Ks. 2,847
j. milling charge (38.8 Ks./100 baskets[4/]) ..... Ks. 19

k. paddy price at mills in the area ..... Ks. 2,828

l. transportation costs (inc. loading & unloading)

o. from Govt. buying depots to mills (by truck)..... Ks. 15

o. from farm gates to qovt. buying depots (by cart). Ks. 20

m. Farm Gate Price of Paddy in the area ..... Ks. 2,793

f. " " " converted to per 100 baskets (4,600 lbs)..... Ks. 5,828

Ks. 58.28/basket

g. taking the by-prodicts into account (x 1.035)[5/] .....

Ks. 59.6/basket

Note:

1/ IBRD International Inflation Index.

2/ This rate is shadow foreign exchange rate.

3/ This conversion ratio has been given by making average ratio of 67.4% in the Wunza mills (for farmers' consumption) and 67.7% in the private mills dealing with the government paddy for domestic consumption. (i.e., in case of 35% broken rice).

Rice Milling Efficiency

	Private Mill dealing with Govt. Paddy		Wunza Mill	
Paddy	100 bskt (4,600 lb)		4,600 lb	
milled rice (35% broken)	41.5 " (3,112.5 lb)	67.66%	3,100 "	(67.39%)
small broken rice	1.0 " (72.0 ")		50 "	
fine bran	4.5 " (202.5 ")		170 "	
coarse bran	3.0 " (135.0 ")		80 "	
point, impurity, dust, husk	1,078.0 "		1,200 "	

4/ This milling charge is the average of 40 Ks/100 baskets in Wunza mills and 37.6 Ks/100 baskets in the private mills dealing with the governmnet paddy for domestic consumption.

5/ In the above table, small broken rice, fine bran and coarse bran can be regarded as the by-products of paddy production, the value of which can be estimated at around 3.5% of the value of paddy on an average. In this case, straw has not been taken into consideration, because it is used as the fodder of cattles, but it is an intermediate product in farming, and it is understood that it will be evaluated in terms of cattle power and farm yard manure.

(2) Economic Price of Long Staple Cotton

1. IBRD projection price, 1990, in 1978 constant dollars (L.S. Cotton yarn, Mexican, CIF, North Europe) ....185.3 CTs/Kg
2. Converted to in 1979 constsnt dollars (x 1.086 1/).201.2 CTs/Kg
3. Converted to Burmese Kayts, assuming that this price can be c.i.f. price at Rangoon harbour (1$=13Ks.2/) .....Ks. 26,156/ton
4. License fee (instead of custom duty) at harbour ...Ks. 614.5/ton
5. Handling charges at harbour .....Ks. 29/ton
6. Warehouse charges at harbour (within week, 35pyis/bale), (460 lb/bale, so 5bale/ton).....Ks. 1.8/ton
7. Transportation charges on an average (from harbour to Zinning mills) .....Ks. 373/ton (inc. loading & unloading,etc.)
8. Price of cotton yarn at the Zinning mill in the area .....Ks. 27,177.3/ton
9. Converted to per lb. .....Ks. 12.33/lb
10. Converted to price of cotton (x 0.1532 x 3.6 3/) ...Ks. 6.8/viss
11. Transportation cost (from depot to Zinning mill by track and from farmgate to depot by cart) .....Ks. 0.2/viss
12. Farm gate Price .....Ks. 6.6/viss

1/ Source of this conversion factor: IBRD International Inflation Index.

2/ This rate is shadow foreign exchange rate.

3/ According to the counterpart, it was rejected to visit the zinning mill near the area. So, it was impossible to study this conversion rate at the factory. In this point, however, another approach has been made as follows:

Conversion Rate from cotton to cotton yarn

a) the government controlled price of L.S. Cotton ...Ks. 7/viss

b) the govt. controlled price of L.S. Cotton yarn

white (1/20) ... Ks. 12.04/lb (ex-factory price)

white (1/30) ... Ks. 13.35/lb (ex-factory price)

Average ... Ks. 12.695/lb ..... Ks. 45.7/viss

c) conversion rate = Ks. 7 ÷ Ks. 45.7 = 0.1532

Namely, in this country, the price of cotton will be Ks. 7/viss when the price of cotton yarn is Ks. 45.7/viss. In other words, therefore, when the price of cotton yarn is Ks. 12.33/lb, the price of cotton/viss should Ks. 12.33 x 3.6 x 0.1532.

(3) Economic Price of Urea

Note: At present, 50% of total requirement of Nitrogen fertilizers are supplied by domestic production and another 50% by Imports. But as far as Urea is concerned, it is prospected in the 4th year plan that self-sufficincy will be achieved in 1983/84 and after that some amount will be exported. So, urea will be regarded as an exporting commodity in this economic analysis.

	(per m.ton)
1. IBRD projection Price in 1990 in 1978 const. dollar (f.o.b. Europe, bagged).....	$ 180.0
2. Converted to in 1979 constant dollar (x 1,086)	$ 195.48
3. Assumed f.o.b.price at Rangoon harbour.....	$ 195.48

4.	Converted to Burmese Kyat (1$=13Ks.).....	Ks. 2,541.24
5.	Service charge at harbour (10%)	Ks. 254.1
6.	Port dues	Ks. 12.1
7.	Handling charges at harbour	Ks. 57.9
8.	Warehouse charge at harbour ..... (3-5 days, Ks.0.2/m.ton/day)	Ks. 1
9.	Transportation cost from factories to harbour	Ks. 200
10.	Ex-factory price	Ks. 2,016
11.	Transportation costs from factories to the Project Area (Tsp.AC level)	Ks. 200
12.	Price of Urea at TspAClevel in the area	Ks. 2,216
13.	Converted to per 56lb (bag)	Ks. 56/bag(56lb)
14.	Farm gate price	Ks. 59/bag(56lb)

(4) Economic Price of TSP

		(per m.ton)
1.	IBRD projection price, 1990, in 1978 constant dollars ..... (f.o.b. bulk, US Gulf/Florida)	$ 165.0
2.	Converted to in 1979 constant dollare (x 1.086)	$ 179.19
3.	Freight charge	$ 55.0
4.	Insurance charge (2% of f.o.b. price)	$ 3.58
5.	c.i.f. price at Rangoon port	$ 237.77
6.	Converted to Burmese Kyats (1$=13Ks)	Ks. 3091.01
7.	Service charge (10%)	Ks. 309.1
8.	Port due (12Ks/m.ton)	Ks. 12
9.	Handling charges at harbour	Ks. 57.90
10.	Warehouse charges at harbour ..... (3-5 days, Ks.0.2/m/ton/day)	Ks. 1
11.	Transportation form harbour to Tsp.AC godown in the Project Area (by railway and truck)	Ks. 76
12.	Price at Tsp.AC level in the area	Ks. 3547
13.	Converted to per bag (112 lb)	Ks. 180/bag
14.	Farm gate price	Ks. 183/bag

(5) Economic Price of Potash

		(per m.ton)
1.	IBRD projection price, 1990, in 1978 constant dollars (f.o.b. bulk, Vancouver)	$ 83.0
2.	Converted to in 1979 constant dollar (x 1.086)	$ 90.1
3.	Freight charge	$ 55.0
4.	Insurance charge (2% of f.o.b. price)	$ 1.8
5.	c.i.f. price at Rangoon port	$ 146.9
6.	Converted to Burmese Kyats (1$=13Ks)	Ks 1909.7
7.	Service charge (10%)	Ks 190.97
8.	Port due (12Ks/m.ton)	Ks 12
9.	Handling charges at harbour	Ks 57.9
10.	Warehouse charges at harbout (3-5 days, Ks.0.2/m.ton/day)	Ks 1
11.	Transportation form harbour to TspAC godown in the Project Area (by train and by truck)	Ks 76
12.	Price at TspAC level in the Area	Ks 2247
13.	Converted to per bag (112 lb)	Ks 114/bag
14.	Farm gate price	Ks 117/bag

(6) Ecnonmic Price of manure

In most cases, marketing of manure can not be found, but it is understood by farmers that manure will be evaluated at Ks. 10/cart, if it is sold. Therefore this price has been employed as its economic price, although most farers apply manure without any cash payment.

(7) Economic Prices of Agricultural Chemicals

Most of agricultural chemicals are imported in this country. So, the same analysis as fertilizers should be made theoritically.

But required quantities for individual farmer are not so much, and its weight in the farm costs is not so big; moreover, any subridies are not found. Therefore, their financial prices have been employed as their economic prices in this study.

C. Analysis of Farming Labor Wage Rate, etc.

(1) In principle, finacial farming wage rates can be found out in on going labor markets. In the project area, it seems that it is realized in accordance with working hours and kinds of works. And if the kind of works and working hours are same, the same wage rate is applied in both cases of male labor and female labor, although some kinds of works depend mainly on male labor and another kinds of works depend mainly on female labor. Moreover, it seems that working hour is customarily different depending on the kind of works. For example, usually, it is 4 hours in the morning in case of land preparation, and 3-4 hours in the morning in case of seeding, weeding, thinning and so on, although in case of up-rooting, transplanting, reaping, etc., whole day working is found.

And even in case of whole day working, their wage rates vary 5 Ks./day - 6 Ks./day - 7 Ks./day - 8 Ks./day - 10 Ks./day depending on the kind of works. For example, 6 Ks. for sesame reaping, paddy transplanting, and sesame reaping (including setting up for drying), 7 Ks. for up-rooting of paddy seedlings, 8 Ks. for paddy reaping and 10 Ks. for gram reaping and sugar cane reaping, although only 4 Ks. will be paid for groundnuts reaping and cotton reaping, the working hours of which are usually 4 hours only.

In case of half day working also, their wage rates vary 2 Ks. - 2.5 Ks. - 3 Ks. - 4 Ks. for the same reason. For example, 2 Ks. for sunflower seeding, 2.5 Ks. for paddy field weeding and sunflower seed separation work, 3 Ks. for seeding of groundnuts, sesame, gram, cotton, sugar cane, Wagyi weeding and cotton thinning, and 4 Ks. for weeding of sesame and cotton, and cotton reaping.

These actual wage rates will be employed in the farm budget analysis in this study.

(2) The above financial wage rates look like reasonable on one hand, but on the other hand, it seems that thses wage rates do not reflect the real socialwage rates, because these wage rates are realized only in case of the peak seasons of farming, and in other seasons their labor is left in the situation of under-employment. Moreover there are found so many landless laborers in the project area. For example, the number and percentage of landless laborers' families in 9 villages selected at random are as follows:

Number and Percentage of Landless Laborers' Families

No. of Village	I	II	III	IV	V
Total households	130	100	62	194	30
Farmers' households	70	80	46	134	24
under 5 ac.	30	56	35	50	5
5-10 ac.	40	4	5	80	15
more than 10 ac.	-	-	-	4	4
Landless Laborers' Families	60	20	16	60	6
(%)	(46.2)	(20.0)	(11.5)	(30.9)	(20.0)

No. of Village	VI*	VII	VIII	IX	Total*
Total households	325	835	30	302	2,008
Farmers'households	240	535	26	156	1,311
under 5 ac.	201	-	8	30	-
5-10 ac.	39	-	10	85	-
more than 10 ac.	-	-	12	41	-
Landless Laborers' Families	50	300	4	146	662
(%)	(15.4)	(35.9)	(13.3)	(48.3)	(33%)

* In case of Village No.VI, Total households include another 35 households (ex. governmental serveices, etc)

Such under-employment situation will disturb the normal competition in the labor markets. So, shadow wage rates should be applied in the economic analysis of the project. In this connection, the government minimum wage rate should be referred, because it is 5.4 Ks. per man.day for 8 hours working and it can be regarded as the opportunity cost of labor in this country. Therefore it may be reasonable to apply this governmmnetal wage rate as the shadow wage rate of unskilled farming labor.

In this case, however, it should be taken into consideration that in case of government laborers, their working hour is 8 hours, whereas in case of farming labor, their working hour is 6 hours on an average even in case of whole day work. Accordingly, 4Ks./man.day ($= 5.4\text{Ks.} \times \frac{6 \text{ hours}}{8 \text{ hours}}$) can be regarded as the shadow wage rate of unskilled farming labor. As such, family labor and mutual helping labor will be evaluated by this wage rate in the economic analysis in this study.

And as for hired labor, 77 per cent of the actual payment will be the shadow wage rate, because 7Ks. is considered as the on-going wage rate for 8 hours working in farming, whereas5.4Ks. is the shadow wage rate for 8 hours working. i.e.5.4Ks. ÷ 7Ks. = 77%.

(3) As regards draft cattles and cartage, most farmers use their own cattles, and accordingly, hired cattles are hardly found. According to farmers, however, the hired rate of them may be 12Ks.-13Ks/pair cattle day including a driver. If it is possible to apply 77% to this hired rate, the shadow hired rate of cattles would be 10Ks./pair cattle day (=13Ks. x 0.77). This rate will be employed in the economic analysis in this study.

(4) Regarding farn mechanization cost, it can be calculated by adding operation cost to their rental fee, which can be derived from the depreciation cost of each machinery. And, according to the Agronomist, the respective rental fee and operation cost are as follows:

	Rental Fee(Ks./ac.) Pilot area	Irrig. area	Operation cost (Ks./ac.)	Financial Farm Machanization cost (Ks./ac.) Pilot area	Irrig. area
Tractor	23.8Ks.	18Ks.	Ks.	Ks.	Ks.
Disc Plow	3.1	2.5	12.6	39.5	33.1(plowing)
Disc Harrow	2.5	2.1	5.0	31.3	25.1(harrowing)
Power Tiller	20.0	15.5	10.0	30.0	25.5(levelling)
Power Sprayer	0.2	0.2	3.3	3.5	3.5
Reaper	34.1	-	10.0	44.1	-

In the above table, Tractor and Power Tiller can be produced in Burma, but others should be imported. So, their foreign currency component shoul be valued by shadow exchange rate and import tax should be excluded in the economic analysis. As such, ecnomic farm machanization cost can be estimated as follows:

	Rental Fee(Ks./ac.) Pilot area	Irrig. area	Operation cost (Ks./ac.)	Financial Farm Machanization cost (Ks./ac.) Pilot area	Irrig. area
Tractor	23.8Ks.	18Ks.	Ks.	Ks.	Ks.
Disc Plowing	5.3	4.1	12.6	41.1	34.7
Disc Harrowing	4.1	3.5	5.0	32.9	26.5
Power Tilloring	20.0	15.5	10.0	30.0	25.5
Power Sprayer	0.3	0.3	3.3	3.6	3.6
Reaper	56.3	-	10.0	66.3	-

D. Shadow Foreign Exchange Rate

Regarding foreign exchange rate also, it seems that present current foreign exchange rate does not reflect its real exchange rate, although float system has been adopted in foreign exchange rate in this country. In this study, therefore, the shadow foreign exchange rate has been assumed at Ks. 13/US$1, taking into consideration recent IBRD feasibility studies in this country, although the actual current foreign exchange rate is Ks.6.44/US$1.

As such, this shadow foreign exchange rate has been employed to value the internationally traded commodities and the foreign currency component of farm costs as well as construction costs in the economic analysis, whereas for financial purpose, the actual current exchange rate has been employed.

E. Taxation for Farmers

As known well, taxes and duties should be left out of consideration in the economic analysis of the project, but in the financial analysis they should be taken into consideration. For budget analysis, therefore, taxation for farmers should be studied. Of course, all lands belong to the government in this country, accordingly all farmers have not any ownership on their farming lands. They have only cultivating right on their farming lands.

Therefore land taxes cannot exist in the real meaning, but for the cultivating right of farmers, land revenue is imposed every year, although income tax is not imposed for farming.

According to Land Record Office, in case of paddy fields, every field has been assessed and classfied into four grades by assessment tract. In the project area, the assessment is as follows:

Land Revenue in the Area (Ks./acre)

Paukkoung Township

Assessment	Paddy Field			
Tract	1st grade	2nd grade	3rd grade	4th grade
No.5	2.75	2.00	1.00	0.50
No.6A	2.00	1.00	0.50	-
No.6B	1.50	0.75	0.25	-
Thegon Township				
No.12	2.00	1.00	0.50	-
No.13B	3.00	1.75	0.75	0.50

No.14T	2.50	1.25	0.50	-
No.15	2.00	1.00	0.50	-
No.16	3.00	2.00	1.00	0.50

And it is understood that the majority of land revenue for paddy field in the area is 2Ks./acre at present.

In case of other lands than besides paddy field, the following standards are applied:

Home compound	2Ks./acre
Garden Land	3Ks./acre
Ya (dry cultivation)	1.25Ks./acre
Kaing land	
Sugar cane planted land	4Ks./acre
Tobacco planted land	4Ks./acre
Other cropped land	2Ks./acre

After irrigation project, land revenue will be increased. In principle, consolidated land revenue will be imposed for the land benefited by the government irrigation facilities, although so-called water charges are not imposed in this country. Actual revenue standards will be made after actual assessment, but it may be assumed at Ks.6/acre on an average from the examples of Kyaukse, Mandalay and Minbu.

6B-2. Study on Farm Cost

In principle, farm costs can be calculated in accordance with its farming practices. For this purpose, therefore, interview surveys were carried out with 37 farmers in 9 villages. Of course, strictly speaking, their farming practices were different in accordance not only with their farming conditions but also farmers' farming abilities. In order to simplify the economic and financial analysis of the project, however, the detailed average farming practices should be examined, although its academic aspects have been studied by the Agronomist as seen in D-chapter III and C-chapter IV and Appendix 4C-3.

Through the above interview surveys and in consultation with the Agronomist, the details of the average farming practices of each crop in the area - accordingly, the average labor requirements and material requirements per acre per each crop have been decided as follows:

1. Details of Farming Practices as the Back Data of Farm Costs Analysis

A. Farming Practices of Paddy

- in connection with inputs (labor & material) requirement -

(1) Paddy is the main crop in the area, where is located in the granary area in this country. And the majority of growing variety is EMATA group. HYV cultivation is estimated at less than 10 per cent in growing area.

(2) The size of nursery bed and the requirement of seeds are not standerdized. The acreage of nursery bed varies from one seventh, one tenth to one twentieth of its transplanting area, but the predominant case is one tenth of the transplanting area. Seed requirement also varies 1-1. 5-2 baskets per acre, but it is understood that it is 1.5 basket per acre is most cases. Seed renewal system is not prevailing. Instead, seed exchange system

is found among farmers after 5-6 years cultivation.

(3) As for seed preparation, even one night soaking could not be found. Some seed preparation will be recommended after completion of irrigation project.

(4) Most farmers apply 1 cart of manure before land preparation of nursery bed, and some farmers further apply urea (about one fourth of 28 lb) at the sowing time, although there are found some farmers who do not use even manure. Any way, for the purpose of nursery works including land preparation, 1 man-day of family labor and a pair of bullocks/1 will be required. After irrigation project it is needless to say that watering will be required. But labour requirement for watering will be studied together with watering to transplanting field.

Note /1 In this area, most farmers have at least a pair of bullocks. But if hired, hired charge usually includes one driver per a pair of bullocks. In the above case, therefore, actual labor requirement will be 2 man days and a pair of bullocks. Such calculation may be necessary for actual labor planning. But from the view point of farm costs estimation, labor cost should be calculated for 1 man day, because another 1 man day (i.e. driver' cost) will be included in the cost of a pair of bullocks. So, in the following tables, the latter case will be shown, and for reference the former case (actual labor requirement) will be shcwn in parentheses.

(5) As for land preparation of transplanting field, first of all, "land clearing and mending bunds, diches, etc." will be made. For this works, 4 man days of family labor are required.

(6) After that munuring of 4 cart loads is usually made. But after irrigation project, wartering will be made before plowing.

(7) As regards watering, it is recommended that the first watering should be made 6 days before plowing (during this time land soaking will be made), and the second watering will be made at the time of plowing. 16 days after 1st watering, the third watering will be made and followed by harrowing and puddling. And 26 days after 1st watering (about 35 days after sowing) the fourth watering will be made for transplanting. For these watering (including watering for nursery bed), 1 man-days of family labor and 2 man days of mutual helping labor[2/] will be required per acre.

Note 2/ In irrigation farming, watering will become one important operation. But this work will be usually carried out in the form of mutual helping which needs not to be paid. Therefore such labor needs not be taken into account in case of financial analysis, but in case of economic analysis, it should be taken into account at the same rate of family labor (i.e. at the rate of apportunity cost of labor). Therefore, this labour requirement will be shown in parentheses in the column of hired labour in the following tables.

(8) At present, 1 time plowing is followed by 8 times harrowing and 2 times puddling (with blade harrow). For these works, 2 pair bullocks, 4 pair bullocks and 2 pair bullocks will be required per acre of transplanting field.

(9) For transplanting, up-rooting will be made usually by 2 man days of hired labor, but contract system is also prevailing for this work. (ex. in terms of 6 ks/100bundles). For carrying seedling bundles, couter lining and transplanting, 2 man days of family labor and 5 man days of hired labor will be required in case of local variety (and 6 man days of hired labor in case of HYV). In this case, planting interval is 8 inches×9 inches in case of local variety and 9 inches 6 inches in case of HYV. And at the time of transplanting, urea (another three fourth of 28lb) will be applied. For this work, 1 man day of family labor will be required.

(10) 20 days after transplanting, 1-2 times of weeding will be made. For this work, 2 man days of family labor.and 4 man days of hired labor will be required. But the second fertilizer application and agri-chemical application can not be found in usual case in the area, although trap light is common to protect insects in the area. For this purpose, ks.2.75 will be required per acre. After irrigation project, more fertilizer application (accordingly the second top-dressing) and agri chemicals application will be recommended.

Besides the above plant caring, water-caring will be made from time to time up to harvesting time. For this purpose 1 man day of family labor will be required in usual case.

(11) Before reaping, bumboo pushing operation (pushing paddy plants by bumboo pole to one side to make reaping easy) is usually made in case of local varieties. For this work, 1 man day of family labor will be required.

Reaping is made by sickle. After reaping, paddy plants will be spreaded in the field for the purpose of drying for 3 days. For these works 4 man days of hired labor will be required. If contract system is employed for this works,40 ks/acre is usual case.

3-4 days after reaping, bundling of the plants will be made to carry them to the compound for threshing. For this bundling and carting, 1 man day of family labor and 1 pair of bullocks will be required.

Meantime, threshing floor will be prepared in the compound, which will be made by bullock tamping after mixing cow-dung with the ground, Its area will be usually 100feet×100feet.

On this floor, bundles of paddy plants are placed at the hight of 1.5 feet. And on this piled paddy plants bullock treading will be made, and after treading, replacing of the paddy bundles will be made to make treading again. As such, bullock treading will be usually repeated 4 times in total. For the above works, 2.5 pairs of bullocks will be required.

After treading, straw will be taken out and winnowing will be made. And paddy grains will be piled for drying and stored. For these works, 1 man day of family labor and 1 man day of mutual helping labor will be required.

Sumarized the above, the following table can be arranged.

Labor Requirements/ac. for Paddy Cultivation
-without project case-

	L.V.			H.Y.V.		
	Family labor	Hired labor	Bullocks	Family labor	Hired labor	Bullocks
	m.day	m.day	pair	m.day	m.day	pair
1. Nursery Works	(1) 1	-	1	(1) 1	-	1
2. Land Preparation						
Claring, mending, etc.	4	-	-	4	-	-
Manuring (4 carts)	(1) -	-	1	(2)	-	2
Plowing (1 time)	(2) -	-	2	(2) -	-	2
Harrowing (8 time)	(4) -	-	4	(4) -	-	4
Puddling (2 time)	(2) -	-	2	(2) -	-	2
3. Transplanting						
Up-rooting	-	2	-	-	3	-
Carrying seedlings counter lining and transplanting (inc. fertlilzering)	2	5	-	2	6	
4. Plant Caring						
Weeding	2	4	-	2	4	
2nd fertlizering	-	-	-	1	-	-
Trap lighting	1	-	-	1	-	-
Water caring	1	-	-	1	-	-
5. Harvesting						
Bamboo pushing	1	-	-	-	-	-
Reaping & spreading	-	4	-	-	6	-
Preparation of threshing floor	(1) -	-	1	(1) -	-	1
Bundling	1	1		1	1	-
Carting to house plating on the floor	(1) -	-	1	(1) -	-	1
Treading (4 time)	(2) -	-	1.5	(2) -	-	2
Winnowing, piling & storing	1	-(1)	-	1	(1)	
6. Total	(28) 14	16+(1)	13.5	(29) 14	20+(1)	15

Labor Requirement/ac. for Paddy Cultivation
-with the project case-

	L.V. without mechanization			H.Y.V. without mechanization		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.cay	Hired labor m.day	Bullocks pair
1. Nursery Works	(1) 1	-	1	(1) 1	-	1
2. Land Preparation						
Clearing & mending	4	-	-	4	-	-
Manuring (8 carts)	(2) -	-	2	(2) -		2
Watering (4 times)	1	-(2)	-	1	-(2)	-
Plowing (1 time)	(2) -	-	2	(2) -	-	2
Harrowing (8 times)	(4) -	-	4	(4) -	-	4
Puddling (2 times)	(2) -	-	2	(2) -	-	2
3. Transplanting						
Up-rooting	-	2	-	-	2	-
Carrying seedlings, counter lining, transplanting, 1st fertilizering	2	5	-	2	6	-
4. Plant Caring						
Weeding	2	4	-	2	4	-
2nd fertilizering	1	-	-	1	-	-
Plant protection	1	-	-	2	-	-
Water caring	1	-(2)	-	1	-(2)	-
5. Harvesting						
Banboo pushing	1			-	-	-
Reaping & spreading	-	7	-	-	10	-
Preparation of threshing floor	(1) -	-	1	(1) -	-	1
Bundling	1	1	-	1	2	-
Carting to house, placing on the floor	(1) -	-	1	(2) -	-	2
Treading (4 times)	(2) -	-	2	(3) -	-	3
Winnowing, Piling & soring	1	-(1)	-	2	-(2)	-
6. Total	(31) 16	19+(5)	15	(34) 17	24+(6)	17

- with project (L.V.) with mechanization (pilot area) -

	Family labor (man.day)	Hired labor (man.day)	Bullocks (pair day)	Agricultural machineries (econo-mic)	(finan-cial)
1. Nursery Works by Tractor	1	-	-		
2. Land Preparation					
Clearing & mending	4	-	-		
Manuring (8 carts)	(2) -	-	2	110.3Ks	100.8Ks
Watering (4 times)	1	-(2)	-		
Plowing, Harrowing, Paddling } by tractor & tillor	2	- - -	- - -		
3. Transplanting					
Up-rooting	-	2	-		
Carrying seedlings, Counter lining, Transplanting, 1st fertilizering	2	5	-		
4. Plant Caring					
Weeding	2	4	-		
2nd fertilizering	1	-	-		
Plant protection	1	-	-	3.7	3.5
Water caring	1	-(2)	-		
5. Harvesting					
Bunboo pushing	1				
Reaping & spreading	-	7	-		
Preparation of threshing floor	(1)-	-	1		
Bundling of paddy plants	1	1	-		
Carting to house and placing on the floor	(1)-	-	1		
Treading (4 times)	(2) -	-	2		
Winnowing, piling & storing	1	-(1)	-		
6. Total	(24) 18	19(5)	6	114	104.3

- with project (L.V.) with mechanization (irrigation project area) -

	Family labor (man.day)	Hired labor (man.day)	Bullocks (pair day)	Agricultural machineries (econo-mic)	(finan-cial)
1. Nursery Works by Tractor	1	-	-		
2. Land Preparation					
Clearing & manding	4	-	-		
Manuring (8carts)	(2) -	-	2	87.4Ks	84.1Ks
Watering (4 times)	1	-(2)	-		
Plowing, Harrowing, Paddling by tractor & tillor	2	- -	- -		
3. Transplanting					
Up-rooting	-	2	-		
Carrying seedlings, Counter lining, Transplanting, 1st fertilizering		2	5		
4. Plant Caring					
Weeding	2	4	-		
2nd fertilizering	1	-	-	3.7	3.5
Plant protection	1	-	-		
Water caring	1	-(2)	-		
5. Harvesting					
Bunboo, pushing	1	-	-		
Reaping & spreading	-	7	-		
Preparation of threshing floor	(1)-	-	1		
Bundling of paddy plants	1	1	-		
Casting to house and placing on the floor	(1)-	-	1		
Treading (4 times)	(2) -	-	2		
Winnowing, piling & storing	1	-(1)	-		
6. Total	(24) 18	19 (5)	6	91.1	87.6

- with project (H.Y.V.) with mechanization (pilot area) -

	Family labor (man.day)	Hired labor (man.day)	Bullocks (pair day)	Agricultural machineries (econo-mic)	Agricultural machineries (finan-cial)
1. Nersery Works by Tractor	1	-	-		
2. Land Preparation					
Clearing & mending	4	-	-		
Manuring (8 carts)	(2)	-	-	110.3Ks	100.8Ks
Watering (4 times)	1	-(2)	-		
Plowing, Harrowing, Paddling by tractor & tillor	2	- -	- -		
3. Transplanting					
Up-rooting	-	2	-		
Carrying seedlings, Counter lining, Transplanting, 1st fertilizering	2	6	-		
4. Plant Caring					
Weeding	2	4	-		
2nd fertilizering	1	-	-		
Plant protection (by power sprayer)	2	-	-	3.7	3.5
Water caring	1	-(2)	-		
5. Harvesting					
Reaping (by reaper)	1	-	-	71.4	44.1
Spreading & arrangement		1	-	-	
Preparation of threshing floor	(1)-		1		
Bundling of paddy plants		2	2	-	
Carting to house and placing on the floor	(2)-	-	-	2	
Treading (4 times)	(3)			3	
Winnowing, piling & storing	2	-(2)			
6. Total	(30) 22	16+(6)	8	185.4	148.4

- with project (H.Y.V.) with mechanization (irrigation project area) -

	Family labor (man.day)	Hired labor (man.day)	Bullocks (pair day)	Agricultural machineries (econo-mic)	(finan-cial)
1. Nursery Works by Tranctor	1	-	-		
2. Land Preparation					
Clearing & mending	4	-	-		
Manuring (8 carts)	(2) -	-	2	87.4Ks	84.1Ks
Watering	1	-(2)	-		
Plowing, Harrowing, Paddling by tractor & tillor	2	- -	- -		
3. Transplanting					
Up-rooting	-	2	-		
Carrying seedlings, Counter lining, Transplanting, 1st fertilizering	2	6	-		
4. Plant Caring					
Weeding	2	4	-		
2nd fertilizering	1	-	-	3.7	3.5
Plant protection	2	-	-		
Water caring	1	-(2)	-		
5. Harvesting					
Reaping and spreading	1	10	-		
Preparation of threshing floor	(1)-	-	1		
Bundling of paddy plants	2	2	-		
Carting to house and placing on the floor	(2)-	-	2		
Treading (4 times)	(3) -	-	3		
Winnowing, piling & storing	2	-(2)	-		
6. Total	(28) 21	24 (6)	8	91.1	87.6

B. Farming Practices of Groundnuts Cultivation
- in connection with inputs(labor and material)requirement

(1) In this area, groundnuts is also important crop for oil consumption, and farmers are very fond of its cultivation. Its cultivation is crried out not only in upland field, but also in paddy field as the 2nd crop of paddy cultivation. And in case of upland cultivation, not only winter crop but also monsoon crop are found. In generaal, however, winter crop shows good yield compaired with monsoon crop, although their farming practices are not so different each other.

(2) But as for land preparation, there are found some different practices village by village. Accouding to farmers, such differences were caused by the custom in their villages. After land clearing and manuring of 2 cart loads per acre, in some villages, 3 times of land preparation are carried out, whereas in other villages, 6 times of land preparation are repiated. But in the former case, each preparation consists of 1 time plowing, 2 times harrowing and 2 times levelling. And for these works, 15 pairs of bullocks are required. On the other hand, in the latter case, up to the 3rd preparation, each preparation consists of plowing and rollering, the 4th preparation consists of 4 times harrowing and rollering, the 5th preparation consists of plowing and rollering, and the last preparation consists of harrowing and rollering again. And for these works, 16 pairs of Bullocks are required. Any way, as such, it is understood that 15-16 pairs of bullocks will be required per acre for land preparation of ground nuts cultivation in this area.

(3) After land preparation, sowing line will be made with plow by a pair of bullocks. Interval of sowing line is 6 inches.

(4) For sowing by hand, 3 man days of hired labor or 10 man days of mutual helping labor will be required. Seed requirement is 6 baskets of pod per acre. After sowing, soil covering will be made

with levellor on roller. For this purpose 1 pair of bullocks will be required. After that 28 lb(0.5 bag) of Urea will be applied in usual case.

(5) 25 days after sowing, intercultivation cum weeding will be made 4 times by employing 4 man days of hired labor. And any other plant caring can not been seen until harversting time.

(6) 4 months after sowing, harvest time is coming. For reaping, 20 man days of hired labor will be required on an average, although needless to say that its labor requirement will be increase in accordance with yield increase. For carting the reaped plants to compound 4 pairs of bullocks will be required. And for separating pods from the reaped plants by hand and spreading them to dry for 3-4 days, 1 man day of family labor and 20 days of hired labor will be required.

(7) After drying, dryed pods will be bagged to be stored. For this, 2 man days of hired labor will be required.

(8) After completion of irrigation project, needless to say that watering, more fertilizering and plant protection will be made. More over, farm mechanization will be proposed in land preparation on 10,600 acres of sowing area out of 16,900 acres of total ground nuts sowing area.

As such, labor requirements per acre for ground nuts cultivation can be arranged as the following table.

Labor Requirement/ac. for Groundnuts Cultivation

	Without project			with project (but w/o mechanization)		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.day	Hired labor m.day	Bullocks pair
1. Land Preparation						
Clearing the field	1	-	-	1	-	-
Manuring	(1) -	-	1	(2) -	-	2
Watering	-	-	-	1	-(2)	-
1st plowing (1 time) " harrowing (2 times) " levelling (2 times)	(5)-	-	5	(5) -	-	5
2nd plowing (1 time) " harrowing (2 times) " levelling (2 times)	(5)-	-	5	(5) -	-	5
3rd plowing (1 time) " harrowing (2 times) " levelling (2 times)	(5)-	-	5	(5) -	-	5
2. Sowing						
Sowing line making with slow	(1) -	-	1	(1) -	-	1
Sowing & soil covering	-	3	-	-	3	-
with levellor	(1) -	-	1	(1) -	-	1
1st fertilizering	1	-	-	1	-	-
3. Plant Caring						
Intercultivation by hoe	4	6	-	4	6	-
2nd fertilizering	-	-	-	1	-	-
Watering (3 times)	-	-	-	1	-(2)	-
Plant protection	-	-	-	1	-	-
4. Harvesting						
Reaping & carting	(4) 1	20	4	(6) 1	30	6
Separating pods by hand and spreading for drying	1	20	-	2	30	-
Bagging and storing	2	-	-	3	-	-
5. Total	(32) 10	49	22	(41) 16	69+(4)	25

Groundnuts with the Project Case
(with mechanization)

	Family labor (m.day)	Hired labor (m.day)	Bullocks (pair cattle day)	Farm Mechanization Pilot area (economic)	(financila)	Irrig.Proj.area (economic)	(financial)
1. Land Preparation							
Clearing the field	1	-	-				
Manuring	(2) -	-	2				
Watering	1	-(2)	-				
1st plowing (1 time) " harrowing (2 times) " levelling (1 time)	3	-	-	110.3Ks	87.4Ks		
2nd plowing (1 time) " harrowing (2 times) " levelling (1 time)					100.8Ks		84.1Ks
3rd plowing (1 time) " harrowing (2 times) " levelling (1 time)							
2. Sowing							
Sowing line making with plow	(1) -	-	1				
Sowing & soil covering with levellor	- (1) -	3 -	- 1				
1st fertilizering	1	-	-				
3. Plant Caring							
Intercultivation with hoe	4	6	-				
2nd fertilizering	1	-	-				
Watering	1	-(2)	-				
Plant protection	1	-	-	3.7	3.5	3.7	3.5
4. Harvest							
Reaping & carting to compound	(6) 1	30	6				
Separating pods by hand and spreading for drying	) 2	30	-				
Bagging & storing	3	-	-				
5. Total	(29)19	69+(4)	10	114	104.3	91.1	87.6

C. Farming Practices of Sesame Cultivation
- in connection with inputs(labor materials)requirement -

(1) In general, it is said that sesame is a gambling crop, because its price is relatively good, but the fluctuation of its yield is so big (depending on weather conditions - especially moisture condition), that its cultivation may bring good profits in some years, but in other years its production may not cover even its farm costs. Nevertheless, most farmers are very fond of cultivation of sesame, because most farmers like to make self-sufficiency in home oil consumption.

(2) Sesame cultivation is carried out not only in monsoon season, but also in winter season, And usually monsoon crop shows good yield compaired with winter crop mainly dur to moisture conditions, although its farming practices are not so different in both cases.

(3) First of all, clearing of the field will be made by 1 man day of family labor. Next, manuring of 1 cart load will be made in case of upland cultivation, but any manuring is not carried out in case of 2nd crop in paddy field, because it is understood that the residual effects in paddy cultivation will still affect sesame cultivation.

(4) As regards land preparation, it seems that its practices are not standardized. Some farmers carry out 3 times of plowing and 3 times harrowing, whereas other farmers carry out 2 times land preparation each of which consists of 1 time plowing, 4 times harrowing and 1 time levelling. Moreover in mixed farming with Wagyi(s.s, cotton) cultivation which is found in shifting cultivation, afer burning the land, only 1 time harrowing will be made before broadcasting sowing. But the last case is a rere case. And in the former two cases, any way, 9-10 pairs of bullocks will be required per acre.

(5) In usual cases, before sowing, sowing line will be made with plow, and after sowing, soil covering will be made. For the above works,

a pair of bullocks and 4 man days of hired labor will be required. Seed requirement is 3.4 lb/acre,

(6) 25 days after sowing, weeding and thinning will be made 4 times by 2 man days of family labor and 4 man days of hired labor.

(7) 90 days after sowing, harvesting season will come. After reaping, reaped plants will be covered with leaves for 10 days for ripening. For these works, 1 man day of family labor and 5 man days of hired labor will be required. Instead of 5 man days of hired labor, sometimes there are found contract works at the rate of 30 ks per acre.

(8) 10 days after reaping, bundling will be made, and these bundles will be set up in the field for drying for 2 days, and afer 2 days will be re-set up for further drying for 2 days more. For these works 3 man days of family labor and 4 man days of hired labor will be required.

(9) Threshing will be made by hand in the field. For this, 2 man days of family labor and 2 man days of hired labor will be required.

(10) After carting to house, seeds will be spreaded for further drying, and after dryed up, seeds will be stored. For these works a pair of bullocks and 1 man day of family labor will be required.

Labor Requirement/ac. for Sesame Cultivation

	without project			with project (but w/o mechanization)		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.day	Hired labor m.day	Bullolks pair
1. Land Preparation						
Clearing the field	1	-	-	1	-	-
Manuring	(1) -	-	1	(2) -	-	2
Watering	-	-	-	1	-(2)	-
1st plowing (1 time) " harrowing (4 times) " levelling (1 time)	(5)-	-	5	(5) -	-	5
2nd plowing (1 time) " harrowing (4 times) " levelling (1 time)	(5)-	-	5	(5) -	-	5
2. Sowing						
Watering	-	-	-	1	-(2)	-
Maturing sowing line with plow Soil covering 1st fertilizering	(1) 1	4	1	(1) 1	4	1
3. Plant Caring						
Weeding & thinning (4 times)	1	4		2	6	-
Watering (4 times)	-	-	-	1	-(2)	-
2nd fertilizering	-	-	-	1	-	-
Plant protection	-	-	-	1	-	-
4. Harvesting						
Reaping & covering with leaves	1	5	-	2	10	-
Bundling Set up bundles for drying	2	4	-	2	8	-
Re-set up for further drying	1	-	-	1	-	-
Threshing by hand	2	2	-	4	4	-
5. Carting to house, spreading for drying and storing	(1) 1	-	1	(1) 1	-	1
6. Total	(23) 10	19	13	(33) 19	32+(6)	14

Sesame with the project case
(with mechanization)

	Family labor (man. day)	Hires labor (man. day)	Bullocks (pair. day)	Farm Mechanization costs Pilot area (economic)	(finincial)	Irrig.Proj.area (economic)	(financial)
1. Land Preparation							
clearing the field	1	-	-				
manuring	(2) -	-	2				
watering	1	-(2)	-				
plowing, harrowing, levelling	3	-	-	110.3 Ks	100.8 Ks	87.4 Ks	84.1 Ks
2. Sowing							
watering	1	-(2)	-				
making sowing line with plow; sowing; soil covering; 1st fertilizering	(1) 1	4	1				
3. Plant caring							
weeding & thinning (4 times)	2	6	-				
watering (4 times)	1	-(2)	-				
2nd fertilizering	1	-	-				
plant protection	1	-	-	3.7	3.5	3.7	3.5
4. Harvesting							
reaping & covering with leaves	2	10	-				
bundling; set up bundles for drying	2	8	-				
re-set up for further drying	1	-	-				
threshing by hand	4	4	-				
5. Carting to house, spreading for drying, and storing	(1)1	-	1				
6. Total	(26) 22	32+(6)	4	114	104.3	91.1	87.6

D. Farming Practices of Gram.

- in connection with inputs (labor&materials) requirement -

(1) Gram is an important crop as a kind of beans in this country. Until 1973, it was an exporting commodity, but since 1974, its exports could not he seen, due to a great increase of domestic demands, especially army demands. Accoudingly, relativily good price has been realized in the domestic markets.

(2) Its cultivation is carried out not only in the upland field, but also in the paddy field as the 2nd crop of paddy cultivation. But any way, its cultivation method is not intensive (rather extensive) and still traditional.

(3) In case of upland cultivation, 2-3 cart loads of manure are applied per acre, but in case of the 2nd crop after paddy cultivation, no manuring is the usual case.

(4) In case of upland cultivation, after 1 time plowing, broad casting of seeds will be made, and followed by once more 1 time plowing. But in case of paddy field cultivation, one month before paddy harvesting time, broad casting of seed will be made without plowing. Seed require- per acre. And after that, any plant caring is not givern in both cases.

(5) After reaping, reaped plants will be spreaded in the field for 3 days for drying. For this works, 2 man days of family labor and 2 man days of hired labor will be required. And sometimes contract is made for this works. In that case, 40 ks/acre will be paid.

(6) 3 days after reaping, dried plants will be carried to the threshing floor in the compound. Usually, the same threshing floor for paddy threshing will be used. For the above carting, 4 pairs of bullocks will be required.

(7) Threshing will be made by treading of 2 pairs of bullocks, (although only in the evening time). And winnowing will follow, for which 1 man day of family labor will be required.

(8) After that, the grains are spreaded in the morning for drying, and are collected in the evenig to be stored.

(9) After irrigation project, it was recommended to grow in the paddy field as the 2nd crop of paddy cultivation. Therefore without plowing, broad casting of seed will be carried out, one month before paddy haversing. So, careful soil covering will be required.

(10) Moreover, watering, weeding, fertilizering and plant protection will be recommended.

As such, labor requirement per acre for gram cultivation can be arranged as the following table.

Labor Requirement/ac. for Gram Cultivation

	without case			with case		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.day	Hired labor m.day	Bullocks pair
1. Manuring	(1) -	-	1	-	-	-
2. Plowing (1 time)	(2) -	-	2	-	-	-
3. Broad casting of seeds	1	-	-	1	-	-
4. Plowing/soil covering	(2) -	-	2	1	2	-
5. 1st fertilizering	-	-	-	1	-	-
6. Weeding	-	-	-	2	4	
7. 2nd fertilizering	-	-	-	1	-	-
8. Plant protection	-	-	-	1	-	-
9. Watering (2 times)	-	-	-	1	-(2)	-
10. Harvesting						
Reaping and spreading on the field for 3 days	) 2	2	-	2	4	
Carting to threshing floor	(4) -	-	4	(5)		5
Threshing	(2) -	-	2	(3)		3
Winnowing by hands	1	-	-	1	-	-
Drying 1 day on the floor collecting & storing	1	-	-	1	-	-
Total	(16) 5	2	11	(8) 12	10+(2)	8

E. Farming Practices of Wagyi (s.s.cotton) cultivation

(1) In general, in this area, Wagyi(short staple cotton) cultivation is found only in the mountain side/hill side manly for the purpose of self home use, although 60% of the production will be guoted to be sent to the government zinning mills (TIC factory) through the governnt depot. And shifting farming is now prevailing for this cultivation and moreover, mixed farming with sesame, etc. is common in this cultivation.

(2) First of all, waste government forest land should be reclaimed. Namely, woods will be cut by hand. For this, usually 3 man days of family labor and 2 man days of mutual helping labor will be required per acre. After 3 month, burning will be made by 1 man day of family labor. In the first year after reclamation, soil is fertile, so any manuring and fertilizering are not applied, but good yields can be expected. On the contrary, from the 2nd year, soil fertility will decrease extremely, and accordingly, good yield can not be expected. Therefore, every farmer likes to make new reclamation every year, if labor conditions could be allowed.

(3) After reclamation, 1 time harrowing will be carried out. But this work is so hard that 7 pairs of bullocks will be required.

(4) After harrowing, broad casting of seeds will be made. But as the weight of sesame seeds is light and its size is very small, cotton seed broad casting will be made after sesame seed casting, although they are grown as mixed farming. Cotton seed requirement is 15 viss per acre.

(5) After broad casting, soil covering will be made with harrow by 1 pair of bullocks.

(6) After sprouting, thinning will be made by 1 man day of family labor. And weeding will be made 3 times by 45 man days of hired labor.(i.e. 15 man days per 1 times).

(7) 3 months after sowing, sesame will be harvested. This work does not affect any trouble to cotton growing. (And this works is not taken into account in cotton labor requirement. Instead, has been taken into account in sesame labor requirement.)

(8) 1 more time weeding will be made by 20 man days of hired labor.

(9) Harvesting of cotton will be usually made 3 times in accordance with their maturity. Accodingly 3 man days of family labor will be required for this works.

As such, labor requirement/acre for wagyi cultivation can be arranged as the following table.

Labor Requirement/ac for Wagyi Cultivation

	without project case		
	family labor manday	hired labor manday	Bullocks pair cattle day
1. Cutting woods by hand	3	-	-
2. After 3 months, burning	1	-	-
3. Harrowing (1 time)	(7) -	-	7
4. Broad casting of seeds	1	-	-
5. Soil covering with harrow	(1) -	-	1
6. Thinning by hand	1	-	-
7. Weeding (3 times)	-	45	-
(8. Sesame harvesting)	...	...	...
9. 2nd weeding	-	20	-
10. Harvesting	3	-	-
11. Total	(17)9	65+(10)	8

F. Farming Practices of Long Staple Cotton Cultivation
- in connection with inputs(labor&materials) requirement -

(1) At present, long staple cotton cultivation can not be found in the area. But, as it is an importing commodity, the government is very keen to promote its cultivation. And the its processing factory is now under construction to a large extent near the project area (i.e. Shwe Daung Township under the 4th year plan.

(2) Under such situation, its cultivation has been introduced newly in the proposed cropping pattarn, although the farmers in the area have no experience in this cultivation. According to the government guide line and the farmers' experience in the vicinity of the project area, its farming practieces should be as follows:

(3) Its favorable sowing time is from September to 15th of Octover. If sowing time is delayed, its germination will be affected to a large extent. Therefore, its cultivation has been limitted to the upland cultivation. But upland irrigation should be carried out.

(4) Land preparation should be carried out carefully. Namely, plowing should be made so that tilling soil would be 6-7"deep, and harrowing should be made so that fine and soft tilling soil would be obtained. For this purpose, 2 times of land preparation will be required, each of which consists of 1 time plowing, 6 times harrowing, 1 time weeding and 1 time levelling in case of bullock cultivation. But after irrigation project, farm mechanization will be introduced.

(5) At the time of land preparation, manuring of 4 ton (8 cart loads) and 1st fertilizering (56 lb of urea, 56 lb of T.S.P. and 28 lb of Potash) should be made.

(6) Seed requirement is 15 viss per acre, which will be supplied from the government (i.e. TIC=Textile Industry Corporation). Sowing interval should be 2.5 feet x 1 feet or 2.5 feet x 0.5 feet in case of less fertile soil. 10 seeds will be sown per pit.

(7) 7 days after sowing, germination should be cheskid, because germination rate is 70-80%. And if necessary, supplemental sowing should be made.

(8) When the plants are 15 days old, thinning, weeding and intercultivation should be made. After that intercultivation should be made every 7 days and about 5 times in total.

(9) Watering will be made in terms of furrow irrigation when necessary.

(10) 2nd fertilizering (another 28lb of urea) should be made at the time of flowering.

(11) Plant protection should be started whem the plants are 15 days old, and repeated every 7 days interval, namely, 12 times in total as follows:

	Program of plant protection		Quantity	
	Age of Plant	Name of Agri-chemicals	lb	oz.
1st time	15 days	Malathion		16
2nd time	22 days	Malathion		16
3rd time	29 days	Malathion+Endrin		16+16
4th time	36 days	Malathion+Endrin		16+16
5th time	43 days	Malathion+Endrin		16+16
6th time	50 days	Endrin		32
7th time	57 days	Endrin+DDT		32+32
8th time	64 days	Endrin+DDT		32+48
9th time	71 days	Sevin	5	
10h time	78 days	Sevin	5	
11th time	85 days	Sevin	5	
12th time	92 days	Sevin	5	

(12) Harvesting will be made 3 times in accordance with its maturity.

As such, labor requirement/ac. for long staple cotton cultivation can be arranged as the following table.

Labor Requirement/ac for L.S. Corron Cultivation

- with Project (with mechanization) Case -

(with the project case)	Family labor	Hired labor	Bullocks	Farm Mechanization costs Pilot area (economic) (financies)	Irrig.Proj.area (economic) (financies)
1. Manuring	(4)-	-	4		
2. Plowing 3. Harrowing 4. Levelling	3			110.3 Ks 100.8 Ks	87.4 Ks 84.1 Ks
5. 1st fertilizering	1	-	-		
6. Drawing sowing line with harrow	(1)-	-	1		
7. Seeding in intersection point	1	3	-		
8. Checking germination & supplemental seeding	1	-	-		
9. 1st inter cultivation	1	-	-		
10. Thinning & Weeding	1	7	-		
11. Watering (5 times)	2	-(4)	-		
12. 2nd fertilizering	1	-	-		
13. Further Interculvation (4 times)	4	-	-	14.8 14.0	14.8 14.0
14. Plant Protection (12 times)	6	-	-		
15. Harvesting (3 times)	-	8	-		
Total	(25)21	19+(4)	4	125.1 114.8	102.2 98.1

G. Farming Practices of Maize

- in connection with inputs (labor & materials) requirements -

(1) In this area, maize is cultivated only for local consumption of eating purpose. So, the government is not so keen to promote this cultivation in this area. Therefore, this cropping has been omitted from the proposed cropping pattern. But so far, this cultivation is supported by the strong demands in this area, Accordingly, relatively good price is realized in the local markets, and their farming practices are also not so extensive. Not only manure but also urea are applied, weeding is also carried out, and land preparation is also carried out carefully.

(2) First of all, 4 cart loads of manure will be spreaded per acre. Next, 1st plowing will be made by 2 pairs of bullocks, and harrowing will follow by a pair of bullocks. After that the 2nd land preparation will be made in the same way.

(3) Before sowing, sowing holes will be made by foot. For this sowing works, 4 man days of labor will be required. In some cases, it will be done by family labor only, but in some villages, mutual helping labor will take the place of this works. The seed requirement is 1 basket (34 lb) (or 16 pyis).

(4) 2 weeks after sowing, intercultivation will be made by hand hoe. This will function not only in weeding, but also in ridges making. For this works, 2 man days of family labor and 6 man days of hired labor will be required. And sometimes, contract system will be applied in this works at the rate of 40 ks per acre.

(5) After intercultivation, usually a half bag of urea (28 lb) will be applied, if soil moisture condition is good.

(6) Harvesting will be made by hands day by day in accordance with the maturity of the corn-cobs. And it takes about 10 days. Reaped corn-obs will be carried to house by shoulders on the same day.

Accordingly, for this works, 10 man days of family labor will be required per acre.

As such, labor requirement/ acre for maize cultivation can be arranged as the following table.

Labor Requirements/acre for Maize Cultivation

	without project case		
	Family labor	Hired labor	Bullocks
1. Manuring	(1) -	-	1
2. 1st Plowing (1 time)	(2) -	-	2
3. " Harrowing (2 time)	(1) -	-	1
4. 2nd Plowing (1 time)	(2) -	-	2
5. " Harrowing (2 time)	(1) -	-	1
6. Drawing sowing holes by hand Sowing/bskt/ac. (34lb) Soil covering by foot	2	-(2)	-
7. Intercultivation by hoe (weeding cum ridging)	2	6	-
8. Urea application	1	-	-
9. Reaping cobs from the plants and carrying to house by shoulders	10	-	-
10. Total	(22)15	6+(2)	7

H. Farming Practices of Sunflower Cultivation
- in connection with inputs (labor&materials) requirement -

(1) Sunflower is a recently introduced crop, and the government is now making their effort to promote this cultivation for the purpose to secure food oil resources. But so far its cultivation is not so popular compaired with sesame and ground nuts. Accordingly, its cultivation is carried out in very samll scale in usual cases, although its farming practices look like rather intensive.

(2) First of all, land clearing will be made with harrow, for which 1 pair of bullocks will be required.

(3) As regards manuring, it is understood that a half of manure applied to before cultivated crops will be utilized to sunflower cultivation. And it is also understood that if its cultivation is carried out newly, at least 1 cart of manure will be required.

(4) Plowing will be made 3 times by 6 pairs of bullocks, and Harrowing (8 times) by 2 pairs of bullocks, and levelling (1 time) by a pair of bullocks.

(5) Drawing sowing line will be made by man-pulling harrow, for which 2 man days of family labor will be required per acre.

(6) Sowing and soil covering will be made by 2 man days of family labor and 6 man days of hired labor. In this case, 6 seeds will be sown in every inter section. And total seed requirement per acre is 4 viss. And fertilizering will be made at the rate of a half bag (28 lb) of urea at present.

(7) Intercultivation will be made 2 times with harrow by 2 pairs of bullocks. And 2nd intercultivation will be made 1 time with harrow by a pair of bullocks. By this operation, plants will duly stand on the ridges.

(8) After that thinning will be made by hand so that 2 plants might be in each pit. For this work, 12 man days of family labor will be required.

(9) And endlin application (2.7ounce/ac) will be usually made with shoulder type sprayer by 1 man day of family labor.

(10) Reaping will be made day by day in accordance with their maturity. For this work, it will take 10-13 days in accordance with yield per acre. And reaped plants will be carried to the compound by shoulder in every day to be spreaded for drying for 3 days.

(11) After drying, seed separation will be made usually by 26 children days of hired labor and 3 man days of family labor, including the works of collecting seeds and storing them.

(12) After irrigation project, not only watering but also more application of fertilizers and agricultural chemicals will be recommended. And in accordance with yield increase, harvesting labor requirement will increase to a large extent.

As such, labor requirement/acre for sunflower cultivation can be arraged as the following table.

Labor Requirement /ac. for Sunflower Cultivation

	without case			with case		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.day	Hired labor m.day	Bullocks pair
1. Clearing the field with plow (1 time)	(1) -	-	1	(1) -	-	1
2. Manuring (1 cart)	(1) -	-	1	(4) -	-	4
3. Plowing (3 times)	(6) -	-	6	(6) -	-	6
4. Harrowing (8 times)	(2) -	-	2	(2) -	-	2
5. Levelling (1 time)	(1) -	-	1	(1) -	-	1
6. Drawing Slowing line with man-pulling harrow	2	-	-	2	-	-
7. Seeding & soil covering	2	6	-	2	6	-
8. 1st fertilizering	1	-	-	1	-	-
9. 1st Intercultivation with harrow (2 times)	(2) -	-	2	(2) -	-	2
10. 2nd Intercultivation	(1) -	-	1	(1) -	-	1
11. Thinning by hand	12	-	-	12	-	-
12. Watering (3 times)	-	-	-	1	-(2)	-
13. 2nd fertilizering	-	-	-	1	-	-
14. Plant Protection	1	-	-	1	-	-
15. Harvesting						
Reaping & carrying	13	-	-	20	-	-
Separation of seeds Collecting & storing	3	26	-	4	40	-
16. Total	(48) 34	32	14	44	46+(2)	17

I. Farming Practices of Sugarcane Cultivation
- in connection with input(labor&materials) requirement -

(1) The project area is not sugar cane area. So, there is not any sugar mill in the area and its vecinity. Accordingly, sugar cane is cultivated mainly for the purpose of Jaggery production (more than 80% of the total production) and a small amount (less than 20% of the production) is forwarded to local markets for chewing purpose in the area.

(2) Therefore, their farming is still traditional. New planting is followed by 1 time ratooning. But fertilizers and agricultural chemicals are not usually applied. Even manure is not given. Instead, land preparation is carefully carried out. And Favorable seeding season is early October.

(3) After land clearing for which 1 man day of family labor will be required per acre, 4 times of land preparetion will be made. The 1st land preparation consists of 1 time plowing for which 1 pair of bullocks are required per acre, 4 times harrowing for which 2 pairs of bullocks are requied per acre, and 2 times levelling for which 1 pair of bullocks are required per acre. The 2nd land preparation consists of 1 time plowing, 2 times of harrowing and 2 times of levelling, for each of which a pair of bullocks are required per acre. The 3rd and the fourth land preparation consist of 1 time of plowing and 2 times of levelling respectively, for each operation of which a pair of bullocks are required per acre. So, 12 pairs of bullocks will be required per acre in total for land preparation.

(4) For seeding, firstly, drawing line for seeding will be made by plow. Next, Plowing with "Kywe gaung" (a kind of plow) will be made 2 times, by which ridges will be made. After that seed cane will be laid in the bottom of ridges in terms of whole cane, which will be cut in the length of about 2 feet each in the field,

so that each seed sett can have 2-3 nodes. After that soil covering will be made with hand plow. (Seed cane requirement per acre is 3 ton on an average.) For the above operation, 3 pairs of bullocks and 9 man days of hired labor will be required. And next day the 5th levelling will be made by 1 pair of bullocks to repress the seed sett in the soil.

(5) In the end of May, intercultivation cum weeding will be made by 2 pairs of bullocks per acre.

(6) November is harvest season. For reaping, usually hired labor will be employed. In this case, 1 person will be obliged to reap 1 ton of cane per 1 day. And for carting to Jaggery mill, 1 cart load is usually 0.5 ton.

As regards reaping and carting of sugar cane, therefore, their labor requirement will be increased in accordance with the yield in crease. This point should be taken into account in study on crop economy, because the yield of sugar cane is not only heavy but also bulky compaired with other crops.

(7) In case of ratooning, most of land preparation works and seeding works will be omitted with some exceptions that only the 1st harrowing (4 times), the 2nd harrowing (1 time) and the 4th levelling (2 times) will be made.

As such, labor requirement for sugar cane cultivation can be arranged as follows:

Labor Requirement for Sugarcane Cultivation/ac.

- without Project -

(Without case)	New planting			Ratooning		
	Family labor m.day	Hired labor m.day	Bullocks pair	Family labor m.day	Hired labor m.day	Bullocks pair
1. Land Preparation						
Clearing of the field	1	-	-	1	-	-
1st plowing (1 time)	(1)	-	1	-	-	-
" harrowing (4 times)	(2)	-	2	(2)	-	2
" Levelling (2 times)	(1)	-	1	-	-	-
2nd plowing (1 time)	(1)	-	1	-	-	-
" harrowing (2 times)	(1)	-	1	(1)	-	1
" levelling (2 times)	(1)	-	1	-	-	-
3rd plowing (1 time)	(1)	-	1	-	-	-
" levelling (2 times)	(1)	-	1	-	-	-
4th plowing (1 time)	(1)	-	1	-	-	-
" levelling (2 times)	(1)	-	1	(1)	-	1
2. Seeding						
Drawing seeding line with plow (3 times) Plowing with Kywe Gaurg (2 times) Seeding Soil covering with plow	(4)	- 9	4	-	-	-
5th levelling	(1)	-	1	-	-	-
3. Intercultivation cum weeding with plow	(2)	-	2	(2)	-	2
4. Harvesting	-	- 10	-	-	8	-
5. Carting to mill/house	(18)	-	20 cart	(12)	-	12 cart
Total	(39)	1 19	38	(19)	1 8	18

2. Farm Costs Calculation

In the above, the average labor requirements per acre per crop in both cases of without and with the project, and the average input materials per acre per crop in without project case have been clear. And as regards the recommended inputs requirements in case of with project, they were given by the Agronomist in Chapter IV-C. Therefore, farm costs of each crop can be calculated by applying the farm gate prices (which have been studied in Appendix 6B-1) to the above labor and input materials requirements.

In this case, however, it should be taken into consideration carefully that the proposed extent of farm mechanization is different between the pilot scheme area and irrigation project area. Accordingly, farm costs will be also different between the both area. As such, farm casts of each crop have been calculated carefully as follows:

a) Farm Costs of Paddy Cultivation

-(without case)-

Paddy w/o	Family Labour man day	Family Labour man day	Bullocks pair	cattle day	Seed bskt	Manure cart	Urea lb	TSP	KCL	Trap Light Ks.	Agr. Chemical	Land Tax Ks.	Total Ks.
L.V.(Qty)	14	16+(1)	13.5		1.5	5	28	-	-	2.75	-	2	
E.Cost	56Ks.	70Ks.	135Ks.		89.4Ks.	50Ks.	29.5Ks.	-	-	2.75	-	-	433
Cash cost	-	86Ks.	-		-	-	6 Ks.	-	-	2.75	-	2	97
H.Y.V.	14	20+(1)	15		-	6 (3ton)	56	-	-	2.75	-	2	
E. cost	56Ks.	97Ks.	150Ks.		89.4Ks.	60Ks.	59 Ks.	-	-	2.75	-	-	514
Cash cost	-	121Ks.	-		-	-	12	-	-	2.75	-	2	136

-(with case)-

					bskt	cart	lb	lb	lb	Ks.	Ks.		
L.V. Without mechanization													
Req. Qty.	16	19+(3)	15		1.5	8	84	56	14	2.75	66	6	
E. Cost	68Ks.	105Ks.	150Ks.		89.4	80	88.5Ks.	91.5	14.63	2.75	66	-	690
Cash cost	-	110Ks.	-		-	-	18	33.5	4.25	2.75	66	6	241
H.Y.V. without mechanization					bskt	cart	lb	lb	lb	Ks.	Ks.		
Req. Qty.	17	24+(6)	17		1.5	8	112	56	28	2.75	66	6	
E. cost	68Ks.	144Ks.	170Ks.		89.4	80	118Ks.	91.5	29.25	2.75	66	-	859
Cash cost	-	156Ks.	-		-	-	24	33.5	8.5	2.75	66	6	297

Paddy - (with project-with mechanization)

	Family Labour man day	Hired Labour man day	Bullocks pair cattle day	Farm Machinery Ks.	Seed bskt	Manure cart	Urea lb	TSP lb	KCL lb	Trap Light Ks.	Agr. Chemical Ks.	Land Tax Ks.	Total Ks.
Mechanized Paddy (L.V.) Cultivation in the Pilot Scheme Area													
Req. Qty.	18	19+(5)	6		1.5	8	112	56	28	2.75	66	6	
E. cost(Ks.)	72	82.5	60	107.6	89.4	80	118	91.5	29.25	2.75	66	-	805
Cash cost(Ks.)	-	76	-	104.3	-	-	24	33.5	8.5	2.75	66	6	321
Mechanized Paddy (L.V.) Cultivation in the Irrigation Project Area													
Req. Qty.	18	19+(5)	6		1.5	8	112	56	28	2.75	66	6	
E. cost(Ks.)	72	82.5	60	90.3	89.4	80	118	91.5	29.25	2.75	66	-	788
Cash cost(Ks.)	-	76	-	87.6	-	-	24	33.5	8.5	2.75	66	6	304.4
Mechznized Paddy (HYV) Cultivation in the Pilot Scheme Area													
Req. Qty.	22	14+(6)	8		1.5	8	112	56	28	2.75	66	6	
E. cost(Ks.)	88	82.5	80	173.9	89.4	80	118	91.5	29.25	2.75	66	-	901
Cash cost(Ks.)	-	76	-	148.4	-	-	24	33.5	8.5	2.75	66	6	365.2
Mechanized Paddy (HYV) Cultivation in the Irrigation Project Area													
Req. Qty.	21	24+(6)	8		1.5	8	112	56	28	2.75	66	6	
E. cost(Ks.)	84	144	80	90.3	89.4	80	118	91.5	29.25	2.75	66	-	881
Cash cost(Ks.)	-	156	-	87.6	-	-	24	33.5	8.5	2.75	66	6	384

b) Farm Costs of Groundnuts Cultivation

	Family Labour man day	Hired Labour man day	Bullocks pair cattle day	Farm Machinery	Seed bskt	Manure cart	Urea lb	TSP lb	KCL lb	Agr. Chemical ks.	Land Revenue Ks.	Total Ks.
Without project												
Qty.	10	49	22	-	6	8	28	-	-	-	1	
E. cost(Ks.)	40	149	220	-	282	80	29.5	-	-	-	-	801
Cash cost(Ks.)	-	193	-	-	-	-	6	-	-	-	1	200
With project (without mecharization)												
Qty.	16	69+(4)	25	-	6	8	28	28	-	77Ks.	2nd crop	
E. cost(Ks.)	64	226	250Ks.	-	282	80	29.5	45.75	-	77	-	1,054
Cash cost(Ks.)	-	273	-	-	-	-	6	16.75	-	77	-	373
With project (mechanized cultivation in the Pilot Scheme Area)												
Qty.	19	69+(4)	10		6	8	28	28	-	77	-	
E. cost(Ks.)	76	226	100	107.6	282	80	29.5	45.75	-	77	-	1,024
Cash cost(Ks.)	-	273	-	104.3	-	-	6.0	16.75	-	77	-	477
With project (mechanized cultivation in the Irrigation Project Area)												
Qty.	19	69+(4)	10		6	8	28	28	-	77	-	
E. cost(Ks.)	76	226	100	90.3	282	80	29.5	45.75	-	77	-	1,006
Cash cost(Ks.)	-	273	-	87.6	-	-	6.0	16.75	-	77	-	460

c) Farm Cost of Sesame Cultivation

	Family Labour man day	Hired Labour man day	Bullocks pair cattle day	Farm Machinery	Seed lb	Manure (0.5ton) cart	Urea lb	TSP lb	KCL lb	Agr. Chemical Ks.	Land Tax Ks.	Total Ks.
Without case												
Qty.	10	19	13	-	3.4	4	-	-	-	-	1	
E. cost(Ks.)	40Ks.	69.3	130Ks.	-	9.9	40	-	-	-	-	-	289
Cash cost(Ks.)	-	90	-	-	-	-	-	-	-	-	1	91
With project (without mecharization)											(2nd crop)	
Qty.	19	32+(6)	14	-	3.4	8	28	28	-	48	-	
E. cost(Ks.)	76	147.2	140	-	9.9	80	29.5	45.75	-	48	-	576
Cash cost(Ks.)	-	160	-	-	-	-	6	16.75	-	48	-	231
With project (mechanized cultivation in the Pilot Scheme Area)												
Qty.	22	32+(6)	4		3.4	8	28	28	-	48	-	
E. cost(Ks.)	88	147.2	40	107.6	9.9	80	29.5	45.75	-	48	-	449
Cash cost(Ks.)	-	160	-	104.3	-	-	6	16.75	-	48	-	335
With project (mechanized cultivation in the Irrigation Project Area)												
Req. Qty	22	32+(6)	4		3.4	8	28	28	-	48	-	
E. cost(Ks.)	88	147.2	40	90.3	9.9	80	29.5	45.75	-	48	-	431
Cash cost(Ks.)	-	160	-	87.6	-	-	6	16.75	-	48	-	318

	Family Labour man day	Hired Labour man day	Bullocks pair cattle day	Seed bskt	Manure cart	Urea lb	TSP	KCL	Agr. Chemical	Land Tax Ks.	Total Ks.
d) Farm Cost of Gram Cultivation											
Without case											
Qty.	5	2	11	1	1	-	-	-	-		
E. cost	20Ks.	15.4	110	64	10	-	-	-	-	-	219
Cash cost	-	20	-	-	-	-	-	-	-	-	21
With case			pair	bskt		lb			Ks.	2nd crop	
Qty.	12	10+(2)	8	1	-	28	28	-	68	-	
E. cost	48Ks.	55.7	80	64Ks.	-	29.5Ks.	45.75Ks.	-	68	-	391
Cash cost	-	62	-	-	-	6	16.75	-	68	-	153
e) Farm Cost of Maize Cultivation											
Without case				bskt	cart	lb				Ks.	
Qty.	15	6+(2)	7	1 (350cob)	4	28	-	-	-	2	
E. cost	60Ks.	31.1	70Ks.	35Ks.	40Ks.	29.5Ks.	-	-	-	-	266
Cash cost	-	30Ks.	-	-	-	6Ks.	-	-	-	2	38
f) Farm Costs of Sunflower Cultivation											
With case				viss							
Qty.	37	56+4	14	4	8	84	56	28	48	-	
E. cost	148Ks.	123.8Ks.	140Ks.	30Ks.	80Ks.	88.5Ks.	91.5Ks.	29.25Ks.	48	-	779
Cash cost	-	140	-	—	-	18	33.5	8.5	48	-	248
g) Farm costs of Waggi (S.S. cotton) Cultivation											
Without case				viss							
Qty.	9	65+6	8	15	-	-	-	-	-	2	
E. cost	36	174.15	80Ks.	15Ks.	-	-	-	-	-	-	305
Cash cost	-	193	-	-	-	-	-	-	-	2	197

	Family Labour man day	Hired Labour man day	Bullocks pair cattle day	Farm Machinery	Seed viss	Manure cart	Urea lb	TSP lb	KCL lb	Agr. Chemical Ks.	Land Tax Ks.	Total Ks.
h) Farm Cost of Long Staple Cotton Cultivation												
With case (mechanized in cultivation in the Pilot Area)												
Qty.	21	19+(4)	4		15	8	84	56	28	95	3	
E. cost(Ks.)	84	63.74	40Ks.	118.4	15Ks.	80Ks.	88.5	91.5	29.25	95	-	705
Cash cost(ks.)	-	62	-	114.8	15	-	18Ks.	33.5	8.5	95	3	380
With case (mechanized cultivation in the Irrigation Project Area)												
Qty.	21	19+(4)	4		15	8	84	56	28	95	3	
E. cost(Ks.)	84	63.74	40	101.1	15	80	88.5	91.5	29.25	95	-	688
Cash cost(Ks.)	-	62	-	98.1	15	-	18	33.5	8.5	95	3	333
i) Farm Costs of Sugarcane Cultivation												
Without case (new planning)					ton	cart	lb				Ks.	
Qty.	1	19	38		(3)	2	28	-	-	-	4	
E. cost(Ks.)	4	98.4	380		*	20Ks.	29.5	-	-	-	-	532
Cash cost(Ks.)	-	127	-		-	-	6Ks.	-	-	-	4	137
Without case (Ratooning)						cart	lb					
Qty.	1	8	18		-	2	28	-	-	-	4	
E. cost(Ks.)	4Ks.	61.6Ks.	180		-	20Ks.	29.5Ks.	-	-	-	-	295
Cash cost(Ks.)	-	80	-		-	-	6	-	-	-	4	90

6B-3 Study on Crop Economy

- NPV/acre/crop and Farm Income/acre/crop -

On the other hand, present yields, target yields and its build up periods were given by the Agronomist by each crop concerned, as seen in 3-D-Chapter III & 4-C-Chapter IV. So, crop economy of each crop concerned can be calculated. But farm costs of farm mechanized cultivation are different between the pilot scheme area and the other project area as seen in the previous para, although present yields, target yields and its build up periods are assumed to be equal in both areas. Therefore the calculation of crop economy should be made respectively for both areas as follows:

A. In case of the Pilot Scheme Area

a) Crop Economy of Paddy Cultivation (Ks/ac)

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NVP (1)-(3)	Farm Income (2)-(4)
Without case						
L.V.	2,384	365	433	97	1,951	268
H.Y.V.	-	-	-	-	-	-
With case of L.V. (without mechanization)						
1st yr.	2,890	456	690	241	2,290	215
2nd yr.	3,278	502	690	241	2,588	261
3rd yr.	3,576	547	690	241	2,886	306
With case of L.V. (with mechanization)						
1st yr.	2,890	456	805	321	2,175	135
2nd yr.	3,278	502	805	321	2,473	181
3rd yr.	3,576	547	805	321	2,771	226
With case of H.Y.V. (without mechaniation)						
1st yr.	4,172	638	859	297	3,313	341
2nd yr.	4,470	684	859	297	3,611	387
3rd yr.	4,768	730	859	297	3,909	433
4th yr.	5,364	821	859	297	4,505	524
5th yr.	5,960	912	859	297	5,101	615

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NPV (1)-(3)	Farm Income (2)-(4)
b) Crop Economy of Groundnuts Cultivation (Ks/ac)						
Without case						
monsoon	940	940	801	200	139	740
winter	1,410	1,410	801	200	609	1,210
With case of monsoon crop (with mechanization)						
1st yr.	1,410	1,410	1,024	477	386	933
2nd yr.	1,645	1,645	1,024	477	621	1,168
3rd yr.	1,880	1,880	1,024	477	856	1,403
With case of winter crop (with mechanization						
1st yr.	1,880	1,880	1,024	477	856	1,403
2nd yr.	2,115	2,115	1,024	477	1,091	1,638
3rd yr.	2,350	2,350	1,024	477	1,326	1,873
c) Crop Economy of Sesame Cultivation (Ks/ac)						
Without case						
monsoon	-	-	-	-	-	-
winter	555	555	289	91	266	464
With case of winter crop (without mechanization)						
1st yr.	951	951	576	231	375	720
2nd yr.	1,110	1,110	576	231	534	879
3rd yr.	1,268	1,268	576	231	692	1,037
4th yr.	1,427	1,427	576	231	851	1,196
5th yr.	1,585	1,585	576	231	1,089	1,354
With case of winter crop (with mechanization)						
1st yr.	951	951	449	335	502	616
2nd yr.	1,110	1,110	449	335	661	775
3rd yr.	1,268	1,268	449	335	819	933
4th yr.	1,427	1,427	449	335	978	1,092
5th yr.	1,585	1,585	449	335	1,136	1,250

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NPV (1)-(3)	Farm Income (2)-(4)
d) Crop Economy of Gram Cultivation (Ks/ac)						
Without case	512	512	219	21	293	491
With case (without mechanization)						
1st yr.	640	640	391	153	249	487
2nd yr.	704	704	391	153	313	551
3rd yr.	768	768	391	153	377	615
4th yr.	832	832	391	153	441	679
5th yr.	960	960	391	153	569	807
e) Crop Economy of Sunflower Cultivation (Ks/ac)						
With case (without mechanization)						
1st yr.	1,008	1,008	779	248	209	760
2nd yr.	1,134	1,134	779	248	335	886
3rd yr.	1,260	1,260	779	248	461	1,012
4th yr.	1,386	1,386	779	248	607	1,138
5th yr.	1,575	1,575	779	248	796	1,327
f) Crop Economy of L.S. Cotton Cultivation (Ks/ac)						
With case (with mechanization)						
1st yr.	792	816	705	380	87	436
2nd yr.	1,056	1,088	705	380	351	708
3rd yr.	1,320	1,360	705	380	615	980
4th yr.	1,584	1,632	705	380	879	1,252
5th yr.	1,980	2,040	705	380	1,275	1,660

B. In case of the Irrigation Project Area

a) Crop Economy of Paddy Cultivation (Kc/ac)

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash costs (4)	NPV (1)-(3)	Farm Income (2)-(4)
Without case						
L.V.	2,384	365	433	97	1,951	268
H.Y.V.	3,576	547	514	136	3,062	411
With case of L.V. (without mechanization)						
1st yr.	2,980	456	690	241	2,290	215
2nd yr.	3,278	502	690	241	2,588	261
3rd yr.	3,576	547	690	241	2,886	306
With case of L.V. (with mechanization)						
1st yr.	2,980	456	780	304	2,200	152
2nd yr.	3,278	502	780	304	2,498	198
3rd yr.	3,576	547	780	304	2,796	243
With case of H.Y.V. (without mechanization)						
1st yr.	4,172	638	859	297	3,313	341
2nd yr.	4,470	684	859	297	3,611	387
3rd yr.	4,768	730	859	297	3,909	433
4th yr.	5,364	821	859	297	4,505	524
5th yr.	5,960	912	859	297	5,101	615
With case of H.Y.V. (with mechanization)						
1st yr.	4,172	638	881	384	3,291	254
2nd yr.	4,470	684	881	384	3,589	300
3rd yr.	4,768	730	881	384	3,887	346
4th yr.	5,364	821	881	384	4,483	437
5th yr.	5,960	912	881	384	5,079	528

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NPV (1)-(3)	Farm Income (2)-(4)
b) Crop Economy of Groundnuts Cultivation (Ks/ac)						
Without case						
monsoon	940	940	801	200	139	740
winter	1,410	1,410	801	200	609	1,210
With case of monsoon crop (without mechanization)						
1st yr.	1,410	1,410	1,054	373	356	1,037
2nd yr.	1,645	1,645	1,054	373	591	1,272
3nd yr.	1,880	1,880	1,054	373	826	1,507
With case of monsoon crop (with mechanization)						
1st yr.	1,410	1,410	1,006	460	404	950
2nd yr.	1,645	1,645	,006	460	639	1,185
3rd yr.	1,880	1,880	1,006	460	874	1,420
With case of winter crop (without mechanization)						
1st yr.	1,880	1,880	1,054	373	826	1,507
2nd yr.	2,115	2,115	1,054	373	1,061	1,742
3rd yr.	2,350	2,350	1,054	373	1,296	1,977
With case of winter crop (with mechanization)						
1st yr.	1,880	1,880	1,006	460	874	1,420
2nd yr.	2,115	2,115	1,006	460	1,109	1,655
3rd yr.	2,350	2,350	1,006	460	1,344	1,890
c) Crop Economy of Sesame Cultivation (Ks/ac)						
Without case						
monsoon	713	713	289	91	429	622
winter	555	555	289	91	266	464

	Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NPV (1)-(3)	Farm Income (2)-(4)
With case of winter crop (without mechanization)						
1st yr.	951	951	576	231	375	720
2nd yr.	1,110	1,110	576	231	534	879
3nd yr.	1,268	1,268	576	231	692	1,037
4th yr.	1,427	1,427	576	231	851	1,196
5th yr.	1,585	1,585	576	231	1,009	1,354
With case of winter crop (with mechanization)						
1st yr.	951	951	431	318	520	633
2nd yr.	1,110	1,110	431	318	679	792
3rd yr.	1,268	1,268	431	318	837	950
4th yr.	1,427	1,427	431	318	996	1,109
5th yr.	1,585	1,585	431	318	1,154	1,267

d) Crop Economy of Gram Cultivation (Ks/ac)

the same as the case of the pilot scheme area.

e) Crop Economy of Sunflower Cultivation (Ks/ac)

the same as the case of the pilot scheme area

f) Crop Economy of L.S. Cotton Cultivation (Ks/ac)

With case (with mechanization)						
1st yr.	792	816	688	333	104	483
2nd yr.	1,056	1,088	688	333	368	755
3rd yr.	1,320	1,360	688	333	632	1,027
4th yr.	1,584	1,632	688	333	896	1,299
5th yr.	1,980	2,040	688	333	1,292	1,707

g) Crop Economy of Waggi Cultivation (Ks/ac)

Without case						
	328	305	305	197	23	131

Economic GPV (1)	Financial GPV (2)	Economic Farm Costs (3)	Financial Cash Costs (4)	NPV (1)-(3)	Farm Income (2)-(4)

h) Crop Economy of Sugarcane Cultivation (Ks/ac)

Without case

1,625*	1,625*	1,194**	894**	431	731

* GPV/ac of Sugarcane consists of GPV/0.5ac of new planting and GPV/0.5ac of ratooning.

** These costs includes not only farm costs but also processing cost to Jaggery, because GPV is evaluated in terms of Jaggery.

i) Crop Economy of Maize Cultivation (Ks/ac)

Without case

875	875	266	38	609	837

6B-4 Study on Project Economic Benefits

(1) General

This project includes not only irrigation project but also hydro-power project. So, the project benefits also consist of agricultural benefits and hydro-power benefits. And agricultural benefits are given as the difference of the total NPV (net production value) in the project area between with the project and without the project, and hrdro-power benefits are given as the value of hydro-power generated by the alternative project (i.e. gas turbine generation). And, actual benefits will be accrued in accordance with the construction schedule.

(2) Agricultural Benefits

a) In this project, the Pilot Scheme Area will be developed as the first stage of the project, using the different water resource from the proposed dams, which will be the water resources for the irrigation project area. And the construction works of this pilot scheme area will be completed prior to the completion of the construction works for the irrigation project area. So, agricultural benefits from the pilot scheme area and agricultural benefits from the irrigation project area should be examined respectively.

In this case, needless to say that this pilot scheme will give effects not only on the proposed project area, but also on all over the country to promote modern farming. But this scheme has been originally planned as the first stage of the project for the purpose of promotion of the proposed irrigation project. Therefore, its benefitss will be conservatively confined to its agricultural benefits in this study.

b) Agricultural Benefits in the pilot scheme area

	Total NPV without case		
	Cropping Area ac	NPV/ac Ks	Total NPV '000Ks
Paddy (L.V.)	3,100	1,951	6,048.1
Groundnuts (monsoon)	250	139	34.7
" (winter)	100	609	60.9
Sesame (winter)	100	266	26.6
Gram	50	293	14.6
Total	2,600	-	6,161

	Annual Agricultural Benefits ('000 Ks)		
	Total NPV (with)*	Total NPV (without)	Agr. Benefits
1st yr.	10,168	6,161	4,007
2nd yr.	11,534	6,161	5,373
3rd yr.	12,896	6,161	6,735
4th yr.	14,474	6,161	8,313
5th yr.	16,015	6,161	9,854

* Note: Details will be shown in the next page.

After complition of the construction	Cropping area ac	Total NPV with case: Total NPV ('000 Ks) 1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
Paddy (L.V.)	700	1,603.0	1,811.6	2,020.2	2,020.2	2,020.2
(L.V. mechanized)	300	652.5	741.9	831.3	831.3	831.3
Paddy (H.Y.V.)	500	1,656.5	1,805.5	1,954.5	2,252.5	2,550.5
(H.Y.V. mechanized)	1,500	2,906.5	5,353.5	5,800.5	6,694.5	7,588.5
G'nuts (monsoon, mechanized)	100	38/6	62.1	85.6	85.6	85.6
(winter, mechanized)	500	428.0	545.5	663.0	663.0	663.0
Sesame (winter)	400	150.0	213.6	276.8	340.4	403.6
(winter, mechanized)	1,000	502.0	661.0	819.0	978.0	1,136.0
Gram	650	159.9	203.5	245.1	286.7	369.9
L.S. Cotton (mechanized)	100	8.7	35.1	61.5	87.9	127.5
Sunflower	300	62.7	100.5	138.3	233.7	238.8
Total	6,050	10,168	11,534	12,896	14,474	16,015

c) Agricultural benefits in the Irrigation Project Area

	Total NPV without case		
	Cropping Area ac	NPV/ac Ks	Total NPV '000Ks
Paddy (L.V.)	53,500	1,951	104,378.5
Paddy (H.Y V.)	500	3,062	1,531.0
G'nuts (monsoon)	1,000	139	139.0
G'nuts (winter)	1,500	609	304.5
Sesame (monsoon)	2,000	429	858.0
Sesame (winter)	2,000	266	532.0
Gram	2,000	293	586.0
Maize	1,300	609	791.7
Wagyi (S.S. cotton)	1,000	23	23.0
Sugar cane	1,000	431	431.0
Total	65,800	-	109,575

	Actual Annual Agricultural Benefits ('000 Ks)		
	Total NPV (with)*	Total NPV (without)	Agr. Benefits
1st yr.	182,316	109,575	72,741
2nd yr.	208,550	109,575	98,975
3rd yr.	234,761	109,575	125,186
4th yr.	262,291	109,575	152,716
5th yr.	291,550	109,575	181,975

* Note: Details will be shown in the next page.

After completion of the construction	Cropping area ac	Total NPV with case: Total NPV ('000 Ks) 1st yr.	2nd yr.	3rd yr.	4th yr.	5th yr.
Paddy (L.V.)	13,000	29,770	33,644	37,518	37,518	37,518
(L.V. mechanized)	5,000	11,000	12,490	13,980	13,980	13,980
Paddy (H.Y.V.)	20,000	66,260	72,220	78,180	90,100	102,020
(H.Y.V. mechanized)	15,000	49,365	53,835	58,305	67,245	76,185
G'nuts (monsoon)	1,300	463	768	1,074	1,074	1,074
(monsoon, mechanized)	5,000	2,020	3,195	4,370	4,370	4,370
G'nuts (winter)	5,000	4,130	5,305	6,480	6,480	6,480
(winter, mechanized)	5,000	4,370	5,545	6m720	6,720	6,720
Sesame (winter)	14,000	5,250	7,476	9,688	11,914	14,126
(winter, mechanized)	10,000	5,200	6,790	8,370	9,960	11,540
Gram	13,000	3,237	4,901	4,901	5,733	7,397
L.S. Cotton	6,000	624	2,208	3,792	5,376	7,752
Sunflower	3,000	627	1,005	1,383	1,821	2,388
Total	115,300	182,316	208,550	234,761	262,291	291,550

d) According to the construction schedule, construction works of the pilot scheme area will be completed in the end of the 3rd Project Year, and other irrigation construction works will be completed in the end of the 8th Project Year. Accordingly, the actual agricultural benefits will be accrued from the 4th project year in the pilot scheme area, and from the 9th Project Year in the irrigation project area as follows:

Actual Annual Agricultural Benefits ('000 Ks)

Project Year	Pilot Scheme Area	Irrigation Project Area	Total Agricultural Benefits
1	-	-	-
2	-	-	-
3	-	-	-
4	4,007	-	4,007
5	5,373	-	5,373
6	8,313	-	6,735
7	9,854	-	8,313
8	9,854	-	9,854
9	9,854	72,741	82,595
10	9,854	98,975	108,829
11	9,854	125,186	135,034
12	9,854	152,716	162,570
13	9,854	181,975	191,829

(3) On the other hand, annual hydro-power benefits has been worked out by the power expert as follows, which will be accrued from the 9th project year in accordance with the construction schedule.

- Fixed Benefit.....$1{,}890^{kw} \times 62.50^{\$}$.....$118{,}125^{\$/year}$
- Variable Benefit..$11{,}090{,}000^{kwh} \times 0.95 \times 0.0668^{\$}$..$703{,}771^{\$/year}$

Total Benefit/year.....$821{,}896^{\$/year}$

(1$ = 13Ks) $= 10{,}684{,}648$ ks/year

Details will be shown below:

Benefit analysis of power generation

The power generation benefit analysis was made on the assumption that a gas turbine power station with capacity to generate the power equivalent to the average firm peak by the proposed bydropower station would be provided in the center of the service area and the said construction cost would be estimated at the amount equivalent to the benefit anticipated from this power development plan.

The construction cost of a gas turbine power station with about 2,000 KW range was estimated at $455/KW, and the annual fixed cost was computed for 35-year service life according to the following data -- 12 percent of interest and depresiation cost, 0.58 percent of amortization, 0.4 percent of replacement cost, 0.5 percent of insurance, 0,1323 percent of capital recovery factor and $5.0/KW/year for administration cost. Hence, the fixed cost was estimated at $65.20/KW/year.

On the other hand, the variable cost was estimated as follows; this gas turbine p/s, being of small type, would adopt the oil combustion method, and the necessary oil cost was estimated at $0,0568/KWH according to the data on 284.0 Barrels/10^6KWH obtained from 19,000 B.T.V./Lb of heating value of oil and about 6,690 of fuel economy B.T.V. per KWH. And intaking expected oil cost by $20/Barrel, the necessary cost of oil was estimated at $0.0568/KWH.

Finally, this cost of $0.0568/KWH was added to the cost of operation and maintenance by $0.01/KWH to obtain the variable cost of $0.0668/KWH.

Further more, the estimation of the sales power cost was made as follows in taking the average firm peak by 1,890 KW, the average annual generation by 11,090 KWH inthis power plan, and lossed by five percent in gas turbine p/s.

- Fixed Benefit	1,890 x 62.50	118,125	$/year
- Variable Benefit	11,090,000 x 0.95 x 0.0668 =	703,771	$/year
Total		821,896	$/year

(4) As such, the over all project benefits can be calculated as follows:

('000 Ks)

Project Year	Agricultural Benefits	Hydro-power Benefits	Over all Project Benefits
1	-	-	-
2	-	-	-
3	-	-	-
4	4,007	-	4,007
5	5,373	-	5,373
6	6,735	-	6,735
7	8,313	-	8,313
8	9,854	-	9,854
9	82,595	10,685	93,854
10	108,829	10,685	119,514
11	135,034	10.685	145,719
12	162,570	10.685	173,255
13	191,829	10.685	202,514
⋮	⋮	⋮	⋮
43	191,829	10,685	202,514
44	191,829	-	191,829
⋮	⋮	⋮	⋮
50	191,829	-	191,829
Total	7,812,812	373,975	8,186,787

(5) Present Worth Value of the Project Benefits

In the economic analysis, the above project benefits should be converted to the present worth value to compare with the project costs. And its present worth value can be gotten by using various discount factors as follows:

Present Worth Value of the Project Benefits ('000 Ks)
(discounted by various discount factors)

Project Year	Discount Factors							
	0%	3%	5%	8%	10%	12%	15%	18%
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	4,007	3,560	3,297	2,945	2,737	2,546	2,291	2,067
5	5,373	4,635	4,210	3,657	3,336	3,049	2,671	2,349
6	6,735	5,641	5,026	4,244	3,802	3,412	2,912	2,495
7	8,313	6,759	5,908	24,851	4,266	3,761	3,125	2,609
8	9,854	7,779	6,669	5,324	4,597	3,980	3,221	2,621
9	93,280	71,490	60,128	46,668	39,560	33,637	26,520	21,035
10	119,514	88,930	73,370	55,359	46,073	38,484	29,544	22,839
11	145,719	105,267	85,202	62,499	51,075	41,894	31,315	23,592
12	173,255	121,521	96,468	68,800	55,199	44,475	32,381	23,771
13	202,514							
:	:	}2,840,952	1,758,263	912,740	611,601	420,302	249,018	153,448
43	202,514							
44	191,829							
:	:	} 335,360	125,097	36,454	15,503	6,654	1,995	585
50	191,829							
Total	8,186,787	3,591,894	2,223,638	1,203,541	837,749	602,184	384,993	257,411

Present Worth Value of the Project Benefits (for sensitivity test)
In case of 2 years delay in construction works

Project Year	Discount Factors							
	0%	3%	5%	8%	10%	12%	15%	18%
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
6	4,007	3,356	2,990	2,525	2,262	2,030	1,732	1,484
7	5,373	4,369	3,819	3,135	2,757	2,431	2,020	1,687
8	6,735	5,317	4,558	3,639	3,142	2,720	2,202	1,792
9	8,313	6,371	5,359	4,159	3,526	2,998	2,363	1,875
10	9,854	7,332	6,049	4,563	3,799	3,272	2,436	1,883
11	93,280	67,385	54,541	40,008	32,695	26,818	20,046	15,102
12	119,514	83,827	66,545	47,459	38,077	30,679	22,377	16,397
13	145,514	99,235	77,275	53,581	42,215	33,399	23,679	16,947
14	173,255	114,539	87,511	58,993	45,618	35,448	24,481	17,083
15	202,514							
:	:	}2,677,720	1,595,005	782,645	505,444	334,997	188,262	110,277
45	202,514							
46	191,829							
:	:	} 232,280	92,973	23,973	9,831	3,554	1,222	360
50	191,829							
Total	7,802,924	3,301,731	1,996,625	1,024,680	689,366	478,346	290,820	184,887

6B-5 Study on Project Economic Costs

a) General

Needless to say that in economic analysis of the project taxes should not be included in the costs, and subsidies should be included and foreign components should be evaluated by shadow foreign exchange rate in economic analysis, (see Appendix 6B-1-D) whereas in financial analysis taxes should be included, subsidies should not be included, and current foreign exchange rate should be applied.

In irrigation project, financial costs will cover up to water course construction, but in order to make expected effects, farmers should arrange their own fields for irrigation farming by their own expense, i.e. field ditches should be made by themselves, field levelling also should be made, if necessary. Although, such costs are not included in financial costs, they should be included in economic costs.

On the other hand, price contingency (or price escalation) portion should be excluded in economic costs, whereas it should be included in financial costs.

As regards wage rate of unskilled labour, any adjustment has not been done, because the government wage rate can be regarded as the opportunity cost of labour in this country as seen in Appendix 6B-1-C.

Regarding the treatment of farm mechanization, there can be two ways in the economic analysis. In the first way, its costs will be treated as the project costs, but in the other way, will be treated as the farm costs. Any way, double accounting should be avoided. And in this study, the latter way has been applied.

b) Annual Economic Costs

After such adjustments, the economic costs of the project have been broken down annually as follows:

(1) Annual Irrigation Project Costs ('000 Ks)

(i) Pilot Scheme Area

Project year	Initial Investment costs	O&M costs		Total
		Recurrent cost	Replacement cost	
1	14,293	-	-	14,293
2	26,167	-	-	26,167
3	28,585	-	-	28,585
4	-	577	-	577
5	-	577	-	577
⋮	⋮	⋮	⋮	⋮
29		577	3,980	4,557
30		577	-	577
⋮	⋮	⋮	⋮	⋮
50	-	577	-	577

(ii) Irrigation Project Area

	-	-	-	-
⋮	-	-	-	-
3	131,515	-	-	131,515
4	228,989	-	-	228,989
5	51,885	-	-	51,885
6	60,226	-	-	60,226
7	55,555	-	-	55,555
8	33,354	-	-	33,354
9	-	4,307	-	4,307
⋮	⋮	4,307	-	4,307
⋮	⋮	⋮	⋮	⋮
50	-	4,307	-	4,307

(2) Annual Hydro-Power Project Costs ('000 Ks)

Project year	Initial Investment Costs	Operation & Maintenance Costs [1/]	Total
:	-	-	-
:	-	-	-
:	-	-	-
:	-	-	-
:	-	-	-
6	69,450	-	69,450
7	75,084	-	75,084
8	52,882	-	52,882
9	-	832	832
10	-	832	832
:	:	:	:
:	:	:	:
43	-	832	832

Note: 1/ In case of this hydro-power project, replacement cost will be actually required every 5 years, but this cost has been included in the annual O&M cost as the depreciation cost.

(3) Over-all Project Costs ('000 Ks)

Project year	Irrigation Project		Hydro-power Project	Total
	Pilot Area	Irrig.Proj.area		
1	14,293	-	-	14,293
2	26,167	-	-	26,167
3	28,585	131,513	-	160,100
4	577	228,989	-	229,566
5	577	51,885	-	52,462
6	577	60,226	69,450	130,253
7	577	55,555	75,084	131,216
8	577	33,354	52,882	86,813
9	577	4,307	832	5,716
10	577	4,307	832	5,716
:	:	:	:	:
29	4,557	4,307	832	9,696
30	577	4,307	832	5,716
:	:	:	:	:
43	577	4,307	832	5,716
44	577	4,307	-	4,884
:	:	:	-	:
50	577	4,307	-	4,884

c) Present Worth Value of the Project Costs ('000 Ks)

In order to compare the above project costs with the benefits, their present worth value should be calculated. These works have been done as follows:

Project year	Various discount factors							
	0%	3%	5%	8%	10%	12%	15%	18%
1	14,293	13,877	13,613	13,234	12,994	12,762	12,429	12,113
2	26,167	24,665	23,733	22,433	21,624	20,860	19,785	18,993
3	160,100	146,508	138,294	127,087	120,283	113,959	105,266	97,437
4	229,566	203,969	188,864	168,731	156,794	145,889	131,266	118,410
5	52,462	45,254	41,104	35,706	32,574	29,767	26,084	22,931
6	130,253	109,087	97,195	82,085	73,528	65,986	56,308	48,246
7	131,253	106,692	93,255	76,565	67,340	59,362	49,324	41,189
8	86,813	68,530	58,755	46,905	40,498	35,064	28,379	23,092
9	5,716							
:	:							
29	9,696							
30	5,716	}98,645	64,313	36,421	25,966	19,010	12,433	8,457
:	:							
43	:							
44	4,884							
:	:	} 8,538	3,468	928	395	169	51	15
50	4,884							
Total	1,069,098	825,765	722,594	610,095	551,996	502,828	441,325	390,683

d) Present Worth Value of the Project Costs (for sensitivity test)
in case of 2 years delay in construction works ('000 Ks)

Project year	Pilot Area	Other Area	Power Project	Total	Discount Factors 3%	5%	8%	10%	12%	15%	18%
1	14,293			14,293	13,877	13,613	13,234	12,994	12,762	12,429	12,113
2	13,084			13,084	12,333	11,867	11,217	10,943	10,431	9,893	9,297
3	13,083	131,245		144,328	132,075	124,671	114,568	108,434	102,733	94,896	87,838
4	14,293	227,909		242,202	215,196	199,260	178,018	154,525	153,919	138,491	124,928
5	14,292	50,805		65,097	56,153	51,003	44,305	40,419	36,936	32,366	28,454
6	577	59,146	39,483	99,206	83,085	74,028	62,520	56,002	50,258	42,887	36,746
7	577	54,475	39,483	94,535	76,866	67,186	55,161	48,515	42,768	35,536	29,675
8	577	32,274	39,483	72,334	57,100	48,956	39,082	33,744	29,216	23,646	19,241
9	577	2,712	39,482	42,772	32,780	27,571	21,399	18,140	15,424	12,160	9,645
10	577	2,712	39,483	42,773	31,827	26,258	19,812	16,489	13,773	10,573	8,174
11	577	2,712	832	5,716							
⋮	⋮	⋮	⋮	⋮							
31	⋮	8,287	⋮	9,696							
32	⋮	4,307	⋮	5,716	} 92,984	58,336	30,857	21,458	15,166	9,401	6,073
⋮	⋮	⋮	⋮	⋮							
45	⋮	⋮	⋮	5,716							
46	⋮	⋮	⋮	4,884							
⋮	⋮	⋮	⋮	⋮	} 5,914	2,353	610	254	107	31	9
50	577	4,307	832	4,884							
Total				1,059,084	810,190	705,102	589,783	521,917	483,493	422,309	372,293

6B-6 Farm Budget Analysis

(1) Selection of the Representative Farmer

In farm budget analysis, what kind of farmer should be selected ? --- It is one of the main points. As seen in 3 (Farming Status) -- D (Present Agriculture)-- Chapter III (the Project Area), it is estimated that the average size of farm land holding of farmers is about 5 acres per farmers' household in the area. So, it may be reasonable to take up a 5 acres' farmer as the representative farmer in the farm budget analysis.

Moreover, if this representative farmer should represent the representative farm budget status in the project area, the proportion of paddy field and upland feild in his land holding and his cropping pattern also should be assumed at the same ratio as those of the project area.

According to the Agronomist, cropping pattern is a little different between the pilot scheme area and the irrigation project area. But it may be reasonable to take up this representative farmer from the irrigation project area, because the pilot scheme area is a special case. If assumed as the above, his farm size and his cropping pattern can be assumed as follows:

Note: In the following table, his farm land of 5 acres in the case of without project becomes to 4.82 acres in the case of with project, because it is understood that some portion will be used for the purpose of irrigation canal and farm road. And this ratio is also assumed at the same as that of the proposed project.

Farm Size and Cropping Pattern of the Representative Farmer

	Without case	With case
Farm Size	5 acres	4.82 acres
Cropping Intensity	107.0	194.4
Total Cropping Area	5.35	9.37
Paddy (L.V.) - non-mechanized	4.35	1.06
" - mechanized	-	0.40
Paddy (L.V.) - non-mechanized	0.04	1.63
" - mechanized	-	1.22
G'nuts (monsoon) - non-mechanized	0.08	0.10
" - mechanized	-	0.40
G'nuts (winter) - non-mechanized	0.13	0.40
" - mechanized	-	0.40
Sesame (monsoon)	0.16	-
Sesame (winter) - non-mechanized	0.16	1.14
" - mechanized	-	0.82
Gram	0.16	1.06
Maize	0.11	-
Wagyi	0.08	-
L.S. Cotton (mechanized)	-	0.50
Sunflower	-	0.24
Sugar cane	0.08	-

(2) Calculation of his Farm Income

Based on the above cropping pattern, his farm income can be calculated by using "farm income/acre" studied in "Crop Economy, Appendix 6B-3" as follows:

Without Project Case

	Cropping Acreage ac	Farm Income/ac Ks	Farm Income Ks.
Paddy (L.V.) - non-mechanized	4.35	268	1,165.8
(H.Y.V.) - non-mechanized	0.04	411	16.4
G'nuts (monsoon) - non-mechanized	0.08	740	59.2
(winter) - non mechanized	0.13	1,210	157.3
Sesame (monsoon)	0.16	622	99.5
(winter) - non-mechanized	0.16	464	74.2
Gram	0.16	491	78.6
Maize	0.11	837	92.1
Wagyi (S.S. Cotton)	0.08	131	10.5
Sugar cane	0.08	131	58.5
Total	5.35	-	1,812.1
			= 1,812 Ks

With the Project Case

	Cropping Acreage ac	Farm Income/ac Ks	Farm Income Ks
Paddy (L.V.) - non-mechanized	1,06	306	324.4
" - mechanized	0.40	243	97.2
Paddy (H.Y.V.) - non-mechanized	1.63	615	1,002.5
" - mechanized	1.22	528	644.2
G'nuts (monsoon) - non-mechanized	0.10	1,507	150.7
" - mechanized	0.40	1,420	568.0
G'nuts (winter) - non-mechanized	0.40	1,977	790.8
" - mechanized	0.40	1,890	756.0
Sesame (winter) - non-mechanized	1.14	1,354	1,543.6
" - mechanized	0.82	1,267	1,038.9
Gram	1.06	807	355.4
L.S. Cotton (mechanized)	0.50	1,707	853.5
Sunflower	0.24	1,327	318.5
			8,943.7
			= 8,944 Ks

(3) Estimation of Farmers' Living Standard

In interview surveys to with farmers, it was very difficult to approach to the realities of their living costs, because it seemed that their answers sometimes exaggerated their poverty and at the same time they emphasized their good appearance. Through the interview surveys, however, some tendencies have been derived in light. Speaking in the short run, most farmers in the project area are living on the subsistence level. Their living can be roughly classified into the following four classes:

Examples of Farmers' Living Costs

	Class I	Class II	Class III	Class IV
Family size	6	6	6	6
Rice	800 Ks	800 Ks	800 Ks	800 Ks
Other foods	4,800	3,000	1,800	1,000
Colthing	200	150	100	50
Housing	300	200	100	80
Light & Fuels	250	200	150	100
Others	1,000	700	300	100
Total	6,550	5,050	3,050	2,130

Class I farmers can be found only in the case of a few big size farmers. And the living standards of most farmers in the area belong mainly to Class III and Class IV, which are surely subsistence level.

According to the farm income analysis of the representative farmer in the area, his farm income shows only Ks.1,800. Therefore, he can not escape even from Class IV living standard, unless he can get any other off-farm incomes more than 300 Ks.

After completion of the project, however, the farm income of the representative farmer will become Ks. 8,944. It means that he can save come surplus from his farm income after he could enfoy

Class I living standard without any off-farm income.

(4) *Conclusion*

Through the avove farm budget analysis, it is quite clear that the proposed irrigation project is feasible from the viewpoint of individual beneficial farmer's economy.

CHAPTER VII. OTHER STUDIES

Table 7-1 WATER REQUIREMENT ON PUMP IRRIGATION AREA

		JAN			FEB			MAR			APR		
		1	2	3	4	5	6	7	8	9	10	11	12
DAYINDABO P.I.P. 7700AC (3117HA)													
W.R.	1000 M**3	838	934	1087	1045	997	794	935	1234	1316	1310	1400	1289
DISCHARGE	M**3/SEC	0.97	1.09	1.26	1.21	1.16	0.92	1.09	1.43	1.53	1.52	1.63	1.50
PUMP OPERATION	HR	205	229	266	256	244	194	229	302	322	321	343	315
NATHMAW P.I.P. 7900AC (3198HA)													
W.R.	1000 M**3	859	958	1115	1072	1023	814	960	1266	1350	1344	1436	1322
DISCHARGE	M**3/SEC	1.00	1.11	1.30	1.25	1.19	0.95	1.12	1.47	1.57	1.56	1.67	1.54
PUMP OPERATION	HR	205	228	265	255	244	194	229	301	321	320	342	315

		MAY			JUN			JUL			AUG		
		13	14	15	16	17	18	19	20	21	22	23	24
DAYINDABO P.I.P. 7700AC (3117HA)													
W.R.	1000 M**3	589	337	0	969	0	2578	0	2923	2174	0	0	937
DISCHARGE	M**3/SEC	0.69	0.40	0.00	1.13	0.00	2.99	0.00	3.39	2.52	0.00	0.00	1.09
PUMP OPERATION	HR	144	83	0	237	0	630	0	715	532	0	0	229
NATHMAW P.I.P. 7900AC (3198HA)													
W.R.	1000 M**3	604	346	0	995	0	2645	0	2999	2230	0	0	961
DISCHARGE	M**3/SEC	0.70	0.41	0.00	1.16	0.00	3.07	0.00	3.48	2.59	0.00	0.00	1.12
PUMP OPERATION	HR	144	83	0	237	0	629	0	713	530	0	0	229

WATER REQUIREMENT ON PUMP IRRIGATION AREA (2)

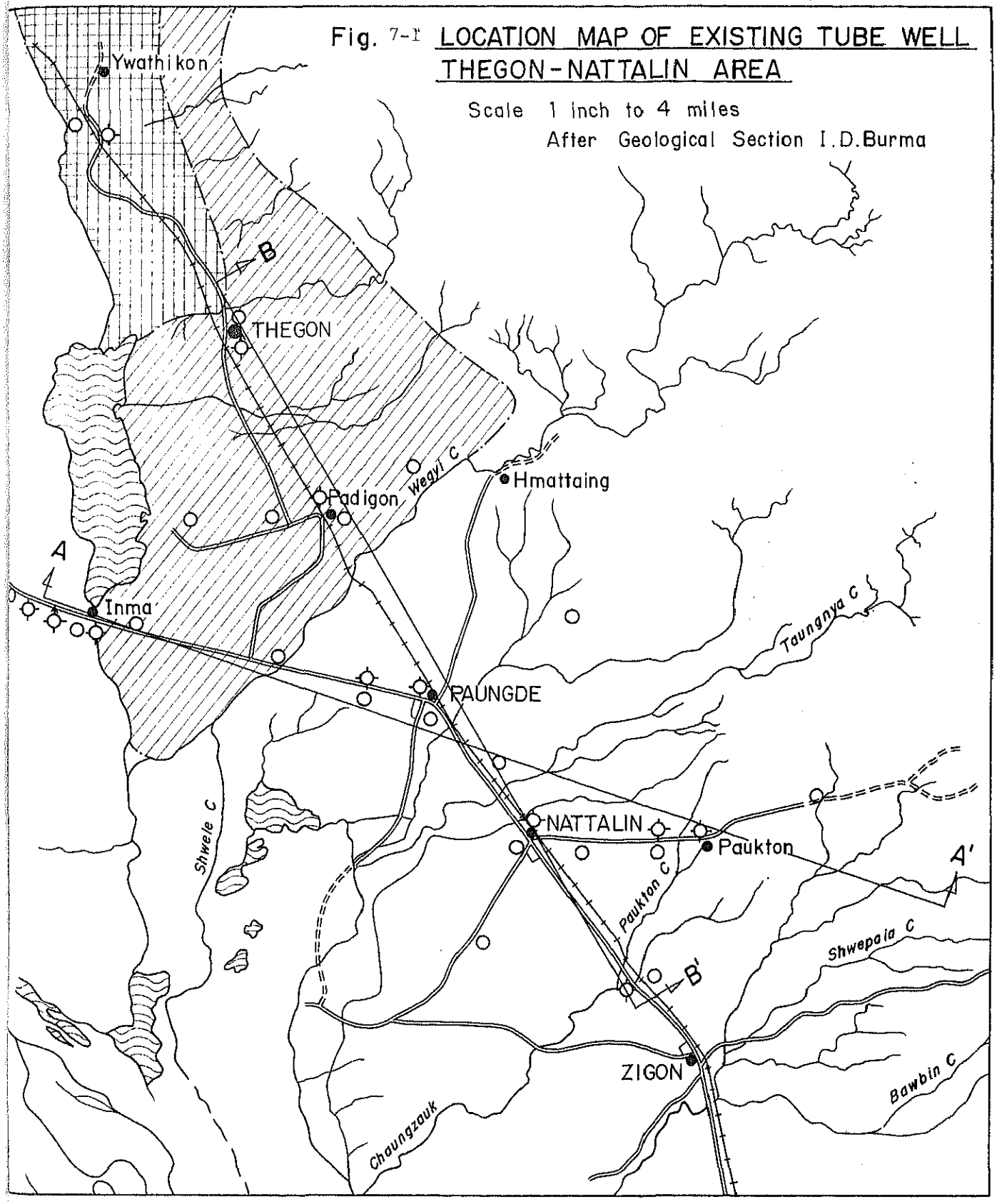
		SEP			OCT			NOV			DEC	
	25	26	27	28	29	30	31	32	33	34	35	36
DAYINDABO P.I.P. 7700AC (3117HA)												
W.R. 1000 M**3	2224	303	0	1051	513	2786	1324	1310	707	221	659	866
DISCHARGE M**3/SEC	2.58	0.36	0.00	1.22	0.60	3.23	1.54	1.52	0.82	0.26	0.77	1.01
PUMP OPERATION HR	544	75	0	257	125	681	324	321	173	54	161	212
NATHMAW P.I.P. 7900AC (3198HA)												
W.R. 1000 M**3	2282	311	0	1078	526	2858	1359	1344	725	227	677	888
DISCHARGE M**3/SEC	2.65	0.36	0.00	1.25	0.61	3.31	1.58	1.56	0.84	0.27	0.79	1.03
PUMP OPERATION HR	543	74	0	257	125	680	323	320	173	54	161	211

TOTAL PUMP OPERATION HOUR

DAYINDABO P.I.P. 7700AC (3117HA)	8724
NATHMAW P.I.P. 7900AC (3198HA)	8708

Fig. 7-1 LOCATION MAP OF EXISTING TUBE WELL
THEGON-NATTALIN AREA

Scale 1 inch to 4 miles
After Geological Section I.D.Burma



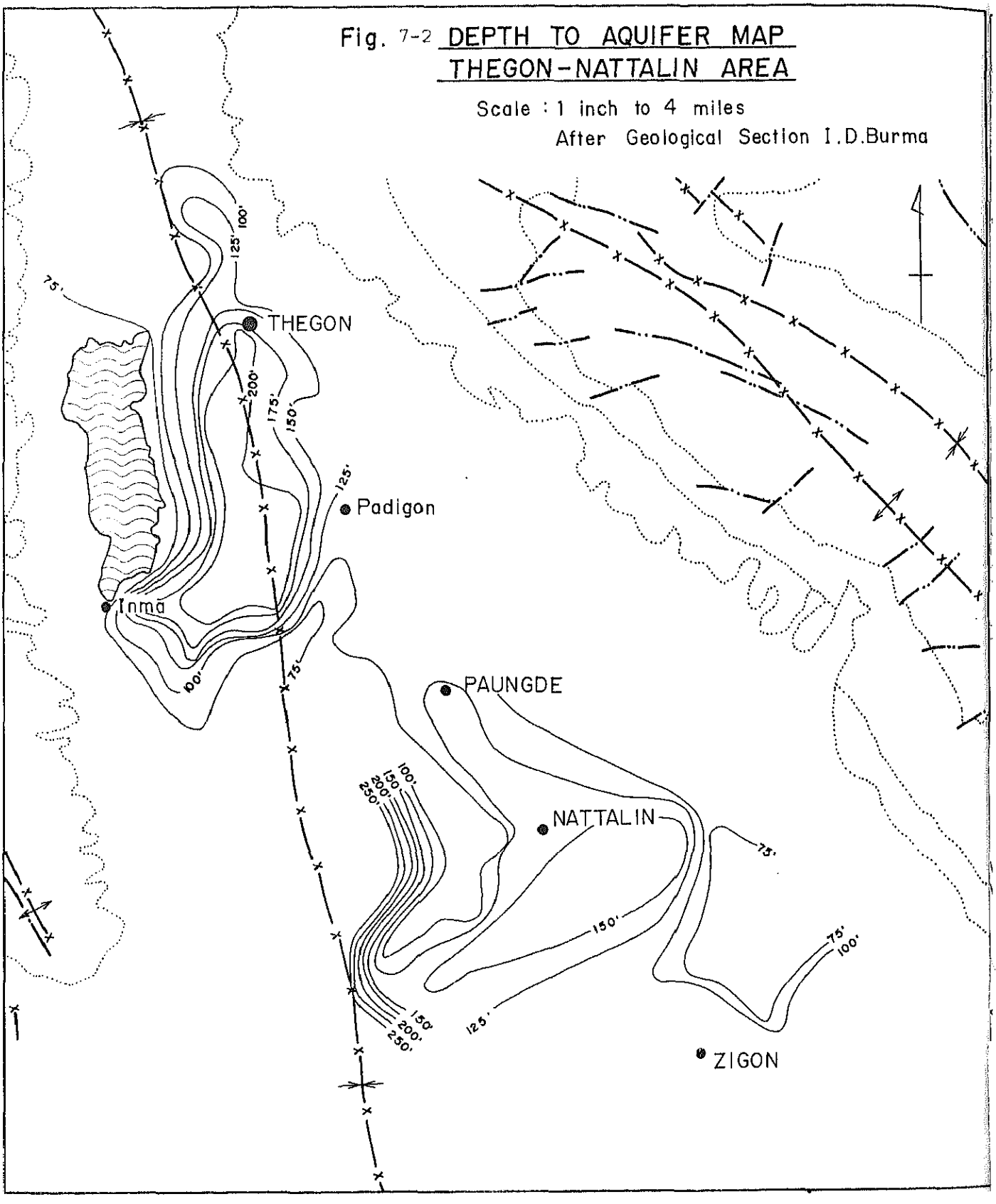
LEGEND

- Roads improved & culverted
- Roads surfaced
- Railway
- Project Area
- Dug well
- Bore hole
- Artesian borehole
- Area to be irrigated from North Nawin Project (under construction)
- Area to be irrigated from the proposed South Nawin Project

Fig. 7-2 DEPTH TO AQUIFER MAP THEGON-NATTALIN AREA

Scale : 1 inch to 4 miles

After Geological Section I.D.Burma



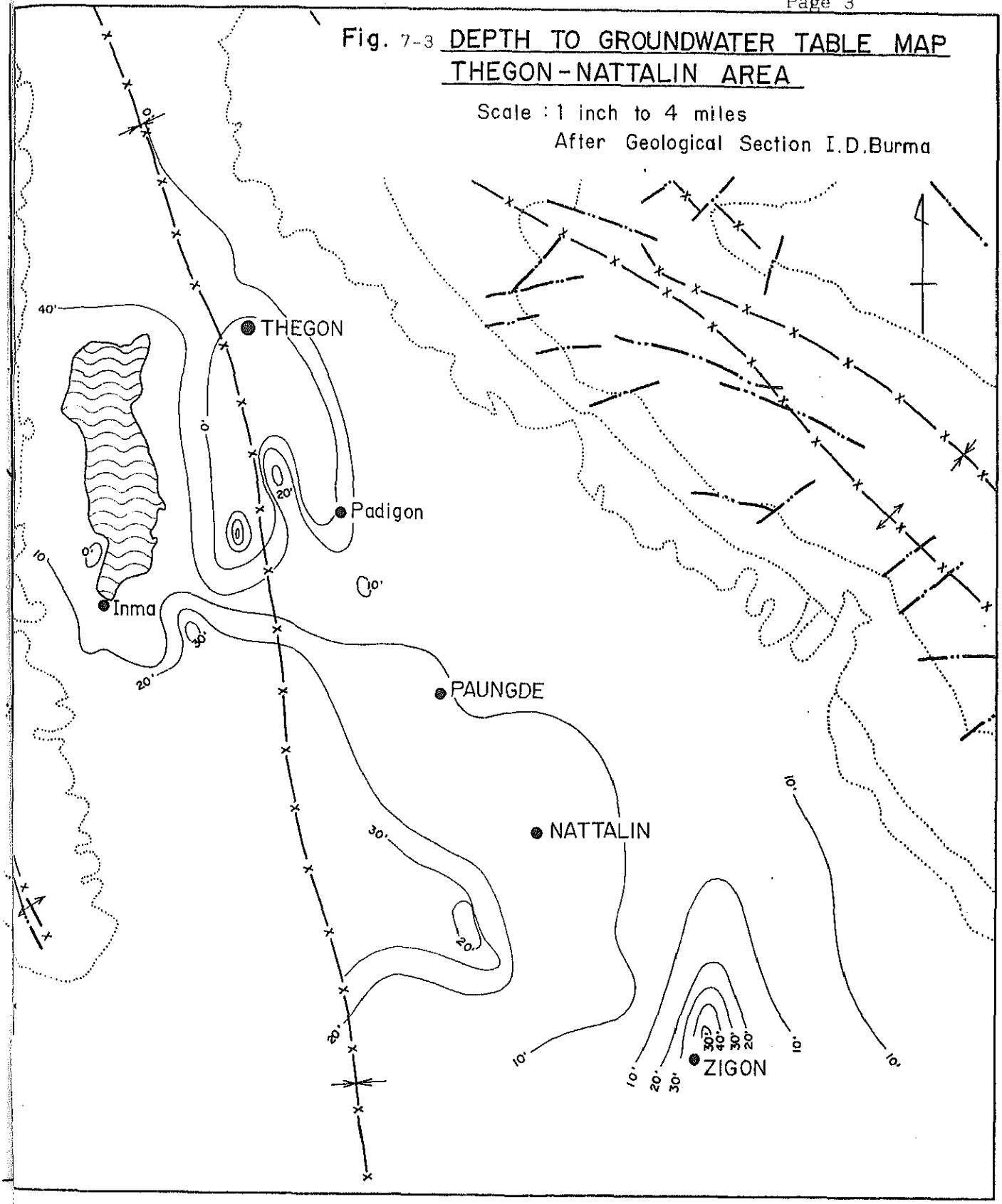
LEGEND

- Alluvium
- Irrawadian Sand stone
- Obogon Alternations
- Kyaukkok Sand stone
- Pyabw clays
- Geological boundary
- F---- Fault
- —x— Fold Axis
- Anticline
- Syncline
- — — Margin of the Project area
- —70'— Contour
- Lake

Remark – This map is based on the data from (173) tube wells.

Fig. 7-3 DEPTH TO GROUNDWATER TABLE MAP
THEGON-NATTALIN AREA

Scale : 1 inch to 4 miles
After Geological Section I.D.Burma



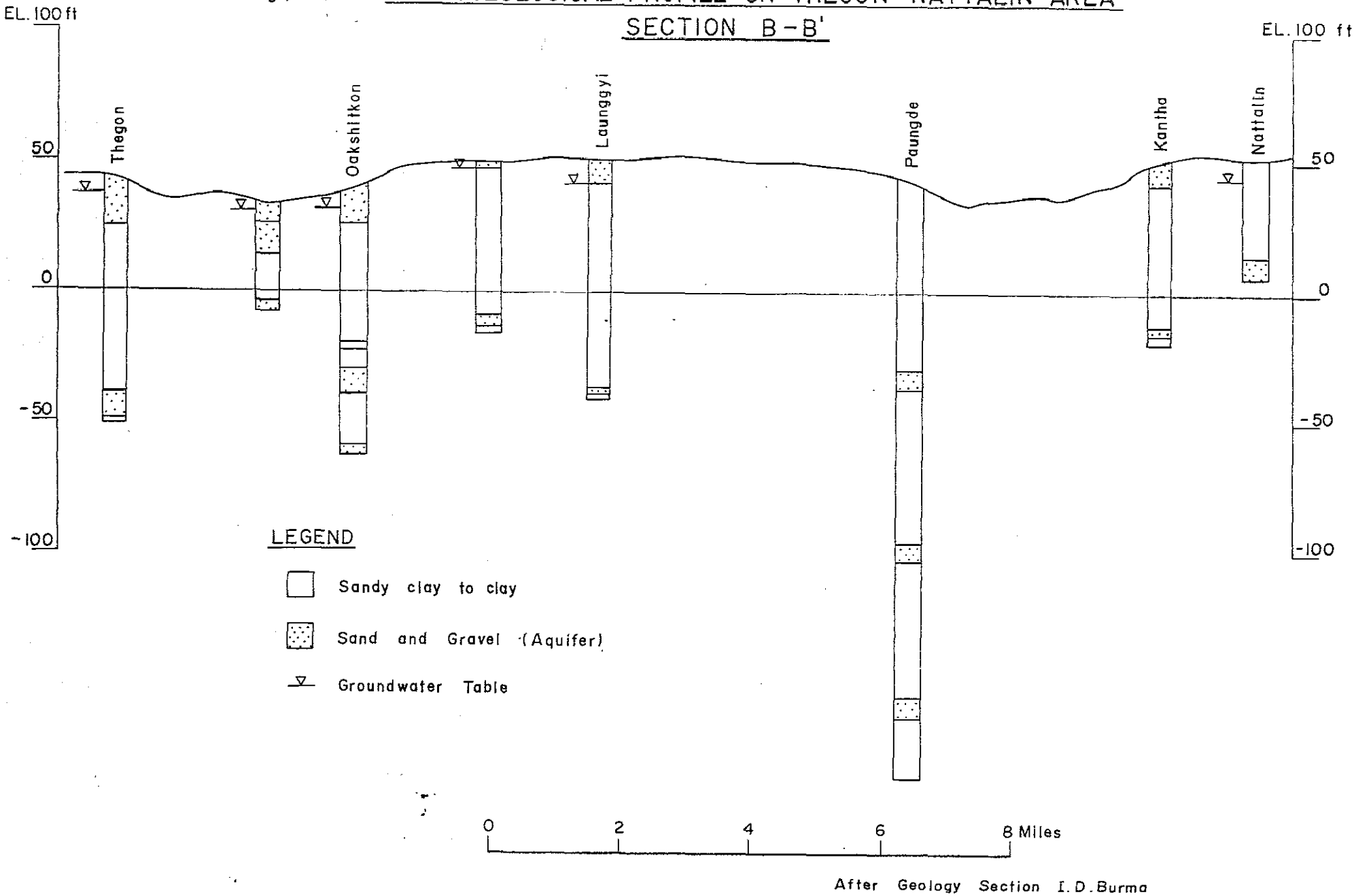
LEGEND

- Alluvium
- Irrawadian sand stone
- Obogon Alternations
- Kyaukkok Sand stone
- Pyabw clays
- Geological boundary
- F---- Fault
- —x— Fold Axis
- Anticline
- — — — Margin of the Project area
- —30'— Contour
- Lake

Remark – This map is based on the data from (173) tube wells.

Fig. 7-4 HYDROGEOLOGICAL PROFILE ON THEGON - NATTALIN AREA

SECTION B - B'



After Geology Section I.D. Burma