Division	Township	Number of Village Tract	Number of Village	Acreages (ha)
Irrawaddy	Kyonpyaw	88	527	82,819
	Yegyi	88	517	128,190
	Henzada	103	894	98,083
	Zalun	72	496	74,633
	Lenmyethna	41	284	103,353
	Kyangin	30	234	115,149
	Ingapu	73	661	162,705
	Myanaung	58	507	155,223
	Danubyu	63	450	74,942
	Total	616	4570	995,097
	Grand Total	1454	9076	2,887,429

Population

3.40 Some related information and record suggested the present status of population in the Project Area as follows:

	Population in the Project Area		
Division	Below 17	Above 18	Total
Irrawaddy	594,208	857,394	1,451,602
Pegu	627,523	875,812	1,503,335
Rangoon	180,094	206,933	387,027
Total:	1,401,825	1,940,139	3,341,964

The above table suggests that the total population of the Project Area is about 3.3 million, about 2.0 million of which will be working population.

3.41 Present conditions of Industry

1. Manufacturing

In the Project Area, most of manufacturing plants are located in the west bank tract of the Irrawaddy River, and working population therein is estimated at about 4,000. In the area, a farming machines manufacturing plant and an electric equipment manufacturing plant, both of which have been established under the Japanese aid by the reparation treaty of World War II, are in operation at Sinde in Padaung Township, the opposite side of Prome, and the former has about 1,800 employees and some Japanese engineers reside to render technical guidance in manufacturing small-size pumps, sprayers, power-tillers, etc and the latter has about 400 employees and manufacture various kinds of electric equipment and appliances.

There are also Cement Mill in Kyangin Township and Gas Turbine Plant and Oil Field in Myanaung Township in west bank tract of the Irrawaddy River.

On the other hand, there exist a very few factories in the east bank tract of the Irrawaddy River; only a pottery plant in Tharrawaddy and a foot-ball manufacturer in Taikkyi are observed.

The reason of concentration of factories or plants in the west bank is that the west bank extends a little higher in elevation and is less damaged by floods than the east bank, and furthermore the Government has been encouraging the development of the west bank which is less developed than the east bank to provide the employment opportunities for the habitants.

2. Small-scale agri-industry

This kind of industry includes food-processing, textile industry, sawing, farming machines manufacturing and repair-shops.

In nationwide breakdown, a great number of these factories are private enterprises, and nearly 90 percent of workers belongs to cottage industry with employees below 10 and the rest 10 percent belongs to the large-scale industry.

Regarding the Project Area, the following table shows the number of private enterprises with employee more than five.

Table

Pegu Division	509
Irrawaddy Division	707
Rangoon Division	313

(Source: The Central Statistics Bureau)

From the above, the number of wokers in the Project Area can be estimated at about 7,645 or more.

Fish-processing plants are located in Yegyi, Kyonpyaw and Danubyu of the southern Delta. Many rice mills and bran oil extract plants are operated in every townships of the Project Area.

III.4 Characteristics of Regional Economy of the Project Area and its perspective

In general view, the west bank tract is more thinly populated in the lower level of living standard than the east bank, and also more sparcely provided with transportation facilities.

With new factories introduced therein, the inhabitants can have some employment opportunities, although very limited. As an example, the farming machines manufacturer in Sinde has employed labourers with the average salary of 200 Kyats, and the pottery with average salary at 180 Kyats. In both cases, unskilled labourers employment is not firmly established yet.

Contrarily, however, the farmers, after selling the quota of paddy to the Government, can sell their harvest by 17-19 Kyats per basket in free market. Therefore, the farmers are considered more advantageous than the factory labourers.

On the other hand, in the near future no large-scale plants or factories will be provided in the Project Area, excepting for some plans of construction or renewal of rice mills and oil-extracting factories.

Funds and technology are the major bottleneck for construction of new factories, though labour forces and raw materials supply are not so serious problems. In other words, new factories have been constructed in those areas where no problems exist with labour forces and raw materials supply.

For the labourers, well-educated people from urban have been employed and trained as skilled labourers, and local people have been employed as unskilled labourers in the extent that such employment does not exert bad influence upon local labour demand-and-supply nor upon the structure of the rural community.

The agriculture and industry co-exist in the state of mutual support in the regional economic structure, and the industry has not influenced and stimulates so much on the labour situation and farm production. Under the situation, the Project Area is expected to be developed with agriculture as nucleus of the development, and the socio-economic structure of the region will not change so much, although some processing industry of farm products and transportation facilities may be developed.

However, agricultural development needs to be supported by any external assistance such as Government financial aid or foreign investments because agriculture is limited in its spontaneous developing power.

III.5 Present Situation of Agriculture

3.42 General Descriptions

The definite figures in details on agriculture are unobtainable due to no agricultural census carried out. The related data available up to the present outlines the present situation of agriculture in the Project Area as follows.

The number of farm households is about 586,000 (1975-76), and the total cultivated area is about 1,179,000 ha (2,914,000 ac) which occupies 11.7 percent of the total cultivated area of the country and about 40 percent of the total area of the Project Area.

The above cultivated area includes 1,003,000 ha (2,478,000 ac) of paddy fields, which account for about 85 percent of the total cultivated acreage of the Project Area.

These figures prove the Project Area is one of the major farming area with paddy as a stable crop, although some 7.5 percent of cultivated lands is fallowed annually.

The average size of holding per household is 1.91 ha (4.72 ac), which is a little below than the national average of 2.19 ha (5.41 ac) per household, and is larger in the south of the Project Area and smaller in the north.

The average size of holding per household growing paddy only is 2.55 ha (6.3 ac).

In general view, the Project Area is one of the big rice bowl of the country with seedling in the early rainy season and harvesting in the early dry season, although the second cropping is different from region to region.

Land Use

3.43 Most of the cultivated area are rainfed, and only about four percent of the total cultivated area is irrigated. The fallow lands account for about eight percent of the total cultivated acreage of the Project Area.

The culturable waste lands occupy about eight percent of the total of the Project Area, and this suggests that the further land reclamation can expand the acreage of cultivated land in future.

The data of the Land Records Department show the land classification in the Project Area as follows:

Net Area Sown	1,089,494 ha
Fallow Land	89,587 ha
Culturable Waste Land	240,893 ha
Reserved Forest	920,868 ha
Other Forest	112,056 ha
Other Area	434,531 ha

Production of main crops

3.44 Most of the crops are rainfed due to scarcity of irrigation facilities. Some irregularity of the rainfall is observed in both the early part and the end of the rainy season, but much rainfall can be expected in the peak of the rainy season; therefore little damage by drought takes place to the rainy season cropping, whereas flood damages sometimes have taken place to the crops in the low-lying lands.

The paddy cropping, which accounts for 85 percent of the total cultivated area, is harvested immediately after the rainy season. The second cropping becomes sometimes difficult due to the insufficient moisture in the soil and is damaged by drought. These conditions prevent two-crops a year from being diffused in resulting in only eight percent of the two-crops a year diffusion rate.

1. Paddy

The Project Area is one of the major rice prducers of the country. The sown area of paddy in the Project Area occupies about 17 percent of the nationwide total, and about 30 percent of that of the project related three Division (Rangoon, Irrawaddy and Pegu).

The yield per acre of the Project Area is 2.176 kg/ha (42.2 Bkt/acre) which is about 19 percent higher than the national average of 1,831 kg/ha (35.5 Bkt/acre) (1975-76).

Within the Project Area, the townships located in the central part of the left bank of the Irrawaddy River have produced a high yield by some 2.5 tons per ha, (47 Bkt/acre) and the townships in the north of the right bank of the River have produced an average yield of 2.0 to 2.2 tons per ha, (38-40 Bkt/acre) but the areas in the south of the left bank of the River, where the soil fertility is lower, have produced only 1.7 to 1.9 tons per ha, (32-37 Bkt/acre).

In the depressed areas, the floods occur in every rainy season, sometimes causing serious damages. In the Project Area, no harvest ratio to the cropping acreage is about two or three percent in the normal year.

The paddy is harvested immediately after the end of the rainy season. When the rainy season is over earlier than usual, the late matured variety will be incompleted in its ripening at the ordinary harvest season.

In general, harvesting tends to be delayed to result in degrading of paddy quality and losses in quantity as well. In addition, the dry condition of soil after the rainy season is a bottleneck to the second cropping. In order to solve these problems, the irrigation/drainage facilities and transportation facilities should be provided.

2. Jute

Irrawaddy and Pegu Divisions are the main producers of jute in the country. In the Project Area Monyo township and the Delta area produce considerable amount of jute.

Pre-monsoon jute is cropped much in the right bank and monsoon jute prevails in the left. Both types of jute cropping are carried out before the paddy.

Pre-monsoon jute sowing needs an adequate irrigation water, and growing large before the rainy season, the pre-monsoon jute can resist to the rain and flood to yield high.

Sown after the rainy season comes, the monsoon jute some difficulty in farming management and yet as growth period just meets with rainy season, sometimes this kind of jute is vulnerable to rain and flood damages. The no harvest ratio of this kind is larger than that of the pre-monsoon jute.

Generally speaking, both jute cropping has much more risk than the other crops.

The monsoon jute cropping currently prevailing in the left bank can be shifted to pre-monsoon cropping with improvement of water supply, so as to stabilize and increase the harvest.

3. Groundnuts

The main producer of groundnuts is the Upper Burma, but some are found in the Lower Burma, and in the Project Area, groundnuts are an important crop as the winter crop after paddy or after flooding in Kaing land.

Some are cropped in Ya land as a crop in the rainy season, having not so high yield, sharing about 10 percent of total winter crops.

For groundnuts cropping, the Government has been encouraging farmer by providing rental system of tractors for the purpose of promoting multiple cropping. Furthermore, groundnuts with price uncontrolled, are sold at comparatively high price, and farmers enjoy the cropping of groundnuts.

When more mechanized system is introduced for land preparation the acreages of groundnuts cropping will be much more increased.

4. Sesamum

The Upper Burma is a main producer of sesame in the country. In the Project Area, there are not so much sesame cropping found. Some are cropped in Ya land or in Kaing land as pre-monsoon crop.

5. Matpe

Irrawaddy Division produce remarkably this pulse. Two townships of Danubyu and Zalun occupy more than 70 percent production share in the Project Area.

The Mappe had been exported very much to Japan and other countries; however, recently, Burma has been loosing its market share in the international competition, due to quality problem. Improvement and control of varieties and farming techniques, and selection of quality products will be essentially required to meet the demands of international market.

6. Cropping pattern

In the Project Area, the cropping pattern of paddy after paddy is not extensively practiced. The following two patterns are familiarly employed:

jute - paddy
paddy - groundnuts, pulses, chilli or sunflower

In Kaing Land, one of the crops such as groundnuts, pulses, sesamum, chilli or Burmese tobacco is grown after

flooding. In the areas where the flooding period is comparatively short, sesamum or any other crops with short life period are grown before flooding.

In the Ya land, two-upland crops a year or mixed cropping are carried out. The Ya land with serious soil and little water retaining capacity are cultivated with crops of short life period, so that the life period does not go over the rainy season.

The second crops after paddy will be reduced in their harvest due to water shortage, if the planting after the harvesting of paddy is delayed. To solve the problem, it is necessary to expand the cropping acreage of early maturing paddy for facilitating to introduce the second crops and so increase the yield.

Production cost of paddy and cotton

3.45 Interview with AC officers at Prome revealed the following matters:

Paddy cropping

Scale : 10 ac of irrigated fields

Production : 60 baskets per ac with HYV

Cotton cropping

Scale : 3 ac

Production : 200 viss per ac with long staple cotton

The production cost for paddy was estimated at 184.45 Kyats per ac for a family labour, while that of cotton at 298 Kyats per ac for a family labour. The production cost of family labour of cotton is almost double of paddy.

The production cost of paddy per basket is 9.31 Kyats, which is almost the same of the price the Government purchases at.

The production cost of cotton per viss is 5.76 Kyats, which accrue some margin of 1.24 Kyats by the price of 7 Kyats the Government purchases at. The margin is an income of the farmer.

IV. Development Strategy

4.01 Major issues of the Agricultural policy are to increase farm production and improve quality of the products. Thereby level-up of the people's living standard can be ensured and the export can be increased to develop the national economy.

The study of the agricultural development in the Project Area requires to take the following points into consideration along with these guidelines.

(1) The Project Area, bordering on the dry upland field area in the Upper Burma north of Pegu, belongs to the wet paddy field area in the Lower Burma, but the agriculture in the Project Area has a little different features from the Delta Agriculture representing that in the Lower Burma. In other words, the agriculture of the Project Area has features as in between of the dry and the wet.

(2) Yearly mean rainfall is about 1,000 mm in Prome and its vicinity, and shows a tendency to increase up to around 2,000 mm in the south.

(3) The rainy season and the dry season distinctively divide the year; almost of all rainfall concentrates in the rainy season, no rainfall is observed in the dry season.

(4) The Project Area includes a vast low-lying flat land inundated by floods from the Irrawaddy River, the Myimatkka river and the Bassein river in the rainy season.

The above-mentioned local, seasonal concentration of the rainfall and much surplus water have caused instability of farm production to restrict production increase and upgrading of the quality.

Under the circumstances, the study and the plan formulation to implement irrigation/drainage projects in the Area are of vital importance to develop the regional agriculture, although these study and implementation of the projects requires for much time and a huge investment.

4.02 On the other hand, even under these comparatively severe natural conditions, the Project Area is one of the major agricultural producers with a quantity of paddy and other various farm products.

The specific features of the present situation of agriculture in the Area are summarized as follows:-

(1) Rain-fed paddy cropping is prevailing over the Area.
(2) Average paddy yield per acre is about 20 percent higher than that of national average.
(3) The ratio of multiple cropping (two-crops a year) in the Area is lower than that of the national average.
(4) The fertilizer application level is considerably low. Recently, however, the Government has been encouraging farmers to apply much fertilizers to the rain-fed paddy cropping to result in remarkable production increase in a short period. Thereby, the farmers have been establishing techniques for fertilizer application as a habit of paddy farming.
(5) Diffusion of HYV is also restricted by lack of water supply facilities and low level of fertilizer application.

4.03 There are two measures to increase the agricultural production, one is the intensification of agricultural production, and the other is the expansion of cropped area.

Those facts mentioned above and the past experiences shown in the Chapter II indicate that, in the short-run strategy of agricultural development, emphasis should be put on the method of intensification. This means to endeavour to increase the paddy yield per acre as well as to increase the acreage under multiple cropping, both resulting in the higher use of the existing farm lands. Whole Township Paddy Production Development Project has been promoted for this purpose.

Furthermore, the Government has devoted itself to promoting the irrigation projects as many as possible within the financial capacity available.

These policies and measures taken are considered reasonable and the Government should promote and extend the measures along this policy line for the further agricultural development of the Project Area.

Project Identifications Available in the Area.

4.04 For the development of the Area, there will be several projects to be identified or formulated, which are classified into two-types, the short-range projects and the long-range.

A rough sketch of the related projects is worked out, based on the data available so far, as follows: however, further study and investingation will be required to finalize the Project formulation.

1. Short-range Projects

(1) One is the Intensive Agricultural Development Project (provisionally named) which aims to concentrate the various measures for increasing the production and the efficient use of the resources for agricultural production on the basis of some selected townships as corner stone or model for the intensive agricultural development.

(2) Among many, some irrigation projects having high feasibility in terms of both economy and techniques, should be studied and investigated for implementation.

2. Long-range projects.

An integrated irrigation and drainage projects should be formulated so that most effective water resources utilization and control in the whole Project Area may be available.

V. Projects

Intensive Agriculture Development Project

5.01 The specific feature of the Whole Township Paddy Production Development Project, discussed in II. 3. 2.19 are to concentrate the intensified extension works to selected townships -- as corner-stones or models -- so that production increase can be accomplished by the village-basis effort in package-deal with increasing application of productive inputs. The project aims at increase in the yield per acre and multiple-cropping acreage.

5.02 The Productivity levels that the respective selected townships could reach should be maintained in the future as well, and every effort so far made should be continued to meet the purpose.

For further development of these areas, a wide range of policy will be required to use the land and water more efficiently. And the technical improvement of extension workers is also essential to give proper guidances to the farmers for their level-up of farming techniques.

These measures should be concentratively carried out in the selected townships so that the respective townships can accomplish the target successfully to become models of the development in the Project Area.

In other words, taking level-up of farmers' techniques by power increase of village managers, introduction of HYV, and increasing application of chemicals as the first step of the Whole Township Paddy Production Development Project; the second step will be to continue to take these measures and to establish an intensive agriculture development plan with new approaches.

5.03 A proposed intensive Agriculture development plan may involve following items:

I. Strengthening of extension organization

1) The young extension workers in the Whole Townships Paddy Production Development Project, most of whom are BAGS or Diplomas, are now under temporary employment, but after trained and experienced, these people will be nominated to village managers. In this case, current seats of the position is very limited in number; thereby it may be required to increase the numbers of seats.

2) The higher farming technique is extended the closer relationship should be established between extension works and various research institutes. Such a situation will require to urgently provide some subject matter specialists in the Divisions and State level. These subject matter specialists should be highly qualified in the fields of agricultural techniques and extension methodology of the country and abroad. In addition to these specialists those staff who will distribute the collected information to farmers, will be required.

3) The training system and relating facilities are inevitably required for increase in number of extension staff and their technical level-up. At present, the training for the staff in the Project Area is carried out at Central Farm in Hmawbi. However, since the equipment and other materials for training are inadequately provided, substantial supplement to these is urgently required. Furthermore, it is recommended that additional training centers are established for strengthening the training systems and that key-farmers are also trained in these organizations for successful achievement of the Project.

4) There are only three seed farms in the Project Area and superior quality seed distribution should be further promoted as well as the HYV be introduced positively. The seed farms also play a role to educate the farmers and to show them various modern technique. Therefore, it is desirable to provide at least three to four seed farms in one Division.

2. Land classification and its mapping

Existing soil maps are so roughly made that information on fertility and classification of the farm lands is inadequate to prepare suitable cropping programmes. The more detailed land classifications and the maps developed therefrom are essentially required, and in the maps farm lands inundated in the rainy season should be clearly marked for successful introduction of the HYV paddy.

3. Multiple-cropping

An increase in multiple-cropping acreage is a policy established for intensive land use. Multiple-cropping requires for mechanization of farming works in paddy harvesting and land preparation for second cropping after paddy so as to possibly shorten these work period. However, increase in animal power qualitatively and quantitatively is necessary because the animal is an important supplier of the farm yard manure. It is recommended to study to improve the quality of feeding grass and to introduce some kinds of fodder trees.

4. Land Consolidation

The existing farm lands are quite irregular in both sizes and shapes; some are too small to carry out a proper farmin works. Such unfavourable situation has hindered farmers from doing efficient works and producing quality products.

Under the circumstances, land consolidation work should be done to reform the lands in regular shapes, to provide on-farm irrigation/drainage facilities farm roads and embankments for flood controls, etc.

5. Development of water resources

In the Project Area, many farmers make temporary weirs across small rivers and streams pouring into the Irrawaddy River at the end of the monsoon and before water run-off, so that the farmers can secure the irrigation water for the second crops.

However, these temporary weirs, provided with improper design and construction method, have often been easily destroyed by floods before their functioning.

The proper guidance by engineers and experts will make these weirs stable and the water resources available in the Area utilized much more.

6. Improvement and construction of rice mills, warehouses and oil-extracting plant

With increase in farm production, it will become necessary to improve or consolidate the warehouses, rice mills, oil-extracting plant, and may be recommendable to construct new rice bran oil plants.

For quality improvement of paddy, the study for total aspects ranging from drying method and warehouses to the milling and distribution system is required.

Objective Areas

5.04 The Intensive Agriculture Development Projects are better to be formulated as the second stage of the Whole Township Paddy Production Development Project, and to be implemented on the basis of the results so far obtained.

That is because, for successful implementation of the Intensive Agriculture Development Project, the farmers should have sufficient knowledges and experiences for HYV paddy and related farming techniques with chemicals, and the farmers, their leaders and officials concerned should have ardent desire to complete the Project.

In view of the above, several townships are to be selected among the townships of the Whole Township Paddy Production Development Project to carry out the Intensive Agriculture Development Project in coping with the local situation.

A good success in this Projects will show an example of the agriculture development of the area and suggest a general direction of the development of the Project Area.

Engineering Projects

5.05 The plan formulation of the engineering project holds the most important position among the Master Plan Study. Employing the available data, especially based on the Maps stated in Paragraph 3.12, preliminary plan formulation for the engineering project has been elaborately conducted. The engineering projects which provide infrastructural arrangement for an increased agricultural production could be tentatively categorized in terms of the nature of works, for convenience sake, as follows.

(1) Irrigation Project inclusive of hydropower generation scheme
(2) Drainage Project and Flood Protection Project
(3) Land Reclamation
(4) Major Farm Road Project
(5) Land Consolidation Project and Water Management Project
(6) Rural Development Project
(7) Hydrological Survey

The conception of the above items is as follows.

5.06 The provision of the irrigation facilities has key importance as well as immediate priority among the engineering projects. Corresponding with the type of water sources, the irrigation projects could be distinctly grouped into three items such as (1) dam and reservoir

irrigation project (with storage function), (2) diversion weir irrigation project (intake of natural flow), and (3) pumping plant irrigation project (out from river or lake). Among the above groups the irrigation projects by means of dams and reservoirs would be major concerns, because the storage function is an essential condition for stable water source during the dry season. Table 5-1 summarizes the proposed irrigation projects which are concluded from the preliminary study conducted so far.

5.07 No drainage project is independently considered in this Master Plan Study but it incorporated within the irrigation project, land reclamation project or land consolidation project. The drainage project is closely connected with flood control project, as mentioned in Paragraph 3.34. It would be more effective to implement the drainage project conforming to the river improvement works likewise river training and river dike construction of the related rivers.

5.08 The land reclamation project designates the development of the low-lying swamp areas which are located in the northern part of Henzada, right bank of upper reaches of the Bassein river and the middle or downstream sections of the Myitmaka river. The land reclamation project may comprise such facilities as embankment, drainage channel, drainage sluice and drainage pumping plant as the case may be. Since some of these facilities are already completed, some areas would be easily developed by integrating such existing facilities. The land reclamation project doubtlessly contribute towards the expansion of farm land and have an advantage of rather easy introduction of modernized farming in comparison with the existing farm system.

5.09 The major farm road project is proposed to overcome one of the constraints to current farming operation. Thus, the arrangement of the farm roads under certain planning criteria would provide a milestone to the modernized farming practices facilitating the transportation of the agro-input and output, the introduction of farm mechanization, etc.

5.10 The land consolidation project and the water management project have less priority in light of the current agricultural situation. Therefore, these should be experimentally introduced to some model farms and the results obtained could be reflected on future project planning stages.

5.11 The rural development project aims at an environmental improvement of the farm life furnishing not only engineering works but also water supply, rural electrification and other related components. This project will contribute toward the amenity of rural life considering overall aspects which may improve the living standard in the rural areas.

5.12 The hydrological survey furnishes the basic data for plan formulation of the engineering projects so far stated. The long-ranged basic investigation, non-recurrent in nature, can justify the project plans both in technical as well as economic aspects without any big investment. The importance of the systematical basic investigation should be recapitulated because less expense saves much construction cost.

5.13 Basing upon the above mentioned consideration, further study on individual projects will be specifically conducted to formulate and finalize during the course of the following stage. Particularly, the possibility of a hydroelectric power scheme in the watersheds of the Arakan Yoma which forms the western border of the project area would be carefully scrutinized, if the Government of Burma has an interest. Since Runoff in

the western side of the Arakan Yoma is directly poured into the Bay of Bengal at present, a joint development with the hydro-power scheme by means of trans-basin diversion tunnel will be one of the promising projects.

Table 5 - 1 Proposed Dam within the Project Area

Sr. No.	Name of Dam	Location (Township)	C.A. (sq.km)	Reservoir Area (ha)	Storage Capacities (MCM)	Dam Height (m)	Dam Length (km)	Dam F.W.S.L. (m)	Irrigation Area (ha)	Remarks
	A. Myitmatka River Basin Zone									
L 1	North Nawin[1]	Paukkong	592	3,560	359	35	1.6	70	39,200	Under construction F/S stage
L 2	South Nawin[2]	-ditto-	642			30	6.0	90	32,000	
L 3	Wegyi	Paundo	525	5,700	850	60	1.9	75	24,000	
L 4	Taungnyo	Nattalin	545	1,300	98	30	1.0	75	20,000	
L 5	Bawbin	Zigon	260	800	80	40	1.4	75	24,000	
L 6	Gamon	Gyobingauk	95	470	35	30	1.8	75	8,000	
L 7	Minhla	Minhla	80	340	26	30	1.2	85	8,000	
L 8	Kadia-Billin[3]	Letpadan	154	1,120	176	38	0.3	68	16,800	
L 9	Thegaw[3]	-ditto-	90	1,230	82	21	1.6	51	7,200	
L 10	Thonse	Tharrawaddy	250	4,400	440	40	1.8	75	20,000	
L 11	Okkan[3]	Taikkyi	205	2,370	204	25	0.3	56	17,600	
		Sub-total								
	B. West Zone of the Irrawaddy River Basin									
R 1	Nyaungaung	Padaung	80	2,000	150	30	1.2	75	-	
R 2	Thani	-ditto-	110	750	75	40	0.5	120	-	
R 3	Buyo	-ditto-	330	980	147	60	0.7	150	-	
R 4	Kyaukphu	-ditto-	180	220	22	40	0.5	75	-	
R 5	Thaledan	-ditto-	540	880	33	15	0.4	75	-	

Sr. No.	Name of Dam	Location (Township)	C.A. (sq.km)	Reservoir Area (ha)	Storage 4/ Capacities (MCM)	Dam Height (m)	Dam Length (km)	Dam F.W.S.L. (m)	Irrigable Area (ha)	Remarks
R 6	Alonmyauk	Kyangin	120	460	86	75	0.6	150	-	
R 7	North Kun	-ditto-	75	300	34	45	0.6	150	32,900	
R 8	Phatashin	-ditto-	55	260	33	50	0.6	225		
R 9	Manya	Myanaung	90	530	146	110	1.2	300	44,100	
R 10	Kanyin	Myaunaung	490	510	64	50	1.1	75	25,200	
R 11	Mankathu	Ingabu	110	600	105	70	0.8	150	43,000	
R 12	Mankathu	-ditto-	115	840	168	80	0.9	150	16,500	
R 13	Gyat	Lahmyethno	95	480	60	50	1.0	75	13,600	
R 14	Mesali	-ditto-	80	420	53	50	0.6	75	10,700	
R 15	Thida	-ditto-	220	260	10	15	1.5	45	12,200	
R 16	South Kun	-ditto-	90	1240	186	60	1.4	75	11,200	
R 17	Kyetpaung	-ditto-	80	106	8	30	0.7	70	6,200	

Note; All figures except ∠1, ∠2, ∠8, ∠9 and ∠11 projects, have been estimated based on the quarter inch maps (scale 1:63,300)

1/ The North Nawin project (∠1) is under construction. This project will be completed by 1981/82.

2/ The Feasibility Study (F/s) of the South Nawin Irrigation Project (∠2) will be started within 197[illegible]

3/ The preliminary studies of the Kadin-Billin (∠8), the Thegaw (∠9) and the Okkan (∠10) project have been done by the planning and design section of the Irrigation Department.

* When more detail studies for the master plan is done on the next stage, the above figures may be changed.

4/ Storage capacities is estimated by following equation:

Storage capacities (MCM) = Reservoir area + Dam height$^{1.4}$

VI. FORESTRY

6.01 General description of forest industry in Burma

Burma has a forest area of approximately 388.5 million [illegible] (15000 sq.miles), equivalent to about 57 percent of the whole land. The forest industry of the country, though sharing only a small part of its gross national products, has greatly contributed to its national economy as one of the vitally important export items and occupied about 25.4 percent of the total export in 1974/75, which was the second largest foreign currency earner next to rice. The teak production has been tending upward since 1976/77, not yet reaching the level before the war.

6.02 Present conditions in the Project Area

1) Forest resources

Most of the forest in the Project Area extends along the Pegu Yoma, the east of the Area, and the Arakan Yoma, the west, and the total acreage is estimated at 2.3 M ha (5.6 M ac). Involving the Pegu Yoma, the main teak producer of Burma, the Project Area is considered as one of the important area in forest industry in the country.

The forests of the Pegu Yoma are mainly composed of an evergreen-deciduous mixed forest type including such valuable hardwoods and teak, whereas that of the Arakan Yoma presents a forest type growing teak sparsely.

Of the total forest acreage of the Project Area, about 0.9 M ha (2.1 M ac) is a reserved forest 1/ (hereinafter referred to as RF), and about 1.4 M ha (3.5 M ac) is an unclassed forest 2/ (hereafter referred to as UCF). A stock of valuable species in the above RF is estimated at about 25.3 M cu.m (14 M H tons). The actual forest area and stock in the above UCF have not been surveyed yet.

Note: 1/ The RF is managed as commercial forest, though partly protection forest exists.

2/ The UCF supplies domestic use wood for the local people.

2) Forestry organization and forest ownership

The Forest Department is responsible for forest management and the Timber Corporation for cutting, transportation and sales.

The Forest Department controls 14 Administrative Divisions in the whole country, and the forest of the Project Area has been administered by three Administrative Divisions involving five divisions.

All forests in Burma are national forests, forest lands and trees belong to the state. However, those forest products produced from UCF within a range of 32 km (20 miles) from villages can be freely harvested by the said villagers for their own use and not for trade.

3) Forest condition

A. Forest Zone in the Pegu Yomas

a) The RF is in good close stands.

b) The proposed dam site is located in such a well-conserved forest and the catchment area seems to have an adequate water regulation function.

c) Non-tree lands and shrub lands in the UCF have become mostly converted to farm lands, and in places agriculture and forestry are competitively co-existing, but trends show the UCF are being increasingly depleted year by year.

B. Forest Zone in the Arakan Yomas

The RF area, providing a dense forest, has not been fully exploited yet due to sparsity of teak.

4) Forest working plans

The forest working plans in Burma have a long history since establishment of the Forestry Department fostering effective forest management on the basis of stand types, stocks, and annual increment. The forest plans are implemented by every working circle provided in regions.

5) Forestry production

The forestry production of the Project Area reached 1,900,000 cu.m (105,000 H tons) in 1975/76, which [illegible] about 14.7 percent of the total production of the [illegible] (The above figures include the production from the whole Bassein and Insein areas).

Each Forest division has its own annual allowable cut imposed. In some areas, actual annual cut of teak exceeds the allowable level, but other hardwood cut is still below the annual allowable cut in the whole Project Area. The level of annual allowable cut was revised to a new one in August, 1978.

Dry teak are felled after girdling and air drying and generally transported by floating. However, truck transportation has been increased in frequency recently to effect saying of some 25 percent loss taking place in the course of transportation by floating. Green teak and hardwood are also transported by trucks. However, scarcity of forest road networks and a suitable type of logging trucks seem to be bottlenecks in effective land transportation.

In the Project Area there are no forestry-related industries with the exception of several saw mills which provide much labour-intensive work but it is necessary to improve the system and efficiency for productivity increase.

6) Planatation work

Natural forest has been harvested on the basis of [illegible] selection operations, and for the poorer forests clear cutting and artificial planting are carried out.

The teak plantations are concentrated in the area along the Pegu Yomas, and these constitute about 39 percent of the total teak plantation acreage of the country. It can be said that the nursery and plantation techniques for teak

and Eucalyptus Camaldulensis have been already established in the country, and seem assured of success in the future.

7) Forest for local supply

The RF and the UCF in the Project Area are the supply sources of bamboo, fuel-wood, posts and poles to the local people including inhabitants of southern big municipalities like Rangoon and Bassein. In the future with expected population increases and no other substitute fuel available, these forests will play increasing important roles as supply sources for all domestic wood requirements. However, the UCF has deteriorated considerably and such a critical situation will result in encroachment on the RF. Therefore, the Forest Department has been trying to promote increase planting of Eucalyptus year by year and further encouraging people in planting the said trees around houses by free supply of the seedlings on every Arbor Day (1st July) since 1976.

6.03 Problems and development strategy

1) Wood supply for domestic use

A) Construction of model nursery

In order to meet the increasing demand for domestic use wood and to conserve the forests, both the RF and UCF, from destruction, the Forest Department has carried out free supply of Eucalyptus seedlings every year for the people to plant them around their houses.

The Project Area has been the source of supply for domestic use wood to roughly 1,560,000 households, and the total volume required annually is estimated at 7.11 M cu.m (3.93 M tons), whereas the allowable cut and supply is far below the actual consumption volume. Without taking some effective countermeasures to solve this problem, approximately 32,000 ha (80,000 ac) of forest would be destroyed every year.

As countermeasures, the Forest Department has [illegible] four-year plantation programme and free supply [illegible] Eucalyptus seedlings. Actually, however, shortage in [illegible] of nurseries has become a bottleneck for successful [illegible] tation of these plans.

In the free supply movement in the Project Area, temporary nurseries had supplied 50,000 - 90,000 seedlings to [illegible] local requirement, but the increased demand for seedlings is estimated at about 700,000 in 1979 and 930,000 in 1980 and onwards. Under the circumstances, permanent nurseries should be provided to meet sharp increases of seedling demand from now on.

The permanent nursery can produce a very large number of seedlings with mechanized system and modern equipment, and will also permit quality control. Furthermore, a wide variety of study and research can make efficient production more easy with a permanent nursery than with a temporary one.

There is one permanent nursery for Eucalyptus in the Project Area, a few in the dry zone of the Central-Burma, and another one is now under construction near Rangoon.

However, these nurseries provide only pumping facilities, water storage tanks and delivery pipes; and these may not be adequate for production increases and successful quality control.

Several new permanent nurseries should be provided in the Project Area taking into account the fact that the seedlings are free-supplied to cover the whole Project Area and the road network in the Area is so poor.

However, if the nurseries are to produce quality seedlings with high productivity, they require adequate facilties and application of rational production and management techniques. Therefore, it is recommended to establish one model nursery as the first step and build up an effective organization and to apply the results obtained from the model nursery to the other nurseries.

B) For the same purpose as mentioned in A), the Forest Department has made a long-range plan for 30-40 years to provide plantation of 1,000 ha (2,500 ac) every year so as to supply domestic use wood.

The descriptions of the plan are as follows:

Species: Eucalyptus Camaldulensis or Tereticornis

Cutting period: 12 - 15 years

Harvest yield: 220 cu. m/ha (50 H tons/ac).

Since Eucalyptus is also available from coppice, it is expected to cover about 30,000 ha (75,000 ac) plantation for 30 years after planting, to be harvested at the rate of 6.6 M cu. m (3,750,000 H tons) per annum.

Eucalyptus has been successfully planted in some of the suitable lands in the dry zone of the Central-Burma; however, it may present a problem to plant in the Project Area successfully. The problems likely to be encountered in the plantations in the Project Area are as follows:

i) to select the major best-suited species for plantation in the Project Area,

ii) to select the best-suited species for special areas such as - swampy lands, hilly lands, etc, and

iii) to establish a method of plantation for local supply areas so as to achieve early maturity and a quick harvest.

The Forest Department provides an experimental forest of early maturing species as well as a nursery in Hmawbi. The experimental forest, however, has only eight hectares (20 ac) which will be too small to conduct a successful experiment for resolving the above problems.

On the other hand, there have been little effort made to provide a systematic experimental forest and obtain related data and records on increment, etc. So, it is recommended that an experimental plantation in the Project Area should be

originally established as an experimental program to out various research and studies.

2) Consolidation of forest roads and provision of machinery

The networks of forest roads should be consolidated to facilitate the harvesting operations under the system of selection Logging, and capacities of both roads and bridges should be increased for efficient transportation of the products. In other respect, the best-suited type of trucks should be employed to meet the purpose and the repairshop for vehicles also should be constructed.

3) Consolidation of saw mills

To achieve high productivity of the saw mills and high quality of the products it is necessary to improve the mill facilities and to apply a system of sufficient and continuous supply of the logs to the mills.

4) Development of the forests in the Arakan Yoma

Cable-logging or any other system available will be helpful to develop the forests in the Arakan Yoma, if the hardwood market is adequately secured for their products.

5) Development of forestry-related industries

Not only saw mills but other industries such as paper mills should be developed for the effective utilization of the forest resources.

6.04 Outlines of programmes to be formulated

1) Model nursery construction programme

The descriptions of proposed nursery are as follows:

Production capacity: 300,000 - 500,000 seedlings/year
Location : Tharrawaddy or Insein in terms of transportation availability
Nursery acreage : 1 - 2 ha (2.5 - 5 ac)

Environmental conditions of nursery:

i) availability of water intake and drainage
ii) suitable soil and cow-dung or ganic manure
iii) possibly close to areas with demand for seedlings (a center of such demand areas preferable)
iv) easy employment of seasonal laborers
v) free from transportation troubles in the rainy season
vi) flat lands with shelter forest-belts, etc.

Equipment and materials required:

i) sprinkler system
ii) water intake and drainage facilities
iii) small-size dumptrucks and water wagons
iv) tractors with necessary attachment
v) concrete-made nursery beds
vi) sunshades
vii) germination room
viii) refrigerator for seed stock
ix) various measuring equipment and devices
x) working lot and warehouse
xi) office space and necessary equipment
xii) various facilities for staff and labourers
xiii) vehicles for manager and staff
xiv) vehicles for labourers and for seedling transportation
xv) fire extinguishers and others.

Further study will clarify the details of the design nursery, necessary construction costs and operation costs, and specifications of the facilities and materials required.

With construction of model nursery, it will become necessary to train nursery engineers and experts, for whom necessary educational facilities should be provided, or it may be required to send such staff to Japan for training and education.

2) Experimental forest programme for domestic use wood

The descriptions of proposed experimental forest are as follows:

Acreage : 200 ha (500 ac) for each sub-division per year; total 1,000 ha (2,500 ac) in the Project Area

Period : 5 years

Grand total Acreage : 5,000 ha (12,500 ac)

Location : Any suitable site available in the respective UCF_s

Experiment items:

i) land type and species
ii) close planting and sparse planting; thinning and final cutting; and harvest volume forscast
iii) various works, i.e. machanized land preparation, etc
iv) extension of planting season
v) fertilizing and weed control
vi) construction and maintenance of forest roads
vii) nursery works and techniques
viii) management of plantation and others.

Further study will clarify the details of locations, species, cost, test items of nursery, equipment and materials required, etc.

The development of the forestry project from the experiment stage will require the increase of necessary staff of the Forest Department in both numbers and capability; so, engineers/experts including those who cover the statistics should be trained. It may be, therefore, required to provide the related educational facilities or opportunities to send such staff to Japan for training and education.

3) others

Consolidation fof forest roads, provision of machinery and equipment, etc shall be studied in details in forthcoming survey.

6.05 Study items in future

1) Construction of model nurseries and experimental forest programme

2) Growing stock and annual allowable cut in the UCF

3) Forest road networks, capacity increase of the roads, and transportation facilities

4) Productivity increase of the saw mills

5) Development of the forest in the Arakan Yoma

6) Encouragement of forestry-related industry (Pulp and Paper mills, etc.), in the vicinity of the Project Area, and conservation of forestry resources.

7.1 FISHERY

7.01 Brief Description of Survey

In the first survey (11th March - 31st March, 1978) report on several problems on present inland fisheries in the country and measures for solving those problems have been presented as follows.

1) Natural fishing grounds

A) Proper management and conservation of natural fishing grounds and resources available

a) Improvement of fishing grounds (prevention of fishing from ageing)

o to accelerate exchange of water masses in waterways

o to dredge waterways so as to keep the water deep enough for fish to move freely.

b) Extermination of aquatic weeds in waterways and fish ponds (major weed: Eichornia crassipes)

2) Hatchery

Besides the natural fishing grounds, a particular attention should be paid to fish culture.

A) Encouragement of dissemination of fry and fingerling production techniques by means of hormone injection applicable to edible carps like Labeo rohita (Rohu), and Ctenopharyngodon idella (Grass carp).

B) Introduction of new species such as grass carp is highly essential.

3) Fish ponds

An extensive fish culture is recommended using only natural food.

4) Relationship between fishery and agricultural development

A) A special attention should be paid so that agricultural development should not affect detrimentally on inland fisheries such as leasable fisheries.

B) Reservoir and other irrigation canals should be effectively used for fishery development.

The second survey was conducted from 24th October to 23rd December, 1978, to cover the main stream of the Irrawaddy River and its tributaries and branches between Rangoon and Prome area. The major issues taken up through the survey are discussed in the following paragraphs.

7.02 Approach to the Fishery Development

The production increase is the basic concept of inland fishery development on which the first survey has already emphasized. Fundamentally, health promotion of the Burmese people seems to depend greatly upon animal protein intake especially from fish. In order to meet the national requirements for health promotion, the increase in fish catch as well as in cereal crops should be realized by the most effective and efficient way.

A plan should be made to achieve the goal of harmonious co-existence of every industry taking into account the development of large latent potential of the Irrawaddy and other two major rivers.

The followings are the main points where urgent measures should be taken.

1) Conservation of natural resources

A) The environment of natural spawning grounds and habitats should be properly conserved for both adult fish and fry.

B) The control and management of good natural fishing grounds should be made properly for Padaung, Henzada, Yandoon and other grounds in the mid-stream

of the Irrawaddy River where conditions are favourable.

C) The resources survey and stock assessment is necessary for fish conservation, should be conducted by statistical study and biological survey particularly for Hilsa ilisha a marine commercial species coming up the rivers from the sea to spawn.

D) Regulations on fishing should be thoroughly exercised to conserve resources; a special attention should be paid to those anadromous fish in spawning mirgation and young fry and fingerlings descending from the inundated areas to the main river system.

2) The following measures are also proposed for positive action

A) Countrywide existing hatcheries should be substantially consolidated with new hatcheries, engineers and technicians trained, and related technical improvement made wherever necessary.

a) There exist 9 hatcheries in Lower Burma and 12 in Upper Burma; in the Project Area, a new hatchery starts operation in Okpo next year.

b) More than 10,000 trainees and about 2,200 college or university graduates have completed courses in Fish-culture within the last 13 years. Many of them should be adequately employed in the fishery development works accordingly.

c) Hormone injection has been successfully carried out in three hatcheries of Lower Burma with a production of about 2.8 million of Labeo rohita frys this year. An effort should be made to improve the survival rate of these frys during

growth to 1.5-2.0 inches in length. About 10 to 15 percent production increase could be realised with these 2.4 millions frys if techniques were improved in a range between 3.08 and 3.22 million frys could be expected by the improved method.

B) Fisheries with fishing right, such as leased fishery, were operated totalling 3,400 fisheries last year. They have increased in number this year and amount to 3,480 fisheries in the whole country. Such an increase in the number of leasable fisheries is considered effective to protect fishing grounds from their ageing and to increase the fish production. The production of inland fishery is estimated at 138,000 tons this year, which shows an increase of 10.9 percent over those production four years ago. The annual increase rate is 2.73 percent on an average.

On the assumption of annual production increase by about 3 to 5 percent, the production next year could be estimated at 143,100 to 145,800 tons.

Furthermore, fish culture as the effective use of the water resources is a basis for increase fish production. During the last five years, fish ponds have kept their production constant at about 161 gm/m^2 (The figures are based on rough estimates). The fish ponds, however, may be possible to increase the production by 10 to 15 percent per annum, (equivalent to 177 to 185 gm/m^2) in future.

C) Reservoirs and irrigation canals in the country can be used for fish culture, and in such cases,

the most suitable species for such localities should be [illegible] The grass carps and major carps are recommended for introduction in these water bodies for the best use of the water resources.

7.03 Relation between Fisheries and Agriculture

Firstly chemical are not yet intensively-used to affect detrimentally to fisheries at present. But in future increased application of chemicals such as inorganic fertilizers, insecticides, herbicides, etc may damage fisheries. Therefore, authorities concerned with Agriculture and Fisheries should in close coordination plan and conserve both the fish and their environment from deterioration.

Secondly, the Project Area covers about 2.5 million hectares most of which is farm-land. In such a wide area, there exist farm ponds at a density of about one for every 20 ha of farm-land. The average water surface area of a farm pond is estimated at 0,25 ha. So, the total water surface area in the Project Area could be estimated at about 31,250 ha, which could foster a production of about 12,500 tons of fish annually by fish culture alone and since the population of the Project Area is estimated about 2.56 millions, the per capita consumption of fish from the fish ponds would naturally be about 4.87 kg per annum.

7.04 Relation between Fisheries and Proposed Reservoirs, Irrigation canals, and Drainages

In the Project Area, 28 dams are proposed to be constructed; 11 dams in the area from South Nawin, Shwele to Kalitaw in the east bank of the Irrawaddy River, and 17 dams in the west.

Problems of fisheries in relation to these irriga[illegible] are that the latter may interrupt or limit the migra[illegible] range of small fish and consequently limit the spa[illegible] grounds as well. These limitations in fish migration ma[illegible] lead to overfishing of certain local species and thus stu[illegible] them as important protein suppliers. Under such circumstances, it is recommended that the authorities concerned with irrigation and fisheries cooperate with one another [illegible] the establishment of new hatcheries within the Irrigation Area to facilitate stocking of fish in the reservoirs an[illegible] any other well-suited waters. Thus the local species of fish could be saved from being overfished and at the sa[illegible] time propagated successfully.

A special consideration should be given to providing suitable spawning grounds for Hilsa ilisha, one of the most important fish species, which migrates from the sea to the rivers for spawning.

An ecological survey should be made on the fish in the reservoirs, and new leasable fisheries should be established within the reservoirs for conservation and production of fish.

Besides, a due consideration should be given to construction of irrigation canals and drainages so that they may not render detrimental effects on the existing fisheries. Necessary measures are also required to conserve fishes affected by the change of water course or reduction in water level.

7.05 Processing, Marketing, Storage, Transportation & Cost

Proper measures should be established to augment adequate supply of fish at a more stable price to consumers throughout the year.

In the rainy season, both sea and inland fishing become more or less inactive resulting in deficit supply and prices of fish and fish products rise accordingly. It is therefore imperative to take appropriate measures to overcome the deficit supply of fish by processing the catches long before the rainy season. Marketing of much more sea fish and provision of cold storage facilities and means of transport are the major problems which need immediate attention.

7.06 Development of fishing industries (Ancillary Indust.

In addition to fish culture and production increase, such ancillary industries like fishing boat building, fish-ing, nets and gears manufacture, and supply of other related materials are the important fields which need to be develo... in the near future. (Some new equipment or materials for fish culture, e.g. Fish Cage and Fish Pen are now being developed in the country for the experimental phase.)

7.07 Suggestions and Recommendations

For successful fishery development, the following items are suggested and recommended for implementation as a first step to solve the existing problems encountered in the current survey.

1) Introduction and culture of new species, the grass carp Ctenopharyngodon idella, and experiments of induced breeding and stocking in water bodies.
A) 10,000 frys are to be imported annually from Japan to affect a continuous experiment of three years.
B) Experiments shall be carried out at the new hatchery constructed in Okpo.

2) Dry Bundh Method, which is successfully employed in India and other countries to facilitate spawning, shall be introduced for experiment.

The following are the general [illegible] of the Dry Bund method. Some hatcheries, providing suitable conditions, for experiment, shall be selected from among the newly constructed hatcheries. The favourable topographic conditions are that hatcheries should be located on slopes of some degree, where rain water can gush down in torrents through the ponds. Bundh to be made in these hatcheries will allow the water to gush down in torrents, when adult fish will be stimulated to spawn.
Since this method does not cost much, it is recommended to be employed at several sites, including the Prome hatchery.

3) Fingerlings of edible fish to be stocked adequately in the proposed reservoirs and the water bodies in their parameter shall be produced within the reservoir area to facilitate stocking.

A) Conservation of Hilsa ilisha plays a vital role in the inland fishery development.

B) The important fast-growing species like major carps should be positively cultivated and the techniques disseminated to most possible extent within the country.

C) A new hatchery (about 30 acres) shall be constructed around Paukkaung near the proposed South Nawin Dam.

4) Fry production shall be promoted by research and development of methods for storing the hormone for a longer period.

A) Hormone preservation test shall be carried out by the use of Hormone Freeze-dryer suitable for ampoulisation.

B) Many other equipments and tools required for experiments and tests shall be provided for rapid implementation.

5) Possibly many equipments and tools shall be provided in every hatchery to help increase productivity, and also new engineers/experts shall be trained.
A) Facilities on the ground, such as water tanks and filter tanks shall be provided in every hatchery.
B) Various measuring devices for water quality shall be equipped with hatcheries.

6) Data and records of fish catches and biological statistics shall be prepared substantially so that specieswise and regionwise resources assessment and fishing forecast may be available.

7) Existing natural spawning grounds and new ones to be found shall be scientifically conserved.
A) In Shwedaung and Henzada areas, the existing spawning grounds and fry collection grounds, shall be completely conserved.
B) New spawning grounds and fry collection grounds should be explored in Kyangin and Danubyu areas.

8) With appropriate regulations, the water weed like Eichornia crassipes shall be exterminated, for these weeds will definitely contaminate the environment by covering the water surface with their luxuriant growth.

9) As already mentioned, the existing farm ponds in the Project Area have a large potential to produce fish (about 125,000 ton/year) with further improvement and application of adequate culture techniques. Accordingly, the fry required for stocking in the farm ponds is estimated at about five millions. Hence, fry production plays an important role in this aspect.

PERSONNEL CONTACTED DURING THE SURVEY

NAME	STATUS
U Kyaw Htein	Deputy Minister Ministry of Agriculture and Forests (MAF)
U Khin Maung Latt	Director General, Planning and Statistics Department, MAF
U Hla Moe	Director, Planning and Statistics Department, MAF
U Khin Win	Managing Director, Agriculture Corporation (AC), MAF
U Chit Saing	Deputy General Manager, Extention AC, MAF
U Maung Maung Khin	Deputy General Manager, Administration AC, MAF
U Hla Myint Oo	Divisional Manager, Rangoon Division AC, MAF
U Kyaw Myint	Assistant General Manager, AC, MAF
U Tin Htut Oo	Deputy Assistant General Manager AC, MAF
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U Maung Maung Aye	Director, Finance and Planning Ministry of Industry I
U San Thein	Director, Production Ministry of Industry I

NAME	STATUS
U Than	Director, Project Ministry of Industry I
U Tin Aung Gyan	Director, Technical Ministry of Industry I
U Sein Hlaing	Director General, Settlement and Land Record Department, MAF
U Sein Kyo	Deputy Director General, Settlement and Land Record Department, MAF
U Kyaw Hla	Director, Settlement and Land Record Department, MAF
U Thein Han	Deputy Director, Settlement and Land Record Department, MAF
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U Hla Khin Maung	Director, ID, MAF
U Yi	Deputy Director, ID, MAF
U Paw Oo	Assistant Director, ID, MAF (Working Officer)
U Than Myint	Assistant Director, ID, MAF (Administration)
U Thein Tun	Assistant Director, ID, MAF (Planning and Design)
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NAME	STATUS
U Kyaw Hlaing	Executive Engineer, Henzada Division ID, MAF
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U Myint Kyaw	Assistant Director, MHD, Ministry of Transport and Communications
U Maung Galey	Director General, Forest Department, MAF
U Tha Tun San	Director, Forest Department, MAF
U Myint Aung	Deputy Director, Forest Department, MAF
U Tint Hlaing	Director General, Fishery Department, MAF
U Hla Gyaw	Director General, Survey Department, MAF
U Lun Pe	Deputy Director, Survey Department, MAF

LIST OF COLLECTED DATA

(1) Daily Rainfall

	Gauging Station	Observation Period
1.	KYAIKGIN	1946 - 1976
2.	MYANAUNG	1946 - 1977
3.	INGABU	1967 - 1976
4.	ZALUN	1951 - 1972
5.	DANUBYU	1946 - 1975
6.	LEMYETHNA	1946 - 1970
7.	YEGYI	1968 - 1978
8.	KYONPYAW	1966 - 1972

(2) Daily Water Table of Irrawaddy River

	Gauging Station	Observation Period
1.	PROME	1973 - 1974
2.	HENZADA	1973 - 1974

(3) Daily Water Table of Myitmaka River

1.	GAMON	1968 - 1978
2.	DAWWI	1972 - 1978
3.	KUNAKYAIK (Hlaing River)	1970 - 1978
4.	MYAUNGTANGA " "	1974 - 1978

(4) Tide Table for the Rangoon River 1972, 1974, 1976

(5) The Council of State

(6) The Council of Ministers

(7) Government Agencies under Organs of State Power

(8) Government Agencies under Ministries

(9) Acreage under Principal Crops (1974 - 1976) and Production Plan (1977 - 1978)

(10) Sown and destroyed acreage by principal crops

(11) Irrigated acreage of principal crops

(14) Utilization of fertilizers

(15) Purchase of Fertilizers

(16) Plant Protection pesticides utilized by crops

(17) Agricultural equipment

(16) Livestock

(17) Purchase prices paid by State-owned organizations for agricultural commodities

(18) Industrial productions

(19) Balance of Payments

(20) Cost of Cultivation (Paddy and Cotton)

(21) Provisional List of Private industrial establishments (1976 - 1977)

(22) List of Agricultural Machinery manufactured by No.3 Heavy Industries at Sinde

(23) Japanese Aid for Rice Production Development Project in Rangoon Division

(24) Selected Monthly Economic Indicators (C.S.O.)

(25) Yearly Production of main crops of 26 Townships in the Project Area

(26) Basic Data of Hmawbi and Hlegu Township

(27) Land classified Area by Use

(28) Continued Collection of Data regarding to Agriculture in 26 Townships of the Project Area

Data Source:	1 to 2	Meteorological and Hydrological Department
	3 to 4	Irrigation Department
	5 to 8	The Ministry of Planning and Finance
	9 to 16	Agriculture Corporation
	17	AFPTC
	18	The Ministry of Industry
	19	The Ministry of Planning and Finance
	20	Agriculture Corporation
	21	Central Statistical Organization
	22	Factory at Sinde
	23	Agriculture Corporation
	24	Central Statistical Organization
	25 to 28	Agriculture Corporation