

G. Proposed Fisheries

1. General

251. Fisheries are one part of the diversification in agricultural development. In fact, especially in the northwestern part of Peninsular Malaysia, freshwater fish culture plays an integrated role in rural development. Incorporation of inland fisheries in the Pilot Project area may favourably attract underemployed fishermen living along the coast through providing greater employment opportunities to them.

252. In the development of fish farming the structure of biological production must be studied at first although we do not have at present any agreed way to elucidate the biological production structure. However, the general features of a production space on land in a closed environment must be fully understood: i.e. the productivity of fish ponds tends to be affected by the atmospheric condition, soil character and surrounding vegetation and its humus.

253. Further studies must be performed to assess priority of establishing institutional facilities in the vicinity of the Pilot Project area, where experiments to artificially hatch species of high commercial value, to introduce new species suitable for intensive culture, to develop economical primary processing methods for the fish, to train fish culturists for extension work, to assess the impact of fish culture on or from the environment and to conduct surveys on fresh and the blackish water resources to acquire background data and knowledge.

254. The commercialization of inland fisheries on a individual operation basis must be explored by analyzing the following factors. First the selection of the right species for culture must be made which will be decided from the availability of water and the water quality including temperature, pH, turbidity, dissolved oxygen, etc. Studies on the profitability of a single culture or mixed culture must also be made with consideration of the feeding habits and the habitat of the specific species as well as the size of ponds.

255. Availability of fish fry is another dominant factor for successful aquaculture. Fish fry of desired species with adequate size must be obtainable at reasonable cost without difficulty of transportation. The cost of feed accounts for a considerable portion in the total production cost of cultured fish. From this viewpoint herbivorous or plankton feeder type fish seem to be more suitable costwise. However, availability, cost and type of feed will greatly influence the introduction stage of intensified or carnivorous fish culture methods, which must be discussed as one of the phases for commercialization through the increase of productivity and market value of products.

2. Fish pond development

256. As the Pilot Project area is primarily to be developed for diversified agriculture some farms will have small scale fish ponds of 1 to 2 acres within the respective homestead. However, at present further surveys are required to determine the availability of good quality water for fish ponds in the Pilot Project area. Feed and variety of available fish fry seem to be important problems, solution of which may be possible only within the wider social framework.

257. Therefore, three development stages in 10 - 12 years will be necessary to commercialize fish culture in ponds.

Phase 1. (3-4 yrs) Culturing of existing common species such as Lamper Jawa, Lee Koh and Kap Perak of herbivorous or omnivorous type on artisanal or a subsistence scale.

Phase 2. (3-4 yrs) Increase of productivity through intensified culture methods, introduction of new species and primary processing experiment. Limited transferring of pond ownership may be realized to expand the production scale during this phase.

Phase 3. Commercialization of pond culture with the participation of the public sector such as the Fisheries Department.

3. Possibility of Catfish Culture

258. During the survey period the possibility of rearing catfish in the Pilot Project area was discussed repeatedly. Catfish is warm water, carnivorous, nocturnal fish and widely known as a culturable fish. However since it is carnivorous, the intensified, controlled feed culture method must inevitably be adopted for commercial scale culture which however raises the following problems in the Pilot Project area.

259. Further field surveys must be conducted for selection of the most suitable catfish species locally available for aquaculture. The artificial seed production method must be established as larval stage mortality is generally high for carnivorous fish due to carnibalism.

260. The cost of feed is another problem. Although the feed-flesh conversion ratio of catfish is not clear at present the production of 1 ton of catfish may require at least 2 to 3 tons of formula feed conforming to the nutritional requirements of catfish.

261. At present catfish meat is not marketed in Malaysia at all and it is difficult to estimate the market value for catfish. However with its white meat and no strong fishy flavour, catfish might be gradually find a market if reasonably priced.

262. From the situation mentioned above it is appropriate to conclude in this report that catfish rearing is feasible at a commercial level in the Pilot Project area but further studies on this subject must be continued in future studies on swamp utilization.

H. Proposed Settlement

1. General

263. The economy of Malaysia is largely agricultural both in domestic and international terms. Therefore, it is quite natural for the government to give powerfully propel her efforts to the development of agriculture centering on cash crops, mainly rubber and oil palm of high international marketability.

264. Presently, Malaysia faces the serious domestic problems of unemployment and under-employment. In order to improve the situation, steps must urgently be taken to enlarge the scale of farm management of small farmers to afford more employment opportunities to farm labourers and fishermen who subsist below the poverty line. In Trengganu State alone, an estimated 20,000 people stricken with poverty are eagerly waiting for the employment situation to improve.

265. When Malaysia social life improves, the demand for high-grade subsidiary food such as vegetables, fruits and meat will normally increase at a faster rate than that for staple food. As Malaysia has attained self-sufficiency in her staple food supply, she has entered the new stage of boosting production of higher-grade subsidiary food.

266. However, Malaysia today faces two contradicting problems in agriculture. While she must encourage farmers to boost production of higher grade food-stuffs, she must also extend a helping hand to the unskilled poor. Furthermore, in order to convert swamps into rich farm lands, Malaysia must introduce advanced techniques for soil improvement, irrigation and drainage and maintain these facilities in proper condition besides maintaining a high degree of farm management.

2. Basic Idea for Proposed Settlement

267. For the proper management of the Pilot Project and the selection of the proposed settlers, the followings are essential guidelines.

- i. Both experienced, seasoned farmers and unskilled poverty-stricken people should be selected at an appropriate ratio. If only one of these groups is selected, the problem outlined above will not be solved.
- ii. Settlers should be divided into individual management households and employees including seasonal laborers be engaged in estate farm activities.
- iii. Either a paddy field + a small acreage of upland field or a fish-culture farm should be allocated to experienced farmers for individual management.

- iv. Stock-rearing, dry field farming and fruit growing should be organized into estate farm systems and work allocated to unskilled people also.
- v. Overall Pilot Project management should be supervised by a government body who showed dispatching specialists to the work site to give technical guidance.
- vi. As many technical problems remain unsolved in swamp area farming, a demonstration farm for basic studies should be established.
- vii. Over the years, the unskilled settlers will become seasoned farmers. Therefore, there should be a system to provide these people opportunities to become individual management households.

3. Selection Criteria for Proposed Settlers

268. The proposed settlers will be selected from among many applicants throughout Tenggau State. An applicants must be:

- i. A married man between the ages of 18 and 35 of Malaysian nationality.
- ii. A man who either owns no land or possesses land of less than 2 acres.
- iii. Other criteria cover health, education, level of acquired skills, family environment, children, etc. as basic information for selection.

4. Number of Settlers' Households and Housing Acreages

269. The number of households for settlement is planned as follows:

Items	Acreages	Unit Acreage per Family (acre/family)	Number of Families (family)
Paddy cultivation farm	835	4.85	172
Livestock estate farm (incl. long-term crops)	2,158	15	143
Upland crop estate farm	1,874	6	312
Demonstration farm	467	6	78
Total			705 families

Housing area

Paddy cultivation farmers' houses:

172 families x 0.05 acre = 9 acres

The above farmers' ponds or small farms:

172 families x 0.10 acre = 17 acres

Other farmers' houses:

533 families x 0.05 acre = 27 acres

The above farmers' joint ponds or farms:

533 families x 0.28 acre = 150 acres

Total 203 acres

5. New Rural Community

270. In the Pilot Project area, a new community is to be established. It is not to include the existing rural communities surrounding the Pilot Project area from the viewpoint that it is far better to establish a new local public body for the proposed settlers themselves. The concept to establish an entirely new community in an entirely new land provides a very new attempt for Malaysia.

271. Very careful and detailed study should proceed immediately after commencement of the Pilot Project to determine what kind of farm management pattern is to be introduced for reclaimed land, what kind of ideal rural society is to be developed, and how to improve peat soil areas. To realize concepts for developing an entirely new rural community the study in the Pilot Project area will be based on principles to introduce modernized farming with improved production infrastructures and agricultural techniques to facilitate medium-scale farm management and together with the improved rural environment to ultimately develop a model new rural society.

272. On the basis of the development plan for the new rural community, a total of 25 acres will be allocated for common facilities as below:

Clinic	10 m x 10 m	1 building
Assembly hall	15 m x 20 m	2 buildings
Kindergarten	15 m x 20 m	2 buildings
School	20 m x 50 m	2 buildings
Simple water supply system		1 system

6. Demonstration Farm

273. As this Pilot Project is to be the first in Malaysia to utilize swamps for agricultural purposes on such a large and full scale, there are many unknown problems with regard to the management and operation of the Pilot Project, for example, groundwater control, use of fertilizers, farming techniques, selection of suitable crops, etc. Also, tests for mechanization of farm work in preparation for the next phase are important. Further, facilities to temporarily store harvested crops, livestock quarantine quarters and others are necessary.

274. The demonstration farm and facilities should be grouped together and come under the management of a demonstration center. The scale of this center is to be as follows:

Demonstration Farm	Paddy field	59 acres
	Upland field	74
	Grassland field	321
	Long-term crop field	13
Testing Pond	Fishculture	5
Site for Buildings		92
<hr/>		
Total		564 acres

275. The institution will comprise the following:

Office (incl. laboratory)	1
Housing for staff	5
Refrigerator	1
Stores	2
Machinery house	1
Cattle pens	2

I. Environmental Problems

1. General

276. Environmental assessment is one of the newest fields of science, and its importance can never be overvalued. If man seeks safety in his daily life, he must find it necessary to undertake development of some kind or other which is occasionally accompanied by the occurrence of negative effects. In some cases, these negative effects present themselves in direct connection with the progress of development. In some other cases, they appear ten or twenty years later or sometimes even a longer period after the development. The pollution problems which have occurred in many parts of the world in recent years are ascribable to the fact that development has been pushed forward almost recklessly in pursuit of its own merits without heeding its negative side. Environmental assessment carries heavy weight in the Pilot Project since the planned swamp utilization in Trengganu Tengah will be a milestone for similar land use in the various swamp areas distributed throughout Malaysia.

2. Environmental Problems Caused by Agricultural Development

277. From the viewpoint of a city environment, agriculture is considered to be an industry which makes use of the land while preserving the natural environment. Farmland is often thought of as being "semi-natural" land which has been shaped to a large extent by man. However, it is necessary to adopt suitable farming techniques in order for agriculture to be effective in the preservation of the environment, and for farmland to remain "green land". If insufficient thought is given to environmental preservation, even agriculture itself may result in the spoiling of the environment.

278. In the development of inland swamps for agricultural purpose, it is necessary to give due consideration to the proper way in which the development should proceed in order for agriculture to be effective in environmental preservation after completion of the project. Furthermore, since development will usually result in extremely drastic changes in the natural environment, it is also necessary to consider what environmental preservation measures are required prior to the commencement of development.

279. Farmland development may have the following adverse effects on the surrounding environment.

- i. Creation of factors which lead to soil erosion, flooding, cave-ins, and other calamities.
- ii. Creation of factors which lead to various forms of pollution and other problems related to environmental preservation.

- iii. Creation of factors which lead to the loss of the area's characteristic nature (which ought to be preserved).

3. Soil Erosion and Flood Damage

280. The danger of soil erosion and cave-ins within the Pilot Project area is for the most part restricted to the hilly area surrounding the swamp. However, since this area is not very large, nor very high, and the slope relatively gentle and not very long, and also the effective soil layer quite thick, soil erosion preventive measures should be quite easy to make and should also be quite effective in combating the problems.

281. Major problems to be considered in the flat areas of land include preservation of farm roads (against wind erosion during the dry season, and against mud in the wet season), soil erosion which occurs readily on the surface of farm roads, and peat deposition in the canals plus prevention of a tendency towards reversion of the area to swamp land caused by shrinkage of the peat.

282. Problems related to flooding concern changes in the outflow system accompanying farm development plus embankment construction by raised district roads. These embankments will reduce the areas prone to flooding by 480 ha, and this is estimated to be equivalent to some 5 million m³ of flood water, or almost 0.6% of the total catchment area (750 Km²) of the Paka river. Due to lack of data, it is difficult to estimate how much this flooding reduction will effect the extent of flooding in the Paka river catchment area, but the effect is expected to be quite small.

283. The following changes are expected to take place in the outflow system as a result of developing forest swamp land for agricultural purposes. Changes in direct outflow will not be so great. Excessive water in swamp areas usually accumulates in a basin, or accumulates in soil layers due to lack of drainage facilities. Because of this excessive water, the area cannot hold very much extra water when it rains, and direct outflow will be relatively high. Once the area has been developed for farming, and systematic drainage incorporated, there will be very little excess water, so the soil layers will have considerable capacity to store extra water when it rains. The direct outflow will consequently be regulated, and the base flow will continue for rather long periods.

284. It is generally believed that opening up of forest lands results in larger floods, but this does not necessarily apply in the case of swamp lands. It usually applies to the development of mountainous and hilly areas only. Since there is considerable scope for development of the base flow, this may have beneficial results in times of drought rather than for the farmland itself.

4. Pollution Sources and Countermeasures

285. The likely sources of pollution include waste effluents from livestock and the settlers themselves, and the use of fertilizers and agro-chemicals. The settlement is expected to contain 700 families with a population of 3,500, so the disposal of waste effluents will have to be given due consideration from the very beginning.

286. Livestock will include grazing animals kept mainly in the grassland area, plus smaller farm animals looked after by individual families. With regard to the former, environmental pollution due to waste effluents may be prevented by restricting the number of grazing animals to a number suitable for the area of grassland available. With regard to waste effluents from the latter, the effects on the environment may be kept to a minimum by waste disposal into each family's field of agricultural activities.

287. As far as agricultural chemicals are concerned, utilizing a small amount of low-toxicity chemicals of a non-residual nature (i.e. chemicals which decompose relatively quickly) will keep environmental pollution below permissible levels.

5. Natural Conservation

288. With regard to the protection of nature, no clear study has been made on whether there are species peculiar to the Pilot Project area, and whether they ought to be preserved or not. This is largely due to the insufficient comparative research with other swamps in the feasibility study, and also due to the fact that there was no preceding master plan.

289. Hence, a survey on nature protection will be required in the master plan study. As the need for development becomes increasingly important in a progressive society, and as development is approached in an increasingly positive manner in order to improve the international economy, it becomes all the more necessary to be very careful of environmental problems so as not to plant the seeds of future discontent. Development in harmony with the environment is both possible and essential.

J. Cost Estimate

1. General

290. The Pilot Project costs are estimated using figures provided by KETENGAH, DID and governmental departments on unit prices and costs as of 1977. Major construction machinery and materials such as steel, cement and lubricant will be procured from abroad. Cost of the imported plant, equipment and services to be procured by international competitive bidding is estimated based on international price level. The local cost such as materials and labor is estimated taking into account the experience of similar on-going projects in Trengganu State.

291. Imported items such as pumps, gates, construction machinery and major construction materials, will incur duties and taxes. Handling charges including domestic transportation are calculated at 5% of c.i.f. cost at Kelang port. Physical contingency of the cost estimate is about 10% of direct cost. Price contingency is calculated for each year of the construction period.

2. Project Cost

292. The project cost consists of (i) cost for civil works including land reclamation, (ii) cost for storage facilities including project office and its related facilities, and (iii) initial farm investment.

293. On the basis of the above-said assumption and condition, the construction cost of the civil works is estimated in Table VI-3 and Table VI-4. The estimated cost of the Pilot Project is estimated at M\$27,937,000 for the First Phase and M\$12,411,000 for the Second Phase. The cost for the engineering services includes the cost required for the detailed design and technical supervision during the construction by foreign experts.

3. Operation and Maintenance Cost

294. Operation and maintenance cost is needed annually after commencement of the Pilot Project operation. It comprises the costs for: (i) operation and maintenance of the irrigation and drainage facilities, and roads, (ii) maintenance of the project office and the related facilities, and (iii) overhead and personnel expenses.

Table VI-3 Cost Estimate

(Unit: M\$10³)

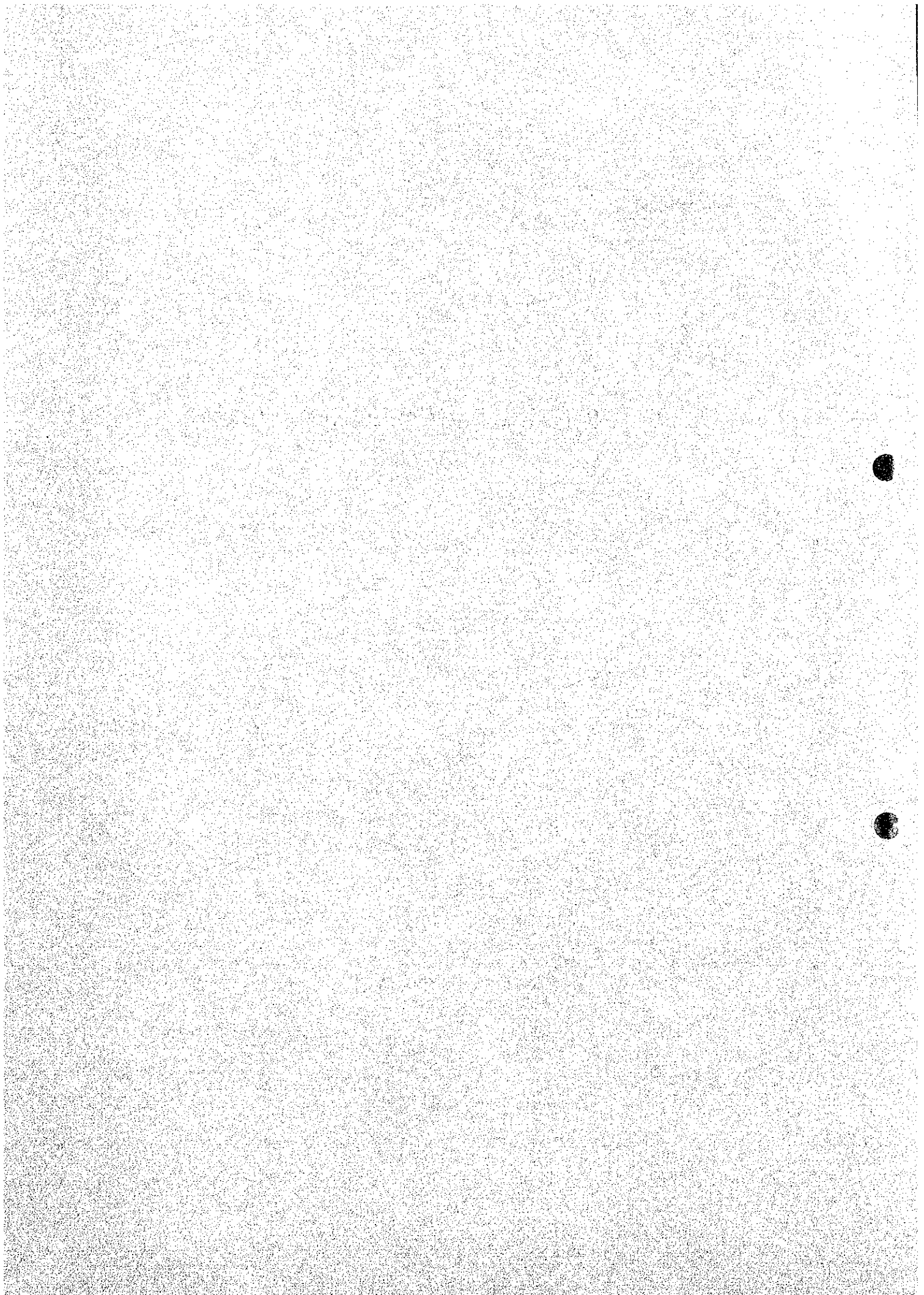
Work Item	First Phase		Second Phase		Total Work	
	Foreign	Local	Foreign	Local	Foreign	Local
I. Civil works						
1. Preparation work	-	7	-	-	-	7
2. Embankment	305	214	490	340	797	554
3. Irrigation	1,179	689	-	-	1,179	689
4. Drainage	713	403	1,390	345	2,103	748
5. Roads	1,627	861	-	-	1,627	861
6. Land reclamation	5,341	4,307	729	602	6,133	4,909
Sub-total	9,167	6,481	2,672	1,287	11,839	7,768
II. Settlement and demonstration farm	2,935	2,157	1,454	320	4,389	2,477
III. Engineering services	605	431	206	81	811	512
IV. Physical contingency	915	648	267	128	1,183	776
V. Prices contingency	2,682	1,915	3,714	2,282	6,396	4,197
Total	16,305	11,632	8,313	(4,098)	(24,618)	(15,730)
Unit cost per ha (2,622.0 ha)		M\$10,654 (US\$5,327)		(M\$4,733)		(M\$15,387) (US\$7,693)
Unit cost per acre (6,480 acres)		M\$4,311		(M\$1,915)		(M\$ 6,226)

Table IV-4

Outline of Main Civil Works

Item	Unit	Quantity
[Drainage]		
Driving channel	m	230
Main drainage canal	m	5,655
Secondary canal	m	23,250
[Irrigation]		
Pipe line: Main	m	5,800
Pipe line: Secondary	m	5,080
Open canal: Secondary	m	5,600
Irrigation pump: $\phi 600\text{mm}$	Set	1
[Road]		
Main road	m	6,910
Secondary road	m	19,830
District road	m	4,898
Bridge, culverts	places	78
[Demonstration farm]		
Site arrangement	ha	228.4
Buildings and facilities	houses	13
[Settlement]		
Site arrangement	ha	92.1
Housing	houses	705
Public buildings	houses	6
[Land reclamation]		
Cutting	ha	2,066.7
Transportation	ha	2,066.7
Uprooting	ha	2,066.7
Land clearing	ha	2,066.7
Land grading	ha	337.8
Farm road	ha	2,158.5
Farm drainage canal	ha	2,158.5

V. PROJECT IMPLEMENTATION



V PROJECT IMPLEMENTATION

A. Organization for Implementation

1. Organization and Management

295. Successful and efficient project execution presupposes a high degree of coordination at the national (ministerial) and the project level. At the same time there should be adequate delegation of power and responsibility to the executing agency and the project management. Proposals along these lines are illustrated graphically in Fig. V - 1.

2. Executing Agency

296. With regard to project execution the Economic Planning Unit (EPU) will be the principal implementing agency except for the construction of various facilities such as irrigation and drainage canals, pumping station, power transmission lines, and also agricultural extension, fisheries development, forestry development, marketing, credit, settlement, etc. EPU has always been the executing agency for all foreign aid technical assistance and loan projects in Malaysia. The Pilot Project will be within the jurisdiction of KETENGAH in Kuala Trengganu on behalf of EPU.

297. The Ministry of Agriculture, the Ministry of Land and Regional Development, the Ministry of Science, Technology and Environment, etc. will be responsible for agricultural development matters like agricultural extension and research, fisheries development, forestry development, irrigation and drainage, environmental problems and marketing as part of their regular functions. Prior to the release of the loan, EPU will enter into appropriate agreement with the above-said ministries regarding the implementation of these activities.

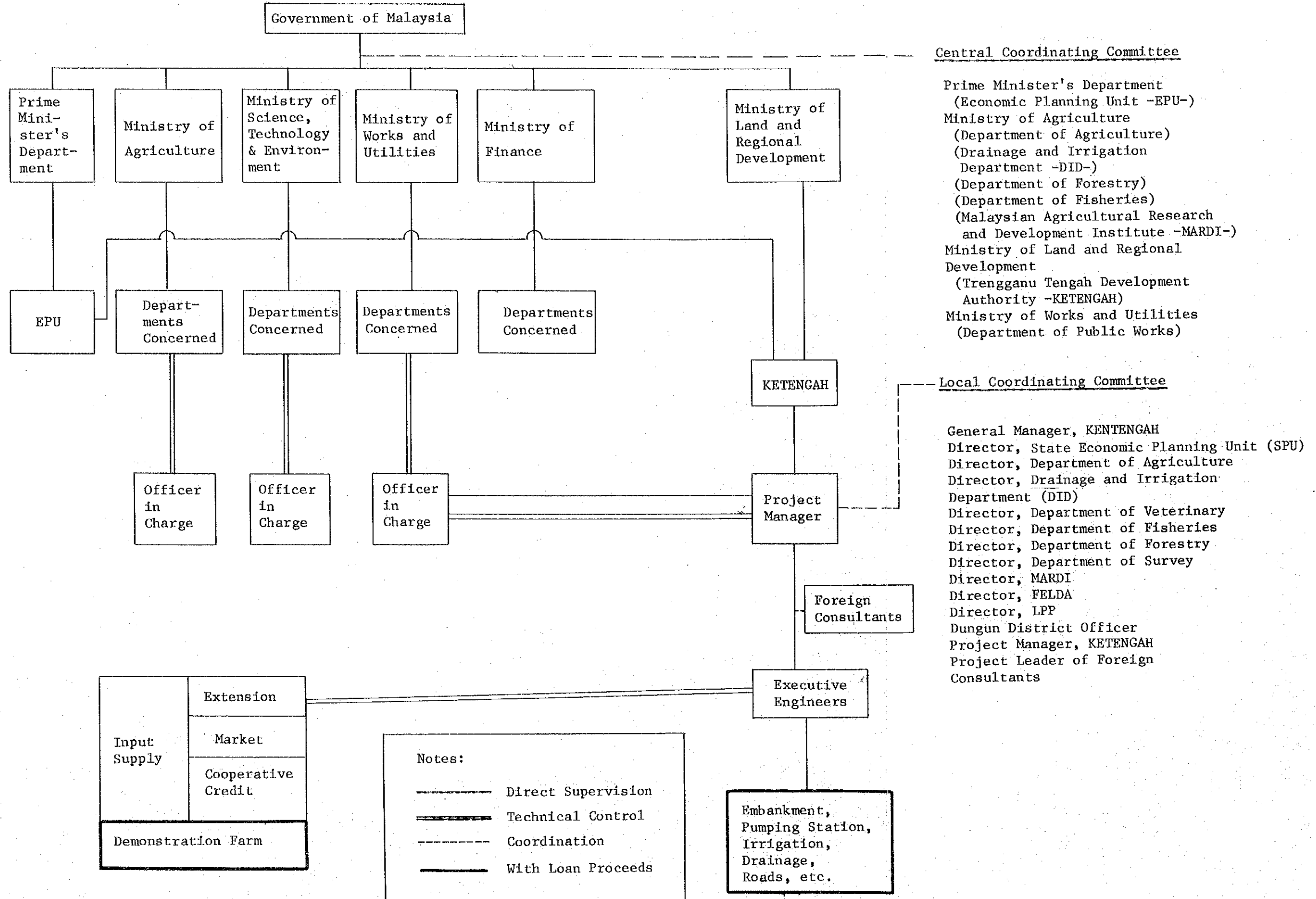
3. Central Coordinating Committee

298. Although a central steering committee has been already established at the ministerial level for this feasibility study in Kuala Lumpur, a central coordinating committee should be established for the proposed Pilot Project prior to the commencement of project implementation. This committee should be composed of representatives in a similar way to the existing steering committee. The committee will be headed by EPU representative as the chairman.

4. Local Coordinating Committee

299. A local coordinating committee is to be established at the project level to coordinate the various agencies

Fig. V-1 Organization Chart for Project Implementation



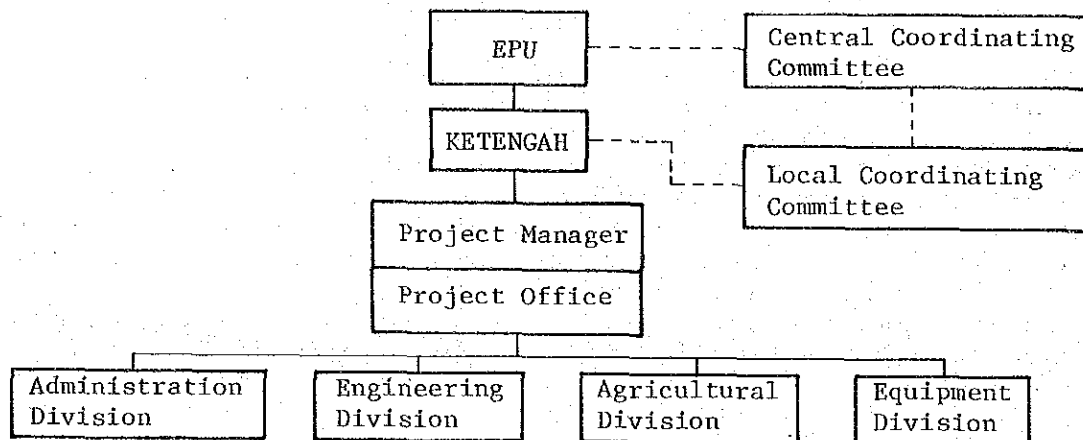
and authorities of the government involved in the Pilot Project. The committee will include state level officers of the agencies.

5. Project Office and Project Manager

300. A project office of KETENGAH will be necessary in or near the Pilot Project area. The project office will be headed by a full-time project manager, together with personnel assigned to the Pilot Project by other participating government agencies and authorities. During the construction phase, the project office will include an engineering division, an agricultural division, an equipment division and an administration division, and the project manager will be a construction-oriented executive officer. During the agricultural development phase, the project office will include an engineering division, an extension & demonstration farm division, a farmers' organization & estate farm management division, an equipment division, and an administration division, and the project manager will be an operation-oriented executive officer. The project manager will be responsible for the overall implementation of the Pilot Project. He will also be charged with coordinating agricultural extension, agricultural research, marketing, credit, environmental problems, etc. with the participating government agencies and authorities through the local coordinating committee. Figs. V - 2 and 3 illustrate the organization charts in the construction phase and in the agricultural development phase respectively.

Fig. V-2

Organization Chart
(Construction phase)

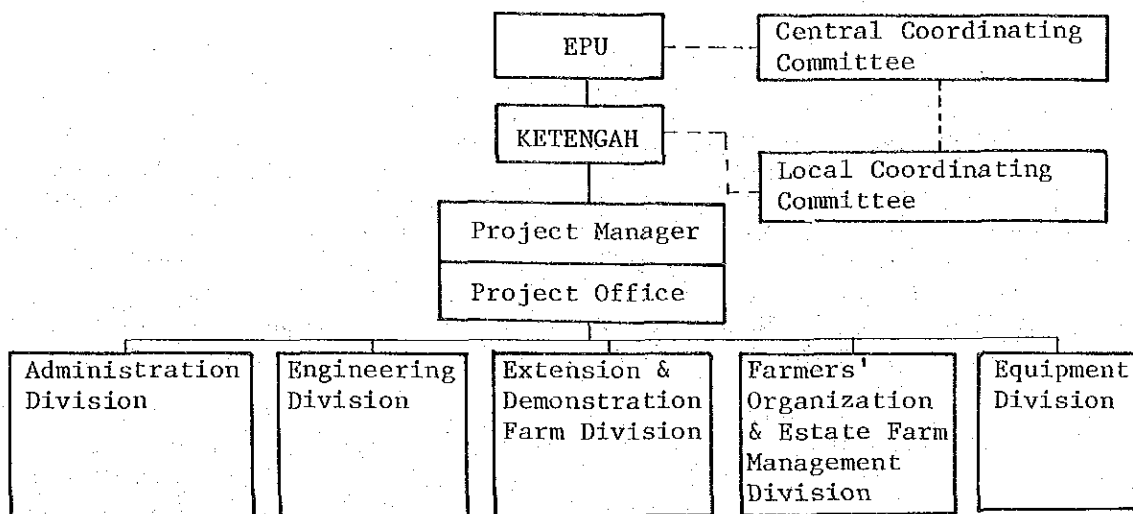


Remarks:

1. This phase is mainly the construction of the Pilot Project facilities. The project manager will be a construction-oriented executive officer.
2. Engineering division is responsible for survey design, cost estimate, right of way, supervision, force account, etc.
3. Agricultural division is responsible for demonstration farm operation, farmers' training, settlement, farmers' organization, estate farm management, etc.
4. Equipment division is responsible for equipment control and maintenance.
5. Administration division is responsible for personnel, accounting, property and office supply, etc.

Fig. V-3

Organization Chart
(Agricultural development phase)



Remarks:

1. This phase is mainly the implementation of the agricultural development programme. The project manager will be an agriculture-oriented executive officer.
2. Engineering division is responsible for operation and maintenance of irrigation and drainage systems and other minor engineering work.
3. Extension & demonstration farm division is responsible for the operation of demonstration farm and the integrated extension work to farm production.
4. Farmers' organization & estate farm management division is responsible for the establishment and the supervision of farmers' organization and estate farms.
5. Administration division is in charge of general administrative affairs and water charge collection.

B. Arrangements for Project Implementation

1. Construction Schedule

301. The construction schedule for the Pilot Project foresees work completion by December 1984, or about five years after the envisioned conclusion of a loan and technical assistance agreement. However, the major part of the work will have to be undertaken in the course of about four years since earth-moving work is generally possible only during the April-October off-season. The construction work will be executed by local and/or foreign contractors, who will be supervised by KETENGAH, and the Consultants; the latter will also train local staff in the execution and supervision of irrigation, drainage and other construction work. The construction schedule is shown in Fig. V-4.

302. The recruitment of consultants should take place as early as possible, preferably in 1979-80, since their services will be needed for the preparation of specifications and tender documents for procurement, the drawing up of tender and contract documents for construction work execution by local and/or foreign contractors and, simultaneously, for supplementary field surveys and detailed design work. All engineering design, supervision, operation, maintenance, training and extension guidance should be undertaken by the same consulting firm.

303. After deforestation in the limited part of the Pilot Project area as per the previous design, all construction work such as irrigation and drainage systems, roads, community centers, etc. will be executed through the year. It is expected that about 700 families of settlers will be settled on the basis of the migration plan which is to be established separately, about one-half of the arable area will be cultivated in the monsoon season of 1984, and the entire arable area of 5,688 acres (2,302 ha) from April 1985 onwards.

2. Land Acquisition

304. An assurance should be received from the Government that all land, rights-of-way and easements necessary for the implementation of the Pilot Project will be acquired by KETENGAH in time to avoid delay in the implementation of the Pilot Project.

3. Construction Equipment

305. A list of the construction machinery, equipment and materials required for Pilot Project implementation is shown in Table V-1. The construction machinery and equipment will be necessary at an early stage for the construction of the pumping station, canals, etc.

Fig. V-4

Construction Schedule

Work Items	1st Year	2nd Year	3rd Year	4th Year	5th Year
[Drainage]					
Driving channel	m	230			
Main drainage canal	"	5,655			
Secondary canal	"	23,250			
[Irrigation]					
Pipe line : Main	m	5,800			
" : Secondary	"	5,080			
Open canal : Secondary	"	5,600			
Irrigation pump	set	1			
[Road]					
Main road	m	6,910			
Secondary road	"	19,830			
District road	"	4,898			
Bridges, culverts	place	78			
[Demonstration farm]					
Site arrangement	ha	228.4			
Building and facilities	house	13			

Work Items	1st Year	2nd Year	3rd year	4th Year	5th Year
[Settlement]					
Site arrangement	ha	92.1			
Housing	house	705			
Public buildings	"	7			
[Land reclamation]					
Cutting	ha	2,066.7			
Transportation	"	2,066.7			
Uprooting	"	2,066.7			
Land clearing	"	2,066.7			
Land grading		337.8			
Farm road	"	2,158.5			
Farm drainage canal	"	2,158.5			

Table V - 1 List of Main Construction Machinery, Equipment and Materials

Item	Required Nos.	Remarks
Doser 11t	4	
Truck 4t	5	
Dump truck 6t	4	
Trailer truck 15t	1	
Road roller	1	
Tamping roller	1	
Truck shovel 0.4 m ³	2	
Generator 100 KW	2	
Air compressor 50 hp	1	
Water pump 1.0 cause	3	
- do - 0.5 cause	3	
Sludge pump	3	
Truck crane	1	
Meter scraper	2	
Well point pumps ϕ 50	6	
Welding equipment, diesel	2	
Rammer	10	
Scrapedoser	2	
Backhoe 0.4 m ³	3	
Rake doser 15 ton	12	
Tractor 6 ton	10	
Lime sower	4	
Disk harrow	6	
Irrigation pump ϕ 600	1	
Generator 700kW	1	

C. Procurement

1. Equipment and Materials

306. KETENGAH, the principal Executing Agency, will be responsible for the procurement of all equipment and materials required under the Pilot Project. The equipment, however, such as construction machinery, pumps, steel gates, steel sheet piles, etc. will be subject to international competitive bidding or internationally authorized guidelines for procurement.

2. Civil Works

307. The civil works of the Pilot Project are simple and distributed over a large area except for soil improvement. Following the established practice of KETENGAH, the civil works contract might be not of interest to international contractors; moreover, local contractors are considered already well experienced in such contracts. All the civil works contracts will be awarded to prequalified contractors through competitive bidding in accordance with KETENGAH procedures which will be satisfactory to any international development bank or other relevant body.

3. Consulting Services

308. Due to the inadequate number of experienced technical personnel in KETENGAH to undertake implementation, a total of 139 man-months of foreign consulting services will be needed. Fourteen months of these will be for detailed design and 125 man-months for the supervision of Pilot Project implementation. The required consulting experts will be: a team leader (irrigation engineer), a design engineer, a mechanical engineer, a construction engineer, a soil scientist, an electrical engineer, an agronomist, an agro-economist and an institutional expert.

309. In general terms of reference, the consultants will be needed to assist KETENGAH in preparing detailed designs and tender documents, monitoring agricultural developments and in supervising the project implementation. Detailed terms of reference for consultants and the criteria for selection will be prepared by KETENGAH for the review and concurrence of any international development bank or other relevant body.

310. The foreign consultants will work in association with local consultants engaged by KETENGAH. The local consultants will be employed to carry out survey, investigation and design work prior to the foreign consultants' arrival. They will also support the foreign consultants in preparing tender and contract documents, and in the supervision of effective project implementation.

4. Agricultural Development Phase

311. During the construction phase, agricultural support services to new settlers will be provided in those areas with a ready supply of irrigation water. However, in order to ensure that full benefits of the Pilot Project can be realized as early as possible, it will be necessary to make further appropriate arrangements for support services for a period of not less than five years after completion of the construction phase of the Pilot Project in due consideration of the heavy clay soil as well as peat soil improvement. This period is referred to as the agricultural development phase. A specific action programme for agricultural development acceptable to any international development bank or other relevant body is to be prepared by the end of 1980 by KETENGAH in consultation with other government agencies concerned. The programme, among other things, is to cover arrangements for extension services, marketing, credit, farmers' organization, operation and maintenance of facilities, water charges and especially peat soil and heavy clay soil improvement.

5. Operation and Maintenance

312. After completion of the Pilot Project, the regulation and control of irrigation water will become the responsibility of an Irrigation Association which, if feasible, will form part of multipurpose farmers' cooperative covering the entire Pilot Project area. In this way, administrative and operating expenses can be greatly reduced and the collection of water charges simplified.

313. At the project level there will be a Central Irrigation Association. This association will appoint a permanent staff, headed by a Project Water Master who will be assisted by two technical personnel, four assisting and one administrative personnel.

314. The Pilot Project area will be divided into four sub-areas and at the sub-area level, actual water regulation and distribution will be managed by a sub-area water master or common irrigator. He will be assisted by technical personnel and experts from the demonstration farm to be established in the community center. The sub-area water master will work under the guidance of the Central Water Master and will be responsible for all installations situated in a sub-area.

315. Each sub-area will be further divided into units or blocks and each of these will be under the control of a block master assisted by 3-4 technical assistants. The block master will be responsible for:

- a. Operation and maintenance of all installations with the block.
- b. Collection of water charges

6. Water Charges

316. After completion of the Pilot Project, both small-scale paddy farmers and estate farms will have to pay water charges which will cover fully all operation and maintenance costs. Annual operation and maintenance costs are roughly estimated to be M\$28 per acre (M\$70 per ha) on an average.

317. In accordance with one of the agricultural policies provided by the Government of Malaysia, estate farms will also be required to repay the development cost besides water charges mentioned above. Small-scale paddy farmers as an individual basis are not required to repay such a development cost.

318. Paying of water charges for operation and maintenance costs will be commenced on and after the season when irrigation water is first supplied.

319. It is proposed that the collection of water charges be made one of the responsibilities of the union covered by the Pilot Project. A confederation of the union heads might be required to centralize control of the collection of these charges.

**VI. ECONOMIC JUSTIFICATION AND
FINANCIAL ANALYSIS**



VI. ECONOMIC JUSTIFICATION AND FINANCIAL ANALYSIS

A. General

320. The proposed Pilot Project aims to create both agricultural production and employment opportunities through the provision of irrigation and drainage facilities examining ways in which the multifarious development plan is needed. The investment in the Pilot Project area is justifiable in terms of the net value that will be added to the national economy, the benefits to farm families (settlers' families), estate farms and other socio-economic benefits though any additional public investment is specially desirable.

B. Economic Justification

1. Economic Costs and Benefits

321. The economic costs of the Pilot Project are estimated at M\$23,340,000 for the first phase at October 1977 prices in which allowance for price escalation is not included. Operation and maintenance costs (M\$80,000 per year from 1987/88 onwards) during the estimated project life (50 years) are also included.

322. The major tangible benefits to evolve from the Pilot Project will be a substantial paddy, upland crop and livestock production, and the resulting income and employment opportunities for more than 700 settlers families and seasonal laborers. The economic benefits attributable to the Pilot Project area are mainly in the form of incremental agricultural production including livestock less incremental costs, both of which are calculated on the basis of economic value from the viewpoint of the national economy. The creation in agricultural production will be mainly due to: (i) application of the cropping patterns with more than 170% of cropping intensity for paddy cultivation farm, and 100% for upland crop estate farm at full development; and (ii) expectation of higher annual average yields of paddy (1.4 - 1.5 tons per acre) resulting in a paddy production of about 1,600 tons per year when the Pilot Project area is fully developed in 1991/92 and onwards. The Pilot Project will, when fully developed, generate incremental net benefits of M\$4,608,000 per year including incomes derived from the other crop production and livestock rearing.

2. Economic Internal Rate of Return

323. On the basis of the economic costs and the direct tangible economic benefits from crop and livestock production mentioned above, the economic internal rate of return (EIRR) for the Pilot Project has been calculated at 16.5%^{1/}. The EIRR has been calculated on the basic assumptions of: (i) a Pilot Project price of M\$528 per ton for the improved variety of paddy based on the IBRD projection prices, and M\$470 per ton for the local variety of paddy, (ii) an average yield of 1.44 tons per crop per acre for improved paddy (main season) and 1.52 tons per crop per acre for improved paddy (off-season), (iii) an agricultural development period of seven years after completion of the Pilot Project in due consideration of swamp area development, (iv) a Pilot Project economic life of 50 years, and (v) a cropping intensity of more than 170%. In general, these assumptions are considered to be on the conservative side. Sensitivity tests conducted for a variety of circumstances show that the Pilot Project would be still economically justifiable.

The results are:

<u>Case</u>	<u>EIRR</u> <u>(%)</u>
i. Reduction in improved paddy price from M\$528 per ton to M\$475 per ton, and in local paddy price from M\$470 per ton to M\$423 per ton.	17.1
ii. Cost over-run of 5%	15.8
iii. Delay in completion by one year	14.9
iv. Combination of ii. and iii. above	13.8

3. Income to Small-Scale Farmers and Estate Farm

3.1 Small-scale farmers' income

324. From the viewpoint of small-scale farmers as individual settlers, the Pilot Project will generate a significant income for all of settlers. The majority of these proposed settlers are very poor and are unable to earn sufficient income to support even a low standard of living. Income to farm households includes the net value of crops produced and off-farm income from paddy processing, fishing, water buffalo rearing, etc. By utilizing irrigation facilities efficiently, combined with improved farming practices, a settler managing an average of 5 acres including 0.15 acre of his homestead will be able to create a gross farm income of M\$13,171 per annum even if the income is limited to that from crop production only.

^{1/}: Refer to Tables VI-4 and 5.

3.2 Income to Estate Farm

325. As described previously, in the Pilot Project area two kinds of estate farms will be established, namely livestock estate farm and upland crop estate farm. The revenue for these estate farms consists of income from selling the products. Assuming that selling prices of the products are appropriate, the expected annual revenues of respective estate farms are estimated at M\$4,434,000 and M\$1,206,000 in total after full development.

4. Socio-Economic Impact

4.1 General

326. In addition to creating agricultural production which will help achieve self-sufficiency in rice and the crop diversification for the nation, the Pilot Project will have a significant socio-economic impact on employment, environment and other direct benefits as below.

4.2 Employment opportunities

327. The population in the Pilot Project area will benefit directly from the creation of employment opportunities in agriculture, transportation and marketing even during the construction period. Created production will result from the intensive agricultural land use. The agricultural labor requirements will increase gradually in parallel with development, and will reach more than 90 thousand man-days annually at full development. While much of the increased farm labor requirements will come from the seasonal laborers living in the surrounding area who are under-employed, such laborers will also benefit significantly by the creation of more jobs. Employment opportunities in marketing and transport will also increase significantly as a result of the increased paddy and upland crop production and livestock rearing. It should be noted that immediately after deforestation in the Pilot Project area, employment opportunities will significantly increase.

5. Environmental Impact

328. The Pilot Project will enhance the environment of the Pilot Project area by flood protection and improvement of land drainage. Completion of the engineering works will result in improved living conditions, village activities, road systems and fishing areas which will be able to be utilized year round.

6. Other Indirect Benefits

329. The Pilot Project will also generate other indirect benefits such as possible expansion of agro-based industries like rice-milling, bran oil extraction, etc. Increased availability of farm by-products such as bran, broken rice and straw will also encourage settlers to provide more adequate sustenance for their draft animals, which in turn will result on more efficient draft cultivation at the initial stage of agricultural development.

330. In the meantime, it is considered the emphasis should be given to the demonstration effect on swamp area agricultural development. As mentioned previously, swamp area agricultural development is one of the most important tasks of Malaysia. Of the potential agricultural land of about 520,000 acres (210,000 ha) in the whole area of Trengganu Tengah, Trengganu State, about 73,000 acres (29,500 ha) or 14% are inland swamp areas which are at present permanently waterlogged and generally overlaid with varying depths of peat. Development planning for such swamp areas has already been tried by foreign consultants as well as the Government of Malaysia itself. As for inland swamp areas like the Bukit Bauk area, however, study has never been attempted due to the lower possibility of development.

According to the feasibility study, it is undoubtedly expected that such swamp area development could be achieved by the full utilisation of many experiences in similar swamp area development projects in the world as well as in Japan. Realization of the Pilot Project will provide useful swamp development guidelines for identification of the swamp areas in other parts of the country.

C. FINANCIAL ANALYSIS

1. General

Financial analysis of the Pilot Project area is conducted from the viewpoint of small-scale paddy cultivation farmers as well as estate farms. With regard to small-scale farmers, typical farm budget is analyzed, and as for estate farms, the productivity is studied on the basis of the expected revenue and the operation cost.

2. Analysis for Small-Scale Paddy Cultivation Farmers

2.1 Gross return

With irrigation and drainage, the annual gross return in farm production by the farmer is expected to increase due to increase in unit yield of crop year by year. The return will be at its maximum starting from the seventh year and onwards after irrigation farming has commenced.

Actual gross return from crop products on a standard farm of 5 acres (2 ha) including 0.15 acre of his homestead on and after the seventh year of irrigation farming by rotation is estimated to be as shown in the following table.

Table VI-1 Annual Gross Return from Crop Products on a Standard Farm of 5 Acres (2 Ha) Including his Homestead of 0.15 Acre on and after the Seventh Year of Irrigation Farming Onwards 1/

Kind of Crop Product	Acreage (acre)	Unit Yield (ton/acre)	Total Yield (ton)	Unit Price (M\$/ton)	Total Value (M\$)
<u>Paddy</u>					
Improved (main season)	2	1.44	2.88	480	1,382
- do - (off-season)	3	1.52	4.56	480	2,189
Local (main season)	1	1.0	1.0	450	450
<u>Upland Crops</u> 2/					
Chillies	1	8.0	8.0	850	6,800
Fruits (Rambutan)	0.35				1,050
Other vegetables	1	4.0	2.0	700	1,400
Total	8.35				13,171

(Cropping intensity: 172%)

2.2 Farming expenditure

On the standard irrigation farm, farming practices such as the effective application of fertilizers and agro-chemicals, efficient use of farm implements, successive introduction of improved varieties and others should be carried out for profitable farm management.

Accordingly, the funds needed for the performance of such activities will necessarily be more when compared to those needed for primitive methods.

Farming expenditures increases with the advance of irrigation farming and is at a maximum on and after seventh year of irrigation farming. The outlines of the estimated farming expenditures are listed on the next page.

1/: Refer to the Cropping Pattern -Type 1- illustrated in Fig. IV-2, THE PILOT PROJECT of the MAIN REPORT.

2/: Kinds of crops were presented as representatives among various crops.

Annual Farming Expenditures on a Standard Farm
(5 Acres) on and after the Seventh Year of
Irrigation Farming Onwards

Expense Item	Amount (M\$)
Crop operation cost ^{1/} (Crop input cost)	7,164
(Labor cost including family labor force)	3,400
	3,764
Overheads ^{2/}	4,112
Total	11,276

2.3 Annual returns and expenditure budget

The annual net return on the "capacity to pay" can be estimated by deducting the annual expenditure from the annual gross returns derived from crop products as below:

Annual Budget on a Standard Farm (5 Acre)
on and after the Seventh Year of Irrigation
Farming Onwards

Item	Amount (M\$)
Gross return (A)	13,171
Expense (B)	11,276
Net return (A - B)	1,895

2.4 Net return

From the above net return, the farmers pay the annual water charge which is estimated at M\$135 per farmer. Therefore, he can still reserve nearly M\$1,700 even after payment.

1/: Labor charge was estimated at M\$7 per head on an average.

2/: Including taxes, expenses for clothes, housing, electricity, communication, education, medical treatment, etc.

3. Analysis for Estate Farms

3.1 Revenue

339. The revenues of the estate farms consists of income from selling the products. Assuming that selling prices of the upland crops, livestock products and fruits are adequate as shown in the below table, the expected annual revenues of the estate farms are estimated at M\$4,434,000 for the upland crop estate farm and at M\$1,206,000 for the livestock estate farm at the maximum starting from the seventh year after completion of the Pilot Project.

<u>Item</u>	<u>Selling Price</u>	<u>Item</u>	<u>Selling Price</u>
	(M\$/ton)		(M\$/ton)
Pineapple	500	Onion	700
Watermelon	300	Oxen beef	5,800
Tomato	700	Buffalo beef	5,620
Chillies	850		

340. The operation cost for the estate farms includes the production cost, depreciation cost for equipment and building facilities, and operation and maintenance cost for various facilities. The estimated annual operation costs of the estate farms are estimated at M\$3,046,000 for the upland crop estate farm and at M\$700,000 for the livestock estate farm at the maximum starting from the seventh year after completion of the Pilot Project.

341. Net profits of the estate farms are, thus, calculated at M\$1,388,000 for the upland crop estate farm and M\$506,000 for the livestock estate farm. From the net profit, salary for staff, fees for employees, repayment charge for the development cost, taxes, etc. will be paid. The annual budgets for estate farms are shown in the following tables.

Reamrks: Estimated as financial prices based on figures shown in "Commodity Bulletin", Vol. IX, No.10 published by Federal Agricultural Marketing Authority in 1979.

Table VI-2 Project Revenue and Cost for
Upland Crop Estate Farm

Item	Annual Amount
	(M\$ '000)
1. Revenue	
1) Selling of crop products	
Pineapple M\$5,264/farm x 324.7 farm ^{5/}	1,709
Vegetables M\$6,700/farm x 324.7 farm	2,175
2) Selling of processed products	550
Total	4,434
2. Operation cost	
1) Production cost	
Farm inputs ^{4/} M\$4,100/farm x 324.7 farm	1,331
Farm machinery cost	450
Cannery, storage, etc.	320
Depreciation cost ^{1/}	530
Sub-total	2,631
2) O & M cost ^{2/}	415
Total	3,046
3. Net Profit ^{3/}	1,388

^{1/}: Including the depreciation cost for farm machinery, cannery, storage and office buildings.

^{2/}: Consists of O & M costs for farm machinery, cannery, storage, office buildings.

^{3/}: From the net profit, salary for staff, fee for employees, repayment charge for the development cost, water charge, taxes, etc. will be paid.

^{4/}: Excluding employees' fee, salary, etc.

^{5/}: Number of farm units.

Table VI-3 Project Revenue and Cost for
Livestock Estate Farm

Item	Annual Amount
	(M\$ '000)
1. Revenue	
1) Selling of beef	
Oxen beef 122.58 x M\$5,800	711
Buffalo beef 26.61 x M\$5,620	150
2) Selling fruits	145
3) Selling by-products	110
4) Selling calves	90
Total	1,206
2. Operation Cost	
1) Production cost	
Farm inputs ^{4/} 2,158 acre x M\$70/acre	150
Farm machinery cost	70
Slaughterhouse, storage, etc.	110
Depreciation cost ^{1/}	130
Sub-total	460
2) O & M cost ^{2/}	180
3) Purchasing cost of feed	60
Total	700
3. Net Profit ^{3/}	506

1/: Including the depreciation cost for farm machineries, slaughterhouse, storage and office buildings.

2/: Consists of O & M costs for farm machinery, slaughterhouse, storage, office buildings.

3/: From the net profit, salary for staff, fee for employees, repayment charge for the development cost, taxes, etc. will be paid.

4/: Excluding employees' fee, salary, etc.

Table VI-4 Income^{a/} With and Without the Pilot Project

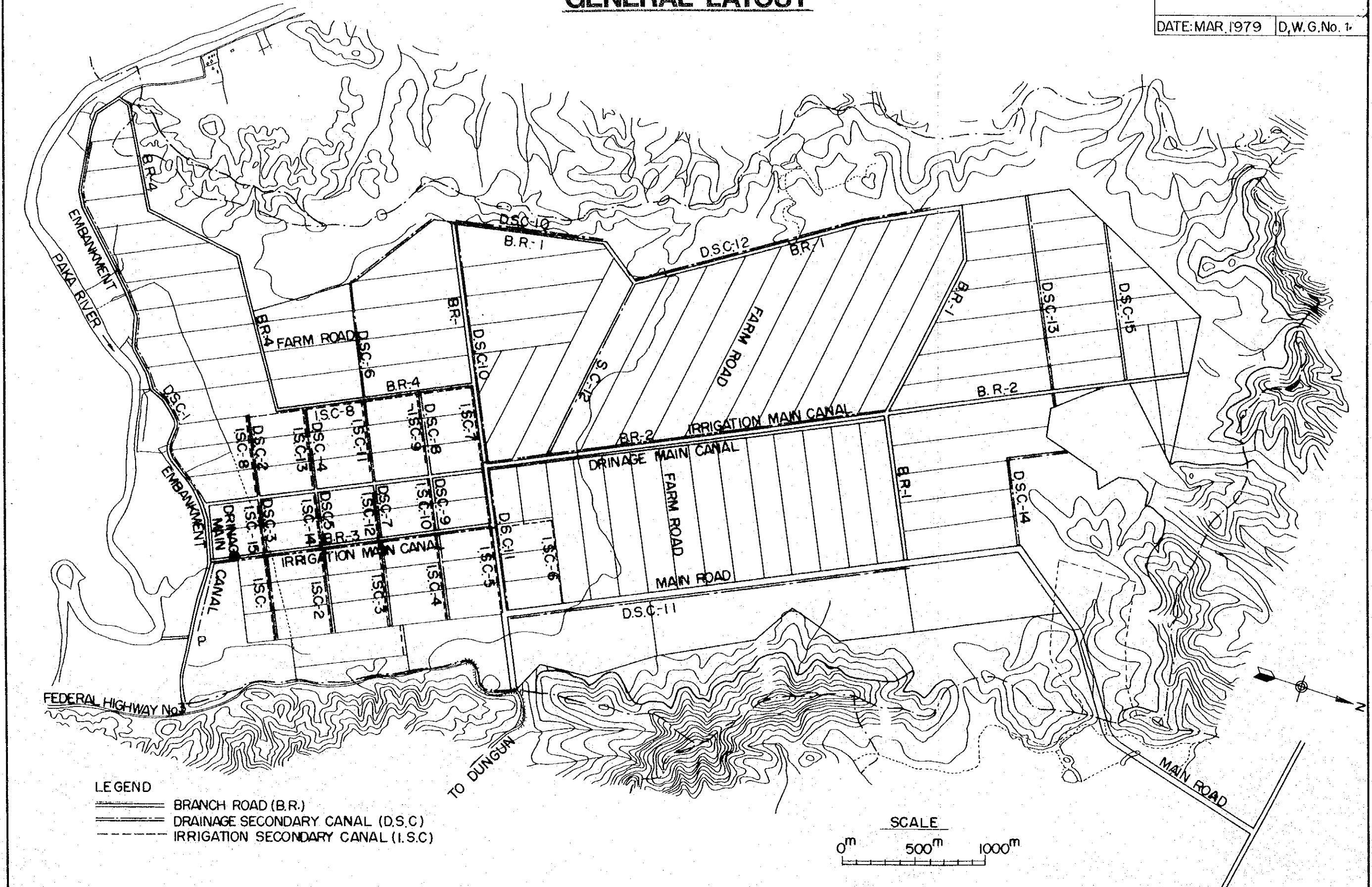
No.	Year	Without Pilot Project				With Pilot Project			Difference
		Income (M\$ '000)	Income (M\$ '000)	Income (M\$ '000)	Income (M\$ '000)	Paddy Cultivation Farm	Upland Crop Estate Farm	Livestock Estate Farm ^{b/}	
1.	1980/81	0	0	0	0	0	0	0	0
2.	1981/82	0	0	0	0	0	0	0	0
3.	1982/83	0	0	0	0	0	0	0	0
4.	1983/84	0	712	1,688	0	2,400	0	2,400	2,400
5.	1984/85	0	768	1,818	49	1,635	49	1,635	2,635
6.	1985/86	0	839	1,948	49	2,835	49	2,835	2,836
7.	1986/87	0	925	2,078	138	3,141	138	3,141	3,141
8.	1987/88	0	1,025	2,156	469	3,650	469	3,650	3,650
9.	1989/90	0	1,124	2,363	588	4,025	588	4,025	4,025
10.	1989/90	0	1,224	2,363	588	4,175	588	4,175	4,175
11.	1990/91	0	1,338	2,493	588	4,419	588	4,419	4,419
12.	1991/92	0	1,423	2,597	588	4,608	588	4,608	4,608
55.	2030/31	0	1,423	2,597	588	4,608	588	4,608	4,608

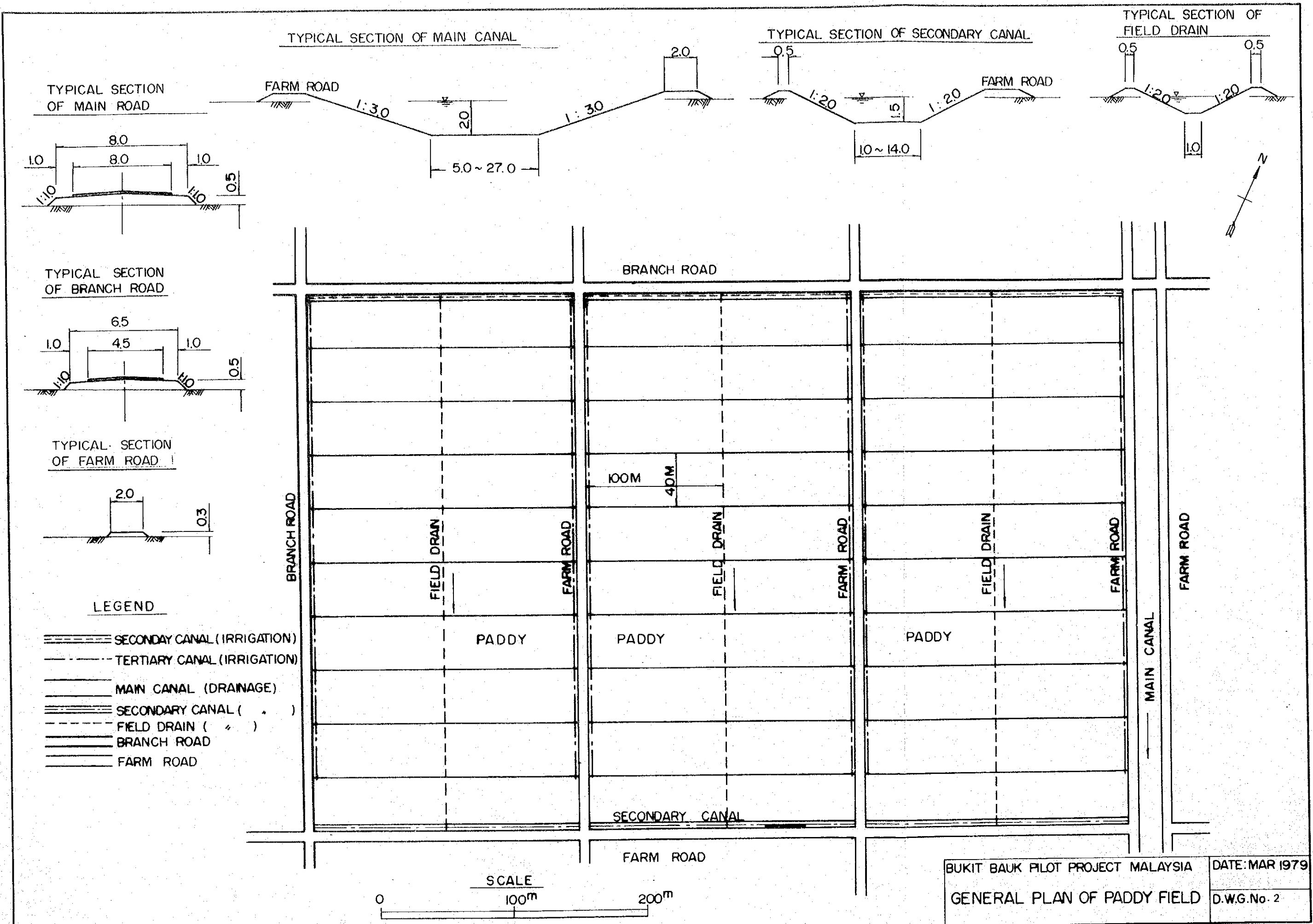
a/: Incomes here represent value net from production cost.

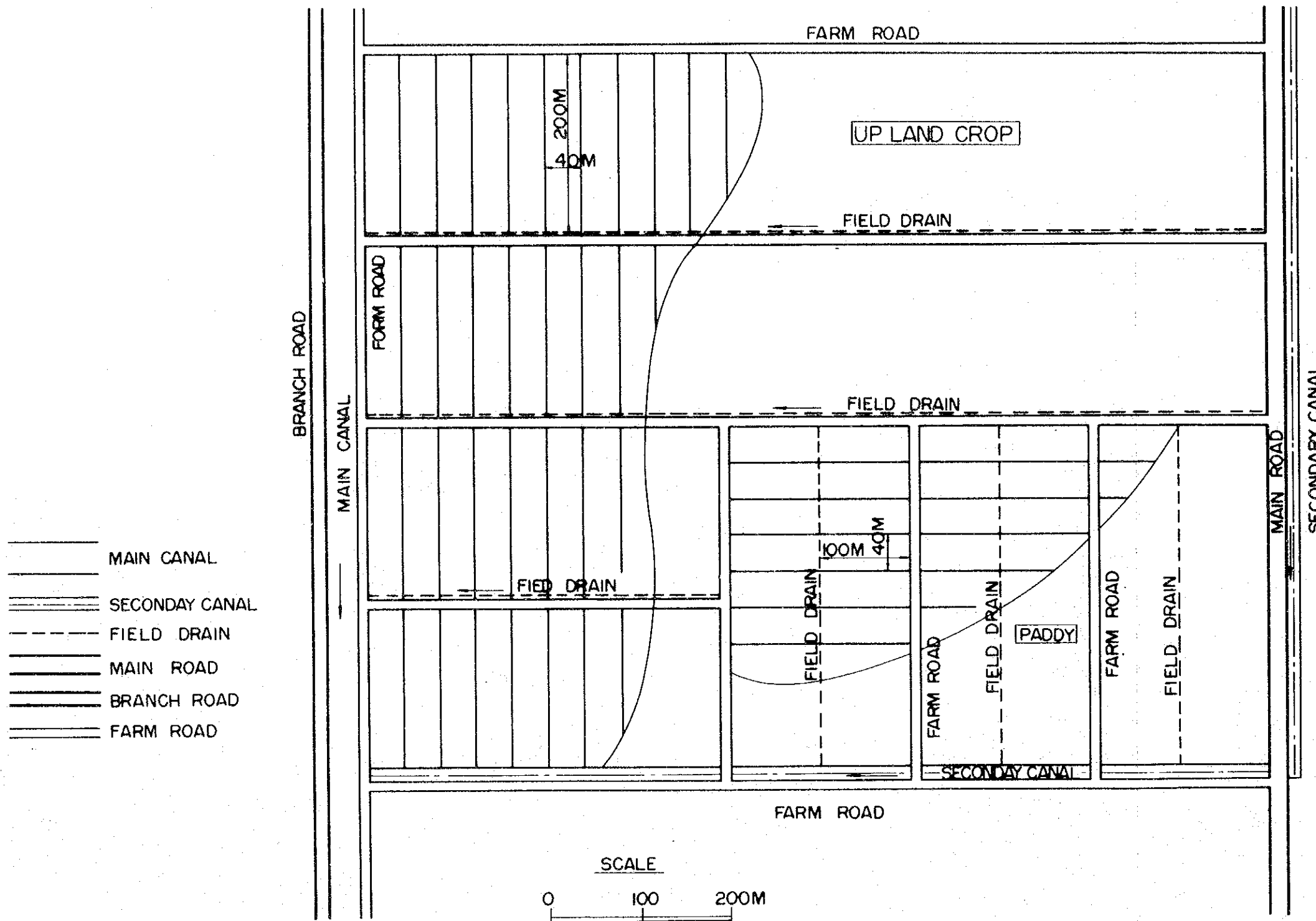
Incomes derived from fisheries development, deforestation are not included.

b/: Excluding incomes derived from by-products and long-term crops like papaya.

GENERAL LAYOUT

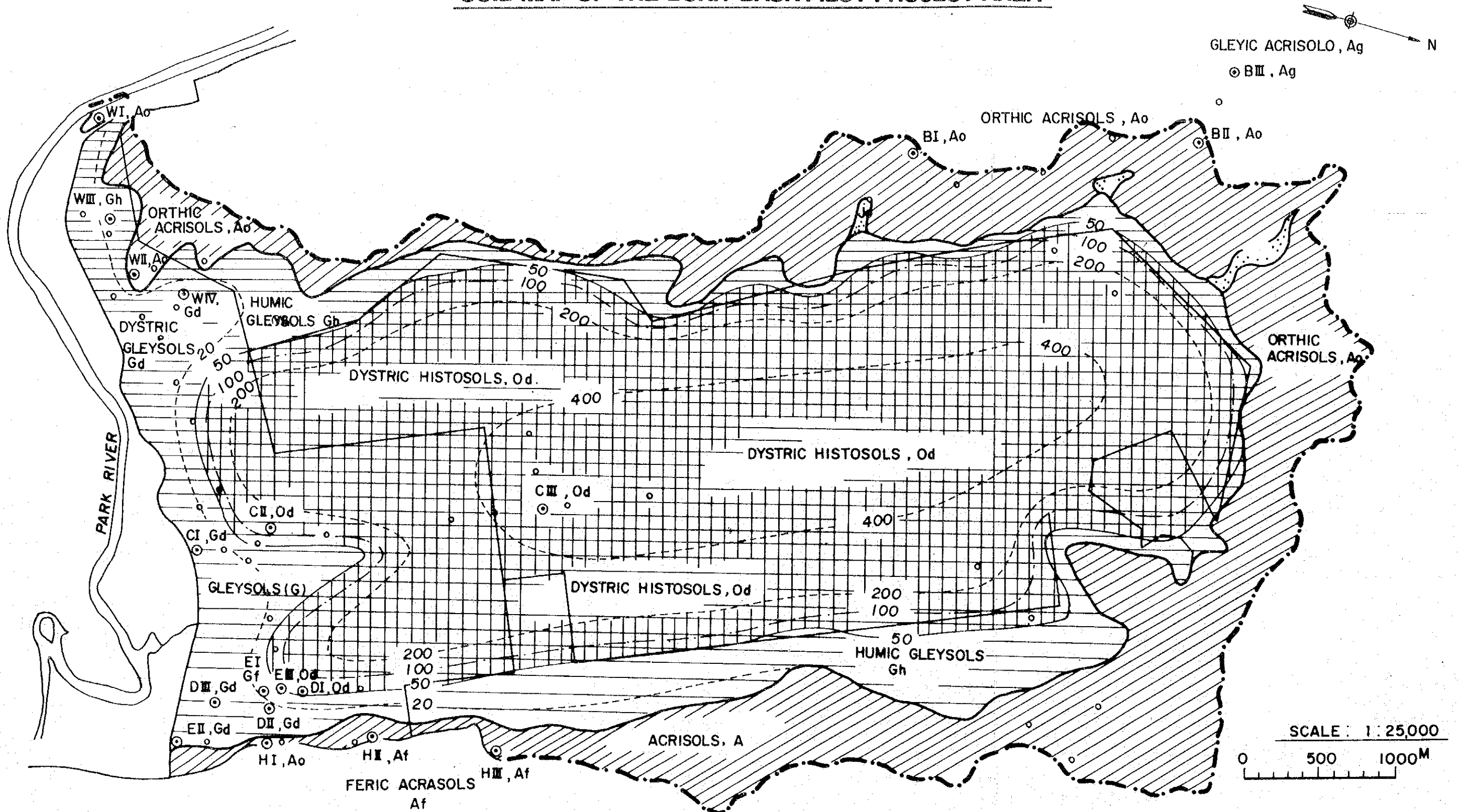




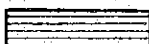
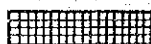

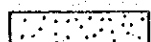


BUKIT BAUK PILOT PROJECT
MALAYSIA
GENERAL PLAN OF
UPLAND CROPS
DATE: MAR.1979 | D.W.G.No. 3

SOIL MAP OF THE BUKIT BAUK PILOT PROJECT AREA



LEGEND

1.  GLEYSOLS (G)  HISTOSOLS (O) 2. SUFFIX : d : DYSTRIC , f : FERRIC , h : HUMIC
-  ACRISOLS (A)  FLUVISOLS (J) g : GLEYIC , o : ORTHIC
3. NUMERICAL NUMBERS REPRESENT THE THICKNESS OF PEAT LAYER
4. ⊙ PITS ○ SITES OF BORING STICK SERVEY
5. — ROAD ~ RIVER - - - BOUNDARY

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