Report No. 314a-MA

Malaysia
Appraisal of the Western Johore Agricultural Development Project

February 22, 1974

Irrigation and Area Development Division I
Asia Projects Department

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CURRENCY EQUIVALENTS

Currency Unit	=	Malaysian Dollar (M$)
US$1	=	M$ 2.33 /1
M$ 1	=	US$0.4292
M$ 1 million	=	US$429,200

WEIGHTS AND MEASURES

1 acre (ac)	=	0.405 hectare (ha)
1 mile (mi)	=	1.609 kilometer (km)
1 sq mile (sq mi)	=	640 ac
1 ton = 2240 pound (lb)	=	1000 kilograms (kg) (approx.)

ABBREVIATIONS

AA	=	Agricultural Assistant
ADC	=	Agricultural Development Center
AO	=	Agricultural Officer
BPM	=	Bank Pertanian Malaysia (Agricultural Bank)
DID	=	Drainage and Irrigation Department
DOA	=	Department of Agriculture
FA	=	Farmers' Association
FAMA	=	Federal Agricultural Marketing Authority
FELDA	=	Federal Land Development Authority
FFB	=	Fresh Fruit Bunches (Oil Palm)
FO	=	Farmers' Organization
FOA	=	Farmers' Organization Authority
GNP	=	Gross National Product
ICB	=	International Competitive Bidding
JAA	=	Junior Agricultural Assistant
MARDI	=	Malaysian Agricultural Research and Development Institute
MPIB	=	Malaysian Pineapple Industry Board
MRDC	=	Malaysian Rubber Development Corporation
MSL	=	Mean Sea Level
O&M	=	Operation and Maintenance
PIMC	=	Pineapple Industry Marketing Corporation
RISDA	=	Rubber Industry Smallholders' Development Authority
RRIM	=	Rubber Research Institute of Malaysia
Sg	=	Sungei (River)

GLOSSARY

Kampong	= Village
Ketua Kampong	= Village Head
Mukim	= Sub-district
Pengulu	= Sub-district Chief
Sungei	= River

/1 From June 21, 1973, the Malaysian dollar has floated in relation to the US dollar.

NOTATION

--	less than half the smallest unit shown
-	nil or negligible
...	not available separately but included in total
..	not available
.	not applicable

Malaysian Fiscal Year

January 1st to December 31st

MALAYSIA

APPRAISAL OF THE WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

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This report is based on the findings of an appraisal mission, composed of Messrs. H. J. Tennent, P. W. Whitford (Bank) and R. Shepherd (Consultant).

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SUMMARY AND CONCLUSIONS

i. The proposed project is the first large scale integrated agricultural and engineering scheme to raise incomes of existing tree crop smallholders in Peninsular Malaysia. Several drainage schemes have been completed in the past along the West Coast of Johore, but none has included sufficient agricultural supporting services. The Government's new economic policy aims to increase income and employment opportunities of the unemployed and underemployed. Previous efforts have concentrated on land settlement and paddy schemes. This project would directly benefit rural coconut and rubber smallholders by providing drainage and diversifying from rubber into oil palm as well as inter-cropping coconuts with other crops. Moreover, the project would increase the cultivated area by more than 50,000 ac and enable planting of remunerative cash crops on peat soils.

ii. The project, covering 330,000 ac, consists of (a) a coastal enbankment to prevent salt water intrusion; (b) improvements to existing river channels and drains, and provision of new drains to improve drainage conditions and open up new land; (c) provision of new feeder and on-farm drains and roads; (d) agricultural development centers, agricultural headquarters and experimental stations; (e) processing plants for crops; and (f) equipment for agricultural development as well as operation and maintenance. Funds would also be provided under the project to finance feasibility studies for a second phase.

iii. Total costs of the proposed project are US$100 million (M$ 233 million). The Bank proposes to finance the foreign exchange component, which is estimated to be US$45 million (M$ 105 million) or 45% of total cost. Civil works contracts (US$36.8 million) and equipment contracts (US$4.8 million) would be awarded after international competitive bidding in accordance with Bank guidelines. Agricultural buildings and processing plants (US$3.1 million) would be awarded on the basis of local competitive bidding as they are small and scattered. Feeder drains (US$6.2 million), which are individually very small and are scattered in space and time would be carried out through rural works contracts at fixed unit rates set annually by Government. Physical and price contingencies of US$30.9 million (M$ 72.0 million) are included. Costs of engineering and supervision by the Drainage and Irrigation Department, replanting, operation and maintenance, and agricultural services during construction have been included in the project cost. Construction is scheduled to take five years.

iv. A Special Division would be established within the Ministry of Agriculture to direct and coordinate the activities of all the Government agencies concerned with the project. The establishment of this Division would be a condition of loan effectiveness.

v. The economic rate of return of the proposed project is 15%. Some 200,000 rural smallholders, made up of about 30,000 farm families, would benefit from the project. Average incomes per farm throughout the area would increase from M$ 2,100 per year to M$ 3,700 in 1983 and M$ 4,800 in 2003.

vi. This would be the eighth agricultural or forestry project financed by the Bank in Malaysia. Previous land settlement projects include three loans for the Jengka Triangle Program (Loans 533-MA, US$14.0 million; 672-MA US$13.0 million; and 855-MA US$25.0 million) approved in 1968, 1970 and 1973. The other projects are: a forestry project (Loan 673-MA US$8.5 million, 1970) and two irrigation projects - Muda (Loan 434 MA US$45 million, 1966) and Kemubu (Loan 500-MA, US$10.0 million, 1967). All projects are progressing satisfactorily. The Johore Land Settlement Project was negotiated and approved in February 1974.

vii. Subject to appropriate assurances, the proposed project is suitable for a Bank Loan of US$45 million for a term of 25 years with six years grace. The borrower would be the Federation of Malaysia.

MALAYSIA

APPRAISAL OF THE WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

I. INTRODUCTION

1.01 The Government of Malaysia has requested Bank assistance in financing the construction of the Western Johore Agricultural Development Project, which consists of drainage works, coastal embankments and supporting agricultural services. This would be the eighth Bank Group operation in support of agricultural development in Malaysia.

1.02 The project was prepared by the Ministry of Agriculture and Fisheries. This report is based on the findings of an appraisal mission which visited Malaysia in July/August, 1973, comprising Messrs. H.J. Tennent, P.W. Whitford (Bank), and R. Shepherd (Consultant) and was assisted by Mr. Affifudin bin Haji Omar (Consultant) in the field.

II. BACKGROUND

General

2.01 While Malaysia covers about 128,000 square miles, less than one-fourth of Peninsular Malaysia and only about 3% of Sarawak and Sabah are under cultivation. Tropical rain forest covers most of the remaining area. The climate is characterized by uniformly warm to hot temperatures and abundant rainfall.

2.02 Population in 1972 was estimated at 11.4 million, and growing at 2.7% a year. About 85% of the people live in Peninsular Malaysia with the highest densities on the coastal strip and foothills of the west coast and in the south. Malays account for about 53% of the population, Chinese 35%, Indians 11% and others 1%.

2.03 The economy is export-oriented. In 1972, exports accounted for almost 40% of GNP, principally rubber, US$558 million, tin, US$397 million, timber, US$372 million and palm oil, US$155 million. Real GNP at market prices grew at an average yearly rate of 6% during the last decade and amounted to about US$5.7 billion in 1972. Average real GNP per capita, which grew at about 3.0% yearly during the 1960s, was about US$400 in Malaysia in 1970, but much less in the rural areas. During the 1960s, consumer prices rose by about 1% yearly on the average. During 1972-73, however, price increases accelerated to about 5% yearly, mainly as a result of sharp increases in import prices. Further rapid inflation and increase in export prices occurred at the end of 1973.

2.04 Wide disparities in income and ownership of assets reflect ethnic imbalances. Malays have lower incomes than non-Malays. Much of this income imbalance arises because nearly 80% of Malay employment is in the rural sector compared with slightly more than 50% for the non-Malay. But even within the rural sector, Malay incomes are generally much lower. More than half of the total Malay labor force is engaged in traditional low income smallholder agriculture compared to 14% of the non-Malay labor force. In the rubber smallholder sector, Malays outnumber non-Malays by 2 to 1. The average size of non-Malay holdings of 8.3 acres is almost twice that of Malays. The dissatisfaction with the distribution of benefits of economic growth and with growing racial income inequalities provides the basis for the New Economic Policy. Two of the major aims of this policy which are expressed in the Second Malaysian Plan 1971-75 are: (a) to reduce poverty by raising income levels and increasing employment opportunities for all Malaysians, irrespective of race; and (b) to accelerate the process of restructuring Malaysian society to correct economic imbalances so as to reduce, and eventually eliminate, the identification of race with economic function. One of the results of the policy is the increasing attention given to raising rural incomes, especially those of smallholders.

Agricultural Sector Policies

2.05 The agricultural sector holds a pre-eminent position in the Malaysian economy. In 1972 it generated around 30% of gross domestic product, provided employment for over 50% of the economically active population and accounted for about 60% of Malaysia's foreign exchange earnings. Expansion of rubber exports in the 1960's, in the face of declining prices, was achieved by large gains in productivity. At the same time, crop diversification, mainly to oil palm, was vigorously encouraged and has resulted in Malaysia becoming the world's largest producer of palm oil. Rice production has been increased by half through the provision of irrigation, and Malaysia is now nearing self-sufficiency in rice. Malaysia is second only to Taiwan as an exporter of pineapple but is finding it increasingly difficult to maintain her share of the market (para 6.07). Other major crops, such as coconut, coffee, cocoa, fruits and vegetables, are grown mainly for internal consumption.

2.06 The agricultural population includes some of the most economically and socially depressed sectors of the Malaysian community. Coconut and rubber smallholders are particularly depressed. Government's major agricultural policy thrust has been to develop new land for settlement of landless laborers and marginal farmers. Related programs have been mainly carried out by the Federal Land Development Authority (FELDA) and Bank finance has assisted several major projects, namely: Jengka I (Loan 533-MA); Jengka II (Loan 672-MA); Jengka III (Loan 885-MA); and Johore Tenggara approved in February 1974. Other land settlement programs for marginal smallholders are being undertaken by the Rubber Industry Smallholders Development Authority (RISDA). This, however, takes time and cannot alone alleviate rural poverty throughout Malaysia. Government policy has therefore tackled two other major sectoral programs:

(a) Paddy Farming. Irrigation systems have been constructed for a number of major smallholder paddy producing areas. One of these was the Muda Irrigation Project (Loan 434-MA), which has been notably successful in introducing double-cropping and improving yields. Another major paddy project is the Kemubu Irrigation Project (Loan 500-MA). The successful programs for extension and credit development on these projects provide a useful model for the present project;

(b) Smallholder Development. The remaining major need is for physical infrastructure and agricultural supporting services to improve incomes on existing smallholdings. Efforts in the past have concentrated on infrastructure, such as drainage (para 3.01), but the proposed project would be the first large-scale, integrated project to assist small rubber, coconut, and pineapple growers. The present family income in this area is about M$ 1,800 per annum, which puts these smallholders in the lowest 25% of the income scale in Malaysia.

2.07 Another basic concern of the Government has been diversification away from rubber. The proposed project provides for this diversification out of rubber into oil palm, as well as helping the relatively worse off coconut growers to plant with additional crops.

Project Formulation

2.08 Various drainage schemes have been completed in the Western Johore region over the past decades (para 3.01). In 1970, however, the Government decided that the major investments needed to improve and complete the drainage of Western Johore should be accompanied by vigorous efforts in extension, credit, processing and marketing, if worthwhile improvements in farm incomes were to be obtained. A project covering 930,000 ac was identified by the Bank's Sector Survey Mission in 1970 as having high priority. Following a preparation mission in February 1973, it was decided that the southern part of this area covering 330,000 ac should be developed as a first phase. Accordingly, a feasibility report was prepared by the Ministry of Agriculture. This report formed the basis for Bank appraisal of the proposed project.

III. THE PROJECT AREA

General

3.01 The proposed project is situated on the west coast of the State of Johore in the southwest of Peninsular Malaysia (Map 10691). Late in the last century the flat coastal land was opened up by settlers in a haphazard fashion. These early settlers constructed drains and isolated

coastal bunds to protect their properties. Gradually, the whole area was opened up and extended inland, overloading the drains. Starting in 1938 and continuing intermittently to 1967 the Drainage and Irrigation Department (DID) has designed and built drainage and salt water exclusion schemes along the coast from Muar to Sg 1/ Pinggan covering a total area of 220,000 ac. Coastal embankments are included in the project (para 4.02) because the land south of Sg Pinggan still suffers from salt water intrusion and poor drainage.

3.02 In the northern part of the project area, there are three contiguous drainage schemes (Tampok, Rengit and Sg Pinggan) covering about 90,000 ac. The coastal embankment and tidal control gates are in good condition and are well maintained by DID. Continuing development of the hinterland in recent years, however, has rendered the main drains inadequate. There are large areas of peat swamps in the hinterland, which also require drainage. The project is designed to remedy this situation through suitable improvement works (paras 4.01 and 4.02).

The Area

3.03 The current project covers a gross area of about 330,000 ac, of which about 195,000 ac are cropped at present. A second stage project of about 450,000 ac has also been partially prepared (para 4.06). The project extends from Parit Botak in the north to Tanjong Piai in the south, a distance of 48 miles, and covers the coastal plain which varies in width from 4 miles in the extreme south to 16 miles in the north (Map 10691). The project area extends over four administrative districts (Batu Pahat, Pontian, Kluang and Johore Bahru) and contains 15 subdistricts, known as mukims, and parts of three others. There are four small towns in the area (Kukup, Pontian Kechil, Benut and Rengit) each with less than 10,000 people. Batu Pahat and Kulai are bigger towns of 25,000 people adjacent to the area.

Climate

3.04 The climate is tropical and monsoonal. There is little difference in temperature throughout the year, day or night, and maximum variations are between 72°F and 95°F with relative humidity about 85%. Rainfall is heaviest in the inter-monsoon periods (April/May and October/November), but there are rarely completely dry months. Rainfall is about 100 in per annum. Annex 1 contains climatic data. The climate is ideal for the tree crops grown in the area without need for irrigation.

Topography and Soils

3.05 The project area runs in a south-westerly direction following the coastal plain between the foothills and the coastal mangrove swamps. Land levels vary from 4 ft above Mean Sea Level (MSL) at the coast to

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1/ Sg = Sungei = Malay word for River.

33 ft above MSL at the foothills. Generally there is an even rate of rise between coast and foothills. Several small rivers flow through the area.

3.06 Land capacity was carefully considered in projecting the future cropping pattern (para 5.05). Soil surveys have been undertaken and mapped on a 1:25,000 scale. The soils are divided into those developed over coastal marine deposits, which gradually have formed into fertile clays, the riverine alluvial deposits of very heavy texture near the rivers and the peat (organic deposits) filling the gap between the sedentary soils and the marine deposits. Some soils with acid-sulphate characteristics are interspersed between the peats and the coastal deposits and around the estuaries of rivers and creeks. The soils of the project area are described in Annex 2 and shown in Map 10695. The heavy clay soils are well suited to certain tree crops while peat soils, when adequately drained and fertilized, are well suited to annual crops.

Agricultural Production and Processing

3.07 The main crops grown in the area at present are rubber (87,000 ac), coconut (53,000 ac), pineapple (35,000 ac) and mixed crops (20,000 ac), such as vegetables, fruit, cocoa and coffee. In addition, there are about 137,000 ac of uncultivated land in the area. These include mangrove and peat swamps, urban areas, roads and drains. There are two large pineapple estates (7,000 ac each) and a few small rubber estates in the project area, the remainder of the cropped land being smallholdings (average 10 ac). Improved yields and changes in cropping pattern cannot be achieved without further investments in drainage and agricultural inputs (para 4.01).

3.08 Rubber is presently the dominant crop, although yields are poor (550 lbs/ac) as the soils (particularly those which are acid-sulphate) are not well suited to this crop. Processing facilities for rubber are adequate in the area, but quality of sheet rubber is generally low, due to dirt contamination and exposure to sunlight. About 20% of the area consists of pre-1941 trees, which are at the end of their economic life, and 20% is immature. The balance of the area has been replanted since 1952, but trees are of varying quality. Extension services as well as research and development for rubber are provided by RISDA. The importance of rubber would decline in the project through diversification mainly into oil palm (para 5.05).

3.09 Coconuts are the next most important crop in the area. They are mainly grown on marine deposits, which are suitable soils for this crop. Yields are low (440 lbs/ac) due to palm age, poor husbandry and lack of on-farm drainage. Processing of copra is in the hands of the private sector and is adequate. At present the farmers receive reduced prices for their copra due to lack of on-farm drying facilities. Although most palms are between 25 and 40 years old, coconut replanting has only been in progress since 1963. Extension services for coconut are provided by the Department of Agriculture (DOA) and these would be improved under the project (para 5.09).

3.10 Intercropped with coconuts at present, there are about 4,000 ac of bananas, 3,500 ac of coffee (Liberica variety) and 2,000 ac of cocoa. It is Government policy to encourage this diversification of crops in coconut smallholdings, since copra alone gives a very low income. The small amount of cocoa grown is processed in the area. Several small units for coffee processing exist in the area. The coffee is a variety used locally only. Bananas are well suited to inter cropping with coconuts and the bulk of the crop is exported to Singapore. Extension services for all inter crops are provided by DOA. Intercropping would be expanded under the project (para 5.05).

3.11 Pineapple cultivation occupies 11% of the project area and is almost entirely on peat soils, suited to this crop. The present variety, however, has deep eyes, small fruit size and a poor canning shape, resulting in only 15% recovery at the canneries. The 85% waste is passed into drains thus adversely affecting the environment (para 4.16). Research is proceeding into improved varieties. Replanting, however, has been slow and 35% of smallholdings have old uneconomic plants. At present canneries pay a fixed price for pineapples and grade or reject (almost 15%) fruit at the cannery. Greater incentive to grow better-sized and shaped fruit would be provided by grading in the field and paying higher prices for better fruit. The pineapple industry is regulated by the Malaysian Pineapple Industries Board (MPIB). Of five canneries in the area, three are in the private sector and two owned by Government. The project would provide for measures to increase efficiency in the pineapple industry (para 5.07). Annex 3 contains reports on crops and the proposed agricultural development under the project.

3.12 All agricultural research and development, apart from rubber, is the responsibility of the Malaysian Agricultural Research & Development Institute (MARDI), which has only recently become established in the area. MARDI's activities would be intensified under the project (para 5.13). Rubber research is carried out by the Rubber Research Institute of Malaysia (RRIM).

Farmers' Associations, Extension and Credit

3.13 Farmers' Associations (FA) have been developed in Malaysia since 1967 to bring agricultural inputs and supporting services to the farmer. They are directed by an elected Board of local farmers and are provided with offices, stores, warehouses and lecture rooms in centers known as Agricultural Development Centers (ADC). They provide agricultural extension advice, fertilizers and pesticides, credit, transport and marketing services for produce on a commercial basis. FA's have had great success in various parts of Malaysia (notably in the Muda Irrigation Project) in improving smallholder production and marketing of produce. There are two FA's in the project area at present. In June 1973, the Farmers' Organization Authority (FOA) was established by Federal Act to integrate the work of the FA's and the agro-based cooperatives, in newly-formed Farmers' Organizations (FO). Management staff for the FO/FA's are provided by the DOA. The FOA is part of the Ministry of

Rural Economic Development and, under Section 10 of its Act, may declare any area for special development a Farmers' Development Area. The FO's will continue to operate in the same way as FA's and provide all agricultural services required by farmers. FO's would be expanded under the project (para 5.08).

Population, Social Structure, and Land Tenure

3.14 The population in the project area is about 200,000 persons made up of 61% Malays, 37% Chinese and 2% Indian. Density is 520 per sq mi, which is comparatively high for Malaysia. The rural population is 174,000 and the average family size is six. The majority of families are smallholder farmers owning their own land. There are some tenants among pineapple smallholders and several large private estates in the pineapple area. There are marked differences in economic status and commercial outlook between the Malays and Chinese. The project would aim to narrow these differences by introducing the Malays to modern farming techniques and supplying the necessary support services.

3.15 Each sub-district (mukim) in the area is headed by a Local Chief (Pengulu) appointed by Government from the traditional leaders. Each village chief (Ketua Kampong) is elected by the people of the village and confirmed by Government. These local institutions, which have considerable influence over the villagers, would be used to disseminate new technology under the project. Each village has recently formed development committees which discuss all matters relating to the village--from family squabbles to requests for new feeder roads or health services. Local chiefs chair sub-district committees, which coordinate the activities and recommendations of village committees and deal with the District Officer, the official in charge of the District. Annex 4 describes the social structure in the project area and how it would be used to help ensure the success of the project, particularly in changing the cropping pattern and introducing new agronomic techniques to the presently backward farmers (paras 5.06, 5.08 and 5.09).

3.16 The average size of holdings varies considerably but the overall average is about 10 ac, which may be split into two or three separate parcels. For the major crops, farm sizes are:

Crops	Average Holding	Area of Major Crop	Average No. of Parcels
	ac		
Rubber	10.2	8.9	2.3
Coconut	13.3	9.4	2.8
Pineapple	11.7	8.0	1.7

In many cases the coconut or pineapple smallholder has one or two acres of his land planted with rubber or fruit trees.

Replanting Schemes

3.17 The Government operates a number of replanting schemes for various crops to encourage good husbandry practices and use of improved agronomic technology. The oldest of these schemes is the Rubber Replanting Scheme started in 1952, now operated by RISDA, and financed from a cess (export duty) on rubber. When replanting with rubber, smallholders receive a grant of M$ 750 per ac spread over five years. If they replant with oil palm they receive M$ 750 per ac over two years.

3.18 A coconut replanting and rehabilitation scheme was initiated in 1963. The replanting grant amounts to M$ 500 per ac spread over two years. Rehabilitation schemes involve cutting out and replacing old palms and interplanting with cocoa, coffee and bananas. The grant in this case is M$ 300 per ac over two years. These schemes are operated by the DOA, but more effective demonstration and extension is needed and this will be provided under the project (para 5.08).

3.19 A pineapple replanting scheme was introduced in 1971 with a grant of M$ 400 per ac financed from the pineapple cess. Recently, to persuade more smallholders to join the scheme, the grant was raised to M$ 650 per ac spread over two years. MPIB operates the pineapple replanting scheme and has begun a program to replant the whole pineapple area with the improved "Mas Merah" variety.

3.20 Replanting grants are given partly in new planting material and fertilizer and partly in cash. The land is regularly inspected by the agency concerned and proper standards of weeding and on-farm drainage are required. Unfortunately, due to staff constraints, there is insufficient sustained follow-up after grant payments have been made; as a result, husbandry standards decline. Under present conditions the initiative to replant generally lies with the farmer, who approaches the agency concerned when he decides to replant. The lack of coordination between agencies and lack of staff has, in the past, meant that only the most progressive farmers obtain the benefits from the schemes or use the best agronomic techniques. The project would greatly improve this situation (para 5.08).

Transportation

3.21 There is a good system of main highways in the area, one running along the coast and the other on the inland side of the project area with several asphalted roads crossing the area. At present, there are several laterite light vehicle roads following the main drains, but there is a lack of roads at the farm level. The current method of bringing out farm produce is the bicycle or a boat in the drains. Substantial improvements in farm and feeder roads are needed to bring down transport costs and reduce damage to crops and minimize delays in processing fruit crops and marketing of perishable fruit and vegetables. The project would provide feeder roads (para 4.01(b)).

IV. THE PROJECT

General Description

4.01 The proposed project would improve drainage facilities over 330,000 ac in Western Johore (Map 10691), including on-farm drains, roads and agricultural supporting services. It would also provide about 29 miles of coastal embankments with drainage outlets to prevent sea water intrusion. The southern part of the area is at present unprotected from sea water intrusion and has a very rudimentary drainage system. The northern part of the area has a coastal embankment and an internal drainage system which has become inadequate due to development of the hinterland. Agricultural development would not only increase yields by more sustained extension work and new agronomic techniques, but would change the cropping pattern by growing crops best suited to specific soils within the area. Over a period of 30 years rubber would be largely replaced by oil palm, 60,000 ac of cash crops would be grown on presently undeveloped peat soils after drainage, and coconut areas would be inter-planted with bananas, coffee and cocoa. Engineering construction would require five years. The project would include feasibility studies for a proposed second phase.

Project Works

4.02 The project works, which are described in detail in Annex 5 and Maps 10691 and 10692, would consist of the following major items:

(a) Drainage Works

(i) A coastal embankment about 10 ft top width and 5 ft high and 29 miles long to prevent salt water intrusion would be built along the coast between Sg Sanglang and Tanjong Piai. About 20 reinforced concrete tidal control structures would be constructed along the embankment;

(ii) 36 miles of river channels would be improved and 68 miles of new main and lateral drains excavated. Lateral drains would be constructed at half-mile intervals;

(iii) In the southern tip of the area, where there is no hinterland, 32 miles of existing drains would be widened and deepened. In the existing drainage schemes, where Rengit and Tampok main drains would be converted into "high level" drains to drain only the hinterland, new main drains (collector drains) would be dug on either side of these "high level" drains to take care of drainage of the land previously drained by

Rengit and Tampok main drains. Four new drainage control gates would be built at the coastal embankment;

(iv) 150 miles of new drains would be excavated to drain the peat soils;

(v) On the Sg Benut and Sg Pontian Besar, because of the high flash flood flows, small retention reservoirs would be built covering not more than 2,000 ac, to mitigate flooding following heavy rains; and

(vi) New feeder drains at about 220 yd intervals would be dug throughout the area to convey run-off from farms to lateral and main drains. On-farm drains, generally about 40 yd apart for tree crops, would be dug by farmers under the guidance of the extension services.

(b) Roads

10 ft wide feeder roads of laterite would be constructed alongside all lateral drains, both new and existing, at half-mile intervals. Asphalted roads would be built along the main drains. Bridges would be built to ensure communications were not broken by the new drains.

(c) Agriculture

(i) The agricultural development plan is described in Chapter V;

(ii) Eight new Agricultural Development Centers (ADC) would be built to house the Farmers' Organizations (FO's) and all extension services for farmers;

(iii) An agricultural center would be built as a Project Headquarters and for use by FOA, DOA and MARDI. A new agricultural station would be established in the northern peat area and improvements would be made to the existing Parit Botak agricultural station so that it could be used by both DOA and MARDI; and

(iv) The project would include the processing facilities needed during the construction phase for cocoa, tapioca, coffee, and groundnuts. These are listed in Annex 6.

(d) Equipment for agricultural development and for O&M of the drainage works (Annex 7).

(e) A Feasibility Study for the second phase (para 4.06).

Engineering

4.03 Design and construction supervision would be by DID, who have had many years of successful experience in similar work. Preliminary engineering has been completed and detailed surveys and investigations and some designs are now in progress. The principle used in designing the drainage system is to drain the hinterland (25 ft above MSL) directly to the sea and to drain the low-lying coastal lands by a separate drainage system with tidal control gates. The existing rivers would be used to drain the hinterland and they would be improved by enlarging and straightening their channels. In their lower reaches they would be bunded to protect the lower land from flooding. No gates would then be needed to these rivers. Where rivers are bunded, main, or collector drains, would be built to drain the low land into separate compartment drainage gates. Drainage systems are designed for a run-off of 80 cusecs per sq mi. These figures were recently reviewed and agreed by a New Zealand hydrological group currently working with the DID.

Implementation Schedule

4.04 The proposed construction schedule is shown in Chart 7989. DID began construction of the coastal embankment from Sg Sanglang to Pontian in October 1973 with their own funds and equipment, since damage by salt water to coconuts and rubber in that area is very bad. They are also preparing final designs and tender documents for work in the Kukup "basin" area (the southern part of the area, which is in the worst condition) so tenders can be called before the end of 1973 with a view to letting the first contract as soon as the loan is approved. Tender documents and bids would be prepared in accordance with the Bank Guidelines. The construction phase of the project would take five years.

4.05 The agricultural development and processing schedule is shown in Annex 3. The full development would take 30 years, but more intensive and sustained agricultural extension would commence in the second year of project construction. The recent high prices for rubber may cause some delay in crop conversion, but since the soils are so unsuited for this crop, any delay is not likely to be serious. The build-up of new crops and production is shown in the Annex together with the timing for new processing facilities throughout the development period. The Government would ensure that the necessary processing plants would be constructed throughout the period of project development after completion of the project (Section 4.08 of the Agreement).

4.06 Ministry of Agriculture staff would prepare a feasibility study for a similar second stage project of about 450,000 ac by the third year of current project implementation. This project has already been identified (para 2.08).

Cost Estimates

4.07 Total project costs are estimated to be US$100 million, of which the foreign exchange component for the project is US$45 million or 45% of total project cost.

4.08 Detailed cost estimates are presented in Annex 8 and summarized below:

	Foreign	Local	Total	Foreign	Local	Total	% Foreign Currency
	------M$ Million------			-----US$ Million------			
Coastal Bunds	2.5	2.4	4.9	1.0	1.1	2.1	50
Drainage Works	22.9	24.8	47.7	9.4	11.0	20.4 /1	50
Feeder Drains	2.2	12.3	14.5	0.9	5.3	6.2	15
Structures	12.4	10.8	23.2	5.6	4.6	10.2	55
Roads	5.7	7.1	12.8	2.5	3.0	5.5	45
Impounding Dams and Reservoirs	6.0	4.0	10.0	2.6	1.6	4.2	60
Buildings and Processing Plants	2.7	4.6	7.3	1.1	2.0	3.1	45
Equipment	11.2	-	11.2	4.8	-	4.8	100
Sub-total	65.6	66.0	131.6	27.9	28.6	56.5	50
Engineering	1.0	9.0	10.0	0.4	3.8	4.2	10
Cost of Replanting during Construction	-	8.1	8.1	-	3.7	3.7	-
O&M and Agricultural Services during Construction	2.0	9.3	11.3	0.7	4.0	4.7	15
Sub-total	68.6	92.4	161.0	29.0	40.1	69.1	42
Contingencies							
Physical	9.4	10.6	20.0	4.2	4.3	8.5	50
Price	27.0	25.0	52.0	11.8	10.6	22.4	50
GRAND TOTAL	105.0	128.0	233.0	45.0	55.0	100.0	45

/1 Includes land acquisition costs, totalling US$5.6 million.

The civil works costs are based on preliminary designs and on unit prices for similar works carried out in the area. They were updated during negotiations to take account of latest price increases in Malaysia in early 1974. A total price contingency of 32% is included on both local and foreign cost items, including physical contingencies. The annual rate of inflation during the life of the project ranges between 5% and 12% per annum (see Annex 8, Table 4).

Financing

4.09 The Bank would finance the foreign exchange component of US$45.0 million, which is 45% of total project cost. The loan would be for 25 years with six years grace. The Government's contribution of M$ 128 million (US$55 million) would finance the local currency requirements and would be met by annual budgetary allocations to the agencies involved in project implementation.

Procurement

4.10 Contracts for drainage and coastal embankments (US$35.4 million), individually valued at more than US$200,000, and for equipment (US$4.6 million) would be awarded after international competitive bidding in accordance with the Bank's Guidelines. It is expected that about 60% of the contracts would be won by foreign contractors. Some urgently required works (estimated to cost US$1.4 million) would be constructed by force account in 1974 (para 4.04). A preference limited to 15% of the cif price of imported goods, or the actual custom duty, whichever is lower, would be extended to local manufacturers in the evaluation of bids. Small off-the-shelf items costing less than US$5,000 each and limited to a total of US$200,000 which are not suitable for international tendering, would be purchased through normal government procurement procedures, which are satisfactory.

4.11 The contracts for agricultural processing plant and buildings (US$3.1 million), which would be scattered in space and time and individually small, would not be of interest to international contractors and would be awarded after locally advertised competitive bidding.

4.12 Feeder drains (total cost US$6.2 million), which are individually very small, scattered in space and time and are not suitable for mechanical excavation, would be carried out under DID through local rural works contracts with village chiefs at fixed unit rates, determined annually by the Government at competitive rates, as is now done for the maintenance of existing schemes. This system is used in most irrigation and drainage schemes in Malaysia and is in keeping with Government's New Economic Policy (para 2.04). Apart from the fact that these minor works would not interest international contractors, the use of local institutions would save an estimated land acquisition cost of about US$2 million for such drains, as farmers would donate the land required along their lot boundaries, which usually parallel the contours. DID would ensure that correct technical requirements were met. In the event that contractors were awarded these works, time would be lost through the need for lengthy and costly land acquisition proceedings and payments for land acquisition would have to be made. These procedures would provide work for and benefit the local rural population during the development stage of the project. Assurances were obtained that unit rates established for feeder drains in the area would be submitted to the Bank for comment each year before they were announced (Schedule 4 of the Agreement).

Disbursements

4.13 Disbursements would be made against: (a) a percentage of total expenditure on civil works; (b) 100% of the c.i.f. cost of imported vehicles and equipment; (c) 100% of ex-factory cost (net of taxes) of vehicles and equipment produced locally; and (d) 70% of imported but locally procured vehicles and equipment. The estimated schedule of expenditures on the project and the semi-annual disbursement schedule are shown in Annex 9. The calculation of Schedule I in the Loan Documents is shown in Annex 8, Table 3. It is expected that disbursements would be complete by June 30, 1980.

Accounts and Audits

4.14 The agencies involved in the project are all subject to normal Government control and audit procedures. Assurances were obtained that:

(a) all project accounts would be consolidated;

(b) auditors satisfactory to the Bank would be employed to audit these accounts annually; and

(c) the audited project accounts, together with the auditor's comments, would be forwarded to the Bank within six months of the close of each financial year (Section 4.02 of the Agreement).

Environmental Effects of the Project

4.15 Under present conditions, the indiscriminate use of broad-spectrum pesticides, which kill harmful and beneficial organisms alike, is a matter of some concern. These insecticides are being promoted by distributors. Under the project, the extension workers would advise the farmers in the correct use of insecticides. These efforts, together with a Pesticides Act to regulate the sale of pesticides, now under parliamentary consideration, should deal with the above problems.

4.16 Another environmental problem at present is the indiscriminate dumping of pineapple canning wastes into streams. This results in severe oxygen depletion in the streams concerned and their estuaries. However, this waste is a potentially valuable resource and several studies have shown promising uses for the material and it is expected that the practice of dumping would cease (para 5.07). Riverine and inshore fish and shellfish have never been prolific in this area and there is no evidence that drainage schemes similar to the proposed project, or that insecticides and canning wastes, have had any significant effect on fisheries.

4.17 The most serious public health problem in the area is malaria (about 200 cases per year) but an eradication program is being planned by the Government for 1974-1975. The project would assist this effort by draining swamps.

V. ORGANIZATION AND MANAGEMENT

Project Management and Coordination

5.01 The smallholders in the project area are now served by many agricultural agencies. Close coordination would be necessary to carry out the project successfully. The Government would establish the Western Johore Agricultural Development Division under the Minister of Agriculture to manage the project. The Division would be headed by a Project Director whose powers over all other agencies involved with the project would be confirmed by the Cabinet. The other organizations would act as agents of this special Division in the project area -- DID to construct the drainage works and later maintain them; the DOA, FOA, RISDA, and MARDI to provide agricultural inputs; and MPIB to deal specifically with pineapples. The agricultural organizations serving in the project are described in Annex 10 and Chart 7988. The Government's plans for establishment of the Special Division and Project Director's responsibilities were discussed at negotiations and are satisfactory. The establishment of the Division and the appointment of a suitably qualified and experienced Project Director, in consultation with the Bank, would be conditions of effectiveness of the proposed loan.

5.02 The Project Director would have overall responsibility for the project. His duties would include planning, the approval of budgets and staff for all the agencies concerned, and overall direction of these agencies in the implementation of the project. The Project Director would be guided on policy by a Steering Committee of Federal and State senior officials and would be advised by District Integrated Action Committees, headed by the District officers and consisting of sub-district and village leaders and health and public works officials.

5.03 The Project Director would have a small staff of two deputy directors (planning and execution), a rural sociologist to advise on methods of motivating farmers to use new techniques, a statistical group to monitor project progress and achievement, an industrial development group to encourage local agro-based and other industry in the area, and an administration section. The majority of staff would be from the various executing agencies, who would work under the overall direction of the Project Director. These agencies would, however, receive technical guidance from their own headquarters. This type of organization has worked well at Muda Irrigation Project and elsewhere in Malaysia.

The Agricultural Development Plan

5.04 As the drainage is improved, agricultural supporting services would provide a sustained effort to improve agronomic techniques and change the cropping pattern by growing crops best suited to specific soils within the area. An agricultural inventory of the age and quality of all crops would be undertaken in 1973/74 to enable detailed planning of changes in cropping pattern to proceed.

5.05 Land use would be changed as follows over the next 30 years (Maps 10693 and 10694):

Crop	1973		2003	
	ac		ac	
Rubber	86,500		10,000	
Coconut	53,000		53,000	
Intercrops - Banana		4,000		10,000
- Coffee		3,500		10,000
- Cocoa		2,000		30,000
Pineapple	35,000		45,000	
Oil Palm	-		60,000	
Vegetables, Tapioca, Groundnut	-		60,000	
Mixed Crops	20,000		20,000	
Cropped area	194,500		248,000	
Uncultivated area	136,500		83,000	
Total	331,000		331,000	

Annex 3 gives details of agricultural development with a report on each crop and tables showing proposed planting schedules by crop, assumed yield progressions and production estimates.

5.06 The large areas of the peat soils presently undeveloped, due to lack of drainage, would be opened up. After 30 years, 60,000 ac would be fully developed for tapioca (40,000 ac), groundnuts (10,000 ac), and vegetables, such as cucumber, chillies, beans, tomatoes, yams and sweet potatoes (10,000 ac). These crops would be grown on a rotational basis to avoid disease problems. The major part of this undeveloped land is already owned by smallholders living in the area. The balance would be allocated by the State Director of Lands to farmers residing in the project area, giving priority to: (a) landless people, (b) young farmers, and (c) farmers with less than 4 ac. Assurances were obtained that a land allocation scheme based on the above, would be prepared by the State within one year of loan signing (Section 4.03 of the Agreement).

5.07 Special measures would be taken in the pineapple industry by MPIB to provide better incentives to farmers, improve fruit quality, and lower production costs. Specifically the following measures would be taken:

(a) Grading and selection would be introduced at farm collection centers with a new price schedule to pay more for new varieties and larger fruit better suited for canning;

(b) A replanting drive would be started to introduce better varieties;

(c) Studies on the use of pineapple waste as cattle feed or for other use would be intensified; and

(d) Greater use of fruit stimulants would be encouraged to minimise seasonal crop fluctuations.

Assurances were obtained (Section 4.04 of the Agreement) that these measures would be carried out. An intensified pineapple research and development program would also form part of the project (para 5.13).

Agricultural Supporting Services

5.08 Farmers' Organizations. FO's would be the key organization for bringing agricultural supporting services to the farmers. They would work from Agricultural Development Centers (ADC) throughout the area. All the other agencies concerned with agriculture would also work from the ADC's (Chart 7988). A sufficient number of FO's, at present thought to be ten (one per 3,000 farms), would be established throughout the area. Since two exist, an additional eight would be required within the construction period. FO's would provide agricultural extension, training in new agronomic techniques, credit (para 5.12), farm inputs and transportation, processing and marketing of produce. FO's would be located to fit the pattern of sub-district boundaries and would work through the local chiefs and village heads to obtain maximum cooperation from the smallholders (para 3.15). The project sociologist (para 5.03) would assist in integrating the modern economic institutions, such as FO's, with the traditional village influence structure so as to maximise the effectiveness of extension work.

5.09 DOA. The DOA operating from the ADC's would continue its present services in the project area, but would build up staff so that extension services and follow-up on replanting programs for coconuts, and interplanting with cocoa, coffee and bananas would be made more effective. DOA would also be responsible for extension services for new crops on peat soils. Employment of more women extension officers would facilitate expansion of new techniques (Annex 4). DOA would establish a pest control team to carry out contract work for the smallholders especially for cocoa.

5.10 RISDA. RISDA would be directly responsible for persuading smallholders to replant their rubber with oil palm. Rubber areas presently on peat would be converted to cash crops (vegetables, groundnuts or taipoca) or to pineapple. RISDA would be advised on motivation and incentives to farmers by the rural sociologist in the Project Authority and would have increased staff to provide better and more sustained extension services. RISDA would provide the extension services required for oil palm would organize the collection and transportation of fruit to oil mills. They would be responsible for the construction of oil mills within the project area.

5.11 MPIB. MPIB would provide extension services to the pineapple smallholders and would be responsible for the intensive effort to improve the efficiency of the industry (para 5.07). The staff of MPIB extension workers and replanting officers would be increased and MPIB would work closely with MARDI on the demonstration of new varieties.

5.12 Credit. The Bank Pertanian Malaysia (BPM), which would be responsible for all agricultural credit within the project, would carry out a survey of the credit needs of the farmers in the project area during the next 12 months. FO's would act as local credit centers for the BPM. Whilst tree crops were maturing and cash crops were being grown, farmers would obtain subsistence credit to a maximum of M$ 70 per month per family (the standard used by FELDA). Production credit of about M$ 40 per ac per annum would be available for fertilizer. An Agricultural Credit Project, for which BPM would be the on-lending agency, was appraised by the Bank in September/October, 1973. This would strengthen BPM's ability to provide credit in this and other areas.

5.13 Research. MARDI would intensify research and development in the project area. MARDI and DOA would work closely together in establishing an agricultural center in Batu Pahat to serve both this project and the proposed second phase, they would also jointly operate the Parit Botak Station for both research, development and plant breeding. They would strengthen activities of the existing pineapple research station at Pekan Nanas. MARDI would establish a station on peat soils and would develop appropriate cropping techniques for the crops to be grown on these soils. They would prepare guidelines for the use of fertilizer and pesticides for all crops in the area. The Development Division of MARDI would use local smallholder farms as trial areas to develop new techniques and new varieties after the research phase is complete and prior to full demonstration by DOA. MARDI would intensify use of their development projects within the area to disseminate the latest agronomic techniques. Since research by MARDI into new pineapple varieties is essential to the success of the project, assurances were obtained that the Government would initiate within one year of signing of the loan, a pineapple research and development program satisfactory to the Bank to meet the needs of the project (Section 4.05 of the Agreement).

5.14 New Planting Material. The supply of planting materials to keep pace with proposed development would be the responsibility of DOA and should not present problems (Annex 3).

Training

5.15 The increases in agricultural staff required by FOA, DOA, MPIB, and RISDA would be considerable, particularly at the level of Junior Agricultural Assistant (JAA), who would comprise most of the staff of the FO's and would be the key field extension workers. Annex 11 describes the training establishments in Malaysia and the additional numbers of staff required. A total of nine additional agricultural officers (AO), 30 agricultural assistants (AA) and 157 JAA's would be required by 1978. Since the University of Agriculture at Serdang produces 120 AO level and 350 AA level graduates annually there would be little problem with senior staff. The Agricultural Institutes, of which there would be six by 1975, would have an annual output of 590 JAA level graduates by 1977, which would meet project and other requirements. Loan MA-599 is partly financing three of the Agricultural Institutes. Additional strengthening of MARDI would be required and a project is being prepared for Bank consideration, which would include technical staff and additional physical facilities.

Land Title Conversion

5.16 Under the land taxation system, which is a State matter, each land title specifies the crops that may be grown on the land. When a land owner wishes to change from one crop to another he must pay a conversion fee, which could be as high as M$ 145 for changing 5 ac of rubber to oil palm. This fee would be a serious constraint to the project objective of converting 60,000 ac to oil palm. Assurances were obtained from both Government and the State of Johore that crop conversion fees on land titles would be deferred for five years from planting, by which time the new crops would be income-producing (Section 4.06 of the Agreement).

Operation and Maintenance

5.17 DID would be responsible for operation and maintenance (O&M) of all drainage works down to feeder drains and roads. Farmers would be responsible for on-farm drains. During construction, DID would continue to operate and maintain existing schemes in the area and would take over the new works as completed. No budgetary allocation problem is expected. The farmers would have to complete and maintain their on-farm drains as a condition of replanting grants. The extension workers of the FO's would also be required to convince farmers of the value to themselves of correctly performing this work. The construction of the new feeder drains would make the farmer's task much simpler, since his on-farm drains would not be longer than 100 yd (map 10692). Particular attention would be paid to water level control in acid-sulphate soil areas. During wet periods, drains would be flushed out but in dry periods water level would be kept up by the water control structures (Annex 2).

5.18 The cost of O&M is estimated to be about US$4.30 (M$ 10.00) per ac. The present drainage rate on completed schemes collected in the State of Johore is US$2.60 (M$ 6.00) per ac and this would have to be raised to cover the full cost of O&M by the time the replanted tree crops had reached maturity and increased farmer's income. In areas where there is at present no drainage rate, Johore State would commence collection of a rate within two years of completion of works in each section of the project area, and by the beginning of the fifth year after introduction of the rate, it would be raised to cover at least the full cost of O&M. Where there is an existing rate, five years would be given to reach full rate. Assurances to this effect have been obtained (Section 4.07 of the Agreement).

Recovery of Costs

5.19 The project beneficiaries would not be required to repay directly the capital costs of the project. This is a deliberate policy of Government related to two facts: (i) incomes in the area would remain below the projected national average rural income, even after full development of the project (para 6.10), and (ii) revenues from export duties, reduced pineapple subsidies and land taxes accruing to the Government as a result of the project would be sufficient to cover the investment costs and incremental expenditures incurred for agricultural extension services throughout the life of the project. A cumulative surplus (excluding interest) of about M$ 15 million would be obtained at the end of the project (Annex 12) and indirect growth effects of the project on the economy would yield additional revenues.

VI. PRODUCTION, MARKETING, PRICES AND FARM INCOME

6.01 Construction of the drainage works would improve crop yields and allow the cultivated area to be expanded. Extension work under the project would be directed at replacing unsuitable crops with crops suited to the soils of the area and intercropping to improve the incomes of coconut smallholders.

6.02 Production statistics with and without the project are presented in Annex 3 and summarized below:

	1973	1983		2003	
With (W) or Without ($\overline{W}$) the project	$\overline{W}$	$\overline{W}$	W	$\overline{W}$	W
	'000 tons				
Rubber	17.1	19.7	20.4	22.0	4.4
Coconut (copra)	10.5	12.0	17.4	16.1	27.7
Cocoa (dried beans)	0.02	0.8	2.0	0.7	8.1
Pineapple (fruit)	207	238	338	280	490
Oil Palm (fresh fruit bunches)	0	5.8	68.8	31	395
Tapioca (tubers)	0	0	150	0	560

6.03 Cropped areas and projected yields are given in Annex 3. In general, estimated yields are based on levels already achieved in other parts of Malaysia under conditions of good drainage and sound management, with appropriate adjustments for soil type, extension effort and the status of research. The factor used to reduce estate yields to smallholder scale was between 30% and 50% for various crops. For annual crops on peat, for which experience is somewhat limited, peat research station yields have been used, with suitable adjustments. While some of the projected yield increases are quite large, this is mainly in consequence of the present very low yields.

Marketing and Prices

6.04 The major crops to be produced in the project area (rubber, palm oil, pineapples and tapioca) would be for export. Copra, coffee, bananas and miscellaneous fruits and vegetables would be marketed in Malaysia and Singapore. In the case of cocoa, Malaysia is expected to change from a net importer to a net exporter in the next few years.

6.05 Prices were estimated for 1983, using projections of world market prices by the Bank's Economic Analysis and Projections Department where available. Where taxes, duties or subsidies are involved, the prices used in economic analysis differ from those used in farm income estimation. Projected prices for the early 1980's are shown in Annex 13.

6.06 No marketing problems are expected for rubber, copra, cocoa and palm oil and kernel. The project area output would be only a small fraction of national production for these crops. The increased production for Liberica coffee can be absorbed in the local market, with possibly minor exports. A sufficient market for bananas exists in Singapore and Johore to absorb the output of the project area.

6.07 Pineapples present a special problem. Malaysia is one of the world's major exporters of canned pineapple but is starting to lose her market share, due to revaluation of the Malaysian dollar and the difficulties of producing an acceptable product from the variety presently grown. These marketing problems will intensify as Malaysia faces an increasing EEC tariff in her major market, the United Kingdom. Almost 90% of Malaysia's acreage of pineapple for canning occurs in the project area and, without the project, it is difficult to see how the industry could survive without subsidies. With the project, yields would be markedly increased, production costs lowered and replanting with improved varieties would increase cannery efficiency. Under these conditions, Malaysia would be able to continue to export at a competitive price and gradually expand her production. The research program now being intensified and Malaysia's past history in lowering the costs of rubber production lend confidence to this assessment.

6.08 A large expansion of tapioca production is forecast. However, projected exports would still be only a small fraction of world trade and would be accommodated by expected market growth. Processing facilities would be geared closely to market preference (presently starch). Groundnuts

are used at present mainly in roasted form on the domestic market. Over the next decade, project area output would replace imports and, thereafter, additional groundnut production would be processed into oil, replacing imports of vegetable oils. Fruits and vegetables would be marketed in Johore and Singapore, where increasing urbanization is reducing local production. Further details on marketing and prices are given in Annex 13.

Farm Income

6.09 Farm income has been estimated for the following types of smallholdings: rubber (converted to oil palm); coconut (with cocoa and bananas as intercrops); pineapple; and annual crops on peat soils. In each case, it was assumed that conversion of the cropping pattern would be completed within ten years. For the first three cases, the following farm sizes were used: the average and the upper and lower 20-percentile areas, as given by the Ministry of Agriculture's smallholder surveys. For annual crops, holdings of 2.5, 5 and 10 ac were used. Estimated 1983 market prices (Annex 13) were used in this analysis. Off-farm income, which is significant for the smaller landowners and also for the Chinese farmers, and replanting grants were also included. All cash inputs, including land tax, a drainage rate equal to project O&M costs, and hired labor, were deducted, using market prices. It was estimated that hired labor would be used wherever labor requirements per farm exceeded 450 man-days per year.

6.10 Under these assumptions, average income per farm with the project would increase as follows:

Year:	Area (ac)	Income per Farm (M$/yr) 1974	1983	2003
Rubber (to oil palm)	4.7	1,500	2,800	3,900
	10.2	2,200	5,100	7,200
	14.0	2,600	6,400	9,000
Coconut (with cocoa)	3.5	1,200	2,000	3,400
	9.4	2,100	5,000	9,300
	20.0	2,900	6,100	12,900
Pineapple	11.7	2,000	2,800	3,900
Annual Crops	2.5	-	2,300	2,800
	5.0	-	3,800	4,800
	10.0	-	6,200	8,000

Only the average farm size is shown for pineapple, as the economies of scale are quite small, under projected prices. Average income per farm throughout the project area would increase from M$ 2,100 at present to M$ 3,700 in 1983 and would remain constant at about M$ 4,800 between 1993 and 2003. At the 1970 census, the mean annual household income in Peninsular Malaysia was M$ 3230, or about M$2500 for rural households and M$ 5200 for urban families. Full details of farm income are given in Annex 14.

VII. BENEFITS AND JUSTIFICATION

7.01 The project is in line with the objectives of the Second Malaysian Plan and would be the first large-scale integrated project to raise incomes of existing tree crop smallholders in Malaysia. Present per capita income levels are generally between M$ 200 and M$ 400 per annum, putting these farmers in the lowest 25% on the Malaysian income scale. The project would tend to reduce rural-urban disparities and would mainly benefit Malay farmers.

7.02 Underemployment in the project area is considerable, possibly as high as 50%, at present. With the opening up of new land and the intensification of agriculture made possible by the project, the equivalent of 12,000 full-time jobs would be created by 1983 and 24,000 by 2003. Additional jobs would be created in processing and service industries. However, even with the project, there would be surplus labor in the area, unless population growth rates can be greatly reduced. Therefore, all farm labor in the project area was costed at a shadow wage rate of M$ 3/man-day (75% of current rates for hired labor), for the purposes of economic analysis.

7.03 The gross value of production per year from the project area would be M$ 102.8 million in 1983, compared to M$ 52.8 million without the project and M$ 41.6 million at present. By the year 2003, the gross value of production would reach M$ 207.7 million, compared to M$ 62.7 million without the project. The incremental net value of production in 1983 is estimated at M$ 23.9 million per annum, rising to M$ 85.2 million in 2003. All the above figures are net of duties, taxes and subsidies. Government revenues (Annex 12) from export duties and cesses on project output would rise by M$ 14.0 million between 1999 and 2003. Subsidies to the pineapple industry would be reduced by M$ 18.0 million by 2003. Land taxes on the project area total about M$ 1.8 million per year at present and would increase as a result of the project. The drainage rate, would equal the average O & M cost of the system and would therefore raise about M$ 3.0 million from 1978 onwards.

7.04 Most of the project output would be exported: in 1983, the fob value of exports from the project area (including those to Singapore) would total about M$ 131 million, and would rise to M$ 235 million in 2003. The value of import replacement crops, at farm-gate prices, would be M$ 14 million in 1983 and M$ 30 million in 2003.

7.05 Under the assumptions listed in Annex 15, the economic rate of return would be 15%. Sensitivity tests were carried out, which showed that: (i) with labor priced at M$ 4 per day, the rate of return would drop to 14.0%; and (ii) a 15% cost over-run would not affect the project's viability significantly.

7.06 The estimated rate of return compares favorably with possible alternative investments in smallholder agriculture in Malaysia. The project would create considerable additional employment and discourage

rural-urban drift. The increased agricultural production would have a significant positive effect on Malaysia's balance of payments and would contribute to the Government's policy of reducing Malaysia's dependence on rubber by developing oil palm and other export crops on a large scale. The project would also restore the viability of the pineapple industry, one of Malaysia's major export earners. For these reasons, the project would make a significant contribution to the economic growth of Malaysia and to the furtherance of the objectives of the Second Malaysian Plan.

VIII. RECOMMENDATIONS

8.01 During negotiations agreement on the following major points was reached with the Government:

(a) It would ensure that the necessary agricultural processing plants would be constructed throughout the period of project development after the completion of the project (para 4.05);

(b) In order to make the pineapple industry more efficient and provide more incentives to farmers, the MPIB would take suitable steps, including the introduction of farm collection centers, replanting clones of new varieties, studies on the use of pineapple wastes and hormone stimulants, and the introduction of appropriate price schedules (para 5.07);

(c) Collection of the crop conversion fee on land titles by Johore State would be deferred for five years from planting (para 5.16); and

(d) Johore State would commence collection of a drainage rate within two years of completion of each section of the project area, and by the beginning of the fifth year after introduction of the rate, it would be raised to cover at least the full cost of O&M (para 5.18).

8.02 Conditions of effectiveness of the Loan would be:

(a) The appointment of a Project Director after consultation with the Bank (para 5.01);

(b) The establishment of a project Division acceptable to the Bank to integrate all services under the project (para 5.01); and

(c) The State of Johore shall have agreed to the relevant assurances.

8.03 With the indicated assurances, the proposed project is suitable for a Bank loan of US$45.0 million, for a term of 25 years, including a six-year grace period. The borrower would be the Federation of Malaysia.

February 28, 1974

ANNEX 1

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Climatic Data

1. Average Monthly Rainfall (1950-65) - inches

Month	Rain Guage Station			
	Rengit	Sg Pontian-Sg Ayer Hitam	Pekan Nanas	Simpang Rengan
January	7.80	7.80	10.00	8.64
February	6.15	7.63	8.98	6.85
March	7.59	10.83	9.76	9.43
April	9.81	10.98	11.13	9.16
May	7.59	8.45	9.69	6.43
June	7.46	7.25	7.98	6.49
July	7.28	8.73	7.78	5.29
August	7.34	8.80	9.29	5.84
September	6.92	7.83	7.85	6.86
October	9.17	9.88	10.09	9.49
November	11.80	11.53	12.64	9.76
December	7.94	9.63	9.46	8.57
TOTAL	86.85	109.34	114.65	82.81

2. Mean Daily Temperature °F

Month	Place		
	Batu Pahat	Ayer Hitam	Pontian
January	79.6	78.7	79.1
February	80.8	78.5	79.5
March	81.7	80.6	79.8
April	81.9	81.1	80.2
May	81.9	81.9	80.3
June	81.4	80.4	80.0
July	80.9	79.9	79.7
August	80.6	79.5	79.4
September	80.7	80.1	79.6
October	80.7	80.5	79.6
November	80.5	80.2	79.4
December	80.1	79.4	78.9

Sources: Feasibility Report by Ministry of Agriculture - May 1973 based on DID Rain Guage Stations and Malaysian Meteorological Service.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Soils

Surveys

1. Reconnaissance soil surveys have been undertaken throughout the project area and soil units mapped on a 1:25,000 scale. Additional surveys were completed in 1973. The objectives of these surveys were to determine the soil pattern and thereby enable identification of areas suitable for cultivation of specific crops (Map 10695).

Origins and Types of Soils

2. Soils fall into four categories:

(I) Soils derived from marine deposits (134,900 ac);

(II) Soils derived from mixed marine deposits and riverine alluvium (23,200 ac);

(III) Soils derived from fresh water deposits (173,000 ac); and

(IV) Sedentary soils on high ground (35,100 ac).

As the sedentary soils would not benefit from project drainage work, these will not be considered further.

Soils Derived from Marine Deposits

3. These soils are of heavy clay texture and poorly drained. The most recently deposited soils (locally termed Kranji series) have very little profile differentiation and contain variable amounts of sulphate and salts. When unprotected from sea water flooding, these saline soils are colonized chiefly by mangrove vegetation and have neutral to alkaline reaction associated with the high proportion of dissolved salts they contain. Given protection from sea water ingression and adequate drainage, toxic salts soon become leached out by rainwater percolating through the soil profile, their physical structure improves and they become fertile clays.

4. The most acidic soils (known locally as Parit Botak Series) are derived from marine and brackish water sediments containing high amounts of sulphur compounds and may be classified as acid-sulphate soils. In the waterlogged state, the sulphur compounds are reduced to sulphides.

However, when these conditions are terminated by excessive drainage, oxidation of the sulphides occurs to give sulphuric acid and sulphates of iron and aluminum which are acidic in reaction and are responsible for a sharp decline in soil pH (occasionally to below 3.0 units). These soils possess satisfactory cation exchange capacities 1/ and are potentially very fertile. Their physical properties are superior to those of the younger saline soils, but subsoil structure is usually weakly developed. This soil is generally poorly drained, the water table commonly ranging between 18 in and 24 in depth.

5. A less acidic soil (referred to locally as Selangor Series) also occurs quite extensively within the project area. This soil occurs at marginally higher levels, possesses superior physical properties and is better drained, the water table usually being found between 24 in and 30 in depth. It has high nutrient reserves and is less acidic, topsoil pH value normally ranging between 3.8 and 4.5 units. It is usually underlain by an acid-sulphate horizon, often below 24 in depth. This soil is quite prevalent along the west coast of Malaysia and is rated one of the most fertile.

Soils Derived from Marine/Riverine Deposits

6. A significant area of soil derived from both marine and riverine deposits is found near rivers. This soil (referred to locally as Briah Series), has a clay texture but somewhat shallow topsoil and impeded drainage. In the dry season the water table is usually between 24 in and 30 in. This soil is rich in plant nutrients and does not present acid-sulphate problems.

Soils Derived from Fresh Water Deposits

7. There are small areas of clays deposited in fresh water, but the major soils of this category are peats, with organic clays and muck soils occurring in the buffer zone between the mineral soils and peats. The peats develop in fresh water swamps and are characterized by their rather coarse texture, high moisture content, low density and acid reaction. They occur extensively between the marine clays and sedentary soils on higher terrain (25 ft above MSL). Fringing on the organic clays and muck soils, the peats are shallow but of limited extent. Most of the peats exceed 5 ft depth and over much of the area are 20-25 ft deep, lying on clay which is over 5 ft above MSL. When compared with mineral soils, peats are chemically impoverished, but possessing superior cation exchange capacities, can readily be improved by application of fertilizers.

1/ Ability to retain and release nutrients.

Distribution and Area of Soils Mapped

8. Map 10695 shows the general distribution of soils in the project area. Briefly, the area of soils identified are as recorded below:

DERIVATION AND AREAS OF SOILS IN PROJECT AREA

Category	Derivation	Present Crop	Suitable Crop	Area ac.
I	Recent marine deposits	Coconut	Coconut	39,500
I	Older marine deposits	Coconut	Coconut	61,100
I	Older marine deposits	Rubber & coconut	Oil Palm	34,300
II	Marine/riverine deposits	Rubber	Oil Palm	11,200
II	Marine/freshwater deposits	Rubber	Oil Palm & Cash Crops	12,000
III	Freshwater deposits	Undeveloped	Rubber	7,400
III	Freshwater deposits	Pineapple & Undeveloped	Pineapple & Cash Crops	9,500
III	Freshwater deposits	Pineapple & Undeveloped	Pineapple & Cash Crops	156,200
	Total area			331,200
IV	Sedentary soils (not benefitting from the project)			35,100
	Total area			366,300

Soil Management

9. Saline soils. The Southern part of the project area is still without coastal embankments, but when protected from sea inundation and adequately drained, salts are readily leached out by rainwater percolating through the soil profile. Almost 24,000 ac are lower than 5 ft above MSL and cannot be reclaimed for agricultural development. Coastal protection would be provided for areas reclaimed. This soil would then be best suited to coconut.

10. Acid-sulphate soils. While it is desirable to improve drainage of these soils, it is vital that acid-sulphate conditions do not become aggravated by further oxidation of sulphides to sulphates through over-drainage. Control gates would, therefore, be included in the project in feeder and lateral drains to maintain water levels above the acid-sulphate horizon in dry periods. It is now accepted that the potential acid-sulphate layer in these soils should be maintained in a reduced condition and attempts made to flush out toxic sulphates during high rainfall periods. This would be achieved by digging field drains to no more than 3 in below the potential acid sulphate layer, blocking drains during dry weather periods to ensure the water level does not drop below the acid-sulphate horizon, and flushing

drains during reliably high rainfall periods. Oil palms, bananas, coffee and cocoa all grow better on these soils than rubber, which is not tolerant to acid-sulphate conditions.

11. Mixed marine/river deposits. These are of heavy texture and weakly structured and require intensive drainage, which would be provided by feeder and on-farm drains. Oil palms are well suited to this soil after drainage.

12. Peat soils. These are at present poorly drained and subject to periodic flooding. The project would alleviate flooding and permit drainage of these soils to sufficient depth for cultivation of shallow rooting crops. With drainage, the peats would shrink due to oxidation and consolidation, which necessitates regular deepening of drains. The rate of shrinkage may amount to 6-10 in in the first year, but rapidly declines to a constant value of about 1 in per annum. Burning is sometimes practiced to reduce further the peat depth and augment its surface nutrient content, but this operation is difficult to control. Due to their lack of consolidation and the presence of amounts of timbers at various depths, hand cultivation must be undertaken for several years whilst they consolidate and timbers are removed. The latter operation is difficult and liable to be costly if the objective is to mechanize cultivation operations within a few years of opening up tracts of peat. With the adequate availability of labor in the area, however, there is no urgency for mechanization of cultivation of the high value crops planned for these peats. With regard to the nutritional requirements of peat soils, in their virgin state they are somewhat impoverished. Consolidation and burning render them more fertile and, possessing very high cation exchange capacities, they are very responsive to applied fertilizers and capable of supporting high yields of crops adapted to them. Fertilizer requirements depend on the crop, but, as a general rule, most crops will respond to basal applications of copper sulphate and lime. The former is very costly but need be applied only at about 30 lb per acre (cost M$ 74) and has long residual action. In the cultivation of short-term crops such as vegetables, very good responses are also obtained following application of wood or oil palm bunch ashes. Oil palms are tolerant to shallow peats, but on the deep peats, tapioca, groundnuts and mixed vegetables grow well with suitable nutrients. Pineapples also do well on peat.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Agriculture

Introduction

1. This annex explains the present situation in the project area on a crop by crop basis and then describes the agricultural development proposed under the project. Table 1 shows the present distribution of crops and the proposed distribution of crops in 30 years. It indicates the planned conversion from one crop to another. Table 2 shows the proposed phasing of changes in the cropping pattern on a crop by crop basis. Table 3 summarizes crop statistics and processing plant schedules. Table 4 shows the yield progressions for each crop on a "without" and "with" basis. The benefits of the agricultural development on each crop are clearly evidenced.

2. A description of each crop follows. The present conditions and techniques are first described followed by the effects of the project development. Tables 5 to 10 show for each crop the projected acreage without the project and the proposed schedule of development with the project, under the title of "Crop Statistics".

Rubber

(a) Present Situation and Techniques

3. Area. Rubber is the most extensively cultivated crop in the project area, covering 86,500 ac. It is almost entirely on individually owned smallholdings, the largest rubber estate being 1,800 ac in extent.

4. Smallholdings. A survey undertaken in 1971 showed that the average size of holding is 10.2 ac, but many of the farms are fragmented. Only 33% of the smallholdings consists of one parcel of land. The average owner has 2.3 parcels. Malays own 60% of the rubber land and Chinese the balance. The average size of Malay smallholding is half that of the Chinese. The average area of rubber covers 88% of the lot, the balance of the land is used for mixed crops, such as, pineapple, coffee, fruit, bananas or arecanut palm.

5. Farming practices. Rubber trees can be tapped from about six years old to about 30 years, after which they should be replaced. Tapping should be carried out on alternate days for best yields but many of the smallholders tap daily. Efforts of RRIM and RISDA to induce smallholders to change tapping habits to improve standards and use yield stimulants have so far not been successful due to lack of sustained effort because of

staff constraints. The smallholders do not weed their lots sufficiently nor do they maintain on-farm drains adequately. 82% of farms are run entirely by family labor.

6. Age and quality. 20% of the rubber is pre-1941 and hence at the end of its economic life. 20% is immature and the balance is of varying age and condition. Since rubber is not well suited to much of the soil, it is in poor condition compared to areas where crop and soil are matched.

7. Yields. Yields are low within the project area, averaging only 550 lb/ac, whereas estates throughout Malaysia averaged 1,100 lb/ac.

8. Replanting scheme. At present smallholders receive a replanting grant amounting to M$ 750/ac, consisting of M$ 450 from the replanting cess (export tax) and M$ 300 in the form of a grant from Government. This is used to replant with rubber or other approved crop. Planting materials are supplied as part of the grant, which is spread over five years. It is estimated that 1,000 ac was replanted in 1973 but, after the project commences, only about 200 ac per annum would be replanted because oil palm would become the main crop.

9. Processing. Most of the latex is processed to unsmoked sheets at village level. The sheet rubber is of low quality because of dirt contamination, exposure to sunlight and mould growths. RRIM has established about 20 small group processing centers in an endeavor to raise quality, but better results would be obtained by bulk collection of latex and transportation to central factories.

(b) Proposed Development

10. Area and cropping pattern. Since the soils, on which the bulk of the rubber is planted are not suitable for that crop, the project would gradually reduce rubber acreage from 86,500 ac to 10,000 ac in 30 years by replanting with mainly oil palm. The smallholders would be induced to work on replanting in groups by extensive extension and close liaison with local chiefs and village heads through the FO's. Planting schedules are shown in Table 5.

11. Improved husbandry. The more sustained extension would ensure that the remaining rubber would be of best planting material and would be well maintained. After more intensive work by RISDA, farmers would be persuaded to tap to better standards and only an alternate days. Ethrel stimulation would be used to improve yields of rubber over 15 years old.

12. Yields. Yields would be expected to rise from 550 lbs/ac to 1,100 lb/ac in 30 years as shown in Table 4. The higher yields would still be 50% less than estate yields predicted at that time and would be entirely possible.

13. Processing. Malaysian Rubber Development Corporation (MRDC) plans to construct a group crumb rubber factory in Pontian in 1974. Smallholders

would then have the opportunity to abandon their poor quality village manufacture of ssheet and take latex to collection centers, also being established by MRDC.

Coconut

(a) Present Situation and Techniques

14. Area. There are 53,000 ac of coconuts in the project area, grown only by smallholders.

15. Smallholdings. These average 13.3 ac (survey conducted in 1965), with the sole crop area of about 9.4 ac of palms. Farms vary considerably in size, 25% are less than 3 ac and 10% over 25 ac. An average holding comprises three non-contiguous plots.

16. Farming practices. Coconuts bear fruit after six to seven years and have a useful life of 50 to 60 years. The nuts are harvested every six weeks using long knives on poles. The nuts are then split open and flesh is incompletely sun-dried or in kilns fueled by coconut shells. The copra is then further sundried, at present at the oil mill.

17. Age and quality. It is estimated that the majority of palms are 25-40 years old and some 5,000 ac have been replanted since 1965. Virtually 100% of palms in the area are of the tall variety, which is better adapted to local circumstances than the sensitive dwarf variety. The vigor and appearance of palms at present, is sub-standard, largely due to:

(i) Inadequate on-farm drainage, resulting in weak growth, lack of foliage lustre and tapering of palms;

(ii) Excessive stands. A stand should not exceed 50 palms per ac for tall variety, but the average stand is 70 palms per ac;

(iii) Poor husbandry. Lack of weeding and very little use of fertilizer; and

(iv) Saline intrusion in the south of the project area. This results in stagnation and death of palms.

18. Yields. Yields are low in the project area, even where already improved by drainage schemes, they are only 440 lbs/ac. Average yields of estates in Malaysia are 1,350 lbs/ac. Yields in areas affected by salt water intrusion are down to 200 lbs/ac.

20. Replanting scheme. Since 1963 the DOA has operated a replanting scheme as well as a rehabilitation scheme. The replanting scheme provides M$ 500 per ac, mostly in the first year. To be eligible for a replanting grant adequate drainage must be available and there must be fewer than 10 economic palms per ac. An economic palm is defined as one producing more than 60 nuts per year (average on good holdings is 100 nuts per palm per

year). Under rehabilitation grants, the smallholders receive M$ 300 per ac mostly paid in the first year. Rehabilitation consists of replacing bad palms and inter-planting with cocoa, coffee or bananas or other approved crop. Part of the grants is given in planting material and fertilizer. Before payment of the cash part of the grants, smallholders' on-farm drains, weeding and standard of husbandry is inspected by DOA. Unfortunately the staff constraint means lack of sustained extension and inspection and, after payment of the grant, farmers tend to thicken stands, and neglect on-farm drainage and weeding.

20. Processing. About 15% of the crop is sold as fresh nuts, the balance is processed in the area. The copra is sold to oil mills, all of which are in the private sector. The copra still has about 14% residual moisture and the oil mill normally further sun-dries the copra to 6% residual moisture. Oil is then extracted by a screw press and the residue is sold for cattle feed. Most of the oil is sold locally. There are 10 mills in the project area and, although old, can well cope with present production.

(b) Proposed Development

21. Area and cropping pattern. Since the soils are generally suited to the crop, the total area of coconut would remain at 53,000 ac. About 8,000 ac presently on deep and shallow peats would, however, be replaced by crops better suited to peats. The coconut area would be restored by establishing plantings on recent marine soils to which coconuts are well suited. Without the project the area of coconuts would be expected to decline due to saline intrusion. Already in recent years 2,000 ac have been destroyed in the Ayer Baloi area. The planting and rehabilitation schedule is shown in Table 6.

22. Improved husbandry. The more sustained and intensive extension service provided by DOA under the project through the FO's would demonstrate modern agronomic techniques to farmers. Surplus palms would be removed to reduce stands. Weeding standards would be improved and fertilizer use encouraged.

23. Yields. As shown in Table 4, yields would rise from a low of 200 lbs per ac in the south and an average of 440 lb per ac in the north to 1,300 lbs per ac over 30 years. The rise would be gradual and would not reach the highest levels without the hybrid varieties. Over 30 years the yields would remain below half that forecast for estates, and is considered attainable.

24. Processing. In order to improve the incomes of these smallholders, FAMA would establish copra drying centers in the project area. One is already under construction. FAMA would purchase nuts and process them to high grade copra, thereby attracting better prices from oil mills. Oil milling would remain in the private sector and additional independent mills would be built to cope with the increased production in later years.

Inter-Planting among Coconuts

(a) Present Situation and Techniques

25. Area. Some coconut stands are inter-planted with cocoa, coffee and banana, the areas being:

Cocoa	2,000 ac
Coffee	3,500 ac
Bananas	4,000 ac

These crops are particularly well suited as intercrops with coconuts and are needed to supplement the incomes of coconut small growers.

26. Smallholdings. These crops are grown entirely by smallholders in the project area. The total intercrop of 9,500 ac amongst 53,000 ac of coconuts amounts to only 18% of the area. The average holding of cocoa or coffee is 3.5 ac and of bananas 4 ac.

27. Farming practices. Cocoa and coffee plants bear crops from about their third year to 25th year, and bananas from the first year for varying periods up to 10 years. In the project, bananas have been assumed to need replanting after five 5 years. Cocoa and coffee are picked when ripe, with harvesting at 10 to 30 day intervals. Bananas are harvested throughout the year. They are cut ripe for local use but in a slightly unripe condition for transport to more distant markets.

28. Age and quality. Cocoa plants are in surprisingly good condition, considering the lack of good on-farm drainage. Their foliage is healthy and of good size. Coffee is the Liberica variety and is well suited to the soils, it appears vigorous and bushes are well grown, comparing well with those in the major coffee growing areas in Malaysia. Bananas are well suited to the soils in the project area, and are tolerant of acid conditions. The variety "Pisang Berangan" does particularly well under coconuts.

29. Yields. As the first cocoa was planted in 1971, there are few yield data available. Coffee yields are about 400 lbs dry beans per ac. This is rather low due to lack of on-farm drainage and low fertilizer use. Banana yields average about 1.25 tons per ac, which can be improved by more frequent replanting, since yields drop with each ratoon.

30. Replanting schemes as described in para 23 are available for these crops under the DOA.

31. Pests and Diseases. Cocoa is affected by leaf-eating caterpillars and beetles, mealy bugs and capsids. These are being treated by farmers with a variety of pesticides, some of which pose hazards to both pests and beneficial insects (pollinating insects and pest predators). DOA is investigating the use of pesticides and the new Pesticide Act (under parliamentary consideration) will help to control use of certain chemicals. There are effective pesticides available to treat the pests affecting the

cocoa and DOA would train a pest control team to provide spraying services at farmer's request. Liberica coffee is particularly hardy and not much affected by pests, except for berry borer and green scale for which there is treatment. The incidence of disease in bananas in the area is mild, most varieties seem resistant to leaf spot.

32. Processing. FAMA is currently constructing a processing unit for cocoa at the Rengit FO. Cocoa pods are split, fermented, then dried and bagged for market. A number of small coffee processing units exist in the area. These remove the skin and pulp from coffee beans in water, then ferment, wash and dry them. Dried beans are sorted and bagged for market.

(b) Proposed Development

33. Area and cropping pattern. Over the next 30 years, the areas of the intercrops would be increased gradually to the following:

Cocoa	30,000 ac
Coffee	10,000 ac
Banana	10,000 ac

Planting schedules are shown in Table 7. Smallholders would be induced to follow these schedules by better and more sustained extension services, with guidance from the project sociologicist and economist, and the spread of the FO's.

34. Yields. Under the project yields would increase gradually over 30 years as follows:

Cocoa:	450 to 800 lbs dry bean per ac
Coffee:	400 to 600 lbs dry beans per ac
Bananas:	1.5 to 4 tons per ac

The cocoa yields anticipated are only 70% of those now obtained on estates in Malaysia. Yields of 5,000 lbs per ac under research station conditions have been obtained in Sabah and the private sector there expects to reach yields of 3,000 lbs/ac commercially in 10 years. Cocoa is highly responsive to good management practices. Coffee yields are expected to remain below those experienced in the main coffee-growing districts of Malaysia and should easily be obtainable, allowing for improvement in planting materials. Banana yields would be expected to rise mainly due to better husbandry and more frequent replanting.

35. Processing. The first processing unit for cocoa is being built (para 32) and, as production increases, additional units would be built commencing in 1976. The present method of processing cocoa is satisfactory. The existing small coffee processing units would be replaced by larger modern units commencing in 1975 with a 3 ton per day unit (See Table 3).

Pineapple

(a) Present Situation and Techniques

36. Area. Pineapples are planted extensively in the project area, mainly on the peat soils around Pekan Nanas and west of Simpang Rengam. Smallholders account for more than 20,000 ac of the pineapple acreage, the balance is cultivated on estates, 14,000 ac of which are owned by two companies.

37. Smallholdings. There are over 3,000 smallholdings averaging 11.7 ac in extent with about 8 ac of pineapples on each lot. Other crops are rubber, coconuts and fruit trees. Holdings vary considerably in size; 15% have less than 3 ac pineapples, while 12% have more than 15 ac of the crop. Chinese farmers cultivate an average of 10.6 ac, whereas Malays cultivate 5.1 ac; some Chinese rent additional areas. Most smallholdings consist of a single block.

38. Farming practice. Pineapples produce one plant crop in about 18 months and thereafter ratoon crops, mainly in May/June and January, although harvesting does continue throughout the year. The percentages of annual crop produced monthly are:

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
10	6	10	8	12	14	6	5	7	7	6	9	100

The fluctuations in monthly crop can be reduced by regularly replanting and by flower induction programs using stimulants. At present many plants are more than ten years old. Lack of roads hampers the transport of fruit to the canneries and causes severe losses.

39. Age and quality. Much of the present crop is too old to produce good yields. The variety is mostly "Singapore Spanish", which possesses the following characteristics:

	Favorable		Unfavorable
(i)	Good fruit color and flavor for canning purposes;	(i)	Rather low yields;
(ii)	Satisfactory fungal disease resistance;	(ii)	Small fruit, poor shape and deep eyes, resulting in low factory recovery rate;
(iii)	Responsive to flowering stimulants.	(iii)	Susceptible to Erwinia fruit collapse.

By selecting within the "Singapore Spanish" variety a new cultivar, "Mas Merah" was introduced in 1971. This cultivar has 30% better yields than present plants and yields a larger fruit. There is, however, an urgent need for a variety with better canning shape, yield and fruit size.

40. Yields. The average yield of existing plantings is 7.8 tons of fresh fruit per ac. "Mas Merah" is capable of producing 20 tons per ac in first crop and 10-12 tons annually in ratoon crops. Yields are affected by high water tables as well as by lack of care. Estates production raises the average yield since they have better agronomic techniques.

41. Replanting scheme. In 1971 a replanting scheme was introduced, which granted smallholders M$ 400 per ac in the first year. This grant was raised in 1973 to M$ 650 per ac as response to the initial replanting grant had not been very satisfactory (only 230 ac being replanted by the end of 1972). However, a shortage of planting material was also a factor. The grant is administered by MPIB, who are planning a major drive to increase replanting as soon as more "Mas Merah" plants become available.

42. Pests and Diseases. Mealy bugs are the most prominent insect pests while Erwinia fruit collapse is the only disease of significance.

43. Extension and Research. Extension is provided by MPIB but, due to staff constraints, has not been reaching the smallholders, who have not been replanting nor using flowering stimulants in an effective manner. Research was taken over by MARDI from MPIB on 1 August 1973. The 250 ac Pineapple Research Station near Pekan Nanas has made good progress in the development of "Mas Merah". Future reasearch efforts would be directed particularly at:

(i) Production of superior varieties and cultivars to increase yields and improve recovery rate at canneries, including trials on varieties from other countries, such as Australia;

(ii) Novel methods of propagation, by tissue culture or other means, to accelerate the pace of replanting with new cultivars;

(iii) Investigation of the optimum drainage regime. Tank investigations indicate that both under and over drainage can significantly influence growth and yield;

(iv) Nutritional investigations to enhance productivity;

(v) Use of growth regulating hormones to minimize fluctuations in monthly production and thereby increase the annual throughput of canneries; and

(vi) Studies of the economic returns in different cycles of replanting.

MARDI has requested a loan from the Bank, which would include strengthening of staff and facilities for pineapple research. Preparation prior to appraisal is underway.

44. Processing. There are five canneries in the region and two, both managed by PCM and owned by Government, are in the project area. Other privately

owned canneries are in Johore Bahru and Singapore. All activities of the canneries are regulated by MPIB and the Food Technology branch of the Ministry of Agriculture. Apart from a small amount of fresh fruit sold locally, all pineapples are canned.

45. Farmers sell their crop to registered vendors and co-operatives who are responsible for fruit delivery to canneries. Prices paid by can-canneries to farmers are reviewed every three months by the MPIB and fixed by Government. Payment is made only for accepted fruits at the fixed rate and deductions are made for transportation charges (usually M$ 5 - M$ 6.50 per ton delivered). Members of the MPIB Inspectorate Division are stationed at each cannery to supervise various activities, including deliveries, fruit grading, processing operations, general sanitation, labelling of products, etc. Rejection of fruits by canneries is to some extent subjective and averages 15% of fruits delivered, being higher during peak cropping periods. The extent of fruit rejection has been a constant source of dispute, because growers receive no payment for rejected fruits, which are often utilized for production of juice and lower grade products. Guidance to farmers on optimum harvesting standards and visual grading of fruits at collection centers before loading would reduce considerably the extent of fruit rejection at canneries. As fruit size is a very important criterion, it would also be desirable for canneries to grade fruits by mechanical means into different size grades, paying premia for large fruits of the required quality and applying discounts to undersized or sub-standard fruits.

46. With regard to fruit utilization, the average recovery rate at canneries is reported to be only 15% of accepted fruits. This figure compares unfavorably with values closer to 30% to 40% recorded in Australia, Taiwan and Hawaii. The very poor recovery rate in the Malaysian canneries can be attributed largely to small fruit size (averaging less than 3 lb each) deep eyes and lack of incentive to grow and supply large fruit. "Mas Merah" variety is reported to have a recovery rate of about 20%.

47. Waste materials are granulated and flushed into rivers which are consequently polluted. Investigations are being undertaken on utilization of fresh or dried pineapple waste as a foodstuff for animals and for manufacture of alcohols and acids.

(b) Proposed Development

48. Area and cropping pattern. No immediate increase in pineapple area is proposed. After better yielding and shaped varieties are planted, the acreage under pineapple would increase gradually over 30 years by 10,000 ac to 45,000 ac. All pineapple would be grown on peat, to which it is well suited. About 4,000 ac presently on mineral soils would be replaced by oil palm and the acreage regained from the newly drained peat areas. The planting schedules are given in Table 8.

49. Improved husbandry. Once the drainage is improved and the new varieties planted, the farmers would be persuaded by greater extension efforts from MPIB through FO's to use fertilizers to improve yields and flowering stimulants to spread the peak harvesting periods. This would improve regular

incomes and reduce rejections at canneries. MARDI would carry out an intensive program of research on the pineapple varieties and their fertilizer and stimulant needs (para 43).

50. Processing. By grading the fruit in the field at collecting centers and revising the prices paid from the fixed system to a variable system based on size, shape and quality, an incentive would be provided to farmers to produce better fruit. Better roads would be provided in the project between farms and collection centers, sharply reducing transport costs and fruit damage. Use of flowering stimulants would alleviate the peaking problem. The above factors would enable canneries to obtain a better recovery rate. An improvement in fruit size alone would be of considerable benefit, for the following reasons:

- Apart from transport costs, field costs per unit number of fruits would not be increased.
- Fewer fruits would be rejected.
- Factory recovery would increase considerably and this substantially greater recovery rate would allow the price canneries pay growers for fruit to rise.
- Cannery productivity would be increased considerably with no increase in machinery, labor, etc.

51. Present canning capacity is estimated to be 375,000 tons annually. As the initial rate of crop production would increase slowly, no additional canneries would be required before 1980. Starting in 1980 a new cannery of 75,000 tons annua capacity would be built and before the end of the project development period, another two similar canneries would be required (Table 3).

Oil Palm

(a) Present Situation

52. Area. Oil palms are grown extensively on sedentary soils just outside the project area where there are ample oil milling facilities. Only sporadic palms, mainly planted as ornamentals, are found in the project area. Small estates within the area are contemplating planting the crop and one small estate near Kukup had established sufficient nursery seedlings for planting 200 ac in 1973. The slow pace of oil palm development in the project area can be attributed to a combination of factors, including inadequacy of drainage, unsuitability of certain soils (such as deep peats), absence of demonstration plots or estate plantings which would indicate the crop's potential, and mostly, the need to organize collection of fruit and transport for processing in factories outside the area.

53. Smallholdings. At present, there are no smallholdings with this crop in the project area.

54. Farming Practice. Oil palm has an economic life from about three years to 25-30 years of age but its fruit bearing is variable, reaching a peak in the twelfth year, and then gradually falling off. Fresh fruit bunches (FFB) are harvested at intervals of 10-14 days and are then be taken to collection centers for transport to the oil mill. The distance to the mill should not be greater than 40 miles to avoid excessive transport costs and deterioration in oil quality.

55. Age and Quality. The condition of the few palms in the area is very encouraging. Palms are up to 20 years old and have not received much attention and yet there is a good display of fronds and little sign of nutrient deficiency. There are clear indications, from other areas of similar soils in Malaysia, that oil palms would be well suited to those soils in the project area for which it would be recommended.

56. Replanting Scheme. RISDA operates the scheme for replanting rubber with oil palm. M$ 750 per ac spread over 2 years is provided. The grant includes planting material and fertilizer as well as a cash element. RISDA has already supervised replanting of some 15,000 ac of oil palm in Johore State since 1956 on smallholdings. RISDA would also provide extension services and mills for oil palm.

57. Diseases. The only major insect pest in the area, the rhinoceros beetle (Oryctes), can be reduced in significance by destruction of potential breeding sites (e.g. rotting rubber and palm timbers) and by regular patrols within young plantings to remove adult beetles before they inflict appreciable damage. Control measures for other insect pests are seldom required and would be the responsibility of the proposed project pest control team under the direction of an extension services entomologist. Rats can be troublesome in both young and mature oil palm plantings. A close check would be maintained for, and appropriate measures taken against, fungal disease, especially Ganoderma stem rot and Marasmius bunch rot, which would not present major problems.

(b) Proposed Development

58. Area and Cropping Pattern. It is planned to replant 45,000 ac of rubber with oil palm over 30 years. The total area of oil palm at the end of the development period would be 60,000 ac. The other acreage would come from undeveloped land (9,000 ac) and marine deposit soils (6,000 ac) presently planted with pineapple or coconut. The proposed planting schedule is shown in Table 9. The initial pace of oil palm planting would be slow, amounting to 100 acres in 1974, 400 acres in 1975 and 1,300 acres in 1976. This slow pace is recommended as trial-cum-demonstration blocks of reasonable size (at least 50 ac) would need to be established in advance by MARDI and the DOA on representative soils.

59. Improved Husbandry. There would be no problem in securing adequate supplies of D x P (Tenera) planting materials from reputable sources. Material for the 1974 planting would be obtained from established estate nurseries which usually carry surplus seedlings. Materials for subsequent plantings would preferably be raised in central polybag nurseries (operated by DOA and Farmers' Organizations) for subsequent distribution to farmers. Guidance as to the most appropriate field practices would be obtained through RISDA from research institutions and organizations which have experience in the cultivation of oil palms in similar circumstances. Few problems are liable to arise for which satisfactory solutions have not already been found. To ensure success in the change of cropping pattern, social factors would be considered as well as agronomic to ensure that replanting takes place in compact blocks, thereby facilitating the supervision of field practices and the transport of fruit. Oil palm cultivation practices would include:

(a) water table regulation in potential acid-sulphate soils to ensure reducing conditions are maintained within the acid-sulphate horizon in dry weather;

(b) use of fertilizer based on soil and foliar analysis results, with due consideration to experience in field experiments. The main requirements are likely to be for nitrogen and potash, the latter preferably supplied by oil palm bunch ash; and

(c) regular weeding, since strongly competitive growths must not be allowed to establish within the avenues between trees and clean weeded circles should be maintained around palms.

60. Yields. Yields would increase slowly as palms come into production after the third year. Maximum yields on smallholdings would be 8.5 tons FFB per ac in the twelfth year. This would be about 75% of estate yields and would be possible under smallholder conditions with good extension services. Yield progressions are shown in Table 4.

61. Processing. There are no oil palm mills in the project area. The build-up of oil palm production in the project area is shown in Table 3. It is envisaged that, until production exceeds 40,000 tons per annum -- sufficient to justify operation of an oil mill within the project area -- fruit bunches would be sent to the FELDA oil mill at Kulai for processing. According to production estimates, the first oil mill would be operational in 1982. Altogether three mills would be required, two of 30 tons and one of 40 tons FFB per hour capacity, to process crops expected in 30 years' time. Processing requirements are based on the following assumptions:

(a) a maximum of 12% of annual crop would be harvested in one month;

(b) mill presses would each have a throughput capacity of 10 tons FFB per hour; and

(c) a mill would operate 500 hours in peak cropping months.

It follows that one 10 ton press would be required for every 40,000 tons ffb produced each year. Assurances would be given to the smallholders before planting their oil palms that adequate processing facilities would be available to deal with all fruits produced. RISDA would arrange collection points and transport the fruit to FELDA mills and later to the new mills. Mills would be built and operated under the auspices of RISDA, with advice from FELDA.

Tapioca, Groundnuts and Vegetables

62. Area. There are no significant areas of these crops in the project area at present.

(a) Proposed Development

63. Tapioca. Cultivation would be confined to peat soils. Eventually 40,000 ac would be established. Experience with tapioca in peat soils at the MARDI's Jalan Kebun station in Selangor indicates that tuber yields fully comparable with yields obtained on good mineral soils can be realized on peat soils that are adequately drained and nourished. The crop is less well suited to other soils in the project area which tend to be of too heavy texture and pose cultivation difficulties. Peat soils are very easily cultivated by hand, are inexpensive to maintain weed-free, are flat and not subject to erosion, and facilitate harvesting of tubers. There are several high yielding varieties in the country. The most popular at present are Black Twig and Green Twig. The former is the more adaptable and consistent yielder, and has higher extractable starch. There are ample supplies of planting materials. Tapioca is a heavy feeder and a generous fertilizer program would be provided to sustain high productivity on continuous cropping. As responses are highly economic, liberal manuring is well justified. Although virgin peats have low nutrient reserves, they possess very good cation exchange capacities (superior to clay soils) and therefore efficiently retain nutrients which are applied. As peats are deficient in copper and tapioca is particularly sensitive to shortage of that nutrient, it would be necessary to apply copper sulphate.

64. Tapioca is a very easy crop to grow and has few pests or diseases. The cost of initial land preparation would be higher than for normal mineral soils, on account of the presence of buried timbers, but subsequent costs would be reduced. Mechanization of operations would not be practicable for several years until peats have consolidated and timbers within 18 in of the surface have been removed. Despite the impracticability of mechanizing operations, returns on peat soils compare well with those on mineral soils. On-farm drains for tapioca should be about 25 yards apart and 1.5 ft in depth.

65. Tapioca has not been cultivated extensively on peats, but large scale trials and observation blocks on peats have consistently given yields of between 10 and 15 tons tubers per acre. With rational manuring such high yields can be maintained. As the efficiency of the farmers varies considerably, initial yields would average 8 tons per ac but a gradual improvement to 14 tons per ac would be expected over the 30-year development period as a result of improved varieties and superior agricultural practices.

66. Processing facilities would be built in the area for converting tubers to chips and starch. However, as the crop build-up is rather slow initially and capital costs of a large processing plant are high, the tubers would be processed into chips or pellets at first. The first starch plant would be needed by 1979. By 2003, 12 such 175-ton per day plants would be required.

67. Groundnuts. Groundnuts require soft, friable soils which offer good penetration of roots and facilitate penetration of pods. The crop is therefore best suited to sandy and organic soils. Trials conducted by the DOA and MARDI on peats indicate, however, that very good yields can be obtained provided that an appropriate fertilizer program is followed. 10,000 ac would be planted in the newly drained peat area. Being a legume, the groundnut responds well to fertilizers which reduce soil acidity. Several varieties of groundnut are cultivated in Malaysia. Further investigations would be necessary to determine which varieties are best suited to peat soils. The initial plantings by DOA would include variety/fertilizer/spacing trails to provide additional information and serve as demonstration plots. As the crop is susceptible to diseases, it is not suitable for continuous cultivation. Trials are in progress at the MARDI peat research station to study rotational cropping systems.

68. The cropping cycle is usually about 110 days and three crops per year have been assumed. Harvesting on peat soils is inexpensive as pods can be extracted without difficulty. Yields of almost 1.5 tons of fresh unshelled groundnuts per ac per harvest can be obtained.

69. After harvesting, pods are separated from stalks and pods may be dried intact to 12% moisture content or nuts extracted and dried to 8% moisture content. Small quantities can be dried outdoors on mats to the requisite moisture content in 3-4 days if good sunshine conditions prevail. Artificial drying is necessary when large-scale production commences. The capital investment for a unit capable of processing 3,300 tons of fresh unshelled nuts per annum would amount to $320,000 and yield 1,000 tons roasted peanuts. The early production would be sun dried and sent to Perak State for processing. The first unit would be commissioned in 1978. Fifteen such units would be required in 30 years' time.

70. Vegetables. As the mineral soils in the area are unsuitable for commercial vegetable cultivation, and peats can support high yields of a variety of crops, vegetable-growing ventures would be restricted to the latter. 10,000 ac would be planted in the newly drained areas.

For intensive vegetable cultivation, peats have the following advantages over most sedentary soils:

(a) less subject to erosion;

(b) more satisfactory water holding properties;

(c) moisture availability can be regulated at little cost by control of water level in drains;

(d) good nutrient retention capacities; and

(e) low weeding costs.

Work undertaken by the DOA and MARDI, supported by work of enterprising farmers, has shown that a wide variety of vegetable crops can be grown on peats. Vegetable cultivation is labor intensive and results depend to a large extent on the endeavour and ability of individual farmers. Mechanization of cultivation using heavy equipment would be impracticable until peats have consolidated and timbers within 18 in of the surface have been extracted. Very little mechanization of vegetable cultivation is done at present in the major vegetable-growing areas of the country. Considerable expertise is required in arranging suitable crop rotations, timing of land preparation and planting operations, application of appropriate fertilizers, fungicides and insecticides at the right time and efficiently. With regard to nutrient responses, vegetables respond well to light burning of peat and application of wood and oil palm bunch ashes. FO's would provide the necessary extension advice.

71. Experience of growing vegetables on peats in the area has shown the following average yields are possible after drainage improvements:

Crop	Cropping Cycle ---months---	Yield per Acre -----tons-----	Product
Cucumber	3	6.0	fruits
Chilli	6-1/2	2.4	fresh fruits
French beans	2-1/2	3.0	fresh pods
Tomato	3-1/2	6.0	fruits
Ginger	8-9	5.4	fresh root
Yam (Colocasia)	10	5.0	fresh corms
Sweet potato	5	6.0	fresh tubers
Watermelon	3-1/2	6.0	fresh fruit

The above yields are obtained from relatively unimproved planting materials. Higher yields would be expected in future as a result of breeding and selection work on these crops.

72. Although MARDI is undertaking vegetable research work on peats in Selangor, trials would be carried out on a peat station in the project area which would provide information on planting material performances with different cultural practices and at the same time serve as demonstration areas for farmers. Considerable effort would be required by the extension services to promote vegetable cultivation and ensure that sound agronomic practices are adopted. The extension services would also be responsible for organizing the cropping and planting patterns necessary for a uniform supply of vegetables to markets. Close liaison between research, extension and marketing services would, therefore, be established.

Planting Materials

73. The supply of planting materials to keep pace with proposed development would not be a problem. DOA would be responsible for organizing the supply, which would come from the following sources:

Oil palm	-	MARDI and several large estates in the private sector
Rubber	-	RRIM and RISDA
Coconut	-	DOA's own stations
Cocoa	-	DOA from Sabah and elsewhere
Pineapple	-	MARDI and external sources
Coffee, Tapioca, Groundnut	-	DOA's own stations

Tables

1. Present and proposed distribution of crops
2. Phasing of changes in cropping pattern
3. Summary of crop statistics and processing plant schedule
4. Yield progressions of selected crops
5. Crop statistics - Rubber
6. " " - Coconut
7. " " - Cocoa, Coffee, and Banana
8. " " - Pineapple
9. " " - Oil Palm
10. " " - Tapioca, Groundnuts and Vegetables

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Present and Proposed Distribution of Crops
(ac)

Soil Group	RUBBER						COCONUT								PINEAPPLE						
	Present Area	Planned Conversion to				Eventual Area	Present Area	Conversion to		Balance Area	New Plantings			Eventual Area	Present Area	Conversion to		Balance Area	New Plantings		Eventual Area
		OP	C	P	CC			OP	CC		Ex-R	Ex-P	Undevel			OP	C		Ex-R	Undevel	
Recent marine deposits	2,306		2,000			306	3,101			3,101	2,000	800	5,000	10,901	893		800	93			93
Older marine deposits and alluvial soils	44,791	40,000				4,791	41,840	2,800		39,040				39,040	3,618	3,000		618			618
Shallow peat	5,489	5,000				489	1,372			1,372				1,372	713			713			713
Deep peat	33,914			10,000	19,500	4,414	6,687		5,000	1,687				1,687	29,676			29,676	10,000	3,900	43,576
TOTAL	86,500	45,000	2,000	10,000	19,500	10,000	53,000	2,800	5,000	45,200	2,000	800	5,000	53,000	34,900	3,000	800	31,100	10,000	3,900	45,000

Soil Group	OIL PALM						CASH CROPS					Mixed Horticulture, Market Gardening, Miscellaneous Crops	Total Area Developed		Total Area Undeveloped		Gross Area
	Present Area	New Plantings				Eventual Area	Present Area	New Plantings			Eventual Area		Present	Eventual	Present	Eventual	
		Ex-R	Ex-C	Ex-P	Undevel			Ex-R	Ex-C	Undevel.							
Recent marine deposits												556	6,856	11,856	32,653	27,653	39,509
Older marine deposits and alluvial soils	200	40,000	2,800	3,000	9,000	55,000						14,905	105,354	114,354	20,586	11,586	125,940
Shallow peat		5,000				5,000				300	300	471	8,045	8,345	1,390	1,090	9,435
Deep peat							100	19,500	5,000	35,100	59,700	3,798	74,175	113,175	82,161	43,161	156,336
TOTAL	200	45,000	2,800	3,000	9,000	60,000	100	19,500	5,000	35,400	60,000	19,730	194,430	247,730	136,790	83,490	**331,220**

Notes:

OP = Oil Palm
C = Coconut
P = Pineapple
R = Rubber
CC = Cash crops = Tapioca, groundnuts, mixed vegetables, etc. The averages shown do not include interplanted areas or already planted areas of unknown total acreage listed under mixed horticulture, market gardening, etc.
Undeveloped areas = Forest reserves, gazetted areas, urban areas, etc.

ANNEX 3
Table 1

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Phasing Of Changes In Cropping Pattern
(ac)

YEAR	RUBBER						COCONUT							PINEAPPLE					
	Total Area		Planned Conversion to				Replanting	Total Area	Conversion to		New Plantings			Replanting	Rehab.	Total Area		Conversion to		New Plantings		RP/NP
			OP	C	P	CC			OP	CC	Ex-R	Ex-P	Undevel					OP	C	Ex-R	Undevel.	
1973	86,500	*						53,000								34,900	*					
		(- 8,500)	6,000	500	1,000	1,000	1,000		-	1,000	500	300	200	4,000	6,500		(1,100)	1,000	300	1,000	1,400	1,000
1978	78,000							53,000								36,000						25,000
		(-16,000)	12,000	500	1,500	2,000	1,000		800	1,000	500	500	800	2,200	10,000		(1,500)	2,000	500	1,500	2,500	
1983	62,000							53,000								37,500						37,500
		(-18,000)	12,000	500	2,000	3,500	500		1,000	1,000	500	-	1,500	3,000	-		(2,000)	-	-	2,000	-	
1988	44,000							53,000								39,500						39,500
		(-14,000)	7,000	500	2,000	4,500	500		1,000	1,000	500	-	1,500	3,000	-		(2,000)	-	-	2,000	-	
1993	30,000							53,000								41,500						41,500
		(-11,000)	4,000	-	2,000	5,000	500		-	1,000	-	-	1,000	4,000	-		(2,000)	-	-	2,000	-	
1998	19,000							53,000								43,000						43,000
		(- 9,000)	4,000	-	1,500	3,500	500		-	-	-	-	-	5,000	-		(1,500)	-	-	1,500	-	
2003	10,000							53,000								45,000						45,000

YEAR	OIL PALM					Mixed Horticulture Market Gardening Miscellaneous Crops	CASH CROPS				UNDEVELOPED LAND					Total Developed Land
	Total Area		New Plantings				Total Area	New Plantings			Remaining		Developed to			
			Ex-R	Ex-C	Ex-P	Undevl.		Ex-R	Ex-C	Undevel			C	P	OP	CC	
1973	200	*					100	*			136,790	*					194,430
		(8,000)	6,000	-	1,000	1,000		(4,400)	1,000	1,000	2,400	(- 5,000)	200	1,400	1,000	2,400	
1978	8,200					19,730	4,500					131,790					199,430
		(16,800)	12,000	800	2,000	2,000		(18,500)	2,000	1,000	15,500	(-20,800)	800	2,500	2,000	15,500	
1983	25,000					19,730	23,000					110,990					220,230
		(15,000)	12,000	1,000	-	2,000		(14,000)	3,500	1,000	9,500	(-13,000)	1,500	-	2,000	9,500	
1988	40,000					19,730	37,000					97,990					233,230
		(10,000)	7,000	1,000	-	2,000		(10,000)	4,500	1,000	4,500	(- 8,000)	1,500	-	2,000	4,500	
1993	50,000					19,730	47,000					89,990					241,230
		(5,000)	4,000	-	-	1,000		(7,000)	5,000	1,000	1,000	(- 3,000)	1,000	-	1,000	1,000	
1998	55,000					19,730	54,000					86,990					244,230
		(5,000)	4,000	-	-	1,000		(6,000)	3,500	-	2,500	(- 3,500)	-	-	1,000	2,500	
2003	60,000					19,730	60,000					83,490					247,730

Notes:

OP = Oil Palms
C = Coconuts
P = Pineapple
R = Rubber
CC = Cash crops = Tapioca, groundnuts, mixed vegetables, etc. The averages shown do not include interplanted areas or already planted areas of unknown total acerage listed under mixed horticulture, market gardening, etc.
Undeveloped areas = Forest reserves, gazetted areas, urban areas, etc.

RP = Replanted
NP = New Planted
* = Change during five-year period

ANNEX 3
TABLE 2

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Summary of Crop Statistics and Processing Schedule

Crop	Unit	Project	Construction Period 1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1988	1993	1998	2003
Rubber	'000 acres	With	86.5	86.4	86.4	84.0	81.0	78.0	75.0	72.0	69.0	66.0	62.0	44.0	30.0	19.0	10.0
		Without	86.5	86.3	86.0	85.5	85.0	84.5	84.0	83.5	83.0	82.5	82.0	79.5	77.0	74.0	70.0
	'000 tons	With	17.1	18.5	19.6	20.4	20.9	21.3	21.8	21.8	21.5	21.1	20.4	15.5	11.4	7.8	4.4
		Without	17.1	17.4	17.8	18.1	18.4	18.8	19.1	19.2	19.4	19.6	19.7	20.5	21.3	21.9	22.0
Coconut	'000 acres	With	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0	53.0
		Without	53.0	51.0	51.0	51.0	51.0	51.0	50.0	50.0	50.0	50.0	50.0	49.0	48.0	46.0	45.0
	'000 tons copra	With	10.5	11.0	11.3	11.7	12.4	12.9	13.7	14.3	15.3	16.3	17.4	19.2	21.9	24.8	27.7
		Without	10.5	10.5	10.6	10.8	11.0	11.3	11.1	11.4	11.6	11.8	12.0	12.8	13.8	14.6	15.7
	Copra drying unit[1]:					6T			12T			12T		12T	12T	12T	
Cocoa	'000 acres	With	2.2	2.5	3.0	4.0	5.0	6.0	7.0	8.5	10.0	12.0	14.0	20.0	25.0	28.0	30.0
		Without	2.2	2.5	2.8	3.1	3.4	3.7	4.0	4.3	4.6	4.8	5.0	5.0	5.0	5.0	5.0
	'000 tons dried beans	With	.02	.07	.2	.3	.4	.5	.7	1.0	1.3	1.7	2.0	4.5	6.5	7.3	8.1
		Without	.02	.07	.2	.2	.3	.4	.5	.6	.7	.7	.8	.9	.8	.7	.7
	Processing unit[1]:					4T			2x8T				4x8T	4x8T	2x8T		
Coffee	'000 acres	With	3.5	3.8	4.1	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	10.0	10.0	10.0	10.0
		Without	3.5	3.8	4.1	4.4	4.7	5.0	5.2	5.4	5.6	5.8	6.0	7.0	8.0	8.0	8.0
	'000 tons dried beans	With	.34	.42	.52	.62	.73	.86	.98	1.1	1.2	1.3	1.4	2.0	2.2	2.2	2.1
		Without	.34	.42	.50	.57	.64	.70	.76	.8	.9	.9	1.0	1.1	1.2	1.2	1.1
	Processing unit[1]:				3T				3T			3T	3T				
Banana	'000 acres	With	4.0	4.2	4.4	4.6	4.8	5.0	5.4	5.8	6.2	6.6	7.0	10.0	10.0	10.0	10.0
		Without	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	6.8	6.0	7.0	8.0	8.0	8.0
	'000 tons fruit	With	5.0	5.2	5.6	6.0	6.5	7.2	8.0	9.4	11.3	12.0	12.5	17.9	17.9	17.9	17.9
		Without	5.0	5.2	5.5	5.8	6.1	6.3	6.4	6.8	7.1	7.3	7.5	8.8	10.0	10.0	10.0
Oil Palm	'000 acres	With	.2	.3	.7	2.0	5.0	8.0	11.0	14.0	17.0	21.0	25.0	40.0	50.0	55.0	60.0
		Without	.2	.3	.5	.6	.8	1.0	1.2	1.4	1.6	1.8	2.0	3.5	5.0	6.5	8.0
	'000 tons ffb	With	-	-	-	.1	.8	1.8	4.4	11.4	25.7	45.7	68.8	208.0	327.0	388.0	395.0
		Without	-	-	-	.1	.6	1.1	1.9	2.7	3.6	4.7	5.8	12.7	19.4	27.0	31.0
	Oil Mill[2]:											30T		30T	40T		
Pineapple	'000 acres	With	35.0	35.0	35.0	35.5	35.5	36.0	36.0	36.5	37.0	37.5	37.5	39.5	41.5	43.0	43.0
		Without	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	'000 tons fruit	With	207.0	207.0	216.0	228.0	244.0	264.0	287.0	307.0	322.0	330.0	338.0	371.0	419.0	452.0	490.0
		Without	207.0	207.0	207.0	210.0	213.0	216.0	225.0	229.0	232.0	237.0	238.0	245.0	252.0	266.0	280.0
	Cannery[3]:							1						1		1	
Tapioca	'000 acres	With	-	.1	.2	.5	1.0	3.0	5.0	7.0	9.0	12.0	15.0	25.0	30.0	35.0	40.0
	'000 tons tubers		-	.8	1.6	4.5	9.0	27.0	50.0	70.0	90.0	120.0	150.0	275.0	360.0	455.0	560.0
	Processing unit[1]:					40T			175T		175T		175T	3x175T	2x175T	2x175T	2x175T
Groundnut	'000 acres	With	-	.01	.05	.1	.2	.5	1.0	1.5	2.0	2.5	3.0	5.0	7.0	9.0	10.0
	'000 tons fresh unshelled nuts		-	.04	.2	.4	.7	1.8	2.7	5.6	7.5	9.5	11.6	20.8	31.2	42.9	50.6
	Processing unit[4]:							1	1	1		1	2	3	4	2	

1/ Daily output in tons.
2/ Daily production in tons ffb.
3/ 75,000 ton/yr per unit.
4/ 3,300 ton/yr per unit.

ANNEX 3
Table 3

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Yield Progressions of Selected Crops

Year 1/	Oil Palm		Cocoa		Coffee		Bananas	
	Without	With	Without	With	Without	With	Without	With
	--tons ffb-----		----------lb. dry beans----------				lb fruit bunches	
1	-	-	-	-	-	-	200	200
2	-	-	-	-	-	-	400	600
3	-	-	-	-	-	-	330	460
4	0.5	0.7	70	120	10	20	270	200
5	2.5	3.6	190	320	70	100	200	270
6	3.8	5.6	290	480	140	200	Replant	
7	5.1	7.5	340	560	210	300		
8	5.6	8.2	380	640	280	400		
9	5.7	8.4	430	720	350	500		
10	5.8	8.5	450	760	420	600		
11	5.8	8.5	480	800	460	650		
12	5.8	8.5	480	800	460	640		
13	5.6	8.3	480	800	450	630		
14	5.6	8.2	460	780	440	620		
15	5.5	8.1	450	760	430	610		
16	5.4	7.9	440	740	420	600		
17	5.3	7.9	430	720	410	590		
18	5.1	7.5	420	700	400	580		
19	5.0	7.3	410	680	400	570		
20	4.9	7.2	400	660	390	560		
21	4.7	7.0	380	640	380	550		
22	4.6	6.7	370	620	370	540		
23	4.4	6.5	360	600	360	530		
24	4.3	6.2	350	580	350	520		
25	4.1	6.0	340	560	340	500		
26	4.0	5.8	320	540	330	480		
27	4.0	5.7	310	520	320	470		
28	3.9	5.6	300	500	310	460		
29	3.9	5.5	290	490	300	450		
30	3.8	5.4	280	480	290	440		

1/ Year from planting.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Rubber

	Unit	1973	1978	1983	1988	1993	2003
Without Project							
Area - Total	'000 ac	86.5	84.5	82.0	79.5	77.0	70.0
- Mature	'000 ac	69.5	70.0	68.0	65.5	63.5	57.9
Yield	lb/ac	550	600	650	700	750	850
Production	'000 ton	17.1	18.8	19.7	20.5	21.3	22.0
With Project							
Area - Total	'000 ac	86.5	78.0	62.0	44.0	30.0	10.0
- Mature	'000 ac	69.5	73.5	60.8	43.3	29.4	9.4
Yield	lb/ac	550	650	750	800	870	1,050
Production	'000 ton	17.1	21.3	20.4	15.5	11.4	4.4
Incremental Production	'000 ton	-	2.5	0.7	(5.0)	(9.9)	(17.6)

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Coconut

	Unit	1973	1978	1983	1988	1993	2003
Without Project							
Area[1/] - Total	'000 ac	53.0	51.0	50.0	49.0	48.0	45.0
- Replanted	'000 ac	4.0	5.0	6.0	7.0	8.0	10.0
- Rehabilitated	'000 ac	13.0	14.2	15.5	16.8	18.0	20.0
Yield - Replanted	lb/ac	730	800	930	1,065	1,130	1,265
- Rehabilitated		530	600	665	730	800	930
- Balance	(copra)	440	440	425	410	400	370
Production - Total	'000 ton	10.5	11.3	12.0	12.8	13.8	15.2
With Project							
Area[1/] - Total	'000 ac	53.0	53.0	53.0	53.0	53.0	53.0
- Replanted	'000 ac	4.0	9.0	13.0	18.0	23.0	33.0
- Rehabilitated	'000 ac	13.0	19.5	29.5	29.5	27.0	17.0
Yield - Replanted	lb/ac	730	865	1,000	1,130	1,265	1,530
- Rehabilitated		530	665	800	865	930	1,065
- Balance	(copra)	440	530	665	730	800	930
Production - Total	'000 ton	10.5	12.9	17.4	19.2	21.9	27.7
Incremental Production	'000 ton	0	1.6	5.4	6.4	8.1	12.5

1/ Mature area only used in calculating production.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Cocoa, Coffee and Banana 1/

	Unit	1973	1978	1983	1988	1993	2003
COCOA							
Without Project							
Area - Total	'000 ac	2.2	3.7	5.0	5.0	5.0	5.0
- Mature	'000 ac	0.5	2.8	4.3	4.8	4.4	4.4
Production	ton (dry beans)	15	400	760	920	760	650
With Project							
Area - Total	'000 ac	2.2	6.0	14.0	20.0	25.0	30.0
- Mature	'000 ac	0.5	3.0	8.5	16.4	22.0	28.8
Production	ton (dry beans)	15	540	2,020	4,460	6,520	8,130
Incremental Production	ton	0	140	1,260	3,540	5,760	7,480
COFFEE							
Without Project							
Area - Total	'000 ac	3.5	5.0	6.0	7.0	8.0	8.0
- Mature	'000 ac	2.6	4.1	5.4	6.4	7.4	7.4
Production	ton (dry beans)	340	700	970	1,110	1,200	2,130
With Project							
Area - Total	'000 ac	3.5	5.5	8.0	10.0	10.0	10.0
- Mature	'000 ac	2.6	4.1	6.5	8.8	9.4	9.4
Production	ton (dry beans)	340	860	1,410	2,010	2,240	1,130
Incremental Production	ton	0	160	440	900	1,040	(1,000)
BANANA							
Without Project							
Area	'000 ac	4.0	5.0	6.0	7.0	8.0	8.0
Production	'000 ton (bunches)	5.0	6.25	7.5	8.75	10.0	10.0
With Project							
Area	'000 ac	4.0	5.0	7.0	10.0	10.0	10.0
Production	'000 ton (bunches)	5.0	7.15	12.5	17.85	17.85	17.85
Incremental Production	'000 ton	0	0.9	5.0	9.1	7.85	7.85

1/ Yields are based on number of years from planting and are shown in Annex 3, Table 4.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Pineapple

	Unit	1973	1978	1983	1988	1993	2003
Without Project							
Singapore Spanish							
Area	'000 ac	34.5	24.3	0	0	0	0
Yield 1/	ton/ac	5.9	5.9	..	..	..	..
Production	'000 ton	204	143	0	0	0	0
New Varieties							
Area	'000 ac	0.5	10.7	35.0	35.0	35.0	35.0
Yield 1/	ton/ac	6.5	6.8	6.8	7.0	7.2	8.0
Production	'000 ton	3	73	238	245	252	280
Total Production	'000 ton	207	216	238	245	252	280
With Project							
Singapore Spanish							
Area	'000 ac	34.5	19.5	0	0	0	0
Yield 1/	ton/ac	5.9	6.6	..	..	..	..
Production	'000 ton	204	129	0	0	0	0
New Varieties							
Area	'000 ac	0.5	16.5	37.5	39.5	41.5	45.0
Yield 1/	ton/ac	6.5	8.2	9.0	9.4	10.1	10.9
Production	'000 ton	3	135	338	371	419	490
Total Production	'000 ton	207	264	338	371	419	490
Incremental Production	'000 ton	0	48	100	126	167	210

1/ Yields shown are for fruit acceptable for canning. Farm production would be somewhat higher.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Oil Palm 1/

	Unit	1973	1978	1983	1988	1993	2003
Without Project							
Area - Total	'000 ac	0.2	1.0	2.0	3.5	5.0	8.0
- Mature	'000 ac	0	0.4	1.4	2.6	4.1	7.1
Production - ffb	'000 ton	0	1.1	5.8	11.7	19.4	31.1
- oil	'000 ton	0	0.2	1.1	2.4	4.3	6.4
- kernels	'000 ton	0	0.1	0.2	0.5	0.8	1.3
With Project							
Area - Total	'000 ac	0.2	8.0	25.0	40.0	50.0	60.0
- Mature	'000 ac	0	0.7	14.0	22.0	44.0	57.0
Production - ffb	'000 ton	0	1.8	68.8	208	327	395
- oil	'000 ton	0	0.3	12.7	41.6	67.1	83.0
- kernels	'000 ton	0	0.1	2.4	8.1	13.3	16.4
Incremental Production							
- ffb	'000 ton	0	0.7	63	196	308	364
- oil	'000 ton	0	0.1	11.6	39.2	62.8	76.6
- kernels	'000 ton	0	--	2.2	7.6	12.5	15.1

1/ Yields are based on number of years from planting and are shown in Annex 3, Table 4.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Statistics: Tapioca, Groundnut and Vegetables

	Unit	1973	1978	1983	1988	1993	2003
TAPIOCA							
With Project							
Area	'000 ac	0	3.0	15.0	25.0	30.0	40.0
Yield[1/]	ton/ac	..	9.0	10.0	11.0	12.0	14.0
Production	'000 ton	0	27	150	275	360	560
GROUNDNUT							
With Project							
Area	'000 ac	0	0.5	3.0	5.0	7.0	9.0
Yield[2/]	ton/ac/yr	..	3.7	3.9	4.2	4.5	4.8
Production	'000 ton	0	1.8	11.7	21.0	31.5	43.2
VEGETABLES							
Without Project							
Area	'000 ac	0.1	0.25	0.5	0.75	1.0	1.0
Net Value of Production:							
- financial terms[3/]	M$ '000	95	237	474	711	948	948
- economic terms[4/]	M$ '000	(124)	(309)	(618)	(927)	(1,240)	(1,240)
With Project							
Area	'000 ac	0.1	1.0	5.0	7.0	10.0	10.0
Net Value of Production:							
- financial terms[3/]	M$ '000	95	948	4,740	6,640	9,480	9,480
- economic terms[4/]	M$ '000	(124)	(1,240)	(6,180)	(8,650)	(12,400)	(12,400)
Incremental Net Value of Production							
- financial terms[3/]	M$ '000	0	711	4,270	5,920	8,530	8,530
- economic terms[4/]	M$ '000	(0)	(930)	(5,560)	(7,720)	(11,100)	(11,100)

1/ Yield of fresh tubers.
2/ Three crops per year assumed.
3/ Estimated for an average mixture of vegetable crops with all labor evaluated at M$4/man-day.
4/ Estimated for an average mixture of vegetable crops with all labor evaluated at M$3/man-day.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Social Structure

Introduction

1. The total population within the project area is about 200,000, nearly 90% of whom live within the rural farm sector while the other 10% are located within four semi-urban centres, which mainly serve as market towns for the farm area. Their populations ranged from 1,300 to 9,000 persons in the 1970 census.

2. The rural settlement pattern is predominantly of the linear type stretching along the ditches, the main drains, the link roads, and the coastal highway. Even the towns are in the form of linear settlements straddling the coastal highway. They are very poorly linked to the rural farm sector due to the acute lack of an adequate and well-constructed road network. They are agriculturally based towns and their rates of growth are slow, mainly due to the stagnant level of agricultural production in the surrounding area. Within the rural sector itself, there is an acute shortage of farm and link roads. This hinders efficient marketing of rural produce and limits social and economic interactions among the rural community groups. The entire population within the project area is in a relatively static social and economic developmental environment, when compared to populations in other development areas in Malaysia.

3. The rural population is a young one. Around 65 to 70% of the population are under 35 years old. With an average family size of six, it can be theoretically assumed that only about 30% of the entire family work on the farm. Labor shortages may arise when the level of education increases, as children with some secondary education often do not return to the farm. At the beginning of the rubber price slump in 1971, some of the younger people, who form the main farm labor force, migrated to Johore Bharu and Singapore in search of better-paid manual jobs.

4. The racial composition of the project population is 61% Malays, (comprising the following sub-groups: Javanese, Peninsular Malays, Bugis, (from South Sulawesi), and Banjaris); 37% Chinese; and 2% Indian. In the rural areas, the proportion of Malays tends to increase.

5. The ethnic distribution of the smallholders is as follows:

	MALAYS		CHINESE	
	%	Average Holding (ac)	%	Average Holding (ac)
Rubber	75	8.2	25	17.4
Coconut	90	5.0	10	8.0
Pineapple	48	8.8	52	14.6

6. It is apparent that, although there are more Malay farmers than there are Chinese, the latter operate bigger holdings than the former and have higher yields. However, smallholders in both groups are predominantly owner-operators, except in pineapple farming where 25% of the Chinese farmers are tenants, many of whom rent land from Malay farmers or operate on mortgaged lands belonging to Malay farmers. The few Malay tenant farmers rent land from close relatives.

7. The Malay farms, especially those producing rubber and coconut, are more fragmented than the Chinese farms. This has been due to the traditional law of inheritance according to which every inheritor receives an equal share in every piece of land, rather than each of them being alloted a particular parcel. This has caused moderate land fragmentation, some farmers having as many as six scattered parcels of land.

8. Most of the Chinese-operated farms are situated near the all-weather roads while Malay farms tend to be located away from these roads. The Chinese farmers are more market oriented than the Malay farmers, most of whom still possess high degrees of subsistence mentality, despite the fact that they produce mainly cash crops (para 18). They are less innovative than their Chinese counterparts, as a result of both their value system and their geographical isolation, and this determines the pattern of their socio-economic behavior.

9. The basic differences in the patterns of socio-economic behavior between Malay and Chinese farmers have been the major factors which have set these two racial groups economically apart. The present project would envisage a change in the socio-economic behavior system of the Malay farmers towards a more commercial orientation and thus would go a long way towards bridging this economic gap. This indeed is one of the major goals in the Government's Second Malaysia Plan which adopts a two-pronged strategy of integrated social and economic development.

The Malay Farming Group

10. The Malay farming group falls under three major ethnic sub-groups; namely, the Bugis, the Peninsular Malays, and the Javanese. Each of these subgroups can roughly be identified with a major crop. The Bugis are mostly coconut smallholders settled along the coastal regions, the Peninsular Malays are often rubber smallholders scattered within the middle region, while the Javanese are mostly pineapple smallholders occupying the interior peat soil region. All the three sub-groups have other minor crops - such as coffee, cocoa, bananas, or tapioca, mostly planted as intercrops with the main crops. Their villages stretch along the main

drains, ditches, and link roads across the entire project region. There are rarely any clear boundaries demarcating one village from another. Usually a village is defined as the extent of settlement along a drain, a ditch, or a road falling under the jurisdiction of a village leader. A group of villages forms a sub-district (mukim) which acts as an administrative unit of a District. The sub-district is under the jurisdiction of a local Chief (Pengulu), who is directly responsible to the District Officer.

11. There are about 564 villages in the project area. The people are administratively linked to the Government through village development committees which consist of elected village elder and are chaired by the village heads. The range of issues tackled by these committees is wide, ranging from family squabbles to petitioning the Government for development projects.

12. Above the village committees there are the sub-district development committees, consisting of the heads of the villages in the sub-district and chaired by the Pengulu. The function of this committee is to act as the intermediary between the grassroot village committees and the District development committee. However, these committees have not been given sufficient emphasis either by the villagers or by the Government.

13. At the next level there is the District Action Committee chaired by the District Officer. The members are the various Pengulu within the District, the legislative councillors, and the Assistant District Officers. Special Assistant District Officers have been recently assigned to coordinate the work at the various committees described above.

14. The Rural leadership pattern is reflected in the composition of these committees. When Farmers' Associations (Annex 11) were formed two years ago in the area, most of the leaders in the existing village committees and the traditional leaders (village heads) were elected by the farmers to represent them at all levels in this modern socio-economic organization. These traditional leaders are mostly middle-aged. In the Pontian FA alone, five out of seven directors are village heads, while in the Rengit FA it is four out of seven. The dominance of traditional leaders in the modern socio-economic organization clearly shows that there is very little separation of leadership roles between the social and economic aspects of village life. This high degree of integration of leadership roles (which is true for each of the three ethnic subgroups) reflects the homogenous and strongly structural rural social systems through which the influence system works. 1/ Recognition of this fact should assist in project implementation, in that the traditional leaders and village committee could be influential in introducing new agricultural techniques, in parallel with the FA's.

1/ This situation is just the reverse of that in the Muda Scheme where most of the elected FA leaders are not traditional leaders. Instead, they are younger more educated men. In Muda, there is thus a high degree of separation of leadership roles along social and economic lines.

15. In the FA's within the project area, the elected leaders do not confine themselves to policy-making. Many of them have participated in the management activities of the FA's and have carried out activities which would normally be done by trained extension workers. There is also a high degree of integration between the grassroot political leadership and the economic and social leadership roles. The village heads and many village elders are in one way or another active in politics.

16. In all the subgroups, women play very important roles in both the economic as well as the social spheres. Although their roles are rather unobtrusive, their influences in the decision making processes are very significant. In most cases, they are consulted before any major social or economic decisions are made by the men, as the heads of the households. Women leaders are emerging in the two FA's within the project area and active participation by women in FA activities has gone beyond original expectations.

17. The strong within-group rural social structure is again manifested by the fact that the three major sub-ethnic identities are still strongly maintained, even after more than 200 years of living side by side. The number of intermarriages between these groups is not significant. However, all thse subgroups identify themselves as Malays and Moslems within a wider perspective.

18. Through the years of western cultural influence and the influence of a monetary economy, some of the Malay farmers have oriented their farming more toward commercialization than subsistence. A preliminary survey has shown that 27% of the Malay farmers who are FA members are classified as highly commercialized, 32% are in the medium category, while 41% are of low commericial orientation. In other words, the bulk of the Malay farmers are still subsistence oriented. Malay subsistence mentality may be an outcrop of their religious orientation, perceiving the present life as a mere transition to another more meaningful life, the quality of which will never be determined by material parameters of the present life. However, many social and economic factors also come into play to sustain these attitudes.

19. Past economic development projects always encountered these problems. For instance, the effectiveness of the coconut rehabilitation scheme has been reduced by the reluctance of farmers to remove self-sown seedlings after the old stands have been thinned out. This has been due to farmers' attitudes in maintaining what they call "security", despite the fact that they are advised that the thinned stand would produce a better yield. Moreover, the farmers' traditional practice of excessive planting density is a manifestation of their fatalistic attitudes, in the face of natural disasters such as pests, floods, and the ingress of sea water, which consequently cause low yields.

20. A very low percentage of Malay farmers are tenants. Most of them are owner-operators in all the three main crops. A high value on individual land ownership prevails and the possession of land is as much a social status symbol as an economic asset. However, among the younger farmers, this value

orientation does not occur in as absolute form as it is among the older groups. The fact that many young farmers have left their smallholdings, especially during price slumps, to look for urban jobs supports this point. They can be considered as being more amenable to the changing pattern of socio-economic reality, due to their relatively higher level of education and higher degree of exposure to other cultures.

The Chinese Farmers

21. Most of the Chinese farms in the project area are highly commercialized. They are roughly equally distributed among the three major crops and occur mostly along the main link roads and the coastal highway, interspersed among the Malay settlements. Many of the Chinese farmers do not rely on the farm for the major portion of their income. Some keep shops to serve the needs of other farm people, some work in local Chinese-owned agro-industries such as coconut oil mills, while others own a few fishing boats, most of which are rented out to fishermen. This economic diversification among Chinese farmers evens out income for the whole year, unlike the case of Malay farmers many of whom rely on seasonal peak flows of income, between which they have to purchase their daily essential goods on credit payable at a high rate of interest. This is where the Chinese farmers-cum-village sundry shop proprietors play their role as creditors.

22. The location of the Chinese farmers along the link roads and the coastal highway gives them a more efficient communication with market towns and other urban centres. They are also socially and economically well linked to these semi-urban and urban centres and agro-industries, often through family ownership of transport and processing facilities. These links enable them to orientate and phase their plantings to suit market demands. Their higher average farm holdings may be a factor in making them more amenable to technological innovations. They do not rely much on FA's or cooperatives to aid them in marketing since they are well integrated with the marketing system.

Conclusions

23. The diversity of crops and social groups within the project area pose both favorable and unfavorable conditions for agricultural and socio-economic development. The fact that there are so many government development agencies to serve the farmers, adds further to the problematic aspects. Farmers are rather confused as to what source of developmental service they should turn to when problems are confronted. The favorable conditions are the agricultural diversification which provides a high degree of economic flexibility to the area and the existence of a strong system of traditional community leadership among the farmers.

24. Agricultural development is the development of people in the final analysis. In the project area, where it is recommended that there should be a substantial shift (80%) from the present 87,000 ac of rubber to oil palm, a large program to convince the rubber smallholders has to be planned and executed. The question is: what are the incentives needed to motivate farmers

to change their traditional crops to entirely new crops with which they have no acquaintance? In the case of replacing rubber smallholdings with oil palm an added problem has recently appeared. This is the recent favorable rubber prices. There is also the proposed settlement of farmers on about 60,000 ac of unused peat soils, which involves human problems. Finally, there is the major problem of inducing sustained conviction and interest on the part of the farmers in replanting and rehabilitating old crop stands. We need to know in what ways could the farmers be made aware of the significance of thinning out their old stands, replanting them with better varieties at optimal planting distances, using recommended fertilizers at recommended levels, and planting good intercrops, so that their interests and convictions do not end when the last of the replanting grant is paid. These are all questions pertaining to the human aspects of agricultural development.

25. Looking at the Malay farm population in the project area, there is more of a need for improvement in the existing socio-economic organizations (i.e. village development committees, FA's) to provide favorable media for technological innovations, than for direct extension. The farmers have been exposed to many innovations in the past decade but very few innovations survived beyond the trial stage.

26. It is not that the innovations are incompatible with their culture but rather that Malay farmers' conception of the loss and gain relationships from the adoption of innovations prevents sustained interest. Because of high degree of susbsistence mentality and security conciousness, their concepts of loss and gain relationships are confined to short term considerations. They would hesitate to take risks in adopting new innovations which require a few years of waiting before they are positively proven as in the case of all tree crops and even pineapple.

27. The Chinese farmers are more cosmopolitan in their economic contacts than the Malay farmers and hence they are generally more innovative. Hence, among them there is no need to improve their socio-economic organizations. Direct diffusion of innovations by extension workers is all that needs to be done.

Recommendations

(i) Changing Rubber to Oil Palm

28. The problem of crop changing would mainly lie among the Malay farmers, who own too little land to accept big risks. However, through efficient and sustained extension machinery which operates within an effective grassroot organizational structure, most of the farmers could be persuaded to change.

29. It seems that the younger set of farmers are more amenable to this type of change than the older groups. They are more aware of the low yield of rubber in their area as compared to other areas while at the same time they are aware of the economic potential of oil palm. The government development agencies certainly enjoy a higher degree of credibility among them than among the older groups.

30. However, in the socio-economic organizations which would be the medium for extension under the project (the FO's), the degree and and extent of active participation is lower for younger farmers. This is because of the leadership patterns described above where traditional leaders control all modern organizations. Since the proportion of younger farmers is high, there is an urgent need to involve more of them in the FO's. Since farmers' wives play important roles in economic decision making they should not be left out in the extension effort. There is an urgent need to form strong units for extension among farm women at all levels.

31. The present extension philosophy seems to underestimate the degree of influence the traditional village structure would wield on the farmers. In the process of persuading the farmers to change, proper utilization of the existing influence systems in the form of sub-district and village committees, and the small agricultural units of the FO's should be stressed. Farmers in the area seldom decide independently of family or village sanctions. These social sanctions are significant factors determining their socio-economic behavior.

32. The existing 564 village development committees may be too numerous to form effective direct links between the farmers and innovative agencies. The existing fifteen sub-district committees should form the intermediate linkages to these agencies. These committees, however, are not being emphasized by the district administration as much as the village committees are at present. It is recommended that these sub-district committees should be strengthened to form more effective, and manageable links between farmers and the innovative agencies. Likewise, the District development and action committees should not only be strengthened but also should play more initiating roles rather than passively waiting for initiatives from the lower level committees.

33. The FOA and DOA should be the prime movers of extension activities. The delineation of FO boundaries should, as far as possible, be made to coincide with the District, sub-district and village boundaries. This would enable the creation of organically functional agricultural development centers from which the FO's operate. The optimal membership size should be between 3,000-4,000 farmers and the locations of the agricultural development centers should be within easy reach of the farmers.

34. To achieve the challenging goal of crop change, adequate numbers of field extension staff are needed. The staff to farmers ratio should be the criterion in measuring this adequacy, instead of using staff to acreage ratio. The ideal ratio for this particular work would be one JAA to 150-200 farmers. There is also a need to have more women JAA's in each FO.

35. Once the organizational systems are established, improved, and strengthened, incentives for farmers to change their rubber to oil palm have to be created. The existing incentive system in the form of replanting grants may not be enough since many farmers would be tempted to exploit the grants for other purposes. Moreover, these grants might all be spent in paying for the cost of replanting, leaving many farmers without sources

of income while waiting for their replanted crops to begin producing. The possibility of this happening may cause farmers to cling to their existing crops, even though they afford only subsistence income. Cash crops should be introduced in conjunction with replanting. There would also be opportunities for casual labor off the farm, such as feeder drain excavation.

(ii) The Rehabilitation and Replanting of Crops

36. Responses to the Government rehabilitation and replanting scheme among coconut smallholders up to June 1973 differed between the races as shown in the following table:

	Malays		Chinese	
	No.	Area (ac)	No.	Area (ac)
Rehabilitation	3,682	17,747	1,427	7,091
Replanting	1,150	3,909	350	1,674

37. Only about 71% of the rehabilitation was done by Malay smallholders although they constitute 90% of the smallholder population, while in replanting activities only 58% of the total participation is from Malays. This is also true in the pineapple rehabilitation and replanting schemes. This further confirms the more commercial orientation of the Chinese farmers in the project area.

38. For extension work pertaining to rehabilitation and replanting it is, therefore, imperative to utilize as much as possible the existing influence systems as described above. Farmers have shown their ability to rehabilitate with whatever means they can afford, for example, by constructing their own field drains. The fact that many of them have not followed the agencies' advice concerning rehabilitation or replanting is not so much due to their unwillingness to innovate but more due to their lack of confidence in the advice. There indeed has been a credibility gap between the innovative agencies and the farmers.

39. It is, therefore, strongly recommended that extension workers should have proven innovations to show and should know the farmers better. Extension service should not stop at the production level as mostly is the case at present. Equal emphasis should be given to improving processing, storage, and marketing. Incentives to produce better quality products at increased levels are highly correlated with favorable market conditions.

(iii) Settlement of Farmers on Unused Peat Soils

40. Much of the undeveloped land is already alienated (that is, privately owned) the remainder is state land and could be sold to settlers after completion of drainage. The issues to be considered here are as follows:

(a) Which groups of people are to be settled?

(b) What are their motives for wanting to participate in the settlement scheme?

41. Looking at the relatively youthful population within the project area, the first criterion for selection should be farmers below 30 years old. Although there may not be an acute population pressure on land at present, this problem will eventually arise, considering the rate of population increase. Moreover, some of the younger farmers are sharecropping or renting lands from relatives. As population grows, the present farmer-to-land ratio may no more be economically favorable. Given the lack of industrial jobs in the region, the best way to employ these younger farmers would be by settlement on new land.

42. Another criterion for selection is the size of the smallholding related to the size of the farm family. The low average rural household income is due to the small size of the smallholdings. It is, therefore, recommended that the selection for participants should be made among farmers operating below 5 ac of land. However, priority should be given to tenants and farmers whose lands are at present under mortgage, even though their numbers are low.

43. The above two criteria would help to enable the selection of farmers whose motives are entirely for self-improvement. These land-hungry farmers would at least guarantee a motivated resettlement population. Although modest in scale, the resettlement should aim to redistribute the farm population of the project area rather than to bring in outside settlers.

(iv) Market Towns and Agro-Industries

44. The lack of market facilities and strategically located market centers are also reasons for low motivational levels for agricultural development. If this were to continue, not only would there be a lack of marketing channels but there would also be a low availability of attractive consumer goods to increase the utility of money earned from increased agricultural production.

45. The establishment of agro-industries in selected townships would go a long way towards improving marketing arrangements and encouraging urbanization. Urbanization in this context is not only confined to the establishment of urban centers, but also the establishment of optimal urban-rural links which would facilitate, among other things, the changing of the subsistence oriented values of most farmers.

(v) Public Health

46. The immediate health problem posed by the implementation of the project is the increasing water surface area, if the drains to be constructed are not properly operated and maintained. On the other hand, large areas of swamp would be drained. The incidence of malaria and dengue fever are

currently the major health problem of the project area. However, health services are being strengthened and an anti-malaria campaign will be initiated in 1974.

47. Malnutrition is another health hazard. As farmers are expected to double their efforts in the implementation of the project, their ability to do so has to be considered. A weak, undernourished farmer is certainly not an economically productive man. The need for nutrition improvement again justifies the need for more women extension staff.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

The Project Works

1. Project works would improve the drainage facilities over a gross area of 331,200 ac in Western Johore (Maps 10691 and 10692), include on-farm drains, roads and an intensive program of agricultural supporting services. They would also provide about 29 miles of coastal embankments with drainage control gates to prevent salt water intrusion. The southern part of the area is unprotected from sea water intrusion and has only a very rudimentary drainage system. The northern part of the area, however, has a coastal embankment and an internal drainage system, which has become inadequate due to opening up of the hinterland. Agricultural Development Centers (ADC's) would be constructed throughout the area as centers for dissemination of all agricultural supporting services. The project is the first of two proposed phases. Phase II would consist of similar development over an area of about 450,000 ac-along the coast immediately to the north.

Engineering Works

The Coastal Embankment and Gates

2. The coastal embankment to prevent saline intrusion would be constructed from Sg 1/ Sanglang to the southern tip of the project area. It would be located about a quarter of a mile inside the coastal mangrove swamps and would have an earth section 10 ft wide at the top with 3:1 side slopes. Top level would be 9.5 ft above MSL. Soil would be obtained from excavation by dragline from a borrow pit on the inland side of the bund 45 ft from the toe of the bund. 14 tidal control gates would be constructed to allow drainage water to discharge to the sea. They would be reinforced concrete structures with steel gates, designed for a discharge of 100 cusecs per sq ml. The gates would be closed at high tide and opened during falling tides. Gate keepers' quarters would be provided adjacent to the gates.

The Drainage System

3. The contours run nearly parallel to the coastline rising gradually from about 4.0 ft above MSL at the coastal bund to 33 ft above MSL in the foothills. The drainage system, therefore, consists of some natural rivers and many dug drains running at right angles to the coast. The principle

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1/ Sg = Sungei = Malay word for river.

used in designing the drainage system is to drain the hinterland (25.0 ft above MSL) directly to the sea by means of "high level" drains or natural canalized rivers and to drain the low-lying land by a separate drainage system through tidal control gates.

4. In the south of the project area, where the coastal strip is narrow with little hinterland, a coastal bund would be built and the existing drains at about half-mile intervals would be widened and improved. A total of about 32 mi of drain would be improved.

5. The rivers throughout the area would be canalized by enlarging their channels to deal with the design flow and by improving their alignment to reduce length and thereby increase the hydraulic gradient. These rivers would only drain the hinterland and in their lower reaches they would be confined within embankments. These embankments would prevent the lower lands being flooded by the rivers and by high tides. At locations where these river embankments are necessary, new main drains (collector drains) parallel to the embankments would be provided for the low-lying land which would discharge into the sea through control gates. The rivers: Sg Benut, Sg Pinggan, Sg Sanglang, Sg Ayer Baloi, Sg Pontian Besar and Sg Pontian Kechil would be enlarged and canalized. The channel section would be designed for a runoff of 80 cusecs per sq mi. Because of the urban development at the mouth of the Sg Pontian Kechil, a major part of the flood flow from the upper catchment of the river would be diverted through a "high level" drain discharging into the Sg Pontian Besar near its mouth. A total of 36 miles of rivers would be improved.

6. In the north of the project area, where there are existing drainage systems (Rengit, Tampok and Sg Pinggan), drainage improvements would be effected. The hinterland would be drained by converting both Rengit and Tampok main drains into "high levels" drains i.e. they would drain only the hinterland above 25 ft above MSL and would be bunded in the lower reaches. They would have open outlets to the sea. New main (collector) drains would be excavated parallel to them on each side to take care of local drainage and would discharge through newly constructed tidal control gates at the coastal embankment. About 68 mi of new main drains would be included.

7. In the existing drainage schemes, the area has been compartmentalized by cross-drains, which are fed from lateral or internal drains every half mile with control gates to regulate water level in dry periods. A new cross drain would be excavated in the hinterland behind Rengit and Tampok schemes at 25 ft above MSL.

8. Hitherto undeveloped areas in the hinterland, mostly peat, would be drained by a series of new drains at half-mile intervals, which would discharge into the rivers. A total of 150 mi of new drain would be dug. Drainage controls would be provided to retain water in dry periods. Only temporary structures would be built initially on the peat soils because of high sinkage. Due to the volume of flood waters in the Sg Benut and Pontian Besar basins, small retention basins of earthfill construction with control gates and spillways would be built in their upper reaches to retain flood waters in the peak rainy season. Final design of these structures is not yet complete.

9. Feeder drains would be excavated every 220 yd to convey farm runoff to internal drains and main drains (Map 10692). Quantities are shown in Annex 9. These feeder drains would make it easy for the farmers to dig their own on-farm drains since they would never have to dig more than 100 yd in length. Control structures would be provided when necessary. For tree crops the farm drains are generally 40 yd apart to a depth which depends on soil properties. These drains are very small usually about three feet wide at the top, one to two feet wide at the bottom and two feet deep. It is important not to drain deeply in acid-sulphate soils, thereby resulting in aeration which leads to extreme acidity development causing severe nutrition problems, but rather to have a flow of water to leach out the acid. In the past farmers have not completed all necessary farm drains because the outlets were not adjacent to their land. The feeder drains would remove this constraint. Farmers would be expected to maintain these drains. Construction and maintenance of farm drains is stipulated in replanting programs and work is inspected.

Roads and Bridges

10. New roads 10 ft wide would be constructed along all existing and new internal drains at half-mile intervals. Bridges would be built across main and internal drains wherevever necessary to maintain communications. These farm roads and bridges would be designed for light vehicular traffic suitable for transporting the farm produce to collection points on surfaced roads, where heavy trucks would take the produce to market or processing plant. The roads along internal drains would be surfaced with laterite. Quantities are shown in Annex 9. Roads along main drains would be asphalted in due course by the Public Works Department. A transportation study is being commenced shortly by Government to establish collection points for the various crops to ensure farm-to-market transport is efficient.

Agricultural Center and ADC's

11. An agricultural center would be built to serve both this project and the second phase. It would serve as Project Headquarters for the Authority, the Department of Agriculture and MARDI. The existing Parit Botak Station would be expanded to accommodate both the Department of Agriculture and MARDI. Copra drying facilities would be provided through FAMA at suitable centers in the area. Laboratory facilities would not be included in the project since central laboratories in Kuala Lumpur under DOA and MARDI can deal with requirements. Eight additional ADC's would be constructed, in addition to the two already existing, to accommodate the FO's and other extension agencies.

Phase II

12. During the project implementation the DID would carry out surveys, investigations and preliminary design for the Phase II area. The objective would be for Ministry of Agriculture to prepare a feasibility study by mid-1976, for Bank consideration.

Operation and Maintenance

13. The DID would be responsible for O & M of the project as they are for the existing drainage schemes, where O & M is proceeding satisfactorily. Large drains which have to be kept in use, would be excavated by draglines, and rivers by dredgers. Smaller drains would be maintained by small contracts with Village Chiefs (Ketua Kampong). This is current practice and State Government policy. Every year a schedule of rates for standard works, such as grass clearing and excavation of small drains, is agreed at State level by all concerned and thereafter, contracts are let at these rates. Village chiefs have the work carried out by the people of their villages. The system is working well and ensures some return to the people who pay drainage rates. Special care would be taken to maintain water levels in acid-sulphate soils during dry periods by retaining water behind control gates and by flushing drains in rainy periods.

Drainage Design Criteria

14. The DID has a well staffed and competent design office, which has designed many similar structures and drains over the past 30 years. The following criteria have been used in designing the project. The design of Compartment No. 2, Sg Pontian Kechil basin is shown in Table 1 as an illustrative example.

Design Runoff

15. The design runoff, based on flood frequency studies for a cycle of 50 to 100 years, would be 80 cusec per sq mile for major rivers and internal drains. This has been recommended by the New Zealand hydrological engineering group currently working with DID. Internal (or lateral) drains would be spaced at half-mile intervals, but in this basin, many drains already exist. A study of the alignment of these drains indicates that most of them had been well aligned. They would be improved where necessary. The existing drains selected for improvement and new internal drains proposed for the basin are as shown on the Project Plan (Map 10691). Feeder drains would be spaced at 220 yd (10 Chain) intervals. On areas which have been alienated, the alignment of the drains would run along lot boundaries (Map 10692).

Major Drains

15. The Sg Pontian Kechil forms the major drain for the basin. The outlet of the river is thickly populated, and improvement to the river would involve expensive land compensation. The possibility of diverting the hinterland drainage was investigated, and it was found that this is feasible. Accordingly, a high level drain would be excavated diverting the hinterland drainage to Sg Pontian Besar. With the hinterland runoff diverted, the existing section of Sg Pontian Kechil is sufficient to cope with the drainage of the remaining surrounding land and no improvement works other than bunding the low stretches of the river at the outlet end would be required. The

design calculations for the river and the high level drain are attached in Table 1.

Structures

16. Water control structures would be located along internal drains where necessary to regular the water level in the drains during dry weather, particularly in acid-sulphate soils. These would also serve as bridges. Light traffic, medium traffic and main road bridges would also be provided to meet access requirements. Tidal control gates would be provided along the coastal embankment at about three mile intervals.

DESIGN OF SG. PONTIAN KECHIL HIGH LEVEL DRAIN AND SG. PONTIAN KECHIL(UPPER)

Chainage	Water Level	Distance	Fall	Slope	Catchment	Runoff	Discharge	Bed Level	Depth	Slide Slope	Bed Width
	ft				--sq. mi.-	------- c.f.s. -------		------- -ft -------			----ft---
0	7.00				22.85	80	1,828	- 8.00	15.00	2 = 1	35'-0"
		9,000	0.45	1 = 20,000							
9,000	7.45				22.85	80	1,828	- 7.55	15.00	2 = 1	35'-0"
		17,000	0.85	1 = 20,000							
26,000	8.30				19.38	80	1,550	- 5.70	14.00	2 = 1	35'-0"
		6,500	1.20	1 = 5,417							
32,500	9.50				15.27	80	1,220	- 0.50	10.00	2 = 1	24'-0"
		9,500	7.00	1 = 1,357							
42,000	16.50				8.00	80	640	+ 9.50	7.00	2 = 1	9'-0"
		3,000	5.50	1 = 545							
45,000	22.00				7.15	80	572	+16.00	6.00	2 = 1	7'-0"

DESIGN OF SG. PONTIAN KECHIL(LOWER)

0	3.00				15.43	80	1,235	- 5.00	8'=0"	2 = 1	45'-0"
		26,000	4.50	1 = 5,780							
26,000	7.50				0	80		+ 1.50	6'-0"	2 = 1	6'-0"

Sample calculation for Sg. Pontian High Level Drain

Chainage 0

Catchment 22.85 sq/ mile
Runoff 80 cusec/sq. mile
∴ Discharge 22.85 x 80 = 1,828 cusec
Water Level + 7.00
Bed Level - 8.00
Depth of flow 15.00
Proposed bed width 35'-0", side slope 2 = 1

$$Q = \frac{1.486}{N} \times R^{2/3} \times S^{1/2}$$

A/P = R
A = (35 + 2 x 15) x 15 = 975
P $2\sqrt{5}$ x 15 + 35 = 102.1

R = 975/102.1 = 9.55
$R^{2/3}$ = 4.50
N = 0.025
S = 1 = 20,000
V = 1.486/0.025 x 4.50 x 1/ $\sqrt{20,000}$ = 1.89
Q = 975 x 1.89 = 1840 cusec

Legend

Q = Quantity in c.f.s.
A = Cross Section area
P = Wetted Perimeter
N = Constant, based on bed roughness
S = Slope
c.f.s. = cusecs = cu. ft. per sec.

Note: Chainage runs from mouth of river or drain to upstream

ANNEX 5
Table 1

August 30, 1973

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Processing Plants

Plant required during construction period [1/]

	M$
Coconut	
Copra drying center, 6 ton/day	150,000
Cocoa	
One unit, 4 ton/day	100,000
Coffee	
One unit, 3 ton/day	150,000
Tapioca	
First unit for chips, 40 ton/day	200,000
Cost of second unit (due in 1979) for starch	2,500,000
Groundnuts	
One unit, 3,300 ton/year	500,000
Spare parts	400,000
TOTAL	4,000,000

1/ See Annex 3, Table 3 for processing plant schedule up to 2003.

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Equipment List [1]

1. Operation and Maintenance Equipment

Item	Number	Unit Cost (US$ '000)	Total (US$ '000)
Dragline, 3/4 yd^3	10	40	400
Hydraulic excavator, 1/2 yd^3	10	30	300
Cutter-suction dredge, 8"	2	400	800
Dump truck, 3 ton	20	12	240
Tractor, 60 hp with blade	20	15	300
Grader, 120 hp, 6-wheel	10	30	300
Road Roller, 5 ton	8	15	120
Truck, 5 ton	5	6	30
Field vehicle	4	5	20
Sub-Total:			2,510
Spares and Contingency			590
Total:			3,100

2. Equipment for Agricultural Development Centers

Field vehicle	10	5	50
Truck, 5 ton	20	6	120
Farm tractor, 45 hp	30	10	300
Sub-Total:			470
Spares and Contingency			130
Total:			600
Overall Contingency:			1,100
Grand Total:			4,800

1/ This list has been prepared for estimating purposes and would be adjusted as necessary during project implementation. The operation and maintenance equipment would be purchased towards the end of construction.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Cost Estimate

	Item	Unit	Quantity	Rate (M$)	Foreign	Local	Total	Foreign	Local	Total	% of Foreign Exchange
					M$ Thousands			US$ Thousands			
1.	Coastal Bunds										
	(i) Land acquisition	ac	150	3,000	-	450	450	-	190	190	-
	(ii) Clearing	ac	650	350	140	90	230	60	40	100	60
	(iii) Earthworks-bund & drains	cu yd	1,600,000	2.10	2,200	1,170	3,370	930	500	1,430	65
	(iv) Creek closures	No	61	5,000	170	130	300	70	60	130	55
	(v) Turfing	sq yd	955,600	0.60	-	550	550	-	250	250	-
	Sub-Total				2,510	2,390	4,900	1,000	1,100	2,100	50
2.	River Improvements, High Level Drains and Collector Drains										
	(i) Land acquisition	ac	3,000	3,000	-	9,000	9,000	-	3,900	3,900	-
	(ii) Clearing	ac	4,570	350	960	640	1,600	410	290	700	60
	(iii) Earthworks	cu yd	13,150,000	2.00	17,400	9,400	26,800	7,115	4,285	11,400	65
	Sub-Total				18,360	19,040	37,400	7,525	8,475	16,000	50
3.	Drains (main, internal and feeder)										
	(a) Improvements to existing drains										
	(i) Land acquisition	ac	880	2,500	-	2,200	2,200	-	950	950	-
	(ii) Clearing	ac	1,400	350	300	190	490	125	85	210	60
	(iii) Earthworks	cu yd	1,500,000	1.95	1,900	1,010	2,910	800	440	1,240	65
	Sub-Total				2,200	3,400	5,600	925	1,475	2,400	40
	(b) Construction of new main and internal drains										
	(i) Land acquisition	ac	1,184	1,000	-	1,200	1,200	-	510	510	-
	(ii) Clearing	ac	1,680	350	350	230	580	150	100	250	60
	(iii) Earthworks	cu yd	2,200,000	1.30	1,850	1,020	2,870	800	440	1,240	65
	Sub-Total				2,200	2,450	4,650	950	1,050	2,000	50
	(c) Feeder Drains										
	(i) Clearing	ac	7,800	350	410	2,320	2,730	175	1,000	1,175	15
	(ii) Earthworks	cu yd	11,300,000	1.00	1,760	10,010	11,770	725	4,300	5,025	15
	Sub-Total				2,170	12,330	14,500	900	5,300	6,200	15
4.	Structures										
	(i) Tidal Control Gates	LS	-	-	2,250	2,150	4,400	1,100	900	2,000	55
	(ii) Bridges	LS	-	-	4,600	4,000	8,600	2,100	1,700	3,800	55
	(iii) Water Control Structures, Culverts, etc.	LS	-	-	5,500	4,700	10,200	2,400	2,000	4,400	55
	Sub-Total				12,350	10,850	23,200	5,600	4,600	10,200	55
5.	Roads										
	Lateral and Farm Roads	cu yd	1,820,000	7.00	5,750	7,050	12,800	2,500	3,000	5,500	45
6.	Impounding Dams and Reservoirs - Sg Benut and Sg Pontian Besar				5,960	3,840	9,800	2,600	1,600	4,200	60
	Total DID Works				51,500	61,350	112,850	22,000	26,600	48,600	45
7.	Agricultural Development Centres	LS			750	1,750	2,500	320	750	1,070	30
	Agricultural Centres and Stations	LS			250	550	800	110	240	350	30
8.	Processing Plants during construction (See Annex 6)	LS			1,900	2,100	4,000	670	900	1,570	45
	Land acquisition for Agriculture	LS			-	250	250	-	110	110	-
	Sub-Total				2,900	4,650	7,550	1,100	2,000	3,100	35
9.	Equipment for O & M and ADC's (See Annex 7)	LS			11,200	-	11,200	4,800	-	4,800	100
	Total DID and Agriculture				65,600	66,000	131,600	27,900	28,600	56,500	40
10.	Engineering and Supervision	LS			1,000	9,000	10,000	400	3,800	4,200	10
11.	Replanting grants during Construction	LS			-	8,100	8,100	-	3,700	3,700	-
12.	O & M and Agricultural Services during Construction	LS			2,000	9,300	11,300	700	4,000	4,700	15
13.	Physical Contingencies @ 15% of Civil Works				9,400	10,600	20,000	4,200	4,300	8,500	50
	Price Contingencies, in accordance with Guidelines dated January 17, 1974				27,000	25,000	52,000	11,800	10,600	22,400	50
	Grand Total				105,000	128,000	233,000 1/	45,000	55,000	100,000	45

Rate of Exchange US$ 1 = M$2.33

1/ Exchange errors due to rounding.

ANNEX 8
Table 1

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Estimated Cost by Civil Works and Equipment Contracts[1/]

CONTRACT	DESCRIPTION	Estimated Value		
		Foreign	Local	Total
	DID WORKS		M$ '000	
By DID	Coastal Bund and Gates - Sg Sanglang to Sg Pontian Besar	2,260	1,620	3,880
ICB Contract 1	Coastal Bund and Gates - Sg Pontian Besar to Kukup	2,610	2,090	4,700
ICB Contract 2	Kukup basin complete, including main and internal drains, roads, bridges and structures	3,210	2,330	5,540
DID Contracts	Feeder drains - Kukup basin	200	1,220	1,420
ICB Contract 3	Pontian Kechil basin complete	2,840	2,040	4,880
DID Contracts	Feeder drains - Pontian Kechil basin	150	920	1,070
ICB Contract 4	Ayer Hitam basin complete	1,800	1,300	3,100
DID Contracts	Feeder drains - Ayer Hitam basin	100	640	740
ICB Contract 5	Pontian Besar basin complete	7,060	5,140	12,200
DID Contracts	Feeder drains - Pontian Besar basin	260	1,540	1,800
ICB Contract 6	Ayer Baloi basin complete	2,610	1,890	4,500
DID Contracts	Feeder drains - Ayer Baloi basin	170	1,030	1,200
ICB Contract 7	Sg Sanglang Basin complete	3,540	2,560	6,100
DID Contracts	Feeder drains - Sg Sanglang	270	1,570	1,840
ICB Contract 8	Sg Pinggan basin complete	3,800	2,750	6,550
DID Contracts	Feeder drains - Sg Pinggan	240	1,410	1,650
ICB Contract 9	Sg Benut basin improvements complete	14,200	10,400	24,600
DID Contracts	Feeder drains - Sg Benut basin (many contracts)	700	4,080	4,780
ICB Contract 10	Storage Reservoirs	5,480	3,970	9,450
	Total DID Works	51,500	48,500	100,000 [2/]
	Land acquisition for DID	-	12,850	12,850
	Total for DID with Land	51,500	61,350	112,850
	AGRICULTURE			
Various small contracts	Construction of ADC's	750	1,750	2,500
Various small contracts	Agricultural Centre for Phase I & II) Peat Station and Parit Botak Station)	250	550	800
Various small contracts	Processing Plants (See Annex 6)	1,900	2,100	4,000
	Total Agriculture	2,900	4,400	7,300
	Land acquisition for agriculture	-	250	250
	Total for Agriculture with Land	2,900	4,650	7,550
ICB Contract 11	Equipment for O & M by DID and for ADC's (See Annex 7)	11,200 65,600	- 66,000	11,200 131,600
	Engineering and Supervision	1,000	9,000	10,000
	Replanting grants during construction period	-	8,100	8,100
	O & M and Agricultural Services during construction period	2,000	9,300	11,300
	Physical Contingencies 15% of Civil Works	9,400	10,600	20,000
	Price Contingencies (based on Guidelines dated Jan. 17, 1974)	27,000	25,000	52,000
		105,000	128,000	233,000 [3/]

1/ This estimate to be used for cost control of the project.

2/ Made up of M$ 85,500,000 for Contracts 1-10 and DID Force A/C Work and M$ 14,500,000 for DID Rural Works Contracts for Feeder Drains.

3/ Errors in exchange conversion due to rounding.

February 8, 1974

MALAYSIA

ANNEX 8
Table 3

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Calculation for Schedule I of Loan Documents

	US$-Million
Sub-Total of Works & Equipment	56.5
Equipment	4.8
	51.7
Less Land Costs	5.6
Basic Civil Works 1/	46.1
Price Contingency (See Table 4)	17.4
Total Civil Works	63.5

	Foreign Element		Total
	US$ Million		
Basic Civil Works	23.1		46.1
Price Contingency	8.7		17.4
Finance 50%	31.8	= 32	63.5
Equipment	4.8		4.8
Price Contingency (part)	1.2		1.2
	6.0	= 6	6.0
Unallocated (Physical Contingency and Balance Price Contingency)		7	
		45	

	Category	Amount of the Loan Allocated (Expressed in Dollar equivalent)	% of Expenditures to be Financed
I.	Civil Works	32,000,000	50% of total expenditures
II.	Equipment and vehicles	6,000,000	100% of foreign expenditures
III.	Unallocated	7,000,000	
	TOTAL:	45,000,000	

1/ Includes Agricultural Building and Processing Plants (43.0 + 3.1).

MALAYSIA

ANNEX 8
Table 4

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Revised Price Contingencies - Feb. 1974

Year		Type of Work Annual Expenditure	% 1/	Escalation
		----------US$ Million----------		
		CIVIL WORKS 2/		
1974	1	2.5	12	0.3
	2	11.0	22	2.4
	3	13.0	30	3.9
	4	13.0	38	4.9
	5	8.0	46	3.7
	6	4.0	54	2.2
		51.5		17.4
		EQUIPMENT 3/		
	1	-	9	-
	2	-	16	-
	3	2.0	21	0.4
	4	4.0	26	0.8
	5	1.0	31	0.3
	6	0.9	36	0.3
		7.9		1.8
		OTHER 4/		
	1	2.5	5	0.1
	2	5.6	10	0.6
	3	3.6	15	0.5
	4	2.4	20	0.5
	5	2.5	25	0.6
	6	1.6	30	0.5
		18.2		2.8
		TOTAL: 77.6		22.0

1/ Percentage Escalation based on Bank Guidelines dated January 17, 1974.

2/ From Annex 9, Table 1. Civil Works include Physical Contingencies.

3/ From Annex 9, Table 1, Equipment, include Equipment and Processing Plants (4.8 + 3.1).

4/ From Annex 9, Table 1.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Schedule of Expenditures

	Malaysian Fiscal Year						
	1974	1975	1976	1977	1978	1979	TOTAL
	(US$ Millions)						
1. Capital Expenditures							
Civil Works	2.5	11.0	11.0	11.0	6.0	1.5	43.0
Physical contingencies	-	-	2.0	2.0	2.0	2.5	8.5
	2.5	11.0	13.0	13.0	8.0	4.0	51.5
Equipment	-	-	2.0	4.0	1.0	0.9	7.9
Other							
Land	2.0	3.0	0.6	-	-	-	5.6
Engineering	0.5	1.2	1.2	0.5	0.5	0.3	4.2
Replanting	-	0.7	1.0	1.0	1.0	-	3.7
O&M during construction	-	0.7	0.8	0.9	1.0	1.3	4.7
	2.5	5.6	3.6	2.4	2.5	1.6	18.2
TOTAL	5.0	16.6	18.6	19.4	11.5	6.5	77.6
Price Contingencies	0.4	3.0	4.8	6.2	4.6	3.4	22.4
GRAND TOTAL	5.4	19.6	23.4	25.6	16.1	9.9	100.0
	(M$ '000)						
2. Recurrent Costs							
Operation & Maintenance (by DID)	600	600	1,000	2,000	3,000	3,500	
Agricultural Development Centers	-	200	400	700	800	1,000	
Other Agricultural Costs	-	100	250	500	700	1,000	
TOTAL	600	900	1,650	3,200	4,500	5,500	

ANNEX 9
Table 2

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Estimated Schedule of Disbursements

IBRD Fiscal Year and Semester	Accumulated Disbursements US$ Million Equivalent
1975	
1st	0.5
2nd	2.0
1976	
1st	6.0
2nd	11.0
1977	
1st	17.0
2nd	23.0
1978	
1st	29.0
2nd	35.0
1979	
1st	39.0
2nd	43.0
1980	
1st	45.0

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Agricultural Organizations

Introduction

1. There are many agricultural authorities, departments and boards involved in the project (Chart 7988). This annex explains the origins and functions of the various bodies, which would act as agents of the project organization and would be responsible to the Project Director while receiving technical direction from their headquarters when necessary. The overall management of the project would be provided by the Western Johore Agricultural Development Division under the Minister of Agriculture.

Organizations

2. The names of the organizations involved are:

(a) Farmers Organization Authority (FOA)

i. Farmers Organizations (FO)
ii. Bank Pertanian Malaysia (BPM) (Agricultural Bank)
iii. Cooperatives

(b) Department of Agriculture (DOA)

(c) Drainage and Irrigation Department (DID)

(d) Malaysian Agricultural Research and Development Institute (MARDI)

(e) Rubber Research Institute of Malaysia (RRIM)

(f) Rubber Industry Smallholders Development Authority (RISDA)

i. Malaysian Rubber Development Corporation (MRDC)
ii. Federal Land Development Authority (FELDA)

(g) Malaysian Pineapple Industries Board (MPIB)

i. Pineapple Industries Marketing Corporation (PIMC)

ii. Pineapple Cannery of Malaya (PMC)

iii. Consolidated Pineapple Sales (CPS)

(h) Federal Agricultural Marketing Authority (FAMA)

(i) State Economic Development Corporation (SEDC)

(j) Veterinary Department.

3. The major organizations concerned with the project are the FOA to manage the FO's (paras 4-7), the DID to construct the drainage works and later maintain them (paras 17-19), DOA (paras 11-16), RISDA (paras 25-28) and MARDI (paras 20-23) to provide the agricultural inputs and, lastly, MPIB (paras 31-32) to deal specifically with the pineapple industry.

FOA

4. The FOA was established by Federal Act in June 1973, under the Ministry of Rural Economic Development, to coordinate and control the activities of Farmers Associations (FA's) and agro-based cooperatives, as well as to undertake agricultural development in areas declared Farmers Development Areas (Under Sec 10 of the Act).

5. FA's have been established in many parts of Malaysia since 1967. They are located at strategic areas so that they are close to farmers and supply the bulk of their needs. FA's provide: agricultural extension; training in new techniques; Credit (through BPM) farm inputs; mechanical equipment; marketing of produce; agro-processing; and transportation of produce.

6. 102 FA's now exist in Malaysia. They have been a great success. Two operate in the project area at present. Agro-based cooperatives have been operating all over Malaysia since 1922. They provide farmers with credit and become involved to a varying extent in transport and marketing of farm produce. 1,785 agro-based coops exist in Malaysia, with varying success.

7. FOA is in the process of consolidating the FA's and Coops into Farmers' Organizations (FO's), which would continue to provide the above agricultural services. As soon as the project commences, additional FO's would be established throughout the area at appropriate locations. At present ten is considered the number required for Phase I, based on one FO per 3,000 farmers.

8. FO's would provide the main thrust of agricultural development in the project area. They would operate from Agricultural Development Centers (ADC), where all the services required by the farmer would be made available (Chart 7988). Each FO would be staffed by a General Manager (Agricultural Assistant - AA) and five division heads (Junior Agricultural Assistant - JAA), supplied by the DOA. The divisions would cover: extension and home economics; extension education and training; credit and savings; trading and farm inputs; and organization and production.

Field assistants and other staff would cover processing, accounts, equipment and transportation. Staff from the other organization's extension services would also operate through the ADC's (paras 11, 22, 24 and 27). Total agriculture staff requirements for 10 FOs would be 10 AAs and 50 JAAs. Each FO would normally have about 10 Small Agricultural Units within its area, which would be represented by locally elected farmers and, covering a smaller number of farmers, would more readily disseminate the new agronomic techniques and other information. One Unit would cover about 300 farmers. Some JAA's would be women (Annex 4), since women have a strong economic influence on the farmers' actions.

B P M

9. The Agricultural Bank was established in 1969. BPM has progressively increased its role as the central agency for agricultural credit. It has requested a Bank loan for a project involving oil palm plantings on estates and agro-industries in the private sector.

10. In the project area, BPM would operate through the FO's as local credit centers. Details of the type of credit needed for tree crops would be worked out over the next 12 months, since previous experience of the BPM has been with paddy production loans. Tree crops and crop processing and marketing would need longer-term loans, but BPM has expressed its intention of being the prime credit source in the area.

Cooperatives

11. Of 29 cooperatives in the area, only about a quarter are fully agro-based. They are mainly involved in the pineapple industry, where they supply fertilizer and market pineapples. Some are involved in the coconut industry but on a small scale. Since, at present, farmers can obtain credit from cooperatives as well as FO's, there is a tendency for loans to be misused and then farmers default on cooperative loans, unless they are marketing through the coop. The FOs would eventually eliminate this competitive credit system and coordinate the activities of FOs and coops, so that duplication of effort ceases.

DOA

12. This is the oldest established agricultural agency in Malaysia, from which all other agricultural institutions originated. It operates both at Federal and State level, having a Director-General and staff in Kuala Lumpur and a State Director of Agriculture in Johore, with staff throughout the State. The functions of the DOA in the project area would be:

(a) to train staff for the FO's and work closely with them to perform their tasks;

(b) to carry out soil surveys where required;

(c) to promote better utilization of modern agronomic techniques and, in particular, crop protection;

(d) to arrange agricultural education and training;

(e) to arrange distribution of new or improved planting materials;

(f) to organize and supervise coconut replanting and rehabilitation which includes inter-planting with cocoa, coffee and bananas;

(g) to provide technical back-up to the FO's for coconuts, cocoa, coffee, bananas, and all field crops;

(h) to liaise with RISDA on oil palm plantings;

(i) to liaise closely with MARDI in research needs and furthering development of new varieties;

(j) to manage propagation and demonstration plots; and

(k) to share with MARDI the project headquarters, the peat station and Parit Botak Station.

13. Foliar and soil analysis would be undertaken in Kuala Lumpur at DOA headquarters.

14. The DOA would expand during the project construction period to ensure that its services were intensified and sustained. The increases are estimated to be as follows:

	1974	1975	1976	1977	1978
AO's	2	4	6	6	6
AA's	1	4	8	12	12
JAA's	-	10	20	30	40

Requirements would be met from present training plans (Annex 14).

DID

15. The DID was established in 1932 from the Hydraulic Branch of the Public Works Department. At that time its prime responsibility was the development and improvement of paddy cultivation with a view to making Malaysia self-sufficient in rice. Other responsibilities included river conservancy, drainage and flood control.

16. The DID has been responsible for the design and construction of numerous irrigation and drainage schemes throughout Malaysia. It has only used outside consultants for the design and supervision of the Muda and

Kemubu irrigation schemes. All drainage schemes have been wholly carried out by DID. They are responsible for new construction and for O & M of the schemes on completion. Seven drainage schemes are currently operated in Johore.

17. The DID has a Director-General and Staff at Federal level and a State Director and staff in the State of Johore, which totals eight engineers at present. Tables 1 and 2 attached show the staff required during construction and for later O & M for the project.

MARDI

18. MARDI was established by a Federal Act in 1969 and became operational in March 1971 as staff became available from DOA. Its function is to lead national agricultural research and development in all fields, except rubber (see RRIM).

19. MARDI is guided by a Scientific Council in its broad lines of research. The Council has members from DOA, agricultural education, agricultural industry, and the Economic Planning Unit.

20. Prior to MARDI, agricultural research and development was done by DOA and MARDI has progressively taken over DOA's Research Stations in various parts of Malaysia. They will be establishing a Research Center on the edge of the project area at Simpang Rengam. They have taken over the Pineapple Research Station at Pekan Nanas and will be taking over Parit Botak Research Station, where coconut, cocoa and coffee research has been undertaken by DOA. A new station would be established in the project area on peat soils to determine the best crops and rotations for such soils (Annex 3). MARDI has a Project Development Division, which brings the results of research to the farm level by setting up trial areas on farms. When trials are successful, DOA takes over further demonstration and extension work.

21. MARDI is currently planning for a staff of 350 research officers by 1975. At present there are 136 graduate research officers and, as it is unlikely that they can reach their target, they will recruit several experienced foreign scientists to bridge the gap. MARDI has applied for a Bank loan to finance research facilities and specialist staff. Preparation for appraisal is in progress.

RRIM

22. The RRIM was established in 1925 to concentrate research and development of natural rubber in one body. They have 160 scientists and research officers, making it the largest institute in the world dealing with natural rubber. RRIM would provide training facilities for RISDA project personnel as needed.

RISDA

23. RISDA was established in 1972 by a Federal Act, but it is not an entirely new organization since it took over the responsibilities of the Rubber Industry Replanting Board, which was started in 1952. The functions of RISDA are:

(a) the administration of the rubber replanting cess (at present 4.5 M¢ per lb and yielding M$ 130 million per annum);

(b) the management and operation of replanting schemes; and

(c) implementation of agricultural innovations and new techniques through extension work amongst the farmers.

There are seven Divisions in RISDA under a Director-General: Administration and Finance; Replanting; Modernization and Development; Plantation Development; Nurseries and Services; Economics and Planning; and Estate Replanting. The project is mainly the concern of the Replanting and Modernization Divisions.

24. Under replanting schemes now in effect farmers may replant rubber with almost any other approved crop. RISDA staff endeavor to persuade farmers to replant with crops suitable to their soils. Under the project, RISDA would operate more positively to persuade farmers to replant rubber with oil palm, where soil is suitable.

25. RISDA's senior staff are graduates from the University of Malaysia. Extension staff have been trained in the Agricultural Institutes and are able to receive additional training as necessary from RRIM and FELDA. There are 11 senior staff in Johore State and 122 field inspectors or extension workers. For more sustained extension work in the project area, RISDA would need 15 senior officers (AO and AA) and 50 extension workers and inspectors (JAA) to be in place between 1976 and 1978 (based on one extension worker per 2,000 ac).

26. RISDA's Plantation Division plants and operates rubber and oil palm estates for the benefit of marginal farmers, who own less than 5 ac. The farmers are given shares in the estates in addition to replanting grants.

MRDC

27. MRDC would be responsible with RISDA for setting up central rubber processing factories to improve quality of the smallholder's rubber. Small collection centers would be established for weighing and collecting latex and transporting it to the central factory. MRDC would thus not only ensure markets for smallholder's rubber, but would, by its central facilities, ensure higher quality standards.

FELDA

28. FELDA is a large organization established in 1956 to develop rubber and oil palm plantations for landless people. Its only concern with the project is to provide initial facilities for processing oil palm fruit in their oil mill at Kulai, until the production in the project area has expanded enough to justify construction of oil palm mills within the project area (expected in 1982). FELDA would also be responsible for marketing palm oil produced by the project and would be available for advice on all aspects of the industry.

MPIB

29. The MPIB - a joint Board between Malaysia and Singapore - was established in 1957 by an ordinance. Its major functions are to fix prices for fresh pineapples at which canneries must buy them, to regulate and supervise proper processing of canned pineapple and to conduct agronomic development amongst the small pineapple growers. Up to 1973 it conducted pineapple research, but this function has been taken over by MARDI. The main objective is to make the industry as economically viable and efficient as possible. The board has four divisions: Inspectorate; Extension; Replanting; and Administration.

30. MPIB's Replanting Division operates the replanting schemes and administers the replanting grant. The Inspectorate Division has plans to improve the grading and pricing of fruit in the project area. The Extension Division presently has 11 workers and this would be increased during the project to 20. As the better varieties of pineapple (both in shape and quality) are developed, the Replanting Division would engage in a major replanting campaign.

31. PMC is a Government guaranteed Company which operates two canneries in the project area. Canneries are also operated by the private sector.

32. PIMC is a joint marketing corporation dealing with both the Government canneries and private sector.

33. CPS is a sales organization dealing entirely with U.K. sales of pineapple.

FAMA

34. FAMA was established in 1965 and its main functions are:

(a) to coordinate activities of the various bodies concerned with the marketing of agricultural products; and

(b) to promote ways and means of improving agricultural produce marketing and to find new markets.

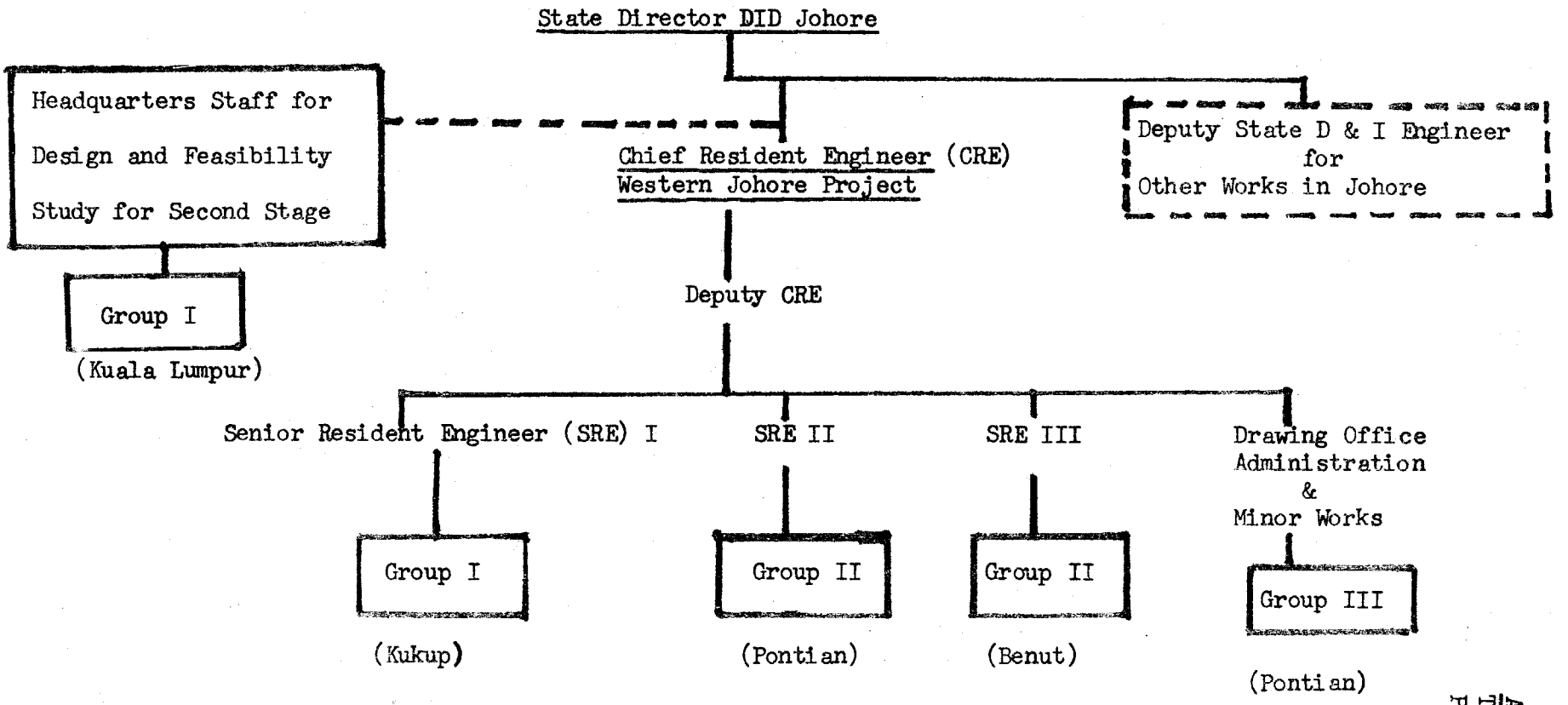
In the project area, FAMA would offer alternative marketing facilities from the private sector for coconut, set up copra drying facilities, and assist in the processing and marketing of cocoa, coffee, mixed vegetables and tapioca as required.

SEDC

35. SEDC, within the State of Johore, establishes companies to help the economically disadvantaged with particular emphasis on agro-based industry. They would establish tapioca plantations in cooperation with smallholders and build the processing facilities in the project area. Tapioca would be processed to chips and pellets initially, and later to starch, and exported through an SEDC based company or companies.

ANNEX 10
Table 1
Page 1

DID STAFF FOR PROJECT IMPLEMENTATION 1974/79



Details of Groups on Page 1

Group I

1	Senior Design Engineer
1	Senior Planning Engineer
4	Design Engineers
2	Planning Engineers
2	Quantity Surveyors
4	TAs (SG)
2	TAs
2	TAs
12	Technicians
10	Draftsmen
4	Tracers
2	Office boys

Group II

3 Units

1	Senior Resident Engineer
3	Resident Engineers
1	Technical Assistant (TA) (Special Grade) (SG)
2	TAs
3	Technicians (SG)
15	Technicians
9	Junior Technicians
1	Stenographer
4	Clerks
2	Typists
1	Office boy
60	Survey laborers, drivers, storemen , etc.

Group III

1	Senior D & I Engineer
1	D & I Engineer
1	TA Superscale
1	TA (SG)
2	TAs
6	Technicians
6	Junior Technicians (Draftsmen)
1	Executive Officer
1	Chief Clerk
1	Financial Clerk
3	General Service Clerks
4	Contract Clerks
1	Stenographer
2	Typists
1	Telephone Operator
2	Office boys

ANNEX 10
Table 2

DID STAFF REQUIREMENTS FOR OPERATION & MAINTENANCE OF ENGINEERING WORKS

AFTER COMPLETION OF PROJECT - PHASE 1

SDIE Batu Pahat

D & I Engineer

Benut
Tampok

1 Tech Assistant (Sp Grade)
1 Tech Assistant

1 Technician (Superscale)
1 Technician (Sp Grade)
8 Technicians

2 Junior Technicians (Sp Grade)
12 Junior Technicians

SDIE Pontain

D & I Engineer

Ayer Baloi
Sg Sanglang
Pinggan

1 Tech Assistant (Sp Grade)
1 Tech Assistant

1 Technician (Superscale)
1 Technician (Sp Grade)
8 Technicians

2 Junior Technicians (Sp Grade)
12 Junior Technicians

D & I Engineer

Pontian Besar
Pontian Kecil
Sg Rambah

1 Tech Assistant (Sp Grade)
1 Tech Assistant

1 Technician (Superscale)
1 Technician (Sp Grade)
8 Technicians

2 Junior Technicians (Sp Grade)
12 Junior Technicians

Drawing Office

1 Tech Assistant (Superscale)

1 Technician (Superscale)
4 Technician

1 Junior Technician (Sp Grade)
6 Junior Technicians

Workshop

1 Tech Assistant (Mechanical)

1 Storekeeper (Gr 1)
1 Storekeeper

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Agricultural Staff and Training

1. Agricultural training facilities are well advanced in Malaysia. Training is basically at three levels, with a variety of specialized training.

2. The University of Agriculture at Sendang, has a four-year Degree course which has an output of about 120 graduates per annum. Of these graduates, about 30% stay in teaching, 30% go on to higher education and 40% go into the agricultural professional fields. The University also has a three-year Diploma course with an annual output of 350. AO's must have degrees and AA's require diplomas.

3. There are six Agricultural Institutes, which have a three-year course based on more practical farmer needs and most of the output from these Institutes become JAA's. Three of these Institutes (to be progressively operational between 1973 and 1975) are being financed by the Bank (Loan MA 599 - US$8.8 million). All will be in operation in 1975. Table 1 attached shows the scheduling and output from these Institutes, which would total 590 by 1977.

4. In additional to these training facilities, there are specialized training courses available through the RRIM and FELDA. These are also training facilities being planned by FOA and RISDA on specialized extension needs.

5. Additional agricultural staff build-up in the project for the major agencies involved is estimated to be as follows:

Organization and Staff Grade	1974	1975	1976	1977	1978
FOA					
AA	2	4	6	8	10
JAA	8	20	30	40	50
DOA					
AO	2	4	6	6	6
AA	1	4	8	12	12
JAA	5	10	20	30	40
RISDA					
AO	-	-	1	1	3
AA	-	-	2	2	4
JAA	-	10	20	30	40
MPIB					
AA	1	1	2	4	4
JAA (Extension)	2	4	8	10	15
JAA (Replant)	2	4	8	10	12
TOTALS					
AO	2	4	7	7	9
AA	4	9	18	26	30
JAA	17	48	86	120	157

6. In view of the outputs from all training facilities and, in particular, the large output of JAA's by 1977, the provision of suitably trained agricultural staff for the project would present no difficulty.

7. Agricultural training would be provided to farmers in the project at all ADC's. These training courses would be conducted by the DOA and would normally take from one week to three weeks. Subject matters would cover such topics as:

(a) Choice of fertilizer and application techniques;

(b) pest, disease and weed control;

(c) home economics (for women);

(d) new techniques in crop planting; and

(e) new varieties of seedlings.

In addition to these courses DOA would organize conducted tours for farmers to places of agricultural interest in the State such as the FELDA oil palm plantation at Kulai.

8. Training of farm youths between 16 and 20 years is arranged by DOA, usually lasting six months, and selected students may have extended training for a full year to qualify them as field assistants in DOA or RISDA.

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Output From Agricultural Institutes

YEAR	INSTITUTES	INTAKE/ TIME OF INTAKE	ENROLMENT YEAR I	ENROLMENT YEAR II	ENROLMENT YEAR III	ENROLMENT TOTAL	GRAND TOTAL ENROLMENT	ANNUAL OUTPUT/ TIME OF GRADUATION	AVAILABLE TO TAKE UP ASSIGNMENT	CUMULATIVE OUTPUT OF GRADUATES
	FIRST MALAYSIA PLAN 1966 - 1970									
1966	1. (a) Serdang (17 months)	-	-	-	61	61	98	61	1 Jan 1966	61
	2. (b) Serdang (3 years)	37 (Jan)	37	-	-	37				
		37	37	-	61	98				
1967	1. Serdang	46 (May)	43	36	-	79	156	NIL	-	61
	2. Bumbong Lima	78 (May)	77	-	-	77				
		124	120	36	-	156				
1968	1. Serdang	112 (May)	109	42	36	187	264	36 (Dec.1968)	1 June 1968	97
	2. Bumbong Lima	NIL	NIL	77	-	77				
		112	109	119	36	264				
1969	1. Serdang	141 (May)	142	108	43	293	370	NIL	-	97
	2. Bumbong Lima	NIL	NIL	NIL	77	77				
		141	142	108	120	370				
1970	1. Serdang	70 (Jun)	74	79	108	261	462	120 (May 1970)	1 Nov 1969	217 to this date 18 month course
	2. Bumbong Lima	146 (Jun)	144	57	-	201				
		216	218	136	108	462				
	SECOND MALAYSIA PLAN 1971 - 1975									
1971	1. Serdang	107 (May)	107	69	76	252	597	108 (May 1971)	1 Nov 1970	325 (108) 1/
	2. Bumbong Lima	109 (May)	116	93	56	265				
	3. Kuala Lipis (New Institute)	40 (May)	41	39	-	80				
		256	264	201	132	597				
1972	1. Serdang	82 (May)	85	102	69	256	664	127 (May 1972)	1 Nov 1971	452 (235)
	2. Bumbong Lima	85 (May)	92	98	90	280				
	3. Kuala Lipis	48 (May)	50	41	37	128				
		215	227	241	196	664				
1973	1. Serdang	90 (May)	90	85	102	277	958	196 (May 1973)	1 Nov 1972	648 (431)
	2. Bumbong Lima	100 (May)	100	92	98	290				
	3. Kuala Lipis	100 (May)	100	50	41	191				
	4. Parit (New Institute)	200 (May)	200	-	-	200				
		490	490	227	241	958				
1974	1. Serdang	90 (May)	90	90	85	265	1207	241 (May 1974)	1 Nov 1973	889 (672)
	2. Bumbong Lima	100 (May)	100	100	92	292				
	3. Kuala Lipis	100 (May)	100	100	50	250				
	4. Parit	100 (May)	100	100	-	200				
	5. Ayer Hitam (New Institute)	100 (May)	100	100	-	200				
		490	490	490	227	1207				
1975	1. Serdang	90 (May)	90	90	90	270	1570	227 (May 1975)	1 Nov 1974	1116 (899)
	2. Bumbong Lima	100 (May)	100	100	100	300				
	3. Kuala Lipis	100 (May)	100	100	100	300				
	4. Parit	100 (May)	100	100	100	300				
	5. Ayer Hitam	100 (May)	100	100	100	300		490		NOTES:
	6. Besut (New Institute)	100 (May)	100	-	-	100		590		Output in 1975
		590	590	490	490	1570				Output in 1977
TOTAL FOR 6 INSTITUTES (FULL CAPACITY 1977)		2671	590	590	590	1770				

ESTABLISHMENT OF INSTITUTES

Institutes	Year of Construction	Intake Year
1. Serdang - Existing Institutes	1965	1966
2. Bumbong Lima - Existing Old Institutes	1966	1967
3. Bumbong Lima - Existing New Complex	1969/70	1970
4. Kuala Lipis - New Institutes Federal/ Pahang State Project	1970/71	1971
5. Parit) New Institutes financed	1972/73	1973
6. Ayer Hitam) by World Bank Loan 599 MA	1973/74	1974
7. Besut)	1974/75	1975

Source: Agricultural Dept.
Kuala Lumpur

August 1973

1/ Figures in brackets denote cumulative output for the period between 1971 - 1975 with full 3 year course.

ANNEX II
Table 1

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Government Revenues and Expenditures
(M$ '000)

	Incremental													
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984-1988	1989-1993	1994-1998	1999-2003
Revenues:														
Export duties and cesses	300	500	650	955	1,240	1,730	2,210	2,709	2,640	2,535	11,920	13,235	13,925	14,100
Reduced pineapple subsidies 1/	-	100	200	700	1,500	2,200	2,800	3,300	3,700	3,900	18,700	17,100	17,100	18,000
Land taxes and title conversion fees 2/	-	-	-	5	15	30	65	115	125	135	810	855	780	720
Sales taxes, income taxes import duties	1,165	3,900	4,400	4,640	2,630	1,515	1,000	1,200	1,455	1,650	8,205	8,880	9,340	9,725
TOTAL	1,465	4,500	5,250	6,300	5,385	5,475	6,075	7,320	7,920	8,240	39,635	40,070	41,145	42,545
Expenditures: 3/	11,650	38,980	43,990	46,400	26,295	15,145	1,000	1,000	1,000	1,000	5,000	5,000	5,000	5,000
Annual surplus (deficit):	(10,185)	(34,480)	(38,740)	(40,100)	(20,910)	(9,670)	5,075	6,320	6,920	7,240	34,635	35,070	36,145	37,545

1/ See para 5.07 and 7.03 of text.
2/ Payment of the conversion fee assumed to be made five years after conversion of crop.
3/ Derived from Annex 9, Table 1. Excluded are expenditures for processing plants and operation and maintenance by DID -- both are covered by separate charges. Included are the costs of additional agricultural extension services throughout the life of the project and a 15% physical contingency during the development period.

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Marketing and Prices

1. The major crops produced in the project area (rubber, palm oil, pineapples, and tapioca) would be mainly for export. Copra, coffee, bananas, and miscellaneous fruits and vegetables would be marketed in Malaysia and Singapore. In the case of cocoa, Malaysia is expected to change from a net importer to a net exporter in the next few years.

2. Marketing problems and projected prices are discussed below for each crop. "Bank Projections" refer to projections made by the Economic Analysis and Projections Department. Other sources of information include the Ministry of Agriculture's 1971 Statistical Digest and various reports by the Federal Agricultural Marketing Authority (FAMA). All prices are in 1974 constant values. Projected prices are summarized in Table 1.

Rubber

3. Malaysia's rubber production and exports have risen steadily over the last decade despite a slight decline in acreage. However, the export value has declined due to low prices in 1970 and 1971. 1973 and 1974 prices on the other hand have been exceptionally high. Rubber production from the project area (with the project) would reach no more than 20,000 tons and would gradually decline. Therefore, the project would have no significant effect on Malaysia's total production or on prices.

4. The current Bank forecast for the price of rubber in 1980 is US$0.33/lb for RSS 1 (Ribbed smoked sheet, first grade), cif New York. The farmgate price in the project area was derived as follows:

Rubber /a

	Without Project		With Project	
RSS1, cif New York - (US$/lb)		0.54		0.33
- (M$ /lb)		0.76		0.76
Freight		0.07		0.07
RSS1, fob Singapore		0.69		0.69
Equivalent price /b (M$ /lb)		0.62		0.62
Export duty and cess /c	(-)	0.12	(-)	0.12
Marketing margin (M$ /lb) /d	(0.11)	0.11	(0.08)	0.08
Farm-gate price (M$ /lb)	(0.51)	0.39	(0.54)	0.42

/a All prices are in 1974 constant values. Figures in parentheses refer to prices net of taxes and duties for use in the economic analysis.

/b USS (Unsmoked sheet) is the grade of rubber normally produced in the project area and it is expected that this will continue to be the case. Its price is equivalent to RSS3 or RSS4 or about 90% of RSS1.

/c

	M¢ /lb
Export duty	4-1/8
Export surcharge	2
Research cess	1
Replanting cess	4-1/2
Total	11-5/8
Say	12

/4 Observed marketing margins for USS in Johore some years ago averaged M$ 0.11/lb. This figure is used to calculate farmgate price without the project. With the project, a reduction to M$ 0.08 is postulated, because of the growth of group processing centers and a vastly improved road network, which would lower transport costs. Although centralized crumb rubber production would result in some cost reductions, it has not been included in the present calculation.

Copra

5. Areas of coconut palms and calculated copra production statistics for Peninsular Malaysia are shown below:

	1967	1968	1969	1970	1971
Area - ('000 ac)	504	517	523	527	519
Estimated copra production ('000 ton)	166	170	160	160	150
Net exports (or imports)					
- copra (M$ million)	0.4	(0.9)	(0.9)	(0.8)	(1.1)
- coconut oil (M$ million)	22	37	19	37	32

6. The 1970 Bank Sector Survey reported that internal consumption accounted for half Malaysia's production of coconut oil and that consumption was increasing at 5.5% per annum. At this rate, and with copra production fairly static, there would be no export surplus by 1985. Copra production from the project area is at present 10,500 tons per annum and, with the project, would rise to 17,400 tons in 1983 and 27,800 tons in 2003. This rate of increase should not seriously affect the overall market situation for copra in Malaysia.

7. Forecasting the future price of copra or coconut oil is difficult because of the high degree of substitutability between the various vegetable oils and animal fats. Total estimated world consumption of fats and oils expanded steadily at a rate of 2.9% in the 1960's but both the geographic and product composition of demand changed during that period. It is expected that this rate of increase will continue but that coconut oil will have difficulty in maintaining its share of the market, due to the effects of devaluation of the United States dollar and to consumer preferences. Hence, a reduction in price from recent levels may be assumed.

8. Prices in 1972 fell sharply from their 1971 levels but increased substantially in 1973 to levels around M$ 750/ton copra, fob Singapore. Malaysian research workers have calculated an average price of M$ 500/ton, based on a 20-year regression analysis, and predict a decline to M$ 470/ton by the early 1980's. FAMA forecasts a price in the range M$ 390-420/ton fob Singapore for the "future". By contrast, a recent Bank forecast is M$ 480/ton. After weighing these predictions, a farm-gate price of M$ 462 (US$198)/ton copra, dried to 10% moisture and bagged, was used in the economic and farm income analyses.

Pineapple

9. This crop is the only one in the project area likely to present difficult marketing problems. Production statistics for Peninsular Malaysia in recent years are shown below:

	1967	1968	1969	1970	1971
Area ('000 ac)	57	56	52	64	62
Exports - canned pineapples ('000 tons)	62	66	63	60	57
- value (M$ million)	43	48	44	42	40
Export price - canned pineapples (M$ /ton)	700	725	701	702	705

Of the 40,000 ac in Peninsular Malaysia cultivated solely for canning, 35,000 ac are found within the project area.

10. The pineapple industry was reorganized in 1960 after a disastrous price war. The price to the grower was set by the Government at M$ 0.029/lb (M$ 65/ton) at factory and has remained at that level. The MPIB (Annex 11) was set up and charged with research and extension into cultivation improvements, pineapple marketing through a subsidiary, the Pineapple Industry Marketing Corporation, and the canning of smallholder crops through PMC. Despite these improvements, little replanting has taken place, leading to a gradual decline in fruit quality, and currency realignments have caused the export price (expressed in Malaysian Dollars) to decline. As a result, both the Government and private canners, which formerly operated at a profit, have recently incurred heavy losses. As a relief measure, the Government has suspended the export cess, which has financed MPIB's replanting activities, and has increased the replanting grant from M$ 400 to M$ 650/ac. The price to the grower, however, has not been changed.

11. In the longer term, Malaysia will have to face the additional difficulty of an EEC tariff in its present major market, the United Kingdom. In order to maintain its share of the United States and United Kingdom markets, Malaysia will have to reduce significantly production costs and produce cuts and sizes which are closer to the market demands.

12. With the above considerations in mind, future prices for the economic analysis have been projected as follows:

	Pineapple - Fresh Fruit (M$/ton at factory)			
	1973	1983	1993	2003
Without project - old variety	55	50	.	.
- new varieties	60	55	50	50
With project - old variety	55	.	.	.
- new varieties	60	60	62	64

Actual 1973 prices are above the levels shown above but, as the canneries are operating at a loss, do not represent free market values. There is at present no price differential between old and new varieties although the recovery ratio of the new varieties is significantly better and thus their value to the cannery should be greater. The above prices for 1973 are intended to represent shadow prices.

13. Without the project, yield improvements would not balance the increasing marketing difficulties (para 10) and prices would have to decline as production rises. With the project, because of higher yields, larger fruit, lower transport costs and a higher cannery recovery ratio, production costs per unit of output would be greatly reduced, product quality would improve and therefore prices for fresh fruit are forecast to decline for five years then gradually increase.

14. In financial terms, actual prices received will depend on Government policy, which may be assumed to aim at shielding the smallholder from the full impact of the above marketing difficulties, possibly through subsidies. Without the project, the average smallholding would probably not be viable at the above shadow prices. However, with the project, the need for subsidies would disappear within ten years. Therefore, the following prices were used in calculating farm income:

	Pineapple - Fresh Fruit (M$/ton at factory)			
	1973	1983	1993	2003
Without project - old variety	65	65	.	.
- new varieties	65	65	60	60
With project - old variety	65	.	.	.
- new varieties	65	60	62	64

Oil Palm

15. Malaysia is now the world's largest producer of oil palm products and the crop is expected within the next decade to replace rubber as the chief earner of foreign exchange. Production statistics for recent years are shown below:

	Oil Palm				
	1967	1968	1969	1970	1971
Area ('000 ac)	401	496	597	675	769
Production - palm oil ('000 ton)	213	261	321	396	542
- palm kernel ('000 ton)	48	59	73	86	117
Export volume					
- palm oil ('000 ton)	177	264	326	365	523
- palm kernel ('000 ton)	23	32	34	22	16
Export value					
- palm oil (M$ million)	111	117	143	245	353
- palm kernel (M$ million)	9	14	12	9	6
Price - palm oil (M$/ton)	627	443	439	671	675
- palm kernel (M$/ton)	378	448	350	405	363

Estimated Production from the Project Area

	(With project)			
	1973	1983	1993	2003
Palm Oil ('000 ton)	0	12.7	67.1	83.0
Palm Kernel ('000 ton)	0	2.4	13.3	16.4

16. With Malaysian production continuing to expand rapidly -- oil production in 1990 is forecast to be 3.7 million tons -- production from the project area would remain a very small proportion of the total and would thus not influence marketing conditions or prices.

17. Export prospects for palm oil are expected to remain favorable through the 1980's. However, competition from other vegetable oils may lead to price reductions. 1974 prices have been exceptionally high - over M$ 700/ton. The Bank's projected price for 1980, in 1974 constant values, is US$278/ton or M$ 648/ton. After deducting freight and insurance, the fob Singapore price would be M$ 551/ton. This price was used in economic analysis. For financial analysis, a duty of 9.8% was deducted, giving a price of M$ 497/ton. As Malaysia is expected to be using all palm kernel production for internal use by 1980, palm kernel has been evaluated at the domestic ex-mill price of M$ 290/ton.

Cocoa

18. Cocoa became established in Peninsular Malaysia in the 1950's, originally in Trengganu State. In recent years there has been a rapid expansion of acreage, mainly as an intercrop under coconuts. With government encouragement, this rapid expansion is expected to continue, as shown below:

Cocoa (Peninsular Malaysia)
Area - sole crop equivalent ('000 ac)

Year	Estates	Smallholders	Total
1967	...	...	2
1968	...	...	3
1969	...	...	5
1970	...	...	8
1971	...	...	19
1975 (est)	35	20	55
1980 (est)	55	55	110

19. In thirty years' time, the area of cocoa in Peninsular Malaysia could exceed 250,000 ac sole crop equivalent. In Sabah, 13,500 ac of cocoa was established by the end of 1972 and this is likely to increase to 30,000 ac by 1975. As soils in Sabah are among the best in the world for cocoa, the potential for cocoa in that state is exceptionally good. The highest yielding cocoa estate in the world is located in Tawau District in Sabah. It is clear that Malaysia very soon is going to become a major cocoa producer.

20. The sole crop equivalent area of cocoa in the project area is expected to rise from 1,100 ac in 1973 to 7,000 ac in 1983 and 15,000 ac in 2003, or about 6% of the total area in Peninsular Malaysia. Therefore the project would have no significant influence on marketing conditions or prices.

21. Figures on Malaysia's trade in cocoa and cocoa products are uninformative due to the fact that a major chocolate factory, using Malaysian cocoa and supplying much of the Malaysian market, is located in Singapore. A second factory is located at Butterworth, Province Wellesley. However, it is clear that, with rising domestic production of cocoa, dependence on imported supplies will cease and Malaysia will become a net exporter of cocoa beans, and possibly cocoa products, within the next few years.

22. The Bank's projected price for 1980 is US$0.374/lb, spot New York. The farm-gate price is calculated below:

Cocoa Beans, cif New York (US$/lb)			0.470
Freight, insurance			0.035
fob Singapore (US$/lb)			0.435
	(M$/lb)		1.014
Port handling	M$/lb	0.005	
Transport	M$/lb	0.037	
Processing	M$/lb	0.050	
Total			0.092
Farm-gate price (M$/lb) (dry beans equivalent)			0.922

This price was used in both the economic and farm income analyses.

Coffee

23. Annual production of coffee beans in Peninsular Malaysia averaged 4,400 tons in 1968-70. Most of the coffee is grown under coconut or other shade trees of economic value and the sole crop equivalent in Peninsular Malaysia is about 13,000 ac. Most of the coffee produced is sold to local millers and is consumed in Malaysia. Total consumption of regular coffee is about 6,400 tons.

24. Malaysia is a net importer of coffee beans and products, as shown below:

	1967	1968	1969	1970	1971
			Coffee beans - not roasted		
Exports - (tons)	1,205	1,499	735	894	968
- (M$ thousand)	2,082	2,536	1,368	1,448	1,730
Imports - (tons)	3,661	4,164	3,234	2,312	3,148
- (M$ thousand)	5,081	6,616	4,445	3,842	5,367
			Roasted Beans and Coffee Products		
Net Imports (M$ thousand)	2,605	3,206	2,104	3,680	3,679

25. Domestic production of coffee is confined to the Liberica variety, which is preferred by most Malaysians but has a very limited export potential. Current imports are mainly of the Robusta or Arabica types or "instant" coffee. The increase in coffee production in the project area, with the project, would be 1,000 tons by 1983 and 1,800 tons by 2003. While these amounts are fairly large compared with current national production, it is believed that they can be absorbed in the Malaysian and Singapore market with possibly minor exports to Indonesia.

26. Domestic prices are expected to be fairly stable over the next decade and hence the present farm-gate price of M$ 0.10/lb wet beans (equivalent to M$ 0.99/lb for dry, processed beans) is used both for the economic and farm income analyses.

Bananas

27. Bananas would be a relatively minor crop in the project area, with production expected to reach 7,500 tons in 1983. This production would be sold locally and in Singapore and the present farm-gate price of M$ 140/ton (on the bunch) has been used for the economic and farm income analyses.

Tapioca

28. Tapioca in Peninsular Malaysia is cultivated mainly in the states of Perak, Johore, and Pahang. Total acreage and exports are shown below, together with figures from Thailand, which has become a major producer of this crop, for comparison.

Tapioca and Starch

	1967	1968	1969	1970	1971
Area ('000 ac)	44.8	42.1	43.3	43.6	36.7
Production ('000 ton)	..	..	..	204	159
Export Volume					
- Tapioca ('000 ton)	16.2	18.2	10.4	..	..
- Starch ('000 ton)	..	18.2	20.1	29.6	..
Export Value					
- Tapioca (M$ million)	4.6	4.5	4.2	..	..
- Starch (M$ million)	..	4.5	4.1	5.6	..
Thailand					
Export Volume ('000 ton)	800	860	940	1,320	..

29. Fresh tapioca is either processed into chips for animal feed, into flakes or pearls for export (mainly to Europe for animal feed), or into starch for the domestic and export markets. The potential for increased exports lies more in the field of tapioca pellets and starch, rather than the traditional form of chips, as experience from Thailand indicates.

30. Production of tapioca from the project area would reach 150,000 tons tubers in 1983 and 560,000 tons in 2003. As most of the increased production will have to be exported, a major expansion of effort in exporting would be required. However, experience in Thailand suggests that, if processing and marketing is well organized, rapid increases in exports can be achieved.

31. In the absence of a Bank projection for the world market price of tapioca and its products, the present farm-gate price of M$ 42/ton for fresh tubers has been used in the economic and farm budget analyses.

Groundnuts

32. Despite recent increases, domestic production of groundnuts in Malaysia is insufficient to meet demand, mainly because of a lack of suitable soils. Production statistics are given below:

Groundnut

	1967	1968	1969	1970	1971
Area (ac)	..	5,400	5,900	6,200	6,400
Production /a (ton)	..	..	..	4,400	6,400
Imports /b (ton)	13,900	10,800	6,900	5,300	4,000
Exports /c (ton)	170	140	400	670	870

/a Fresh, unshelled.

/b Mostly fresh, shelled.

/c Roasted.

33. The decline in imports reflects the growing domestic production. There also appears to has been a decline in consumption though the reasons for this are not clear. Exports are almost entirely of roasted nuts to Hongkong and Singapore, for which a price of about M$ 1700/ton is obtained. Production from the project area is estimated to reach 11,600 tons of fresh, unshelled nuts by 1983 and 51,000 tons by 2003. Thus, by 1983, the domestic market will have been fully supplied and a small surplus would be available for export. While it is likely that the traditional markets would be able to absorb these surpluses up to at least 1985, prospects beyond that are more uncertain and it is likely that production increases would have to be processed for oil rather than roasted.

34. In the absence of a Bank price projection for roasted groundnuts, farm-gate prices for the early 1980's have been set equal to present average values, that is, M$ 462/ton for fresh, unshelled nuts.

Fruits and Vegetables

35. Vegetable acreage in Malaysia in recent years has been about 19,000 ac. Per capita demand in Malaysia was 80 lb per annum in 1966 and is increasing at about 1% annually. The supply of all types of vegetables, which was 360,000 tons in 1970, would need to increase to 525,000 tons by 1980. A similar situation exists in Singapore, where the local supply is decreasing due to urbanization. Output from the 5,000 ac estimated to be planted with vegetables in the project area by 1983 would be of the order of 60,000 tons, much less than the aggregate increase in demand. Therefore, no marketing constraints are expected, even allowing for production increases elsewhere in Malaysia. Due to its proximity to Singapore, the project area would be well placed to supply that growing market. However, there would be a need for dissemination of market information to the farmers to ensure steady supplies without gluts. There are also prospects for canning vegetables such as tomatoes, gherkins, cucumbers, and for processing chillies and ginger, both for the domestic and export trade.

36. Income from vegetables has been estimated by averaging a number of the more important varieties, using average prices for the last few years.

37. The project would also increase yields from existing stands of fruit trees, arecanuts, etc. This has been evaluated in terms of an income increase of M$ 55/ac after 10 years, M$ 110/ac after 20 years, and M$ 165/ac after 30 years.

ANNEX 13
Table 1

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Summary of Prices

Crop	With (W) or Without ($\bar{W}$) Project	Basis /a	Source	Unit	1983 Projected Price Economic	Financial
Rubber	$\bar{W}$	FG	/b	M$/lb	0.51	0.39
	W				0.54	0.42
Copra	-	FG	/c	M$/ton	462	462
Cocoa, dried beans	-	FG	/b	M$/lb	0.92	0.92
Coffee, dried beans	-	FG	/d /e	M$/lb	0.99	0.99
Bananas, fresh	-	FG	/d	M$/ton	140	140
Pineapple						
- old variety	$\bar{W}$	FY	/f	M$/ton	50	65
- new variety	$\bar{W}$				55	65
	W				60	60
Palm Oil	-	FB	/b	M$/ton	551	497
Palm kernel	-	XF	/g	M$/ton	290	290
Tapioca, tubers	-	FG	/d	M$/ton	42	42
Groundnuts						
- fresh, unshelled	-	FG	/d	M$/ton	462	462

/a FG = farmgate; FY = at factory; FB = fob Singapore; XF = ex-factory.

/b Bank projections.

/c Based on Federal Agricultural Marketing Authority (FAMA) reports and published sources.

/d Present price used.

/e Coffee is Liberica variety for which no international market exists.

/f See paras 9-14.

/g By 1983, all palm kernel will be processed in Malaysia. Therefore, projected domestic prices used.

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Crop Budgets and Farm Income

Crop Budgets

1. Crop budgets for the existing and proposed future crops in the project area are shown in Tables 1 to 4, in a rather condensed form. Physical inputs, such as fertilizer, planting material, tools and equipment, are shown at their market prices. Other inputs, which consist largely of labor, are evaluated using the market wage rate of M$ 4/man-day for financial analysis and a shadow rate of M$ 3/man-day for economic analysis. Taxes and drainage rates are shown as production costs. Labor requirements are shown for each crop (on a year-by-year basis for the tree crops).

Farm Income

2. Smallholders in the project may be categorized by their principal crop, viz, rubber, coconut or pineapple. With the project, annual crops on peat areas would be important. Three farm sizes were used for each crop. For the existing crops, these comprised the average size and the upper and lower twenty percentile sizes, as given in the Ministry of Agriculture smallholder surveys 1/. For annual crops, three arbitrary sizes, representative of probable future conditions, were chosen.

3. The cropping pattern for each model, under present conditions, was based on the smallholder surveys. Normally this consisted of a main crop, a subsidiary crop and "other" crops, for which the mixed horticulture data was used. For the rubber farm model, it was assumed that, without the project, no changes to oil palm would take place, while with the project all rubber would be replanted with oil palm before 1983. This emphasizes the range of farm incomes rather than average conditions. Similarly for coconut, full replanting before 1983 was also assumed. Two intercrops, cocoa and banana, were used to demonstrate the variability of farm income. For all tree crops, the percentage of mature trees in any year was based on the average for the project area for that year (Annex 3). For the subsidiary crops, no replanting or intercropping was assumed.

1/ References 1, 2 and 3.

4. Farm income was evaluated by calculating the net value of production, using projected 1983 prices in financial terms (Annex 15), without costing labor, and then adding the cash cost of hired labor (at M$ 4/man-day). For immature tree crops, income from replanting grants and a nominal amount from cash crops was estimated and the establishment costs of the tree crop deducted. Hired labor was estimated as the difference between total labor requirements and the average family labor contribution of 450 man-days/year (i.e. 1.8 workers per family and 250 working days per year). Off-farm income, which consists of wages earned in other farms or non-farm work, as well as gifts and transfers from relatives in the city, was also estimated, using the smallholder surveys as a basis. This is particularly important for the smaller farms where off-farm income may exceed on-farm income.

Results

5. For the average-sized rubber farm (Table 5) present income is about M$ 2,200/year. With the project, this would increase to M$ 5,100 by 1983 and M$ 7,200 by 2003 due to the change to oil palm. The 1983 incomes of 60% of the smallholders would lie between M$ 2,800 and M$ 6,400. For coconut (Table 6) the present average income is about M$ 2,000 and this should rise to between M$ 4,200 and M$ 5,000 by 1983 and between M$ 6,100 and M$ 9,300 by 2003, depending on which intercrop is grown. The 1983 incomes of 60% of the smallholders would lie between M$ 1,800 and M$ 2,000. For pineapple smallholders (Table 7), the present average farm income is about M$ 2,000/year, and this would rise to M$ 3,900 by 2003. The 1983 income of 60% of smallholders would lie between M$ 2,700 and M$ 2,900. However, these incomes are all evaluated at projected crop prices which are regulated by Government and are expected to be above economic values, especially in the early years of the project. The lack of variation with farm size is a reflection of the labor intensive nature of this crop and the need to hire labor on all but the smallest farms, as well as the low profit margin from this crop under projected prices. Incomes from cash crops (Table 8) would vary from M$ 2,300 in 1983 to M$ 2,800 in 2003 for 2.5 acre holding and from M$ 6,200 in 1983 to M$ 8,000 in 2003, for a 10-acre holding.

6. In almost all the above cases, 1983 incomes of at least 80% of the smallholders would be above the level of M$ 2,400, estimated by the Ministry of Agriculture as being equivalent to the 1973 wages of urban factory workers and used as a target figure for agricultural development projects. However, since not all changes in the cropping pattern would take place before 1983, these results do not represent average conditions (as noted in para 3). For this reason, Table 9 has been prepared which shows that average farm income would increase from M$ 2,100 at present to M$ 3,700 in 1983 and to M$ 4,800 in 2003. Average family income would be somewhat lower, due to the influence of tenants and landless laborers. In this calculation, labor is not costed, as all hired labor is drawn from surrounding farms.

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3. S. Selvadurai and S. Jegatheesan, "An Economic Survey of Pineapple Smallholdings in Pontian, Johore", Ministry of Agriculture and Cooperatives, Kuala Lumpur, August 1968.

List of Tables

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Production Costs: Rubber, Coconut, Cocoa and Coffee 1/

(M$/ac)

Year from planting:	1		2		3		4		6		8		10		15		20		25		30		50		Average Immature	Average Mature
Rubber																										
Without Project																										
Cost - A2/	2	(-)	2	(-)	2	(-)	2	(-)	2	(-)	6	(-)	6	(-)	6	(-)	6	(-)	6	(-)	6	(-)				
- B	111	(111)	51	(51)	61	(61)	69	(69)	65	(65)	42	(42)	42	(42)	42	(42)	32	(32)	22	(22)	2	(2)				
- C	181	(140)	130	(97)	86	(64)	76	(57)	42	(30)	82	(61)	185	(140)	194	(147)	198	(151)	202	(155)	199	(152)				
Total	294	(251)	183	(148)	149	(125)	147	(126)	109	(95)	130	(103)	233	(182)	242	(189)	236	(188)	230	(177)	207	(154)			220	149
With Project																										
Cost - A	12	(12)	12	(-)	12	(-)	12	(-)	12	(-)	16	(-)	16	(-)	16	(-)	16	(-)	16	(-)	16	(-)				
- B	137	(137)	59	(59)	67	(67)	75	(75)	71	(71)	58	(58)	58	(58)	66	(66)	60	(60)	47	(47)	17	(17)				
- C	211	(151)	144	(107)	100	(75)	89	(67)	56	(41)	197	(149)	197	(149)	205	(154)	220	(152)	198	(148)	176	(138)				
Total	360	(300)	215	(166)	179	(171)	176	(142)	139	(112)	271	(207)	271	(207)	287	(220)	296	(212)	261	(195)	209	(155)			209	264
Labor requirement - Without	39		28		19		16		8		18		41		42		41		41		41				18	41
(man-days/ac) - With	45		32		22		19		12		43		43		45		45		44		41				24	44
Coconut																										
Without Project																										
Cost - A	2	(-)	2	(-)	2	(-)	2	(-)	2	(-)	7	(-)	7	(-)	7	(-)	7	(-)	7	(-)	7	(-)	7	(-)		
- B	155	(155)	38	(38)	50	(50)	59	(59)	32	(32)	27	(27)	29	(29)	29	(29)	29	(29)	29	(29)	29	(29)	29	(29)		
- C	212	(162)	54	(41)	48	(37)	41	(32)	35	(25)	38	(29)	51	(38)	54	(41)	52	(40)	52	(40)	52	(40)	34	(26)		
Total	369	(317)	94	(79)	100	(84)	102	(91)	69	(57)	72	(56)	87	(67)	90	(70)	88	(69)	88	(69)	88	(69)	70	(55)	134	82
With Project																										
Cost - A	12	(-)	12	(-)	12	(-)	12	(-)	12	(-)	17	(-)	17	(-)	17	(-)	17	(-)	17	(-)	17	(-)	17	(-)		
- B	155	(155)	38	(38)	50	(50)	59	(59)	42	(42)	37	(37)	39	(39)	39	(39)	39	(39)	39	(39)	39	(39)	39	(39)		
- C	226	(172)	68	(51)	62	(47)	52	(40)	44	(31)	47	(35)	59	(44)	61	(46)	59	(45)	59	(45)	59	(45)	41	(31)		
Total	393	(327)	118	(89)	124	(87)	123	(99)	98	(73)	101	(72)	115	(83)	117	(85)	115	(84)	115	(84)	115	(84)	97	(70)	158	107
Labor requirement - Without	45		12		10		6		7		8		11		12		11		11		11		7		14	11
(man-days/ac) - With	48		15		13		8		9		10		12		13		12		12		12		8		17	12
Cocoa																										
Without Project																										
Cost - A3/	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)						
- B	124	(124)	56	(56)	61	(61)	75	(75)	83	(83)	75	(75)	77	(77)	77	(77)	77	(77)	77	(77)						
- C	140	(108)	79	(62)	76	(60)	79	(62)	76	(62)	82	(66)	86	(68)	81	(67)	77	(63)	77	(63)						
Total	264	(232)	135	(118)	137	(121)	154	(137)	159	(145)	157	(141)	163	(145)	158	(144)	154	(140)	144	(140)					200	156
With Project																										
Cost - A2/	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)						
- B	132	(132)	68	(68)	77	(77)	93	(93)	101	(101)	93	(93)	95	(95)	95	(95)	95	(95)	95	(95)						
- C	244	(112)	86	(68)	87	(70)	99	(79)	107	(88)	119	(96)	125	(99)	117	(97)	111	(91)	111	(91)						
Total	376	(244)	154	(136)	164	(147)	192	(172)	208	(189)	212	(189)	220	(194)	212	(192)	206	(186)	206	(186)					216	208
Labor requirement - Without	30		17		17		17		16		18		18		17		17		17						24	17
(man-day/ac) - With	30		17		18		19		21		25		25		24		23		23						24	23
Coffee																										
Without Project																										
Cost - A3/	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)						
- B	49	(49)	14	(14)	18	(18)	24	(24)	28	(28)	24	(24)	24	(24)	24	(24)	24	(24)	24	(24)						
- C	131	(101)	82	(64)	75	(57)	82	(70)	81	(81)	136	(103)	158	(119)	147	(111)	136	(103)	136	(103)						
Total	120	(150)	96	(78)	93	(75)	116	(94)	144	(109)	160	(127)	182	(143)	171	(135)	160	(127)	160	(127)					124	155
With Project																										
Cost - A	-	(-)	-	-	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)						
- B	55	(55)	26	(26)	34	(34)	44	(44)	48	(48)	44	(44)	44	(44)	44	(44)	44	(44)	44	(44)						
- C	142	(110)	106	(81)	109	(83)	137	(104)	172	(114)	192	(153)	214	(169)	203	(161)	192	(153)	192	(153)						
Total	197	(165)	132	(107)	143	(117)	181	(148)	220	(162)	236	(197)	258	(213)	247	(205)	236	(197)	236	(197)					157	227
Labor requirement - Without	29		19		17		20		26		30		36		33		30		30						22	32
(man-day/ac) - With	31		24		24		30		38		45		51		48		45		45						26	47

1/ Costs include all labor, both family and hired, evaluated at M$4/day. Figures in parentheses are economic costs with all labor shadow priced at M$3/day.

2/ Cost Categories: A = land tax, drainage rate (equal to project operation and maintenance cost only);
B = Physical inputs: tools and equipment, planting material, fertilizer, insecticide, weedicide, etc.; and
C = Other inputs: clearing, drainage, planting, weeding, pest control, fertilizing, pruning, harvesting and contingency.

3/ Taxes accounted for under coconut.

ANNEX 14
Table 1

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Production Costs: Pineapple [1/]

(M$/ac)

		Without Project										With Project									
	Crop	1		2		3		4		Average		1		2		3		4		Average	
	Duration (months)	0-18		19-30		31-42		43-54		(per yr)		0-18		19-30		31-42		43-54		(per yr)	
A.	Quit Rent	5	(-)	3	(-)	3	(-)	3	(-)			5	(-)	5	(-)	3	(-)	3	(-)		
	Land Rent	12	(-)	8	(-)	8	(-)	8	(-)			12	(-)	8	(-)	8	(-)	8	(-)		
	Drainage Rate	-	(-)	-	(-)	-	(-)	-	(-)			15	(-)	10	(-)	10	(-)	10	(-)		
B.	Planting Material	145	(145)	5	(5)	5	(5)	5	(5)			145	(145)	5	(5)	5	(5)	5	(5)		
	Sprayer	15	(15)	-	(-)	-	(-)	-	-			15	(15)	-	(-)	-	(-)	-	(-)		
	Fertilizer	100	(100)	40	(40)	40	(40)	40	(40)			120	(120)	50	(50)	50	(50)	50	(50)		
	Fungicide	10	(10)	5	(5)	5	(5)	5	(5)			10	(10)	5	(5)	5	(5)	5	(5)		
	Pesticide	10	(10)	10	(10)	10	(10)	10	(10)			12	(12)	11	(11)	11	(11)	11	(11)		
	Hormones	3	(3)	2	(2)	2	(2)	2	(2)			3	(3)	2	(2)	2	(2)	2	(2)		
C.	Clearing	160	(120)	-	(-)	-	(-)	-	(-)			160	(120)	-	(-)	-	(-)	-	(-)		
	Drainage	33	(25)	13	(10)	13	(10)	13	(10)			47	(35)	27	(20)	27	(20)	27	(20)		
	Roads	33	(25)	8	(6)	8	(6)	8	(6)			33	(25)	5	(4)	5	(4)	5	(4)		
	Planting	93	(70)	20	(15)	20	(15)	20	(15)			93	(70)	20	(5)	20	(15)	20	(15)		
	Weeding	48	(36)	19	(14)	19	(14)	19	(14)			48	(36)	19	(14)	19	(14)	19	(14)		
	De-crowning	-	(-)	9	(7)	9	(7)	9	(7)			-	(-)	9	(7)	9	(7)	9	(7)		
	Spraying	20	(15)	13	(10)	13	(10)	13	(10)			20	(15)	13	(10)	13	(10)	13	(10)		
	Fertilizing	27	(20)	11	(8)	11	(8)	11	(8)			29	(22)	12	(9)	12	(9)	12	(9)		
	Hormone Application	19	(14)	9	(7)	9	(7)	9	(7)			19	(14)	9	(7)	9	(7)	9	(7)		
	TOTAL FIXED COSTS:	733	(608)	175	(139)	175	(139)	175	(139)	280	(228)	786	(642)	208	(159)	208	(159)	208	(159)	313	(248)
	Harvesting	10.0y	(7.4y)	10.0y	(7.4y)	10.0y	(7.4y)	10.0y	(7.4y)			10.0y	(7.4y)	10.0y	(7.4y)	10.0y	(7.4y)	10.0y	(7.4y)		
	Transport to road	3.3y	(2.5y)	3.3y	(2.5y)	3.3y	(2.5y)	3.3y	(2.5y)			1.7y	(1.3y)	1.7y	(1.3y)	1.7y	(1.3y)	1.7y	(1.3y)		
	to cannery	7.8y	(7.0y)	7.8y	(7.0y)	7.8y	(7.0y)	7.8y	(7.0y)			5.8y	(5.3y)	5.8y	(5.3y)	5.8y	(5.3y)	5.8y	(5.3y)		
	TOTAL VARIABLE COSTS: [2/]	21.1y	(16.9y)	21.1y	(16.9y)	21.1y	(16.9y)	21.1y	(16.9y)	18.8y	(15.0y)	17.5y	(14.0y)	17.5y	(14.0y)	17.5y	(14.0y)	17.5y	(14.0y)	15.6y	(12.4y)
	Labor requirement (man-days/ac)	108+4.0y		26+4.0y		26+4.0y		26+4.0y		41.3 + 3.6y		112+3.5y		29+3.5y		29+3.5y		29+3.5y		44.2 + 3.1y	

/1 Costs include all labor, both family and hired, evaluated at M$4/day. Figures in parentheses are economic costs with all labor shadow priced at M$3/day.
/2 y = yield in ton/ac.

ANNEX 14
Table 2

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Production Costs: Oil Palm 1/

(M$/ac)

Year	1		2		3		4		6		8		10		15		20		25		Average Immature	Average Mature
Fixed Costs																						
A. Quit Rent 2/	2	(-)	2	(-)	2	(-)	2	(-)	13	(-)	13	(-)	13	(-)	13	(-)	13	(-)	13	(-)		
Drainage Rate	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)	10	(-)		
B. Planting Material	120	(120)	4	(4)	4	(4)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)		
Fertilizer	10	(10)	50	(50)	60	(60)	70	(70)	80	(80)	80	(80)	80	(80)	70	(70)	60	(60)	40	(40)		
Insecticide	-	(-)	4	(4)	2	(2)	2	(2)	8	(8)	8	(8)	8	(8)	6	(6)	4	(4)	4	(4)		
C. Clearing, roads, etc.	85	(64)	2	(2)	5	(4)	4	(3)	2	(2)	1	(1)	1	(1)	1	(1)	1	(1)	1	(1)		
Drainage	30	(23)	12	(9)	8	(6)	8	(6)	9	(7)	9	(7)	9	(7)	9	(7)	9	(7)	9	(7)		
Lining, holing, planting	32	(24)	-	-	-	-	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)	-	(-)		
Weeding	40	(30)	40	(30)	40	(30)	30	(22)	22	(16)	22	(16)	20	(15)	19	(14)	7	(13)	15	(11)		
Fertilizing	2	(2)	8	(6)	10	(8)	10	(8)	10	(8)	10	(8)	10	(8)	10	(8)	10	(8)	6	(4)		
Spraying	-	(-)	11	(8)	10	(8)	7	(5)	2	(2)	2	(2)	2	(2)	2	(2)	1	(1)	1	(1)		
Pruning, castration, pollination	-	(-)	8	(6)	10	(8)	20	(16)	14	(9)	12	(7)	10	(5)	6	(4)	6	(4)	6	(4)		
Sub-Total	331	(273)	151	(119)	161	(130)	163	(132)	170	(132)	167	(129)	163	(126)	146	(112)	131	(98)	105	(72)		
Without Project																						
Yield (ton/ac)-ffb	-		-		-		0.5		3.8		5.6		5.8		5.6		5.1		4.0			
-oil	-		-		-		0.08		0.65		1.18		1.22		1.18		1.07		0.84			
-kernel	-		-		-		0.02		0.13		0.22		0.23		0.22		0.20		0.16			
Variable Costs																						
Harvesting and transport	-	-	-	-	-	-	11	(9)	57	(46)	78	(64)	81	(66)	78	(64)	72	(59)	56	(46)		
Processing	-	-	-	-	-	-	6	(6)	30	(27)	39	(35)	41	(37)	39	(35)	36	(32)	28	(25)		
Transport and port handling	-	-	-	-	-	-	2	(2)	9	(9)	16	(14)	18	(16)	16	(14)	15	(13)	12	(11)		
Contingency	33	(27)	13	(9)	13	(10)	15	(11)	23	(17)	26	(20)	26	(20)	24	(19)	22	(17)	18	(13)		
Total Costs	364	(300)	164	(128)	174	(140)	187	(160)	289	(331)	326	(262)	329	(265)	303	(254)	276	(219)	219	(167)	218	285
Gross Value of Production-oil	-	-	-	-	-	-	33	(37)	265	(299)	481	(543)	498	(561)	481	(583)	437	(492)	343	(386)		
-kernel	-	-	-	-	-	-	5	(5)	31	(31)	52	(52)	54	(54)	52	(52)	47	(47)	38	(38)		
Net Value of Production	-359	(-295)	-139	(-103)	-144	(-110)	-114	(-83)	47	(139)	247	(373)	263	(390)	265	(376)	238	(350)	182	(277)		
Labor requirement (man-day/ac)	47		20		21		22		28		34		34		32		30		24		28	30
With Project																						
Yield (ton/ac)-ffb	-		-		-		0.7		5.6		8.2		8.5		8.2		7.4		5.9			
-oil	-		-		-		0.08		0.95		1.72		1.78		1.72		1.55		1.24			
-kernel	-		-		-		0.02		0.20		0.33		0.34		0.33		0.30		0.24			
Variable Costs																						
Harvesting and transport	-	-	-	-	-	-	10	(8)	67	(52)	91	(72)	94	(74)	91	(72)	81	(64)	65	(51)		
Processing	-	-	-	-	-	-	8	(7)	45	(40)	57	(51)	59	(53)	57	(51)	52	(47)	41	(37)		
Transport and port handling	-	-	-	-	-	-	2	(2)	14	(12)	24	(22)	25	(23)	24	(22)	21	(19)	17	(15)		
Contingency	33	(27)	13	(9)	13	(10)	15	(11)	26	(20)	30	(23)	30	(24)	28	(22)	25	(20)	21	(15)		
Total Costs	364	(300)	164	(128)	174	(140)	198	(160)	322	(256)	369	(297)	371	(300)	246	(279)	310	(246)	249	(190)	219	321
Gross Value of Production-oil	-	-	-	-	-	-	33	(37)	388	(437)	702	(791)	726	(819)	702	(791)	632	(713)	506	(570)		
-kernel	-	-	-	-	-	-	5	(5)	47	(47)	78	(78)	80	(80)	78	(78)	70	(70)	56	(56)		
Net Value of Production	-359	(-295)	-139	(-103)	-144	(-110)	-125	(-83)	153	(268)	451	(612)	475	(639)	469	(625)	422	(565)	333	(456)		
Labor requirement (man-day/ac)	46		20		16		20		36		41		41		38		34		29		26	36

1/ Costs include all labor, both family and hired, evaluated at M$4/day. Figures in parentheses are economic costs with all labor shadow priced at M$3/day.
2/ Land Tax.

ANNEX 14
Table 3

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Production Costs: Banana, Groundnut and Tapioca

(M$/ac)[1]

	Banana[2]				Groundnut[3]				Tapioca			
	Without		With		First Crop		Later Crop		First Year		Later Year	
A. Quit Rent	-[4]	(-)	-	(-)	1	(-)	1	(-)	3	(-)	3	(-)
Drainage Rate	-	(-)	-	(-)	3	(-)	3	(-)	10	(-)	10	(-)
B. Planting Material	2	(2)	2	(2)	53	(53)	20	(20)	20	(20)	-	-
Fertilizer, Lime	30	(30)	15	(30)	160	(160)	60	(60)	180	(180)	120	(120)
Pesticide	5	(5)	5	(5)	15	(15)	15	(15)	-	-	-	-
Weedicide	5	(5)	5	(5)	-	-	-	-	-	-	-	-
Tools, Packing Materials, etc.	4	(4)	4	(4)	40	(40)	30	(30)	10	(10)	10	(10)
C. Clearing and Draining	-	(-)	-	(-)	100	(75)	10	(8)	100	(75)	10	(8)
Land Preparation	3	(2)	3	(2)	20	(18)	20	(18)	20	(18)	16	(12)
Lining and Holing	7	(5)	7	(5)	-	-	-	-	-	-	-	-
Planting	3	(2)	3	(2)	28	(21)	28	(21)	12	(9)	12	(9)
Fertilizing	4	(3)	4	(3)	6	(5)	6	(5)	8	(6)	17	(5)
Liming	-	(-)	-	(-)	6	(5)	6	(5)	8	(6)	1	(1)
Pest Control	7	(5)	7	(5)	4	(3)	4	(3)	-	(-)	-	(-)
Weeding	24	(14)	24	(14)	20	(15)	20	(15)	20	(15)	20	(15)
Harvesting	14	(11)	20	(15)	64	(48)	64	(48)	3.3y[5]	(2.5)	3.3y	(2.5y)
Contingency	-	(-)	-	(-)	44	(38)	26	(22)	30+.33y	(25+.25y)	15+.33y	(12+.25y)
Total Costs	108	(88)	114	(92)	564	(496)	313	(270)	421+3.63y	(364+2.75y)	224+3.63y	(192+2.75y)
Labor requirement (man-day/ac)	15		17		62		40		42+0.82y		16.5+0.22y	

/1 Costs include all labor, both family and hired, evaluated at M$4/day. Figures in parentheses are economic costs with all labor shadow priced at M$3/day.
/2 Costs averaged over five-year life.
/3 Costs per crop. Three crops per year estimated.
/4 Taxes accounted for under coconut.
/5 y = yield in tons tubers/ac.

ANNEX 14
Table 4

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Farm Income: Rubber/Oil Palm Smallholder

	A = 4.7 ac					B = 10.2 ac					C = 14.5 ac				
	1973	1983		2003		1973	1983		2003		1973	1983		2003	
Area (ac)		$\bar{W}$	W	$\bar{W}$	W		$\bar{W}$	W	$\bar{W}$	W		$\bar{W}$	W	$\bar{W}$	W
Rubber	4.0	4.0	-	4.0	-	8.9	8.9	-	8.9	-	12.0	12.0	-	12.0	-
Oil Palm	-	-	4.0	-	4.0	-	-	8.9	-	8.9	-	-	12.0	-	12.0
Coconut	0.4	0.4	0.4	0.4	0.4	0.8	0.8	0.8	0.8	0.8	1.5	1.5	1.5	1.5	1.5
Other - Mixed Horticulture	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0
Total	4.7	4.7	4.7	4.7	4.7	10.2	10.2	10.2	10.2	10.2	14.5	14.5	14.5	14.5	14.5
Net Income (M$/ac)															
Rubber	146	184	227	262	353	146	184	227	262	353	146	184	227	262	353
Oil Palm	-	-	667	-	667	-	-	667	-	667	-	-	667	-	667
Coconut	113	154	147	223	257	113	154	147	223	257	113	154	147	223	257
Other	132	132	187	132	297	132	132	187	132	297	132	132	187	132	297
Net Income (M$/farm)															
Rubber - mature	467	611	-	865	-	1,037	1,362	-	1,913	-	1,402	1,822	-	2,568	-
- immature @ 129	103	88	-	90	-	232	194	-	206	-	310	271	-	284	-
Oil Palm - mature	-	-	1,494	-	2,601	-	-	3,315	-	5,736	-	-	4,469	-	7,757
- immature @ 172	-	-	303	-	17	-	-	676	-	52	-	-	912	-	64
Coconut - mature	42	54	54	80	95	80	108	106	156	180	148	209	200	299	347
- immature @ 22	1	1	1	1	1	2	2	2	2	2	4	4	4	4	4
Other	40	40	56	40	89	66	66	93	66	148	132	132	187	132	297
Total Net On-Farm Income (excluding labor)	653	794	1,908	1,076	2,803	1,417	1,732	4,192	2,343	6,118	1,996	2,438	5,772	3,287	8,469
Hired Labor - man-days	-	-	-	-	-	-	-	-	-	-	8	17	-	17	2
- cost (M$/farm)	-	-	-	-	-	-	-	-	-	-	32	68	-	68	8
Net On-Farm Income (rounded)	650	790	1,910	1,080	2,800	1,420	1,730	4,190	2,340	6,120	1,960	2,370	5,770	3,220	8,460
Other Income	800	800	900	800	1,100	800	800	900	800	1,100	650	650	600	650	500
Total Income	1,450	1,590	2,810	1,880	3,900	2,220	2,530	5,090	3,140	7,220	2,610	3,020	6,370	3,870	8,960

ANNEX 14
Table 5

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Farm Income: Coconut Smallholder

Area (ac)	A: 3.5 ac							B: 13.3 ac							C: 20.0 ac						
	1973	1983			2003			1973	1983			2003			1973	1983			2003		
		W̄	W 1/	W 2/	W̄	W 1/	W 2/		W̄	W 1/	W 2/	W̄	W 1/	W 2/		W̄	W 1/	W 2/	W̄	W 1/	W 2/
Coconut	2.5	2.5	2.5	2.5	2.5	2.5	2.5	9.4	9.4	9.4	9.4	9.4	9.4	9.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Cocoa	-	-	2.5	-	-	2.5	-	-	-	9.4	-	-	9.4	-	-	-	15.0	-	-	15.0	-
Banana	-	-	-	2.5	-	-	2.5	-	-	-	9.4	-	-	9.4	-	-	-	15.0	-	-	15.0
Rubber	0.7	0.7	0.7	0.7	0.7	0.7	0.7	3.2	3.2	3.2	3.2	3.2	3.2	3.2	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Other	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total	3.5	3.5	(6.0)	(6.0)	3.5	(6.0)	(6.0)	13.3	13.3	(22.7)	(22.7)	13.3	(22.7)	(22.7)	20.0	20.0	(35.0)	(35.0)	20.0	(35.0)	(35.0)
Net Income (M$/ac)																					
Coconut	113	154	147	147	223	257	257	113	154	147	147	223	257	257	113	154	147	147	223	257	257
Cocoa	36	318	434	434	269	586	586	36	318	434	434	269	586	586	36	318	434	434	269	586	586
Banana	127	127	204	204	127	204	204	127	127	204	204	127	204	204	127	127	204	204	127	204	204
Rubber	146	184	227	227	262	353	353	146	184	227	227	262	353	353	146	184	227	227	262	353	353
Other	132	132	187	187	132	297	297	132	132	187	187	132	297	297	132	132	187	187	132	297	297
Net Income (M$/farm)																					
Coconut - mature	254	288	184	184	502	578	578	931	1,078	691	691	1,887	2,172	2,172	1,525	1,732	1,103	1,103	3,010	3,470	3,470
- immature 22	6	14	27	27	6	6	6	26	53	103	103	21	21	21	33	82	165	165	33	33	33
Cocoa - mature	--	--	651	--	--	1,392	--	--	--	2,448	--	--	5,227	--	--	--	3,906	--	--	8,345	--
- immature 128	--	--	128	--	--	16	--	--	--	481	--	--	61	--	--	--	512	--	--	97	--
Banana	--	--	--	510	--	--	510	--	--	--	1,918	--	--	1,918	--	--	--	3,060	--	--	3,060
Rubber - mature	80	103	132	132	152	205	205	372	488	601	601	694	935	935	467	607	749	749	865	1,165	1,165
- immature 129	19	18	15	15	15	15	15	84	71	71	71	71	71	71	103	90	90	90	90	90	90
Other	40	40	56	56	40	89	89	92	92	131	131	92	208	208	132	132	187	187	132	297	297
Total Net On-Farm Income (excluding labor)	399	463	1,193	924	715	2,301	1,403	1,505	1,782	4,526	3,515	2,765	8,695	5,325	2,260	2,643	6,712	5,354	4,130	13,497	8,115
Total Labor Cost - (M$/farm)	221	228	496	434	223	475	414	906	931	1,952	1,719	914	1,870	1,643	1,281	1,319	2,931	2,559	1,292	2,801	2,439
-(man-days)	55	57	124	109	56	119	104	227	233	488	430	229	468	411	320	330	733	640	323	700	610
Hired Labor -(man-days)	--	--	--	--	--	--	--	--	--	38	--	--	16	--	--	--	283	190	--	250	160
-(M$/farm)	--	--	--	--	--	--	--	--	--	152	--	--	64	--	--	--	1,132	760	--	1,000	640
Net On-Farm Income - M$	400	460	1,190	920	720	2,300	1,400	1,510	1,780	4,370	3,520	2,770	8,630	5,330	2,260	2,640	5,580	4,590	4,130	12,500	7,480
Other Income - M$	800	800	850	900	800	1,050	1,100	630	630	650	700	630	700	750	600	600	500	550	600	400	450
Total Farm Income - M$	1,200	1,260	2,040	1,820	1,520	3,350	2,500	2,140	2,410	5,020	4,220	3,400	9,330	6,080	2,860	3,240	6,080	5,140	4,730	12,900	7,930

1/ Cocoa intercrop.
2/ Banana intercrop.

ANNEX 14
Table 6

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Farm Income: Pineapple Smallholder

	A = 8.0 ac					B = 11.7 ac					C = 13.2 ac				
	1973	1983		2003		1973	1983		2003		1973	1983		2003	
		W̄	W	W̄	W		W̄	W	W̄	W		W̄	W	W̄	W
Area (ac)															
Pineapple	4.0	4.0	4.0	4.0	4.0	7.9	7.9	7.9	7.9	7.9	10.0	10.0	10.0	10.0	10.0
Rubber	3.5	3.5	3.5	3.5	3.5	3.2	3.2	3.2	3.2	3.2	2.5	2.5	2.5	2.5	2.5
Other	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7
Total	8.0	8.0	8.0	8.0	8.0	11.7	11.7	11.7	11.7	11.7	13.2	13.2	13.2	13.2	13.2
Net Income (MS/ac)															
Pineapple	233	288	367	319	521	233	288	367	319	521	233	288	367	319	521
Rubber	68	88	110	120	182	68	88	110	120	182	68	88	110	120	182
Other	120	120	170	120	270	120	120	170	120	270	120	120	170	120	270
Net Income (MS/farm)															
Pineapple	932	1,152	1,468	1,276	2,084	1,841	2,275	2,899	2,520	4,116	2,330	2,880	3,670	3,190	5,210
Rubber - mature	190	256	320	349	530	174	234	293	319	484	136	183	229	250	379
- immature	105	53	66	72	109	44	48	59	65	98	34	38	47	52	78
Other	60	60	85	60	135	72	72	102	72	162	84	84	119	84	189
Total On-Farm Income (excluding labor)	1,287	1,521	1,939	1,757	2,858	2,131	2,629	3,353	2,976	4,860	2,584	3,185	4,065	3,576	5,856
Total Labor - M$/farm	1,624	1,711	1,840	1,795	1,932	2,659	2,818	3,021	2,983	3,202	3,139	3,336	3,571	3,546	3,801
- Man-days	406	428	460	449	483	665	705	755	746	801	785	834	893	887	950
Net On-Farm Income	1,287	1,521	1,899	1,757	2,726	1,271	1,609	2,133	1,792	3,456	1,244	1,649	2,293	1,828	3,856
Other Income	800	800	750	800	650	750	700	650	600	450	700	650	600	550	400
Total Net Farm Income - M$	2,087	2,321	2,699	2,557	3,376	2,021	2,309	2,783	2,392	3,906	1,944	2,299	2,893	2,378	4,256

ANNEX 14
Table 7

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Farm Income - Annual Crop Smallholder

	A = 2.5ac		B = 5.0ac		C = 10.0ac	
	1983	2003	1983	2003	1983	2003
	With Project					
Area (ac)						
Tapioca	1.5	1.5	3.5	3.5	7.0	7.0
Groundnut	0.5	0.5	0.75	0.75	1.5	1.5
Vegetable	0.5	0.5	0.75	0.75	1.5	1.5
Net Income (M$/ac)						
Tapioca	259	424	259	424	259	424
Groundnut	1,343	1,851	1,343	1,851	1,343	1,851
Vegetable	2,363	2,363	2,363	2,363	2,363	2,363
Net Income (M$/farm)						
Tapioca	389	636	907	1,484	1,813	2,968
Groundnut	672	926	1,007	1,388	2,015	2,777
Vegetable	1,182	1,182	1,772	1,772	3,545	3,545
Total On-Farm Income	2,243	2,744	3,686	4,644	7,373	9,290
Labor Required (M$/ac)						
Tapioca	99	111	99	111	99	111
Groundnut	480	480	480	480	480	480
Vegetable	1,200	1,200	1,200	1,200	1,200	1,200
Labor Cost (M$/farm)						
Tapioca	149	167	347	389	693	777
Groundnut	240	240	360	360	720	720
Vegetable	600	600	900	900	1,800	1,800
Total	989	1,007	1,607	1,649	3,213	3,297
Total Labor Man-days)	247	252	402	412	803	824
Hired Labor - man-days	-	-	-	-	353	374
- M$/farm	-	-	-	-	1,412	1,496
Net On-farm Income - M$	2,240	2,740	3,690	4,640	5,960	7,790
Other Income - M$	100	100	150	150	200	200
Total Farm Income - M$	2,340	2,840	3,840	4,790	6,160	7,990

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Total Farm Income

	1973			1983 With Project			2003		
	Area ('000 ac)	Net Income (M$/ac)	Net Income (M$ m.)	Area ('000 ac)	Net Income (M$/ac)	Net Income (M$ m.)	Area ('000 ac)	Net Income (M$/ac)	Net Income (M$ m.)
Mature Crops									
Rubber	69.5	146	10.1	60.8	227	13.8	9.4	353	3.3
Coconut	50.0	113	5.6	48.5	147	7.1	47.0	269	12.6
Cocoa	0.5	36	0	8.5	434	3.7	28.8	586	16.9
Coffee	2.6	292	.8	6.5	442	2.9	9.4	552	5.2
Banana	4.0	127	0.5	7.0	204	1.4	10.0	204	2.0
Pineapple	34.9	233	8.2	37.5	367	13.8	45.0	521	23.4
Oil Palm	0	413	0	14.0	667	9.3	57.0	667	38.0
Tapioca	0	..	0	15.0	259	3.9	40.0	424	17.0
Groundnut	0	..	0	3.0	1,343	4.0	10.0	1,851	18.5
Vegetables	0.1	2,363	0.2	5.0	2,363	11.8	10.0	2,363	23.6
Mixed Horticulture	19.7	110	2.2	19.7	165	3.3	19.7	275	5.4
Sub-Total 1/	174.2		27.6	203.5		75.0	238.1		165.9
Immature Crops									
Rubber	17.0	129	2.2	1.2	129	0.2	0.6	129	0.1
Coconut	3.0	22	0.1	4.5	22	0.1	6.0	22	0.1
Cocoa	1.7	128	0.2	5.5	128	0.7	1.2	128	0.2
Coffee	1.9	200	0.2	1.5	200	0.3	0.6	200	0.1
Oil Palm	0.2	172	0	11.0	172	1.9	3.0	172	0.5
Sub-Total 1/	20.2		2.7	16.7		3.2	9.6		1.0
TOTAL	194.4		30.3	220.2		78.2	247.7		166.9
Non-Agricultural Income		50	9.7		50	11.0		50	12.4
Total Farm Income - M$ m.			40.0			89.2			179.3
Number of farm families '000		29			36			56	
Income/family - M$			1,379			2,477			3,202
Number of Farms '000		19			24			37	
Income/farm - M$			2,105			3,716			4,846

/1 Totals do not include coconut intercrops.

ANNEX 14
Table 9

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Economic Analysis

Assumptions

1. The assumptions used in deriving the time stream of costs and benefits are described in the following paragraphs.

2. Capital Costs - Estimated project expenditures from Annex 9, Table 1, were used, less the following amounts:

(a) Processing Plants - in the case of oil palm, the cost of processing has been included, on a per unit of output basis, in the production cost. For the other crops the price used forevaluating production has been applied to the unprocessed product at the farmgate;

(b) Replanting Grants - costs of replanting have been included, year by year, as they would occur, as part of the production costs;

(c) Price Contingencies - all costs and benefits have been evaluated in constant 1973 currency values;

(d) Muda Irrigation Improvement Study.

3. Annual Costs - The full costs of operating and maintaining the project works and providing agricultural supporting services have been included.

4. Agricultural Inputs - All physical inputs have been costed at their 1974 market values, as there are no major taxes, subsidies or other market distortions, which might cause any significant divergence from real economic values.

5. Crop Prices - Annex 15 explains the derivation of the prices used in this analysis. Projected prices for the early 1980's are used, rather than prices which vary with time, as approximately the same result will be obtained and the calculation is simplified. Prices, net of duties and cesses, have been brought back to farm-gate level, except for oil palm. In this case, the costs and benefits of the whole production process have been evaluated as the provision of transport and milling facilities is part of the project.

6. Farm Labor - As there is considerable underemployment in the project area, under present and projected future conditions, a shadow wage rate for farm labor of M$ 3/man-day, which is 75% of the market rate, has been used. The derivation of this is described in para 9.

7. Evaluation Period - A period of thirty years has been used for project evaluation.

Labor Analysis

8. According to the 1970 census, the population in the project area was 193,000, of whom 23,000 were urban dwellers. Table 1 shows a population projection to the year 2003 using a growth rate of 2.5% for the total area, corresponding to a rate slightly lower than the national average in recent years, and a growth rate of 4% for the urban areas. The rural population is given by subtraction. A family size of six, including the equivalent of 1.8 full-time workers and a working year of 250 days, has been assumed. Both the latter figures are less than would be the case in other Asian countries, reflecting the Malaysian standard of living and the high proportion of children in school. Based on these assumptions, the labor supply will increase from 13 million man-days in 1973 to 25 million man-days in 2003.

9. Labor requirements were calculated for each crop with and without the project. For the tree crops, labor requirements for the immature and mature periods were separately averaged. Labor demand does not vary seasonally to any great extent, except to a degree in the pineapple industry, so seasonal effects were ignored. Total labor requirements for selected years are shown in Table 2. It is seen that, under present conditions, labor demand is only half the available supply. With the project, the utilization factor rises to a peak of 61% while, without the project, it falls to 28% by 2003. However, this analysis does not take account of non-farm employment, in agricultural processing and other industrial employment and in services. At present, such opportunities are mainly limited to pineapple canneries, copra mills and trucking. However, a reasonable increase in employment in processing and service industries may be expected due to the project and, in the longer term, the project area will find itself on the fringe of the Singapore-Johore Bahru conurbation and employment opportunities will be greatly enhanced.

10. After weighing all those factors, it was decided that a shadow wage rate of 75% would be a fair representation of the opportunity cost of labor under present and expected future conditions in the project area. As mentioned previously, no seasonal variation was assumed. As the market wage rate for casual farm labor in the project area is around M$ 4/day, a value of M$ 3/day was used in the economic analysis. It is interesting to note that surveys of prospective FELDA settlers, who are landless laborers and marginal smallholders, have shown that their previous income was about M$ 2.90/day, reinforcing the belief that the opportunity cost of labor in the smallholder sector is about M$ 3/man-day.

Project Benefits

11. The time stream of benefits or the incremental net value of production from each crop is shown in Table 3, based on the planting schedules described in Annex 3, and the crop budgets described in Annex 15. It is seen that, in the early years, the existing crops, rubber and pineapple, are the major contributors to project benefits. After ten years, the cash crops, tapioca, groundnut and vegetables, begin to contribute heavily. In 1993, benefits from rubber become negligible, while oil palm and cocoa begin to make a contribution. At the end of the evaluation period, the greatest benefits are obtained from oil palm, followed by tapioca, groundnut and pineapple. Cocoa and vegetables are also important while coconut, horticulture, coffee and bananas are minor contributors. By this time the incremental net value of production from rubber is negative, due to a declining acreage with the project.

Rate of Return

12. The cost and benefit streams are tabulated in Table 4. The economic rate of return of the project, under the assumptions described in paras 1-7, is 14.8%.

13. The sensitivity of the rate of return to some of the important assumptions made in formulating the project has been tested. The following results were obtained:

	Test	Rate of Return %
(a)	All labor evaluated at M$ 4/man-day;	14.0
(b)	Cost over-run of 15% and benefit slip of 15%;	11.6
(c)	Benefits increased by 25%.	17.6

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Population and Labor Force

Year	Population in Project Area 1/	Urban Population 2/	Rural Population	Farm Families 3/	Farm Workers 4/	Labor Supply 5/ (million man-days)
1970	193,000 6/	23,000 6/	170,000	28,000	51,000	12.8
1973	200,000	26,000	174,000	29,000	52,000	13.0
1983	256,000	39,000	217,000	36,000	65,000	16.3
1993	327,000	57,000	270,000	45,000	81,000	20.2
2003	419,000	85,000	334,000	56,000	100,000	25.0

1/ Growth rate of 2.5% per annum assumed.
2/ Growth rate of 4% per annum assumed.
3/ Six persons per family.
4/ 1.8 equivalent full-time workers per family.
5/ 250 days of work per year.
6/ From 1970 Census.

ANNEX 15
Table 2

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Labor Requirements
('000 man-days)

Year	1973	1983		1993		2003	
With (w) or without ($\bar{w}$) Project		$\bar{w}$	w	$\bar{w}$	w	$\bar{w}$	w
Crop							
Rubber - immature	306	252	29	243	14	218	14
- mature	2850	2788	2575	2604	1294	2374	414
Coconut: Replanted							
- immature	17	17	76	19	102	17	102
- mature	31	53	102	75	204	97	324
Coconut: Rehabilitated							
- immature	12	12	12	20	0	10	0
- mature	126	154	210	182	324	207	204
Coconut: Balance	396	314	126	242	36	165	36
Cocoa - immature	41	17	132	15	72	14	29
- mature	8	73	196	75	506	75	662
Coffee - immature	20	13	39	13	16	13	16
- mature	83	173	306	237	442	237	442
Bananas	60	90	119	120	170	120	170
Pineapple	2590	2590	2862	2660	3279	2835	3780
Oil Palm	10	65	313	152	733	239	884
Tapioca	-	-	453	-	806	-	1146
Groundnut	-	-	371	-	849	-	1204
Vegetables	30	150	1500	300	3000	300	3000
Horticulture	197	197	236	197	296	197	355
Total	6,777	6,958	9,757	7,154	12,143	7,118	12,782
% of supply	52	43	61	35	60	28	51

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WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

Net Incremental Value of Production
(M$ Million)

Year	Rubber	Coconut	Cocoa	Coffee	Bananas	Pineapple	Oil Palm	Tapioca	Groundnut	Vegetables	Horticulture	Total
1974	1.47	(0.49)	(0.07)	(0.10)	0.33	0.20	0.00	0.01	0.01	0.11	0.11	1.66
1975	2.10	(0.49)	(0.07)	(0.20)	0.22	0.60	0.00	0.03	0.03	0.11	0.22	2.86
1976	2.59	(0.49)	(0.07)	0	0.33	1.00	(0.30)	0.08	0.08	0.33	0.33	3.88
1977	2.95	(0.49)	(0.14)	(0.10)	0.33	1.60	(0.70)	0.06	0.16	0.55	0.44	4.76
1978	3.30	(0.49)	(0.15)	0	0.33	2.30	(0.90)	0.18	0.37	0.99	0.55	6.48
1979	3.64	0.32	0.19	0.11	0.44	3.10	(0.35)	0.70	0.80	1.65	0.66	13.52
1980	3.81	0.32	0.53	0.11	0.44	4.00	1.10	1.10	1.27	2.20	0.77	15.65
1981	3.75	0.32	0.87	0.11	0.44	4.60	2.37	1.50	1.73	3.52	0.88	20.09
1982	3.65	0.32	1.21	0.22	0.55	4.80	3.50	1.95	2.26	4.84	0.99	23.18
1983	3.73	0.32	1.55	0.22	0.55	5.30	5.23	2.55	2.87	6.16	1.10	29.58
1988	(0.32)	1.91	4.48	0.99	0.88	7.10	14.51	5.70	5.56	8.47	1.65	50.93
1993	(3.71)	2.67	8.22	1.43	0.88	9.90	25.56	8.22	8.79	12.21	2.20	76.37
1998	(6.95)	3.34	9.21	1.54	0.88	11.00	34.32	10.98	12.58	12.21	2.75	91.86
2003	(10.00)	4.07	10.32	1.43	0.88	12.50	27.12	14.13	14.91	12.21	3.30	90.87

ANNEX 15
Table 3

MALAYSIA

WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT

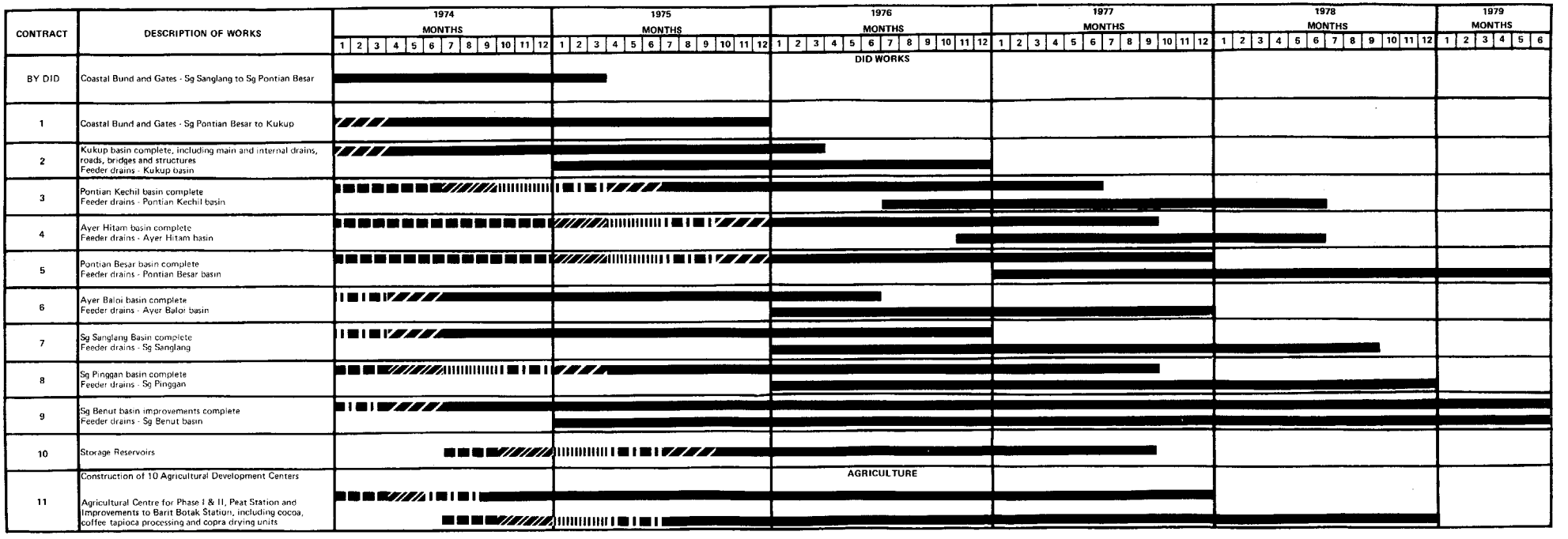
Rate of Return Calculation
(M$ Million)

Year	Civil Works	Physical Contingencies	Equipment	Land	Engineering & Supervision	Replanting	O & M	Agricultural Services	Total Costs	Total Benefits
1974	5.83	--	--	4.66	1.17	--	--	--	11.66	1.66
1975	25.63	--	--	6.99	2.80	1.63	1.63	0.30	38.98	2.86
1976	25.63	4.66	4.66	1.40	2.79	2.33	1.86	0.70	44.03	3.88
1977	25.63	4.66	9.32	--	1.16	2.33	2.10	1.20	46.40	4.76
1978	13.98	4.66	2.33	--	1.16	2.33	2.33	1.40	28.19	6.48
1979	3.50	5.82	2.10	--	0.70	--	3.03	1.50	16.65	13.52
1980	--	--	--	--	--	--	3.50	2.00	5.50	15.65
1981	--	--	--	--	--	--	3.50	2.00	5.50	20.09
1982	--	--	--	--	--	--	3.50	2.00	5.50	23.18
1983	--	--	--	--	--	--	3.50	2.00	5.50	29.58
1984	--	--	--	--	--	--	3.50	2.00	5.50	31.14
1985	--	--	--	--	--	--	3.50	2.00	5.50	35.90
1986	--	--	--	--	--	--	3.50	2.00	5.50	40.77
1987	--	--	--	--	--	--	3.50	2.00	5.50	45.53
1988	--	--	--	--	--	--	3.50	2.00	5.50	50.93
1989	--	--	--	--	--	--	3.50	2.00	5.50	56.70
1990	--	--	--	--	--	--	3.50	2.00	5.50	61.47
1991	--	--	--	--	--	--	3.50	2.00	5.50	66.14
1992	--	--	--	--	--	--	3.50	2.00	5.50	71.44
1993	--	--	--	--	--	--	3.50	2.00	5.50	76.37
1994	--	--	--	--	--	--	3.50	2.00	5.50	79.70
1995	--	--	--	--	--	--	3.50	2.00	5.50	82.49
1996	--	--	--	--	--	--	3.50	2.00	5.50	85.39
1997	--	--	--	--	--	--	3.50	2.00	5.50	88.19
1998	--	--	--	--	--	--	3.50	2.00	5.50	91.86
1999	--	--	--	--	--	--	3.50	2.00	5.50	91.91
2000	--	--	--	--	--	--	3.50	2.00	5.50	91.71
2001	--	--	--	--	--	--	3.50	2.00	5.50	91.53
2002	--	--	--	--	--	--	3.50	2.00	5.50	91.20
2003	--	--	--	--	--	--	3.50	2.00	5.50	90.87

Rate of Return = 14.8%

ANNEX 15
Table 4

MALAYSIA
WESTERN JOHORE
AGRICULTURAL DEVELOPMENT PROJECT – PHASE I
CONSTRUCTION SCHEDULE



LEGEND:

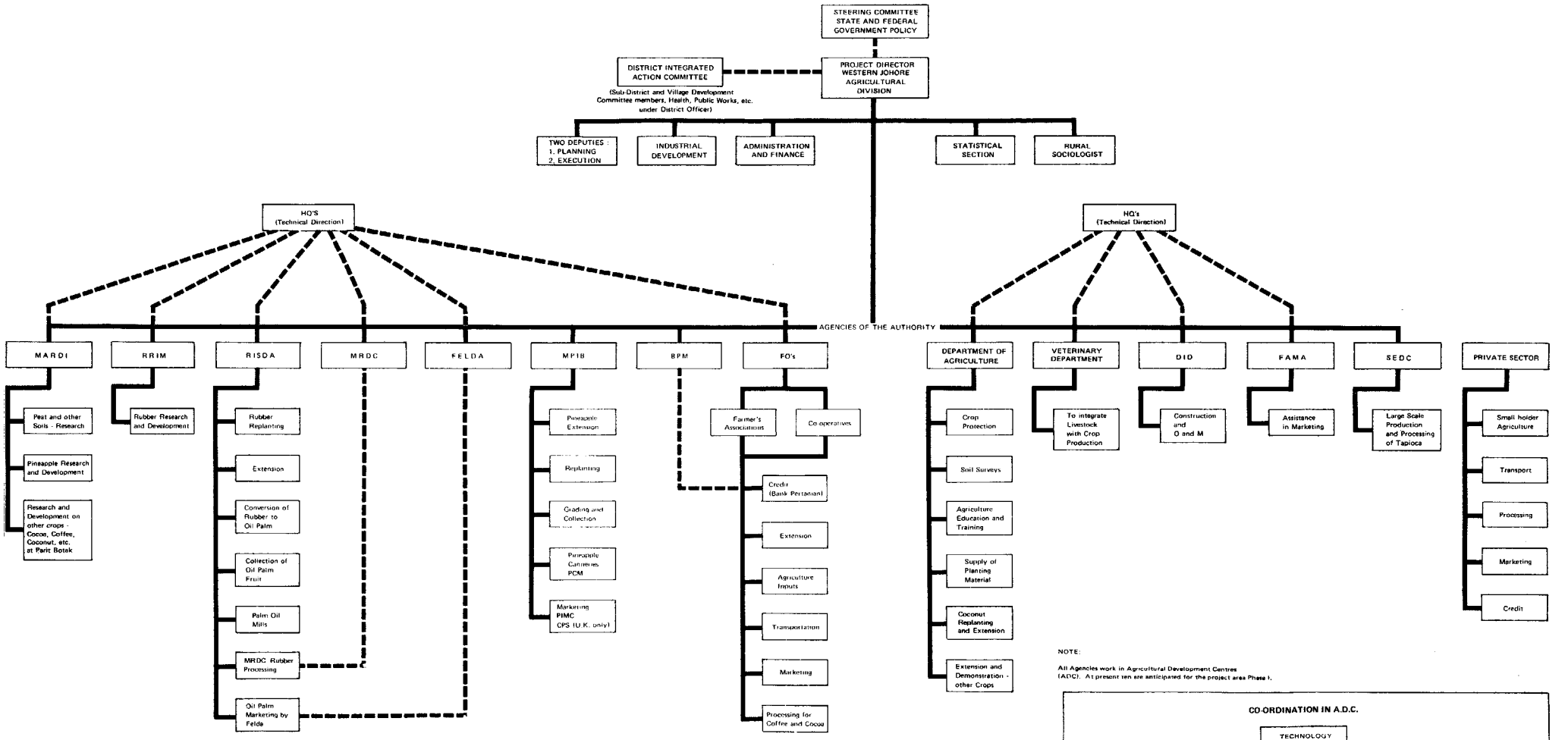
Survey | Land Acquisition | Design | Calling Tenders | Evaluation and Acceptance of Tenders | Construction

NOTE:

1. All Feeder Drains Are To Be Constructed By Rural Works Contract
2. Tenders For Contracts No. 1–10 Are To Be Called In Accordance With World Bank Guidelines For International Competitive Bidding.
3. Design And Contract Preparation Started in 1973 On Contracts 1, 2, 6, 7 And 9.

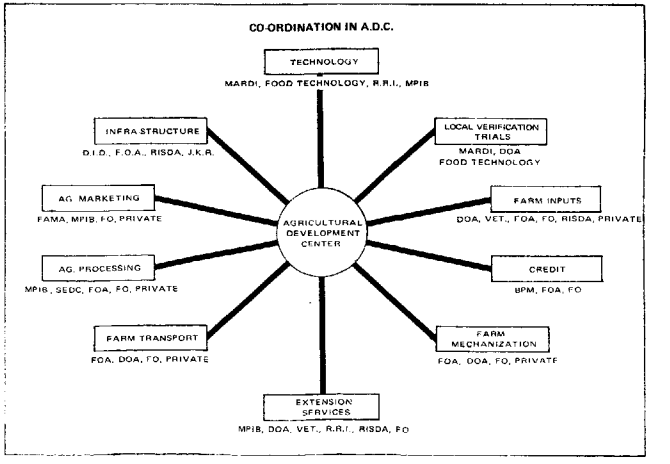
World Bank–7989(R)

MALAYSIA
WESTERN JOHORE AGRICULTURAL DEVELOPMENT PROJECT
ORGANIZATION CHART



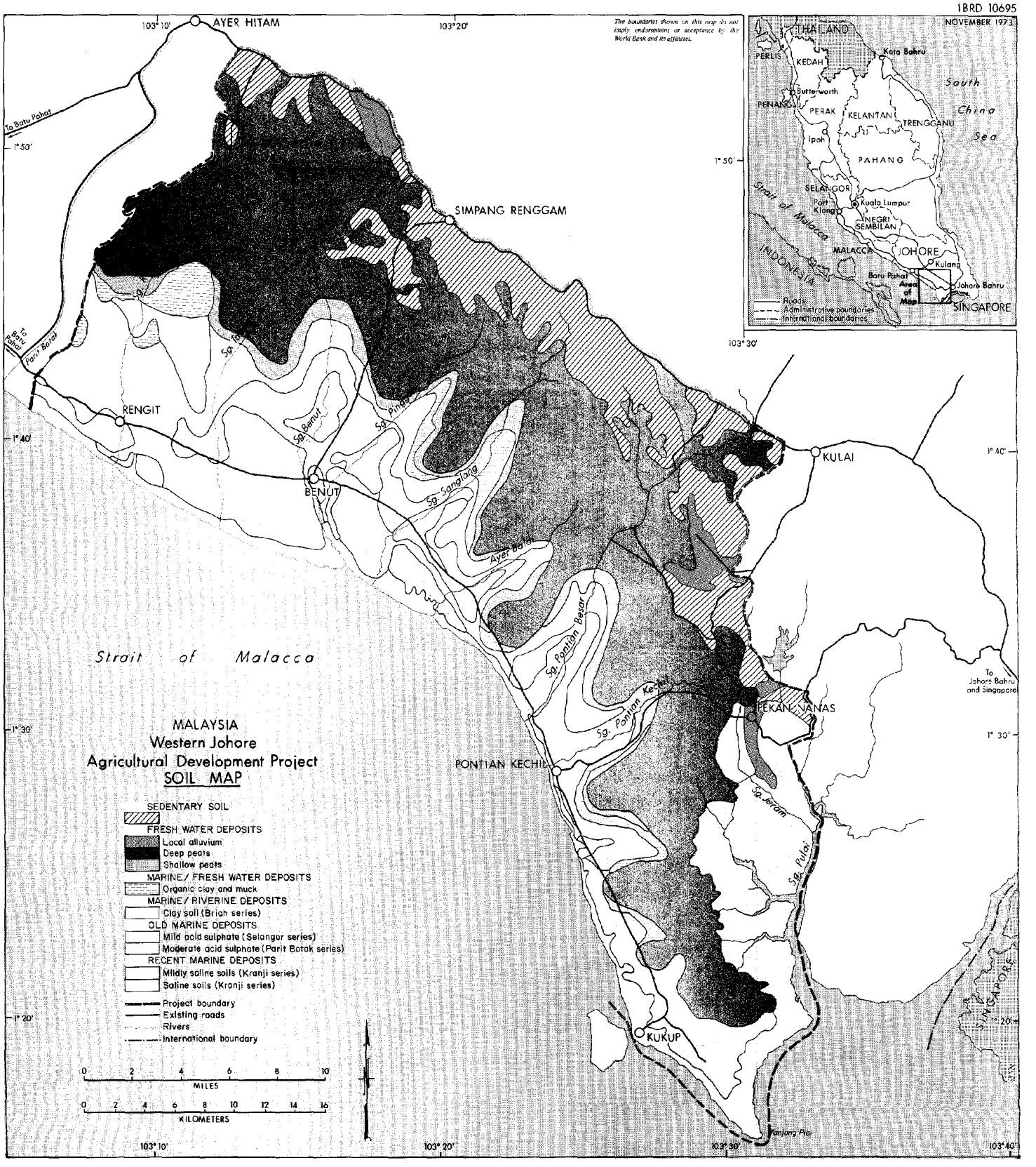
NOTE:

All Agencies work in Agricultural Development Centres (ADC). At present ten are anticipated for the project area Phase I.

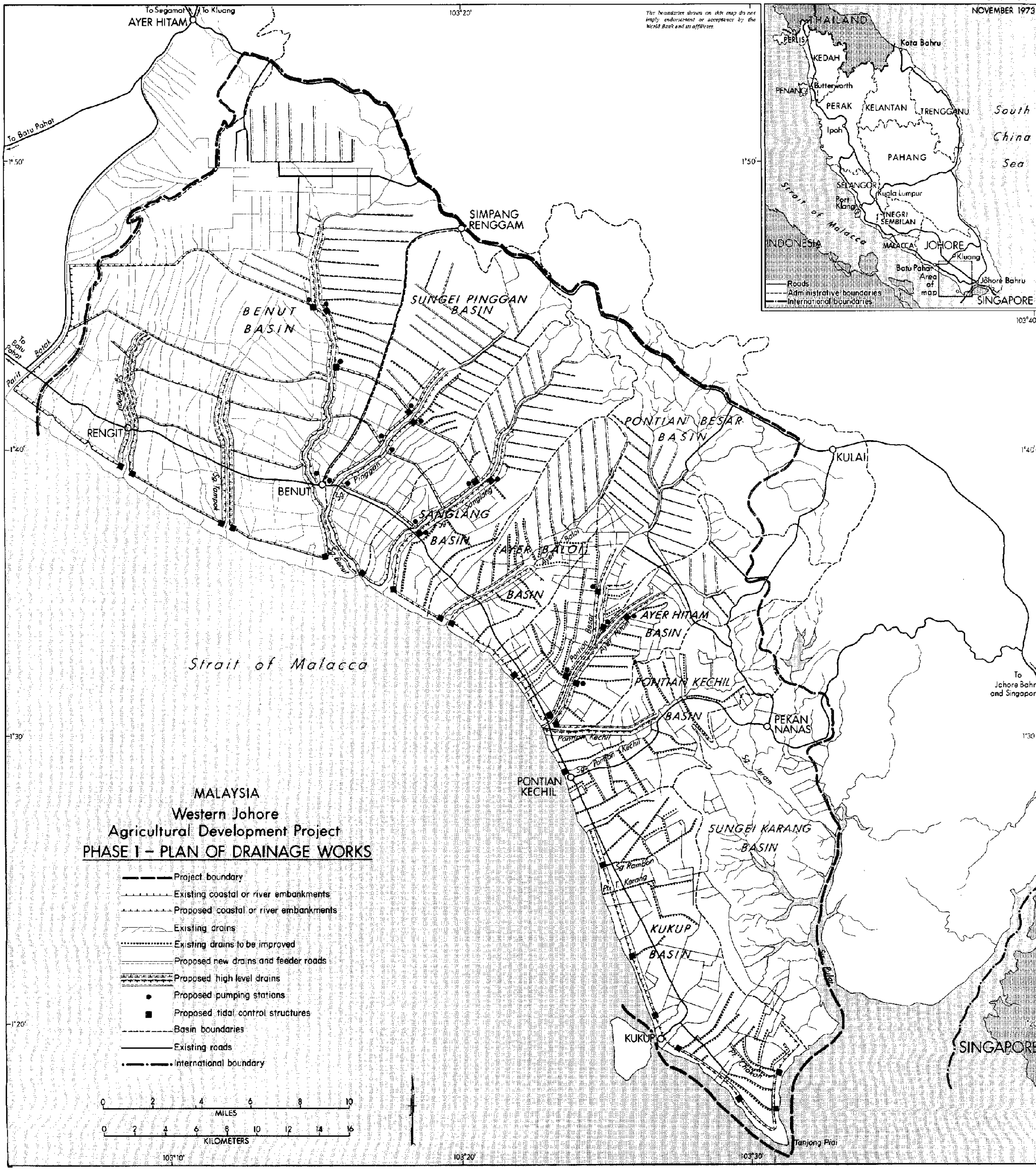


LEGEND

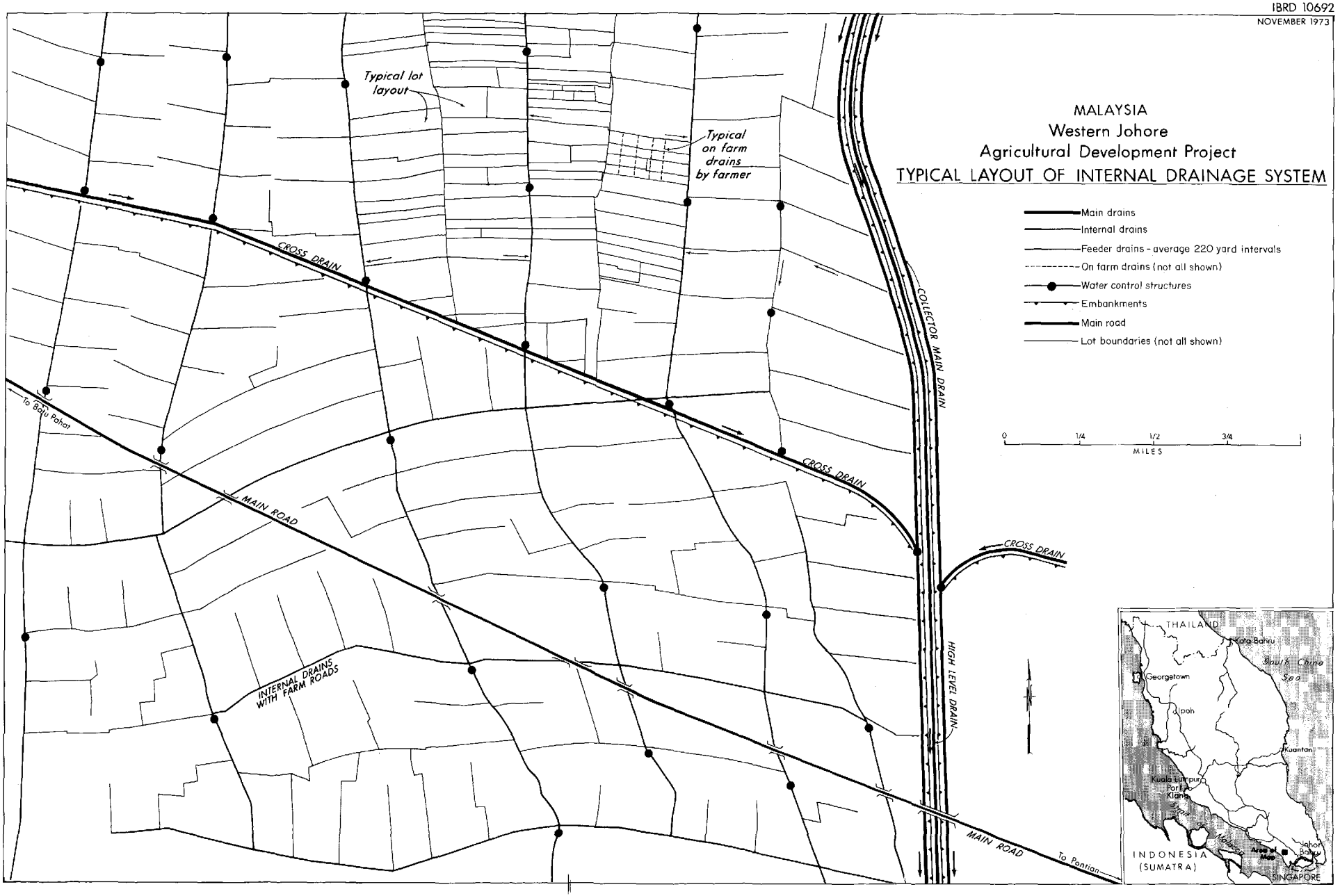
FOA	Farmers Organization Authority (Min. of Rural Economic Development)
MARDI	Malaysian Agricultural Research & Development Institute (Min. of Agriculture)
RRIM	Rubber Research Institute of Malaysia (Min. of Primary Industries)
RISDA	Rubber Industry Smallholders Development Authority (Min. of Primary Industries)
MRDC	Malaysian Rubber Development Corporation (Min. of Primary Industries)
FELDA	Federal Land Development Authority (Min. of Primary Industries)
MPIB	Malaysian Pineapple Industry Board (Min. of Primary Industries)
BPM	Bank Pertanian Malaysia (Agricultural Bank) (Prime Minister's Dept.)
FO	Farmer's Organizations (Prime Minister's Dept.)
DID	Drainage and Irrigation Department (Min. of Agriculture)
FAMA	Federal Agricultural Marketing Authority (Min. of Agriculture)
SEDC	State Economic Development Corporation (State of Johore)
JKR	Public Works Dept. (Min. of Works)
PIMC	Pineapple Industry Marketing Corporation
CPS	Consolidated Pineapple Sales
DOA	Department of Agriculture


The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.
NOVEMBER 1973
THAILAND
PERLIS
KEDAH
Kota Bahru
Butterworth
PENANG
PERAK
KELANTAN
TRENGGANU
Ipoh
PAHANG
SELANGOR
Port Klang
Kuala Lumpur
NEGRI SEMBILAN
MALACCA
JOHORE
Kulang
Batu Pahat
Area of Map
Johore Bahru
SINGAPORE
South China Sea
Strait of Malacca
INDONESIA
Roads
Administrative boundaries
International boundaries
AYER HITAM
To Batu Pahat
Parit Barat
SIMPANG RENGGAM
RENGIT
BENUT
Sg. Benut
Sg. Pinggi
Sg. Sanglang
Ayer Baloi
KULAI
Strait of Malacca
Sg. Pontian Besar
Sg. Pontian Kechil
PEKAN NANAS
To Johore Bahru and Singapore
PONTIAN KECHIL
Sg. Jeram
Sg. Pulai
KUKUP
Tanjong Piai
SINGAPORE
MALAYSIA
Western Johore
Agricultural Development Project
SOIL MAP
SEDENTARY SOIL
FRESH WATER DEPOSITS
Local alluvium
Deep peats
Shallow peats
MARINE/ FRESH WATER DEPOSITS
Organic clay and muck
MARINE/ RIVERINE DEPOSITS
Clay soil (Briah series)
OLD MARINE DEPOSITS
Mild acid sulphate (Selangor series)
Moderate acid sulphate (Parit Botak series)
RECENT MARINE DEPOSITS
Mildly saline soils (Kranji series)
Saline soils (Kranji series)
Project boundary
Existing roads
Rivers
International boundary
0 2 4 6 8 10
MILES
0 2 4 6 8 10 12 14 16
KILOMETERS
103° 10'
103° 20'
103° 30'
103° 40'
1° 50'
1° 40'
1° 30'
1° 20'

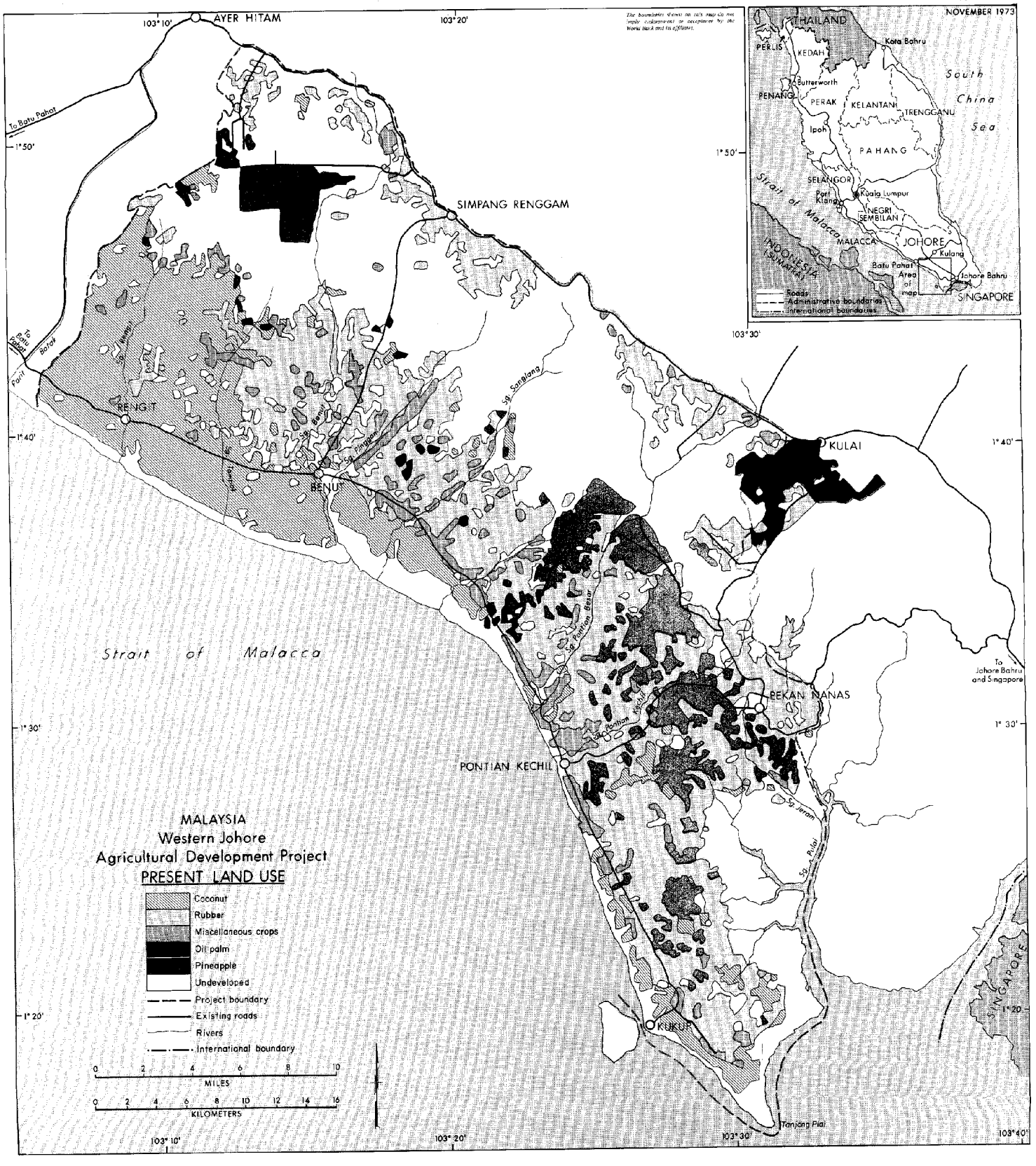
IBRD 10691


MALAYSIA
Western Johore
Agricultural Development Project
PHASE I – PLAN OF DRAINAGE WORKS
Project boundary
Existing coastal or river embankments
Proposed coastal or river embankments
Existing drains
Existing drains to be improved
Proposed new drains and feeder roads
Proposed high level drains
Proposed pumping stations
Proposed tidal control structures
Basin boundaries
Existing roads
International boundary
MILES
KILOMETERS
NOVEMBER 1973
The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.
To Segamat
To Kluang
AYER HITAM
To Batu Pahat
SIMPANG RENGGAM
BENUT BASIN
SUNGEI PINGGAN BASIN
PONTIAN BESAR BASIN
RENGIT
BENUT
SANGLANG BASIN
AYER BALOI BASIN
AYER HITAM BASIN
PONTIAN KECHIL BASIN
KULAI
PEKAN NANAS
PONTIAN KECHIL
SUNGEI KARANG BASIN
KUKUP BASIN
KUKUP
Tanjong Piai
Strait of Malacca
To Johore Bahru and Singapore
SINGAPORE
THAILAND
PERLIS
KEDAH
Kota Bahru
PENANG
Butterworth
PERAK
KELANTAN
TRENGGANU
Ipoh
PAHANG
South China Sea
SELANGOR
Kuala Lumpur
Port Klang
NEGRI SEMBILAN
MALACCA
JOHORE
Kluang
Batu Pahat
Area of map
Johore Bahru
INDONESIA
Roads
Administrative boundaries
International boundaries

IBRD 10692
NOVEMBER 1973



IBRD 10693


The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.
NOVEMBER 1973
THAILAND
PERLIS
KEDAH
Kota Bahru
Butterworth
PENANG
PERAK
KELANTAN
TRENGGANU
South China Sea
Ipoh
PAHANG
SELANGOR
Port Klang
Kuala Lumpur
NEGRI SEMBILAN
MALACCA
JOHORE
P. Kulang
Batu Pahat
Area of map
Johore Bahru
SINGAPORE
INDONESIA (SUMATRA)
Strait of Malacca
Roads
Administrative boundaries
International boundaries
AYER HITAM
To Batu Pahat
SIMPANG RENGGAM
RENGIT
BENUT
KULAI
Strait of Malacca
To Johore Bahru and Singapore
BEKAN NANAS
PONTIAN KECHIL
KUKUP
Tanjong Piai
SINGAPORE
Sg. Sanglang
Sg. Pontian Besar
Sg. Pontian Kecil
Sg. Jeram
Sg. Pulai
103° 10'
103° 20'
103° 30'
103° 40'
1° 50'
1° 40'
1° 30'
1° 20'
MALAYSIA
Western Johore
Agricultural Development Project
PRESENT LAND USE
Coconut
Rubber
Miscellaneous crops
Oil palm
Pineapple
Undeveloped
Project boundary
Existing roads
Rivers
International boundary
0 2 4 6 8 10
MILES
0 2 4 6 8 10 12 14 16
KILOMETERS

IBRD 10694

NOVEMBER 1973