

- 2) Protector of the natural environment to conserve the all-important resource of the province: water

### 6.2.2 Provincial and IDEP Objectives

Provincial Repelita V of Lampung places priority on the following issues:

- 1) Agriculture and irrigation
- 2) Infrastructure, especially transportation
- 3) Industry, especially agro-industry
- 4) Human resources development
- 5) Population problems such as employment, high fertility rate, migration, resettlement, etc.
- 6) Rural and urban development
- 7) Participatory development
- 8) Cooperatives (KUD)
- 9) Upgrading capability of local government
- 10) Creation of new kabupaten and kecamatan

BAPPEDA Tk I of Lampung has specifically supplemented the above issues by further pointing out:

- 1) Environmental conservation, such issues as protected forests, land degradation, water pollution
- 2) Conflicts over land title
- 3) Development of manufacturing and services
- 4) Agriculture, particularly large-scale estates and smallholder agriculture under the transmigration scheme
- 5) Tourism development
- 6) Improvement of transportation and other infrastructure
- 7) Income disparities
- 8) Institutional strengthening, e.g., adjusting government's span of control, improving officials' capability

Taking all those issues into account and considering the IDEP's roles identified above, we can further set out the IDEP's objectives as follows:

- 1) Fully develop high-potential economic sectors
- 2) Improve the Gateway functions
- 3) Protect the marine and forest environment
- 4) Develop human resources to accommodate and facilitate social transformation

## 6.3 DEVELOPMENT STRATEGY FOR BANDAR LAMPUNG/LAMPUNG SELATAN

### 6.3.1 Main Themes of the IDEP

The Bandar Lampung/Lampung Selatan IDEP will focus on several very specific themes to pursue its general objectives set out above. There are six themes:

- 1) Full development of three highly potential sectors. Pursuant to the first role, three sectors will receive priority to develop their potentials to their maximum. The three sectors: industry, tourism and fisheries.
- 2) Better functioning as the Gateway to Sumatra. Also to facilitate the formation of the Java-Sumatra axis, the site will be so organized as to better serve as the

Gateway to Sumatra. With this respect, two sectors are particularly relevant: transportation and urban development.

3) Releasing ever-mounting population pressure. Overcrowdedness has already reached such a level in some parts that they resemble Java! How to release at least part of the population pressure must be one main theme of this IDEP.

4) Bandar Lampung: a city in search for clear vision. This city, in its own right, must be at the core of the development process in various respects (look at themes 1, 2 and 3 above, for instance). The city, however, has so far failed to come up with a long-term vision which is concrete enough to lay down the solid ground for the city's future development. Of immediate concern is the lack of a city-wide land use plan.

5) Water: a critical factor. It will be no exaggeration to say that it depends much on the water whether this IDEP site will prosper or not. We can raise three distinct questions with this respect:

- How to secure water supply?
- How to protect the sea from pollution?
- How to mitigate flooding?

6) Protecting the protected forests. If all the rain forests vanish from the site, consequences will be nightmarish. Different approaches than translok must be explored now in earnest so as not to nullify the past efforts and to avoid a horrible scenario.

### 6.3.2 Strategy

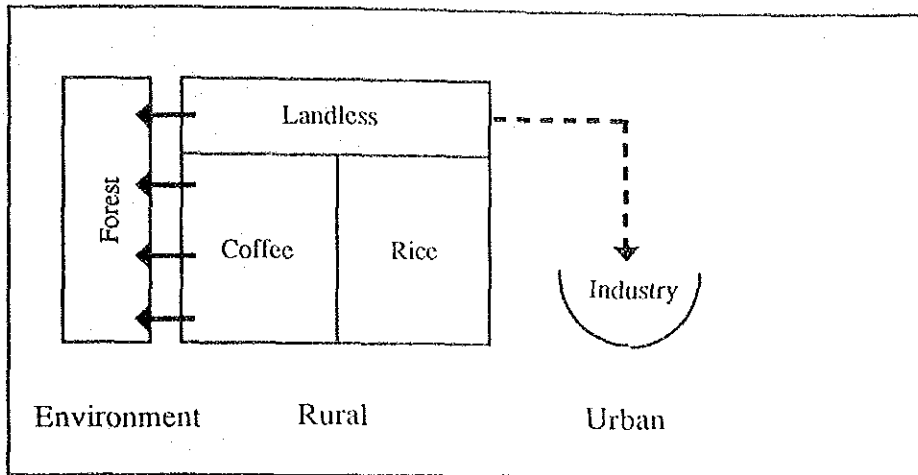
Development strategy for this IDEP is illustrated in Figure 6.3.1, juxtaposing the present and the future. Present conditions are summarized as follows: In rural areas agricultural production centers around two main, traditional crops, rice and coffee, while landless farmers keep increasing. The urban sector, on the other hand, is showing a rapid growth but its ability to provide jobs is still limited due mainly to underdeveloped industry. Population pressure in the rural areas is thus directed toward forests.

Those conditions should be changed in the following way: To begin with, the urban sector has to be consolidated with industry and tourism as leading sectors. Infrastructural development must support this transformation. The full-fledged city can benefit the rural areas in two major ways: first, it can absorb more rural-urban migrants; second, it can provide a bigger market for agricultural produce, possibly nontraditional crops. To assist migrants in acquiring necessary skills, vocational training should be amply provided. On the rural front, it is imperative to diversify agriculture, reducing the dependency on coffee and generating higher value from the limited land. This in turn will remove pressure on the forest.

This strategy strongly advocates the development of the urban/industrial sector. This in fact derives from the long-term prospect of Indonesian national development: Urbanization is not merely inevitable but also necessary and, more important, beneficial. It is almost obvious that rural areas even in Sumatra will eventually become unable to carry their whole population on agriculture alone. It is likely that a massive migration reversal will take place in, say, ten years, with people moving back from the outer islands to Java in absence of large mature provincial cities which can provide better opportunities locally. If Indonesia's national priority should remain the population dispersal from Java, then workable strategy may be to develop large enough cities in the outer islands to attract out-migrants who otherwise may head for Java. In view of this, Bandar Lampung is clearly such a strategic city that must grow into a major urban center on Sumatra.

So far, however, the city's achievements in this respect have been rather limited. Figure 6.3.2 shows population age structures for Indonesia (rural, urban), Jakarta, Lampung, Bandar Lampung and Lampung Selatan. One may easily notice the deficit of 15-29 age groups

Current Conditions



Future Conditions

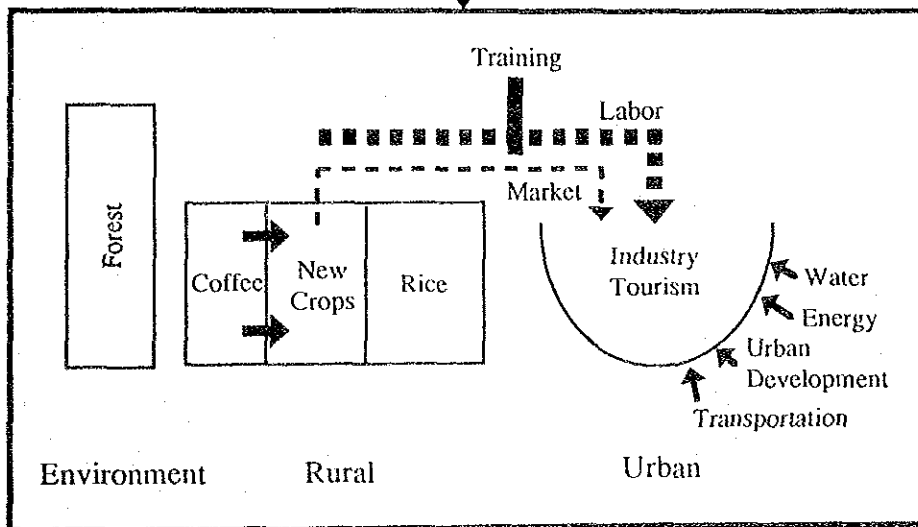
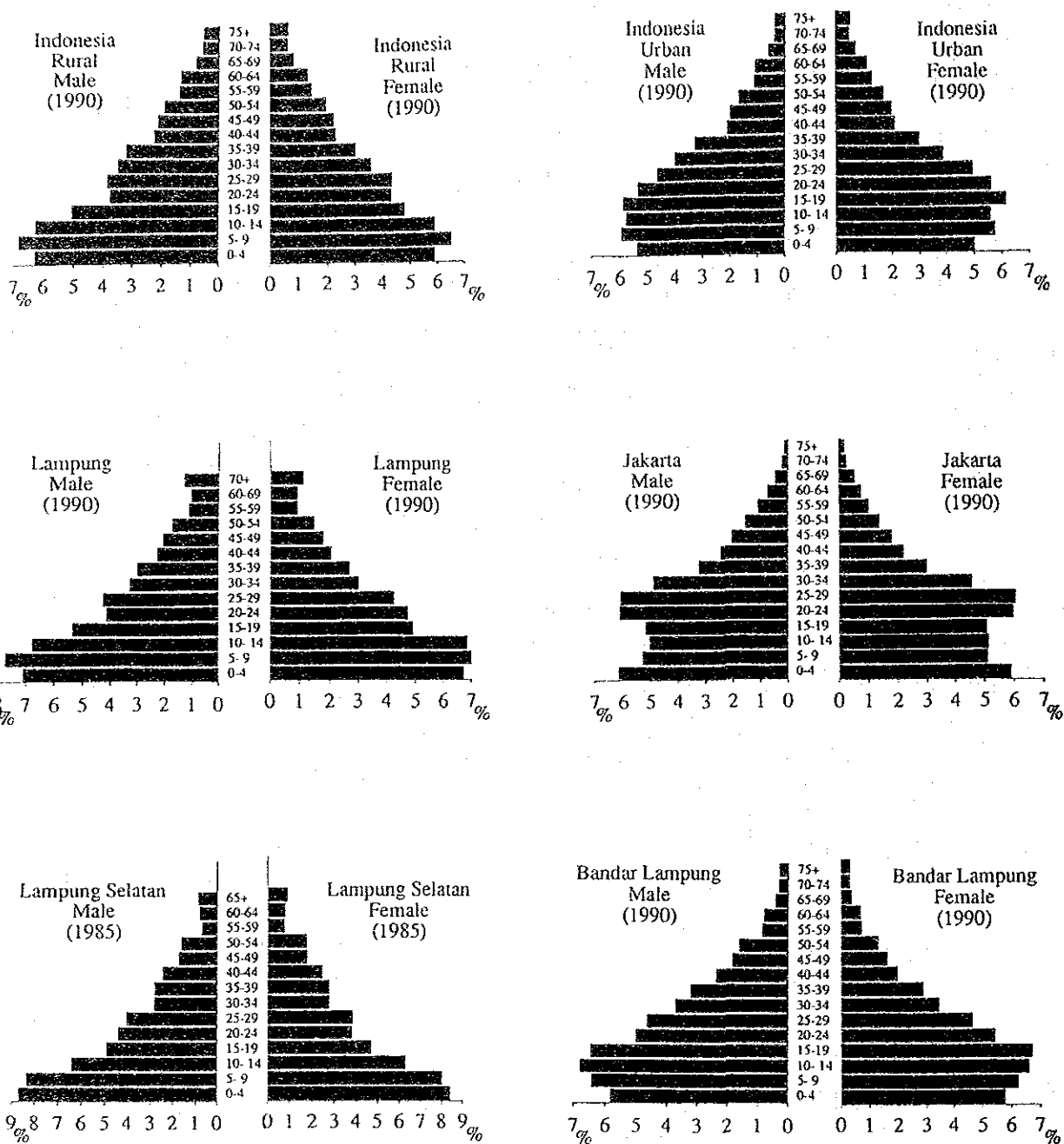


Figure 6.3.1 Development Strategy for the Bandar Lampung/Lampung Selatan IDEP



Sources: BPS, Penduduk Indonesia Tabel Pendahuluan Hasil Sub-Sampel Sensus Penduduk 1990, Table 02  
 Kantor Statistik, Jakarta Dalam Angka 1991, Table 3.1.5.  
 Kantor Statistik, Lampung Dalam Angka 1990/1991, Figure 1.  
 Kantor Statistik, Kotamadya Bandar Lampung Dalam Angka 1990/1991, Table III.1.5.  
 Direktorat Tata Kota dan Tata Daerah, Departemen Pekerjaan Umum, Rancangan Rencana Umum Tata Ruang Kabupaten Daerah Tingkat II Lampung Selatan, Tabel III-5.

Figure 6.3.2 Age Structure of Population

in the rural sector and their surplus in the urban sector. The surplus is highly salient with Jakarta, but Bandar Lampung's structure is not so much skewed as Jakarta's, indicating the city's still limited capacity to offer jobs to the most productive age cohorts.

To summarize its strategy, this IDEP has two major fronts and focal points. One is the urban/industrial sector represented by Bandar Lampung. The other is the forest conservation/agricultural diversification drive to be initiated particularly in the western part.

## **6.4 BANDAR LAMPUNG/LAMPUNG SELATAN IDEP**

### **6.4.1 Identified Subprograms and Their Relations**

As the building blocks of the Bandar Lampung/Lampung Selatan IDEP, nine subprograms are first identified. They are:

- Industry subprogram
- Tourism subprogram
- Fisheries subprogram
- Gateway city subprogram
- Gateway transportation subprogram
- Water subprogram
- Energy subprogram
- Forest conservation/agricultural diversification subprogram
- Institutional support subprogram

The first three subprograms respectively aim to facilitate the development of the three high-potential economic sectors. In each subprogram, one training or education project is included specifically to upgrade the level of manpower and secure the supply of qualified workers.

The two Gateway subprograms are mostly concerned with physical infrastructure necessary to function as the Gateway as well as to support the three economic subprograms above.

The water and energy subprograms deal with the two most essential, lifeline natural resources that are or will be in short supply in the IDEP site. They together support the three economic subprograms on the one hand and, on the other, supplement the two Gateway infrastructural subprograms.

The forest conservation/agricultural diversification subprogram specifically addresses the deforestation problem. Its target location will be confined to the neediest part, that is, the mountains and foothills of the Barisan Range.

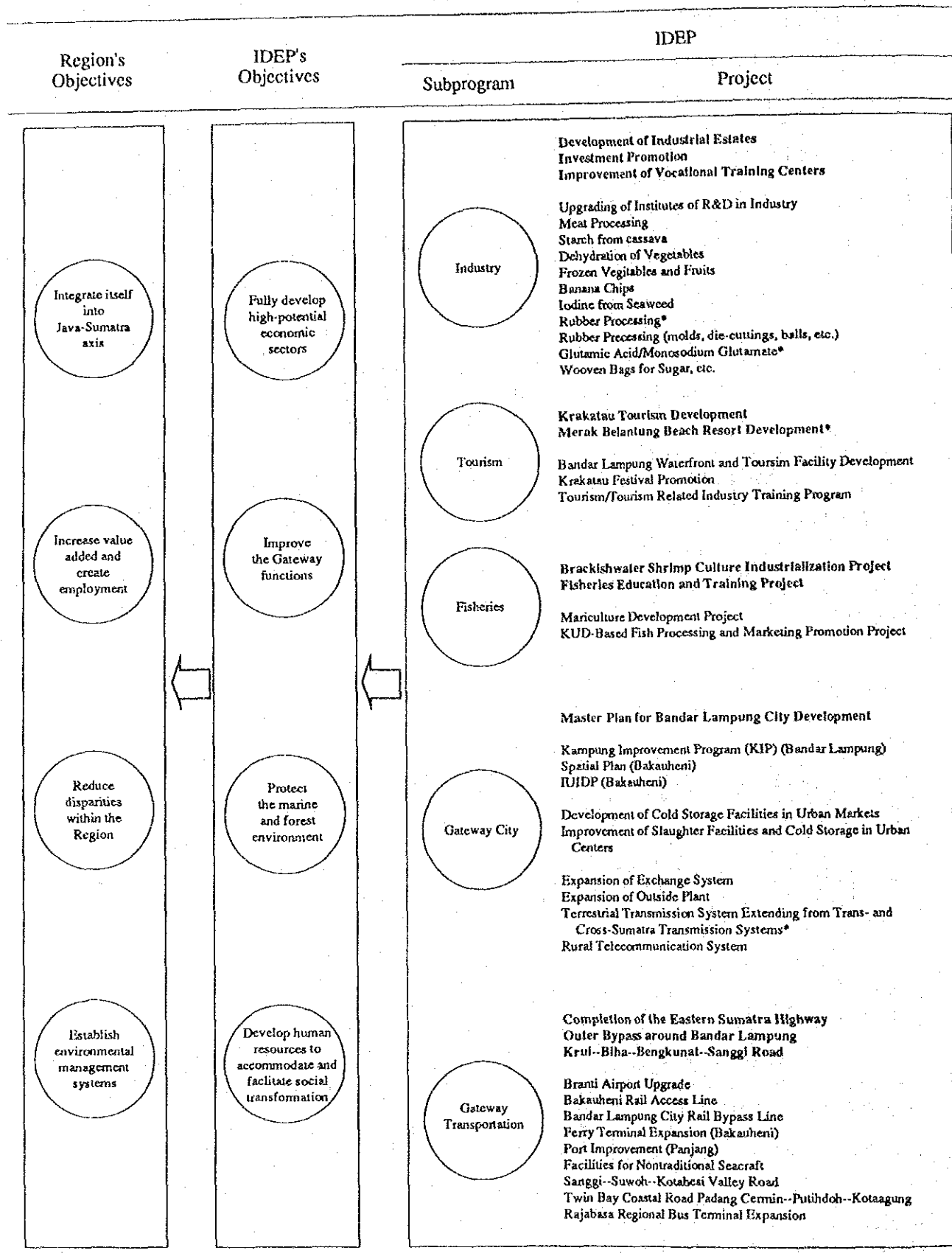
The last subprogram is designed to support the implementation of the whole or part of this IDEP by strengthening the planning and management capability of, above all, provincial BAPPEDA.

Those nine subprograms are listed in Figure 6.4.1 with their respective component projects also shown. In bold characters are key projects, whose descriptions will be given below in Section 6.5.

### **6.4.2 Subprograms and Projects**

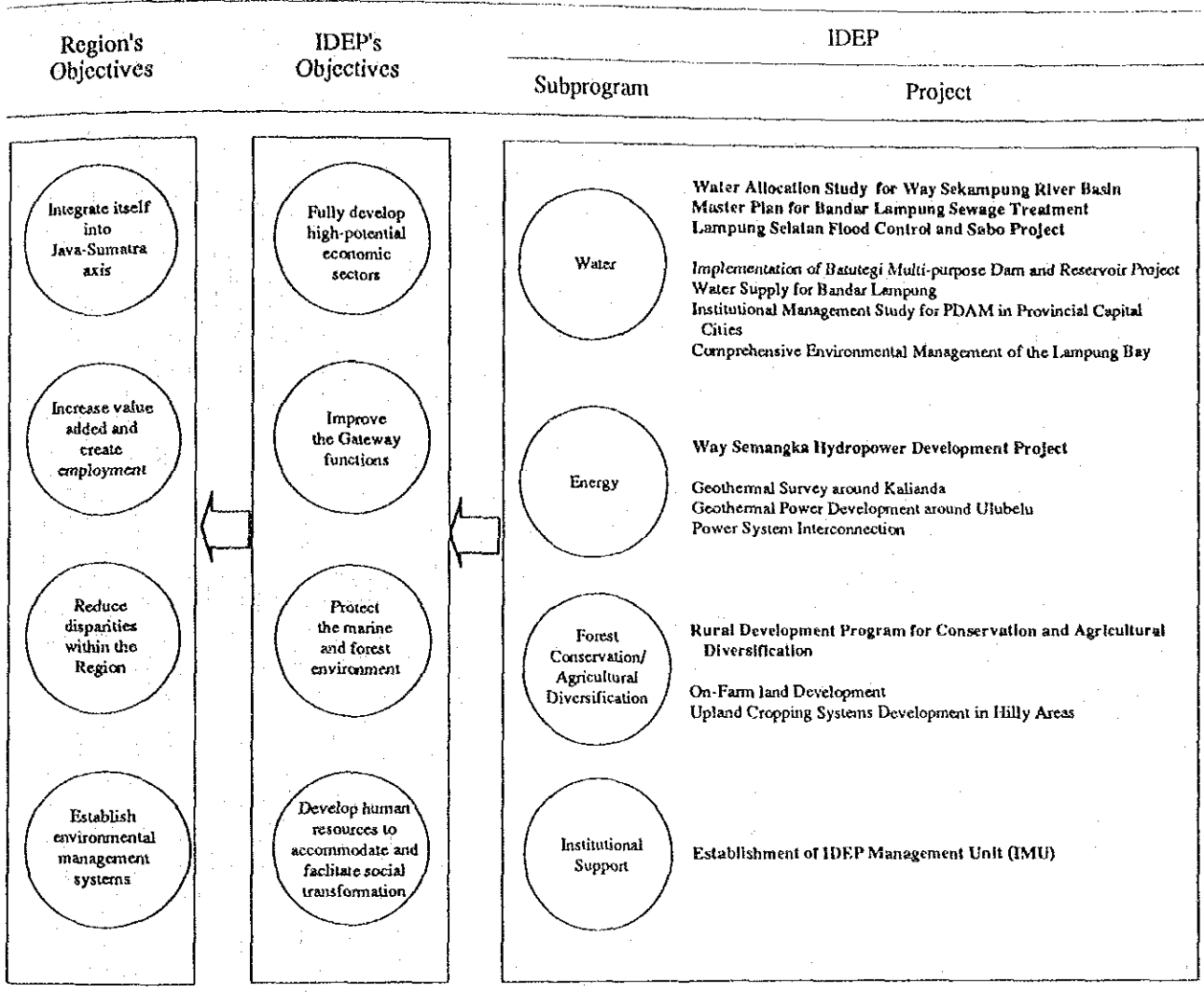
Figure 6.4.2 indicates, project by project, appropriate timing and sequence of implementation and estimated costs (in the US dollar). Figure 6.4.3 shows the concept of the IDEP together with the locations of some major projects.

Figure 6.4.1 Objectives, Subprograms and Projects : Bandar Lampung/Lampung Selatan IDEP



Notes: In bold letters is the key project.  
\* denotes an on-going project.

Figure 6.4.1 (Continued)





Notes: In bold letters is the key project.  
 \* denotes an on-going project.

Figure 6.4.2 Phasing of IDEP Projects: Bandar Lampung/Lampung Selatan IDEP

Sub-program	Project 1)		Phasing 2)											Tentative Cost 3) (US\$ mil)									
	No.	Title	Repelita VI		Repelita VII			Repelita VIII - IX															
			94	95	96	97	98	99	00	01	02	03	04		05	06	07	08	09	10	11	12	13
Industry	C-4	<b>Industrial Estate</b>																					10.0
	C-10	<b>Investment Promotion</b>																					3.0
	C-6	<b>Vocational Training Centers</b>																					3.0
	C-5	<b>Institutes of R&amp;D in Industry</b>																					1.0
	C-#	<b>Various Private Investments</b>																					5.0
Tourism	E-16	<b>Krakatau Tourism Development</b>																					3.7
	E-17	<b>Merak Belantung Beach Resort</b>																					10.0
	E-21	<b>Bandar Lampung Waterfront</b>																					4.2
	E-22	<b>Krakatau Festival Promotion</b>																					0.5
	E-23	<b>Tourism Training Program</b>																					0.3
Fisheries	B-8	<b>Brackishwater Shrimp Culture</b>																					20.4
	B-21,22	<b>Fisheries Education and Training</b>																					5.6
	B-17	<b>Mariculture Development Project</b>																					4.3
	B-6,7	<b>KUD-Based Fish Processing/Marketing</b>																					1.2
Gateway City	I-19	<b>Master Plan for Bandar Lampung</b>																					1.5
	I-22	<b>KIP (Bandar Lampung)</b>																					0.5
	I-23	<b>Spatial Plan (Bakauheni)</b>																					0.5
	I-24	<b>IUIDP (Bakauheni)</b>																					0.8
	A-12	<b>Cold Storage Facilities</b>																					0.2
	A-22	<b>Slaughter Facilities/Cold Storage</b>																					0.3
	H-1	<b>Expansion of Exchange System</b>																					50.0
	H-2	<b>Expansion of Outside Plant</b>																					77.0
	H-5	<b>Terrestrial Transmission System</b>																					200.0
	H-8	<b>Rural Telecommunication System</b>																					7.0
Gateway Transportation	G-38	<b>Eastern Sumatra Highway</b>																					92.0
	G-76	<b>Outer Bypass Bandar Lampung</b>																					7.0
	G-67	<b>Krui-Sanggi Road</b>																					10.0
	G-9	<b>Branti Airport Upgrade</b>																					13.0
	G-13	<b>Bakauheni Rail Access Line</b>																					70.0
	G-14	<b>Bandar Lampung City Rail Bypass Line</b>																					21.0
	G-24	<b>Ferry Terminal Expansion (Bakauheni)</b>																					21.4
	G-36	<b>Port Improvement (Panjang)</b>																					110.0
	G-37	<b>Facilities for Nontraditional Seacraft</b>																					0.3
	G-68	<b>Sanggi-Suwah-Kotabesi Valley Road</b>																					7.0
Water	F-30	<b>Water Allocation Study</b>																					1.1
	F-31	<b>Bandar Lampung Sewage</b>																					2.5
	F-36	<b>Flood Control and Sabo Project</b>																					25.5
	F-32	<b>Bautege Dam/Reservoir</b>																					310.0
	I-20	<b>Water Supply for Bandar Lampung</b>																					3.6
	F-41	<b>Institutional Management PDAM</b>																					0.5
	J-13	<b>Environmental Management</b>																					0.8
Energy	F-37	<b>Way Semangka Hydropower</b>																					511.0
	D-19	<b>Geothermal Survey (Kalianda)</b>																					4.0
	D-20	<b>Geothermal Power (Ulubelu)</b>																					4.0
	D-23	<b>Power System Interconnection</b>																					138.0
Forest Conservation/Agricultural Diversification	I-28	<b>Rural Development Program</b>																					4.0
	A-2	<b>On-Farm Land Development</b>																					3.2
	A-4	<b>Upland Cropping Systems</b>																					1.8
Institutional Support	K-1	<b>IDEP Management Unit (IMU)</b>																				1.8	
		<b>IDEP Total</b>																				<b>1,788.7</b>	

Notes: 1) In bold letters are the key projects.

2)  Pre-implementation study/plan-making

 Implementation

 On-going

3) Some cost estimates only cover study components and do not include construction costs.



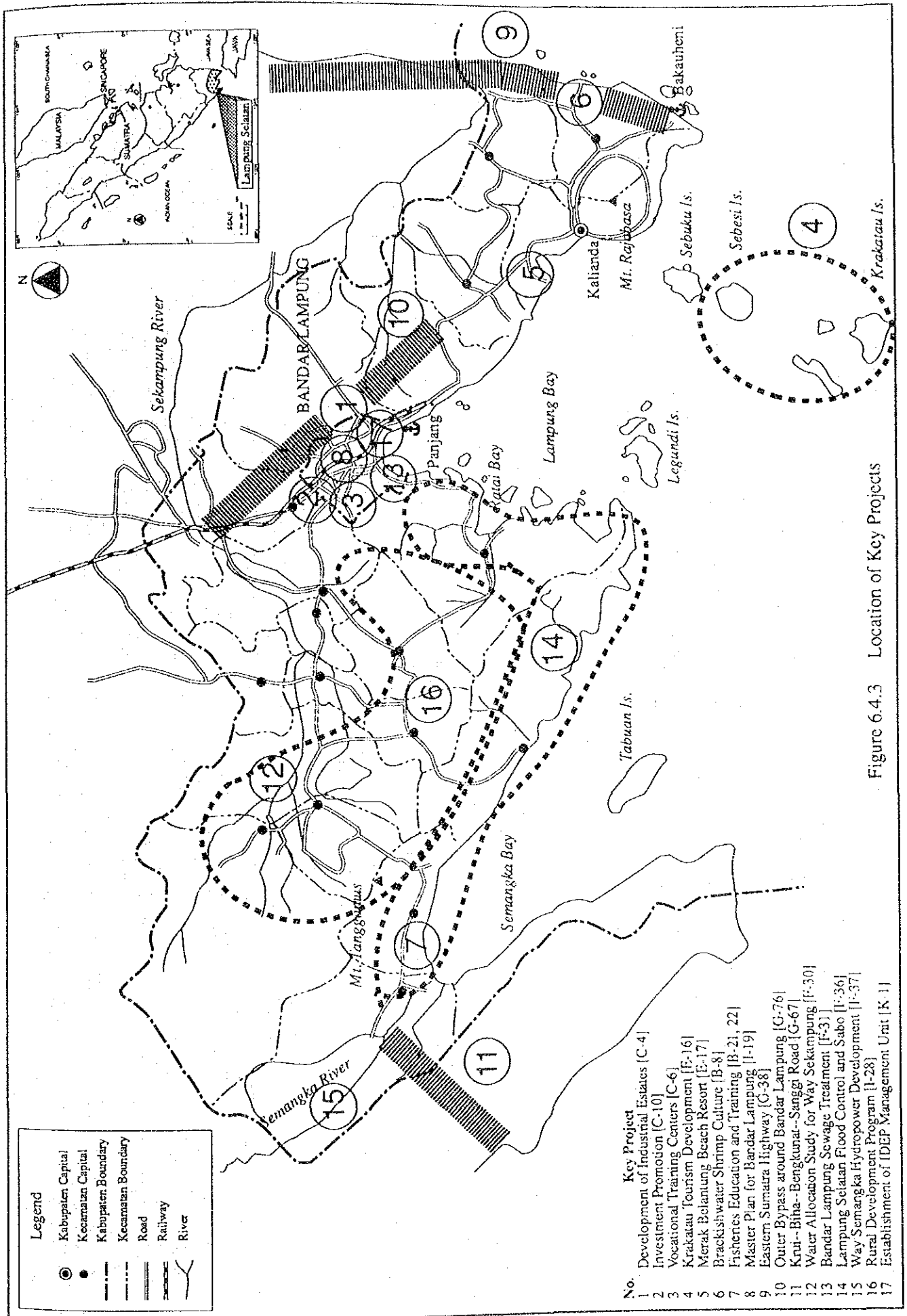


Figure 6.4.3 Location of Key Projects

## **6.5 DESCRIPTIONS OF KEY PROJECTS**

### **6.5.1 Development of Industrial Estates (C-4)**

There already exists one industrial estate in Kecamatan Tanjung Bintang, just outside Bandar Lampung. Out of 300.24 ha of total land area, 102.16 ha has been completed as Stage I. Land for Stages II to IV (35.08, 90.0, 73.0 ha, respectively) is already secured and waits for clearing (currently, a PTP X rubber plantation). What is urgently needed for this estate development is an aggressive promotion among foreign investors. See another key project, Investment Promotion, below.

An idea is already circulating about a second industrial estate north of Bakauheni. Its transportation advantage appears strong, particularly if the eastern trans-Sumatra highway extends northward directly from the ferry port. The plan deserves a serious consideration.

### **6.5.2 Investment Promotion (C-10)**

To accelerate industrial development in general and to boost the Lampung Industrial Estate in particular, a program of foreign investment promotion must be launched soon. Target countries include Singapore, Taiwan, South Korea and Japan, all of which are current importers of raw or semi-processed materials from the Lampung region. Gradually losing their competitive edge because of rising labor cost, many manufacturers in those Asian countries are considering relocation. An aggressive and right promotion among them could prove very effective.

### **6.5.3 Improvement of Vocational Training Centers (C-6)**

In this IDEP site there are two vocational training centers (BLKs): one in Bandar Lampung and the other in Kalianda. In anticipation of a larger local demand for middle-tier management personnel and engineers, those centers need a substantial improvement both on the curriculum and on the facilities/equipment so that it can provide qualified graduates for local enterprises.

### **6.5.4 Krakatau Tourism Development (E-16)**

Krakatau Island should be the flagship attraction in the IDEP site. At present, however, tourists visiting the famous volcano still number in the thousands a year, and most of them come through Javanese access points. To lure more visitors from the Lampungese side, a transit center is planned on nearby Sebesi Island. Infrastructure to support the transit center will also be installed under this project.

### **6.5.5 Merak Belantung Beach Resort Development (E-17)**

A private concern called PT. Lampung Krakatau Tourism Development Corporation is in the final stage of project preparation. (The company was established jointly by the government of Indonesia, PT. Bali Tourism Development Corporation, PT. Bakli Nusantara Corporation and PT. Gliawisata.) According to their plan, a major beach resort will be constructed on a 500 ha plot on the beautiful beach of Merak Belantung northwest of Kalianda. Once completed, this resort is expected to become a major attraction in the south Lampung tourism zone. Construction will begin within 1993.

### **6.5.6 Brackishwater Shrimp Culture Industrialization Project (B-8)**

Out of 3,015 ha of traditional brackishwater ponds (tambak) located in the Lampung east coast, Lampung Selatan accounts for 886 ha. To this the kabupaten can add an estimated 255 ha (net area excluding reserved green belts) if several obstacles are removed. Among them: lack of appropriate canals for water supply and drainage; poor management

skills (pond control); missing coastal buffer zones (mangrove belts); underdeveloped farmers' organization; lack of utility and infrastructure like electricity, roads and ice plants.

Expanding an existing hatchery is another component. A government hatchery in Kalianda is in operation to supply shrimp seeds to tambak farmers in the area, but demand already exceeds its supply capacity. Its expansion is thus necessary from current 8 million/year to 50 million/year.

#### **6.5.7 Fisheries Education and Training Project (B-21, 22)**

This project has two main components: 1) Fisheries Senior High School (SPP Perikanan) and 2) Upgrading of KUD's Management Capability. A fisheries senior high school is proposed in Kotaagung because no similar institutions exist in the southern part of Sumatra. (In the northern part, one DGF fisheries training center is located at Belawan, North Sumatra, and two fisheries senior high schools in Banda Aceh and Padang.) Kotaagung is an ideal location for such a school in view of its closeness to the resource-rich west coast (a road crossing the Barisan Range will be open in a few years), availability of both brackish and fresh water ponds in the vicinity, and easy access to Bandar Lampung. According to a master plan drafted by the provincial government, the school will enroll 720 students (total 3 grades) in three courses: fishing technique, fishing gear and engine, and aquaculture. The facilities will also be used for training extension officers and local fishermen.

The second component intends to upgrade KUD's management capability chiefly through an exchange program sponsored by Japanese cooperatives. Under this program, Indonesian fishermen will receive on-the-job training in Japan on technical as well as managerial aspects of cooperative activities. This program is supplemented with provision of scholarship for fishermen who attend domestic training courses.

#### **6.5.8 Master Plan for Bandar Lampung City Development (I-19)**

An ADB-funded IUIDP program has just entered the implementation stage in Bandar Lampung (as of August 1992). This program covers seven elements of basic urban infrastructure: water supply, solid waste management, human waste disposal, kampung improvement, urban flood protection, urban drainage and urban roads. Improvements on those elements are long awaited and the program's start marks a significant progress. In view of the city's long-term prospects, however, the IUIDP program seems far from sufficient. One crucial aspect which is totally missing from the program is land use planning. Considering the city's expansive dynamism in recent years (housing estates in Way Halim, land reclamation projects in the bay, new factories popping up near the port, just to name a few), some control over land use based on a long-range plan appears an absolute necessity. It is even feared that without such a broad framework, the IUIDP-planned components could quickly become obsolete and inadequate.

With this particular respect, three long-term plans which are officially in effect seem to fall short of giving any concrete guidance. They are:

- 1) Rencana Induk Kota Bandar Lampung 1983-2004
- 2) Penyusunan Strategy Pengembangan Wilayah Metropolitan Bandar Lampung
- 3) Penyusunan Rencana Struktur Tata Ruang Propinsi Lampung

Since the city's development will surely accelerate further, a master plan which is comprehensive and concrete enough (that is, includes a land use plan in particular) is something it cannot dispense with.

#### **6.5.9 Completion of the Eastern Sumatra Highway (G-38)**

A JICA-funded feasibility study is in progress on this new artery (as of August 1992). Though it is still pending which route the highway takes in Lampung, its potential impact on this IDEP site is undoubtedly large.

#### **6.5.10 Outer Bypass around Bandar Lampung (G-76)**

This project proposes a new bypass road which circumvents the busiest sections of the trans-Sumatra highway. It deviates from the highway somewhere near Tegineneng, heads southward on the eastern foothills totally avoiding Bandar Lampung and finally meets the highway again near Tanjungan, Kecamatan Ketibung. It will relieve the traffic congestion expected to develop in the future in the vicinity of the Panjang port.

#### **6.5.11 Krui--Biha--Bengkunat--Sanggi Road (G-67)**

The Barisan Range crossing is the main section of this project. Currently, Sanggi in Kecamatan Wonosobo is the west end of an asphalt road from the capital. Extending the road further to reach the west coast of Kabupaten Lampung Barat will open a number of development opportunities on both sides of the range. Immediate impact will probably be felt most strongly in Kabupaten Bengkulu Selatan. Completed and upgraded, this section will eventually form part of the west trans-Sumatra road, reaching Sibolga, North Sumatra, or further Banda Aceh, the northern end of Sumatra.

#### **6.5.12 Water Allocation Study for Way Sekampung River Basin (F-30)**

A basin-wide study is proposed to answer some crucial questions concerning the long-term prospects of water supply. The Sekampung River is the only water source available in southern Lampung that is large and stable enough to meet the huge demand expected in the future. Currently, irrigation schemes around Metro are the sole major consumer, using up the water at the intake in the dry season. In the long run, however, it is most likely that water supply to Bandar Lampung (both for domestic and industrial uses) will also come to rely on the same river. A crucial question: can the river meet the whole demand? On the other hand, a dam construction project is in progress in the upper reach of the river (Batutegi dam, D/D completed in 1991). According to the plan, the dam is mainly for irrigation purposes and does not consider the possibility of Bandar Lampung water supply. Thus, this study tries to answer the above question while reviewing the dam project.

#### **6.5.13 Master Plan for Bandar Lampung Sewage Treatment System (F-31)**

This project will be a follow-up of the "human waste and waste water disposal" component of IUIDP. Elements to be carried out in the IUIDP component are four:

- promotion of on-site disposal
- extension of public toilets and baths
- septic tank maintenance
- study of off-site disposal

In the last element, low-cost sewerage and sewage treatment systems will be studied and may be undertaken as pilot projects. Following these IUIDP initiatives, the proposed project will further prepare a plan on full-scale systems for sewage treatment.

#### **6.5.14 Lampung Selatan Flood Control and Sabo Project (F-36)**

Many areas in this IDEP site are prone to recurrent flooding, which sometimes claims human casualties. This project focuses on a few kecamatan which are most severely affected by small but steep rivers, often with extremely high levels of sedimentation. Target locations include Kecamatan Wonosobo, Kotaagung, Cukuh Balak, Padang Cermin and Kotamadya Bandar Lampung. Main components will be check dams in the upstream and embankments in the downstream.

### 6.5.15 Way Semangka Hydropower Development (F-37 also D-21)

There are three high potential sites for hydropower stations in the Semangka valley: two along the Semangka main stream and one on the Semung River, a tributary. In order to provide base load electricity to metropolitan Bandar Lampung and densely populated areas around Pringsewu, those power stations (total installed capacity: 217 MW) have a particular advantage of being close to the consumer (about 150 km). Their topographical conditions are also appealing: large flow with unusually steep gradient.

### 6.5.16 Rural Development Program for Conservation and Agricultural Diversification (I-28)

How to conserve the forests on the mountain slopes is indeed a serious question in the western part of this IDEP site. Migratory pressure coupled with declining coffee productivity has been urging the traditional coffee farmers to crawl up the slopes deep into the protected area. The translok program has an impressive record, but its effectiveness and viability are already undermined. This program specifically addresses this problem, attempting a new approach which could replace translok in the long run. Target locations are the following kecamatan: Wonosobo, Kotaagung, Pulau Panggung, Talang Padang, Pagelaran, Pardasuka, Kedondong, Cukuh Balak, Padang Cermin and Gedong Tataan.

The gist of the problem is the highly monocultural and extensive nature of the coffee production there. Raising land productivity either by intensifying coffee production (e.g., rejuvenation with higher yielding varieties) or by introducing higher value crops will release much pressure on the forest land. In fact there already exist a few local initiatives with which innovative schemes in that direction are being carried out. Among them (in parentheses are kecamatan):

- vanilla plantation (Gedong Tataan)
- honey bee farming (Pardasuka)
- demonstration chili farm (Pulau Panggung)

In line with and supporting those local initiatives, this program intends to broaden the economic base of the target areas. Four components make up the program:

- 1) Intensification/diversification
- 2) Local roads improvement
- 3) Community leader training
- 4) Land titling

The first component will introduce various new crops while carefully identifying the most suitable crops kecamatan by kecamatan taking into account soil suitability, local preference, marketing conditions, local leadership, etc. Possible crops: cocoa, durian, melinjo, vanilla, banana, chilli, honey. Along with diversification, replacement of coffee trees with higher yield varieties will be promoted. The second component is the key to a successful diversification drive since good local roads are essential to market the products. The third component aims to train community leaders lending support to the on-going BANGDES programs of KPD (Kader Pembangunan Desa) and UED (Usaha Ekonomi Desa). The land titling component intends to facilitate land registration among the target farmers.

In designing and implementing this program, a close reference should be made to two parallel projects aimed at the same area: Estate Crops Development in Critical Watershed Areas (ADB loan under appraisal as of October 1992); and Upper Way Sekampung Watershed Development Project (planned to start implementation in 1993; whose base study funded by the Netherlands). Both projects share the same concern with this Rural Development Program, but their scope differs from one another. Unnecessary duplications or neglects should be avoided to attain the maximum benefit of combining them.

### 6.5.17 Establishment of IDEP Management Unit (IMU) (K-1)

The executing agency of this whole IDEP will be BAPPEDA Tk.I of Lampung Province. This project aims to support provincial and kabupaten/kotamadya BAPPEDA in implementing this IDEP. Two main components are: IDEP Management Unit (IMU) inside BAPPEDA Tk.I and Tk.II and an expatriate expert attached to provincial IMU.

### 6.6 KEY RELATIONS AMONG THE PROJECTS

In this Program, following relations among the projects are of particular importance:

1) The project which has the widest range of inter-project relations is **Master Plan for Bandar Lampung City Development (I-19)**. Providing the framework for many infrastructural projects, it must precede, among other projects, **Outer Bypass around Bandar Lampung (G-76)**, **Bandar Lampung City Rail Bypass Line (G-14)**, **Master Plan for Bandar Lampung Sewage Treatment System (F-31)**, **Water Supply for Bandar Lampung (I-20)**.

2) **Water Allocation Study for Way Sekampung River Basin (F-30)** is another priority project which must be followed by **Water Supply for Bandar Lampung (I-20)**.

3) **Sanggi - suwuh - Kotabesi Valley Road (G-68)** is rather a small project but this must be completed before the construction stage of **Way Semangka Hydropower Development Project (F-37)** starts to provide the vitally needed road access to the work.

### 6.7 SPECIAL CONSIDERATIONS

Future is a pack of uncertainties. It is then too natural that uncertainties lurk in the IDEP future. Three uncertainties are particularly worrisome.

#### 6.7.1 Land Reclamation Projects in the Lampung Bay

There are two major land reclamation projects going on in the Lampung Bay, as listed in Table 6.7.1 and shown on Figure 6.7.1.

Table 6.7.1 Lampung Bay Land Reclamation Projects

No.	Concessionaire	Year granted	Reclamation area	Purpose	Stage
1	PT. Bina Bumi Segara	1983	225.5 ha	-housing -hotel -amusement/ recreation	-reclamation partly in progress
2.	PT. Sorento	1990	about 90 ha	-housing -commercial/ business -recreation	-under layout planning -reclamation to start soon in two phases

Source: Interviews

It is instantly evident that those projects will have profound impacts on the future course of the city of Bandar Lampung and of this IDEP site as well. Their very location is

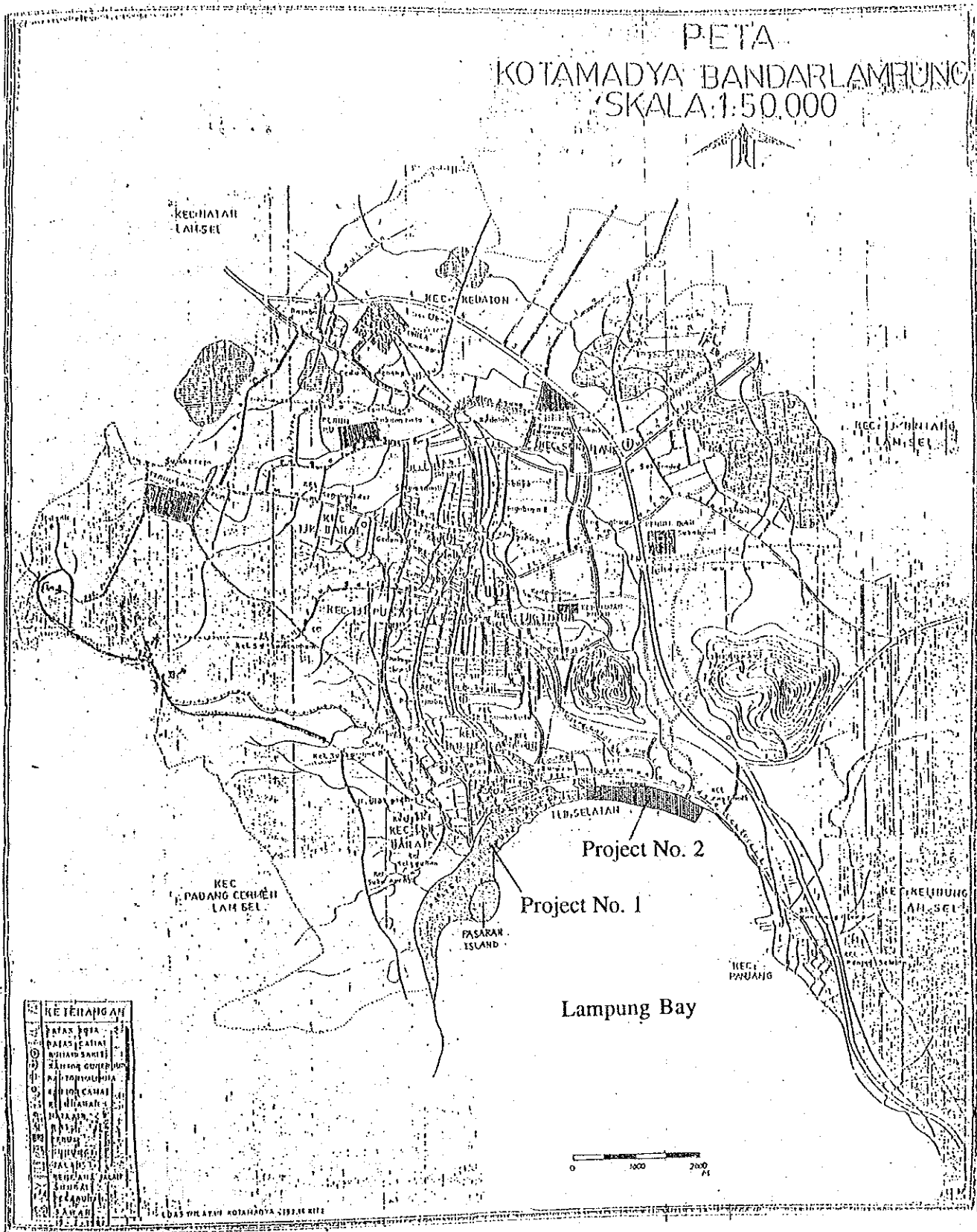


Figure 6.7.1 Land Reclamation Projects

crucial enough to redefine the city's image. (The project sites will be the first to catch the tourist's eyes approaching the city by boat. They will become part of the city's facade.) They can greatly enhance the city's status if the plans are just right, or they can simply ruin it. Three concerns appear legitimate here.

It is rather striking that such projects of this magnitude and significance are under way without much guidance from a long-term plan, both economic and physical. Barring the question of whether those concessions should have been granted in the first place, we can still ask what plan is in the best interest of both the concessionaire and the public. However, it is uncertain whether effective dialogue will be possible between the local governments and the concessionaires. If no or little dialogue takes place, chances are that the projects end up with something unimaginative, never able to ignite a dynamic process of urban transformation.

Another concern is with those people who will be adversely affected by the projects. The first project, in particular, will dislodge a large number of residents on Pasaran Island and in the Kankung area. Also, there are people living on the current shore who will be removed or lose access to the sea. Whether or not they receive fair compensation is not certain, particularly because most of them do not have land titles. The last concern is with the sea environment. If disturbance by land reclamation is kept minimal, it is again not certain how sewage will be treated on the reclaimed lands.

Two recommendations may be appropriate here to make:

- 1) The local governments should monitor the projects more closely, giving guidance when necessary.
- 2) The projects should be reflected at least in the IUIDP program in the absence of any concrete long-term development plan. Or, more sensibly, the local government could put a moratorium on the projects until their long-term citywide effects are assessed and their appropriate uses are spelled out.

As of December 1992, the concessionaire of Project No. 2 has commissioned a consulting firm to prepare a master plan for the reclamation site. The local governments, on the other hand, have issued a rather strict set of guidelines for the undertaking, in part responding to the rising concern. Dialogue among the governments, the concessionaire and the consultants is taking place at least on this project, which is certainly a positive, welcome development.

### **6.7.2 Naval Base in the Ratai Bay**

A major naval base will be constructed on the small bay of Ratai, located on the west side of the Lampung Bay. Reportedly, 8,000 ha of land circling the bay has been secured with some former residents being already evacuated. One particular problem with this plan is that a provincial road passing through the designated base area must be realigned, but no information is available to the province on the base's boundary. Also unknown is the magnitude of navy operation in the Ratai Bay. Interference in civilian traffic is one possibility and sea water pollution is another.

### **6.7.3 Railway System with Unclear Future**

In the Gateway Transportation subprogram proposed above, there are two railway projects, which could have been key projects themselves. What disqualified them is the railway company's financial situation, reported recently as stringent. Though the railway system has regional, or even national, significance, its future is murky. There is no policy consensus on whether or not the coal, the system's largest freight commodity, should be carried by rail in the future. An opportunity for the rail system to reshape the Region's passenger traffic is there (Bakauheni access line), but it may not be up to this challenge, let alone forming a Sumatra-wide system in the very long run.



## Part 2 Prefeasibility Studies



## 1. AGRICULTURE

### 1.1 On-farm Land Development Project

#### (1) Background

Most of the Project area; Kabupaten Lahat (South Sumatra) and Bengkulu Selatan (Bengkulu), are situated in the Bukit Barisan Range as shown in Figure 1.1.1. Because an increase of the degradation of forests by the agricultural activities and their rolling topography as well as the heavy rainfall, the Project area is one of the most important areas for the forest and soil conservation in Indonesia. In spite of governmental continuous efforts to overcome the above issue, no effective counter measures have been taken mainly due to shortage of appropriate techniques and funds. An increase of the existing farm land productivities in the dissected valleys and gently sloping plateaus in the Project area is one of the important approaches to increase the farming activities in the existing arable lands and to reduce the agricultural activities in the forests so as to mitigate the forest degradation and soil erosion.

In the Project area, about 41,000 ha of the lands are already developed into the irrigation command areas by the Ministry of Public Works. Among of which, however, approximately 12,000 ha or 30% of the irrigation areas are currently not yet irrigated mainly due to delay of land and tertiary development, and sometime deterioration of facilities and water shortage. In addition, there are about 31,000 ha of the village irrigation areas in the Project area. The village irrigation systems constructed and managed by farmers themselves, plays an important role in the rural and regional economy. While, more than half of the village irrigation systems are currently poor in condition because of inadequate planning, low quality of construction material, and improper operation and maintenance.

Therefore, the efficient and/or intensive utilization of the the lands requiring to the tertiary and/or on-farm development and rehabilitation in the existing irrigation systems under MPW, and the existing damaged village irrigation systems are expected to the most efficient approach to mitigate the forest degradation and soil erosion in the Project area. This development project, in terms of the "quick yielding and lower cost", also meets the government policies, e.g. self-sufficiency in food crops (mainly rice), the raise of income and living standard of the farmers in rural areas and the poverty alleviation.

#### (2) The Project

##### (a) Present Condition

The location of the Project area is shown in Figure 1.1.1. The Project area comprises two (2) Kabupaten; Lahat in South Sumatra province and Bengkulu Selatan in Bengkulu province, and the most part of the areas are situated in the the Barisan mountain system (Bukit Barisan Range) stretching from Aceh province in the north down to Lampung province in the south in the Sumatra Island. The Bukit Barisan Range is the one of the most important watershed of the Project area and South Sumatra and Bengkulu provinces as well. The primary mountain forests cover most of the watershed areas, but degradation of the forests by agricultural activities has been increased year by year so as to bring out the soil erosion due to their rolling topography as well as the heavy rainfall and to cause the floods in the downstream areas. The general conditions of the Project area are summarized in Table 1.1.1.

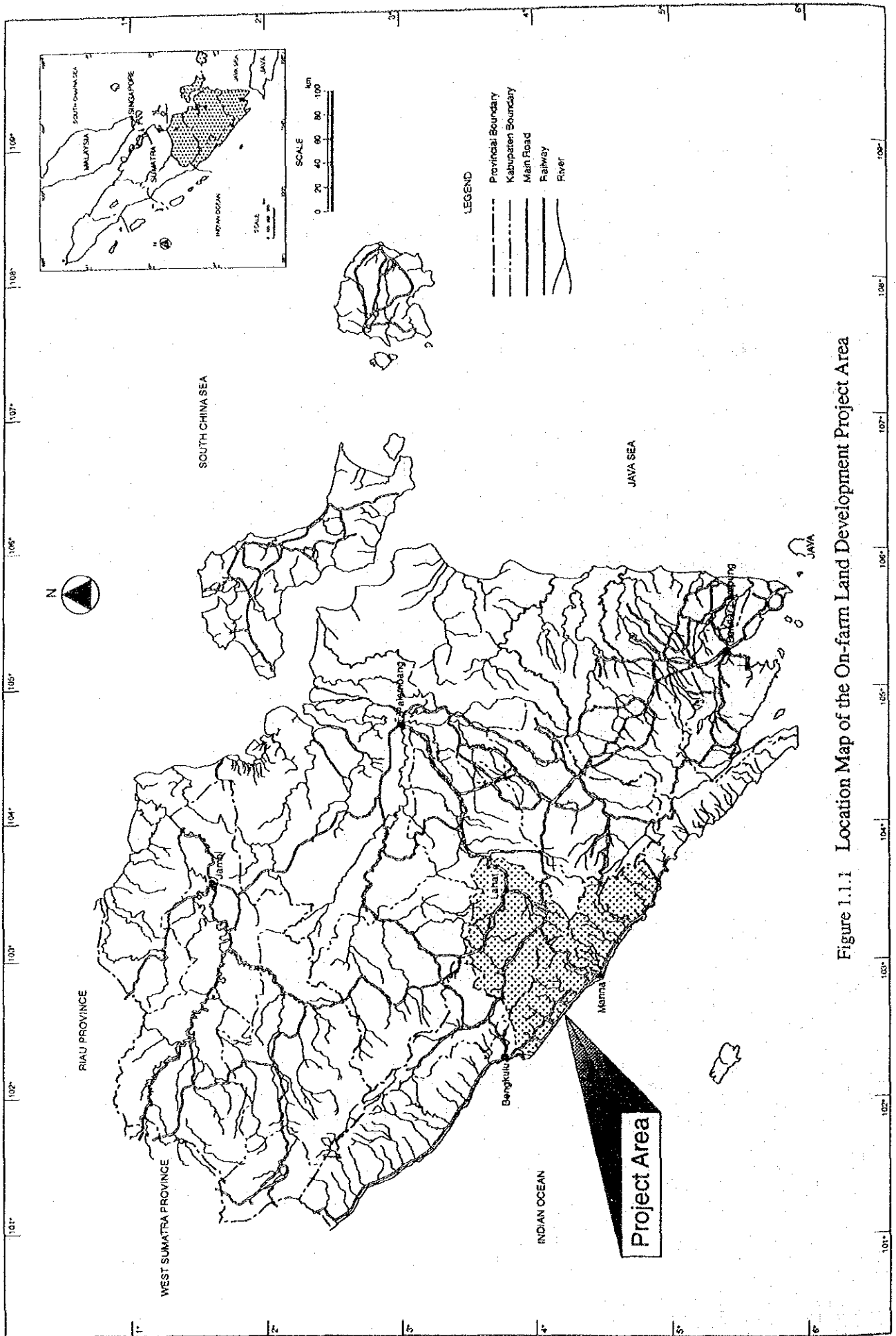


Figure 1.1.1 Location Map of the On-farm Land Development Project Area

Table 1.1.1 General Conditions of the Project Area

Items	Lahat	Bengkulu Selatan	Total/ Average
Capital	Lahat	Manna	-
Land Area (km <sup>2</sup> )	7,252	5,949	13,231
Annual Rainfall (mm)	2,500-3,500	3,000-4,000	-
Duration of Dry Months	4 months	3 months	-
Population ('90)	601,400	299,815	901,215
Population Density (persons/km <sup>2</sup> )	83	50	68
Agricultural Land Area (ha)			
Drylands	225,487	106,551	332,038
Wetlands rice	43,113	29,340	72,453
Total	268,600	135,891	404,491
Average Land Holding Size (ha in 1983)			
Drylands	1.3	0.9	1.1
Wetlands rice	0.4	0.6	0.5
Total	1.7	1.5	1.6
Rice			
Production (dried paddy ton)	165,793	132,083	297,876
Yield (ton/ha)	4.7	4.0	4.3

Source: 1) Kabupaten Dalam Angka 1990.  
2) Agricultural Census 1983, BPS

Among of the total wetlands rice area (about 72,000 ha), about 41,000 ha (15,000 ha in Lahat and 26,000 ha in Bengkulu Selatan) of the lands are already developed into the irrigation command areas by the Ministry of Public Works (MPW) in the Project area. As a rule, the MPW is responsible for implementation of the irrigation projects but MPW constructs up to the tertiary boxes at the secondary canals and the on-farm development within tertiary irrigation block are done by the farmers themselves in general. In this circumstances, on-farm development of some irrigation command areas are delayed. At present, about 12,100 ha (3,900 ha in Lahat and 8,200 ha in Bengkulu Selatan) or 30% of the irrigation command areas are not yet irrigated mainly due to delay of land and tertiary development, and sometime deterioration of facilities and water shortage as shown in Table 1.1.2.

Table 1.1.2 Irrigation Area under MPW

Kabupaten	Technical	Semi-technical	Simple	Total
<b>Lahat</b>				
Developed irrigation area	0 (-)	13,316 (100)	1,233 (100)	14,549 (100)
Actually irrigated area	0 (-)	9,564 (72)	1,073 (87)	10,637 (73)
Area not irrigated				
paddy field*	0 (-)	1,454 (11)	0 (0)	1,454 (10)
non-paddy field**	0 (-)	2,298 (17)	160 (13)	2,458 (17)
others (road, village, etc.)	0 (-)	0 (0)	0 (0)	0 (0)
<b>Bengkulu Selatan</b>				
Developed irrigation area	9,266 (100)	10,560 (100)	6,505 (100)	26,331 (100)
Actually irrigated area	4,043 (44)	8,844 (84)	4,939 (76)	17,826 (68)
Area not irrigated				
paddy field*	201 (2)	593 (5)	743 (11)	1,537 (6)
non-paddy field	4,915 (53)	1,054 (10)	687 (11)	6,656 (25)
others (road, village, etc.)	107 (1)	69 (1)	136 (2)	312 (1)

Note: \*, This may include no land development, deterioration of the tertiary facilities and sometime water shortage.

\*\* This may include no land development.

Source: Summary of Inventory for the Irrigation Area under MPW, DGWRD April 1989.

In addition to the above irrigation areas under MPW, there are about 31,000 ha (23,000 ha in Lahat and 8,000 ha in Bengkulu Selatan) of the village irrigation area in the Project area. The village irrigation systems constructed and managed by farmers themselves, plays an important role in the rural and regional economy. While, more than half of the village irrigation systems are currently poor in condition because of inadequate planning, low quality of construction material, and improper operation and maintenance. The rehabilitation of village irrigation schemes has been implemented by the Ministry of Agriculture and/or the provincial governments but the implementation is not satisfactory mainly due to the funds shortage and inadequate technique.

(b) Objective of the project

The conservation of the degradation of forests mainly caused by agricultural activities in the forests and the soil erosion is one of major issues in the Project area and the nation as a whole. To mitigate the forest degradation and soil erosion, the an increase of the lowlands productivities so as to increase the farming activities in the lowlands areas and to reduce the agricultural activities in the forests is the most efficient approach in the Project area.

While, there are significant lands under both MPW irrigation and village irrigation systems are currently not irrigated due to delay in on-farm development and/or deterioration of irrigation facilities. Therefore, the efficient and/or intensive utilization of the the lands requiring to the tertiary and/or on-farm development and rehabilitation in the existing irrigation systems under MPW, and the existing damaged village irrigation systems are proposed to the Project area. The main objectives of the Project is:

- 1) to develop on-farm facilities of the area requiring on-farm development in the existing MPW irrigation command area,
- 2) to rehabilitate or up grade the damaged village irrigation systems,
- 3) to maximize the land resources potential benefits,
- 4) to achieve the sustainable self-sufficiency in food crops,
- 5) to contribute the conservation of forest degradation and soil erosion in the mountainous areas,
- 6) to create new employment opportunities, and
- 4) to contribute the poverty alleviation in rural areas.

The Project area are tentatively estimated on the basis of the following assumption for this Pre-feasibility study and is subject to modification through further study.

- 1) The project areas for the land development is 1,200 ha equivalent to 10% of the lands requiring the land development in the existing MPW irrigation command areas , and
- 2) The project areas for the village irrigation system development is 15,000 ha equivalent to 50% of the village irrigation systems.

(c) Project Components

The expected project components, the development of physical infrastructures and the coordinating and management of the project, are as follows:

- 1) Land Development: The completion of the land development works of the areas requiring on-farm development in the existing MPW irrigation systems. This land development works also include the rehabilitation and improvement of existing facilities in tertiary systems.
- 2) Village Irrigation Development: The rehabilitation and/or upgrading of the damaged village irrigation facilities so as to expand the irrigation area and to supply the stable water to the systems.

- 3) Institutional Strengthening: The institutional strengthening component include training of the agricultural extension staff and farmers, providing of necessary facilities and equipment for training, and supporting of farmers' organization establishment and strengthening.
- 4) Strengthen of Coordination and Monitoring: This component includes the supporting of coordinating and monitoring activities of BAPPEDA (agency for coordinating and monitoring of the Project works at province and district level) by the training of staff and providing of necessary facilities and equipment.

(d) Executing Agency

For smooth implementation of the Project, two (2) types of agencies, i.e. the project coordinating agency and executive agency, are expected to indispensable both at national and provincial levels.

1) At National Level

- a) Project Coordinating: A steering committee consists of BAPPENAS, Ministry of Agriculture, Ministry of Public Works and Ministry of Home Affairs and other agencies concerned if necessary, and is responsible to inter-government coordinating and monitoring of the project implementation. Under the steering committee, the DGFCFA and DGWRD establish its respective project unit for coordinating and monitoring technical and practical issues of the Project.
- b) Project Management: The Directorate General of Food Crops Agricultural (DGFCFA) in Ministry of Agriculture is only the agency to execute the land development and village irrigation projects and has a direct responsibility for the On-farm Development Project and implements the project works in coordinating with the Directorate General of Water Resources Development (DGWRD) in Ministry of Public Works and the agencies concerned.

2) At Provincial Level

- a) Project Implementation: The provincial level coordinating agency is also indispensable for the Project implementation. The coordinating agency consists BAPPEDA and BANDES and is responsible to inter-provincial coordinating and monitoring of the Project implementation. The actual executing agencies for the project implementation are the Provincial Agricultural Service (PRAS) and the Provincial Irrigation Service (PRIS). The PRAS and PRIS establish its respective project management unit for implementation of the Project.
- b) Project Operation and Maintenance: The farmer's group is responsible for the operation and maintenance (O&M) of the irrigation system. The O&M of the irrigation system have to carry out by the irrigation fees and labor services from farmers.

(3) Project Evaluation

For economic evaluation, the preliminary economic project costs and annual benefits are estimated by using the average unit values as shown in Table 1.1.3. Thus the economic project costs and benefits are tentatively estimated at about Rp. 20.7 billion (US\$ 10.3 million) and Rp. 5.6 billion/year (US\$ 2.5 million/year), respectively.

Table 1.1.3 Unit Economic Project Costs and Benefits

Item	Area (ha)	Costs (1,000 Rp.)*		Benefits (1,000 Rp.)	
		Total	per Ha	Total	per Ha
Land Development					
North Sumatra	262	273,108	1,042	99,743	381
South Sulawesi	101	81,487	807	14,565	144
West Nusa Tenggara	227	485,417	1,752	157,523	569
Total/Average	590	840,012	1,424	271,831	461
Village Irrigation					
North Sumatra	731	865,482	1,184	201,378	275
South Sulawesi	1,506	1,955,796	1,852	575,858	545
West Nusa Tenggara	586	747,739	1,276	169,152	289
Total/Average	2,823	3,569,017	1,264	946,388	335

Note: \*; The operation and maintenance, and replacement costs are converted into initial cost.

Source: Draft Final Report (Table 5-7-1), Feasibility Study for Land Development Project Improvement of Land and Irrigation System at Farm Level, JICA, August 1992.

A number of basic assumptions have been made in carrying out the economic evaluation as follows:

- 1) The economic life of the project is 50 years.
- 2) The exchange rate is US\$ 1.00 = Rp. 2,000
- 3) The project costs and benefits flow is as follows:

Year	Cost	Benefit*
1st	70%	50%
2nd	30%	75%
3rd	-	100%

Note: \*; Shorter build up period due to rehabilitation.

A preliminary economic evaluation is made through calculation of the economic internal rate of return (EIRR). The EIRR is calculated on the basis of the economic costs and benefits flows estimated by the above assumptions shown in Table 1.1.4. The EIRR thus calculated as 20.7 % and these results confirm that the Project is economically feasible.

The financial project costs for land development, village irrigation development, institutional strengthening and strengthen of coordinating and monitoring is tentatively estimated at about Rp. 25.9 billion equivalent to US\$ 12.9 million.



Table I.1.4 Economic Costs and Benefits Flow

BIRR = 20.71 %  
 NPV at 10 % discount rate = 24,300 Rp. million  
 B/C at 10 % discount rate = 2.33

(Unit: Rp. million)

Year	Costs			Benefits			Increment
	Land Development	Village Irrigation	Total	Land Development	Village Irrigation	Total	
1	1,196.2	13,272.0	14,468.2	0.0	0.0	0.0	-14,468.2
2	512.6	5,688.0	6,200.6	0.0	0.0	0.0	-6,200.6
3	0.0	0.0	0.0	276.6	2,512.5	2,789.1	2,789.1
4	0.0	0.0	0.0	414.9	3,768.8	4,183.7	4,183.7
5	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
6	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
7	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
8	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
9	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
10	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
11	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
12	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
13	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
14	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
15	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
16	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
17	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
18	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
19	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
20	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
21	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
22	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
23	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
24	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
25	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
26	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
27	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
28	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
29	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
30	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
31	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
32	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
33	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
34	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
35	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
36	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
37	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
38	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
39	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
40	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
41	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
42	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
43	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
44	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
45	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
46	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
47	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
48	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
49	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2
50	0.0	0.0	0.0	553.2	5,025.0	5,578.2	5,578.2

In addition to the project direct benefits derived from incremental agricultural production, the following indirect and intangible benefits would be expected from the project implementation. These may also be important factors in deciding whether to undertake a project.

1) Indirect Benefit

- a) effect of an increased demand in the construction sector through the Project investments (backward linkage),
- b) effect of an increased agricultural production to be generated by the Project (forward linkage), and
- c) creation of new employment opportunities in the agricultural sector and its related works.

2) Intangible Benefit

- a) contribution of soil conservation in the mountainous area through the effective and intensive land use,
- b) contribution of poverty alleviation through raising income and betterment of transportation etc.,
- c) improvement of institutional building opportunities provided by the Project, and
- d) improvement of farm production quality due to a stable water supply and a proper farm management.

No significant environmental impacts are expected with the implementation of the Project because this project is rehabilitation or land development of the existing irrigation areas and the development areas in each irrigation system is small enough. However, the preliminary environmental study will require prior to the project implementation.

(4) Major Preconditions and Recommendations

Implementation of the On-farm Land Development Project can be preliminary justified from the view points of economic feasibility, social impacts and environmental effects by this Pre-feasibility Study. Therefore, the early implementation of the On-farm Land Development Project is recommended.

However, it is proposed that the feasibility study (12 months) would be made to identify the actual situation and problems of on-farm irrigation areas consisting of those area undeveloped in the existing irrigation schemes and existing village irrigation areas in the Project area, and then to make appropriate recommendation for the improvement and rehabilitation of these on-farm irrigation areas prior to the project implementation. The major work items of the feasibility study are:

- 1) Collection and arrangement of data and information,
- 2) Formulation of questionnaire for inventory survey,
- 3) Execution of the inventory survey,
- 4) Arrangement and analysis of the inventory survey data,
- 5) Field checking survey (checking of the inventory survey),
- 6) Study on the basic concepts for improvement of land and irrigation systems at farm level,
- 7) Study on selection criteria of model areas for the feasibility study,
- 8) Selection and grouping of the objective areas for the feasibility study
- 9) Selection of the model area
- 10) Formulation of basic concepts for improvement of land and irrigation systems at farm level
- 11) Topographical survey, soil test and contract and control of land use survey,
- 12) Detailed survey of the model areas,

- 13) Formulation of guide-line for priority,
- 14) Formulation of development plan on the improvement of land and irrigation systems for the representative schemes, and
- 15) Formulation of project implementation (Selection of project schemes, Estimation of project cost and benefit, Project evaluation and Recommendation for the project implementation).

## 1.2 High Altitude Horticulture Development

### (1) Background

Kabupaten Lahat (the Project Area) has an area of about 7,250 km<sup>2</sup>, lying between 103°00' E and 103°70' E in longitude and between 3°50' S and 4°25' S in latitude as shown in Figure 1.2.1. Roughly the south-western half of Kabupaten Lahat (the Pasemah Highlands and the Lintang Valley) along the border to Bengkulu Province are part of the Barisan mountain system stretching from Aceh in the north down to Lampung in the south. The Barisan Range is the main watershed of the Musi River system in South Sumatra Province. The primary mountain forests cover most of the Mountain Zone, except in the narrow central bands of valleys and gently sloping plateaus stretching from Kota Agung to Pendopo.

Among the valleys and plateaus above 900 m in altitude formed in the Barisan Range of Sumatra Island, some areas have evolved to produce mid-latitude vegetables such as Irish potato and cabbage. The Karo Highlands in North Sumatra, parts of the Minangkabau Highlands in West Sumatra and the Rejang Highlands of Bengkulu are such examples. The Pasemah Highlands (Kecamatan Jarai and Pagaram) of Kabupaten Lahat is also known for such vegetable production.

The Project Area is known for the traditional importance of coffee growing, especially in the Pasemah Highlands. In view of the declining prices of coffee due to the international over-supply, and moreover, the increasing needs of conserving the forest cover in the mountains to protect the vast Musi River basin, highland vegetable cultivation appears to offer a promising cash cropping alternative to coffee.

Although the Project area is close to Palembang, the capital of the province and the largest market of vegetables in the Southern Sumatra Region, its vegetable production is yet limited both in the kind and the quantity of vegetables grown, as shown in Table 1.2.1. According to the information obtained from some traders in Palembang, the supply of vegetables to the city depends more on outside sources like Bengkulu, West Sumatra and West Java than on the Project Area (Pasemah Highlands).

Table 1.2.1 Production of Vegetables in Lahat (1990)

Crops	Area (ha)	Production (ton)
Tomato	1,232	1,232
Green Beans	354	317
Mustard Greens	138	1,453
Green Onion	142	1,211
Cabbage	81	910
Radish (lobak)	33	470
Carrot	22	328
Irish Potato	22	95
Others	87	121
Total	2,111	6,137

Source: Dinas Pertanian Tanaman Pangan

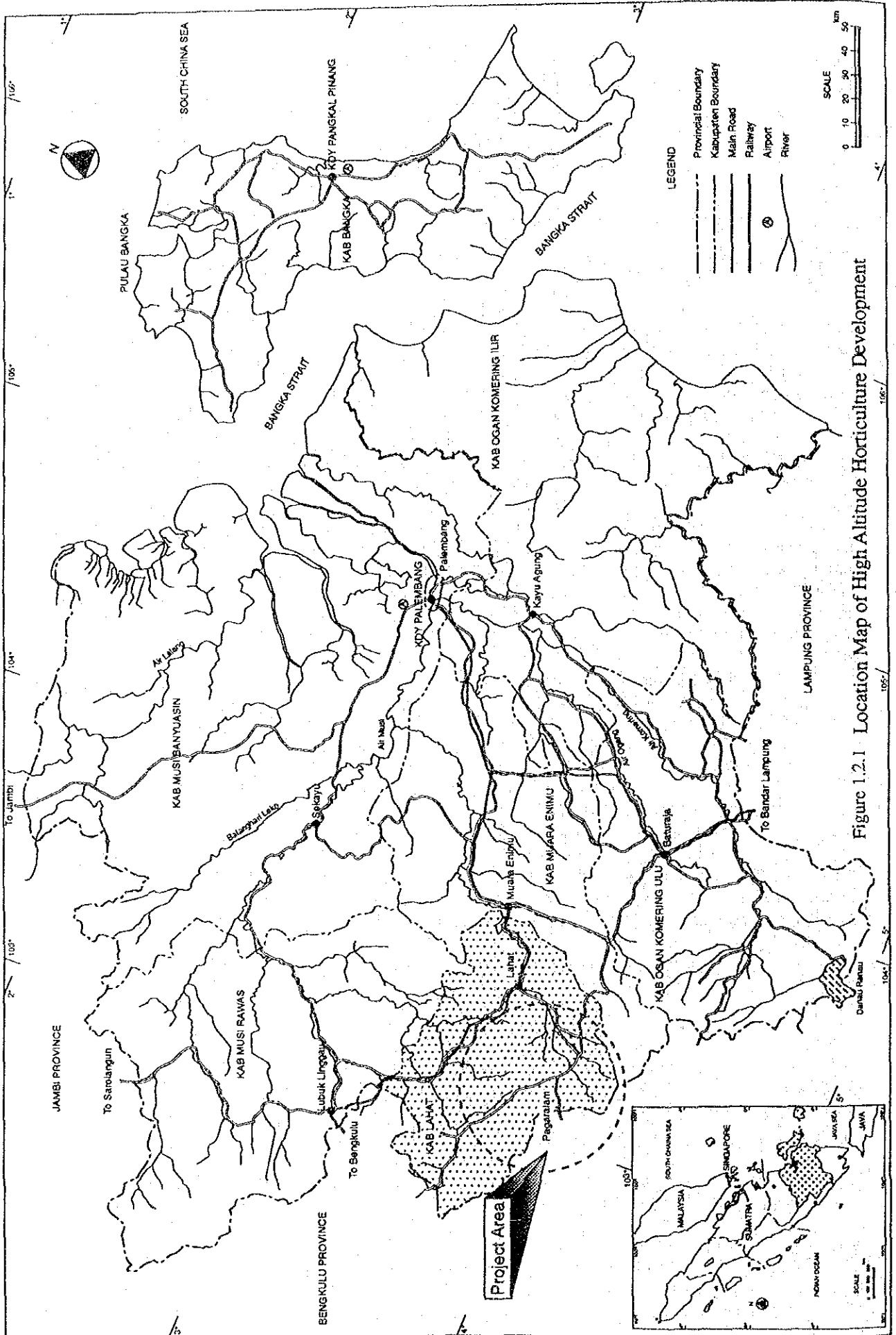


Figure 1.2.1 Location Map of High Altitude Horticulture Development

From the view point of the natural conditions (climate and soils) and the closeness to the major vegetable consuming urban market of Palembang, the Project Area has a substantial potential to expand its vegetable production. The expansion of vegetable production is expected to contribute to (i) creation of new income generating opportunities in the agricultural sector and its related activities (trade and agro-industries), (ii) control of forest degradation and soil erosion in the mountainous area through more effective and intensive land use in the high potential area, (iii) improvement of farm management and quality control, and (vi) supportive institutional development.

## (2) Constraints

Vegetable farming practices in the Project Area are largely traditional, characterized by low yields, indifferent quality and low price. As a result, the vegetable cultivation remains a subsidiary source of income to the majority of local farmers. The major constraints of the vegetable production in the Project Area can be summarized as follows.

- 1) Inadequate Extension Services: Because of the traditional importance of coffee growing, extension services on horticultural crops in the Project Area have been relatively limited. The land area identified by the RePPPOT Study as suitable for high-land arable crops is mainly located in seven Kecamatans of Jarai, Pagaralam, Tanjung Sakti, Pulau Pinang, Muara Pinang, Pendopo and Ulu Musi. In those Kecamatans, there are seven BPPs (extension centers), one for each Kecamatan, with four specialized in food crops, two in fishery and one in estate crops. In addition, the Provincial Horticulture Seed Farm is located in Jarai. However, these establishments generally fall short of giving effective technical advice and information on improved farming practices, partly hampered by the shortage of funds.
- 2) Difficult Access to Credit Facilities: In order to produce for competitive urban markets, it is indispensable to ensure good quality of vegetables. This requires the use of better seeds, fertilizers and agricultural chemicals and the adoption of improved farming practices. Given the limited financial resources of local farmers to purchase these inputs, the virtual absence of formal credit for vegetable production is a serious constraint to increase the vegetable supply for the urban markets.
- 3) Absence of Post-harvest Facilities: The facilities for cleaning, sorting, packaging and storage are vital to ensure the quality of vegetables, and to alleviate to some extent the risks inherent in the high perishability and volatile price fluctuations of vegetables. The absence of such facilities is a major constraint to the further expansion of vegetable production.
- 4) Inadequate Marketing System and Information: The vegetable growers in the Project Area apparently have only limited knowledge of the demands in urban markets, or limited access to the market information. As a consequence, they generally lack the bargaining power in selling their produce to traders. In addition to improving the vegetable farming practices, it is indispensable to provide farmers with the information on prices and urban demands and thereby to enable them to effectively select the kinds of vegetables and the timing of cultivation.

## (3) The Project

### (a) Project components

The project components of the High Altitude Horticulture Development are expected (i) to support the existing horticulture farmers by extension and credits to improve their income

generating capability, and (ii) to establish effective and stable marketing system to promote a new possibility of vegetables supply to the urban markets. Details of each component are as follows:

- 1) Strengthening of Agricultural Support Services: Insufficient agricultural support services are one of the major constraints for the horticultural development in the Project area. To cope with this, the following strengthening plan for agricultural support services are proposed:
  - a) to improve the existing horticultural seed farm in Jarai for provision and distribution of improved varieties seeds to the seed growers and farmers,
  - b) to train the extension staff,
  - c) to establish the demonstration plots for extension and training of the proper and new techniques to the farmers and farmers' groups,
  - d) to support the development of the cropping systems to ensure long-term sustainability,
  - e) to establish rural credit for vegetables production, and
  - f) to support the establishment of farmers' group for smooth provision and distribution of seeds or planting materials and production inputs, and easy access to the credits.
  
- 2) Establishment of Stable Marketing System: The effective and stable marketing system is a key function of vegetables production but currently not well established. The plan for establishment of marketing system includes:
  - a) to assess agro-economic information to obtain a better understanding of production system and marketing mechanism of vegetables,
  - b) to identify the target markets, both domestic and international,
  - c) to select the appropriate crops based on identified target markets,
  - d) to analyze the post-harvest technology aspects with emphasis on handling, preservation and storage of vegetables,
  - e) to improve the facilities for post-harvest handling and marketing such as collection, cleaning, selection (size/quality), packaging, processing and storage facilities,
  - f) to improve local transportation networks,
  - g) to establish effective and stable marketing system by supporting cooperative joint action between traders and farmers' groups, and
  - h) to promote the local agro-industry development which would increase the value added of vegetables in general, and substandard vegetables in particular, for domestic and export markets.

(b) Executing agency

The Directorate General of Food Crops Agriculture (DGFC) in cooperation with Agency for Agricultural Research and Development, Ministry of Agriculture has a direct responsibility for the High Altitude Horticulture Development and implements the project works in coordinating with the other agencies concerned.

(4) Project Evaluation

The financial project costs for the strengthening of agricultural support services and establishment of stable marketing system are tentatively estimated at Rp. 16.0 billion (US\$ 8.0 million) in 5-year implementation.

To implement the Project, the significant direct project benefits from the expansion of production area and increase of vegetable production will be expected. Besides,

the project will contribute:

- 1) to create new income generating opportunities in the agricultural sector as well as its related activities, i.e. trade, transportation, agro-industries, etc.,
- 2) to control the forest degradation and soil erosion in the mountainous area through more effective and intensive land use in the high potential area,
- 3) to improve the quality of products by proper farm management and quality control, and
- 4) to support the institutional development through project implementation.

It is considered that the High Altitude Horticulture Development seems to be feasible in National and Regional economic point of view. The project is also socially and environmentally sound.

#### (5) Major Precondition and Recommendation

Prior to the implementation of the High Altitude Horticulture Development, execution of a feasibility study (1 year period with estimated cost of Rp. 3.2 billion or US\$ 1.6 million) will be proposed:

- 1) to collect and arrange the data and information,
- 2) to execute the field investigation,
- 3) to identify constraints to horticulture development,
- 4) to identify the target markets, both domestic and international,
- 5) to select the appropriate crops based on identified target markets,
- 6) to formulate the appropriate cropping systems to ensure long-term sustainability,
- 7) to propose an effective framework of agricultural support services,
- 8) to analyze the post-harvest technology requirements for better quality control, with emphasis on handling and storage of vegetables relative to the identified markets,
- 9) to select appropriate post-harvest facilities, and
- 10) to evaluate project feasibility.

## APPENDIX 1.1

### 1.1.1 Introduction: Distribution and Marketing - Systems and Problems

This appendix intends to support a specific project, "High Altitude Horticulture Development" (Code Number A-3), proposed in IDEP Musi Rawas/Lahat. Therefore, the survey has focused on distribution and marketing of horticulture, especially vegetables in South Sumatra province. In general, distribution and marketing play an important role in economic activities, because they connect producer with consumer. Even though farmers expand their production without considering distribution and marketing, it may be difficult to sell the commodities at a reasonable price. In this sense, it is necessary to take into account distribution and marketing aspects as well as production aspects that are well explained in IDEP Musi Rawas/Lahat, in order to positively promote the "High Altitude Horticulture Development" project.

In the following parts, 1.1.2 and 1.1.3 describe the flow of vegetables to Palembang and the distribution and marketing structure in the case of Pagaralam. Then, 1.1.4 examines price of vegetables. 1.1.5 deals with issues and problems drawn from the current condition and situation in the previous sections. Finally, some countermeasures on how to improve and strengthen the system of vegetable distribution and marketing are recommended. Due to the lack of consistent statistical data/materials, the description in this appendix is mainly based on the very limited information obtained from farmers, traders, retailers and staff of Kanwil/Dinas Pertanian (Agriculture) during the field survey.

### 1.1.2 Flow of Vegetables to Palembang

In the southern part of Sumatra, Palembang as the main urban center provides the biggest vegetable market. Figure A1.1.1, which is based on information given by a vegetable trader in Palembang, shows the flow of vegetables to Palembang. According to Figure A1.1.1, various vegetables amounting to some 60 to 70 tons per day, of which 24 tons, 12 tons, 24 tons and 6 tons are from Padang (including Bukit Tinggi) in West Sumatra, Curup in Bengkulu, Pagaralam in South Sumatra and Jakarta (mainly West Java), respectively, come to Palembang.

The major commodities flown to Palembang are cabbage, Irish potato, Chinese cabbage, leaf onion, green beans, carrot and eggplant. West Java, which is famous as a vegetable producing center in Indonesia, supplies high quality or rare vegetables that are not produced in Sumatra such as large, well-shaped tomatoes, baby corn, etc., while Padang, Curup and Pagaralam provide ordinary commodities.

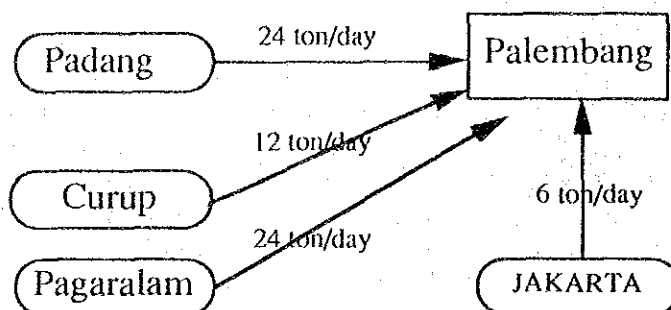


Figure A1.1.1 Flow of Vegetables to Palembang



### 1.1.3 Distribution and Marketing Structure: Case of Pagaralam

#### (1) Pagaralam

Pagaralam, located in Kabupaten Lahat of South Sumatra province, is one of the biggest vegetable producing areas in the southern part of Sumatra. Figure A1.1.2, which is based on information given by Dinas Pertanian (Agriculture) in South Sumatra province, shows the distribution and marketing structure for Pagaralam. Farmers in Pagaralam produce and sell vegetables with a volume of approximately 60 tons per day. There are four local agents dealing with vegetables, of which one is ethnically Chinese. They purchase vegetables directly from farmers and send most of them to big agents in Palembang. Each of the four agents in Pagaralam has three or four trucks, and some of them have non-cold storages. The agents, however, have not handled cleaning; selection according to size and quality; and processing of vegetables. In addition to the agents, many local middlemen, who are small scale traders dealing with vegetables, also buy commodities from farmers and sell them to retailers in Pagaralam and neighboring cities such as Lahat, Muara Enim, Prabumulih, Pendopo and Kayuagung. Sixty percent of the total transaction volume (60 tons) are dealt with by the four agents and the remaining 40 percent are by the middlemen.

Village Level Cooperative (Kooperasi Unit Desa or KUD), which is the most typical farmers' organization in Indonesia, has usually dealt mainly with rice and major palawija. Even though Pagaralam produces vegetables, the KUD does not deal with vegetables. Farmers producing vegetables cannot take advantage of KUD's functions such as farm guidance, credit, procurement and marketing. The agents have provided farmers with marketing channels, informal credit and agricultural inputs. However, the agents cannot take the place of KUD completely. Farmers really need farm guidance/technical assistance, formal credit with lower interest rates, information concerning prices, market demand and consumers preference, bargaining power with buyers and good facilities.

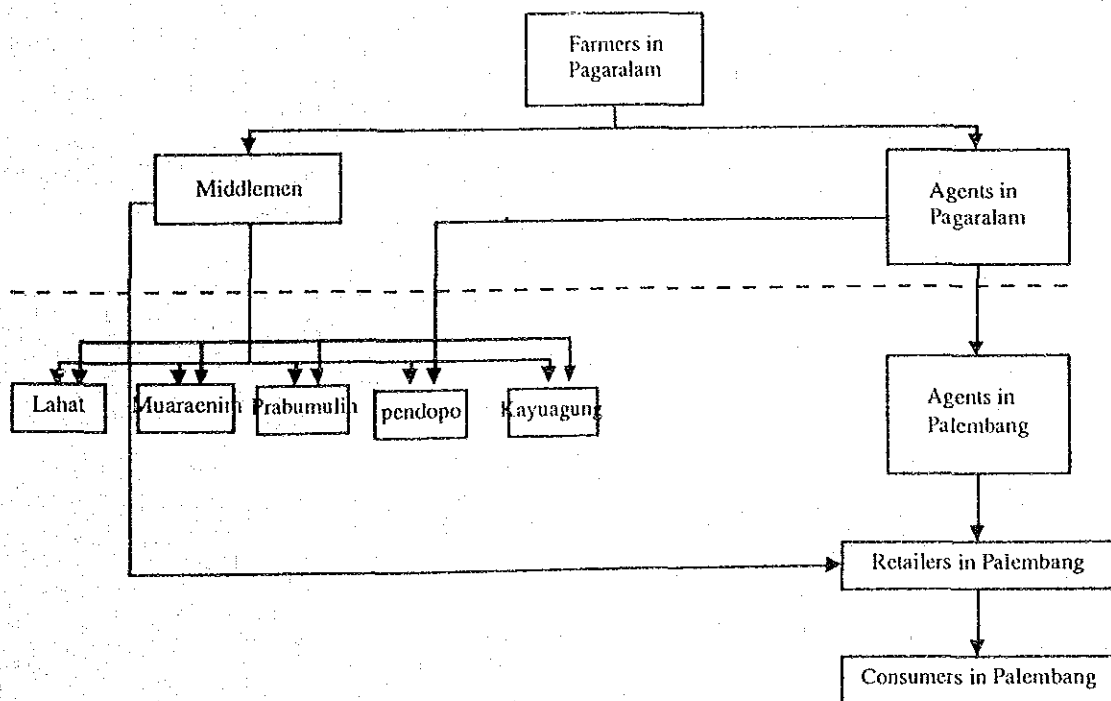


Figure A1.1.2 Distribution and Marketing Structure : Case of Pagaralam

## (2) Palembang

There are 12 big vegetable agents in Palembang, each with a capital of more than one million Rupiah. Nine of them are Indonesian and the remaining three are Chinese. Under the big agents, some 40 to 50 small agents exist. The big agents, as a whole, purchase vegetables of approximately 60 tons per day from the four agents in Pagaralam and some agents in Curup, Padang and West Java, and sell them to the small agents and retailers in Palembang. Instead of a wholesale market, each of the big agents transacts business at a corner of the biggest market place in Palembang, Pasar 16 Ilir, where there are no good market facilities such as truck terminal, auction area, cold storage, etc.

### 1.1.4 Price of vegetables

Table A1.1.1 and Table A1.1.2 show seasonal wholesale price of vegetables in Palembang and Pagaralam. In addition, Figure A1.1.3 and Figure A1.1.4 present the price fluctuation visually.

Table A1.1.1 Seasonal Wholesale Price of Vegetables in Palembang (1991)

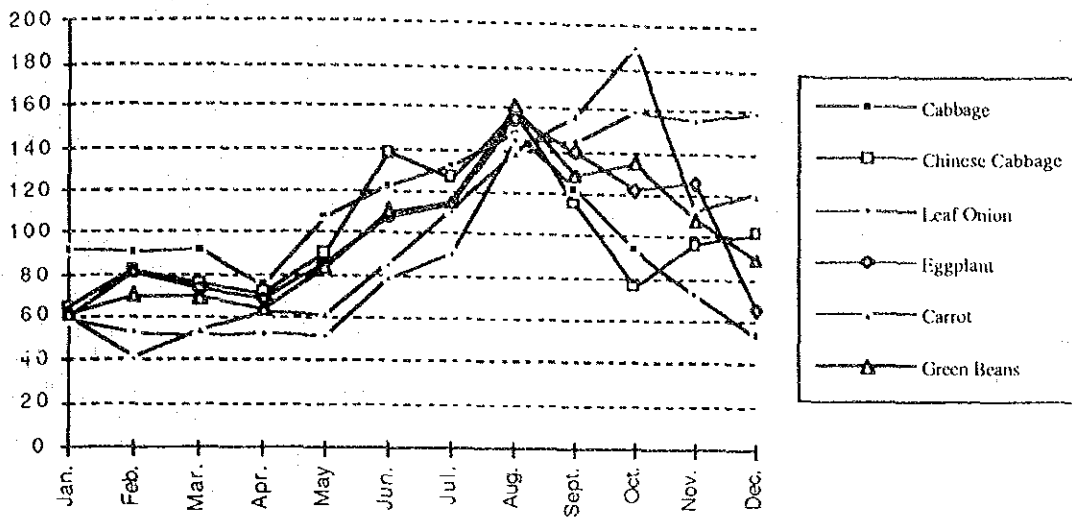
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
Cabbage	247	244	247	202	291	329	358	400	329	252	194	144	270
Chinese Cabbage	144	183	171	160	203	310	284	355	257	170	215	227	223
Leaf Onion	153	139	134	136	135	204	237	378	378	417	407	417	261
Irish Potato	400	524	574	520	434	488	597	570	489	515	530	458	508
Tomato	822	691	423	800	1153	936	637	545	553	519	561	732	698
Eggplant	146	196	178	167	208	261	275	378	340	296	305	160	243
Red Onion	940	808	1073	1295	1344	988	741	516	447	459	653	700	830
Chilies	1441	1587	1060	1065	1217	1411	1714	1945	1969	2239	2532	2472	1721
Carrot	220	154	198	229	226	316	410	510	579	698	414	444	367
Green Beans	245	276	275	250	330	435	456	635	507	535	427	354	394
Garlic	5446	5611	5922	6170	6445	6361	7068	5498	4700	4824	4619	4828	5624

Source : Dinas Pertanian, Wholesale Price of Vegetables in South Sumatra Province, 1991

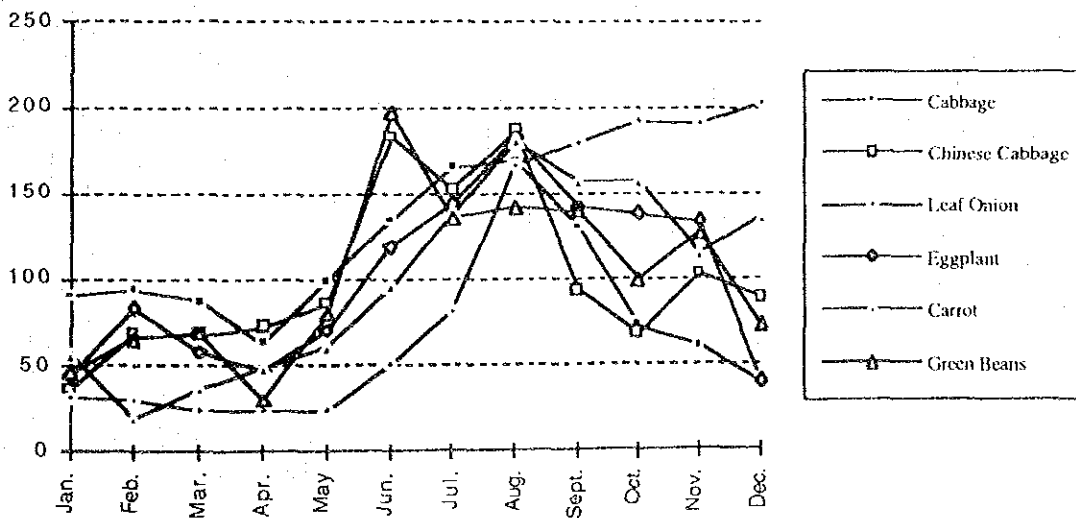
Table A1.1.2 Seasonal Wholesale Price of Vegetables in Pagaralam (1991)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
Cabbage	196	205	189	136	214	294	362	369	283	159	131	87	219
Chinese Cabbage	53	97	97	104	123	265	220	269	133	98	148	127	145
Leaf Onion	50	49	40	39	40	82	129	267	289	311	309	327	161
Eggplant	67	123	86	70	104	176	213	271	210	204	198	60	149
Carrot	141	49	93	123	152	240	348	456	395	394	288	342	252
Green Beans	114	164	171	76	199	494	340	354	348	246	314	182	250

Source : Dinas Pertanian, Wholesale Price of Vegetables in South Sumatra Province, 1991



Source : Calculated from Table A1.1.1  
 Figure A1.1.3 Seasonal Price Fluctuation of Vegetables in Palembang (1991)  
 (Average of Price = 100)



Source : Calculated from Table A1.1.2  
 Figure A1.1.4 Seasonal Price Fluctuation of Vegetables in Pagaralam (1991)  
 (Average of Price = 100)

The following are some remarks drawn from the tables and figures.

- 1) The trends of vegetable prices in Palembang and Pagaralam are almost linked to each other. The difference of the prices between them is the margin for distribution sectors.
- 2) The prices of vegetables are fluctuating seasonally. Generally, the bottom of the prices is around January and the peak is around August. There seems to be some reasons why the prices are fluctuating. One of the main reasons is the gap between supply and demand, which is caused not only internally but also externally. The vegetable prices in South Sumatra province are extremely dependent on the volume supplied by the areas outside the province such as Padang (including Bukit Tinggi), Curup and West Java. The other main reason is that quality of vegetables deteriorates in the rainy season.
- 3) There are some high-priced vegetables in the market of Palembang. However, most of them, like garlic and high-quality tomato, have not been produced in Pagaralam or in the province.

#### 1.1.5 Problems and Issues

This part points out problems and issues drawn from the current conditions in the vegetable distribution and marketing system described in the previous sections. These are summarized as follows.

- 1) Farmers producing vegetables in Pagaralam don't have strong bargaining power relative to the agents because farmers have business relationships individually with the agents. When farmers sell their vegetables, the prices are usually determined by the agents.
- 2) Prices of vegetables are fluctuating seasonally due to the gaps between supply and demand and the deterioration of quality. Unstable prices lead to deteriorating farmers' household economy and diminish their incentive to produce vegetables.
- 3) Farmers don't have enough information about prices, market demand, consumers preference and so on. Therefore, farmers cannot decide adequately what kind of commodities should be produced in what quantity and when.
- 4) The system of farm guidance/technical assistance is not well established. The number of extension officers is limited. Therefore, for example, it is difficult to introduce new commodities and/or technology and develop quality control.
- 5) In Pagaralam, facilities for cleaning, selection, packaging, processing, storage and transportation are not well equipped. If good facilities are provided, farmers can improve quality, keep freshness and enhance value.
- 6) Since KUD in Pagaralam has not dealt with vegetables, it is not easy for farmers producing vegetables to have access to formal credit. The lack of good credit sometimes prevents farmers from smooth operation and expansion of production.
- 7) In Palembang, a formal wholesale market dealing with vegetables has not been well organized. The wholesale market has a key function distinct from retail markets. It channels the increasing bulk of vegetables, divides them into small lots, sets reasonable price and give market signals to producing farmers as well as agents.

- 8) In Pasar 16 Ilir of Palembang, facilities such as truck terminal, auction area, cold storage, etc. have not been well equipped. Without good facilities, efficient market operation cannot be realized.
- 9) Normal vegetables produced in Pagaralam cannot compete with those in the other vegetable producing centers, especially West Java due to price and quality.

#### 1.1.6 Recommendations

The following are some general ideas on how to improve and strengthen distribution and marketing system of vegetables in South Sumatra province.

- 1) KUD in Pagaralam should be given the function of dealing with vegetables. By giving such functions to KUD and developing it, farmers can take advantage of marketing services, farm guidance/technical assistance, the formal credit and procurement services. Figure A1.1.5 presents the function of KUD in Pagaralam proposed here. Marketing activities including collection, cleaning, selection (size/quality), packaging, processing, storage, transportation, etc. will contribute to have access to marketing channel, cope with unstable price and improve farmers' welfare. Farmers can get information concerning price, demand, consumer preference, etc. through marketing function from wholesale market. Facilities are to be well equipped according to marketing activities. Farm guidance/technical assistance and procurement services will develop farmers' production capability and improve the quality of the products. Credit facilities will support farmers financially and enable them to expand production.
- 2) A formal wholesale market dealing with vegetables should be established in Palembang in order to respond to the increasing bulk of vegetables and the need for quick and timely transactions. The wholesale market will contribute to ensuring a stable marketing channel and sending demand information to farmers. For realizing the efficient operation of the wholesale market, related facilities (truck terminal, auction area, cold storage, etc.) and institutional support should be arranged.
- 3) Specific marketing strategies are required for producing vegetables in order to extend markets as follows.
  - a) In order to enter the existing market without hard competition with the other vegetable producing centers, it is necessary to find out the off-peak season and harvest the commodities in such a period.
  - b) In order to avoid hard competition with the other vegetable producing centers, it is required to produce such vegetables that are not cultivated so much in the other vegetable producing centers.
  - c) It is necessary to conduct a market survey in order to find out new markets. For example, Batam and two neighboring countries, Singapore and Malaysia, seem to be big potential markets in the future.

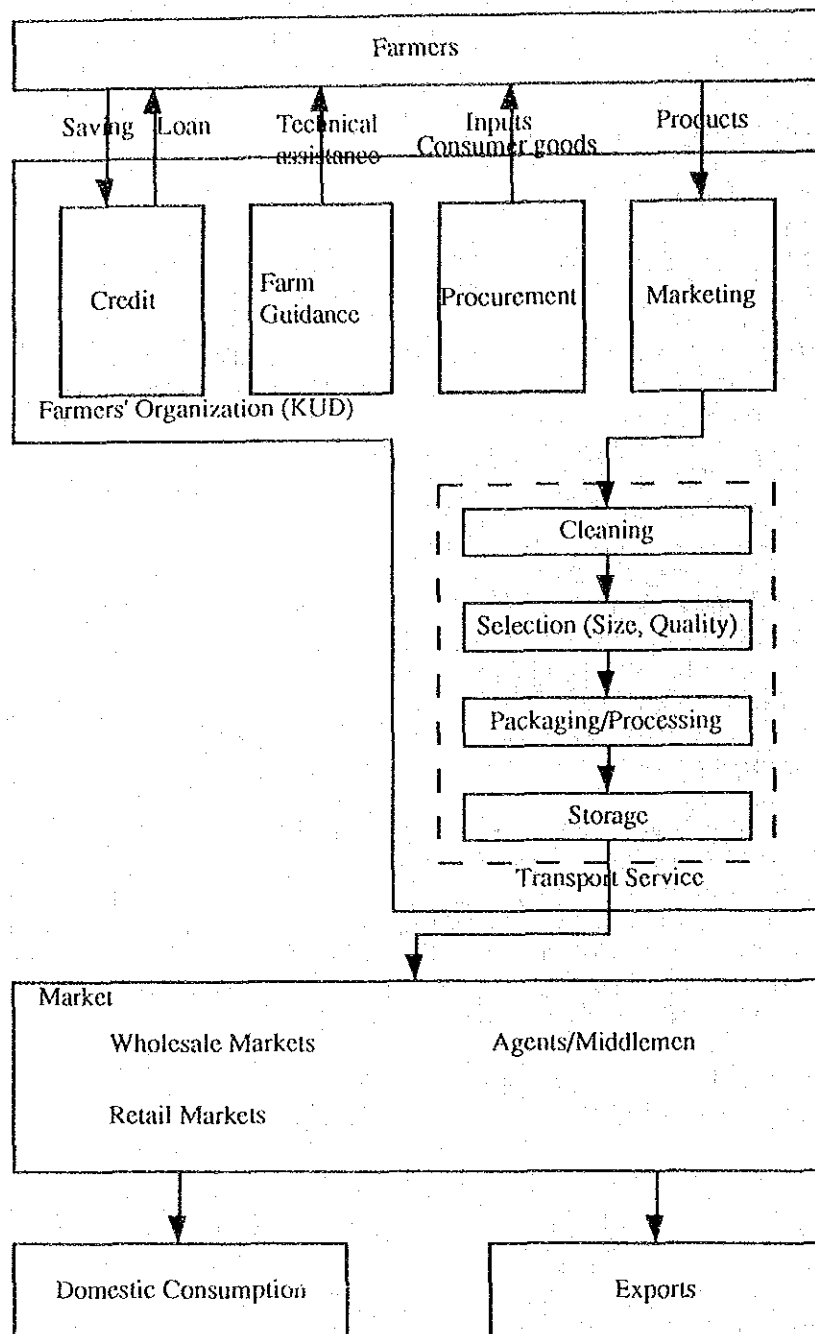


Figure A1.1.5 Proposed Functions of KUD in Pagaralam

## 2. FISHERIES

### 2.1 OFFSHORE FISHERIES DEVELOPMENT PROJECT

#### 2.1.1 Objectives of the Project and its Role in the Regional Development

The Project is aimed at exploitation of fishery resources in the western water of Sumatra, in order to fulfill the increasing local demand for fish particularly in inner part of the Region and Jakarta, as well as to increase export of fresh/frozen tuna. Local fishermen in the Region, however, are small-scale and limited in number. At present, about 50 - 100 units of tuna fishing vessels are operated in the 200-mile EEZ water off the Region from Bengkulu to the south-western part of Java, on export-oriented basis (The records of tuna export from Indonesia and from Jakarta Fishing Port in recent years are shown in tables given in Appendix A.2.1 However, through this kind of operation, no benefit is brought into the Region thereby. In this context, the objective of the Project will also include the upgrading of the required manpower ability and improvement of fishery infrastructures to create the better investment environment. By this way, the Project will play an important role for activating fishery industry in the Region, with the maximum utilization of local resources.

#### 2.1.2 Location

The Project area is the west coast region of the Southern Sumatra, where two provinces, namely, Bengkulu and Lampung are faced. The area has a coast line of about 750 km, which is about one-third of total length of west coast of Sumatra Island. In the western water of Sumatra it is estimated by Directorate General of Fisheries that the potential fishery resources are about 211,900 tons within the 12-mile territorial water (53,000 sq. km) and about 400,000 tons in the 200-mile EEZ (685,000 sq. km). Based on the ratio of length of west coast between northern and southern parts of Sumatra, it seems that about one-third of these fishery resources holdings are available in the southern part. The details of potential fish stock in the project area are as follows:

Table 2.1.1 Potential Fish Stock in the West Coast of Sumatra

(Unit: tons)

Fish	West Coast Total		Southern Area (west)	
	12-mile	200-mile	12-mile	200-mile
Demersals	78,700	94,500	26,200	31,500
Pelagics	115,000	289,000	38,300	96,300
Tunas	1,800	11,000	600	3,600
Skipjack	2,300	5,860	700	1,900
Shrimp/Lobster	2,475	-	800	-
Squid/Cuttlefish	4,880	-	1,600	-
Shellfish	5,592	-	1,800	-
Seaweed	1,200	-	400	-
Total	211,947	400,360	70,400	133,300

Source: Potensi dan Penyebaran Sumberdaya Ikan Laut di Perairan Indonesia, Directorate Jenderal Perikanan, 1989

The actual catch in the west coast of the Region, Bengkulu and Lampung Barat, in 1990 accounted for only 14,140 tons, which was accounted for mostly by local small-scale fishermen in the coastal water. On the other hand, it is recorded that the total of about 1,500 tuna long-line fishing vessels called Jakarta fishing port for landing of about 9,500 tons of tuna in 1990, which are operated in Indian Ocean between the offshore of Bengkulu and Java. Although current tuna catch level seems to be rather high in comparison of the estimated stock, the actual catch seems not to reach to its potential level, since tuna is the highly-migratory

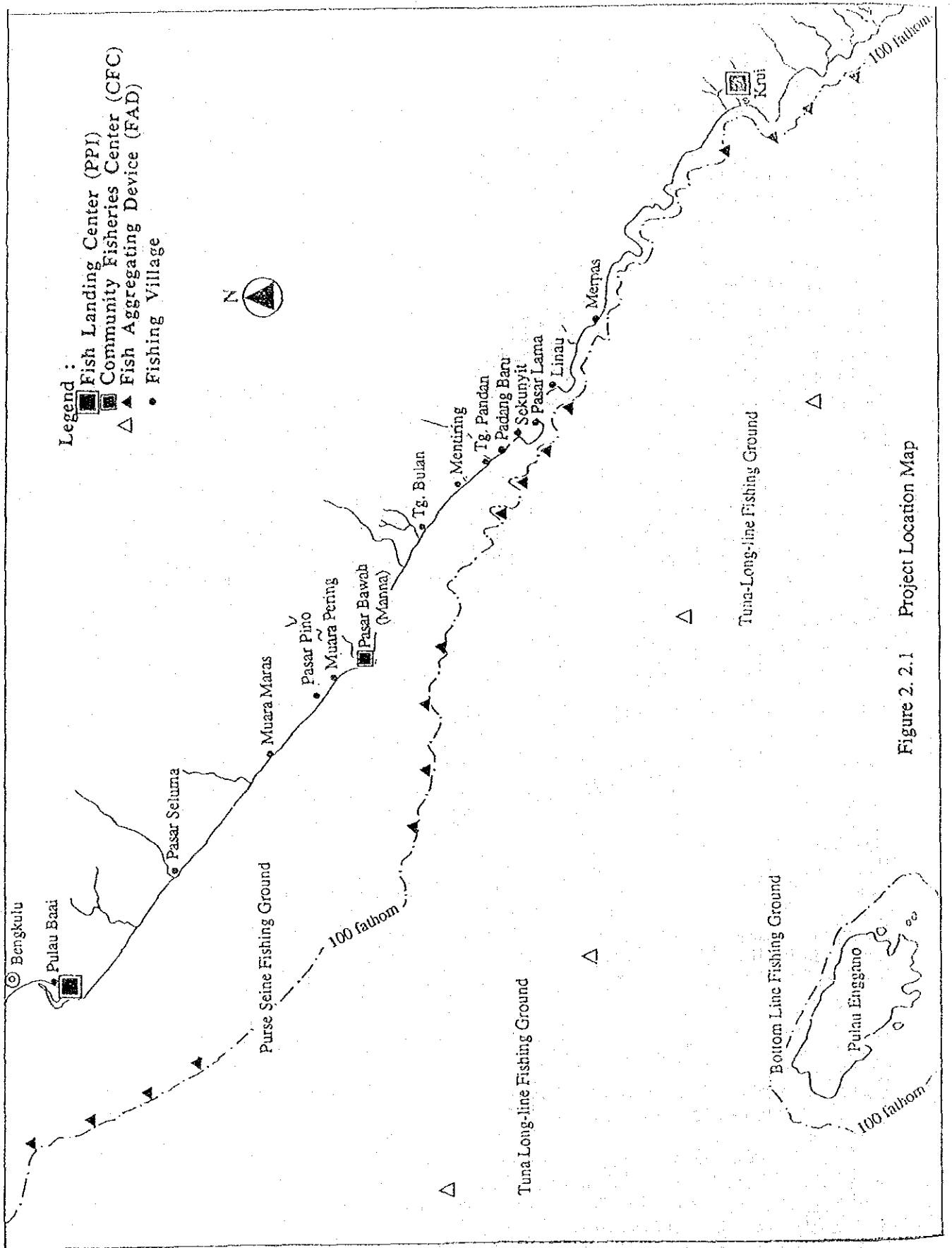


Figure 2.2.1 Project Location Map



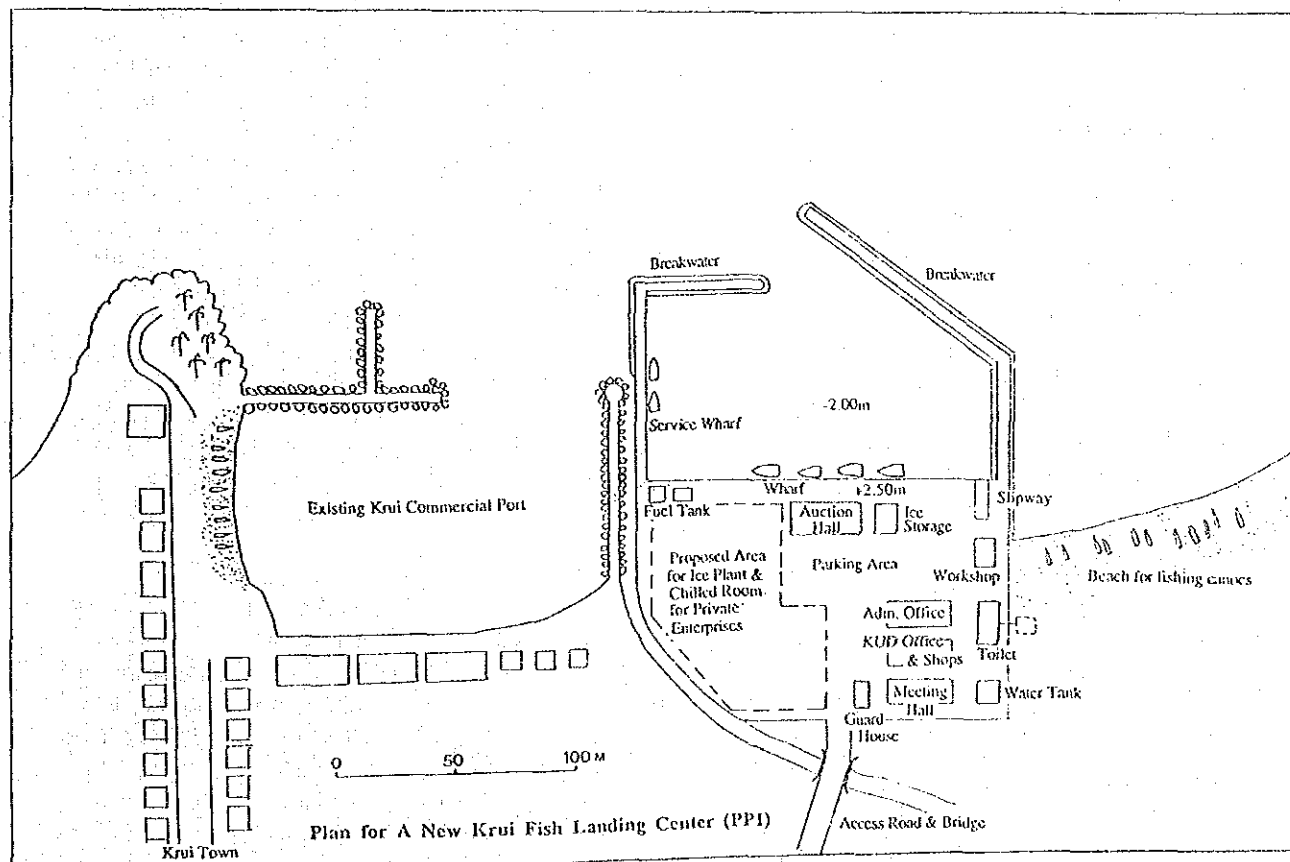
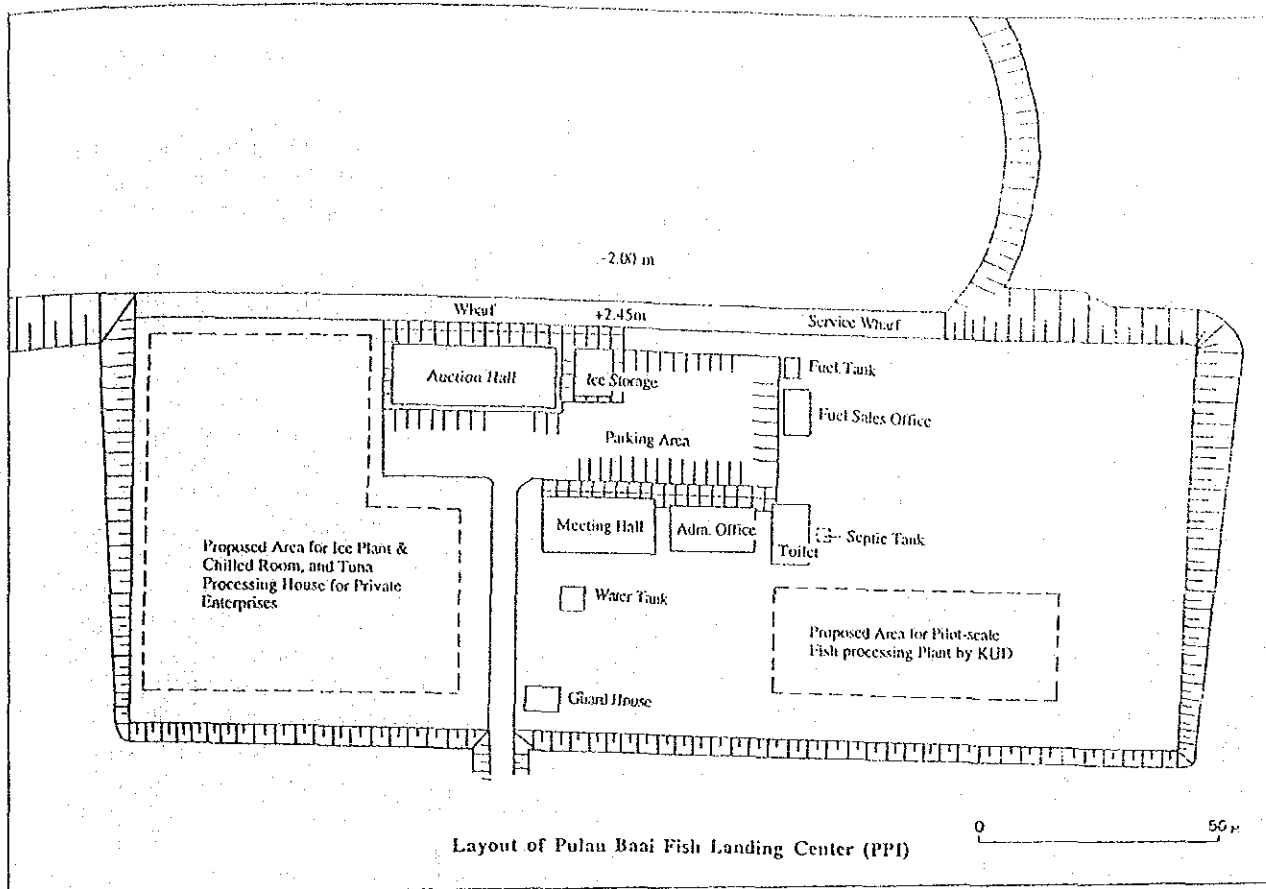


Figure 2.1.2 Proposed Project Facilities for Fish Landing Center (PPI) in Pulau Baai and Krui

species and the tuna in the offshore of the southern part of Sumatra and Java forms the larger school than those in the northern part of Sumatra.

The west coast of Sumatra is directly facing to Indian Ocean, generally forming a sandy beach with a gentle slope up to approx. 20 mile off Bengkulu Utara that become narrower toward south while Lampung Barat generally forms a cliff shaped coast with a sandy beach on inner parts of small bays.

In this area, there are about 6,000 full-time fishermen, of which two-third exist in Bengkulu Province. Most of fishermen are small-scale, as seen with the low motorization rate of 31% (56% in east coast). Some 400 fishing vessels with inboard engines currently operate bottom line fishing around Pulau Enggano and Pulau Mega having a base at a newly established Pulau Baai Fish Landing Center in Bengkulu (under ADB-financed Fisheries Infrastructure Project). Due to geographical, oceanographic and infrastructural conditions, except Pulau Baai (Bengkulu) and Krui (Lampung), there is no appropriate site for fish landing center/fishing port in west coast of Bengkulu and Lampung.

In the project area, there are 4 provincial fish landing centers; 3 in Bengkulu (Ipuh, Pulau Baai, Manna) and only 1 in Lampung Barat (Krui). In addition, a private fish landing jetty was constructed in Pasar Bandar by Bugis fishermen (mainly catching shrimps). Out of that, Pulau Baai and Krui centers are located inside of small bay with breakwater, while Ipuh and Manna are in river mouth. Most of fish landing centers are suffering from sedimentation, and unexpectedly Ipuh and Manna centers have been already useless and just abandoned.

### **2.1.3 Executing Agency**

The Directorate General of Fisheries (DGF), Ministry of Agriculture will be recommended as an overall executing agency of the Project, from the planning to the implementation. The Project will include 2 different natures of components: a) private investment and b) governmental infrastructure. The DGF will have to be responsible for identifying, coordinating and selecting the prospective private enterprises, and the selected companies will be responsible for designing, construction and procurement of fishing boats and marketing facilities. The technical supervision will be available to receive from the project consultants, and financial support, if necessary, will be made through local banks through the 2-step loan, although the current bank's loan condition is too severe to expect the satisfactory return from investment in ordinary cases. The governmental infrastructure such as fish landing center will be designed and constructed by the direct supervision of the DGF.

The commercial fishing including fish marketing facilities such as ice making plant, processing plant and transport equipment will be directly operated and managed by prospective private enterprise(s). Some local fishermen will be employed as crews for fishing vessels, while the DGF will be responsible for operation and management of the public infrastructure of both Krui and Pulau Baai fish landing centers (PPIs).

### **2.1.4 Expected Benefit**

It is no exaggeration that the proposed project, aiming at fishery development in the west coast of Sumatra, would directly give the influence to the improvement of region's economy, particularly that of Bengkulu and Lampung Barat. In addition, the Project would play an important role in supply of cheap animal protein to local people meeting with the increasing demand. With the implementation of the project, the following benefits can be expected.

- 1) More private investments to fishery industry along with the improvement of fishery infrastructure, so as to stimulate the regional economy.

- 2) Increase of job opportunities through employment of local people for fishing, fish marketing and processing.
- 3) Increase of fish supply to the Region as a source of cheaper animal protein.
- 4) Increase of foreign exchange earnings through export of tuna.

### 2.1.5 Outline of the Project

The Project will include the following four components. The detailed technical assumption and costs & benefits calculations are given in Appendix A2.2 and A2.3 respectively.

#### (1) Component 1 : Small-Scale Tuna Fishery Development

20 units of approx. 13 m long wooden tuna long line fishing vessels (approx. 14 G/T) will be constructed as one package of this component. Each vessel will concentrate in operating long line fishing (20 km) for catching tuna (mainly yellowfin, bigeye) for a whole year-round. Bottom fishing (long-line, vertical long-line, and bottom lining) will be sometimes operated for catching demersals (snappers, groupers, etc.) depending on meteorological and oceanographic conditions. About 57.6 tons of tuna and 7.2 tons of demersals will be annually caught by each vessel. Total annual fish catch will be about 2,600 tons (1,150 tons of tuna & 150 tons of demersals per package x 2 packages).

Tuna long line fishing vessels will be operated based in either Pulau Baai (Bengkulu) or Krui (Lampung Barat). The new fish landing center (PPI) in Pulau Baai was just inaugurated on 9 July 1992, while Krui is proposed to establish a new PPI under this Project. Fishing grounds for tuna long lining are about 100 - 200 miles off coast of Bengkulu Selatan, Lampung Barat and the south-western water of Java. Bottom fishing will be mainly conducted in shallow shelf extending around Pulau Enggano and Pulau Mega.

For the fishing operation based on Krui, due to the long distance for transport from Krui to Jakarta by vehicle (about 12 hours), it seems not to be appropriate to keep the exportable quality as fresh tuna. It is recommended based on the aspect of operation cost that fresh tuna should be regularly collected by 3 collector vessels (about 14 m long, with a 105 hp engine, fish hold capacity: approx. 25 cu.m) in the surrounding water of Pulau Enggano during they engage in bottom fishing operation. After collection, the collector vessels will directly transport tuna with the iced water to Jakarta. Tuna will be sorted in Jakarta, and best quality ones are individually packed in carton box with dry ice for export (mostly to Japan) by air, while others are frozen for sashimi or canned tuna. On the return from Jakarta, the collector vessels will bring bait fish, fishing/daily requisites, etc. Necessary ice will be loaded at Krui before collecting tuna around Pulau Enggano.

For tuna fishing operation based in Pulau Baai, tuna will be landed and sorted at PPI. The export quality of tunas will be prepared for fresh tuna packing at PPI site, and sent to Japan by air plane via Jakarta. All necessary export arrangement including custom clearance will have to be made at PPI Pulau Baai before shipment.

Approx. 10 tons/day of block ice making plant with a 60 cu.m ice storage and crusher will be installed by the prospective private enterprise at both Krui and Pulau Baai to support offshore fishing (for each 20 units of tuna long-liners). In addition, some fish containers and the insulated trucks will be procured for local fish marketing. A chill room for fresh tuna treatment and packing will be needed at Pulau Baai PPI.

Key fishermen for fishing vessels (2 crews per vessel including captain) will be scouted among skilled fishermen in Java or elsewhere, while local fishermen (3 crews per vessel) will be employed as an apprentice, and will be trained so as to be skilled.

## (2) Component 2 : Purse Seine Fishery Development

20 units of 13 m long wooden purse seine fishing vessels will be constructed as one package of this component. Each vessel will be equipped with a small purse seine net (approx. 500m(L) x 50m(D)) for the purpose of catching small migratory pelagic species such as scads, anchovies and mackerels (including little tunas). It is expected that each vessel will take 90 trips (10 trips/month during rainy season; 5 trips/month during dry season) catching about 160 tons per annum. Total annual fish catch will be 3,200 tons (160 tons x 20 vessels).

These purse seine fishing vessels will be operated having their base in the newly established provincial fish landing center at Pulau Baai (Kdy. Bengkulu), where depth (L.W.L) is designed at 2 m. Major fishing ground will be 20 - 50 miles off coast of Bengkulu Province, where is closed to the edge of shelf (depth: 100 - 150 m). A skiff boat with fish aggregating lamp with a generator will be provided on deck.

Catch will be treated with iced water on fishing boat. After landing at Pulau Baai or Krui, some fishes will be sold at local market, while the most will be transported in plastic containers with ice to the inland part of the Region.

In order to supply necessary ice for project purse seiners (20 units), to supplement some ice for the existing fishing vessels (about 400 units with inboard engine) and also for on-land transportation by truck, approx. 20 tons/day of block ice making plant with 120 cu.m. ice storage and ice crusher will be installed in Pulau Baai fish landing center. About 300 units of plastic fish containers (60 liters) and 5 units of 2-ton insulated trucks will be also procured for smooth fish marketing.

Key fishermen for fishing vessels (2 crews per vessel including captain) will be scouted among skilled ones in Java or elsewhere, while local fishermen (6 crews per vessel) will be employed as an apprentice, and trained to be skilled.

## (3) Component 3 : Construction of Krui Fish Landing Center (PPI)

The existing Krui commercial port, which is protected from open sea by old stone-piled breakwater constructed in 1930, is now used by only some fishing boats (inboard engine type) and small passenger boats between Krui and Pulau Pisang. Due to the difficulty to procure necessary portyard in this site, the new fish landing center (PPI) will be constructed at the site next to this existing structure. The marine structures of new PPI will include fish landing wharf, fuel/ice service wharf, boat mooring area and breakwater. The existing fishing canoe/boat with outboard engine will continuously use the neighboring beach for their boat hauling and fish landing.

Public port facilities such as fish sorting/auction/packing hall, retail market, slipway and workshop, offices, shops, toilets, fuel/water supply system, etc. will be built in portyard. The sufficient area will be kept as spaces for private enterprises' facilities such as office, ice making plant, chill room, etc.

## (4) Component 4 : Fish Aggregating device (FAD)

In order to increase fishing efficiencies both in coastal and offshore fisheries in the western part of Sumatra, fish aggregating devices (FAD) will be installed, 20 units of shallow water use (about 200 m) and 4 units of deep sea use (about 1,000 m). The places to be installed will be decided during the implementation, but basically in the waters off Bengkulu, Manna, Bintuhan, Krui and Kota Agung respectively. These FAD will create increase fish catch per effort for small-scale fishermen who operate hook-and-lining, trolling, and long-lining. The shallow-water-use FAD will be managed by the respective KUD unit or an association of KUD (to be promoted in the Region), while the deep-sea-use FAD will be managed by Directorate General of Fisheries (DGF) or Dinas Perikanan in each province.

## 2.1.6 Phasing

### (1) Pre-Investment Study

In order to make sure project viability, the in-depth feasibility study (pre-investment study) will be needed before actual implementation. The study will be made for the following 2 categories; a) private investment for fishing and marketing business; and b) government support on improvement of necessary infrastructure and services.

As for private investment, the Directorate General of Fisheries (DGF) will identify, in collaboration with the respective local provincial governments (Bappeda, Dinas Perikanan, etc.), the prospective and interested private entrepreneurs, prior to the study. Each enterprise will be requested to submit the detailed investment proposal, that will be evaluated by the Consultant on both technical and financial aspects and will be finalized but limited to the appropriate scale and numbers based on resource availability and local conditions. In case that no private entrepreneurs show his interest, the project should be operated as pilot- scale business (including training of local fishermen) by enrollment of some government enterprise such as P.T. Samudra Besar Perikanan (PSB), which presently operates commercial tuna long-line fishing based on Benoua, Bali.

The government support for fishery infrastructure will be indispensable to increase private investors' interests. The study should include the prospect and analysis on the appropriate scale and scope of fish landing centers (PPIs) facilities in Pulau Baai (Kdy. Bengkulu) and Krui (Lampung Barat).

The required period for Pre-investment study will be about 4 months.

### (2) Implementation

The proposed implementation schedule is as follows:

1) Detailed design of project facilities/equipment	6 months
2) Procurement and construction	24 months
3) Operation and management	30 months
Total	60 months

## 2.1.7 Cost Estimation

Total project cost is roughly estimated US\$15.0 million. The cost breakdown is as shown below:

### Component 1 : Tuna Long Line Fishery

1) Krui-based tuna long line fishing	
a) Fishing boats (approx. 13 m long) 20 units/package x 1 package @US\$50,000 (local) x 20 boats	US\$1.0 million
b) Collector vessels (approx. 14 m long) @US\$60,000 (local) x 3 boats	US\$0.2 million
c) Fishing gear (tuna long line) @US\$10,000/set x 20 sets x 1.5	US\$0.3 million
d) Ice making plant & storage 10 tons/day block, 60 cu.m @US\$500,000 x 1 unit	US\$0.5 million
e) Marketing equipment trucks, fish containers, etc.	US\$0.2 million
f) Office	US\$0.1 million

	Sub-Total	US\$2.3 million
2)	Pulau Baai based tuna long line fishing	
	a) Fishing boats (approx. 13 m long) 20 units/package x 1 package @US\$50,000 (local) x 20 boats	US\$1.0 million
	b) Fishing gear (tuna long line) @US\$10,000/set x 20 sets x 1.5	US\$0.3 million
	c) Ice making plant & storage 10 tons/day block, 60 cu.m @US\$500,000 x 1 unit	US\$0.5 million
	d) Fresh tuna packing house @US\$100,000 x 1 unit	US\$0.1 million
	e) Marketing equipment trucks, fish containers, etc.	US\$0.2 million
	f) Office	US\$0.1 million
	Sub-Total	US\$2.2 million
3)	Working capital for initial 3 months operation US\$0.4 million/package x 2 packages	US\$0.8 million
Component 2 :	Purse Seine Fishing	
1)	Investment	
	a) Fishing boats (approx. 13 m long) 20 units/package x 1 package (Pulau Baai) @US\$45,000 (local) x 20 boats	US\$0.9 million
	b) Fishing gear (purse seine net) Size: 500 m (L) x 50 m (D) @US\$10,000/set x 20 sets x 1.5	US\$0.3 million
	c) Ice making plant & storage 20 tons/day block, 120 cu.m @US\$1,000,000 x 1 unit	US\$1.0 million
	d) Marketing equipment trucks, fish containers, etc.	US\$0.2 million
	e) Office	US\$0.1 million
	Sub-Total	US\$2.5 million
2)	Working Capital for initial 3 months operation	US\$0.4 million
Component 3 :	Krui Fish Landing Center (PPI)	
	a) Land reclamation @2 ha	US\$0.5 million
	b) Fish landing wharf @200m	US\$2.0 million
	c) Breakwater @100m	US\$0.5 million
	d) On-land facilities fish handling/auction hall, fish market, offices, radio station, storage, workshop, toilet, water/fuel supply, electricity extension, generator, meeting/training room, parking lot, etc.	US\$1.0 million
	e) Equipment	US\$0.2 million

	Sub-Total	US\$4.2 million
Component 4 :	Fish Aggregating Device (FAD)	
	1) For deep sea use (1,000m) @US\$100,000 x 4 sets	US\$0.4 million
	2) For shallow water use (200m) @US\$10,000 x 20 sets	US\$0.2 million
	Sub-Total	----- US\$0.6 million
Component 5 :	Consulting Services, Fellowship & Training	
	1) Consulting Services(60 M/M)	US\$1.5 million
	2) Fellowship & Training	US\$0.5 million
	Sub-Total	----- US\$2.0 million

### 2.1.8 Appraisal

#### (1) Technical

The proposed project is technically viable. At present, having a landing base in Jakarta fishing port, there are about 50 units of 20 - 50 G/T class tuna long liners chartered from Taiwan are operated in the 200-mile EEZ off the west coast of the Region. The proposed type of tuna long-line fishing vessels is about 10- 20 G/T type, smaller in size than the Taiwanese vessel, but would be enough to be operated in safe condition. Because of the short distance from fishing bases (Krui or Pulau Baai) to fishing grounds, the smaller-sized boats would be better in the viewpoint of the operational efficiency. In addition, it is easier to be accustomed by local fishermen to operate, so that the extension of this type of fishing vessel by small-scale fishermen has large possibility.

As for purse seine fishing, as of the present, there is no purse seiner operated in the project area. However, as introduced and developed in Padang (West Sumatra) under Sumatra Fisheries Development Project (ADB loan) since 1989, and the results of some experiments made by Dinas Perikanan Tk.I (Bengkulu), the proposed type of purse seine fishing (10-20 G/T, to be operated with a skiff boat with an outboard engine) would be efficiently operated in the proposed area.

#### (2) Economic

With the improvement of offshore fishery bases in Pulau Baai and Krui, the tuna long-line fishing vessels would be able to save not only operating cost but also increase operational efficiencies by saving days required for navigation between fishing grounds and Jakarta. In this aspect, it is expected that some of fishing companies who are presently operating based on Jakarta may open new office in the project areas. As of today, one commercial fishing company, PT. Nusa-In (originated in Manado, North Sulawesi) opened a new office in Bengkulu, and is now preparing for fishing, marketing and dockyard business based on Pulau Baai.

#### (3) Social

It is expected that about 360 fishermen (50% are local fishermen) will be newly recruited for operation of fishing boats (40 units of tuna long liners and 20 units of purse seiners). In addition, about 100 staffs will be employed by private enterprises for handling and marketing of fishes from the neighboring areas of Pulau Baai and Krui PPI. The local fishermen would be trained on-the-job basis. In the future, they will be upgraded as middle-tier crews when the fishing capacity is increased by the investors or the new investors come.

#### (4) Environmental

It is not anticipated that the Project would cause any environmental damages. Although fishes landed at PPI would be washed and thus the drain usually contains fish blood, there would be no effect if those water are treated by septic tank since the increment of fish landing from the Project is still small (approx. 150 tons at Krui and 2,600 tons at Pulau Baai).

The construction of marine structure like fishing port may sometimes cause the serious environmental effect, e.g., change of coastal shape. As for construction of a new fish landing center (PPI) in Krui, it is necessary to conduct the detailed survey on geographic and oceanographic conditions, e.g., tide, current, depth, soil. Due to the limited scale of the proposed center, the ecological effect to marine organism may not be considered seriously.

#### (5) Financial

As calculated in Appendix A2.3 (Costs & Benefits Calculation), both private investment components of tuna long line fishery and purse seine fishery would generate annual profits ranging from Rp.1.5 to 2.0 billion (US\$750,000 - US\$1,000,000) per each package before depreciation and loan repayment (if any). Since the project facilities life period can be expected 15 years including fishing vessels and on-shore facilities (Annual maintenance cost has already been calculated as one of the operating costs.), the capital investment to the proposed fishing business (approx. US\$3.0 million per package) would be financially-viable. The FIRR is calculated in the range of 30 - 33% for tuna long-line fishing business (Pulau Baai or Krui based), while purse seine fishing business based on Pulau Baai shows 16.7% (Appendix A2.4).

### 2.1.9 Major Preconditions and Recommendations

#### (1) Technical Aspects

Tuna long-lining and purse seining fishing techniques to be involved in the project are small-scale in general, but are still too large and too advanced to be directly introduced to local fishermen. The initial stage of offshore fishery development in the western water of the Region, therefore, should be tackled by private or governmental fishing enterprises. Along with the medium- and long-term operations, local fishermen would be expected to operate such offshore fishery by themselves. Although the enterprises may wish to use the fishermen who have already been acquainted with tuna long lining and purse seining at least for the initial period, it is recommended that the enterprises would employ local fishermen for some parts in terms of technical transfer to local people considering the successful long-run.

#### (2) Trade and Marketing Aspects

It is assumed under this project that all fishes including tuna would be marketed in fresh condition, and sold to the respective cold storage, exporters and local markets depending on the kinds and qualities of fishes. To establish cold storage in Bengkulu or Krui would be dangerous considering the limited fish volume, high operational cost, difficult management, particularly those for tunas (-60 C). In addition, there is very limited local market for frozen fishes in the Region, except some special channels. In these context, the ice making plant and small chilled room for temporary fish stock only are included as on-shore marketing facilities under the project. All tunas will be transported with iced water to Jakarta, Palembang and Bandar Lampung, either for export (fresh or frozen) or local consumption, while demersals and small pelagics are mostly transported with ice to the regional markets. In the future, if the fish landings in both areas become larger with participation of several private fishing enterprises, cold storage may be needed to establish in the project area.



The current fish prices at the project areas are quite high especially during dry season (Apr. - Sep.) due to the shortage of supply. Under the proposed project, therefore, the selling price of fishes are assumed about 30 - 50% lower than the current prices at both landing sites and retail markets, taking into account the anticipated price drop to be caused in accordance with the increase of catch in the future. The prices of tunas for both fresh and frozen for export are referred from the current market prices in Jakarta fishing port .

### (3) Environmental Aspects

The expected increment of pelagic fish catch including tuna in the region would not affect the existing fish stock level, and fishing gears are common ones which have already been operated in Indonesia. However, some care may have to be paid to demersal fishes around Pulau Enggano. Since the demersal fish resources are easy to be damaged with the excessive fishing. The further development of demersal fishery would depend on creation of new fishing grounds other than Pulau Enggano, if the catch efforts increase more.

If the fish landings at fish landing centers in Krui and Pulau Baai are increased as expected, and some fish processing plants are established, it is recommended that the appropriate drain treatment facility should be constructed in the portyard. The PPI Krui locates in the bay having a beautiful beach, while the Pulau Baai PPI locates inside of lagoon. Both locations would be easily damaged with water deterioration.

### (4) Community Aspects

There are a number of small fishing villages scattered along the coast. Some villages have both native fishermen and those from Java or Sulawesi, and others consist of only native people (Asli). The fishing bases, Krui and Pulau Baai, belong to the former case, so that it would be easier for local fishermen to accept the private fishing enterprises from outside. It is recommended that the private enterprises should support local fishing community in fishing and marketing activities, and participate in various social activities, so as to promote communications with local people. In particular, the west coast of the Region is aimed to promote the cooperative (KUD) based activities. The participation of private enterprises would bring great effects in enhancing fishermen's intention, knowhow and experiences.

### (5) Administrative and Financial Aspects

The high interest rates of bank loan in Indonesia usually make the investors reluctant to start new business. The project would be expected to generate enough profits, but loan condition should be as soft as possible in order to reduce the investors' burdens, considering that this would be a pioneer project in the Region to develop the offshore fishery as a backbone of the regional economy.

## Appendix A2.1 Relevant Data on Tuna Marketing

Table A2.1.1 Tuna Export from Indonesia

(Unit: tons or US\$'000)

Year	Fresh		Frozen		Canned	
	Q'ty	Value	Q'ty	Value	Q'ty	Value
1981	1,310	1,137	12,703	14,279		
1982	3	2	18,785	19,862		
1983	5	26	20,306	14,750		
1984	47	190	14,655	10,485		
1985	936	975	16,953	12,795		
1986	2,369	2,261	21,867	15,868	1,823	3,549
1987	2,311	5,139	31,687	25,824	4,284	8,293
1988	4,746	14,841	36,019	38,091	8,504	20,706
1989	8,629	26,668	27,426	36,668	20,621	39,332
1990	14,018	42,404	40,087	38,880	18,651	43,464

Source : Fisheries Statistics Yearbook, FAO

Notes : Major destinations:

Fresh : Japan (75%), Singapore (12%), Taiwan (7%)

Frozen: Japan (73%), Thailand (15%), Taiwan (8%)

Canned: U.S.A.(48%), Netherlands (17%), U.K.(13%), Germany (10%)

Table A2.1.2 Fresh Tuna Export from Tuna Long-Line Fishing Vessels Landings at Jakarta Fishing Port (1990)

(Unit: kg)

Month	Total No. of boats landed	Export fresh Tuna		Frozen	Rejected
		Yellowfin	Bigeye		
Jan.	166	262,995	198,974	500,000	248,712
Feb.	135	177,437	172,595	-	350,395
Mar.	98	94,704	88,237	414,625	110,546
Apr.	77	69,696	95,006	-	74,419
May	77	69,459	64,249	-	77,937
Jun.	101	165,883	86,126	832,000	148,133
Jul.	137	302,043	113,073	219,000	206,563
Aug.	131	304,324	115,150	180,000	150,898
Sep.	136	262,690	116,860	350,000	149,177
Oct.	132	244,751	123,193	773,000	141,931
Nov.	155	279,271	107,929	13,500	168,813
Dec.	132	279,271	107,929	435,000	106,557
Total	1,477	2,512,524	1,389,321	3,717,125	1,934,081

Source : Balai Penelytian Perikanan Laut (BPPL), Jakarta

## Appendix A2.2 Technical Assumptions

### Component 1 : Tuna Long-Line Fishery

#### A. Tuna Fishing Boat

Fishing Boat : FRP. Approx. 13m(L) x 3.5m(B) x 2m(D), with a 90 hp diesel engine, a 4 cu.m. fish hold, a 1,000 liter fuel storage, a 200 liter freshwater storage. Accommodation for 4 crews, with a galley. Service speed approx. 10 knots/hr.

#### Fishing Gear:

Long-line : Main line 20 km, drop lines with hook 500 pcs.  
Others : Bottom long-line : 500m long  
Hand line : 4 reels with 300m coil  
Vertical long-line : 2,000 m long

#### Operation:

No. of days per trip : 8 days (2 days for navigation; 4 days for tuna fishing; 2 days for bottom fishing)

No. of fishing trips : 36 trips (3 trips/month x 12 months)

#### a) Tuna Fishing

Length of main line : 20 km  
Interval of drop line : 40 m  
No. of hooks : 500 pcs.  
Fishing Rate : 2%  
B.W. of tuna : 40 kg/pc.  
Catch per haul : 400 kgs.  
No. of hauls per trip : 4 hauls (1 haul/day)  
Catch per trip : 1,600 kgs.  
No. of days per trip : 4 days per trip  
No. of fishing trips : 36 trips/year (3 trips/month x 12 months)  
Annual catch : 57,600 kgs/boat  
Total catch : 1,152 tons (57.6 tons x 20 boats)

#### b) Bottom Fishing

No. of days per trip : 2 days per trip (after tuna fishing)  
No. of fishing trips : 36 trips (3 trips/month x 12 months)  
Catch per trip : 200 kgs.  
Annual catch : 7,200 kgs/boat  
Total catch : 144 tons (7.2 tons x 20 boats)

#### B. Collector Vessel (for Krui based fishing only)

Specification : 14 m long, 105 hp inboard engine, fish hold approx. 25 cu.m.  
Transport route : Krui - Enggano area - Jakarta  
Distance : approx. 700 miles (one trip)  
Service speed : 8 knots/hr.  
Length per trip : 7 days/trip (4 days for navigation, 1 day in Jakarta, 2 days in Krui & Enggano area)

Tuna to be transported per week : approx. 22 tons (1,152 tons/52 weeks)

Tuna transported per boat: 8 tons

No. of collector boats needed : 3 boats

### C. Ice making plant and storage

Ice for fishing boat	:	1,440 tons (2 tons/trip x 36 trips x 20 boats)
Ice for fish transport	:	1,296 tons (1,296 tons fish x 1.0)
Total ice requirement	:	2,736 tons
Operating days	:	300 days per year
Capacity	:	10 tons/day block, with a 60 cu.m ice storage
Power required	:	approx. 60 kw (220V/50Hz/1 phase, 380V/3 phase)

### Component 2 : Purse Seine Fishery

#### A. Purse Seine Fishing Boat

Fishing Boat	:	FRP. Approx. 13m(L) x 3.7m(B) x 1.5m(D), with a 90 hp diesel engine, a 7.5 cu.m, a 1,000 liter fuel storage, a 200 liter freshwater storage, crew's room with a galley.
Fishing gear	:	Purse seine net: 500 m (L) x 50 m (D)
Catch per haul	:	300 kgs
No. of hauls	:	6 hauls (3 hauls/night)
Catch per trip	:	1,800 kgs
No. of trips	:	90 trips (60 trips in rainy season/30 trips in dry season)
Annual catch	:	162 tons
Total catch	:	3,240 tons (162 tons x 20 boats)

#### B. Ice making plant and storage

Ice for fishing boat	:	3,600 tons (2 tons/trip x 90 trips x 20 boats)
Ice for fish transport	:	1,620 tons (3,240 tons fish x 0.5)
Total ice requirement	:	5,220 tons
Operating days	:	300 days per year
Ice requirement	:	12-24 tons/day depending on seasons
Capacity	:	20 tons/day block
Ice storage	:	50 tons (120 cu.m)
Chilled room	:	15 cu.m x 2 rooms
Trucks	:	2 ton truck x 10 units
Power required	:	approx. 120 kw (AC220V/50Hz/1 phase, 380V/3 phase)

## Appendix A2.3 Costs & Benefit Calculation

### Component 1 : Tuna Long-Line Fishery

#### 1. Tuna Fishing

##### (1) Revenue

Annual catch	:	Tunas; 57.6 tons, demersals; 7.2 tons
Selling price	:	Rp.1,000/kg (tuna), Rp.1,500/kg (demersals)
Annual revenue	:	Rp.57.6 million (tuna), Rp.10.8 million
		Total: Rp.68.4 million

##### (2) Operating Cost

###### A. Bait Fish

Bait fish	:	Round scad, 2 pcs/hook
Total No. of hooks	:	500 pcs.
No. of bait fish	:	1,000 pcs/haul
Total No. of hauls	:	144 hauls/year (96 hauls + 48 hauls)
Total No. of bait fish	:	144,000 pcs/year
Size of bait fish	:	100 gram/pc.
Total volume of bait	:	14,400 kgs/year
Price of bait fish	:	Rp.500/kg
Cost for bait fish	:	Rp.7.2 million

###### B. Fuel

Operating status	:	Navigating	Hauling	Moving
Operating rate	:	95%	12%	37%
Operating power	:	86 hp	11 hp	34 hp
Operating hours	:	12hrs x 2	3hrs x 4 x 2	6hrs x 6
Speed	:	10 knot	4 knot	8 knot
Required fuel	:	462 liter	58 liter	270 liter
Total fuel	:	18,960 liters (790 liters x 24 trips)		
Price of fuel	:	Rp.325/liter		
Total fuel cost	:	Rp.6.2 million		
Lubricant oil	:	3% of above		
Cost of lubricant oil	:	Rp.0.2 million		

###### C. Manpower

Captain @Rp.500,000/month		1 head	Rp.6.0 million
Skilled @Rp.300,000/month		2 heads	Rp.7.2 million
Unskilled @Rp.100,000/month		2 heads	Rp.2.4 million
		Sub-Total	Rp.15.6 million

###### D. Foods

@Rp.2,000/day/head x 5 heads x 180 days/year Rp.1.8 million

E. Ice @Rp.50/kg 60,000 kg/year Rp.3.0 million

F. Fishing Gear (for repair/maintenance) Rp.5.0 million

G. Maintenance Rp.5.0 million

Annual Operating Cost per Boat Rp.44.0 million

##### (3) Operating Profit

Rp.24.4 million

Total Operating Profit  
(Rp.24.4 million x 20 boats)

Rp.488 million

## 2. Fish Marketing Business

### (1) Revenue

Total annual catch	:	tuna:	1,152 tons, demersals: 144 tons
For export	:	fresh tuna:	346 tons (1,152 tons x 30%)
		for frozen:	461 tons (1,152 tons x 40%)
For domestic	:	fresh tuna:	346 tons (1,152 tons x 30%)
		demersals :	144 tons (144 tons x 100%)
Selling price	:		
For export	:	fresh tuna:	Rp.4,000/kg (before packing at Jakarta) Rp.6,000/kg (after packing at Jakarta)
		for frozen:	Rp.2,000/kg (at Jakarta)
For domestic	:	fresh tuna:	Rp.1,500/kg (at Jakarta)
		demersals :	Rp.2,000/kg (at Bandar Lampung)
Gross sales	:		
For export	:	fresh tuna:	Rp.1,384 million (US\$692,000) Rp.2,076 million (US\$1,038,000)
		for frozen:	Rp.922 million (US\$461,000)
For domestic	:	fresh tuna:	Rp.519 million
		demersals :	Rp.288 million
Total	:		Rp.3,113 million (Krui case) Rp.3,805 million (Pulau Baai case)

### (2) Operation Cost

1) Fish purchase cost	:	Rp.1,368 million (Rp.68.4 million x 20 boats)
2) Fish marketing cost	:	For Krui : Rp.379 million For Pulau Baai : Rp.737 million

#### a) Collector vessel (for Krui based fishing only)

Fuel	:	323 kilo-liters (0.225 liter/hp/hr. x 105hp x 95% x approx. 100 hrs./trip x 4 trips/month x 12months x 3boats) Rp.105 million (323 kl x Rp.325/l)
Lubricant oil	:	Rp.3.2 million (3% of fuel cost)
Manpower	:	Rp.54 million (Rp.300,000/month x 12months x 5screws x 3boats)
Foods	:	Rp.10.8 million (Rp.2,000/day x 360 days x 5 crews x 3 boats)
Maintenance:	:	Rp.18 million (Rp.6 million x 3 boats)
Miscellaneous:	:	Rp.15 million (Rp.5 million x 3 boats)
Total cost	:	206 million

#### b) Ice making plant

Electricity	:	Rp.62.2 million (Rp.120/kwh x 60 kw x 24 hrs. x 360 days)
Manpower	:	Rp.36 million (Rp.300,000/month x 12 months x 10 staffs)
Maintenance:	:	Rp.50 million (5% of plant cost)
Miscellaneous:	:	Rp.10 million
Total cost	:	Rp.158.2 million

#### c) Transport cost (Pulau Baai based fishing only)

Packing cost	:	Rp.173 million
--------------	---	----------------

Air transport	:	(Rp.20,000/box x 346 tons/40kg) Rp.311 million
		(Rp.600/kg x 346 tons x 1.5)
d) Local marketing cost:		
for Pulau Baai based		Rp.95.1 million (Rp.100/kg x 951 tons)
for Krui based		Rp.14.4 million (Rp.100/kg x 144 tons)
3) Office administration cost	:	Rp.120 million (Rp.10 million/month x 12 months)
Total Operation Cost:		Rp.1,867 million (Krui based) Rp.2,225 million (Pulau Baai based)
(3) Operating Profit	:	Rp.1,246 million (Krui based) Rp.1,580 million (Pulau Baai based)

## Component 2 : Purse Seine Fishery

### 1. Purse Seine Fishing

#### (1) Revenue

Annual catch	:	162 tons
Selling price	:	Rp.500/kg
Total Revenue	:	Rp.81 million

#### (2) Operational Cost

##### A. Fuel

Engine power	:	90 hp		
Operating status	:	Navigation	Net haul	Moving
Operating rate	:	95%	12%	37%
Operating power	:	86 hp	11 hp	34 hp
Service speed	:	8 knot		
Operating hours	:	6hrs x 2	2hrs x 6	6hrs
Fuel volume	:	231 liters	30 liters	46 liters
Total fuel volume	:	27,630 liters (307 liters/trip x 90 trips/year)		
Price of fuel	:	Rp.325/liter		
Fuel cost	:	Rp.9.0 million		
Lubricant oil	:	3% of above		
Lubricant cost	:	0.3 million		

B. Ice @Rp.50/kg x 2,000 kgs x 90 trips Rp.9.0 million

##### C. Manpower

Captain	@Rp.500,000/month	1 head	Rp.6.0 million
Skilled	@Rp.300,000/month	2 heads	Rp.7.2 million
Unskilled	@Rp.100,000/month	5 heads	Rp.6.0 million

##### D. Foods

@Rp.2,000/day x 8 heads x 3 days x 60 trips Rp.2.9 million

E. Fishing net for repair and maintenance Rp.5.0 million

F. Maintenance 5% of vessel cost Rp.4.5 million

	Total Operating Cost	Rp.49.9 million
(3) Operating Profit	per boat	Rp.31.1 million
	per 20 boats	Rp.622 million

## 2. Fish Marketing Business

### (1) Revenue

Total annual catch	:	3,240 tons (162 tons x 20 boats)
Selling price	:	Rp.1,000/kg (local market)
Gross sales	:	Rp.3,240 million

### (2) Operation Cost

1) Fish purchase cost	:	Rp.1,620 million (Rp.81 million x 20 boats)
2) Fish marketing cost	:	
a) Ice making plant	:	
Electricity	:	Rp.124.4 million (Rp.120/kwh x 120 kw x 24 hrs. x 360 days)
Manpower	:	Rp.54 million (Rp.300,000/month x 12 months x 15 staffs)
Maintenance:	:	Rp.100 million (5% of plant cost)
Miscellaneous:	:	Rp.20 million
Total cost	:	Rp.298.4 million
b) Local marketing cost	:	Rp.324 million (Rp.100/kg x 3,240 tons)
3) Office administration cost:	:	Rp.120 million (Rp.10 million/month x 12 months)

Total Operation Cost: Rp.2,362 million

(3) Operating Profit	:	Rp.878 million
----------------------	---	----------------



## Appendix A2.4 Calculation of Financial Internal Rate of Return (FIRR)

Table A2.4.1 Tuna Long-line Individual Fishing Boat

(Unit: Rp.1,000)							
Project Year	Cost		Sales		NPV	NPV	
	Investment	Operating	Total	Revenue	Balance	0.9	0.8
1	130000		130000		-130000	-130000	-130000
2		44000	44000	68400	24400	21960	17568
3		44000	44000	68400	24400	19764	12649
4		44000	44000	68400	24400	17788	9107
5		44000	44000	68400	24400	16009	6557
6		44000	44000	68400	24400	14408	4721
7		44000	44000	68400	24400	12967	3399
8		44000	44000	68400	24400	11670	2447
9	30000	44000	74000	68400	-5600	-2411	-404
10		44000	44000	68400	24400	9453	1269
11	40000	44000	84000	68400	-15600	-5439	-584
12		44000	44000	68400	24400	7657	658
13		44000	44000	68400	24400	6891	474
14		44000	44000	68400	24400	6202	341
15		44000	44000	68400	24400	5582	245
						12501	-71553
						FIRR =	11.49

Notes : 9th year investment for replacement of fishing gear.  
11th year investment covers replacement of boat engine.

Table A2.4.2 Tuna Marketing Business (Pulau Baai Based)

(Unit: Rp. million)							
Project Year	Cost		Sales		NPV	NPV	
	Investment	Operating	Total	Revenue	Balance	0.7	0.6
1	1800		1800		-1800	-1800	-1800
2	800	1580	2380	3805	1425	998	599
3		1580	1580	3805	2225	1090	392
4		1580	1580	3805	2225	763	165
5		1580	1580	3805	2225	534	69
6		1580	1580	3805	2225	374	29
7		1580	1580	3805	2225	262	12
8		1580	1580	3805	2225	183	5
9	400	1580	1980	3805	1825	105	2
10		1580	1580	3805	2225	90	1
11	500	1580	2080	3805	1725	49	0
12		1580	1580	3805	2225	44	0
13		1580	1580	3805	2225	31	0
14		1580	1580	3805	2225	22	0
15	-800	1580	780	3805	3025	21	0
						2765	-525
						FIRR =	38.40

Notes : 2nd year investment for working capital.  
9th year investment for replacement of vehicles, etc.  
11th year investment for replacement of ice plant machinery.  
15th year investment shows the pay-back of working capital.

Table A2.4.3 Tuna Marketing Business (Krui Based)

Project Year	Cost		Sales		NPV		
	Investment	Operating	Total	Revenue	Balance	0.7	0.6
1	2000		2000		-2000	-2000	-2000
2	800	1246	2046	3113	1067	747	448
3		1246	1246	3113	1867	915	329
4		1246	1246	3113	1867	640	138
5		1246	1246	3113	1867	448	58
6		1246	1246	3113	1867	314	24
7		1246	1246	3113	1867	220	10
8		1246	1246	3113	1867	154	4
9	400	1246	1646	3113	1467	85	1
10		1246	1246	3113	1867	75	1
11	2000	1246	3246	3113	-133	-4	0
12		1246	1246	3113	1867	37	0
13		1246	1246	3113	1867	26	0
14		1246	1246	3113	1867	18	0
15	-800	1246	446	3113	2667	18	0
						1693	-985
						FIRR =	36.32

Notes : 2nd year investment for working capital.

9th year investment for replacement of vehicles, etc.

11th year investment for replacement of ice plant machinery.

15th year investment shows the pay-back of working capital.

Table A2.4.4 Tuna Fishing (20 units) including Marketing Business (Pulau Baai Based)

Project Year	Cost		Sales		NPV		
	Investment	Operating	Total	Revenue	Balance	0.7	0.6
1	4400		4400		-4400	-4400	-4400
2	800	2466	3266	5173	1907	1335	801
3		2466	2466	5173	2707	1326	478
4		2466	2466	5173	2707	929	201
5		2466	2466	5173	2707	650	84
6		2466	2466	5173	2707	455	35
7		2466	2466	5173	2707	318	15
8		2466	2466	5173	2707	223	6
9	1000	2466	3466	5173	1707	98	2
10		2466	2466	5173	2707	109	1
11	1300	2466	3766	5173	1407	40	0
12		2466	2466	5173	2707	54	0
13		2466	2466	5173	2707	37	0
14		2466	2466	5173	2707	26	0
15	-800	2466	1666	5173	3507	24	0
						1225	-2777
						FIRR =	33.06

Table A2.4.5 Tuna Fishing (20 units) including Marketing Business (Krui Based)

Project Year	Cost		Sales Revenue	Balance	NPV		
	Investment	Operating			Total	0.7	0.6
1	4600		4600		-4600	-4600	
2	800	2126	2926	4481	1555	1089	
3		2126	2126	4481	2355	1154	
4		2126	2126	4481	2355	808	
5		2126	2126	4481	2355	565	
6		2126	2126	4481	2355	396	
7		2126	2126	4481	2355	277	
8		2126	2126	4481	2355	194	
9	1000	2126	3126	4481	1355	78	
10		2126	2126	4481	2355	95	
11	2800	2126	4926	4481	-445	-13	
12		2126	2126	4481	2355	47	
13		2126	2126	4481	2355	33	
14		2126	2126	4481	2355	23	
15	-800	2126	1326	4481	3155	21	
						166	-3232
						FIRR =	30.49

Table A2.4.6 Purse Seine Individual Fishing Boat

Project Year	Cost		Sales Revenue	Balance	NPV		
	Investment	Operating			Total	0.9	0.8
1	120000		120000		-120000	-120000	
2		49900	49900	81000	31100	27990	
3		49900	49900	81000	31100	25191	
4		49900	49900	81000	31100	22672	
5		49900	49900	81000	31100	20405	
6		49900	49900	81000	31100	18364	
7		49900	49900	81000	31100	16528	
8		49900	49900	81000	31100	14875	
9	30000	49900	79900	81000	1100	474	
10		49900	49900	81000	31100	12049	
11	40000	49900	89900	81000	-8900	-3103	
12		49900	49900	81000	31100	9760	
13		49900	49900	81000	31100	8784	
14		49900	49900	81000	31100	7905	
15		49900	49900	81000	31100	7115	
						69007	-44497
						FIRR =	16.08

Notes : 9th year investment for replacement of fishing gear.  
11th year investment covers replacement of boat engine.

Table A2.4.7 Fish Marketing Business (Pulau Baai)

							(Unit: Rp. million)	
Project	Cost		Sales		NPV	NPV		
Year	Investment	Operating	Total	Revenue	Balance	0.9	0.8	
1	2600		2600		-2600	-2600	-2600	
2	800	2362	3162	3240	78	70	56	
3		2362	2362	3240	878	711	455	
4		2362	2362	3240	878	640	328	
5		2362	2362	3240	878	576	236	
6		2362	2362	3240	878	518	170	
7		2362	2362	3240	878	467	122	
8		2362	2362	3240	878	420	88	
9	400	2362	2762	3240	478	206	35	
10		2362	2362	3240	878	340	46	
11	1000	2362	3362	3240	-122	-43	-5	
12		2362	2362	3240	878	276	24	
13		2362	2362	3240	878	248	17	
14		2362	2362	3240	878	223	12	
15	-800	2362	1562	3240	1678	384	17	
						2436	-999	
						FIRR =	17.09	

Notes : 2nd year investment for working capital.

9th year investment for replacement of vehicles, etc.

11th year investment for replacement of ice plant machinery.

15th year investment shows the pay-back of working capital.

Table A2.4.8 Purse Seine Fishing (20 units) including Marketing Business

							(Unit: Rp. million)	
Project	Cost		Sales		NPV	NPV		
Year	Investment	Operating	Total	Revenue	Balance	0.9	0.8	
1	5000		5000		-5000	-5000	-5000	
2	800	3360	4160	4860	700	630	504	
3		3360	3360	4860	1500	1215	778	
4		3360	3360	4860	1500	1094	560	
5		3360	3360	4860	1500	984	403	
6		3360	3360	4860	1500	886	290	
7		3360	3360	4860	1500	797	209	
8		3360	3360	4860	1500	717	150	
9	1000	3360	4360	4860	500	215	36	
10		3360	3360	4860	1500	581	78	
11	1800	3360	5160	4860	-300	-105	-11	
12		3360	3360	4860	1500	471	40	
13		3360	3360	4860	1500	424	29	
14		3360	3360	4860	1500	381	21	
15	-800	3360	2560	4860	2300	526	23	
						3817	-1889	
						FIRR =	16.69	

## Appendix A2.5 Fishing Village Community Development Project (Code No. B-11, and B-12)

This appendix is for reference in relation to the offshore fisheries development project.

This project is ranked as a low priority in the long list, but it is very important for promotion of fishery in the western water of the Region, in harmony with offshore fishery development project. The former project is aimed at development of artisanal coastal fishery while the later is designed for commercial fishery promotion by the private enterprises. This project will receive both direct and indirect benefits from the participated private enterprises particularly in technical development of fishing and KUD-based fish marketing. The proposed scope of the project including the methods of approach for development of village fishery is given hereinafter for a reference.

### (1) Background

Fisheries, particularly marine fishery in Bengkulu Selatan has a rich fish resources potential. However, the fishermen is limited both in number and capability mainly because of the severe natural condition that coast line is directly faced to Indian Ocean with direct attack of strong waves. This makes difficult to construct appropriate fishing port and thus opportunity of private investment becomes few.

The Kabupaten Bengkulu Selatan produced about 1,360 tons of marine fish in 1991, which accounts for only 10% of the provincial total. Local fishermen engage in artisanal fishing in the coastal water using mainly gill net and hook-and-lines. There are 13 fishing villages with 1,455 fishing households and 406 units of fishing boats/canoes. The fishing canoes/boats are ranged from 2 to 10 m in length, and about 75% are non-motorized. The major catch includes sharks, catfish, grunter, red snapper, king mackerel, etc. The region exported about 57 tons of fishery products comprising of shrimp, lobster, seaweed, shark oil and frog via Bandar Lampung and Jakarta in 1991. Due to low level of fish catch and its seasonal fluctuation in volume, fish price is relatively high, and during east wind season (Mar.-Aug., non-fishing season) the region's demand largely depends on fishes from North and West Sumatra.

The Directorate General of Fisheries (DGF) has been trying to promote those small-scale fishermen with provision of outboard engines and fishing gears, and the recent program includes the following:

Program 1: Outboard Engine Supply (through credit)	
1991/92	12 units for Padang Baru & Pasar Lama (each 6)
1992-93	30 units for Tg. Pandan & Linau (each 15)

Program 2: Fishing Gear Supply (using a revolving fund)	
1992/93	Gill net 150 units for Pasar Bawah
	Gill net 250 units for Muara Kinam

The region has also received about Rp. 10 million for fishery development in Bengkulu Selatan through Badan kredit Kecamatan (BKK) under USAID program. The fund was used for credit to small-scale fishermen (KUD member owning a land as collateral) at max. Rp. 1 million per fisherman with a monthly interest of 1%, a 2-year pay-back period and a 3-month grace period.

In the major fishing villages such as Pasar Bawah (Kec. Manna), Pasar Lama and Sekunyit (Kec. Kaur Selatan), there is village-based cooperatives (KUD). The KUD's activities in the region are still in the embryonic stage, because of the lack of adequate management and financial capabilities. The largest fish landing base, Pasar Bawah (Kec.

Manna), is only one KUD that manages fish auction/bargaining in this Kabupaten even though it is still small-scale.

As for aquaculture in Bengkulu Selatan, freshwater fish ponds are relatively well developed and their productivity is high because of nutrient rich soils and water availability. As one of components for village integrated development and along with the land use plan in the irrigated areas, freshwater fish ponds (Kolam) can be further promoted in the region. In 1992/93, the government plans to construct fish ponds (0.7 ha x 20 ponds) for small-scale farmers at Ulu Kinal. In addition, 3 private companies have launched frog culture in Kec. Segilim for export since 1991. Due to the limitation of forest buffer zone to protect from high wave and heavy metal contents in the coastal area, the potential for brackishwater aquaculture (tambak) seems no to be so prospective. Inland fishery activities are also limited because of short length of rivers with large gravity.

## (2) Project Objectives

- 1) to upgrade living standard of artisanal fishermen with improvement of fishing village environment
- 2) to increase fish catch introducing better fishing equipment and boats.
- 3) to organize and strengthen the fishermen's cooperatives for fish marketing, engine maintenance and other fishery related activities

## (3) Project Scope

### A. Fishing Boat Motorization & Enlargement

#### (1) Development Step

About 400 small-scale fishermen (full-time) will be developed with motorization and enlargement of fishing boat and gear. The development will be made step by step depending on his technical competence (carrier) and within financial allowance (pay back ability of credit). The credit should be provided to fishermen under a revolving fund system which is currently conducted by Directorate general of Fisheries. That is, the paid-back money will be deposited as a fund and used for further purchase of fishing gear and material. Along with the promotion of fisheries cooperatives (KUD) in future, this credit activity will be handed over from the government to an association of KUD.

Table A2.5.1 Development Steps of Fishermen with Boats & Engines

Dev. Stage	Present Status	Minimum Development Step to be Taken
I	fishermen w/o boat	to be independent fishermen with boat.
II	small boat (2-4 m long) w/o OBE	motorization with 8-15 hp OBE
III	medium boat (5-7 m long) w/o OBE	motorization with 15-25 hp OBE
IV	medium boat (5-7 m long) with OBE	large boat with 25-40 hp OBE
V	large boat (8-10 m long) with OBE	inbord engine type boat

Note: OBE; outboard engine

Most of fishermen without boat or with small boats can be assumed to be seasonal fishermen (only engage in fishing during a fishing season Sep.- Mar.)

#### (2) Fishing Boat Motorization Plan

It is proposed that the renewal of fishing boat and engine will be taken place every 5 years (Usual life span of outboard engines are 2-3 years, but will be used in Indonesia for 5 years). All medium and large boats will be objected under this scheme. That is, about 50% of fishing boats out of 400 boats will be improved step-by-step every 5-year span. The remaining

small boats (about 200 units) which are mainly used by seasonal fishermen will not be appropriate to enlarge their fishing capacity even though appropriate technical and financial assistances are provided. It is roughly assumed that about one-fourth of those small boats in every 5 years will be improved in accordance with this scheme. fishermen without boats are not accounted since they will be employed as crew for boats.

Table A2.5.2 Number of Engines to be Provided in Every 5-Year Span

Kecamatan	8-15hp				15-25hp				25-40hp				Inboard engine			
	1995	2000	2005	2010	1995	2000	2005	2010	1995	2000	2005	2010	1995	2000	2005	2010
Seluma	4	4	4	4	-	4	4	4	-	-	4	4	-	-	-	4
Talo	6	6	6	6	-	6	6	6	-	-	6	6	-	-	-	6
Pino	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manna	-	-	-	-	20	-	-	-	30	20	-	-	20	30	20	-
K.Utara	3	3	3	3	-	3	3	3	-	-	3	3	-	-	-	3
K.Tengah	10	10	10	10	15	10	10	10	-	15	10	10	-	-	15	10
K.Selatan	30	30	30	30	50	30	30	30	30	50	30	30	20	30	50	30
<b>Total</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>85</b>	<b>53</b>	<b>53</b>	<b>53</b>	<b>60</b>	<b>85</b>	<b>53</b>	<b>53</b>	<b>40</b>	<b>60</b>	<b>85</b>	<b>53</b>

Under this plan, all fishing boats will be motorized by 2010 gradually, and about 60% of boats (238 units) will be upgraded to the inboard engine type boats (diesel) that enable fishermen go farer fishing grounds and stay in the sea for a longer period. It is estimated that total fish catch will be increased to about 12,800 tons/year as below:

- 1) Inboard engine boat
  - a) Season (1,500 kg/trip x 3 trips/month x 6 months) 27 tons
  - b) Non-season (750 kg/trip x 3 trips/month x 6 months) 20 tons
  - c) Annual Catch per Boat (47 tons/boat x 238 boats) 11,186 tons
  - Total Catch 11,883 tons
  
- 2) Outboard engine boat
  - a) Large sized (average 75kg/day x 240days x 53units) 954 tons
  - b) Medium sized (average 37.5kg/day x 240days x 53units) 477 tons
  - c) Small sized (average 15kg/day x 240days x 53units) 191 tons
  - Total Catch 1,622 tons

### (3) Fishing Boats Enlargement Plan

Fishing boats will be also enlarged step-by-step with the same pace with the promotion of fishing boat motorization. The life span of boats/canoes is normally 10 years, longer than engines. The second-hand boats will have to be well utilized under the KUDs' information network in Bengkulu Selatan.

Since all fishing boats/canoes land fishes at sand beach, and there is no appropriate site for fishing port in Bengkulu Selatan except Linau. In this aspect, the inboard engine boats which can be beaching will be introduced to the region, while ordinarily type inboard engine boats may have to use the proposed new port in Linau for fish landing.

## B. Improvement of Fishing Village Environment

### (1) Establishment of Community Fisheries Center

As a key facilities for strengthening the KUD-based activities; engine repair maintenace service, purchase & sales of fishing and daily requisites, fish marketing and credit

provision, and also for establishing an appropriate network among coastal fishing villages (an association of KUD), the Community Fisheries Center will be established as a key facilities in the most fishing activated area, Pasar Bawah (Kec. Manna). The Center will composed of office, meeting/training room, small engine workshop with a slipway, ice making plant/storage (2-3 tons/day, 30 cu.m.), fish handling/auction shed, retail market, radio station, toilet/shower, fishing gear storage, water/fuel supply system, etc.

## (2) Coastal Line Protection

As often seen in the coastal area of Bengkulu Selatan, Pasar Bawah (Kec. Manna) also suffers from coastal erosion problem. Numerous volume of stones which are brought from nearby Sungai Manna cover the sand beach. These stones seems to play a role as armor stones making slow down of the scooping-out of coast line, but causing the difficulty of hauling of fishing boats to the beach. The stones are collected by manual power and used as construction materials. In order to protect the coast line from the further erosion, it is proposed to install the floating breakwater about 100 m off coast, and to create sand beach for boat hauling.

## (3) Radio Communication Network

Communication network will be indispensable not only to establish a KUD-based fishery-related network services for coastal fishing villages but also to improve their daily life. In order to ensure reliable communication among the villages and the Center, radio communication station (SSB) should be made in each village.

## C. Engine Maintenance/Repair Service System

At present, there is no workshop for boat engines in Bengkulu Selatan. Spareparts supply is depended on the marchants from Palembang, and the maintenane service is only provided at mobile repair shop in Manna. The lack of appropriate engine maintenance/repair system makes life span of engines shorten. In Muara Maras (Kec. Talo), for example, there were 5 units of outboard engines but all were damaged and abundant without bringing into Manna for market, because of no transportation means (no truck and no motorcycle) and they do not know how engines can repair/should be maintained.

Based on the workshop which will be facilitated in the Community Fisheries Center in Pasar Bawah (Kec. Manna), the appropriate engine repair/maintenance service network among 13 coastal fishing villages in Bengkulu Selatan should be established. Mobile stations such as repair service vehicle will be effective for performing the regular maintenance/repair service. In the beginning, private mechanics will be invited to provide fishermen with necessary services using the Center's workshop under the KUD's management. In the meantime, local engineers will be trained in the Center and also in the fields, so that they can open a field service shop in other villages.

## D. Fish Marketing Promotion

Fishes landed at each fishing village are mostly distributed by small-scale motorcycle/bicycle venders to the nearby villages within the same kecamatan. The daily landing volume is limited in volume at present, but will gradually increase along with fishing boat motorization & enlargement scheme. The Center will collect the surplus of fishes from each village using a pick-up truck. Insulated fish containers (approx. 150 liter) with ice will be delivered to each village for temporary stock of fishes.