

## ***CHAPTER 3 THE STUDY AREA***

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### 3.1 General Features

#### 3.1.1 Population and Administration

As mentioned, the Study Area covers the part of Dong Thap and Tien Giang Provinces. Located in the northern/north-eastern part of the Mekong River Delta, the 2 Provinces of Dong Thap and Tien Giang occupy about 14% (560,000 ha) of the Delta's total land area (3,956,000 ha). Total population of each Province is approximately 1,556,667 for Dong Thap and 1,769,257 for Tien Giang in 1998. Administratively, the provinces are divided into districts (and towns) and then to communes. Administrative units of two provinces are shown as follows.

Area - Population - Administrative Units Under the Provinces

Dong Thap Province				Tien Giang Province			
Name of Towns and Districts	Area (Km <sup>2</sup> )	Population (person)	No. of communes / precincts	Name of Towns and Districts	Area (Km <sup>2</sup> )	Population (person)	No. of communes / precincts
<b>Whole Province</b>	<b>3,227</b>	<b>1,556,667</b>	<b>139</b>	<b>Whole Province</b>	<b>2,326</b>	<b>1,769,257</b>	<b>163</b>
2 Towns				2 Towns			
Cao Lanh	97	140,967	13	My Tho*	50	176,107	13
Sa Dec*	58	95,846	8	Go Cong*	31	60,240	8
9 Districts				7 Districts			
Tan Hong	292	75,729	9	Cai Be	401	298,199	24
Hong Ngu	320	209,727	16	Cai Lay	409	346,139	28
Tam Nong	453	92,732	12	Tan Phuoc*	329	45,990	13
Thanh Binh	329	150,754	13	Chau Thanh*	254	267,926	25
Cao Lanh	462	192,902	18	Cho Gao*	235	200,076	19
Thap Muoi	519	120,229	13	Go Cong Tay*	257	178,470	16
Lap Vo*	244	170,092	13	Go Cong Dong*	360	196,110	17
Lai Vung*	219	153,374	12				
Chau Thanh*	234	154,315	12				

(Towns and districts with \* mark above are not included in the Study Area)

#### 3.1.2 General Conditions of Agriculture

As mentioned above, the Study Area covers 1 town (Cao Lanh) and 6 districts ( Tan Hong, Hong Ngu, Tam Nong, Thanh Binh, Cao Lanh and Thap Muoi ) of Dong Thap province and 2 districts(Cai Be and Cai Lay) of Tien Giang province. Most of the inhabitants in these town or districts are involved in agriculture, notably paddy production. With the total farm household of 202 thousand, 519 thousand persons are engaged in agriculture in 1997. Among 228 thousand ha of agricultural land, nearly 90 % or 200 thousand

200 thousand ha are used as paddy land. This clearly shows the importance of paddy in the Study Area. Other agricultural land includes perennial crops of 27 thousand ha or 10% of the agricultural land. These land are mostly devoted to fruits growing which, though rather limited in acreage at the moment, is gradually increasing particularly in the southern part and along the Tien River in the Study Area.

Farm size in the Study Area is around 1.13 ha per farm household, which is fairly higher than the national average of 0.71 ha. As a reference, the corresponding figure for Mekong Delta is 1.16 ha and for Red River Delta is 0.25 ha.

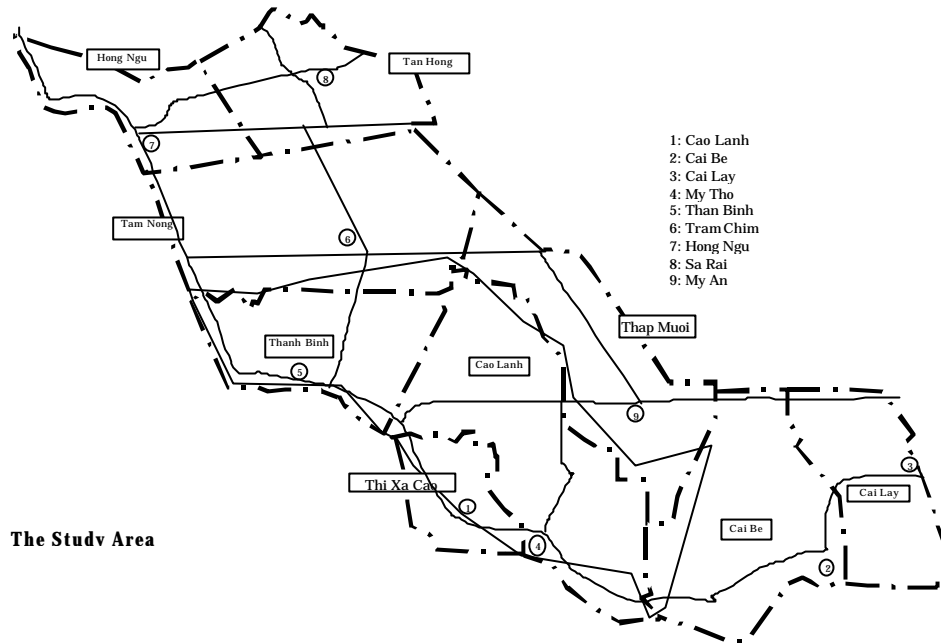
As mentioned elsewhere, the Study Area is roughly divided into 3 sub areas by current inundation condition. Upper part of the Study Area (Hong Ngu, Tan Hong) are deep inundation area and central area (Tam Nong, Thanh Binh and part of Thap Muoi, Cao Lanh) are medium inundation area while the southern part (Cao Lanh town, Cai Be, Cai Lay and part of Thap Muoi, Cao Lanh) are shallow inundation area. Paddy cropping pattern differs from double crops to triple crops according to the above inundation patterns. Generally, double cropping of paddy is popular in northern and central parts of the Study Area (Hong Ngu, Tan Hong, Tam Nong and Thanh Binh), while triple cropping is mostly practiced in the southern part (Thap Muoi, Cao Lanh, Cai Be and Cai Lay). Average farm size differs by districts, from the smallest of 0.41 ha/household of Cao Lanh town to the largest of 2.4 ha/household of Tan Hong district.

The result of socio-economic survey conducted under this study provides some insight on the farm household economy of the Study Area. Gross income/ farm household in the Study Area was 38.95 million VND. On average, farm household income consists of, 91 % from agriculture. Among agricultural income, 93% is from crop production sector. The result of this sample survey also reveals that there exists wide variation among farm household in each province and also existence of landless in substantive number.

## **3.2 Natural Conditions**

### **3.2.1 Topography**

The Study Area is a land of 298,500 ha, surrounded by national border line with Cambodia at the northern part, the Tien River flowing in western and southern parts. Several canals are constructed in the eastern part (Tong Doc Loc, Ba Rai canals). Parts of Dong Thap Province (6 districts and 1 town) and Tien Giang Province (2 districts) are included in the Study Area.



The Study on Integrated Agricultural Development Plan in the Dong Thap Muoi Area

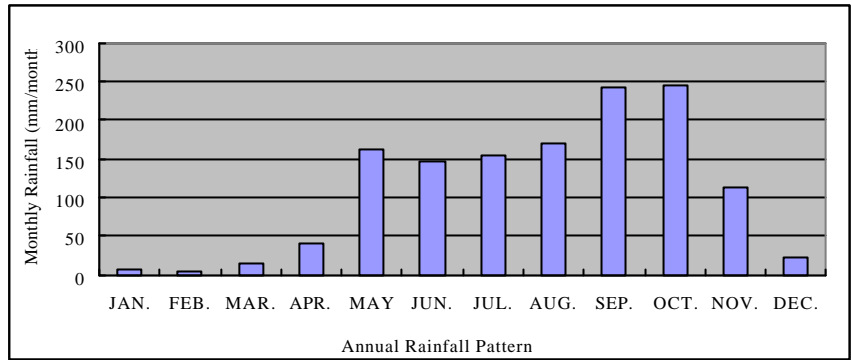
The altitude of the Study Area varies from 0.3 to 4.0 m a.s.l. and the land is gradually sloping down from North-West to South-East topographically. In general, river water from the Tien River is flowing from West to East or North to South through the several canals. However, depending on the river water level, direct runoff of rainfall in the area is drained to canals and flowing into the nearest river connecting point. The water levels in the canals are influenced by tides of the South China Sea and vary approximately 3.0 m/day (at Southern part) to 0.6 m/day (at Northern part) in dry season. The influence of tidal wave is reduced in the rainy season by high river water level.

### 3.2.2 Meteorology and Hydrology

The climate conditions in the Study Area are summarized below:

Annual rainfall	: 1,000 to 1,600 mm/year
Temperature	: 27 °C (Monthly Max.: 37°C, Monthly Min.: 15 °C)
Humidity	: 80 % (Monthly Max.: 98 %, Monthly Min.: 46 %)
Evaporation (Observation)	: 1,200 mm/year
Wind Velocity	: 1.0 to 1.5 m/s (Max. 10.0 to 17.0 m/s)
Sunshine	: 7 hours/day

Annual rainfall pattern in the Study Area as shown in the figure is divided into two seasons (rainy season from May to November, dry season from December to April). More than 90 % of annual rainfall is concentrated in rainy season.

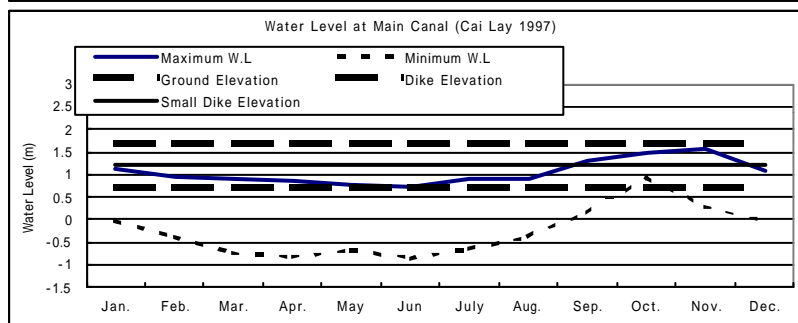
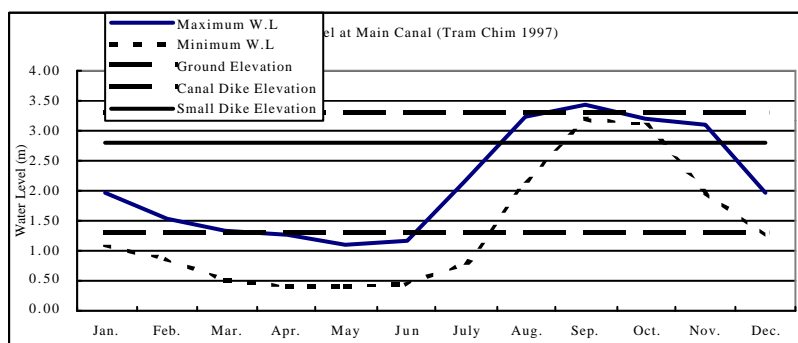


Based on the monthly data, meteorological and hydrological conditions at Cao Lanh are summarized below:

	Jan.	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall (mm)	7.4	3.8	14.8	41.7	161.2	146.2	154.6	169.0	242.9	244.6	112.2	22.1	1,318.8
Mean Temp. (°C)	25.4	25.9	27.4	28.7	28.2	27.5	27.2	27.1	27.3	27.2	26.7	25.4	27.0
Max. Temp. (°C)	31.9	32.8	34.8	36.1	35.2	33.8	33.4	32.8	32.4	31.8	31.5	31.6	33.2
Min. Temp. (°C)	19.8	20.6	21.1	22.9	23.4	22.9	22.8	23.0	23.1	23.0	22.0	20.0	22.0
Relative Hum. (%)	82.2	80.8	77.6	77.8	83.8	86.3	86.5	86.5	86.3	85.8	81.9	80.8	83.1
Evaporation (mm)	91.8	97.4	134.9	135.3	98.6	85.2	83.7	88.4	71.4	67.3	85.5	99.2	1,138.6
Wind Velocity (m/s)	1.1	1.3	1.5	1.4	1.2	1.5	1.2	1.7	1.1	1.1	1.3	1.1	1.3
Sunshine (hours)	272.8	266.2	299.8	275.1	228.2	181.1	211.2	182.3	191.0	188.2	221.7	265.8	2,783.4
Mean Canal W.L. (m)	0.86	0.66	0.52	0.40	0.33	0.45	0.76	1.10	1.48	1.73	1.51	1.11	0.91
Max. Canal W.L. (m)	1.53	1.40	1.28	1.19	1.14	1.27	1.50	1.72	1.96	2.09	1.94	1.68	2.09
Min. Canal W.L. (m)	-0.16	-0.58	-0.78	-0.83	-0.85	-0.74	-0.29	0.18	0.72	1.17	0.77	0.20	-0.85

### 3.2.3 Inundation Conditions

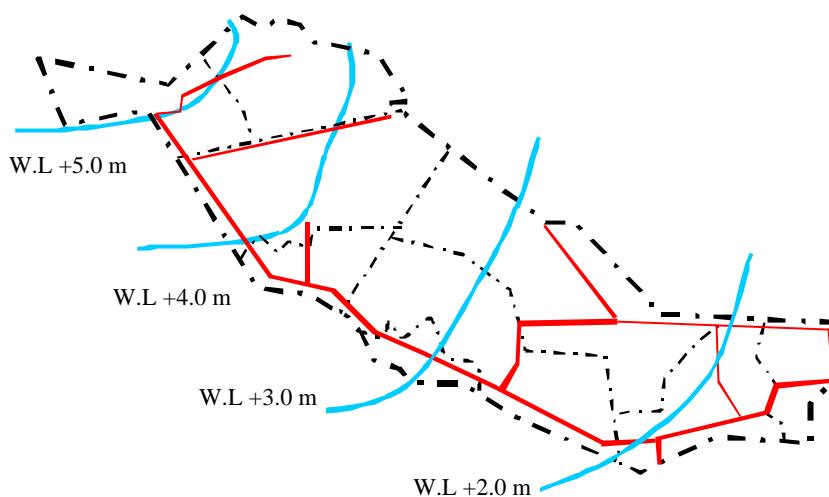
In the Study Area, there are three types of inundation occurring in rainy season (August to November).



One is caused by large amount of flood water from the Mekong River. Usually in August, the inundation starts from northern part of the Study Area bordering Cambodia and, within around two weeks, this inundation covers all the Study Area for three to four months. The water depth of inundation is approximately more than 4.0 m (Northern part) to 0.5 m (Southern part) and this is one of the biggest constrains for

agricultural activities. The dikes with 1.0 m to 4.0 m height are installed along the most of main and

secondary canals. In addition, small dike systems with 0.5 m to 3.0m height for 50 ha to 300 ha have been constructed covering for around 60 % of the agricultural land since early 1980. The inundation can be mitigated by this small dike system in August for securing the harvest of summer-autumn paddy crop. Only around 5 % of small dike systems can prevent inundation throughout the year (the case in 1996 is exceptional). Since these dike systems do not have structures such as spillway and water gate, farmers are now pumping and cutting dike to drain the water inside of the dikes. The maximum water level in 1996 is illustrated as shown below.



Maximum Water Level in 1996

The second type of inundation is caused by tidal influence and occurs in rainy season when river water is high. This occurs only at the Tien River side area in Southern part and continues around 10 days with 12 hours interval. The third type is caused by direct runoff of rainfall with high intensity and this occurs in rainy season for a few hours with around 10 cm of water depth.

### 3.2.4 Soil Conditions

#### (1) Soil Resources in the Project Area

The Study Area is a floodplain extending toward the east of the Tien River and its landscape consists of natural levee along the Tien River and backswamp extending behind the levee. The levee is characterized by relatively higher elevation (2-4m) and is, consequently, in relatively good drainage conditions. Behind the levee, lower laying areas occur formed of heavier-textured and impermeable silts and clays. The area is subjected to periodic inundation, thereby regular supply of fertile alluvium, which is transported from the upstream of the river, maintains the region's soil fertility. On the other hand, the major constraint to region's development is posed by Acid Sulphate Soil (*Thionic Fluvisols*) which covers over northern part of the Medium-Inundation Area, and sparsely spread in the Shallow-inundation Area.

The Study Area contains four soil groups, namely Fluvisols, Cambisols, Acrisols and Arenosols. Soil Map of the Area is given in the following page and their properties, potentials and constraints are

summarized in the Table C-1 (Appendix C).

**(2) Acid Sulphate Soils (*Thionic Fluvisols* )**

Special attention must be paid to *Thionic Fluvisols* which is acidic or become acidic by the drainage or lowered water table. *Thionic Fluvisols* extends over Tam Nong district and sparsely distributes over Cao Lanh, Thap Muoi and Cai Be Districts. Acid sulphate soils in the Study area can be divided broadly into two subgroups, one as Potential Acid Sulphate Soils and another as Actual Acid Sulphate Soils. Potential Acid Sulphate Soils contain ‘sulfidic material’ that does not pose acidity unless the material is oxidized. Mismanagement of water regime, excessive drainage of the field or excavation of the soil induce oxidation of ‘sulfidic material’ to form ‘sulphuric horizon’ resulting in lowered pH of soil and thereby decreased crop yield and negative environmental impacts to the surrounding area. The most severe hazards are presented by Actual Acid Sulphate Soils. They are actively generating sulphuric acid from the reserve of oxidizable sulphides. Their potentials and constraints are summarized in Table C-2 (Appendix C).

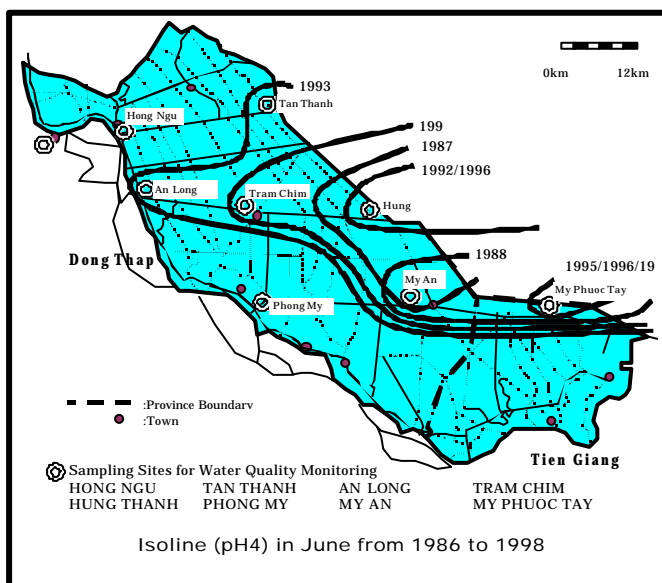
**3.2.5 Natural Environmental Conditions**

**(1) Introduction**

This section deals with environmental problems arising in the study area. The first issue is the problems associated with the presence of acid sulfate soil including the problem in water quality of the region. The second is the description of the Tram Chim National Park situated in the center of the Dong Thap Province. It requires particular attention in formulation of Master Plan.

**(2) Acid Sulfate Soil and associated problem**

As mentioned in 3.2.4 Soil Conditions, acid sulfate soil distributes in the Study Area covering particularly



northern part of the Medium Inundation Area as shown in the Soil Map. Project areas should be carefully selected so as not to include the area influenced by acid sulfate soil. Acid sulfate soils generate sulfuric acid that leaks into drainage and floodwater, dissolves aluminum soil minerals, and corrodes steel and concrete. Presence of Acid Sulfate Soils influences quality of surface water which is exploited for such domestic use as drinking. Sulfate ( $SO_4^{2-}$ ) generated during non-inundation period by oxidation of sulfidic material is washed away at the

beginning of rainy season in June. The figure given above describes the area influenced by decreased pH. The given line is the isoline at pH 4.

### (3) Tram Chim National Park

Tram Chim National Park is located in the central part of the Study Area, with around 7,000ha. The area of the present National Park (Refer to the following figure.) was originally delimited as a plantation zone for Melaleuca trees, on a commercial scale. With the concomitant purposes of preservation of the battle field during the war and that of the last piece of wetland representative of the original vast expanse of fresh water tidal marsh this area was reserved. The rediscovery of the Eastern Sarus Crane in the middle of 1980's drew the world's attention to the area. The International Crane Foundation commenced its assistance to the Dong Thap Province in preservation of the cranes, as well as complex ecosystem of other fauna and flora that support the life of the cranes. The area was designated as a district-level reserve in 1986, and upgraded as a national reserve in 1994. The Park is rich in biological diversity with unique bioresources. The Eastern Sarus Crane (*Grus antigone sharpii*) is, among others, of great importance in respect to its rarity. Apart from the crane, the vegetation such as Melaleuca cajuputi and Eleocharis whose tuber is a main food of the crane are prevalent and freshwater fish, turtles, shrimp and snakes are important bioresources with economic values.

#### The Eastern Sarus Crane (*Grus antigone sharpii*)

Estimated Population	: 500 to 1500
Distribution	: Camobodia, Vietnam and Laos
IUCN Red List Category	: Endangered under criteria Aac, d,e

Meine *et al.* reports the status of the Eastern Sarus Crane. The BOX in the following page is the excerpt form the report.

#### The Eastern Sarus Crane (*Grus antigone sharpii*)

The Eastern Sarus Crane survives in Vietnam, Laos, and Cambodia (Duc 1991) throughout the Mekong River delta. It was presumed to have gone extinct in the area during the devastation of the Vietnamese War. However, in 1984, local officials in Vietnam reported that the species had reappeared. In 1986, ornithologists from the University of Hanoi confirmed that a flock had spent the dry season (December-April) on the Plain of Reeds. The flock was discovered in Vietnam at a 7500 ha impoundment, the Tram Chim wetland (Brehm Fund 1987, Duc 1987, Harris 1987, Duc et al. 1989). The exact location of this population's breeding grounds have yet to be determined, but Eastern Sarus Crane nests have recently been confirmed at three sites in northeastern Cambodia (Barzen 1994). Seasonal movements of the subspecies have not been well studied. They may entail distances of up to several hundred kilometers within the Mekong River basin (R. Beilfuss pers. comm.). The Eastern Sarus Cranes breed during the monsoon season (May-October). Of three nests recently found in northeastern Cambodia, all were located in isolated wetlands less than 150 ha in size and surrounded by dry, open dipterocarp forests (Barzen 1994). As the dry season progresses, the birds gradually concentrate, form flocks, and move to their dry season habitats in the Mekong River delta.

Source: Meine, Curt D. and George W. Archibald (Eds), 1996. The Cranes: - Status Survey and Conservation Action Plan. IUCN, Gland, Switzerland, and Cambridge, U.K. 294pp. Northern Prairie Wildlife Research Center Home Page.



### **3.3 Agricultural and Rural Infrastructures**

#### **3.3.1 Irrigation and Drainage**

Most of the canals have been constructed during the period of 1970s and 1980s and have been used for irrigation and drainage as well as for boat transportation. The pumping operations are required for irrigation and drainage and more than 3,000 private pumps are operating. Though water resources in the canal are sufficient even in dry season, water level varies with tidal influence. Most of the pumps have been used for more than 20 years and their efficiency is quite low. Water use is coordinated by farmers' organizations such as agricultural production collectives and irrigation groups and farmers pay pumping charge to pump owners through collectives or directly.

#### **3.3.2 Inundation Mitigation**

The small dike systems have been constructed since the early part of 1980s and they cover around 60 % of agricultural land in the Study Area. Most of them are designed for water level in August for harvesting of summer-autumn crop. In the upper part of the Study Area, farmers say it is impossible to make double cropping without dike system. There are no such structures as spillway, water gate, culvert, bridge, etc. and farmers have to cut dike for irrigation and drainage. Every commune has a plan to improve dike system. Even in shallow inundation area in Cai Lay and Cai Be, PCs intend to improve the dike system.

#### **3.3.3 Road Conditions**

In the Study Area, only National Road No.1, No.30 and the route from My Tho to My An are perfectly prevented from inundation. Most of the other roads are inundated from August to November and are not paved. It is difficult to pass by car after rainfall and this is one of the reasons for boat transportation being developed. Though bridge construction has been made by the Ministry of Transportation, the Ministry has a improvement plan only for national road by the year 2010.

### 3.4 Agriculture

#### 3.4.1 Land Use

The Study Area of about 290,000 ha is classified into five by land uses. More than 79% of land area is used for agriculture, 4% for forestry, 11% for residence and 5% for other purposes such as roads and public facilities. The remaining 2% is unused land. Most of the agricultural land is used for annual crops of which paddy is dominant with the share of 88%. Agricultural land comprises 200,116 ha of rice based annual cropland, 1,273 ha of other annual cropland and 26,981 ha of perennial cropland.

Present land use in the Study Area is shown in the following table.

Estimate from GIS ha			Source from Statistic Book ha
Total Area	290,309		
Agricultural land	228,370	79%	206,100
Rice based cropland	200,116	88%	176,100
Other annual cropland	1,273	1%	4,200
Perennial cropland	26,981	12%	26,100
Forestry land	10,772	4%	8,994
Residential Area	32,400	11%	-
Unused land	5,333	2%	-
Others land	13,434	5%	-

The Study Area is the rice crop zone where the paddy field spreads extensively. The riverbank of the Mekong River is most intensively used. These are used for road, houses and orchards, and some part of the areas are used for rice + upland crop cultivation. The north-eastern periphery of the study area, in which acid sulphate soils exist with a belt of 10 to 15 km wide, had been developed mainly for single rice crop and reserved forest. Forestland and unused land area are concentrated around this area. Most of residential areas is located along the road scattering in the whole area.

#### 3.4.2 Agricultural Production

##### (1) General Features

In the Study Area, paddy rice is a dominant crop, occupying more than 92 % of total sown area of 424 thousand ha. However, the Study Area can also grow different kinds of crops. Blessed with tropical monsoon climate, other cereal crops, industrial crops, fruits and vegetables are grown in addition to paddy under different cropping systems. Planted area and production of different crop groups in the year 1998 are given below.

**Agricultural Product**

		Planted Area		Production (ton)	Yield (ton/ha)
		(ha)	(%)		
Food Crop	Paddy	388,710	91.66	1,859,433	4.8
	Maize	1,048	0.25	5,295	5.1
	Sweet potato	84	0.02	618	7.4
	Other starch crop	279	0.07	2,881	10.3
Vegetable and Beans	Vegetables	1,259	0.30	12,923	10.3
	Beans	1,205	0.28	1,753	1.5
Annual Industrial Plants	Sedge	334	0.08	1,838	5.5
	Sugarcane	983	0.23	52,283	53.2
	Groundnut	119	0.03	299	2.5
	Soybean	3,727	0.88	7,740	2.1
	Sesame	42	0.01	19	0.5
	Tobacco	156	0.04	500	3.2
Perennial Plants	Coconut	864	0.20	4,547	5.3
	Citrus	1,484	0.35	21,077	14.2
	Longan	6,993	1.65	81,576	11.7
	Banana	2,216	0.52	17,087	7.7
	Mango	7,358	1.74	24,973	3.4
	Star apple	99	0.02	644	6.5
	Jack fruit	35	0.01	76	2.2
	Plum tree	314	0.07	2,845	9.1
	Papaya	294	0.07	3,652	12.4
	Guava/Apple	784	0.18	5,152	6.6
	Custard-apple	111	0.03	194	1.7
	Sapodilla	326	0.08	2,967	9.1
	Rambutan	158	0.04	1,309	8.3
	Durian	103	0.02	715	6.9
	Others	4,983	1.18	185,344	37.2
Total		424,068			

Source from Provincial Statistic Books in 1998 (calculated within only study area)

**(2) Paddy Production**

Rice production in the Study Area has increased rapidly in the past ten years. Average yield increased from 4.1 ton/ha in 1988 to 4.8 ton/ha in 1998. In the corresponding period the paddy-cultivated area increased from 224 thousand ha to 388 thousand ha. Therefore gross paddy production increased from 877 thousand ton in 1988 to 1,859 thousand ton in 1998.

Major factors contributed to the increase in rice production are;

- (a) Progress in flood control by construction of canal system.
- (b) Introduction of new high yielding and short period varieties that enable double and triple cropping.
- (c) Progress in irrigation and drainage system with dyke system.
- (d) Increased input such as fertilizer and agricultural chemicals.

Total planted area and production of paddy from 1988 to 1998 in the Study Area are summarized as follows.

### Rice Cultivation Area, Production and Yield

The Change of Rice Cultivation Area ha

	1988	1990	1992	1994	1996	1997	1998
Winter-Spring Paddy	100,189	134,020	143,389	151,304	166,119	174,712	173,039
Summer-Autumn Paddy	110,651	138,330	121,539	139,981	157,378	145,371	164,997
Autumn-Winter Paddy			26,423	45,391	54,172	34,649	50,674
Tenth month Paddy	12,746	4,548	3,225				
Total	223,586	276,898	294,576	336,676	377,669	354,733	388,710

The Change of Rice Production ton

	1988	1990	1992	1994	1996	1997	1998
Winter-Spring Paddy	518,386	747,900	817,275	844,512	915,804	1,017,237	1,031,223
Summer-Autumn Paddy	348,246	513,083	437,723	539,180	624,999	552,547	624,277
Autumn-Winter Paddy			95,842	174,852	219,366	140,234	203,934
Tenth month Paddy	11,006	6,929	0				
Total	877,638	1,267,913	1,350,840	1,558,544	1,760,169	1,710,019	1,859,434

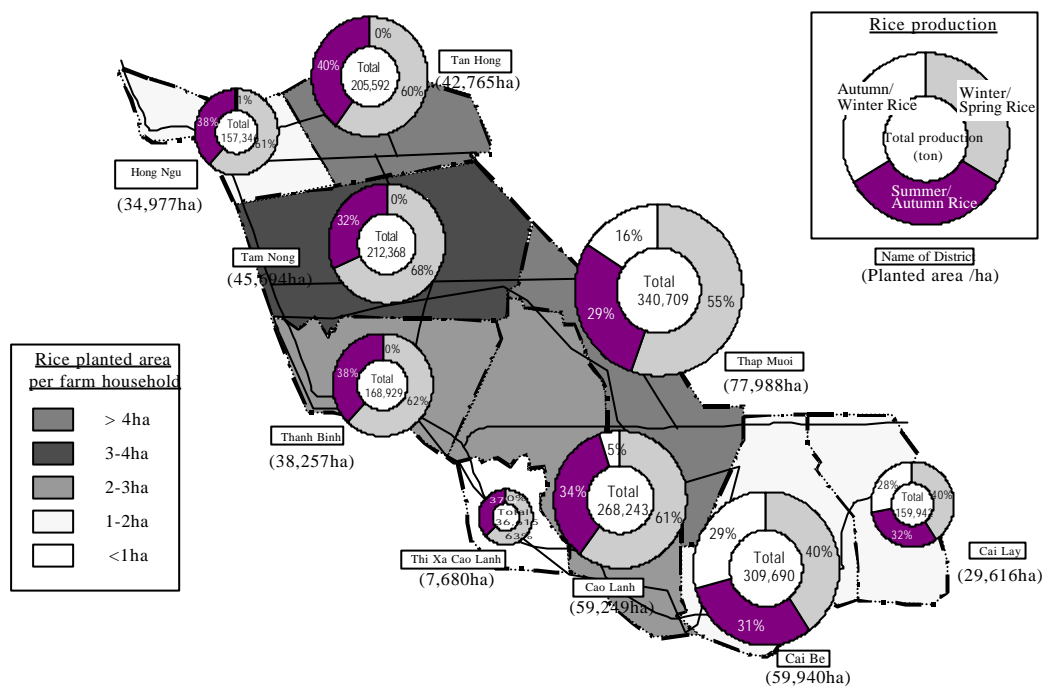
The Change of Rice Yield ton/ha

	1988	1990	1992	1994	1996	1997	1998
Winter-Spring Paddy	5.174	5.581	5.700	5.582	5.513	5.822	5.847
Summer-Autumn Paddy	3.147	3.709	3.602	3.852	3.971	3.801	3.874
Autumn-Winter Paddy			3.627	3.852	4.049	4.047	3.956
Tenth month Paddy	0.863	1.524	0.000				
Average	4.114	4.579	4.596	4.633	4.661	4.821	4.784

Source from Provincial Statistic Books

The following figure shows total rice planted area, production and planted area per farm household in each district.

**The Present Situation of Rice Production**



The rice varieties and rice seed productions are mentioned in Annex.

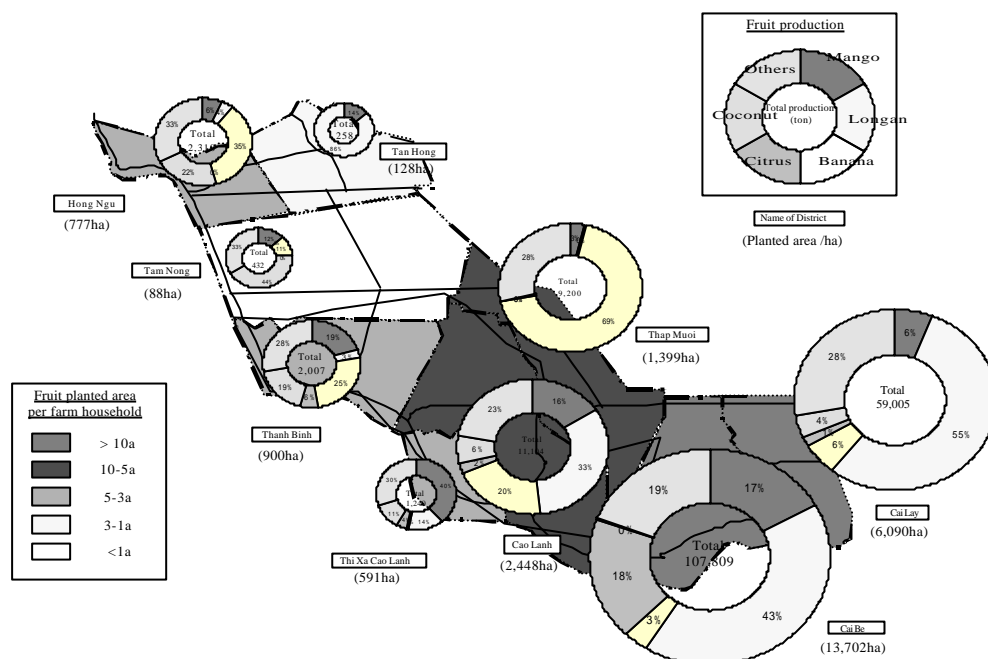
**(3) Other Crops**

**1) Fruits**

Rich soils, favorable climate condition, and plenty of water resources have made it possible for the south of Viet Nam to grow many kinds of fruits. However, the area devoted to growing fruits in the Study Area is limited due to floods. The main fruit production area concentrates on the southern part of the Study Area along the Tien River. Reliable and up-to-date information in detail on fruit production and processing is limited, but estimates suggest that in 1998 there were about 26,000 ha of fruits tree area with total production of around 193,000 tons in Study Area. The most important fruits grown are mango, longan, citrus and banana. The cultivation of longan and citrus are increasing rapidly in this decade, while banana and papaya are decreasing. As for the fruit garden, mixed planting of many kind of fruits had been common in the past. However, the monoculture fruit gardens of mango, longan or citrus are increasing as the market has expanded in recent years.

The general situation of fruit production in each district is shown in the following figure with total planted area, production and planted area per farm household.

The Present Situation of Fruit Production in The Study Area



2) **Subsidiary crops**

Subsidiary crops are maize, beans and vegetables. Cultivation area and yield of these crops changed little in the past several years. In 1998, cultivated maize area was 1,048 ha and production was nearly 5,295 tons. For bean, corresponding figures are 1,205 ha and 1,753 tons, for vegetable 1,259 ha and 12,923 tons respectively.

3) **Industrial crops**

In 1998, the growing area for annual industrial crops was 5,360 ha, accounting for 1.3% of the total annual crop grown in the Study Area. These crops include soybean, sugarcane, sedge, etc.

(4) **Livestock and Aquaculture**

1) **Animal husbandry**

In the Study Area, animal husbandry is less developed due to the effect of flood, lack of breeding space, affection of diseases and lack of technology. Therefore, the share of livestock production in agriculture remains at low level of 8.1% in 1998. Recent trend on livestock shows that buffaloes and cows, traditionally used as draft animals, have decreased rapidly in this decade whereas pigs, chickens and ducks have increased. These reflect the progress of mechanization and increase in livestock products by improvement of living standard.

The Change of Livestock in entire Dong Thap Province, Cai Be and Cai Lay districts

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Buffalo	17,363	13,110	12,938	8,387	5,100	4,180	3,961	3,335	2,710
Cow	15,455	11,683	11,451	6,122	3,544	3,186	3,561	3,346	3,455
Pig (x10)	24,336	19,557	28,456	31,939	27,592	28,004	30,201	31,856	31,830
Chicken (x100)	18,009	16,725	31,436	33,199	30,754	26,973	40,675	38,394	38,006
Duck & Goose (x100)	11,578	14,128	21,914	20,436	22,109	20,834	27,982	26,687	27,051

Livestock production in each district is shown in the following table.

Livestock Production of Each District

	Total in the Study Area	Dong Thap Province							Tien Giang Province	
		Town	District						District	
		Cao Lanh	Tan Hong	Hong Ngu	Tam Nong	Thanh Binh	Cao Lanh	Thap Muoi	Cai Be	Cai Lay
Pig	202,188	11,042	8,819	17,400	13,241	11,017	21,059	14,266	64,200	41,144
Buffalo	2,253	8	779	530	463	188	88	23	150	24
(Draft buffalo)	1,658	4	545	409	428	167	62	19		24
Cow	2,312	224	466	182	66	196	315	242	263	357
(Draft cow)	402		69	92	55	132	48	5		
Chicken	2,085,110	292,489	67,127	220,503	157,778	126,076	225,510	75,328	650,000	270,300
Duck & Goose	1,746,378	19,421	44,772	157,981	94,997	120,462	114,570	362,575	450,000	381,600

## 2) Fishery production

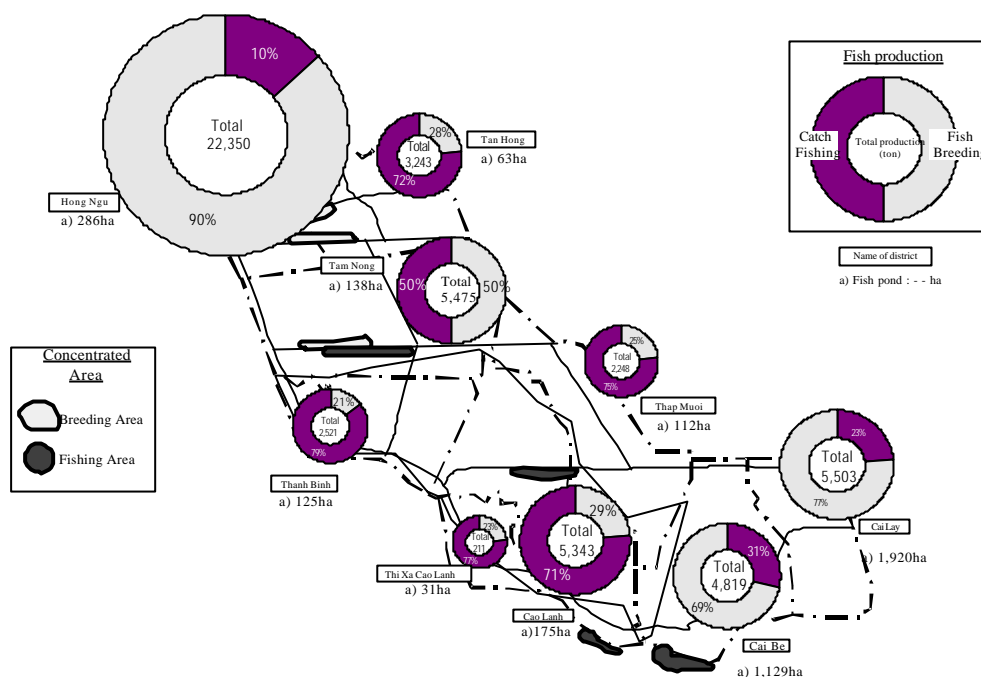
### a. Inland fishery (Catching)

According to the survey result carried out in 1998, the Study Area had a total of 5,000 fish-farmers who professionally used fishing nets. Taking into account the existence of farmers who engage in fishing during off-season of farming, the total persons involved in fishing may be 3 or 4 times more than the above-mentioned figure. As presented in the following figure, the inland fish catch in the Study Area totaled 17,464 tons in 1998. Compared with the total inland fish catch in 1996, this is a marked decrease of 1,000 tons. The reduced inland fish catch is attributed to the flood condition of that year.

### b. Aquaculture

Aquaculture, especially those by fishponds, fish crawls and cages have been developing rapidly in recent years. The fish production was 7,500ton in 1991 and 26,000ton in 1997. The fishing ponds in the Study Area cover 4,000ha in 1998, increasing by two times from that in 1991.

### The Present Situation of Fish Production



### 3.4.3 Farming System

Farming systems in the Study Area reflect the different natural resources such as rainfall and soil fertility, farmers' manpower, capital and knowledge. They are also affected by the present situation of agricultural support services.

In the Study Area, there are two main farming systems, rice-based farming system and fruit trees-based one. Other farming systems are too minor. The share of agricultural land for the rice-based system is 87% and for the fruit trees-based one is 12%. The dominant rice-based farming system can be divided into triple cropping, double cropping and single cropping patterns. When the physical land area for all system is set at 100%, the respective share for the 3 types of cropping patterns are 38%, 42% and 7% respectively.

The intensive farming methods of multicropping involve the introduction of high yielding varieties with the combination of practices such as season selection, mechanized land preparation, fertilization, irrigation, pest control, etc.

The agricultural land for different cropping patterns are shown in the following table.



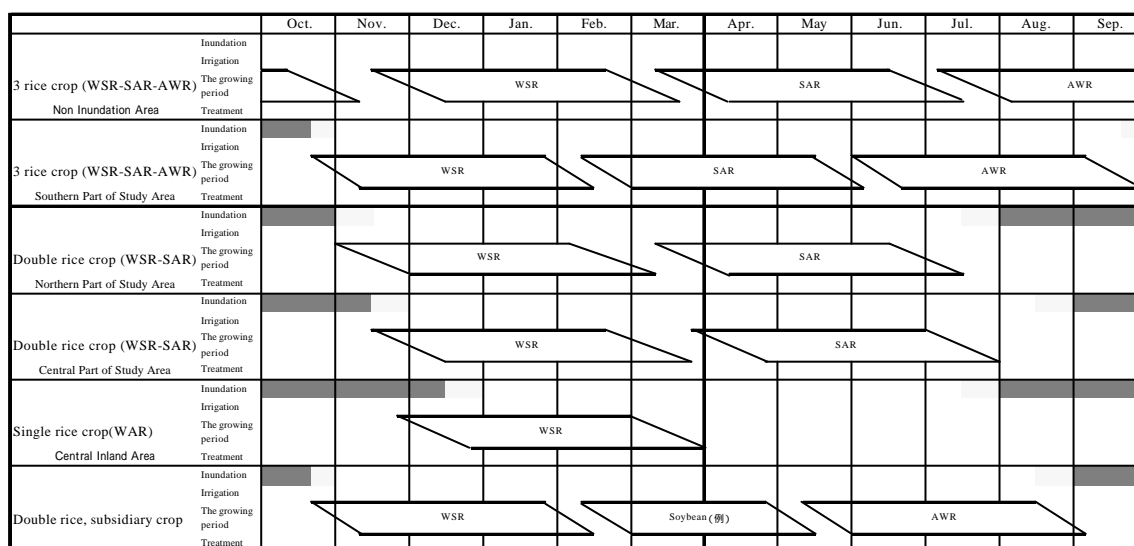
**THE STUDY ON INTEGRATED AGRICULTURAL DEVELOPMENT PLAN  
IN THE DONG THAP MUOI AREA VIET NAM FINAL REPORT**

Annual crop land		ha	
Triple rice cropping land	87,363	38%	
Double rice cropping land	94,910	42%	
Single rice cropping land	15,011	7%	
Rice + Upland crops land	2,832	1%	
Upland crops, vegetables land	1,273	1%	
Perennial crop land			
Fruit tree, perennial crop land	26,981	12%	
<b>Total</b>	<b>228,370</b>		

\* Data calculated from Land Use Map 1998 at 1:100,000 scale by GIS

The typical cropping patterns in the Study Area are shown in the following charts.

Typical Cropping Pattern



### 3.4.4 Farm Mechanization

In 1997, there were approximately 1,500 tractors and 5,000 power tillers with total capacity of some 120,000 HP. The average power capacity per 100ha of cultivated rice area was 30HP. In 1997, there were 402 draft cattle and 1,658 draft buffaloes. As mentioned, draft animals used for land preparation are mainly found in the limited area of the northern part of the Study Area. There were approximately 3,500 threshers with a total capacity of some 3,700 ton/h. There are 40,000 pumps for irrigation and drainage.

Land preparation accounts for the main part of mechanization. According to the statistics of the provinces, approximately 95% of paddy land is prepared mechanically. More than 95% of the farmers use tractors for land preparation and 99% of the farmers use machines for threshing. Currently, fertilizer application, seeding and harvesting are done manually. The labor input is about 100-140 days/ha for rice production, of

which more than 70 days are managed by family labor.

Though the rice cultivation is partly mechanized, it has not been systematized as yet. In upland farming, vegetable culture and fruit growing mechanization has not been observed at all.

Most of the large tractors and power tillers are imported ones. There exist local producers. Local manufactures provide some types of spare parts, small threshers, movable rice mills, small cleaners and husker, tools and carts.

### **3.4.5 Benefit of Farming Types and Farmer's Income**

#### **(1) Benefit by Farming Types**

Based on analysis of the income and expenditure of the typical farming type from the data in 1997, estimation of the benefit by farming types was made as shown in the table below (Refer to the table in the following pages). This shows that fruit is very profitable crop. This is due to the fact that the market price in 1997 was high, and the source of data counted from the cases of the adult tree orchard. The conspicuous difference between the paddy-upland rotation and the continuous paddy cropping didn't come out clearly. However, the planted area of upland crop is not increasing during these several years. Upland crops seem to be not profitable crops in this area. The triple rice cropping exceeds the double rice cropping in income.

#### **(2) Farmer's Income**

Information and data obtained during the field investigation indicate that the average farmer has 1.1ha paddy field with 2.2 crops per year and average yield of 4.8 ton/ha. Other income sources are from orchard (0.09ha), 1.1pigs and 12 chicken and 10 ducks. He gets 300kg fish from pond or river per year. These gross income amount to 26millionVND per year. Deducting the operating cost and the labor cost from this gross income, the average net income of farm household is estimated to be approximately 8 million VND per year.

(/ha)

Land use types	Capital investment (1000 VND)	Recurrent cost (1000 VND)	Gross income (1000 VND)	Gross margin (1000 VND)	Note
<b>MONORICE CULTIVATION</b>					
3 irrigated rice crops	-	15,030	21,920	6,890	
2 irrigated rice crops	-	10,580	15,520	4,940	
1 irrigated rice crop	2,040 (*)	6,120	8,800	2,680	(*) in new -
<b>RICE-UPLAND CROP CULTIVATION</b>					reclaimed land
2 irrigated rice - 1 upland crops					
2 Rice – Soybean	-	16,850	23,500	6,650	
2 Rice – Maize	-	16,430	23,680	7,250	
1 irrigated rice - 1 upland crop					
Rice – Soybean	-	12,420	17,260	4,840	
Rice – Maize	-	12,000	17,440	5,440	
Vegetables	-	ND	ND	ND	ND : No data
<b>PERENNIAL CROPS GROWING</b>					
Fruit trees	8,500 (**)				(**)for making
Longan	-	9,030	55,000	45,970	raised-beds
Mango	-	14,570	43,200	28,630	
Orange	-	22,250	45,600	23,350	
Mandarin	-	18,710	51,000	32,290	

Source : Investigation data of Sub-NIAPP and Dong Thap Province in 1998 (include total labor cost)

Refer to Appendix E for details.

### 3.5 Forestry

#### 3.5.1. Current Forest Conditions

An extensive swamp (closed flood plain) called the Plain of Reeds lies to the northwest of the Mekong River which runs along the southwestern boundary of the Study Area. Acid sulfate soils distribute at the closed flood plain. While natural forests of *Melaleuca cajuputi* which can withstand such acid sulfate soil and which grow in standing water used to be distributed in this area, the construction of irrigation channels has now turned most of the forest area into paddy fields.

##### (1) Forest Area

In general, the subject area of forestry is divided into stocked areas and unstocked areas. As of June, 1999, the forest area in the Study Area is 14,850 ha, of which stocked areas comprise 8,994 ha and unstocked

areas comprise 5,856 ha.

All forests statistically accounted for are plantations and no natural forests are said to exist. In 1994, the total forest area in the Study Area was 9,455 ha, indicating a subsequent decline of the forest area by 4.9% to the present size. Forests currently cover a mere 3.1% of the entire land. With the addition of the area of fruit and perennial crop cultivation of 26,981 ha (source: GIS survey by Sub NIAPP in 1999), green tracts of land account for approximately 12% of the entire land. From the viewpoint of environmental conservation, the role played by fruit trees in the Study Area cannot be ignored.

Forests in the Study Area are predominantly found in three districts, i.e. Tam Nong, Thap Muoi and Cao Lanh Districts. Therefore, forests of these three districts account for some 97% of the entire forest area.

From the functional point of view, forests in the Study Area are classified as protection forests (2,287 ha), special use forests (2,821 ha) and production forests (3,886 ha).

In terms of the planted species, *Melaleuca cajuputi* is by far the most popular species, accounting for 98.4% (8,847 ha) of the forest area, followed by *Eucalyptus camaldulensis* (1.6% or 147 ha). The reason for this overwhelming dominance of *Melaleuca cajuputi* is that the widely distributed acid sulfate soil in the Study Area restricts the introduction of other species. It appears certain that *Melaleuca cajuputi* is primarily selected as a useful species because of its suitability for this type of soil.

In terms of ownership, national forests account for 65.1% (5,851 ha) of the forest area while private forests account for the remaining 34.9% (3,143 ha).

## **(2) Scattered Plantations**

In Vietnam, plantations are created in the form of scattered plantations where trees are planted along roads, irrigation canals and rivers and around houses in a scattered manner, and concentrated plantations where trees are planted in a concentrated manner on bare land, etc. The forest area referred to in 1.2 is that of concentrated plantations.

In the Dong Thap Province of the Study Area, 39,719,000 trees were found in scattered plantations as of October, 1997, showing a year on year increase of 5.6%. As of October 1996, the most eminent tree species was *Eucalyptus camaldulensis*, accounting for 42.6%, followed by *Melaleuca cajuputi* (34.6%) and *Bambusa* spp. (19.2%). These three species accounted for 96% of all trees.

In the Tien Giang Province of the Study Area, 11,100,000 scattered trees were found as of 1996, consisting of 7,800,000 trees in Cai Be District and 3,300,000 trees in Cai Lay District.

### **(3) Stand Increment**

Nguyen Van Duyet conducted an increment survey on *Eucalyptus camaldulensis* and *Melaleuca* spp. in the Phung Hiep area in the Mekong Delta. According to this survey, the average annual increment of *Eucalyptus camaldulensis* is less than 2 cm for DBH, less than 1.5 m for tree height and 10 m<sup>3</sup>/ha for volume at sites with poor growth conditions, 2 - 4 cm for DBH, 1.5 - 2.5 m for tree height and 12.8 m<sup>3</sup>/ha for volume at sites with moderate growth conditions and 4 cm or more for DBH, 2.5 m or more for tree height and 15.6 m<sup>3</sup>/ha for volume at sites with excellent growth conditions. The annual volume growth of *Eucalyptus camaldulensis* reaches its peak at an age of 5 - 10 years.

The average annual increment of *Melaleuca* spp. is less than 0.4 m for DBH, less than 0.4 cm for tree height and 4.3 m<sup>3</sup>/ha for volume at sites with poor growth conditions, 0.5 cm for DBH, 0.6 m for tree height and 6.0 m<sup>3</sup>/ha for volume at sites with moderate growth conditions and 0.6 cm or more for DBH, 0.8 m or more for tree height and 7.7 m<sup>3</sup>/ha for volume at sites with excellent growth conditions. The growth of *Melaleuca* spp. is fast upto an age of 10 years and slows down thereafter.

### **(4) Forest Fires**

In Dong Thap Province, forest fires have occurred every year since 1994. The lost forest area due to fire was 138 ha in 1994, 682 ha in 1995, 64 ha in 1996, 12 ha in 1997 and 9 ha in 1998. Forest fires are said to be caused by hunters of birds, snakes and field mice and by those people collecting honey.

No forest fires have been recorded in Cai Be and Cai Lay Districts in Tien Giang Province since 1994. *Melaleuca* spp. is liable to be damaged by fire because its high essential oil content. At concentrated plantations in particular, fire damage tends to spread because of the extensive area of these plantations and monitoring difficulties. Implementation of forest fire prevention and control measures is extremely important.

#### **3.5.2 Forest Management**

The interview survey conducted at national forest sites in the Study Area found the following forest management techniques for production forests.

The planting season is around October for *Melaleuca cajuputi* and March - April or around November for *Eucalyptus camaldulensis*. Bare stock is used for *Melaleuca cajuputi* while potted seedlings are used for *Eucalyptus camaldulensis*. The planting distance is 0.4 x 0.4 m, 0.5 x 0.5 m, 0.7 x 0.7 m or 1 x 0.5 m for *Melaleuca cajuputi* and 0.5 x 0.5 m or 1 x 2 m for *Eucalyptus camaldulensis*.

Weeding is not conducted in the case of *Melaleuca cajuputi* but the practice varies from one site to another in the case of *Eucalyptus camaldulensis*. If weeding is conducted, it is conducted once or twice

within one year after planting.

Thinning may be conducted once or twice for *Melaleuca cajuputi*. In the case of *Eucalyptus camaldulensis*, thinning is not carried out at the most of sites. Thinning is conducted by farmers free of charge and the thinned wood is given to these farmers.

The cutting period is 10 - 13 years (minimum tree height of 6 - 7 m) for *Melaleuca cajuputi* and 6 - 12 years (minimum tree height of 12 m) for *Eucalyptus camaldulensis*. The produced wood is used as construction materials. *Melaleuca cajuputi* is particularly used as piles.

### 3.5.3. Forestry Production and Consumption of Forest Products

#### (1) Forestry Production

In Dong Thap Province of the Study Area, the annual production volume of industrial roundwood was 111,000 m<sup>3</sup> as of October 1997, showing a year on year increase of 53%.

The annual production volume of fuelwood as of October, 1997 was 186,000 ste (1 ste = 0.75 m<sup>3</sup>), a year on year increase of 22%. 30% and 70% of this 186,000 ste were produced by concentrated plantations and scattered plantations respectively, indicating the prime importance of the latter in terms of fuel wood production.

The production volume of *Bambusa* spp. in the same year was 2,238,000 pieces, with a yearly increase of 32%.

The production volume of bamboo shoots in the same one year period was 147,000 kg, a year on year increase of 232%. No statistics on forest products are available for the Tien Giang Province of the Study Area.

#### (2) Consumption of Forest Products

The consumption volume of sawn timber in Dong Thap Province in 1996 was 54,360 m<sup>3</sup>, consisting of 43,360 m<sup>3</sup> for rural households, 5,000 m<sup>3</sup> for urban households, 2,000 m<sup>3</sup> for boats, 1,600 m<sup>3</sup> for school fixtures, 1,400 m<sup>3</sup> for roads and bridges and 1,000 m<sup>3</sup> for furniture. This volume can be converted to 83,630 m<sup>3</sup> of logs (conversion rate of 65%). Given the population of 1,553,000 in 1996, the annual wood consumption per capita (excluding fuelwood; converted to logs) was 0.05 m<sup>3</sup>.

In 1998, Cai Be and Cai Lay Districts in Tien Giang Province consumed 52,000 m<sup>3</sup> of industrial roundwood (piles accounting for 15,000 m<sup>3</sup>), 15,000 m<sup>3</sup> of fuelwood and 30 tons of honey. Given the population of 645,000 in 1998, an annual consumption per capita of forest products for these two districts

was estimated to be 0.08 m<sup>3</sup> of logs, 0.02 m<sup>3</sup> of fuelwood and 46.5 g of honey.

### **(3) Estimation of Fuelwood Demand**

The Master Plan for 2010 for Dong Thap Province predicts that the provincial population in 2010 will be 1,870,000. Based on it, the population of the Dong Thap Province of the Study Area in 2010 is estimated to be 1,004,000. Assuming that the annual fuelwood consumption per capita in the Dong Thap Province of the Study Area is 0.2 m<sup>3</sup>, the fuelwood demand in 2010 is estimated to be 200,800 m<sup>3</sup>.

The annual fuelwood consumption volume per capita in Cai Be and Cai Lay Districts in Tien Giang Province in 1998 was 0.02 m<sup>3</sup>. The Master Plan for 2010 for Tien Giang Province predicts that the provincial population in 2010 will be 2,176,000. Based on it, the population of the Tien Giang Province of the Study Area in 2010 is estimated to be 590,000 and the fuelwood demand in the Tien Giang Province of the Study Area in 2010 is estimated to be 11,800 m<sup>3</sup>.

### **(4) Wood Price**

According to the results of interviews conducted at national as well as private forests in the Study Area, the standing tree price per ha of *Melaleuca cajuputi* is 35 - 60 million VND for trees of 10 - 13 years of age.

Interviews at private forests in Thap Muoi District found that *Melaleuca cajuputi* sold as fuelwood is normally cut to some 30 cm in length and that a bundle of 0.3 m in width, 1 m in length and 1 m in height is sold as a unit. The unit price is 35,000 VND.

## **3.5.4 Existing Planting Plans**

The planting plan upto 2010 for Dong Thap Province has targets on concentrated plantation area of 19,289 ha and on scattered plantations of 200 million trees. In the case of Tien Giang Province, while there is no plan for concentrated plantations in Cai Be and Cai Lay Districts, the target planting of 10,300,000 trees and 8,800,000 trees, totalling 19,100,000 trees, in scattered plantations in Cai Be District and Cai Lay District is planned.

Given the forest area of 8,833ha in Dong Thap Province as of June 1999, the new planting of 10,456 ha will be required to meet the target for concentrated plantations. As the Study Area only has some 2,000 ha of unused land where new planting can be conducted, excluding the Tram Chim National Park (based on the results of the GIS survey conducted by the Sub-NIAPP in 1999), it will be extremely difficult to meet the target.

### 3.6 Post-Harvest Processing

#### 3.6.1 General Conditions

##### (1) General

The agricultural production in the Study Area is characterized by dominance of rice, while production of vegetable, fruit and small animals such as pig, duck and chicken are mainly for self-sufficiency. Accordingly overall capacity of post-harvest processing of the latter group of products on commercial basis is limited in the Study Area.

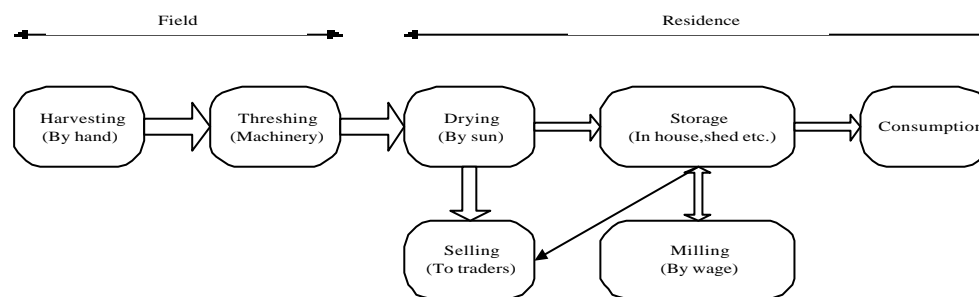
Although they are outside the Study Area, there exist factories such as fish processing and rice powder processing in Sa Dec area in Dong Thap Province, fruit processing and animal feed production in My Tho in Tien Giang Province.

Further, there exist various small-scale industries mostly for traditional food processing such as sugar extraction, bread making, noodle processing and confectionery making in and around the Study Area.

##### (2) Rice Post-harvest Processing

The general condition specified for rice post-harvest processing is summarized as follows:

###### a) Production Stage



Post-harvest Processing by Producer

##### Harvesting and threshing

The paddy harvested by hand is gathered to a place and threshed on the field or on the road along the field. Mobile thresher with capacity of 1-2 tons paddy / hours is prevalent in the Area.

##### Drying

Almost all the farmers dry their paddy under sunshine by spreading out paddy on a net or vinyl sheet opened on drying yards and/or road near their residence after carrying their products back to their residence. Though drying yards made of concrete or tile floors are also seen in a limited number, many producers dry their paddy on back yard, vacant lot or road. The public road is the most popular place for drying during the rainy season, and it may be the only place for drying in the inundated area.



Therefore, such serious losses as germination of paddy occurs in the years having heavy rain and/or deep inundation condition due to less sunshine and lack of drying place.

In spite of such situation, drying machine is not popularly used in the production area. The moisture content of paddy bought by trader from producer is estimated to be about 16% judging from the raw materials collected to rice mills. Generally appropriate moisture content of paddy for preservation is, said to be 14% or less.

### **Storage**

Most of producers usually sell as early as possible after harvest to pay off the loan or obtain funds needed for the next cropping. Some producers have enough funds so as to sell their paddy when the market price rises. The storage of paddy at farmers' level can be found in various ways. Except critical losses by high moisture during the rainy season, damages caused by rats and insects are not serious.

### **Milling for Producer's Consumption**

Farmers carry their paddy and ask milling to rice mills located in the same hamlet or commune. The type of machinery in such rice mills vary from a small unit with capacity of some hundreds kg / hour to a big plant with capacity of some tons / hour.

## **b) Marketing Stage**

### **Rice Mill**

There exist 800-900 rice mills in the Study Area. Processing capacity of mills also differ from some hundreds kg / hour to more than 10 tons / hour. Almost all machinery are manufactured locally, copied from the machinery existing in the developed countries.

Generally rice mills supply milled white rice but also forward brown rice only after husking as a raw material.

These factories are usually equipped with the warehouse corresponding to their scale. Their locations are concentrated on the intersection of canals and/or roads. Major concentrated areas are Hong Ngu, Cao Lanh, Cai be and Cai Lay along Tien River and along the canals from My An to the east.

There is no proper standard of rice quality and inspection applied for daily transactions for rice in Viet Nam. Only limited rice mills have their own inspection standard by limited kinds of inspection devices. However, the moisture content and length of rice kernel are paid attention for checking quality for transaction. The most popular inspection equipment in big rice mills is a portable moisture meter. Only a few big factories have other devices such as a test husker, a test mill, a test length grader and a divider among factories visited.

On the other hand, the raw materials are the mixture of various varieties with different size and

characteristics as there is no practice traditionally of handling by unit of same variety and same production area through a distribution channel. Therefore operation and adjustment of machinery such as husker and whitener for higher recovery and uniform quality of product is very difficult. It also tends to increase broken rice generation and to reduce recovery rate.

Besides, raw material paddy contains many red grain, immature grain and damaged grain such as colored grain, dead grain. More broken rice generates in processing at rice mill. Broken rice generates in threshing and drying process. All these reduce yield of product substantially.

The inspection and management of yield for each processing stage by each lot of a raw material with uniform quality are not carried out daily although they are important to improve efficiency and profitability of rice mill operation.

### **Large Scale Rice Mill**

These mills are equipped with polishing machine for polishing the surface of white rice. The polishing machines used in those factories are wet type polishers using water. Those are manufactured locally coping the machine developed in Japan. The basic functions of these factories are husking-whitening-polishing. However there exist some factories equipped with only polishing process without husking process.

Normally, these rice mills are expected to procure paddy and sell after proper processing and grading. However, current practice is that they procure brown rice and white rice rather than paddy through rice mills and traders in the vicinity after receiving orders. This is due to lack of their own purchasing staff and funds and also shortage of storage capacity.

The problem of insufficient drying continues from production stage and the factories are facing difficulty to meet the contract requirement of moisture set below 14%. To cope with this problem, the dryer for white rice is used in factories in the Area.

### **Warehouse attached to Large Scale Rice Mill**

The warehouses attached to these rice mills are used not only for storage of raw material and product but also as the area for unifying quality of raw material and for grading of product in conformity with the contract.

As mentioned before, it is the practice of the rice mills to procure raw material after receiving orders, and the storage period of materials is not so long. Therefore, the warehouse is used for buffer storage of processing and forwarding rather than for stock of raw material and products. Therefore the losses in storage period are not critical.

## **(3) Other Processing Industry**

### **a) Frozen factory for marine products**

The frozen factory for marine products was constructed in Oct. 1999, along Tien River in Cao Lanh District. This enterprise has a long history of this business in Sa Dec City and moved the factory to

this place, because of the difficulty for expansion of the existing factory. It is a pioneer factory of processing industry other than rice in the Study Area and is expected to be model for the future development of processing industry in the Study Area.

**b) Sugar mill**

Sugar mills with small capacity owned by family base are located along Tien River. Such machines as compressing machine, rotating vessel (crystallizer) and centrifuge are used. Recently local market price of sugar has declined sharply because substantial amount of sugar made in Thailand has been imported. Therefore, many mills stopped their operations.

Since sugar cane fields are scattered along Tien River, thereby, smooth and effective collection of the products is very difficult. It takes about three days after harvesting to compressing. It is hard to judge whether the sugar cane is a suitable crop for the Study Area located in low land area. Competitiveness with imported one is not much expected.

**c) Feed mill**

Small scale feed mills are operating in My Tho and Sa Dec though they are out of the Study Area. These are important for development of livestock industry. Raw materials they can procure locally are rice bran, broken rice and dried small fish. Maize, the major component of feed, and nutritional additives are imported.

**d) Rice bran oil mill**

The vegetable oil factory in My Tho producing oil from soy bean, groundnut and coconut by expellers decided to establish rice bran oil extraction plant obtaining approval of the Provincial Government and the commitment of subsidy for investment. It needs very sophisticated technology for proper operation of plant, compared to the physical extraction plant. If realized, it will be the first rice bran extraction plant using organic solvent in Viet Nam and one of the most effective way to use rice bran generated in huge amount of rice mills. Additionally, the de-oiled bran, by-product of this process will be more valuable material than raw bran for feed industry. The de-oiled bran is also expected to export. The success of this plan is expected to contribute to the development of the Study Area.

**e) Traditional processing industry**

Small scale traditional food industries such as noodle, confectionery exists widely in the Study Area. The characteristics of these business are i) almost handwork by family member, ii) small and only seasonal production in some case, iii) low mechanization level and iv) low level of quality control including hygiene control.

**(4) Extension and training**

There are no schools nor agencies in Dong Thap and Tien Giang Province of the Study Area which provide extension and training services of post-harvest and processing technology for agricultural products.

The Social College in My Tho plans to establish the faculty of food processing in the year 2000 by the assistance of Netherlands Government.

**3.6.2 Development Constraints on Post-harvest Processing**

**(1) General**

**a) Lack of adequate market information**

The information system is not well established for individuals and organizations concerned who need the proper and accurate market information. The necessary information on quality, quantity and price are not effectively disseminated at various stages.

**b) Lack of fund**

Funds for those who intend to invest for new business or for improvement of a processing facilities are not sufficient. Existing credit program can not meet effectively the requirement for investment.

**c) Low technology base**

The diffusion of the post-harvest processing technology required to respond to market needs and also to pursue economic efficiency is not well organized. There are limited number of engineers who are needed for introduction of improved technology.

Furthermore, there is no reliable and precise assessment standard on post-harvest processing losses that can be the basis for estimation of the economic efficiency of each improved technology.

**d) Low level of material supply other than rice**

The crop diversification is at the initial stage in the Study Area. Therefore, the base of material supply of product other than rice for post-harvest processing has not well materialized as yet.

**e) Insufficient business management**

Business management ability is rather low irrespective of SOE and private enterprise in view of medium and long term perspectives, though the efforts to respond to immediate market needs and profit are noted.

**f) Lack of group activities of producers**

To obtain the benefit of the economy of scale, it is necessary to collect and process an appropriate

quantity of material with uniform quality. Since individual producer can not enjoy the scale merit, the group activities among producers are one of the options to meet this requirement. So far this movement is at the initial stage.

**g) Insufficient comparative advantages for investment**

The Study Area is widely shared by the flooded area and the suitable location for processing factory is limited. The infrastructures such as road, electricity and access to market have not been developed well compared to other part of MRD.

**(2) Post-harvest processing of rice**

**a) Producer's Level**

**Little effect to sale price of paddy by quality improvement**

Sales price of paddy is determined by inspection mainly on the shape of grain and moisture content. The paddy price here does not reflect the economic effect brought by the difference of quality at the following stages such as husking, whitening and polishing effectively. As a result, the producers are not motivated to improve the quality of rice, and to invest for it.

**Little stock for marketing**

As many of producers have not enough fund and warehouse for storage, they generally tend to sell their products as soon as possible after harvest.

**Lack of handling practice by large volume with uniform quality.**

The practice of collecting small amount of material from many individual producers makes it difficult to obtain an appropriate unit of material in uniform quality and variety. This leads to the difficulties in effective and economical processing.

**b) Rice Processing Level**

**Low recovery rate**

Many losses occur by mixed varieties and low quality of material at the processing.

**Many loss by high moisture content material**

Rice with high moisture content of over 14%, a recommended level for safe storage, is distributed widely. Most of these materials are processed without drying before processing. This high moisture content of material results in higher broken rice generation and lower recovery rate, particularly in case of long grain. Additionally, as product often can not meet the standard requirement of moisture (14%), they have to install white rice dryer as a last resort to reduce moisture, resulting in more expenditure and losses.

**Difficulty in procurement of paddy material**

Large rice processing factories procure brown rice and white rice rather than paddy from rice mills and traders in the vicinity when they have received orders, due to lack of their own purchasing staff, funds and shortage of storage capacity. As most of the processing plant are equipped with husking, whitening and polishing machinery in a complete system, this procurement system make the plant operations very complicated and difficult one and reduce efficiency.

**Lack of fund and poor management plan of long term**

Such priority machinery as polishing machine and length grader has been introduced to specific processing factories to meet the requirement. However, in other ordinary rice mills, the modernization of machinery has not made progress well due to a lack of fund. It is difficult to judge whether such effort in these factories was made based on the long-term management plan or it was the result of seeking immediate response to the needs of buyers. Layout of processing lines in many factories are seen as addition of new machinery and transformation of line in a limited space, causing difficulty for proper operation and management.

**Many old and obsolete machinery and equipment**

There are many rice processing factories equipped with obsolete and old-fashioned machinery with low efficiency.

**Insufficient operation management method**

The operation of the processing machinery such as husker, whitener and polisher is carried by the operator based on his experience. Recently, more attention has been paid to better quality rather than quantity. It can be said that the factory management should now be encouraged to establish the profitable processing technology. However there is no proper technology and practice yet through which operational condition can be evaluated and improved scientifically from the economic point of view.

### **3.7 Marketing System**

#### **3.7.1 General Features**

Depending on the major market/destination, agricultural products in the Study Area are classified as follow:

Regional markets (within the Study Area)	Outside markets (HCMC, Other provinces )
Live animal (Pig, Poultry) Fish, Vegetable, Minor fruit (Banana, etc.)	Rice, Major fruit (Mango, Citrus) Aquaculture products

Sales of major products such as rice and fruits (longan and mango) considerably depend on markets outside of the area.

Marketing of farm products is done by individual farmers and there is no farmers' group activity. Except some farmers who have good access to market/processing facility from their farm yard, farm products are sold to small scale private traders (collectors) who come to farmyard to buy products. Due to the fact that farmers are scattered and each farmer's production scale is small, many numbers of collectors are engaged in collection business.

Each kind of agricultural products has a different marketing system and marketing intermediaries, such as collector, assembly wholesaler, retailer, processor and big traders, specialized in their handling item(s).

In case of marketing for other regions, final products are directly shipped to boarder-markets from the Study Area without through any other intermediaries after processing/grading and packaging.

In the following section, present situations of marketing system of major products are described.

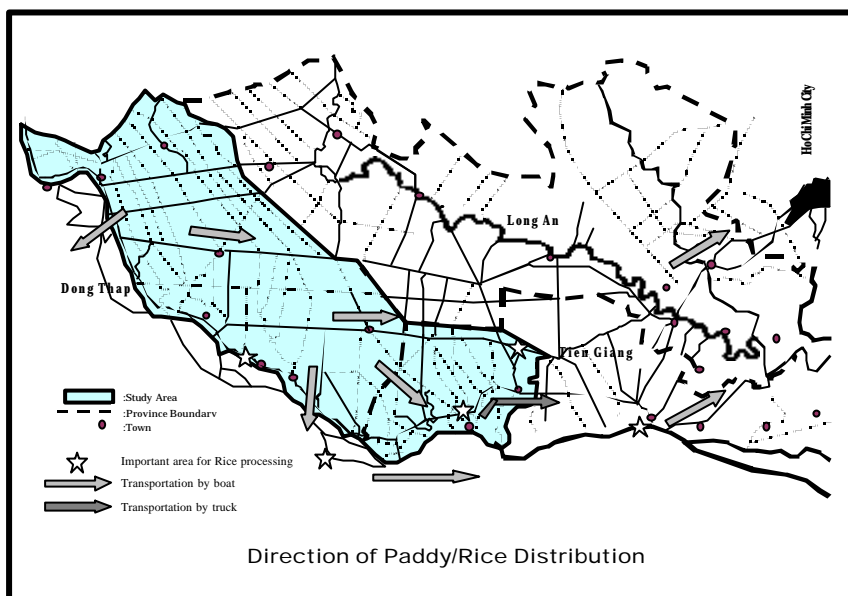
### **3.7.2 Marketing System of Rice**

#### **(1) Commodity Flow**

Paddy collection activities of private traders extend over several provinces and it is difficult to grasp precisely the marketed amount of paddy by its destination. Utilizing some data obtained, it is presumed that about 70% (1,300 - 1,350 Thousand million tons) of paddy out of total production (1,859 Thousand million tons) was marketed in 1998 to the outside of the Study Area.

Paddy/rice are transported through waterway network well developed in the Study Area toward HCMC/Saigon port. Therefore, rice-processing facilities are always facing canal or Tien River. On the routes toward Saigon port/HCMC, paddy is processed to white rice for market supply. Though there are several international ports in/around the Study Area such as Can Tho port, Sa Dec port, Cao Lanh port and My Tho port, most of shipments are made at Saigon port at present. Shipments to Saigon port for loading into ocean vessel are made with 300-400 tons barge ship from processing factories in the Study Area.

Over 100 export rice processing factories are located at Sa Dec Town in Dong Thap province ( out of the Study Area ) and large quantity of paddy/rice is distributed through this town. Some portion of paddy is distributed to export processing factories in An Giang province beyond Tien River. At the north of Cai Be town where Kinh 28 canal and National Road A1 meet, over 40 mills are located alongside National



Road A1. In this area, paddy are processed to white rice and shipped to HCM City or middle part of Viet Nam by truck. Big scale of roadway transportation is significant only on this domestic supply route in the Study Area. Outline of paddy/rice distribution is presumed as shown in above figure.

## (2) Marketing Channel

Channel for rice marketing consists of three sectors : Farmer, Collector/Miller and Polisher/SOEs. Activities of each sector and major characteristics are summarized as follows:

- a. Farmers sell paddy to collectors individually and so far no group sales activity is noted in the Study Area. Human relation between farmer and collector is weak. Farmers sell their paddy to collector who offer higher price.
- b. Collection of paddy from farmers are done almost 100% by small scale private traders (called as collectors). There are two types of collectors;
  - full-time type: conduct collection business all year round.
  - part-time type: conduct collection business mainly after WS crop. This is smaller scale than full-time type, mainly done as side business of farm household.
 10-15 tons boat is commonly used for collection and transportation.
- c. 90-95% of marketed amount of paddy are milled by private millers. In most cases, millers supply milling service to collectors on commission basis. Human relation between miller and collector is tight and collectors usually use same mill.
- d. Most common way of procuring material for processing by private polishers is to wait for collectors who come to factory to sell their material rice in Dong Thap province. In Tien Giang province, exporters/private polishers procure material by contracts with millers.



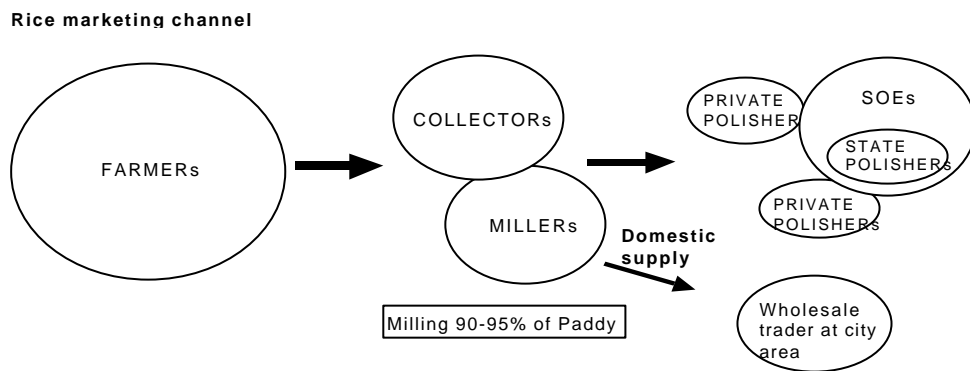
- e. Polishers and exporters (SOEs) do not deal with domestic marketing
- f. Rice processing is separated into two stages:

- 1<sup>st</sup> stage is processing paddy to material rice.

Milling is made by collectors with milling service of privately owned rice mills. Milling degree varies from brown rice to 100% white rice. Polishers and SOEs 60-70% of material as brown rice and 30-40% as white rice.

- 2<sup>nd</sup> stage is processing material rice to final products.

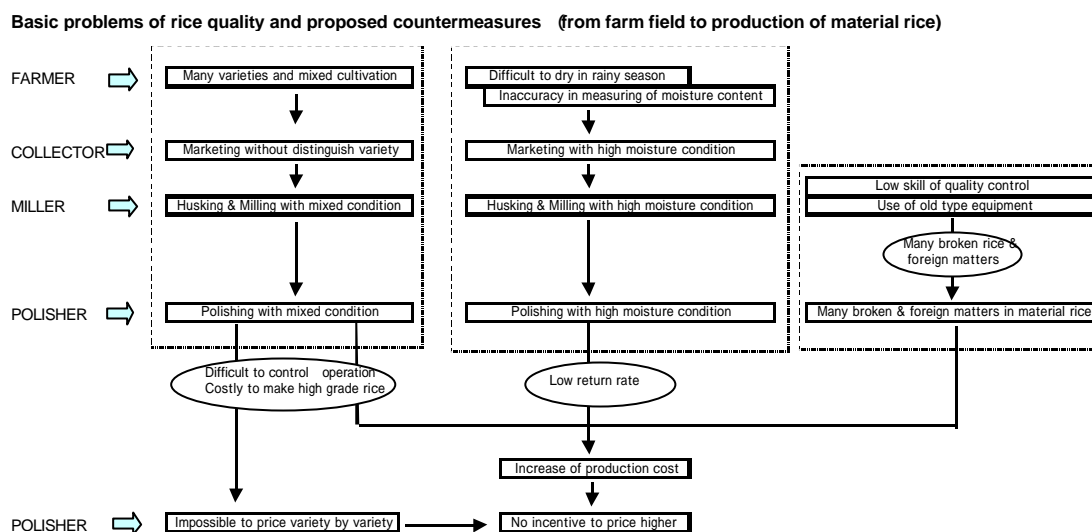
After polishing, by mixing some different qualities (ratio of broken rice and/or moisture contents) of polished rice to produce a commodity to conform to the specification of the contract.



### (3) Price and Quality

Farm gate price is directly influenced with price level of the international market. FOB price of Viet Nam rice show the fluctuation synchronized with that of Thai rice. At rice wholesale market in HCMC, Long An province and Can Tho province are recognized as areas for quality rice in Mekong River Delta. Rice from the Study Area ( Dong Thap province) has no such fame at HCMC.

Detailed causes of inferior quality are shown in the next figure. In addition to problems of seed quality, mixed cultivation and small scale of paddy sales by each farmer, improper post-harvest practices and low ability of quality evaluation lead to inferior quality of paddy/rice. Due to inferior quality of material rice, recovery rate cannot be higher and cannot reduce production cost.



At present, price differences between variety groups are VND100-150/kg and differences between qualities is VND50-100/kg. These price differences are seen not enough to give farmers' an incentive to improve their paddy quality.

#### (4) Transportation

Waterway transportation capacity is considered as generally sufficient. Commodity handling scale of each marketing agents are: farmers 3-4 ton, collectors 5-15 tons and polishers 200-500 tons. Compare to the scale of polishers, scale of farmers and collectors are very small.

Though the waterway network is well developed in the Study Area, there exist canals on which boat over 10-15 tons can not be navigated due to shortage of clearance under bridge in rainy season and/or shortage of water depth in dry season. This is considered as one of the factors limiting the scale of collection. National Road A1 and 30 pass through the Study Area along Tien River, but lateral roads have not well established as yet.

### 3.7.3 Marketing System of Fruit

#### (1) Commodity Flow

Commodity fruit such as mango and longan are transported through waterway or roadway from farmyards to shops of assembly wholesalers. After grading and packaging by wholesalers, fruit are distributed to HCMC, other provinces and China border by 5 - 10 tons truck. Many of assembly wholesalers are located at Cai Be Market, An Huu Market and My Duc Tai bridge area in Cai Be district and these places are major collection/distribution points of fruit in the Study Area. Assembly wholesalers for longan are located alongside of National Road A1 and 30.

SOFRI estimates that about 70% of longan and about 30% of mango are shipped from the southern Viet Nam. It is presumed that the same or higher percentage of fruit are also shipped from the Study Area, with

the estimated amount of 7,500 tons for mango and 57,000 tons for longan.

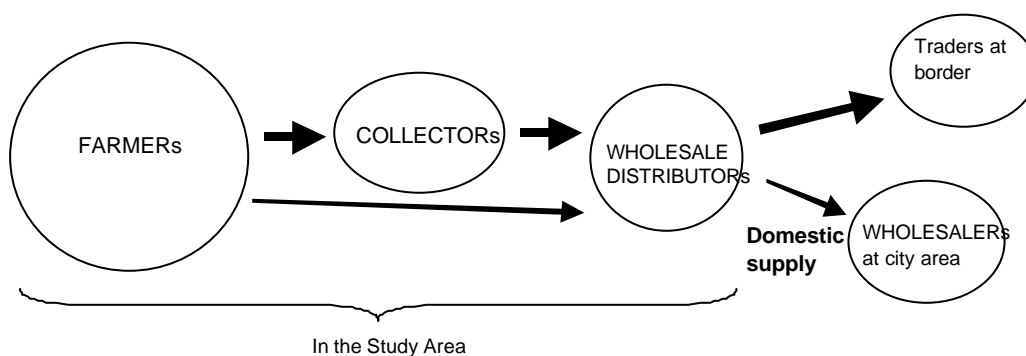
The fruit planted area of mango and longan have risen sharply not only in the Study Area but in the Mekong River Delta as a whole. In case of longan, 10,000 ha out of 40,800 ha (total longan planted area in Mekong Delta) have not yet reached production stage. Therefore, fruit production will be continuing to increase sharply.

## **(2) Marketing Channel**

Marketing channel for major fruit consists of three sectors : Farmer, Collector, Assembly Wholesaler. Activities of each sector and major characteristics are summarized as follows:

- a. Larger scale farmers sell fruit in his garden at one time to collectors. If farmer need money, he may sell fruit on tree before maturing or even at flowering stage. So far no group sales activity is conducted in the Study Area.
- b. Assembly wholesalers of longan are specialized for this commodity. Not only waiting collectors but many wholesalers collect fruit directly from farmers by themselves. Most of longan wholesalers come from the northern part of Viet Nam.
- c. Many of assembly wholesalers in the Study Area come from other provinces. They collect various fruits from the Study Area and other provinces in the Mekong River Delta and directly ship to their home province or HCMC.
- d. No governmental enterprise is involved in fruit trading in the Study Area.

### **Fruit marketing channel**



## **(3) Markets**

There is no specialized market in fruits' trading or wholesaling in the Study Area. Many of assembly wholesalers are located at Cai Be Market area and An Huu Market area in Cai Be district. At each market, 20-30 traders have their shops and play important role for collection and distribution of fruit from the Study Area and other production areas in Mekong River Delta. There are 131 markets including above two markets in the Study Area. In these markets, not only food items but also various commodities are marketed.

**(4) Price**

Price of fruits fluctuates seasonally and range of fluctuation varies among fruits and varieties. Longan has the largest range of fluctuation of 6 times and high-grade longan variety tends to fluctuate more than lower grade variety. There are definite price differences among varieties. The price differences among mango varieties are 3 to 4 times and 1.5 to 2 times among longan varieties. The price of longan is strongly influenced with the demand of Chinese market. The price tends to drop in recent years and it dropped sharply to 1000 – 1500/kg in July and August 1999.

**3.7.4 Major Problems**

**(1) Marketing System of Rice**

**1) Quality**

Inferior quality of material for processing causes the high processing loss and higher production cost. Causes for inferior quality in the marketing stage are summarized as below.

**Individual sales activity of farmers**

In addition to the situation of mixed cultivation and uneven quality of paddy in the field, farmers' individual sales of paddy to collectors cause the mixture of different varieties/quality at the marketing and processing stages.

**Improper quality evaluation**

Due to the mixed cultivation and low ability of quality evaluation, especially of farmers and collectors, quality of paddy is not duly reflected to its price

**Understanding of the market needs by farmers**

Farmers sell their paddy at farmyards and have less interest about further marketing procedures. Due to this, information on quality requirements for market/consumer hardly reaches to farmers.

**Processing quality of private mills**

90-95% of marketed paddy are milled by privately owned mills. Due to the commission business of those millers, they are not much interest in quality. Further, as they often use the old type equipment, recovery rate of head rice is in low level.

**2) Commodity handling scale**

Commodity handling scale of each marketing agents are: farmers 3-4 ton, collectors 5-15 tons and polishers 200-500 tons. Compare to the scale of polishers, scale of farmers and collectors are very small.

## **(2) Marketing System of Fruit**

### **1) Insufficient fruit market information system**

In/around the Study Area, only SOFRI in My Tho has function of regular collection and dissemination of fruit market information since 1998. But the coverage area of information and frequency of collection and dissemination are limited. DARD in both Dong Thap province and Tien Giang province have no function of information service.

### **2) Poor facility of wholesale market**

Many of assembly wholesalers are located at Cai Be Market area and An Huu Market area in Cai Be district. At each market, 20-30 traders have their shops and play important role for collection and distribution of fruit from the Study Area and other production areas in Mekong River Delta. But facilities such as shop of wholesalers, parking place, piers for unloading, storage are in poor condition.

### **3) Establishment of Wholesale Market in HCMC**

Cau Moui Market in HCMC is called as wholesale market for fruit and vegetable, but this is merely a place where many wholesale traders have individual shops alongside the streets. This is not considered as having adequate functions of price determination and of storage as wholesale market. Also, because of its poor facility, congestion and hygiene problem are observed.

Not only for ensuring stable supply of daily food to the people in HCMC, but also for promoting agricultural production in Vietnam, it is essential to establish the proper wholesale markets to strengthen the function of collection/distribution based on the overall plan for food distribution system in HCMC. At the same time, way of price determination shall be modified in the way reflecting the nationwide supply-demand situation and quality evaluation shall be standardized.

### **4) Development of new markets**

At present, market is rather limited but continuous increase of production is expected. It is necessary to develop new markets not only for the farmers in the Study Area but also for those farmers in Mekong River Delta. However, even biggest trader in the Study Area considers that it is impossible to find new markets by oneself due to lack of access to potential markets and lack of business knowledge and information.

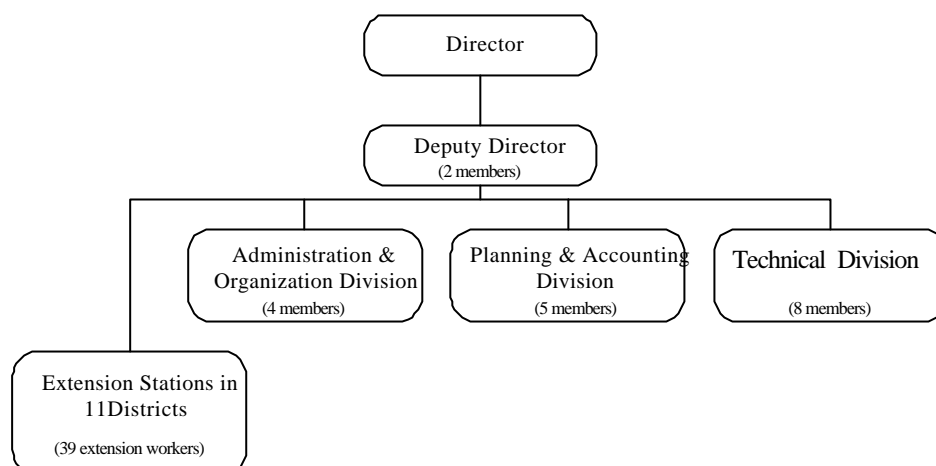
## **3.8 Agricultural Support Services**

### **3.8.1 Extension Service**

The main function of the Agricultural Extension Center (AEC) is to transfer technology to farmers for increasing their incomes and improving their living conditions. The organization of AEC is shown in the

figure below. There are 58 staff members working in the extension system.

The Organization Chart of Extension Center



Provincial budget for extension activities is about 1.6 billion VND (in case of Dong Thap Province) per year. This is used to carry out the following extension programs:

- 1) Increasing rice production and yield, improving rice quality especially for export rice.
- 2) Protecting Melaleuca forest in “Plain of Reeds” from fire. Persuading farmers to plant forest trees along the river or canal bank.
- 3) Increasing economic efficiency of the orchard by planting high economic fruit trees such as citrus, longan and mango.
- 4) Developing upland crops such as soybean, mungbean, watermelon in the rice field.
- 5) Carrying out integrated pest management program
- 6) Improving livestock production
- 7) Building farmers’ capacity
- 8) Strengthening the extension system by organizing training courses for extension workers

Besides the provincial extension budget, AEC also receives about 180 million VND/year from Agriculture & Forestry Extension Department, Ministry of Agriculture & Rural Development.

### 3.8.2 Plant Protection Service

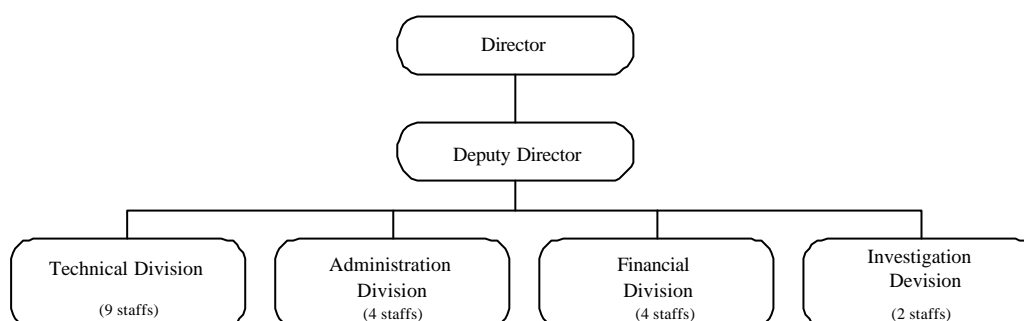
The Sub-Department of Plant Protection, which is under Department of Agriculture and Rural Development, is responsible for assisting Provincial People's Committee in the field of plant quarantine, plant protection, and pesticide. At the same time, the sub-department assists stations of plant quarantine and plant protection at district level.

The Sub-Department of Plant Protection consists of 4 divisions with 19 staff members. Technical division is responsible for 1) surveillance of plant diseases, 2) prediction, 3) dissemination of IPM practice, and 4)

safe use of pesticides. Investigation division is responsible for 1) supervision of distributors of pesticides, 2) issuance of certificates to pesticides dealers, and 3) seminar for dealers. Technical information is disseminated through radio, seminars and publications. Radio program is broadcasted twice a week. Seminars are held once every two years to pesticides distributors. Booklets are published to disseminate IPM practice and other technical matters.

The organization of Sub-Department of Plant Protection is shown in the figure below.

The Organization Chart of Sub-Department of Plant Protection



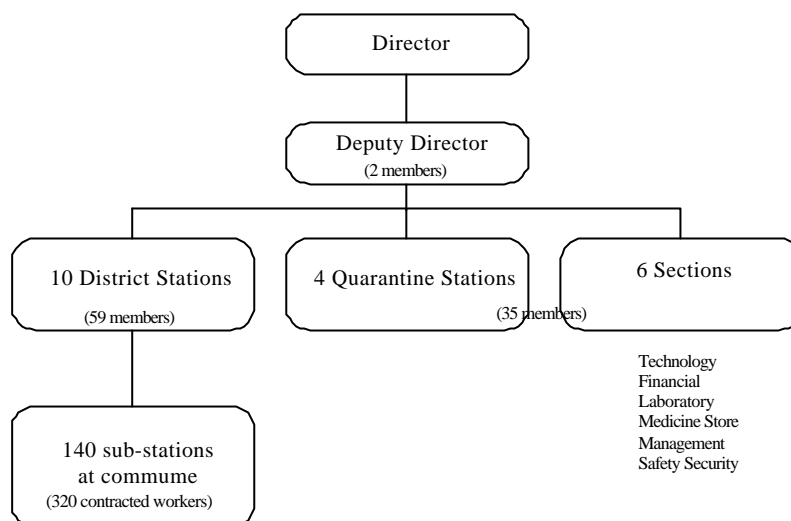
### 3.8.3 Veterinary Service

Sub-Department of Veterinary which is under Department of Agriculture and Rural Development, is responsible for veterinary service. The sub-department consists of 6 sections, 4 quarantine stations and 10 district stations with total staff of 97 members.

This sub-department has main activities for:

- 1) Organizing and guiding farmers for the prevention and control of animal diseases.
- 2) Implementing quarantine activities for animals and animal products transported and sold in the province.
- 3) Conducting state management on veterinary medicines in conformity with the laws and regulations.
- 4) Granting or revoking certificates on vaccination, quarantines of animals and animal products, certificates on veterinary sanitation, license for carrying out veterinary activities and services in the province.

The Organization Chart of Sub-Department of Veterinary



### 3.8.4 Supply of Agricultural Input

Agriculture and Development Service Company (AGRISEDO) is the provincial SOE established in November 1998 combining a number of organizations which belonged to Agriculture and Rural Development Department of Dong Thap Province. These include such organizations as Dong Cat Seed Station, An Phong Seed Station, Fruit Station and the agricultural material shops. Animal Station and the material shops, currently belonging to Sub-Institute for Veterinary, is scheduled to be combined soon. Most of 71 staffs members were transferred from the previous offices concerned and take in charge of the similar works as before.

The main duties and business are the selection, production and sale of rice seeds, production and sale of fruit seedlings, and sale of the agricultural materials (manure, agricultural chemicals, farm implement, etc.). It is also planning to deal with livestock and organic fertilizer.

This company is basically managed as autonomously and has the right to decide sales prices. However Provincial government supervises and provides subsidy for the salary of main staff.

### 3.8.5 Rural Credit

Among formal financial institutions in Viet Nam, Vietnam Bank for Agriculture and Rural Development (VBARD) plays dominant role in extending credit to farmers. Other institutions related to rural credit include Vietnam Bank for the Poor(VBP), People's Credit Fund and Rural Shareholding Bank, although the latter has limited presence in their activities nowadays.



VBARD provides nearly three fourths (3/4) of the total rural credit in the country to 4 million households or 70% of the total households served by financial institutions. With its nation wide network of 1,271 branches, mostly located at district and sub district levels, total number of staff amount to 21,000, out of which 6,500 are specialized credit officers.

Established in 1988 as Vietnam Bank for Agricultural Development (VBAD), it was renamed as Vietnam Bank for Agriculture (VBA) in 1990. Further in 1996, it was renamed as Vietnam Bank for Agriculture and Rural Development (VBARD). Initially it was created to serve the needs of the State Owned Enterprises (SOEs), but now it focuses more on the needs of rural households and private enterprises.

Statutory Capital	:	2,200	billion VND
Total Asset	:	26,510	billion VND
Total Loan amount	:	23,304	billion VND
Total Loan Outstanding	:	21,918	billion VND

At the provincial level there exists each one branch of VBARD.

In Dong Thap province, the branch was established in 1990 in Cao Lanh town, and in Tien Giang it was established in 1988 in My Tho town. The total number of the staff of Dong Thap branch at present is 320. This includes 67 staff at branch headquarter in Cao Lanh and remaining 253 at 10 sub branches at districts. Therefore, the number of staff at district level is 25-26 on average. In case of Tien Giang branch, total staff is 386, of which 87 are at provincial branch and remaining 299 are at 7 district branches.

Around 70-80 % of farmers is covered by VBARD credit in general. Ceiling of each credit at provincial branch and district branch is fixed. If the clients require credit above the ceiling, they have to apply to the higher levels, namely, from district branch to provincial level, to regional level ( Ho Chi Minh )or to main office in Hanoi.

Ceilings applied for respective clients are ;

Individual	:	at district,	less than 200	million	VND
	:	at province,	less than 500	million	VND
Private enterprise	:	at district,	less than 1.0	billion	VND
	:	at province,	less than 4.0	billion	VND
SOE	:	at district,	less than 3.0	billion	VND
	:	at province,	less than 40.0	billion	VND

Terms of credit are classified into 3, long-term (more than 5 years), medium-term (1-5 years) and short-term (less than 1 year). Interest rate is fixed at 0.95 %/ month for the urban and 1.05 %/ month for the rural regardless of the difference of terms.

Collateral is not required for the individuals with the credit less than 10 million VND. However, Land Use

Certificate is required. In case of more than 10 million VND, collateral is required. It is the usual practice to use the asset as collateral in case of enterprise. In case of cooperatives, 50% of the paid capital is allowed as collateral.

Most of the credits are short-term ones at the moment. In case of Dong Thap provincial branch (including districts), long-term and medium-term credit are negligible, whereas in Tien Giang nearly 20% are shared by medium-term credit. Though the share of credit by client shows the increasing tendency for individual / farmers, substantive portion of total credit are given to SOEs.

Apart from VBARD, there are a number of Peoples Credit Funds within the provinces. In case of Tien Giang province, 16 Peoples Credit Funds exist. These are autonomous financial institutions supervised by the State Bank.

Bank for the Poor (BP) was established in 1995 as the fund for the purpose of poverty alleviation. BVP provides credit to the households recognized as poor, In this case, the borrowers are not required collateral. The actual credit operation of VBP is entrusted to VBARD.

The socio-economic survey results show that, while appreciating the credit by VBARD, many farmers felt that the complicated procedure, limited access to branch, term being rather short, amount being rather small and interest rate being high are the problems.

### **3.9 Rural Society and Farm Household Economy**

#### **3.9.1 Living Conditions in General**

##### **(1) Development and Settlement Pattern**

The time of development of the most area in Dong Thap province is concentrated on the period since 1976. On the contrary, Cai Lay, Cai Be and Cao Lanh districts have been inhabited over 100 years. Due to the natural environment and development history of the Delta, population distribution is not uniform. With the excavation of canals, people started to settle along the canal banks. Additionally, as the road system has been developed, houses have been constructed along the roads, resulting in a pattern of ribbon shaped development. Especially, the population is concentrated at the provincial towns and district towns.

##### **(2) Social Services**

As a result of RRA\*, it is found that the interviewed farmers have strong demand for development of social services besides production activities. They are concentrated on education, health, and other infrastructure development such as water supply system, dike, electricity, bridge, etc. Based on the Socio-economic Survey of Farm households\*\* (hereinafter called 'Survey'), the share of the households

using clean water is large in Cai Be and Cai Lay districts and low in Hong Ngu and Thanh Binh districts. While most of the communes have primary schools, 35% of the total communes have secondary schools and only a few have high schools. The problem is not only the insufficient quantity of schools but also the low quality of education facilities. More than 90% of the total communes in the Study Area have health stations. However, these stations are lacking in the medical treatment tools and medicines as well as medical staff.

\* RRA (Rapid Rural Appraisal) was conducted in April 1999 in 5 communes of the Study Area.

\*\* The Survey was carried out in August 1999 with total sample size of 500 farm households covering 20 districts of the Study Area. Questionnaires were used to get information of farmers living conditions, farming system, post-harvesting, marketing, and forestry, etc.

### **3.9.2 Household Economy**

#### **(1) Poor Households**

Total number of poor household (average monthly income/person is less than 125,000 VND) is 35,488 (14.9% of the total farm households) in the Study Area, in which 23,885 (67.3% of the total poor households) in Dong Thap province and 11,603 (32.7% of the total poor farm households) in Tien Giang province. The highest number of the poor household can be seen in Hong Ngu district of 7,212 households, followed by Tan Hong district, and Cao Lanh district. The lowest number can be found in Thanh Binh.

#### **(2) Income and Expenditure**

Average yearly production amounts of the households in the interviewed communes and districts are very much varying. Based on the Survey, average net income in the Study Area is 13.9 million VND/household/year. More than 80% of the households have enough rice for the self-consumption in a whole year. The number of households suffered severely from deficiency of rice is large in Hong Ngu and Tan Hong districts according to the Survey.

The yearly expenses of the households for living and production are also very much varied. Average expense for production is 25.1 million VND/household/year (66.4% of the total annual expenses of 37.8 million VND/household/year) and the rest of 12.7 million VND/household/year is spent for daily activities. The survey found that farmers in Dong Thap province spend more for production than those in Tien Giang province.

### **3.9.3 Land Tenure**

In Dong Thap province, the number of farm household with insufficient land for production (less than 0.2 ha/household) is 6,843 sharing 5% of the total farm households. The number of that farm household is

8,778 (8% of the total farm households) in Tien Giang province.

Landless farm households are 17,180 in the Study Area with breakdown as shown in the table below. The landless households often work as hired labors for other farmers. Most of these two types of households have income under the category of poor household.

	Dong Thap Province							Tien Giang Province		Study Area
	Cao Lanh Town	Hong Ngu	Tan Hong	Tam Nong	Thanh Binh	Cao Lanh	Thap Muoi	Cai Be	Cai Lay	Total
	Landless Farm Household	1,731	1,241	1,220	1,731	1,350	3,119	1,111	2,781	2,896
Share in Total Farm Households in Each District	12.6%	10.0%	19.5%	12.6%	10.9%	8.7%	4.8%	5.1%	6.0%	7.2%

Reasons that many landless farmers are existing are;

- (i) lack of knowledge and technique on agricultural production,
- (ii) lack of labor,
- (iii) lack of capital for investing in the production ,
- (iv) large family members,
- (v) illness and some accidents,
- (vi) land used for mortgage, and
- (vii) return the land to the original owners after disintegration of the collectives (cooperatives).

For the households which have not enough farmland, the government plans to support production funds, to provide production techniques and management through agricultural extension programs. Also, to the landless households, low interest loans will be provided by the government, so that the farmers can get back their land which were used as mortgage. Additionally, the creation of off-farm job opportunities is considered to absorb landless farmers as labors.

Measurement of land and registration of land use right has been conducted. Application forms for registry (98% of the total land area that need to register) were submitted, in which 92% were already issued of land use certificates in Dong Thap province as of 1998.

### **3.9.4 Farmer's Organizations**

#### **(1) Existing Farmer's Organizations**

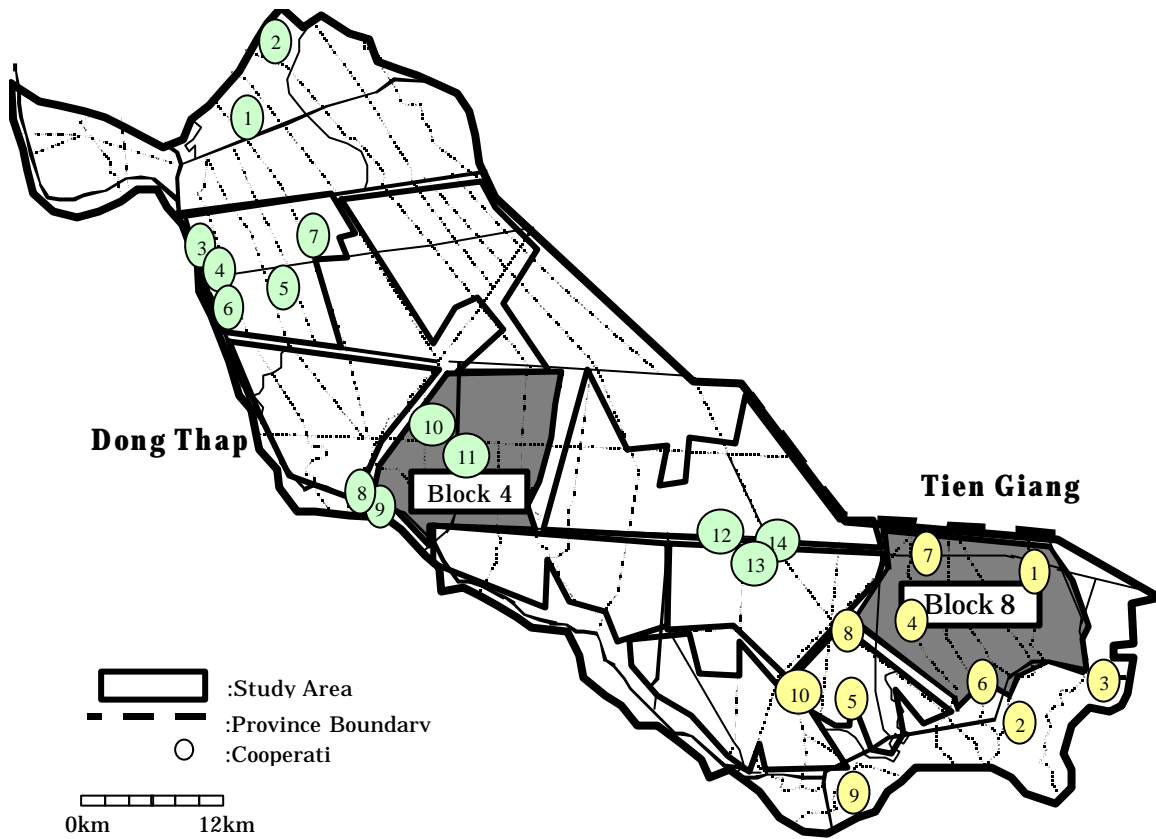
There are many small informal farmer's groups with single purpose in the Study Area such as irrigation group, land preparation group, material supplying group, and credit group, etc. These simple-formed groups have no legal status. They are organized if found necessary and disappeared if found not necessary

any more. However, many of them can provide proper effects. The problems faced by these groups, including those due to lack of legal status, are in general as follow.

- (i) Small scale activities
- (ii) High and unstable price of inputs, low and unstable price of products by individual purchasing materials and individual marketing of products through private traders, which is the important channel now
- (iii) Informal, short-term loan of small amount with higher interest rate, which is also through private traders and individual acquaintance
- (iv) Individual ownership of small agricultural machinery causing higher rental
- (v) Short-term planning of farming management and finance
- (vi) Limited information and technique exchanged among individual farm households (gender issue is not considered)
- (vii) Government support and extension worker's role are insufficient and ineffective
- (viii) Lack of capable leaders with strong will of community development in farmer's side and government side

## **(2) Present Situation of Agricultural Cooperatives**

In the Study Area, 14 cooperatives are established in Dong Thap province and 10 cooperatives in Tien Giang province as summarized in the following map and table. The oldest cooperative is Hau My Trinh in Cai Be district of Tien Giang province established in 1997 and the newest one is Binh Minh in Thanh Binh district of Dong Thap province in January 2000. The common characteristics among the present cooperatives are; a) since all these cooperatives have just established for 1-2 years, their ability is not yet strong enough, 2) their operation is concentrated on providing services on the irrigation and drainage and the other activities have not produced substantial effects yet. Compared two provinces, cooperatives in Tien Giang have more diversified activities, which might come from geographical conditions including transportation, farming pattern, development history, etc.



Cooperatives in The Study Area

**List of Cooperatives in Study Area**

No.	Name of Cooperative (Commune)	No. of Member (households)	Covered Area (ha)	Date of Set-up	Total Capital (million VND)	Major Activities
<b>Dong Thap Province</b>						
<u>Tan Hong District</u>						
1	No. 1 Binh Phu	25	50.5	-	101.5	A, B, C
2	Tan Tien (Tan Hoi Co)	12	5	-	180	D
<u>Tam Nong District</u>						
3	An Phu (An Long)	519	413	6/10/1998	603	A, C, E
4	Phu Tho (An Long)	579	370	21/10/1998	579.0	A, C, E
5	Tan Thong Nhat (Phu Thanh A)	9	815	1997	500	A
6	No.1 Hamlet 3 (Phu Ninh)	240	150	-	112	A
7	Tan Tien (Phu Duc)	159	236	-	166.6	A
<u>Thanh Binh District</u>						
8	Binh Hoa (Binh Thanh)	725	558	19/9/1998	1,342.4	A, C, E
9	Binh Trung (Binh Thanh)	720	810.7	18/12/1998	1,673.1	A, C, E
10	Binh Minh (Binh Tan)**	403	521	28/1/2000	52	A
<u>Cao Lanh District</u>						
11	Gao Giong (Gao Giong)**	127	652	5/5/1998	1,010.0	A
<u>Thap Muoi District</u>						
12	My Dong	15	200	11/1998	300	A, B, G
13	Thi Tran (My An)	9	961	10/1998	2,029	A, B, G
14	Tan Tien (My An)	40	100	-	503	A, B

Note) A: Irrigation/drainage service B: Agricultural material supply service C: Inter credit  
D: Aquaculture E: Fertilizer supply service F: Land preparation service G: Marketing

<b>Tien Giang Province</b>						
<u>Cai Lay District</u>						
1	Quyet Tien (Phu Cuong)*	104	80.5	28/8/1988	25.5	A
2	Cam Son (Cam Son)	236	-	26/6/1998	236	A, B
3	TT Cai Lay (TT Cai Lay)	15	-	7/9/1999	500	D
<u>Cai Be District</u>						
4	Hau My Trinh (Hau My Trinh)*	65	-	25/9/1997	97.5	B
5	My Duc Tay (My Duc Tay)	327	350	26/9/1998	275	A, B
6	My Hoa (Hoi Cu)	62	106	14/11/1998	155	A, B
7	My Quoi (Hau My Bac B)*	188	640	20/3/1998	192	A, B
8	Loi Thuan (My Loi B)	500	900	10/9/1999	445	A, B
9	My Luong (My Luong)	370	1,024	29/12/1999	296.8	A, C, E
10	Loi Nhon (My Loi A)	127	1,357	30/12/1999	127	A

Note) A: Agricultural service B: Rural water supply service C: Veterinary  
D: Water transportation E: Feed supply for livestock

\* are in the Pre-F/S Area and \*\* are in F/S Area.

Source) DARD in Dong Thap Province and Tien Giang Province (11/1999, 4/2000)

Cooperative Alliances are established in Dong Thap province and in Tien Giang province. These organizations are operated based on the Cooperative Law with cooperation of central and province governments. 90% of the total budget of the Alliance is provided by government and the rest 10% is contributed by member cooperatives. The roles of the Alliance are to support for members in legal,

technical, operation/management, and financial aspects, to establish good and close relationship between members and central government, and to coordinate and promote the relationship with other members in and out of the country. All information related to the member cooperatives including financial conditions and activities are reported to the Alliance and monitored whether they comply with Cooperative Law. Furthermore, Alliance provides members with training courses such as business management, accounting, farming technology, etc. Among 27 agricultural cooperatives in Dong Thap province, 18 agricultural cooperatives are members (participation rate is 66%). In Tien Giang province, 15 among 34 agricultural cooperatives join the Alliance (participation ratio is 44%). In the Study Area, 11 agricultural cooperatives are members.

As the pilot project, the provincial and district governments encourage some SOEs to make agreement with cooperatives to buy rice and to provide agricultural inputs. The objectives of this project at SOE side are to get materials for high quality rice. Cooperative side objectives are to sell rice at higher marketing and buy materials at lower price including high quality seeds, to get stable marketing channel, and to receive technique through extension services. In the Study Area, 3 cooperatives in Dong Thap province (An Phu, Phu Tho, and Binh Trung) are selected for this project. The factors for the selection of these cooperatives are (i) more involved into agricultural production activities focusing rice production, and (ii) hold more capitals compared with other cooperatives. System of this cooperation is now under development and need evaluation and assessment in future. However, this will be a good example of cooperation among the government, SOEs and cooperatives to be diffused to other area.

Provincial government has made efforts to the increase the number of cooperatives and the improvement of their quality. The target in year 2000 is to establish 3 new cooperatives in Dong Thap province. However, the approach to implement this plan has not been considered well. The reasons for the lack of feasibility are; a) the number of staff in charge of cooperative in province DARD is not enough to understand the present condition of all cooperatives, and b) the responsibilities of the staff are not clear. Additionally, opportunities of training attended by officials are limited, network with DARD in other provinces is not set up and then useful information is not exchanged.

### **(3) Farmer's Opinions toward Formation of Farmers' Groups**

Based on the question of the expectation toward farmers' groups during the Survey, about 90% of the interviewed farmers answered that it is necessary to establish cooperatives in the communes and they are willing to join the cooperatives. As for the reasons, 78% of them expect to get better services, 13% will sell products with higher price, 7% consider that marketing system of the products will be developed accordingly, and 2% have other answers (contribution to the poverty reduction, together building rural infrastructure such as electricity, road, water control works, etc.).