

**APPENDIX-F**

**AGRO-PROCESSING AND MARKETING**

## APPENDIX - F

### AGRO-PROCESSING AND MARKETING

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## APPENDIX - F

### AGRO-PROCESSING AND MARKETING

#### CHAPTER F-1 GENERAL CONDITION IN THE STUDY AREA

Agriculture in the Study Area is dominated by rice production in the rainy season. The capacity of small animal breeding such as pigs, ducks, chickens, fruits, and vegetable production is still small and no special processing is adopted after breeding and harvesting. There are no factories that can be called “industry” other than the rice processing in the Area. But traditional small food processing operated by a family such as noodle and cake making exists widely over the Study Area even though it is difficult to know the actual conditions in detail.

##### **F-1.1 Post-Harvest Processing of Rice**

The following observations are the result of interviews with farmers, officials, and other people concerned and the review of the existing reports and other relevant information.

##### **F-1.1.1 Farmer’s Practice**

###### **(1) Harvesting and threshing**

The farmers harvest by hand and tie up the panicles into bundles. The bundles are then dried on the field for one to three days if necessary, and carried to the farmer’s house and threshed. Hand threshing is the most common rice processing method in the Study Area. The farmers strike the paddy bundles about 15 to 20 times onto a wooden board to separate paddy grains from the panicles. The mechanical thresher is not in wide spread use yet. The threshed paddy grains are made to fall from head height to the ground for separation of light impurities such as immature grains, dust, husks and straws.

###### **(2) Drying**

After threshing, the paddy is dried one or two days before storage, depending on the sunshine and moisture content of the paddy. This drying is carried out in the backyard or a roadside of the house where the paddy is spread out on a plastic sheet or a palm leaf mat on the ground. The dried paddy is stored once and dried again a few hours before milling following their traditional practice.

### (3) Storage

There are two ways of storing paddy after drying. The first is bulk storage in the basket made of bamboo that is placed on the floor of a house. The second is to put the paddy into a 50 - 70 kg capacity plastic bag, and store on or under the floor of a house or in a wooden shed separated from the house. The farmers said there were no serious losses or damages caused by rats, mold, etc. during storage.

#### **F-1.1.2 Rice Mill**

Almost all rice mills in the Study Area are custom mills having a small capacity machine that provide a processing service for neighboring farmers. The big commercial rice mills are intermediate facilities in the distribution channel to other Provinces. Twenty-three commercial rice mills of more than 1 ton per hour capacity are registered in Takeo Province as of December 2000 and located along National Road No. 2 centering on Takeo Town, which is out of the Study Area.

According to the record of Department of Industry and Mining in Takeo Province, 224 rice mills are registered in Tram Kak District. However, the Authority of the District explained 817 rice mills exist in the latest record. It is estimated that almost 1,000 rice mills are spread over the Study Area including a few outside Tram Kak District.

The processing capacity of those rice mills is mostly very small averaging 200 - 300 kg per hour. Rice mills of more than 16 HP (300 kg/hour) do not exist in the registered record. The most popular machinery in use is the Chinese made Engerberg type and some use a small Vietnamese machine (called a "Stamar") combining the rubber roll type husker and the friction type whitener. The processing wage is normally paid by bartering bran and husk by-products. When millers return the by-products, the milling fee is between Riel 250 and 300 per basket (12 kg) of paddy input.

The total processing capacity in the Area is estimated at almost 160,000 ton/year<sup>1</sup>. That is three times as much as the present total production of the Area. These rice mills are actually operated a very short time during the year.

#### **F-1.1.3 Post-Harvest Loss**

The loss assessment study is effective in determining the present condition, finding out obstacles to improvement, and to consider countermeasures with numerical target.

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<sup>1</sup> 1000 mills x 200kg/hr (actual) x 4hrs/day x 200days/ year = 160,000ton/year

Another JICA Study Team<sup>2</sup> carried out the assessment in four provinces last year. The extensive results of the assessment are introduced below.

(1) Quantitative loss

1) Farmer level

The result of quantitative loss assessment in post-harvest processing is shown in the following table:

Result of Loss Assessment  
(Unit : %)

Province	Season of crop	Harvesting	Drying before threshing	Transportation before threshing	Threshing by hand	Threshing by mech.	Drying	Other transportation	Storage	Transportation for milling
Takeo	Dry	0.77	0.25	0.21	4.95	4.13				
	Rainy	1.08	0.16	0.57	1.30					
Average*	Dry	0.88	0.28	0.23	4.95	1.95	1.61	0.12	2.00	0.01
	Rainy	1.72	0.38	0.83	0.89	0.45	0.80	0.12	1.90	0.01

\* Average among Prey Veang, Takeo, Kandal, and Bat Dambang provinces.

- It is pointed out in the Study Report<sup>3</sup> that the harvesting and transportation loss before threshing of the rainy season crop is more than the dry season crop.
- In addition, the threshing loss of the rainy season crop is less than the dry season crop because there are more easy shattering varieties grown in the rainy season.
- The post-harvest loss in the Study Area of only rainy season cultivation is estimated at 3.11 % by the threshing process and about 6 % during the farmer level.

2) Custom mill

- As for quantitative loss, it is reported that the separation of bran and husks from sound/broken rice was insufficient 2.13 % of rice in the dry season crop and 0.45 % of the rainy season crop were mixed in husks and bran.
- The total loss from harvesting up to farmers own consumption in the Study Area is estimated at about 6.5 %, less than the 7.15 % average in the four provinces.
- The average milling yield measured by this Study is 62.57 % for the dry season crop and 63.61 % for the rainy season crop.

(3) Qualitative loss

As for qualitative loss, the result of this assessment study does not show a numerical

<sup>2</sup> For “the study on improvement of marketing system and post-harvest quality control of rice in Cambodia”, 2001

<sup>3</sup> “The study on improvement of marketing system and post-harvest quality control of rice in Cambodia, draft final report”, March 2001

indication and explains that quality of paddy affects the broken rice ratio of milled rice as well as the quality of milled rice i.e. uniformity, color and appearance. The inferior grains as causes for decreasing of milling yield and broken rice increase in product damaged and immature grain especially broken and cracked grain.

### **F-1.2 Post-harvest Processing of Other Products**

There is no notable industry other than the rice mill processing in the Study Area. But the following traditional processing activities carried out by a family base are observed.

- Rice noodle production
- Cake production
- Palm sugar production
- Bamboo handicrafts production

### **F-1.3 Marketing of Agricultural Products**

The marketing practices of farmers and their situation in the Study Area are as follows:

#### **F-1.3.1 Rice**

##### **(1) Food balance**

Based on the paddy production and population data, food balance in the Study Area is estimated by the following assumptions used by MAFF, FAO and WFP since 1996:

Assumptions for food balance

Items	Assumptions
Post-harvest losses	10 % of production
Seed use	5 % of production
Feed and other uses	2 % of production
Milling yield from paddy to rice	62 %
Annual consumption per capita	151.2 kg

The balance of rice in the Study Area is estimated to be a little surplus at only 2 % of production, according to the results of interview surveys and the estimation below. So, the surplus amount is considered to be almost consumed within the surrounding area. On the other hand, the major rice production area in the Province is the eastern area from National Road No. 2 to Bassac River where dry season cultivation is done. The production in this area ensures Takeo Province being the highest surplus province in Cambodia.

Estimation Result of Food Balance

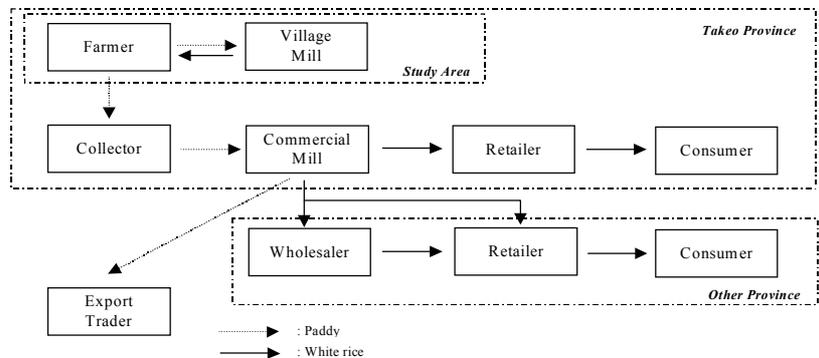
Items	Unit	
Paddy production	ton	51,480
Post-harvest losses	ton	5,148
Seed use	ton	2,574
Feed and other uses	ton	1,030
Available paddy	ton	42,728
Milled rice production	ton	25,637
Population	person	165,600
Rice consumption	ton	25,039
Balance of rice	ton	598
Balance of paddy	ton	965

(2) Marketing practice of farmers

The farmers generally sell their surplus rice to collectors soon after harvesting for repayment of debt and cash needs, and store the rest. The farmers who can store the surplus sell it when they need cash and/or when the market price rises enough. Some farmers sell their rice directly to a middleman, commercial rice mill, or a retailer or a consumer in a market instead of to a collector. In general, the market information they can receive is very limited and only available from: i) collectors coming to their residence, ii) markets they go to and iii) neighboring farmers.

(3) Distribution Channel

Trade flows are basically generated by quantity imbalance, but a specific rice variety need of high-income consumers also generates trade flows. Such trade flows of special varieties from northern provinces is found only in Takeo Town in the Province. In the Study Area, collectors generally buy surplus paddy of farmers and sell them to commercial rice mills out of the Study Area. Some collectors act as a collecting agent for the rice mills. Major distribution channels of surplus paddy in the Area are shown in the following chart:



Rice Distribution Channels

It is said and also reported by the JICA Study Team<sup>4</sup> that the commercial rice produced in the northern area of Takeo Town tends to be transferred to the northern deficit provinces including Phnom Penh and rice, especially of the IR variety, produced in the southern area goes to Vietnam. The collectors for Vietnamese buyers buy mainly paddy, not milled rice.

(4) Transportation mode

Both paddy and milled rice are transported in plastic bags of various sizes containing from 60 kg to 100 kg. For paddy transportation in the Study Area, various means are used depending on distance, quantity and road condition. Generally, motorbike, bicycle and ox cart are popular for short distance and motorbike and motorbike with trailer (used like a public bus) for longer distances like to Takeo Town. Since sales lots of farmers are small, it is judged that a motorbike carrying two to three bags is the most popular means. Trucks for paddy transportation were not seen during the study period but may be used in the harvesting season.

### F-1.3.2 Vegetables and Fruits

In the Study Area, many farmers cultivate vegetables in backyard gardens mainly for self-consumption. In the interview survey, more than 30 % of interviewees sell vegetables and fruits. The number of farmers who can stably produce and sell vegetables though, is very limited because of water shortages. Due to great variety and lack of reliable statistical marketing data, it is difficult to estimate the trade quantity in the Study Area.

(1) Marketing practice of farmers

The farmers' behavior for selling vegetables and fruits is categorized as follows:

- a. Selling to a retailer in a market (used to be the neighboring farmer) or a middleman coming to their residences.
- b. Going to a market and selling to a middleman or a retailer.
- c. Going to a market and selling to consumers as a retailer in a market.

Since sales lots of each farmer are usually very small, transported in a small bamboo bag or basket carried by



hand to a big bamboo basket carried by bicycle (Pic.-1), it is judged many farmers come and sell to retailers or consumers in a market. Market information farmers can receive is almost the same as for rice. Farmers who usually go to a market though,

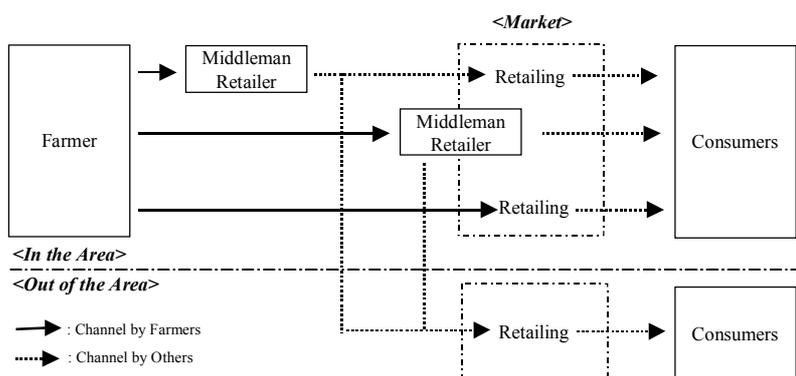
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<sup>4</sup> For “the study on improvement of marketing system and post-harvest quality control of rice in Cambodia”

may have more practical information advantage in quantity and quality over farmers who sell their products in their village.

(2) Distribution Channel

It is observed that some farmers select to go to a far distant market in consideration of market information. Thus, marketing channels are generally short and widely practiced such as farmer direct sales to consumers and direct purchase by retailers from farmers. Although various channels by small trading unit exist, the major channels are abstracted in the figure below.



Distribution Channel of Vegetables and Fruits

(3) Transportation mode

Plastic bags (Pic.-2) and bamboo baskets of various sizes are popular as containers for products transportation except big products such as coconuts. Bicycle, ox cart, motorbike (Pic.-3) and motorbikes with trailers are used for transportation in the Study Area depending on distance, road conditions and volume of products. As the transportation volume of farmers is very small, the bicycle is considered to be more popular for short distance and motorbike for long distance. By contrast, collectors including retailers carrying more volume than farmers tend to use motorbikes.



**F-1.3.3 Animal Products**

In the Study Area, many farmers raise animals such as pig, chicken and duck and such animal products are very important cash income resources for farmers. It is almost a 70 % share of total agricultural income of the average household in the

Study Area according to the results of interview surveys. An average of 1.35 head of pig, 6.93 heads of chicken and 1.81 of ducks are raised in a household according to information from Tram Kak District Office, but it is difficult to estimate actual trade quantity due to lack of reliable market information.

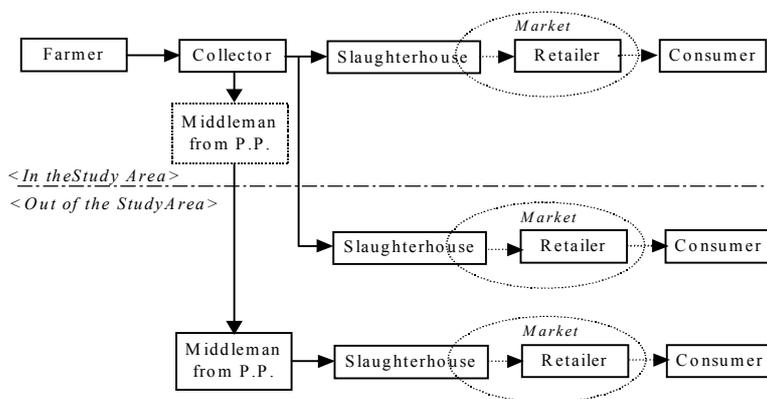
(1) Marketing practice of farmers

Pig, chicken and duck are usually sold to collectors who come to a farmer's residence. Sometime, it is observed in market that a farmer comes and sells a few chickens or ducks to a middleman or retailer.

(2) Distribution Channel

Collectors also act as middleman and own the distribution of animal products in the Study Area, the surrounding area and other provinces. As for pigs, collectors carry a pig by motorbike to a slaughterhouse not only in Takeo Province but also in other provinces. About five middlemen periodically come to the Study Area from Phnom Penh and collect pigs from collectors and transport to slaughterhouses in Phnom Penh by truck. The major distribution channels are shown in the drawing below.

Collectors transport chicken and duck to markets in and out of Province and sell to retailers and middlemen. In Takeo market, there is a wholesale function where middlemen collect ducks and transport them to other provinces mainly to Phnom Penh.



Distribution Channels of Pigs and Pork

(3) Transportation mode

For transportation, a pig is packed in a specific bamboo or rattan basket (Pic.-4), and ducks and chickens are hung from a wooden stick, fastened on the back carrier of a motorbike (Pic.-5). The motorbike is almost the only transportation means for collectors. Trucks are used for long distance transportation. A pig in a basket



Pic.-4

is commonly used for transportation and also used to be loaded onto a truck bed without removing the pig from the basket. Sometimes, trucks loaded with pigs without baskets are also observed for long distance transportation.



#### F-1.4 Markets

There are 26 public markets authorized by the Department of Commerce in Takeo Province of which five are in the Study Area (4 in Tram Kak District). The location of each market is indicated in Figure F-1 The biggest markets in Takeo Province are Takeo Market and Angk Ta Saom Market, located at the cross point of National Road No. 3 and District Road No. 22 going to Takeo City, which is the central market in the Study Area. Besides these public markets, there are many places such as the entrance to a village and the cross point of roads where several small shops are located and small quantity transactions of agricultural products are carried out.

The New Angk Roka Market in the Study Area is under construction now by the financial assistance of ADB. The location is the opposite side of the existing Market on the District Road No. 33. The condition of the new market compared to the present condition is as follows:

Condition of New Angk Roka Market

Item	Present	Plan
Construction cost	-	About US\$70,000 by ADB loan
Opening schedule	-	March - April 2002
Total area	4,475 m <sup>2</sup>	6,421 m <sup>2</sup>
Facility construction area	1,792 m <sup>2</sup>	1,288 m <sup>2</sup> (124 stalls)
Peripheral open area	142 m <sup>2</sup>	1,330 m <sup>2</sup>
Parking area	None	Exist
Registered retailers	107	199 persons
Drainage way	None	262 m
Utility	None	Well 1, Garbage collection points 30
Latrine	None	4

##### F-1.4.1 General Condition

Typical market retailers have a permanent stall inside the market or a place on the periphery, either covered or not, displaying commodities on a table or on the ground. It was common to find that the retailers of vegetables, fruits, and fish are on the ground in the periphery of the market.

There are 2,022 sellers in the markets registered in Takeo Province, of which 543 are in five markets in the Study Area. The breakdown is shown in the following table:

Market Sellers in the Study Area

Market	Registered No.
<Trum Kak Dist.>	
Ang Ta Saom	230
Tram Kak	116
Ang Roka	107
Trapean Ondirk	64
<Samraong Dist.>	
Svey Prey	26
Total	543
<Others for reference>	
Takeo	371
Trum Knar	137
Tonlop	123
Campong Chrey	109

Source: Dept. of Commerce, Takeo Province

### F-1.4.2 Management

There is a Market Management Committee in each market. It is authorized by the District Government and responsible to manage and control the market. The Market Management Committee collects the fee from all sellers. It is usually collected every morning from Riel 200 to 300 depending on the kind of commodity such as Riel 200 for vegetables and fruits and Riel 300 for fish and meat. In Takeo Market, some permanent vegetable retailers pay Riel 2,000 per month instead of a daily fee. The rate applied to each seller is adjusted by the Committee based on the sales volume in a market. Thus, the rate may differ between markets, depending on the discretion of each Market Management Committee.

Judging from the interview of retailers, tax and registration fees collected by the local Government are only collected from the sellers in the permanent stalls inside of the market and are not assessed on sellers of agricultural products outside of the stalls.

In general the markets do not satisfy common sanitary requirements such as a potable water supply and toilets for the use of retailers and consumers.

### F-1.4.3 Sales Conditions

#### (1) Grains

The retailers for grains such as rice, beans, maize and sesame generally have permanent stalls in the markets. It is also observed that farmers who sell milled rice, display only one or two bags on the ground in front of them after milling their own products or after buying from a commercial mill. Almost all grains other than rice are purchased in Phnom Penh and sold in the markets.

#### (2) Vegetables and fruits

The retailers of vegetables and fruits are commonly on the ground in the periphery of

the markets. Since such space outside the stall area under the sky is not shared and allocated to each seller in advance, sellers can join and use any place. Some plots though are customarily kept and used by permanent sellers.

In the early morning from about 6 to 8 a.m., retailers, traders and producers in the surrounding area gather in the market and carry out wholesale trading. Afterwards, retailing activities ensue. It is observed in the markets that more producers who do not join in wholesale trading come and sell their products directly to consumers. The Department of Commerce in Takeo Province does not grasp the actual condition of traders other than retailers in the markets. It is said that traders who handle large volumes and cover a wide area can be called “wholesalers”, and they do not exist in this Province.

Most of the sellers of vegetables and fruits in the markets are the farmer’s spouses. They collect products from neighboring farmers and farmers coming to a market and sell them as well as their own products. Some of them go to other markets even in Phnom Penh to collect products and bring back to the markets to sell. Thus, their activities often combine with various functions like producer / retailer, retailer / middleman and producer / middleman.

In Angk Ta Saom Market, it is observed that there are two traders of the same product such as cabbage and apples imported from Vietnam. One goes to Takeo Market to buy it, and the other goes to Phnom Penh. Such behavior seems to come from their comprehensive economic judgment on not only the market price but other information like product variation. In the market located north of Angk Ta Saom Market along National Road No. 3, there are more products coming from Phnom Penh than from Takeo Market excluding local products. The same condition is observed in the markets along National Road No. 2.

(3) Animal products

Collectors sell chickens and ducks directly to consumers and middlemen in the specific area in the markets. Animal meat retailers separate cow and pig meat and sell on a wooden table with or without a roof. Meats are transported from nearby slaughterhouse attached to the market. The sellers of meat are usually the spouses of collectors or middlemen for animals.

(4) Fish

Fish is sold on the ground in the periphery of the market. Farmers and collectors/middlemen come and sell fish the same as vegetables and fruits. In the

Study Area, the fish supply is short in the dry season. The fish are transported from Phnom Penh and from Ang Kaev located to the southeast of the Study Area. They are competitive with the markets in the Study Area. Along National Road No. 3, markets north of Angk Ta Saom Market get a majority of their fish from Phnom Penh. Markets to the south obtain little fish from Phnom Penh and more from Ang Kaev.

#### **F-1.4.4 Incoming Products**

Under the market economy policy, agricultural product marketing is entrusted entirely to the hands of the private sector. In the Study Area, various agricultural products come to the markets from not only other provinces but also Vietnam and Thailand. The major incoming agricultural products observed during the study period and their origins are summarized in Table F-1. Their incoming channels are also abstracted in Figure F-2. In general, the imported products from Vietnam and Thailand are superior to the local products in quality.

#### **F-1.4.5 Slaughterhouses**

Slaughterhouses are attached to the markets. The livestock, which is mainly pigs, are slaughtered around midnight and their meat is transferred to the market in the early morning.

The condition of slaughterhouses in the Study Area is as follows:

##### **(1) Angk Ta Saom Market**

It was constructed in 1998 for Angk Ta Saom Market and belongs to the District Government. The open-air wooden house with a roof has two big stoves for boiling water and two concrete tables for butcher work. The cross beam under the roof can hang animal carcasses by hook. It is a very poor facility from the view of sanitary control, and the meat is easily contaminated. The authorized butcher slaughters four to five heads of pig every day. There are four butchers belonging to this facility and they work by a daily shift. The veterinarian must inspect meat after slaughtering and stamp only those carcasses that have passed. There are four traders who regularly place orders for meat to sell to retailers in the market. Their expenditures are as follows:

Payment to butcher: Riel 90,000/month

Fee for facility: Riel 500/head, paid to the District Government

The veterinarian receives Riel 90,000/month as a salary from the DAFF

##### **(2) Other markets**

There are one or two slaughterhouses for supplying meat to each market. They are usually located in the trader's residence close to the market. The traders slaughter

animals by themselves, receiving the authorization by the District Government, or ask the butcher to do so. They pay Riel 3,000 per head if they ask the butcher. The veterinarian also inspects the meat after slaughtering. Any carcass meat without the stamp may not be sold.

#### **F-1.4.6 Market Price**

The Market Information System (MIS) for agricultural commodities was already set up in MAFF and the price information is collected from DAFF in each province. Although the MIS section of DAFF in Takeo Province collects information, the information is limited only to selected commodities that is often changed and mostly collected in Takeo Town. There is no other adequate and reliable statistical data on market prices of agricultural products in this region. So it is difficult to study price trend and pricing mechanism precisely in the Study Area during the short study period.

The price information of agricultural products including farm gate prices and retail prices in markets collected by the Study Team is compiled in Table F-2.

##### **(1) Rice**

Medium to High priced rice such as Somaly, Phaka Kagney and N. Menh from Bat Dambang are commonly consumed by residents of the highest income level in Phnom Penh and provincial towns. In contrast, medium-low priced rice such as IR, Local variety and Mixed rice which is a mixture of various rainy season varieties are consumed by residents of lower income level mainly in regional areas. IR and Mixed variety are the major products sold in markets in the Study Area and other local varieties are rarely sold. The price of IR variety rice is always the cheapest in the market not only in Takeo Province but throughout the country and price of Mixed rice is almost same level, just slightly higher than IR variety. The average sale price of IR rice and Mixed rice by the commercial mill in Takeo Town are Riel 545 /kg and Riel 652/kg in 2000.<sup>5</sup> The price order from IR as a bottom to Somaly among major varieties in markets is fixed and does not change from about Riel 600 to more than 1,000 /kg retail.

Rice price trends can be seen in Figure F-3 (1), showing there is a seasonal decrease during the main harvest season from November to January and increase during the rainy season. As for IR rice, the price decrease season is April to June during harvest in dry season because the IR variety is mainly cultivated in this season.

Cost and margin of the IR variety as the difference between buying and selling prices

are roughly estimated from the information collected from millers and collectors as follows:

Cost and Margin (IR Variety)

	Buying/kg	Selling/kg	Difference	Share %
Retailer	R.450-600	R.500-630	R.40	7
Miller	R.300-450	R.450-600	R.150	27
Collector	R.230-350	R.300-450	R.85	15
Farmer	-	R.230-350	-	51

(2) Other grains

The grain shop in the market sells other grains such as maize, groundnut, mung bean and sesame. In the Study Area, those grains are purchased in Phnom Penh and sold in market. Local products were not seen in the grain shops visited. It is considered that the production amount is too little to distribute in the Study Area. Seasonal fluctuation of market price is relatively small and stable as shown in Figure F-3 (2).

Cost and margin of major grains sold in the Study Area is estimated from the information collected from grain shops. The result is shown in the following table:

Cost and Margin of Grain Shop

	Buying/kg in P.P.*	Selling/kg	Difference	Margin %
Maize	R.1,000-1,500	R.1,500-2,000	R.500	29
Groundnut	R.1,800-2,000	R.2,000-2,500	R.350	16
Mung bean	R.1,600-2,400	R.2,200-2,800	R.500	20
Sesame (black)	R.2,500-3,500	R.3,000-4,000	R.500	17

\* Wholesale price in Phnom Penh

If farmers produce and sell the grains to grain shops in the Study Area, they may share 71-84 % of cost and margin to retail price.

(3) Vegetables and fruits

Many varieties of vegetables and fruits produced in the local area as well as other provinces and countries are sold in markets in the Study Area. The market price of selected products can be referred to Table F-2. Since farmers tend to cultivate the same varieties of vegetables in the same season in the Study Area, the harvesting season is overlapped and the market price is down. Because of this, seasonal price fluctuation of these crops is conspicuous. Price of vegetables is generally higher in the rainy season. The seasonal price condition of selected vegetables is shown in Figure F-4.

<sup>5</sup> DAFF in Takeo Province

According to interview results of retailers, the cost and margin rate for local products measured by the difference between buying price from producers and selling price is estimated at about 10-30 %. In the peak of harvesting season such as watermelon and pumpkin, the prices decrease remarkably and it is judged that retailers and collectors ask lower purchasing price of producers to keep the margin above. Generally, farmers follow the asked price by buyers because they do not have any alternative markets or buyers.

(4) Pig

It is said the pig is a guaranteed product for farmers to have a profit. The market price and seasonal tendency is shown in Figure F-3 (3). The margin and cost of collector and middleman coming from Phnom Penh in the Study Area is estimated in the table below.

Cost and Margin of Pig

	Buying/kg	Selling/kg	Difference	Share %
Middleman	R.2,600-3,000	R.3,200-3,700	R.650	19
Collector	R.2,000-2,500	R.2,600-3,000	R.550	16
Farmer	-	R.2,000-2,500	-	65

**F-1.4.7 Transportation Rate**

As mentioned in the “Transportation mode” section 1.3 of each kind of products, motorbikes and motorbikes with trailer (Pic.-6) are the most common transportation means of agricultural products for farmers, collectors and retailers in the Study Area. Transportation charge is based on a traditional rate depending on commodity and unit, distance and road condition, not just a simple rate such as Riel / kg-km. According to the result of interview surveys of motorbike and motorbike with trailer drivers, the transportation rate between markets in the Study Area including Takeo Market is compiled in Table F-3 by commodity-unit base. The conversion rate of per km from the figures in Table F-3 is as follows:



### Transportation Rate per Km

Commodity	Unit*	Motorbike	Motorbike with trailer
		Riel / km	Riel / km
Vegetables	Basket	185 - 250	42 - 54
Fruits	12 pc.	185 - 250	42 - 54
Grains	Bag	185 - 250	42 - 54
Duck / Chicken	Unit	370 - 526	210 - 250
Pig	Head	185 - 250	42 - 54

\* Details are explained in Table F-3.

The transportation rate between Angk Ta Saom and Trapean Ondirk Market is higher due to bad road conditions and lower to Tram Kak Market using National Road No. 3. Additionally, the transportation rate for pig is expensive, about two times more by motorbike and 5 times by motorbike with trailer than other commodities without regard to weight.

#### **F-1.5 Extensions of Processing and Marketing Technology**

No technology extension program exists that is carried out by the official agencies concerning the field of processing and marketing of agricultural products in this Province. The relevant activities are as follows:

##### **F-1.5.1 Vocational Training Center in Takeo Province**

- Location:** Takeo City, next to the Teacher's College
- History:** It is one of the vocational training schools that were constructed in eight major cities in Cambodia assisted by the ILO in 1993. The ILO continuously supported operation of these schools until 1998. Afterward, ADB succeeded in the continuance of assistance to them.
- Agency:** It belongs to the Department of Education, Youth and Sport in Takeo Province under the Ministry of Education.
- Budget:** Only the salaries for the trainers are shared by the local budget. The National Education Fund financed by ADB distributes the budget to the training center for all expenditures necessary to operate after examination of the annual training program plan and budget projections prepared and submitted by each school.

The training fields are decided after an interview study of people, mainly farmers in the Province. Training concerning fields of agricultural production such as pig or chicken raising is implemented. The subject named "food processing" is only carried out concerning this field. But the content of this training is actually "cooking" instead of "food processing". The training fee is free and the trainees are recruited by

advertisement such as a poster and through official agencies concerned 15 days before the start of classes. The number of applicants is usually over the capacity of the school. So they are screened out by interviews and visiting surveys to their homes. One thousand seven hundred trainees (of which 872 were female) already graduated from 1994 to 2000. The particulars of the graduates in 1999 and 2000 are shown in Table F-4.

The center has a credit program for graduates who start or expand their businesses. The credit period is eighteen months and an interest rate of 12 % per year is charged from the 7th month to 18th month after a 6 months grace period. This fund is revolved for program continuance. Two hundred sixty-six graduates received this credit, which equates to 61 % of all 443 graduates in 1999 and 2000. This total credit amount reached USD 45,000 and average of USD 170 to each borrower. The distribution by training fields of the borrowers is shown in Table F-5.

#### **F-1.5.2 Rural Development and Resettlement Project**

The Project aims for rural development in the fields of Agriculture, Public Health, Education and Income Improvement through three basic programs of organizing small farmers' groups, construction of multi-purpose meeting huts and establishing a revolving credit fund for inputs (called PRM: "Partner's Revolving Materials").

The experts from Thailand, Malaysia, Philippines and Indonesia are carrying out the various supporting projects on the above fundamental programs at many villages in Kompong Spu and Takeo Provinces.

In the agricultural field, the activities cover a very wide range, such as rice farming, upland farming, fruit production, vegetable production, animal raising, fish raising etc. However, all activities are not applied to each village and the activities applied actually are planned, selected and/or created by experts' considerations and the farmers' requests.

Although the experts in charge of processing and marketing agricultural products have never joined the Project, some projects concerned are being developed through the effort of agricultural experts in some villages.

The following activities are being conducted in 16 villages:

- Carrying out five days training concerning food processing\* for about 20 village members nominated by the village chief.
  - \* Salted peanut, coated peanut, tamarind ball, pickled onion, banana cracker, papaya nectar, pineapple jam etc.
- Organizing about 10 trainees selected from all the trainees above to a working group.

- Preparation of processing tools and materials by the PRM.  
Repayment period: 6 months  
Interest: 10 % /year (2 % for the commune and 8 % for the village)
- Production of potential products and selling to shops and schools in neighboring areas.
- Strengthening and increasing marketing activity for consumers.  
(Now three working groups sell products directly to supermarkets and hotels in Phnom Penh.)

## **F-1.6 Development Constraints**

There are various constraints on the development for processing and marketing of agricultural products in the Study Area.

### **F-1.6.1 Agro-Processing**

#### **(1) Rice post-harvest processing by farmers**

In the Study Area, the post-harvest loss is estimated at 3.11 % by threshing process and about 6 % total of the farmer level according to the result of the loss assessment survey carried out by the JICA Study Team<sup>6</sup>. A 10 % figure is commonly used as the post-harvest loss for food balance assessments in Cambodia.

- Technical extension service for this field does not exist.

Improvement of post-harvest processing with full knowledge about characteristics of rice is not being carried out. Post-harvest technology is not included in the present extension activities of MAFF.

- Incentives of loss reduction are low.

Improvement of post-harvest processing provides the reduction of losses on quantity and quality. The reduction of quantitative loss can bring profit directly to farmers. On the other hand, improvement of qualitative loss can bring economic effects only if this is reflected in the offer price. At present, there is vague purchasing practice between price and quality by rice millers, due to consumers' weak expectation for high quality especially in the region and lack of quality standard in market. Hence, incentives for farmers to improve post-harvest processing are low.

#### **(2) Custom mill**

Almost 1000 custom mills are spread over the Study Area. Although milling capacity

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<sup>6</sup> For "the study on improvement of marketing system and post-harvest quality control of rice in Cambodia", 2001

of each mill is small from 200 to 300 kg /hour, total capacity is more than three times total production.

- Too many rice mills with small capacities exist.

In considering low density and bad condition of local roads in the Study Area the custom mills might be spread out to respond to households' needs regardless of economic point of view. On the other hand, since the owners of custom mills are relatively rich farmers and earn additional income from milling services, their motivation for improvement of business performance is not high. The machinery used in these custom mills is old type and of small capacity and divided into two types. First is Engerberg type, which is the most compact, low cost and easy to operate. The other is a combination type having a rubber roll type husker above a milling machine. These old type machinery has low milling yield and high broken rice generation. It is generally known that Engerberg type machines have lower milling yield and more broken rice generation among all types. Combination type machinery is becoming more popular over the Engerberg type, judging from observations. They are facing difficulties though getting fund for replacements.

- Incentive to improve quality and machinery is low.

There is no system by which rice millers can obtain technical information. The rice millers are not in a position to do studies themselves. Additionally, the technical level of machinery is low as mentioned above. Other than this technical point of view, the millers have no incentive to increase their milling rate since the farmers traditionally pay by-product, bran and paddy, for milling charges. It means that milling yield increase decreases by-product quantity as income. The incentive to improve quality of rice is not generated by consumers who don't expect high quality over variety and price in markets.

### (3) Other agro-processing

In the Study Area, there are no factories that can be called "industry" other than rice mills. Therefore, various initial constraints, which may be common across regions and provinces, are recognized and considered in order to promote the development of agro-processing industry in the Study Area. The constraints concerning general commercial environments such as transport and communication infrastructures and financing services are described in the next section for marketing.

- Technical extension service is very limited.

In the Study Area, only the Rural Development and Resettlement Project is offering

training services to farmers and farmers groups in a few villages. The training program covers processing technology of agricultural products, business management, accounting and marketing together with the provision of a credit program even though the capacity of the program is very small. Such supporting activities should be expanded for not only farmers, but also entrepreneurs.

- Supporting program for marketing of local products does not exist.

At present, the local processed products have not been well developed and supporting programs for marketing them do not exist. Under the free market economy, marketing is a prior activity for the agro-processing industry. Supporting programs for marketing of local products by the public sector is an important function to improve economic conditions of the region through development of industry.

- Fundamental industries do not exist.

Fundamental industries supplying various materials to agro-processing factories have not been developed well in Cambodia, none in this region. These industries produce processing machinery and equipment, packaging materials, chemicals, other consumables, etc. used in the agro-processing industry. At present, the processors must use many imported machines, equipment and materials that are usually expensive and difficult to be obtained. On the other hand, many imported agro-processing commodities are sold in markets under the free market economy. Such conditions keep the local agro-processing products at a being disadvantage competitiveness to imported products in view of production cost.

### **F-1.6.2 Marketing**

In the Study Area, it is very common that farmers sell their products to collectors coming to their villages, but some farmers transport the products, especially vegetables and fruits, and sell in the market. Collectors, middlemen and retailers in the market are mostly farmers or their spouses. Various constraints on creation of dynamic marketing conditions suited to the free market economy are observed in the Study Area.

- Marketing infrastructure is poor.

Many provincial and district roads are broken and damaged. Village roads are especially very poor in quantity and quality and most are impassible during the rainy season. It impedes effective distribution of agricultural products to markets and of market information to farmers.

A nation-wide telecommunication system has not been well established and several

mobile-phone networks developed recently cover only urban areas and are costly. Small-scale traders and farmers, even local government officials in the Study Area lack effective means of communication to the outside.

- Financial service system is poor.

The fundamental banking services for trading operations have not been established yet in the Study Area or even in the Province. All account settlements for trading are carried out face to face with cash.

Banks also offer only short term lending and limited funds. Some NGOs provide micro-finance services in the Study Area but the conditions do not meet the requirements such as establishment of business, expansion of business and facility renovation. Thus, people who trade and process agricultural products face lack of investment capital for development of their businesses.

- The MIS service does not meet the requirement of farmers and traders

At present, the MIS broadcasting service does not cover regional information and is not used by farmers and traders in the Study Area.

- Bargaining power of farmers is weak.

In the Study Area, farmers generally sell their products to collectors because of their small quantities of products and poor road conditions. Buyers for farmers to select from are limited. All of this means that farmers are limited in looking for better buyers.

In addition, since the existing MIS does not provide useful market information in the regions and market information that farmers can receive is very limited, the position of farmers for price negotiation with buyers is weak.

- Official support system is weak.

Although marketing of agricultural commodities has been handed over to the private sector based on the policy of a free market economy, the official sector should still be responsible to maintain fair and effective market conditions and support farmers and traders concerning this field. At present, there is almost no official support system to the private sector concerning marketing of agricultural commodities.

## CHAPTER F-2 DEVELOPMENT PROGRAM

### F-2.1 Direction of Development

Most agricultural production in the Study Area is still carried out for self-consumption and marketing activities of farmers are small and weak. Immediate problems remain to be solved to expand and improve agro-processing and marketing activities based on the increase of agricultural production. Considering the problems clarified in Chapter F-1, the direction for formulating the development program is described below.

#### F-2.1.1 Agro-Processing

##### (1) Improvement of post-harvest processing

In the Study Area, the post-harvest loss of rice is estimated at about 6 % due to processing such as threshing, drying and storage carried out by farmers. It is expected that the reduction of loss will have a direct impact on the total quantity of rice for self-consumption and sales. But post-harvest technology is not included in the present extension activities of MAFF and farmers are having difficulties in accessing the appropriate technology. The extension system for post-harvest processing technology will be carried out in the agricultural extension system by MAFF.

On the other hand, the reduction of losses from low quality at the farmer level generates profit in rice milling processing in quantity and quality. However, the quality standard of rice does not exist and the buying price of paddy is not influenced by quality. Hence, the motivation for quality control is not encouraged in farmers and collectors. Establishment and extension of the quality standard and inspection system should be a priority.

Since farming practices affect loss generation as much as post-harvest processing, it is advisable that post-harvest technology be extended to farmers in the agricultural extension program.

As for other diversified crops, especially vegetables, the losses and damage of products are not critical in markets in the Study Area because product units being transported are small and handled carefully by farmers. However, many losses and damage are observed in markets in Phnom Penh due to bad packaging and loading conditions in long distant transportation. Farmers and traders will need to improve packaging and loading conditions when they ship their products to distant markets. It is reasoned that the improvement of the handling will be created without much

difficulty if loss reduction will be reflected in a reasonable raise of sales price or competitiveness in markets and if such market needs will be fed back to farmers in the Study Area. The same situation is expected with improvement of quality such as taste, color, shape and size.

(2) Improvement of the custom milling system

Farmers ask custom millers to mill their self-consumption rice whenever they need. Since farmers pay rice bran by-product for the milling charge, millers have no incentives to improve milling yield. It is expected that competition among millers will increase more and millers will have to make efforts to improve milling yield due to farmers demand. But this is only if the rural road condition and network is improved and farmers are able to select the mill of highest milling yield in a wider area.

(3) Strengthening support program

Most agro-processing industries have not been started yet and are facing the initial stage of development in the Study Area. Therefore, the official institutional promotion program for development must be established and strengthened i.e. technical extension service, marketing support program and financial support program.

The Rural Development and Resettlement Project is carrying out training services and financial support concerning small agro-processing businesses to farmers and farmers' groups in a few villages in the Study Area. These kinds of supporting activities, focusing on bottom-up development activities by organizing farmers and entrepreneurs should be expanded.

### **F-2.1.2 Marketing**

(1) Strengthening bargaining power of farmers

Price is always decided by negotiation but information available to farmers is limited. Additionally, farmers used to sell their products to collectors coming to their village and the number of buyers they can choose from is limited. The MIS of MAFF should be strengthened for collection of more regional information and dissemination of useful information to farmers in the Study Area. Creation of regional markets where many buyers and sellers gather for trading of agricultural products is effective to give incentives to farmers for increasing production and to provide more opportunity for farmers to see better buyers. Also, such markets would allow access to trade prices for farmers to learn current market conditions.

On the other hand, although farmers are generally in a disadvantageous position in

selling their products as mentioned above, they have very little marketing sense and make few efforts to improve their bargaining power such as by organizing a group for joint sales. Fostering farmer groups for various activities such as joint sales and processing of their products as well as water management, rural credit, joint procurement of agricultural inputs, etc. is effective in forming the farmer's consciousness about the mechanism of free market economy. It would also help them in receiving program support such as technology extension and market information in addition to strengthening their bargaining power.

(2) Strengthening official activity for a fair and efficient market

Currently, the government has no market intervention and market control system. The government should strengthen the supporting services to the private sector through creating and maintaining better market conditions, that are more fair and efficient. Legislation and regulations concerning private business such as registration, tax, market fee, etc. should be made clearly known to the public.

### **F-2.1.3 Basic Commercial Infrastructure**

The direction of development in the field of basic commercial infrastructure concerning both agro-processing and marketing of agricultural products is described below.

Commercial environments supporting the marketing system such as transportation infrastructure, communication infrastructure and financing services are not well developed. Improvement of such commercial environments is foremost and a basic requirement for an effective market system under a free market economy.

The fields concerning commercial infrastructure above shall be treated as external conditions in view of the study's scope of agro-processing and marketing fields. However, important development activities in such fields are described in the following section.

## **F-2.2 Development Concept**

Based on the direction of development stated in the preceding section, the following development concept is set in order to ensure the increase of a farmer's income as the target of the Master Plan.

### Objectives

i) Creation of market oriented mindset and attitudes in the farmers

If farmers have the market oriented mindset suited to free market mechanism, they

can know what the problem is and how they should make efforts to solve the problem, to improve their business conditions and to increase income. Creation of a market oriented mindset and attitude should be placed as an important objective for all development programs.

ii) Creation and activation of farmers group activities

Under the situation that all commercial activities are carried out by the private sector, it is rather difficult to concentrate and apply the official support programs to a limited number of people, groups and area in view of fairness and equality. As seen in the activities carried out by the Rural Development and Resettlement Project, it is practical and effective that model farmers group activities will be first fostered in some area attaching support programs for their activities and expect far-reaching effects to the surrounding area.

Strategies

Based on the above objectives, the strategies are set as follows:

i) Strengthen technical training to farmers

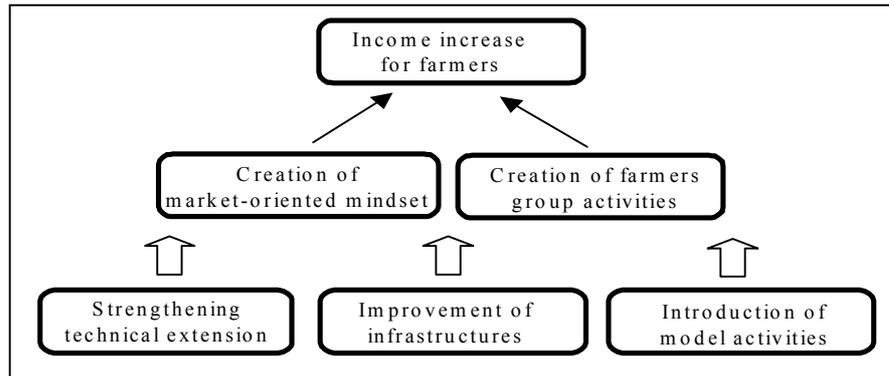
Since the technologies i.e. post-harvest processing, marketing and business management technology at the farmer level and of other people concerned is low, a technical support program is indispensable for development program activities.

ii) Introduce model farmers' group activities

To ensure the objectives above, it is necessary to formulate model farmers group activities to be expected efficient far-reaching effects.

iii) Improve infrastructure

Improve of the market system infrastructure i.e. market facility, transportation and communication infrastructures and financing services, is a precondition and basic requirement for development of the agro-processing industry and marketing of agricultural products.



### F-2.3 Development Program

#### F-2.3.1 Necessary Activities for Development

Necessary activities for agro-processing and marketing development of agricultural products in the Study Area are listed below.

Development Activities

	Agro-processing	Marketing
Technical Extension	1) Extension of post-harvest processing technology to farmers in the agricultural extension system. 2) Strengthening technical extension services to the private sector. 3) Establishment and extension of the quality standard and inspection system.	4) Improvement and strengthening collection of more regional information and dissemination of useful information to farmers by MIS.
Infrastructure Improvement	5) Establishing and strengthening official support programs i.e. marketing and financial support programs. 6) Improvement of market infrastructure such as market facility, transportation and communication infrastructures. 7) Creation of a regional market where many buyers and sellers gather for trading of agricultural products.	
Model Farmers Group	a) Production of edible oil and animal feed b) Agro-processing and marketing	c) Collection and shipping of products d) Sales as commission agent e) Rice security for deficit farmers f) Rice marketing for Farmer Water User Community

#### F-2.3.2 Development Programs and External Requirements

The activities necessary for development of agro-processing and marketing fields in the Study Area are listed in the above table. However, various external requirements beyond the scope of the Study and the Study Area are needed. The potential development programs and external conditions of the field and administrative levels are shown in the following table:

Potential Development Programs and External Conditions

Category	Potential Development Programs	Another Field	Admin. Level	
			Province	Nation
Technical Extension	1) Extension of post-harvest processing technology to farmers in the agricultural extension system	*	*	*
	2) Strengthening technical extension services to the private sector		*	*
	3) Establishment and extension of the quality standard and inspection system			*
	4) Improvement and strengthening MIS		*	*
Infrastructure Improvement	5-1) Establishing and strengthening marketing support program		*	*
	5-2) Improvement and strengthening financial support program	*	*	*
Infrastructure Improvement	6-1) Improvement of market facility		*	
	6-2) Improvement of transportation infrastructure	*	*	*
	6-3) Improvement of communication infrastructure			*
	7) Creation of a regional market		*	
Model Farmers Group*	a) Production of edible oil and animal feed b) Agro-processing and marketing c) Collection and shipping of products d) Sales as commission agent e) Rice security for deficit farmers f) Rice marketing for Farmer Water User Community			

\* Detail of each program is shown in Table F-6.

## F-2.4 Priority Program

### F-2.4.1 Review of Agricultural Production Program

The Agricultural Production Program formulated based on the irrigation development plans is reviewed to clarify necessary support activities in the fields of agro-processing and marketing for assurance of increased income of farmers concerned. The results are mentioned below.

#### (1) Rice Production

The background conditions of the programs are summarized below:

The Area for the Upper Slakou River Irrigation Reconstruction Plan (USP)

No. of places	No. of farmhouses	Area	Area/household
1	Approx. 4,000	3,500ha	0.88

The Area for the Small Reservoir Rehabilitation Plan (SRP)

No. of places	No. of farmhouses	Area	Area/household
15	Approx. 1,400	280ha	0.2

#### a) The Area for the USP

### Production plan

Present	Plan		Increment	
(ton)	(ton)	(kg/house)	(ton)	(kg/house)
4,069	10,350	2,588	6,281	1,507

### Supply and demand in the Area

Precondition: The present condition is balanced.

Incremental factor: 2.4 %/year for population increase

Present (ton)			Plan after 10 years (ton)			
Production	Consumption	Balance	Production	Consumption	Balance	Surplus
4,069	4,065	0	10,350	5,158	5,192	5,194

### Post-harvest processing

It is planned that the yield will increase more than two times from 1.3 t/ha to 2.8 - 3.3 t/ha. In this regard, the following measures will be necessary:

- Expansion of storage capacity

A shortage of storage capacity for each farmer will occur if production increases. However, the average production increment is very little; only about 1 ton for each farmer, equivalent to twenty-one 75 kg gunny or plastic bags. Micro-credit support is recommended for farmers who will invest in expansion of woodsheds and/or bamboo net baskets.

- Mechanization

As the post-harvest processing needs much manpower, the farmers having large paddy fields may start to use machines. The rental of mobile threshers is already popular in the big rice production area in Takeo Province; farmers can begin to use those mobile threshers.

### Marketing and distribution

About 5,000 tons of rice are estimated as surplus equivalent to 10 % of the present production in the Study Area that will be distributed to other areas. This amount is not so large; the equivalent of 13 bags to each farmer. It will increase gradually by small amount over a five-year period. This excess will not cause any special confusion to the existing distribution system in the Study Area.

It's quite important for farmers' profits and efficiency of the distribution system to solve the below stated problems; not only in the area of increasing the rice production program but also in the whole Study Area.

- Prompt selling after harvesting

The products are an important source for farmers to get cash and the farmers without enough funds, normally sell the paddy promptly after harvesting. On the other hand, it is common that the paddy price is cheapest in the harvest period and rises gradually until the next season. Thus, the farmers lose the chance to sell their product at a higher price/profit. This practice is also an obstacle for the stability of rice prices in the market because of the excess paddy supply in the period after harvesting.

To solve this problem, a credit program with a reasonable interest rate is recommended for these farmers. It would be more effective that the program be given priority to farmers in increased rice production areas together with the micro-credit program for the paddy storage.

- Lack of an assembling place

Additionally, the construction of an assembling place should be expected in the increased rice production area where the chance for selling the paddy together with the other diversified products to the traders will increase. If the farmer's activities for assembling their products develop well, they may carry out group collection and shipping activities and introduce a warehouse for temporary storage to await the market price increases.

#### b) The Area for the SRP

##### Production plan

Present	Plan		Increment	
(ton)	(ton)	(kg/house)	(ton)	(kg/house)
325	828	591	503	359

##### Supply and demand in the Area

Precondition: The present condition is balanced.

Incremental factor: 2.4 %/year for population increase

Present (ton)			Plan after 10 years (ton)			
Production	Consumption	Balance	Production	Consumption	Balance	Surplus
325	325	0	828	412	416	416

##### Post-harvest processing

The increment expected for each farmer is only 359 kg (5 bags). No special measures will be necessary. Farmers having large fields may need the same measures as mentioned in a).

### Marketing and distribution

The surplus amount is estimated at about 500 tons, which is only a 1 % share of the present production in the Study Area, and the increased production areas are at 15 locations. The marketing and distribution for the surplus can be covered by the present one.

### (2) Diversified Crops Production

The backgrounds of the Programs are summarized below:

#### The Area for the USP

No. of places	No. of farmhouses	Crop	Area	Area/house
1	Approx. 4,000	Irrigated	3,500 ha	0.729 ha
		Cereals	620 ha	0.155 ha
		Vegetables	430 ha	0.108 ha

#### The Area for the SRP

No. of places	No. of farmhouses	Crop	Area	Area/house
15	Approx. 1,400	Irrigated	280 ha	0.200 ha
		Cereals	49.6 ha	0.035 ha
		Vegetables	34.4 ha	0.025 ha

#### The Area for the Small Pond Development Plan (PDP)

No. of place	No. of farmhouses	Crop	Area	Area/house
-	-	Irrigated	2,100 ha	-
		Cereals	1,825 ha	-
		Vegetables	1,515 ha	-

#### a) The Area for the USP

#### i) Cereals

### Production plan

Crop	Area	Production		Bag	Sale period	Sale amount
	(ha)	• ton •	(kg/house)	(60 kg bag)	(Month)	(Bag/Mon.)
Maize	80	160	40	2,667	8	333
Groundnut	130	111	28	1,850	6	308
Soybean/Mungbean	280	280	70	4,667	6	778
Sesame	130	104	26	1,733	6	289
Total	620	655	164	10,917		1708

### Post-harvest processing

These crops need post-harvest processing such as drying, threshing, peeling, cleaning and bagging. The production of each farmer is more or less only one bag for each crop, hence, manual processing would be practical even for a producer over the average production rate.

### Marketing and distribution

Since the amount each farmer sells is little and the products can be stored after drying, the farmers can sell high by watching the market condition. However, the total amount of production in the USP Area reaches more than 600 tons. The increased production of the same crops is also planned in other program areas (about 2,000 total tons in the Study Area). Therefore, all of these products may not be sold out in this Study Area and even the surrounding area so market prices may decline. Farmers should develop a network with big traders and wholesalers in Phnom Penh and Kg. Cham and promote expansion of the market outside the Study Area.

To invite those traders and wholesalers to the production area, the farmers should assemble and sell their products in a place, as the products of each farmer are too little for traders to handle economically. Measures such as a group collection and selling activity through construction of an assembling place, would make marketing and distribution more effective.

#### ii) Vegetables

Suitable crops in the area, such as cucumbers, string beans and tomatoes should be cultivated.

Crop	Area	Production		Basket	Sale period		Sale amount
	(ha)	(ton)	(kg/house)	(80kg)	(Month)	(Days)	(Baskets/Day)
Total	400	3,583	896	44,788	2+2	80	560

### Post-harvest processing

Generally, vegetables are shipped just after harvesting without storage. Some vegetables are washed, cleaned and/or tied up before shipping. The total harvesting period in a year is 4 months from February to March and July to August. During this period, each farmer produces an average 896 kg (approx. 11 bamboo net baskets). If a farmer loads one basket on the back of a bicycle or motorbike, transports and sells it in the market in a day, all product can be sold in 11 days over four months time. Problems with their post-harvest processing are not anticipated.

### Marketing and distribution

Even though the production of each farmer is small, the average of 45 tons of products is shipped daily from all over the USP Area (80 days in four months). Since vegetables cannot be stored and there are no cold storage facilities in the market, the marketing period overlaps the harvesting time and the product in the USP Area comes to market when in season. Additionally, some products from other areas also come to the same market. Occasionally, farmers may have the trouble of unsold product and slumping of the market price because of over-supply. Such risk is higher

than cereals since vegetables cannot be stored.

Therefore, the following measures should be taken in the area of increasing vegetable production:

- Production of various kinds of vegetables

The risk mentioned above should be lowered by production of various kinds of vegetables if possible. Although it runs against efficiency of the extension service for cropping, such effort could be done especially in the initial stage of the program implementation. Farmers will not have enough experience and market information, and will hardly be able to forecast future market conditions.

- Seeking a wide spatial market

Vegetable consumption in the Study Area is not large because most farmers can produce enough vegetables for their families in the backyard. Farmers who have an increased production program should aim at the wide spatial market beyond this region, including Phnom Penh, and other provinces. The farmers should collect necessary information from Phnom Penh and other expected markets, establish a close working relationship with many traders, and seek new markets.

- Establishment of an assembling place

To promote and ensure sales to the wide spatial market mentioned above, a convenient and suitable sales location should be prepared for buyers. Assembling places would be effective when constructed along the major roads in the program area. Small quantities of product from each farmer could be carried in and assembled into large lots that can be conveniently transported by truck for traders covering a wide area. If such assembling activities can be organized and managed well among the farmers in the surrounding area, it is expected that the farmers would sell their products by themselves not only at the assembling point but also at the markets in and out of the region and even in Phnom Penh.

b) Area for the SRP and PDP

This area is located widely over the Study Area while production is concentrated in one area for the USP. It's especially noted that the PDP provides only 2,100 ha (5.4 %) of the irrigated area for increased production (39,220 ha).

For such areas, it is recommended that the assembling center be placed in Angk Ta Saom Market where farmers' groups collect and sell the products from the

surrounding area.

#### **F-2.4.2 Priority Programs**

In consideration of the results in F-2.2 and F-2.3.1, the priority programs focusing on the support function for the Agricultural Development Program based on the irrigation development plans, the USP, the SRP and the PDP, are formulated and explained below.

##### **(1) Program for Assembling and Marketing Activities**

###### **a) Purpose**

- Strengthening bargaining power of farmers by creation of an assembling and marketing facility and market-oriented activities for products
- Assurance of increased income for farmers by creation and expansion of marketing channels
- Expectation of demonstration and far-reaching effects to the surrounding area

###### **b) Program area**

The area covered by the Agricultural Production Program centering to the USP area.

The location of the assembling and marketing place will be along the District Road No. 33 from Angk Roka to O Saray or the ADB road from Samraong to T. Kranhung in the area of the USP. The Angk Ta Saom Market will have the central assembling function for the other two Plans.

###### **c) Beneficiaries**

Farmers in the program area are the direct beneficiaries. The farmers and the consumers in the surrounding area are also indirect beneficiaries through stabilization of market prices of agricultural products.

###### **d) Main activities**

(The stage-wise activities are abstracted in Figure F-5.)

###### **Stage I:**

- Construction of assembling and marketing facility
- Bringing the products to the facility by farmers
- Promotion of traders' coming to the facility
- Transaction between traders and farmers in the facility

###### **Stage II:**

- Collection and shipping the products to markets by farmer groups
- Collection and analysis of market information
- Construction of warehouse
- Utilizing warehouse to sell products at a higher price by watching market prices

- Promotion of planned farming based on market forecasting

e) Required input

- Facility for assembling and marketing
- Warehouse
- Equipment: Scale, PC, Truck etc.

f) Implementing organization

FWUC of the USP

(2) Paddy Marketing Activities in the FWUC

a) Purpose

- Income increase by selling paddy as the irrigation service fee (ISF) through creation of assembling, storage and shipping system for paddy.
- Expectation of demonstration and far-reaching effects to the other FWUC.

b) Program area

The area covered by SC FWUCs under the irrigation development plan centering to the USP area.

c) Beneficiaries

Farmers in the program area are the direct beneficiaries.

d) Main activities

- Construction of depots (warehouses) for paddy storage
- Receiving, storing and shipping paddy at depots.

e) Required input

- Depots (warehouses) for paddy storage
- Equipment: Scales

f) Implementing organization

FWUC of the USP

## **CHAPTER F-3 AGRICULTURE SUPPORT PROGRAMS**

### **F-3.1 Background and Objectives**

The Agricultural Production Program for the USP assures surplus production i.e. 3,788 tons of rice, 565 tons of cereals and 4,070 tons of vegetables. However, it is assumed that the local market will not have enough trading capacity for all surplus products in the future. Therefore, the Agriculture Support Program will be indispensable for creating the sales channel of those products including Phnom Penh beyond the local area. It will ensure an increase of farmers' incomes as well as financial assurance of the USP's operation and maintenance.

On the other hand, it is popular that farmers pay paddy in kind for a irrigation service fee (ISF) to the Farmer Water User Community (FWUC) after harvesting. The FWUC then sells the paddy to rice millers promptly after collection. Since the paddy price is relatively low in the period after harvesting, the FWUC will have more income if they can store the collected paddy and sell later. Therefore the Agriculture Support Program is proposed in order to increase the revenue and improve the financial condition of the USP.

The Apex Committee of FWUC in the USP area will coordinate among six secondary (SC) FWUCs for sustainable operation and management of the irrigation system under assistance of the Project Office. To assure the financial sustainability of this activity, it is recommended that the MOWRAM will invest in the facilities and equipment necessary for the Support Program's implementation. This will ensure the creation of marketing channels for the products of the beneficiaries of irrigation water supply and the marketing of paddy as ISF by the FWUC. The Apex Committee of FWUC will be a user of the facilities i.e. the assembling and marketing facility for wholesale trading and the six depots for receiving, storing and shipping of paddy as ISF.

The two Agriculture Support Programs for the selected priority irrigation projects carried out by the Apex Committee of FWUC in the USP area are namely the Assembling and Marketing Assistance Program (AMP) and the Program of Storage and Sales of Paddy (PSP). The detail of each program is mentioned below.

### **F-3.2 Target Area and Beneficiaries**

Both Support Programs cover the area of the USP, with 3,500 ha cultivated by about 4,000 households. The priority area of the SRP and PDP could receive the programs

benefits indirectly, but the formations of the Programs were made based on the USP in terms of product amounts and organization capacity.

The direct beneficiaries of the Programs are the farmers in the Target Area, estimated at about 4,000 households. The farmers out of the Target Area may also participate in the activities of the AMP. The farmers and the consumers in the surrounding area are indirect beneficiaries through stabilization of market prices by the AMP.

### F-3.3 Activities

#### (1) Assembling and Marketing Assistance Program (AMP)

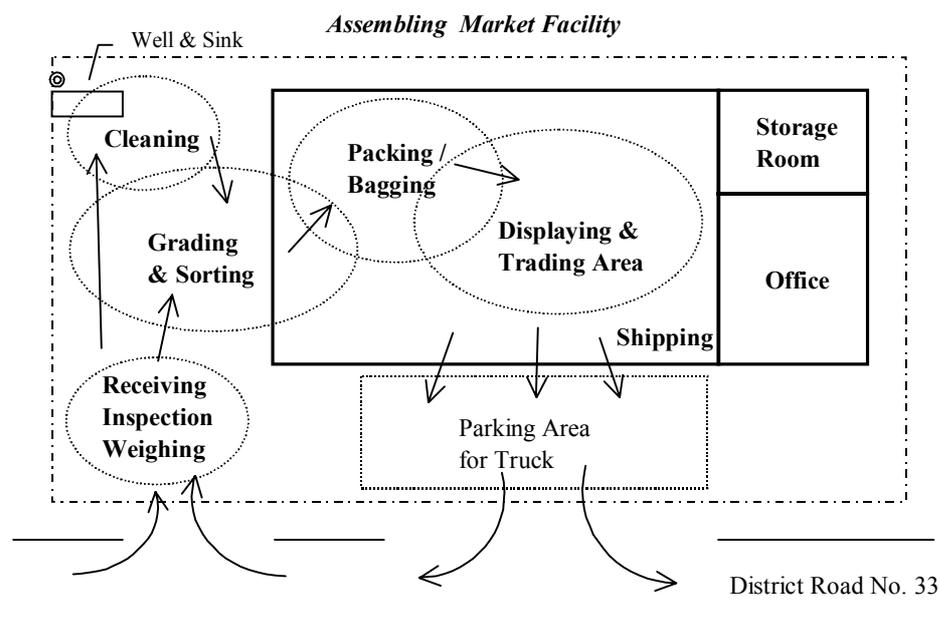
The implementation schedule is divided in two stages. The wholesale trade assistance activity will be executed solely during the Stage I of five years, and the joint shipping assistance activity will start from the 5th year, which is also the beginning of the Stage II, in addition to the wholesale trade assistance activity. The Marketing Unit in the Apex Committee will be responsible for implementing all activities for the AMP. The detail of each activity is as follows:

##### a) Wholesale trade assistance

- To encourage the farmers to trade their products at the assembling market.
- To invite traders, especially big traders covering a wide market area, who will buy the assembled local products in the assembling market.

The promotion effort for invitation of traders should be the most important activity in order to create the advantaged sales condition for farmers.

- To carry out the activities for selling the local products in the assembling market facility shown in the figure below.



The products carried in by farmers are sorted and graded by the inspector's instructions after some products are washed and/or cleaned. Then the inspector records a commodity name, quantity and grade and gives the receipt as a copy of the record to the farmers. The farmers assemble, pack and stack the same product by each grade on the display floor.

Afterwards, the farmers negotiate and settle the trade prices with buyers by each lot under assistance of staffs of the Marketing Unit in the Apex Committee. The products are then shipped.

The accountant receives the sales amount plus 2 % for the market charge from the buyers after trade price settlement. The accountant then pays each farmer based on the receipt kept by them after deducting 1 % for an additional market charge. The market charge will be a fund for O & M and replacement of the facilities including the irrigation facilities.

- To announce trading results such as price, grade and quantity on a blackboard in the assembling market facility.
- To maintain the facility.
- To expand relation to various traders and collect market information through this activity, for the joint shipping activity starting in the 5th year.
- To organize farmers having an interest in selling their products in the terminal markets to the Joint Shipping Group.

b) Joint shipping assistance

- To start the assembling, transportation and sales activities as the agent of farmers carried out by the Joint Shipping Group, in parallel with the activity above.

The Group collects the products by request of farmers and sells them in the terminal market, i.e. Phnom Penh. The manager, market coordinator and inspector in the Marketing Unit will join the sales activity in the terminal markets in shifts.

- To pay farmers 10 % of the balance between the estimated value in case of trading at the assembling market and the sales amount, in addition to the estimated price. Ninety percent of the balance will be a fund for O & M and replacement of the facilities including the irrigation facilities. The sharing rate will be adjusted based on the actual expenditure for this activity and the necessary amount for a fund.
- To develop buyers providing better trading conditions at the terminal markets.
- To strengthen the activity for collection, accumulation and analysis of market information and provide the analysis results such as market demand and requirements to the farmers.
- To promote a planned cultivation with linkage to a shipping plan among farmers

by forecasting the market tendency in the future from the result of market information analysis if farmers agree to it.

(2) Program for Storage and Sales of Paddy (PSP)

a) Activity in each depot

A depot for storing paddy will be attached to the office of each SC FWUC and SC FWUC will assign a depot manager to each depot. The activities carried out by a depot manager are as follows:

- To receive the paddy, inspect the moisture and the impurity content, and ask the farmers for re-drying and/or cleaning of the paddy if necessary.
- To weigh the paddy and record it.
- To store the paddy received and manage the inventory.
- To sell it by the instructions of a responsible member of SC FWUC under assistance of the Marketing Unit of Apex Committee.
- To maintain the facility.

b) Activity of the Marketing Unit of the Apex Committee

The Marketing Unit of the Apex Committee will support and assist the sales activity of the depots of SC FWUCs as follows:

- To survey and collect market information.
- To provide the information such as market price and buyers to each SC FWUC.
- To consider and study the activity for rice milling and sale of milled rice in the future.

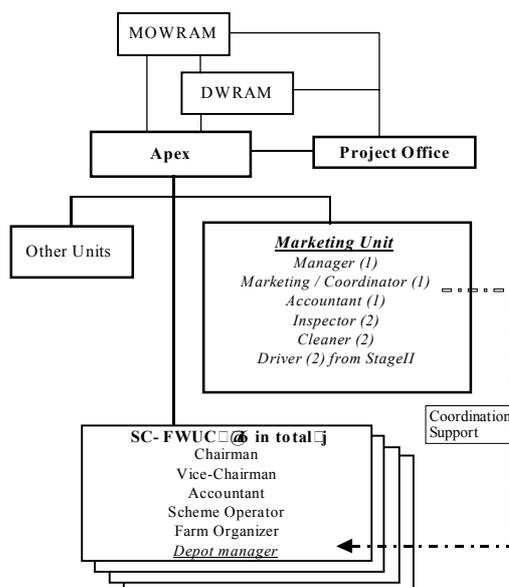
More income increase is expected by sale of milled rice not paddy, but it would be difficult to develop the buyers who can buy big lots of milled rice in this Province. Therefore, it is advisable and practical to start and mill little by little using custom mills in the village and sell them in local markets, while looking for the buyers out of the Province.

### **F-3.4 Implementation Organization and Staff**

(1) Implementation Organization

The implementation organization of the Supporting Programs is solely the Apex Committee in the USP area. The Apex Committee will form the Marketing Unit in their organization together with other units such as accounting unit, technical service unit and O & M unit. This Marketing Unit will manage and coordinate all activities necessary for the Programs implementation. The depot managers in six SC FWUCs will directly engage the activities for the PSP under support of the Marketing Unit.

The organization chart is shown below:



(2) Staff Plan

The staffs and their role in the Marketing Unit of the Apex Committee and SC FWUCs concerning the implementation of the Programs are listed in the table below:

Staff Plan and Role

Staff	No.	AMP	PSP	Role
<b>Marketing Unit</b>				
Manager	1	*	*	Management of all activities. Studying and expansion of marketing activities of Apex Committee.
Marketing / Coordinator	1	*	*	AMP: Promotion of farmer's participation. Invitation to traders covering wide market PSP: Provision of market information to SC FWUCs.
Accountant	1	*	*	Supported by staffs in Accounting Unit for all financial matters of the Programs implementation.
Inspector	2	*		Management of all activities carried out in the assembling market facility. Collection, recording and analysis of trading results and other market information.
Cleaner	2	*		Keeping facility clean
Driver	2	*		For trucks used for the joint shipping activity from Stage II.
<b>SC-FWUCs</b>				
Depot (Warehouse) manager	6		*	Carrying out all activities in the depot supported by Marketing / Coordinator in the Marketing Unit.
Total	15			

(3) Training

The FWUC staff for AMP and PSP will be trained by foreign and local experts

deployed by MOWRAM under the institutional development and capacity building program. After the experts leave the project office, the FWUC staff for AMP will be trained in Phnom Penh under seminar by private sector and NGOs.

### **F-3.5 Implementation Schedule**

#### **(1) AMP**

The AMP aims to handle 40 % of the full planned amount in the 1st year. This is only assembling and marketing assistance to farmers. This is called Stage I. The AMP aims to handle 50 % of the full planned amount in the 5th year, including 10 % of the full amount of marketing. For this, the Marketing Unit will organize the Joint Shipping Group among the farmers participating in this program while collecting market information and expanding the relations with various traders. The Group will start to assemble, transport and sell the product, as the agent of farmers, to the terminal markets such as Phnom Penh. This is called Stage II.

The implementation schedule is shown in Table F-7.

#### **(2) PSP**

The implementation period of the PSP begins from the starting year of the Agricultural Production Program when the FWUC starts to collect the ISF. The PSP aims to build up a stable condition for paddy storage and sales activity in the SC FWUCs.

The implementation schedule is shown in Table F-7.

### **F-3.6 Facility Design**

The facilities, including equipment necessary for implementation of both Programs are designed in the following section. The facilities to be introduced initially will be constructed by the MOWRAM together with the irrigation facilities and used by the Apex Committee and six SC FWUCs. The Apex Committee will invest in the facilities constructed in Stage II for the AMP.

#### **(1) AMP**

##### **a) Condition for Design**

The condition for the facility design is estimated and planned based on the Agricultural Production Program.

Target area:                                      The target area for the AMP is the USP area covering 3,500 ha and about 4,000 households.

Target crops: The target crops are all products produced in the target area. Special attention is given for vegetables concerning the facility design because vegetables cannot be stored and need stable marketing conditions more than other grain products.

Sales period: Vegetables are given a priority for selling. Grain products such as rice, beans and sesame will then be sold between the periods for selling vegetables in season and out of season vegetable sales from February to April and August to September.

Target amount: The target amount that will be handled by this Program is about 50 % of the target production of each crop in the Agricultural Production Program. In the case of rice though, this rate is applied only to the target surplus amount.

The target surplus amount of rice is estimated in the table below:

Items	Unit	
Paddy production	ton	10,350
Post-harvest losses, seed etc.	%	17
Population	person	21,000
Paddy consumption	kg/cap.	244
Gross consumption	kg/cap.	294
ISF (140kg x 3,500ha x 80%)	ton	392
Total consumption	ton	6,562
Surplus of paddy	ton	3,788

Annual operating days: Considering harvesting season and market price tendency the annual operating days of the facility are as follows:

Item	Annual operating days
Vegetables	20 days / month x 4 months = 80 days
Cereals	8 days / month x 6 months = 48 days
Rice	10 days / month x 8 months = 80 days
( Total )	208 days

The operating days will be adjusted flexibly according to the needs and the actual participation rate of traders (buyers). For example, the assembly days for vegetables may be four days a week and two days for grains in the vegetable production season.

Handling amount: The target-handling amount in the assembling market facility is estimated in the following table:

Items	Unit	Vegetables*	Cereals**	Rice**
Target production	ton	4,070	565	3,788
Handling amount / year	ton	1,628	226	1,515
Average handling amount / day	ton	20.4	4.7	18.9
Basket (80kg)*/Bag(60kg)**	Nos.	254	78	316

The target amount will be handled from the 5th year of the program implementation schedule. The following buildup rate of the Agricultural Production Program is applied to the handling plan by the 4th year during the period.

Year	1st	2nd	3rd	4th	5th-
Paddy	70%	80%	90%	95%	100%
Diversified crops	40%	60%	80%	90%	100%

Handling condition: Principally, farmers will bring their products to the assembling market facility from about 6 to 8 in the morning and afterward transactions with traders and shipping of products will be carried out. However like the operating days, the operation time should be adjusted flexibly according to the needs of traders (buyers) such as assembling in the evening and shipping early the next morning, and/or assembling in the afternoon and shipping in the evening.

Group collection and sales: The joint shipping activities will be carried out from the Stage II, 5th year of the AMP after organizing farmers into a group. The handling amount for this activity is targeted at 10 % of the target production.

Storage condition: The joint shipping group will store grain products and sell them while they watch the market conditions. Storage amounts are targeted to 30 % of their total handling capacity, which is 131 tons of rice and cereals. The capacity of the warehouse is estimated about 105 tons at 80 % of their handling amount above. This is because the peak of the storage is expected approximately three months after the rice harvesting period and about 20 % of

the rice will be sold in this period. The handling and storage amount by the Group is as follows:

Items	Unit	Vegetables*	Cereals**	Rice **
Target production	ton	4,070	565	3,788
Handling amount / year	ton	407	57	379
Average handling amount / day	ton	5.1	1.2	4.7
Basket (80kg)* / Bag (60kg)**	No.	64	20	79
Storage amount	ton	-	14	91

#### b) Layout plan

Based on the handling quantity and condition of activities, the following facilities will be required for implementation of the AMP:

Facility List

Item	Stage		Area (m <sup>2</sup> )	Function
	I	II		
Working area for assembling and shipping			263	Receiving, grading, assembling, packing and shipping.
Well			-	Washing of products.
Office			36	Deskwork and storage of packing materials and equipment.
Area for information processing			Included in the above	Accumulation and analysis of market information.
Warehouse			80	Storage of rice and cereals.

The layout plan is shown in Figure F-6.

#### c) Location of facility

The assembling and marketing facility will be constructed beside the head office of the Apex Committee. The location should be selected in an appropriate area in a central place of the target area with good access to the major road, in view of the distribution function of the facility. Therefore, the area along District Road No. 33 near the junction to ADB road is proposed and the MOWRAM will acquire the area in consultation with Tram Kak District Government and T.T.K. Cheung Commune after the program implementation decision is made.

#### d) Equipment plan

In addition to the facilities, the following equipment will be required for the activities in the AMP:

### Equipment List

Place	Stage		Equipment
	I	II	
Assembling & shipping place			Platform scale (2), table scale (2) and a blackboard
Office			PC and printer, and FAX machine
For transportation			Truck (2)

## (2) PSP

The storage facility constructed together with the office of SC FWUCs necessary for implementation of the PSP is designed as follows:

### 1) Basic condition

- Target Area: 3,500 ha (the USP area)
- Number of depots: Six for SC FWUCs of canal 20, 21, 22, 23, 24 and 3d. The SC FWUC of canal 24 covers the area of canal 3u because of 3u's location and quantity of ISF.
- Location of depots: The location of the depot that will receive, store and ship the paddy is selected based on the covering area by each secondary canal, in view of the following points.
- Rice miller (buyer) can reach the depot by truck.
  - Farmers can transport one or two bags of paddy to the depot by bicycle or motorbike.
- The proposed location map is shown in Figure F-7.
- ISF rate: 140 kg of paddy / ha
- Total ISF: 490 tons of paddy
- Handling rate: 392 tons as 80 % of above figure

### 2) Annual operation plan

The operational condition in each depot is as follows:

- Receiving period and quantity: Dec. - Feb.
- Sales period and quantity: Dec. - Nov. excepting the low price period of Apr. - Jun.
- Storage capacity: 212 tons at the end of Feb.

The average depot will receive 65 tons of paddy and ship 30 tons during the three months from Dec. to Feb. Hence, 35 tons is the inventory at the end of Feb, used as the maximum capacity for designing a depot.

The handling plan and storage capacity of an averaged depot is shown in Table F-8.

### 3) Facility Design

The area of the facility for an average depot is shown in the table below:

Facility List

Item	Area ( m <sup>2</sup> )	Remark
Warehouse	42	35 tons of paddy
Drying yard	18	

### 4) Equipment plan

The equipment to be introduced to the facility is a platform scale for each depot.

Equipment List

Item	No.	Specification
Platform scale	6	~ 200 kg

## F-3.7 Financial Assessment

The condition for financial assessment is as follows:

### (1) AMP

#### a) Turnover and income

The turnover and income is estimated by the following price.

Sales Price for Estimation

	For wholesale market activity	For group activity
Vegetables	Average of actual farm gate price of 16 kinds.	Average of actual buying price of 14 kinds in markets in Phnom Penh.
Cereals	Actual farm gate price of five target crops.	80% of actual high price of four target crops in markets in Phnom Penh.
Rice	Actual farm gate price	Average of actual buying price of rice millers in Takeo Town.

Price list above is attached in Table F-9.

Market charge (income): 3 % of turnover, 1 % from farmer (seller) and 2 % from trader (buyer).

Break down of turnover and income estimation is shown in Table F-10.

#### b) Expenditure

Personnel expense: The rate of monthly salary was decided by the local standard.

Personnel Expense

Personnel	No.	Salary (1000 R.)
Manager	1	120
Marketing / Coordinator	1	100
Accountant	1	120
Inspector	2	100
Cleaner	2	40
Driver	2	80

Replacement period: The following periods for facility reconstruction and equipment replacement are used for calculation of the replacement fund.

Period for Replacement

Item	Period
Office equipment	8 years
Other equipment	10 years
Well	30 years
Truck	10 Years
Building	30 years

The breakdown of expenditure is shown in Table F-11.

c) Revenue and expenditure

The gross revenue accrued from the assembling and marketing assistance by the MU of Apex Committee was estimated at Riel 54 million from the wholesale trade assistance and Riel 128 million from the joint shipping assistance. The revenue from the joint shipping assistance will be accrued from the 5th year after the commencement of the Marketing Unit. The expenditure for the assistance comprises the personnel expense of the Marketing Unit staff, O & M cost for the marketing facilities and equipment, and equipment cost procured in the Stage II. The revenue and expenditure for marketing assistance were estimated in Table F-13.

(2) PSP

a) Turnover and income

Sales price of paddy: Based on the actual buying price of rice millers in Takeo Town during the previous year, sales price in the harvesting season and average sales price in planned lean season is estimated as follows:

Price in harvesting season                      Riel 290 /kg

Price in lean season                                Riel 330 /kg

b) Expenditure

Personnel expenses: The rate of Riel 60,000 /month is applied to the manager of depot in each secondary FWUC.

Reconstruction period: 30 years is used for the fund of the facility renewal.

The breakdown of expenditure is shown in Table F-12.

The estimated annual balance of each depot is shown in Table F-14.

c) Additional revenue

Through the implementation of the PSP, additional revenue will accrue from the difference of sales prices at around Riel 15.68 million as follows:

Additional Revenue from ISF Storage and Sales

Quantity (ton)	Price (Riel/kg)			Income (Riel Million)
	Harvesting Season	Lean Season	Difference	
392	290	330	40	15.68

Revenue and expenditure concerning the PSP is included and treated in the cash flow of FWUC.