

# **Executive Summary**

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## 1. Introduction

### 1.1 Background of the Study

Rice production accounts for approximately 90% of total cultivation acreage and it is the most significant industry for the prospective development of society and economy including its food security in Cambodia. The government of Cambodia established their target in agricultural sector for the “Food security by increasing rice production” and “Acquisition of foreign exchange and economic developments by exports of agricultural products”. Although rice production has covered the national demand of rice since 1995 in the statistic, due to poor distribution system and inadequate post-harvest practices, there are many issues to be overcome in rice quantity and quality in Cambodia.

In 1995, Ministry of Agriculture, Forestry and Fisheries (MAFF) requested the Japanese government a technical cooperation on the formulation of Master Plan on Post-harvest Quality Control of Rice. Ministry of Commerce (MOC) also requested a technical cooperation on the formulation of Master Plan on Marketing System of Rice in 1996. After all, the both Ministries jointly submitted the request of the technical cooperation on the formulation of Master Plan on the Improvement of Marketing System and Post-harvest Quality Control of Rice in January 1999. In response, the Japanese government sent a preliminary study mission to discuss and define the Scope of Work (S/W) for the Study and it was signed by the both governments in December 1999. Based on this S/W, the Study was conducted in the period from March 2000 to August 2001.

### 1.2 Objectives of the Study

- (a) To formulate the Master Plan for improvement of the marketing system and post-harvest quality control of rice taking into account of strengthening national food security.
- (b) To transfer technologies to Cambodian counterpart personnel through on-the-job training in the course of the Study.

### 1.3 Scope of the Study

#### (1) Study Area

Kandal, Prey Veang, Kampong Cham, Svay Rieng, Takaev, Kampong Spueu, Kampong Chhnang, Bat Dambang, Siem Reab, Phnom Penh

#### (2) Period and Contents of the Study

**Phase I** (from March 2000 to March 2001) : Preparatory Work in Japan, Field Survey / Data Collection, Loss Assessment Survey, Questionnaire Survey, PCM (Project Cycle Management) Workshops, Preparation of Master Plan, Preparation of Final Draft Report

**Phase II** (from May 2001 to August 2001) : Explanation/Discussion of Final Draft Report, Technology Transfer Seminar

## **2. Socio-Economic Background**

### **2.1 Cambodian Socio-economic Situation**

Since the signing of the Paris Peace Accord in 1991, the transition of the Cambodian economy from a centrally planned system to a free market system has widened significantly. The establishment of a democratic coalition government in 1993 has provided impetus for more decisive reforms. Reforms have moved the economic system substantially towards a market economy, reduced the size of the public sector, and brought about substantial stabilization. With the ensuing political stabilization, the economy started to gain stability as well, achieving growth in GDP of 4.0%, 7.0% and 7.6% in 1994, 1995 and 1996, respectively. The major factors contributing to this economic recovery are: a) Paddy production increased dramatically in 1995, b) Industrialization through increases in direct external investment, such as garment factories, and c) Coordinating programs from the many international cooperation.

After two years of low growth in 1997 and 1998, due mainly to the Asian economic crisis, economic recovery is under way with fiscal and external conditions continuing to strengthen. This was reflected in an estimated GDP growth rate of 4.0 % for 1999. The service sector contributed an estimated 43 % of GDP in 1999, while the agricultural sector and the industrial sector contributing 37 % and 19 %, respectively. GDP per capita recovery to US\$265. While net foreign exchange reserves reached US\$408 million in October 1999 or 3.5 months of imports, from US\$146 million at the end of 1996.

Based on the General Population Census in 1998, about 84 % of the total population or 9.6 million reside in rural areas. Most of the population lives in the Plains Region, along National Roads and along major rivers. The average household size is 5.2 within a range of 4.9 to 5.8. According to the Socio-Economic Survey in 1999, 76% of employed persons are engaged in agriculture sector activities. The average household income of rural households (314,247 Riel / about USD 82) has only 28% of household income of Phnom Penh.

### **2.2 Agricultural Development Plan (2001-2005)**

A very clear development target in conformity with the SEDP II "to assure food security and natural resource conservation" is set for the agricultural sector.

- Continue to focus attention on food security, especially at community and family levels; and on reducing poverty, as there is a high number of poor people in the agricultural sector. Promote the increase in food production: especially the rice crop and other alternative food crops.
- Help promote national economic growth through the export of agricultural produce, which are surplus to domestic consumption.
- Improve the quality of agricultural produce and increase its 'value-added' component, by promoting the development of agro-processing industries; and create new jobs for rural areas.
- Improve family income and reduce poverty through the production of various crops that have high yields with low production costs.
- Manage natural resources effectively through responsible legal and technical regulations in order to assure sustainable development.

### 3. The Study Area / Field

#### 3.1 General Conditions of Agriculture and Rice Production

##### (1) Land Use

Out of total country area (181,535 km<sup>2</sup>), total agricultural land accounts for 22%. Paddy field and upland field including rubber plantation and fruit orchard accounts for about 14% and 7%, respectively. Cash crops, such as vegetables, maize, legumes, sugarcane and tobacco are cultivated in the upland field on natural banks along the Mekong River, Tonle Sap River and Bassac River. Upland field on slopes is mostly located on the outside of the paddy field area, which is not influenced with river flood, and upland paddy, cassava, peanut, jute are grown. Rubber plantation is a little less than 2% of the whole agricultural land, and most of them are concentrating in Kompong Cham province.

##### (2) Rice Production

Cambodia's most important agricultural commodity, rice, accounted for nearly one-third of total agricultural output and about 13 % of total GDP in 1998. In the crop year 1999/2000 approximately 1,915,600 ha (86% of the total cultivated food crop areas) was cultivated for rice and total production of paddy amounted to 4,047,900 ton.

Rice ecosystems in Cambodia are diversified and can be classified into four systems as; Rainfed lowland rice, Deepwater Rice, Rainfed Upland Rice and Dry Season Rice.

Rice production is strongly influenced by changes of climatic conditions and the insect/disease, due to obsolete cultivation technology and poor agricultural production infrastructure without irrigation system and dyke system. The destroyed ratio of wet season rice from 1995 to 2000 were 9%, 15%, 8%, 7%, 4% in order. The destroyed ratios of dry season rice were lower than that of wet season rice. Average yields were stable for both wet season rice and for dry season rice. Although the cause of damage varies by areas, for a country as a whole, it can be said that year 1997 and 1998 were drought years and year 1999 was a flood year. Provincial share (average for three years) of the national damage show that the damages were most serious in Bat Dambang province and Banteay Mean Chey province, occupying 45% of the total damage. Following Kompong Thum province, Takeav province and Prey Veang province, another main rice production area in southeast part, are in the higher rank of the damage share, occupying 11% of the total damage.

##### (3) Supporting System for Rice Production

**Extension Services:** The agricultural extension services to farmer from government organization have been stagnated. Direct technical extension activities to farmer are performed only in the technical seminars that are carried out in villages by supporting organization and in the agriculture related projects. Although MAFF has a system to extend the technical guidance through the agricultural development centers and DAFFs, sufficient activity has not been performed due to the financial difficulties and the shortage of capable persons of DAFFs.

**Research Institute:** Although research facilities and agricultural development centers are existing under MAFF and DAFF, research activity is carried out only at a few research facilities that have received assistance from the supporting organization. If there were no support from such supporting organization, any research activities cannot be carried out only by the Cambodian side. Regarding the rice, Cambodia Agricultural Research and Development Institute (CARDI) is the only institute continuously carrying out the research and extension activities in Cambodia, where the Cambodian-IRRI-Australia Project (CIAP) have been continuing since 1987 with the assistance of AusAID and IRRI.

**Seed multiplication and distribution:** Presently, sustainable system of seed multiplication and distribution hardly exists in Cambodia. Same as the research activity previously mentioned, activities for developing new varieties, seed multiplication and distribution also are carried out under the foreign assistance. Cambodian side cannot carry out any activities independently. CARDI, who have been receiving continuous assistance from AusAID and IRRI, is the only agent developing new varieties and multiplying the breeder seed and foundation seed in Cambodia. CARDI has released 34 varieties since 1990. Among the 34 varieties released from CARDI, IR66 have widely spread to farmers and it occupies about 80 % of dry season rice. However, proper renewal of the seed is not practiced due to lack of stable/sustainable supply system of the new seed for periodical renewal and to lack of farmers' knowledge on seed quality. Development of seed multiplication and distribution project, Agricultural Quality Improvement Project (AQUIP), is under implementation in southern part 4 provinces with assistance from AusAID. The objectives of the project are establishment of seed company, training of farmer's seed production groups, seed inspectors, etc. Popular conventional varieties except IR varieties have been planted for as long as 50 to 80 years to have natural cross breeding at the field, which CARDI assumes that its crossing rate has been 30 to 50% (purification: 50 to 70% only). Besides seeds are not cleaned well, their purity and uniformity of the quality by natural crossing and mixing mainly during the storing are insufficient. There is a bad influence from the mechanization of post-harvest process including rice milling. More attention should be paid to cleaning of the seed rather than to selecting of famous varieties.

## **3.2 Food Security**

### **(1) National Food Balance**

With the yield growth and planted area expansion, Cambodia have achieved the rice self-sufficiency since 1995. In the crop year 1999/2000, Cambodia produced 4.04 million ton of paddy; its largest ever total, and the surplus is estimated to be 260 thousand ton.

Nationwide self-sufficiency of rice has been achieved. However, even in surplus district, there exist certain rice deficit communes. The vulnerable people must rely on international assistance (food aid) through WFP and NGOs.

### **(2) A Future View on Rice Balance**

**Rice production:** MAFF set up the target yield as 2.0 ton/ha and target harvest area as 2,420,000 ha in year 2005. This target yield is slightly higher than the estimated paddy yield in those years (about 1.8-1.9 ton/ha), and it is still in low level comparing with other Asian countries. Target harvest area is set as increase about 14% in wet season rice and about 24% increase in dry season rice. Damage/destroy area is

set as corresponding to the actual result of 1999/00 in which the damage in wet season rice was least in recent years.

Cultivation Result and Target for 2005/06

Description	Results				Estimation 2000/01	Plan to 2005/06
	1996/97	1997/98	1998/99	1999/00		
1. Total cultivated land *1	2,170,900	2,076,011	2,104,013	2,157,592	2,175,000	2,500,000
2. Damaged land *1	288,900	147,422	141,447	78,150	100,000	80,000
3. Harvested land *1	1,882,000	1,928,689	1,962,566	2,079,442	2,065,000	2,420,000
4. Yield (ton/ha)	1.84	1.77	1.79	1.94	1.87	2.00
5. Total output	3,458,000	3,414,918	3,509,871	4,040,900	3,800,000	4,800,000

\*1: Refer to the data of Department of Agronomy. Source: MAFF

Each of these targets corresponds to the actual result in the past. These targets would surely be achieved if the removal of land-mines and the improvement in productivity through rehabilitation of irrigation system, increase in access and better use of quality input (seeds, fertilizers, pesticides) and modernization of agricultural technology are progressed.

**Method for assessment of food balance:** Based on the paddy production estimated by MAFF, food (rice) balance is derived from following assumptions. Data for the quantity of inventories and the quantity of exportation and importation are not grasped and not included in the rice balance. Moreover, the quantity of production of food crops other than rice is not taken into account.

DAFF in each province survey and collects the data for cultivated/harvested area and yield, and estimate the district-wise paddy production. Yield is assessed based on the Crop Cuts Survey by DAFF and quantitative assessments of crop area and production made by village heads. World Bank /APIP pointed out the problems in reliability of the Crop Cut Survey.

Items	Assumptions
A Post-harvest losses	10 percent of production
B Seed use	5 percent of production
C Feed and other uses	2 percent of production
D Milling yield from paddy to rice	62 percent
E National population	Projected population from the general population census of March 1998 carried out by the National Institute of Statistics.
F Annual rice consumption per capita	151.2 kg.
Formula	{ paddy production - [ paddy production × ( A + B + C ) ] } × D - ( E × F )

**Balance prediction for the year 2005/06:** Based on the above target value of paddy production for the year 2005/06 with adopting the result of loss assessment survey for “milling yield of paddy to rice” and “ratio of post-harvest loss”, 404 thousand ton of surplus milled rice is calculated. There is a difference of

134 ~ 171 thousand ton in the estimated surplus of milled rice calculated on the conventional conditions (milling yield 62% and post-harvest loss 10%) and on the conditions based on the result of the study.

**Balance prediction for the year 2010/11:** In case the rice production in 2010 remain stagnant with the level of 2005 and the population increase as estimated by NIS, estimated balance of milled rice calculated on the conventional conditions (milling yield 62% and post-harvest loss 10%) is in small deficit. However, calculation on the conditions based on the result of the loss assessment survey show 130 thousand ton of surplus.

#### **(4) Rice Reserve Policy**

After its official participation in 1999, Cambodia is now obligated to allocate 3,000 ton of milled rice (about 5,000 ton of paddy) for the ASEAN Food Security Reserve. Green Trade Company (GTC) under the MOC is an exclusive agency for the rice reserve and responsible for the storage of 1,000 ton of paddy (about 600 ton of milled rice). The government considers that the paddy stocks of private rice mills in the country can correspond to the remaining of the obligate amount. But none of the preparation for emergency procurement such as selection/contract with rice mills has been made.

#### **(5) Food Distribution for the Vulnerable People**

WFP financially supported by international donors, procures rice from both external and internal sources. It then distributes this rice with other basic commodities to deficit and vulnerable areas. 28,828 ton in 1998 and 27,474 ton in 1999 were distributed by WFP.

The National Committee for Disaster Management (NCfDM) under the Prime Minister's office is responsible to implement the disaster relief scheme, which was established in 1996. In 2000, NCfDM plan to cover 18,000 households, with the allocated budget of 1 billion Riels with which they can supply 1,272 ton of white rice.

### **3.3 Marketing System**

#### **(1) Trade Flows**

According to the Agricultural Statistic 1999/2000, the total of provincial surplus amount is 568,639 ton (milled rice), the total of provincial deficit is 307,928 ton, and the nation-surplus is 260,710 ton. Based on data obtained, the volume of paddy out-flow through informal border is roughly assumed as 477 to 485 thousand ton.

Rice/paddy trade flows vary depending on crop condition in different Provinces and on the prices in neighboring countries. Trade flows are generated not only by quantity imbalance but also by needs for specific rice variety and quality. Rice flow to Phnom Penh is steady. Paddy flow to Vietnam is largely influenced by the rice export situation of Vietnam.

Only varieties of Somaly, Phaka Kagney and Neang Minh produced at the northwest production areas, have an established reputation for high quality and marketed to many urban areas - Phnom Penh, Sihanouk Ville and other provincial towns. Other local varieties are marketed only within the province of origin and/or to

neighboring provinces. Except the paddy flows to Thailand and Vietnam, paddy flows in the country are limited. Most paddy is milled in the province of origin or in a neighboring province.

## **(2) Marketing Agents**

Under the market economic policy, rice/paddy marketing is entrusted entirely in the hand of the private sector. Currently, the government has no market intervention or market control system for the domestic marketing. Under this situation, farmer, middleman, commercial mill, wholesaler and retailer formulate various marketing channels.

**Farmer:** According to the questionnaire survey, only 40% of farmers sold rice, regardless of quantity, during the last 2 years. Average sales volume is 1.6 ton/year and maximum is about 3 ton/year. Thus, the number of farmers involved in the marketing system is limited. Farmers tend to sell part of the surplus paddy immediately to repay debts and store the rest until they need more money. About 70% of farmers sold paddy to middlemen and about 20 % sold to commercial rice millers.

**Middleman (Paddy Collector):** Middlemen play an important role in the marketing of farmer's paddy, especially in remote areas far from rice mills, markets or towns. The area for paddy collection is generally fixed within several districts. Large-scale middleman uses agents to visit individual farmers and buy paddy.

**Commercial rice miller:** Among the marketing agents, commercial rice millers have the largest business scale and play the role of financial supplier to other agents; making advance payments to middlemen and deferred payments to rice sellers. They also play an important role in paddy storage. Scale of business varies from 200 ton/year to 10,000 ton/year in throughput. Except for a few commercial mills in Bat Dambang, which are formed as a company or partnership, almost all commercial mills are family run and categorized as Sole Proprietorship. Many of rice mills have regular business relations with select middlemen. Rice millers order a specific variety of paddy to middleman when they receive a large or urgent order. Many of rice mills have regular business relations with select middlemen to order a specific variety of paddy to middleman when they receive a large or urgent order.

**Rice trader (seller):** Rice sellers can be divided into stall shop type in the markets and independent shop type. Most of all rice traders are small-scale businesses. Especially, stall shop type has small sales of 50 to 300 kg/day and rice shops in are owned and managed by housewives earning supplemental housekeeping money. Except Phnom Penh and Sihanoukville, the number of rice sellers in each provincial town is small due to the small the urban population.

Combining the functions of retailer/wholesaler and direct purchase from rice millers is widely practiced by rice sellers. Between rice miller - wholesaler – retailer, deferred payments are usual. It is common for retailers to settle payment when re-purchasing. Rice sellers in Phnom Penh are facing the situation of “Too many rice shops and too few sales”.

### **(3) Major Trade Flows**

**Trade flows to provincial towns:** Rice sellers in each town buy the locally produced rice directly from rice mills nearby. In addition to the local rice, sellers procure several kinds of rice according the needs (i.e. income level) of local consumers from rice mill/wholesaler in other provinces.

**Trade flows to Phnom Penh:** Phnom Penh has a population of about 1.1 million and is the largest market in the country. Rice of various kinds, quality and price is marketed here. High-medium priced rice such as Somaly, Phaka Kagney, N. Menh from Bat Dambang are the most common in the city center where residents have the highest income level in the country. In contrast, medium-low priced rice from surrounding provinces such as IR, Local variety and Mixed-rice are common in the outskirts of the city area where lower income earners live. Thai fragrant broken rice is sold at most rice shops in center of Phnom Penh. Consumers value this rice and considered as “It is soft and it maintain softness even when rice get cool”. Many local restaurants used Thai fragrant broken rice to blend with local rice. This Thai rice is illegally imported via small corridors and via formal gate without leaving record.

**Trade flows to Thailand and Vietnam:** Main reason for the paddy flow to Vietnam is lack of a domestic market for irrigated early rice (specially IR variety). The main reason for the paddy flow to Thailand is physical difficulty and high costs of transporting commodities within the northwest region and/or higher profit. Due to this informal export, there is no trade data. This is a major hindrance to estimate the national food balance and to formulate policies and intervention measures.

General agreement on trade cooperation between respective country was made and promotion of bilateral trade and border trade is clearly stated in the agreements. But it seems that no definite (written) agreements about paddy border trade exists.

Reportedly paddy trade is banned at Thai border. However, Thai local authority has some flexibility in border trade and admits the paddy import with a limitation of amount at a certain formal gate.

Vietnam government allows Cambodian people with legal permanent residence in border areas in Cambodian territory to conduct trade at border markets in Vietnam if they have border passes. Rice imports need the permit from the Ministry of Trade of Vietnam. According to the hearing from Vietnam traders, paddy import is legalized with import tax, but rice import is banned in border trade.

#### **Rice procurement by the Police and Army:**

Reportedly, the total rice supply for the army and police was 70,000 ton in 1999. This accounts for 12% of the total of the provincial surplus amount (568,639 ton) in 1999/2000. Since 1999, Men Sarun Import & Export Co., Ltd is a sole agent supplying rice to the army and police. This company procures rice from rice mills directly.

**Rice procurement by the WFP:** The amount of rice procured by WFP, from foreign countries/from domestic market, were 16,352 ton /19,673 ton in 1998 and 10,882 ton /13,037 ton in 1999. Domestic procurement accounts for 2.3 % of the total of the provincial surplus amount (568,639 ton) in 1999/2000.

**Rice export:** There is no restriction on rice export but exporter need to apply an export license. Private traders export small amounts of rice. According to information from MOC, export volume was 16,310

ton (1996), 10,947 ton (1997), 3,080 ton (1998) and 7,390 ton (1999). Singapore is a major destination and it occupied 82% of total export and high quality rice was a major export.

#### **(4) Price Mechanism**

**Paddy Selling Prices of Farmers:** According to the comprehensive study made by the Study Team, farmers hoped to sell their ordinary varieties of paddy about 350 to 380 Riel/kg. However, paddy price stayed lower level than their hope during the Study period (260 – 300Riel/kg at Nov/Dec/ 2000, 210 - 250Riel/kg at May 2001) due to the deterioration of international market price.

**Price trend:** Rice price tends to show a seasonal fluctuation pattern: decreasing during main harvest season (Nov. – Jan.) and increasing during off-season (flood season) although the range and pattern of fluctuation varies every year. Paddy price and rice price fluctuates in parallel at each production area. Also, fluctuation of each area is in same pattern. Paddy prices and rice prices of Cambodia, Thailand and Vietnam show similar fluctuation.

**Price differences between Provinces:** Price differences between provinces of Somaly, Ph. Kagney and Neang Menh produced at Bat Dambang are small. Prices of IR variety rice, which are always cheapest in the markets, are in the same level among several provinces. Prices of Mixed-rice, which are mixture of minor wet season varieties and may have different content of varieties depending on the province, also are in the same level (Riel 600- 700/kg) among provincial towns.

**Price difference among variety/grade:** There is a definite price order among major marketed varieties that is Somaly- Phaka Kagney- Neang Khon- Neang Menh- Mixed Rice – IR, and this order never change in the markets. In Phnom Penh, some rice shops have different grade of rice, in higher price variety such as Somaly. The price difference between grades is normally 100-200 Riel/kg. Rice sellers explain the difference is: in appearance (clearness) which comes from different degrees of milling, broken rice ration, or production area (i.e. taste). Although it appears that some common scale/sense of quality evaluation exist among the traders, no numerical indicator is used for grading the rice quality in domestic trade.

**Margin:** Farmers share account for 70 – 80% of the retail price. The cost/margin at milling stage and retail stage is stable: both stages of cost/margin account for 6 – 13% for Ph.Kagney and 8 – 13% for N.Menh.

#### **(5) Market Information System of Rice**

The current Market Information System (MIS) for agricultural commodities was set up in MAFF/DPSC through the FAO project. It started full-scale operations in August 1997. This MIS collects the rice/paddy prices of fixed varieties at 11 places in the country. Collected price data is transmitted daily to the Agricultural Marketing Office of DPSC from the Provinces by fax or telephone. Then, rice/paddy prices are disseminated through a daily radio program of National Radio Cambodia. Due to time limitation of the program, only selected information is broadcasted.

The MOC has been collecting for wholesale prices together with 51 other commodities in 14 provinces.

The information collected has never been disseminated with any urgency to the public. EDC have been providing international market information to RMAs periodically. EDC is setting up a communication and information network among RMAs, called RICENET, through the internet. Market management offices at most of markets in Phnom Penh City also collect the price information of commodities.

There is no collaboration among those MIS institutions.

## **(6) Problems**

The government liberalized rice marketing in 1993. Since then, despite the situation of social unrest and of destructed economical infrastructure, private sector has formed the stabilized marketing system in its own way. At present, there is no serious problem exists for consumers because they (except very poor people) can choose varieties/prices what they want freely at retail shops in the cities. However, commercial environments such as transport infrastructure, communication infrastructure and financing service, which support the fundamental of marketing system, are not well developed. Further, the majorities of the traders engaging in marketing are very small-scale and lack in experience, skill/techniques and management ability of the business. Thus, their business practices are rather old.

As the rice production increased, domestic market has no much greater spare capacity to absorb the increased production. Despite the marketing of surplus rice largely depends on informal trading with Vietnam and Thailand, there is little added value in the present form of paddy trade. Bargaining power of Cambodian traders is weak and they seem to lack an active/aggressive attitude toward increasing their sales to neighboring countries. On the other hand, urban consumers such as in Phnom Penh have strong preference on taste and the fragrant broken rice from Thailand is continuously flowing into those cities. Due to informal way of paddy trade, the trade quantity can not be known and the opportunities to collect informal traffic fees are given to government officials.

Farmers are generally at disadvantageous position in selling paddy due to poor road infrastructure, limited marketing information, small-scale dealings and etc. At present, farmers have very little sense of marketing and pay few efforts to improve their bargaining power such as by organizing a group for collective sales. In order to foster farmers' organization, first of all, farmer's consciousness about farmer's organization needs to be changed. As for the government's promotion and support activities for organizing farmers' group, it is in a stage of just about starting.

The government is required to remove the restrictive factors against market mechanism and to practice complementary functions for market mechanism. Due to introduction of market economy policy, the government officers lack sense of responsibility and lack concrete problem consciousness. It may be partly because of the severe financial condition in Cambodia, they lack manpower of optimum capacity and further there is little motivation to carry out their work. Actually, they have no capability of management to enforce policies. These are the largest constraint factors in extending development assistance by the government.

### **3.4 Post-harvest Processing**

#### **(1) Result of loss assessment**

**Quantitative loss and Qualitative loss:** The loss assessment both in dry season and wet season in rice milling process were conducted in Takeav, Prey Veang, Kandal, and Bat Dambang. The results of post-harvest loss assessment include the loss in rice milling process. The result of the loss assessment is as follows:

- Sub-total for losses of farmer's level were 7.15% and sub-total for losses of commercial sector were 6.59%. Total losses, considering both of handling quantity, were calculated by 6.98%.
- In case moisture content of the paddy is below 21% w.b., the harvesting loss will be over 1% in most cases.
- There is a tendency observed that less is the moisture content, the more is the loss of drying before threshing.
- There are more easy shattering varieties grown in rainy season. The transportation loss of bundled paddy of wet season crop is four times the loss of bundled dry season crop.
- In the case of mechanical threshing, considerable loss can be saved by spreading a sheet in the periphery of thresher. Both in mechanical and manual threshing, there was a tendency that the loss is less in wet season crop of easy-shattering variety. In the finishing drying after threshing, the paddy is usually dried excessively to prepare for the following storage. Therefore, they tend to stay on safe side in the drying of paddy, causing over-drying or cracked grain by absorbing moisture.
- 0.8 to 1.0% (point) increase of husk weight ratio (due to kernel damage by insect) was observed in the IR varieties stored for six months. The loss during the storage was supposed to be about 1.9% here.
- The loss during transportation is mainly caused by the holes in the bags. PP bags made in Vietnam are often used. Those old bags are thin and easily broken and result in the loss by spilling.
- Partly because of the poor quality of paddy, it generates much broken rice, in turn; it increases the pressure inside the milling chamber partly more than necessary causing uneven degree of milling.
- Some rice mills although equipped with rubber roll type husker, lower the pressure (low husking ratio of below 10%) between the two rubber rolls in order to save expenses. In this condition, there would be no effect of using the husker.
- In the types more than 30 varieties, Engerberg type machine produces most unevenly milled rice; the higher rate of broken rice reduces the milling recovery. Generally the quality of the material paddy is somewhat lower than the one brought to the custom mills. Many are insufficiently dried and cleaned. This was a more observed in dry season crop.
- Presently preplanning process after material was fed is not functioning due to poor conditions of the machine and unskilled technology. Although it is possible to recover separately if there is any commercial value in the separated stuff, at present, the rice millers are reluctant to separate immature grains and empty husks and do not utilize the potential value and effect of the preplanning process (specially aspirator function). The same things happen at every turn of factory line.

#### **Result of analysis of other samples:**

- Quality of wet season crops is somewhat better than that of dry season crops. It is considered due to

less amount of damaged and immature grain that affects in the result of milling yield.

- Many samples of paddy yielded over 20% of cracked grain (it was about 14% in average in the custom rice mills)
- Considerable quantity of other variety is mixed and is reducing the machine efficiency, resulting in the lower quality.

## (2) Coefficient for calculation of annual demand/supply balance

The co-efficiencies based on the results of loss assessment survey compare with existing numbers as stated on the next table.

Coefficient to be used in the Calculation of Demand/supply Balance

Item		Losses and requirement to use			Milling yield of milled rice	Per capita Average annual consumption
		Loss after harvest	Seeding	Feed for domestic animals, fowl & fish		
Coefficient	Value currently used	17%			62%	151.2 kg
		10%	5%	2%		
	Result of this study	13%			64%	143.0 kg
		7%	4%	2%		

Note: Taking analyzed co-efficiencies into consideration not to shortage of rice surplus, it should round off/ round up each decimal fraction to the nearest whole number in order to use it efficiently. Analyzed co-efficiencies as stated above is collected as below:

- 1) Loss ratio is set by 7%. According to the answers to the additional questionnaire on rice consumption, the consumption against the quantity of seed broadcast was calculated. The mean of 80kg (mainly 70 to 90kg/hr) was taken to meet 4% for the rate of seed broadcast according to the average yield, 2,00ton/ha, taking a future increase in yield into consideration. Presently, bran mixed with paddy or husks is given to domestic animals and fowl. Therefore, it is quite difficult to decide the method of calculating the consumption quantity. Here, the conventional value used up to the present 2% is used as stated in the next table.
- 2) Milling recovery is 64%, which was in consideration of handling quantity between custom mills and commercial mills.
- 3) Annual per capita consumption was set according to the data of "Cambodia Socio-Economic Survey 1999" (compiled by National Institute). The rice consumption rate was not directly surveyed but calculated based on the price of rice to be 142.2 kg/capita/year. It was 143 kg/capita/year according to the analysis of the study team.
- 4) If the above coefficient was used for calculation, there would be a surplus of approximately 500,000ton of milled rice (800,000ton of paddy), which was approximately 260,000ton surplus of milled rice by existing coefficient. Hereafter, it would be necessary to revise the value at the interval of 3 to 5 years by conducting study and make sure of the current conditions. And the value should be effectively used for chalking out government plans.

## (3) Problems in Post-harvest Processing

**Qualitative loss:** Improvement of post-harvest processing with the full knowledge about the characteristics of each variety is not being carried out. In the custom milling, a large quantity of broken rice is lowering the milling yield. The milling yield is low even though they are lowering the degree of milling in order to increase the edible portion nominally. It would be motive action to mix the broken rice into the bran/husk in order to prepare bran/husk of different broken rice content because of payment system for milling fee.

**Quantitative loss:** Generation of broken rice is the largest problem. In other words, quality of material

paddy (brown rice) is the most serious problem. Broken rice is almost produced in drying and storage. There is also a problem when high rate of broken grain and cracked grain exist in a brown rice in a paddy. More broken rice content in-put to milling machine could not make well milling with higher milling degree. In the custom rice mills, if there is much broken rice, milled rice recovery rate will be less and consequently higher milling charge shall be paid. Further, if broken rice ratio is high, efficiency of length grader will reduce, and uniformity of the quality of finished product will be difficult to achieve regardless of the high or low quality of milled rice. It must make machine efficiency lower to affect running cost. The activities for improvement of qualitative loss should lead to the better results for improvement (reduction) of quantitative loss.

#### **(4) Basic Conditions for Chalking out Improvement Plan**

Regarding the post-harvest processing loss assessment, the basic conditions for chalking out improvement plans on quantitative and qualitative loss and on the quality of rice is summarized as follows:

- 1) In the agricultural works at farmer's level, moisture control at the time of harvesting, drying, transportation and threshing is most important. Keep the crops under optimum moisture content at each stage of above-mentioned process.
- 2) Plan to reduce over-drying and cracked grain due to moisture absorption in drying and storage control, etc...
- 3) Encourage changes from manual threshing to mechanical threshing.
- 4) In the farmer's work, pay more attention to paddy cleaning before sales and storage.
- 5) Realize the importance of proper rpm for each machine in the mechanical threshing and customs mills. In the custom milling, Engerberg type machines should be replaced with other type machines. In that case, try to install rubber roll type husker.
- 6) When quality is decided through using the quality standard or specifications in the contract, reduce the unevenness of quality divisions of each product and of the content. Remove impurities such as stones, sands and earth and low quality of rice, vain paddy, immature and small broken.
- 7) Improve the quality of rice bags.

### **3.5 Milling Process**

Rice mills in Cambodia are classified into Custom Mill (Village Mill) that is working for only processing not buying or selling the rice and Commercial Mill (Large Mill) that has capacity of 0.3 to more than 1.0 ton/hr and conducts for processing, buying and selling the rice. Most of the rice mills have storage facility and adjust the seasonal fluctuations of rice demand and supply. The Ministry of Industry, Mines and Energy (MIME) and the Provincial Departments conduct the registration of rice mills, which were almost (61.5%) installed after 1995 (as liberalized for rice). As the registration is not compulsory, a lot of rice millers are not registered. Numbers of rice millers in 10 targeted provinces based on the data from provincial departments of industry are 12,716 (Commercial mills: 581, Custom mills: 12,198; 1999). The number of large-scale rice mills is increasing.

### **(1) Custom mills**

Typical equipment used for custom milling are identified as; a) Engerberg type, b) compact type, such as Satamar type and Noda type, which equip rubber roll husker on top of the milling machine with one common base and c) small plant type. Besides those, there are various other types with different combination of machines. According the result of questionnaire survey, average processing capacity of custom mill is 0.3 ton/hr, processing volume per year is 67 ton. It means that the machine is operated only one hour a day. Milling rates are 15.77% for husk, 17.51% for bran and 66.22% of white rice including broken rice. About 80% of the custom mills have investment cost for less than US\$1,000. About 70% of them are funded by own budget, and relatives or acquaintance supports 10%. It was surveyed that a few custom mills used a loan from the bank. Usually, customers obtain white rice and owner obtains the by-products such as husk and bran as a milling fee. Although cash payment is introduced in recent years, still the payment by the by-products is main style.

### **(2) Commercial mills**

Typical commercial mill in Cambodia is a plant type composed of : Pre-cleaner (sifting type), Husker (stone type or rubber roll type or both), Paddy separator, Milling machine (2 stages to 4 stages), Grader (sieve type or indent type), Scale, and Packing machine.

It is found that a part of rice millers in Bat Dambang, Banteay Meanchey, Siem Reap and Takeav use length graders in order to meet the customers' demand for high quality rice. Average processing volume is 1,611 ton/year. Number of employees is 5 to 7. Investment cost of rice mill is US\$37,499 in average. About 80% of rice millers established their facility by own budgets. Some borrowed from the relatives or acquaintance. A few millers used loan from the banks according to the questionnaire survey.

### **(3) Trend of Commercial Mill**

**Enterprise Development Cambodia (EDC) and Rice Millers Association (RMA):** EDC is actively supporting the development of this industry. EDC became one of NGO since 1999 after renamed from PSD Unit, which had been supporting the private sectors. PSD Unit/EDC provided technical and funding support to newly created business associations and undertook collection and analyses of relevant research data, established market contact and began training of business management to upgrade members' operation and advance the potential. EDC supported to establish 9 RMAs in 8 provinces and one national level federation. EDC held technical and training tours by the members of rice mill associations to Vietnam, Thailand and Singapore. Further, EDC are planning to provide loan or fund to the members of rice mill associations in the future.

**Ankor Kasekam Roongroeng Co., Ltd.:** Meanwhile, it, a private enterprise, is planning to export Cambodian rice with newly built modern rice mill at the highly convenient place. This enterprise is setting up a complete system from production to export for the selected fragrant rice. The enterprise entered into contract with 2,488 farmers in 1999 in three selected provinces of Kandal, Kompong Spueu and Takaev. The enterprise is planning to collect the raw paddy of 63,750 ton in 2001 from 25,550 ha field where 22,822 contract farmers grow fragrant rice with the seeds given at free of charge. While

providing the know-how of cultivation, application of fertilizer, etc. to the contract farmers by his own trained 60 staff, the local authorities support the enterprise when enter into contract with farmers. The enterprise should give a great impact to the people concerning the rice industry, not only rice millers but also farmers and traders, in whole Cambodia in near future.

#### **(4) Warehouses and Milling Facilities of the Government and GTC**

**Warehouses under MOC:** Most of warehouses owned by MOC were constructed around the year 1985, and they are old and less utilized. However, they are dispersed in whole provinces, having a good accessibility locating along the National Road or main roads or near main cities. Most of them are necessary to renovate to be utilized because the damages on doors, walls, floors and roofs.

**GTC and Warehouses & facilities owned by GTC:** GTC was established on November 23 1998 and formed by combining three companies, one of which is under the MAFF and two the MOC. It has 27 warehouses of 50,000 ton capacity in Phnom Penh, and three plants of rice mills in Phnom Penh and Bat Dambang and one under construction in Kampong Cham. Main activities of it are: (a) Purchase and selling of rice in order to maintain market stability and support the production cost of farmers, (b) Take part in controlling the import and export of rice from Cambodia, (c) Take part in the storage strategy of reserve stock of the Royal Government, and (d) Take part in the supply of the needs of the Royal Government, aiming at the private company's activities, but completely controlled by the government. GTC has just commenced their own operation, working volume is still not so big.

### **3.6 Rice Quality Control**

#### **(1) Present Quality Control**

There is no quality standard for rice in Cambodia. This is because when the rice is consumed in Cambodia, its physical properties are not a problem as far as the variety is identified and nobody questions quality. Not only farmers but also traders and rice millers will take a passive attitude in the sales of rice. There is a feeling of expectation in the public for change; however, an immature system with false idea for market-oriented (market economy) precedes it, and the people are not sure what to do. In the process of the improvement, some targets would be necessary for improvement of quality and mode of transactions. It is said that over 2,000 paddy varieties have been cultivated in Cambodia. Some varieties may have been mixed with other varieties during the cultivation and/ or storage after complete drying; this reduces the efficient use of agricultural machinery and/ or the quality of rice. It will take a long time for farmers to produce uniform quality rice and to improve purity of the varieties.

#### **(2) Problems in Quality Control and Inspection**

There must be exertion by self-reliance, as is required. There is a perplexed situation not to understand them. Uniform quality milled rice can not be produced even if specifications are made without trying to create the situation where high quality milled rice are needed. This reduces the reliability on the present quality of the product. The activities of the rice millers and the pivot of rice marketing are indispensable for disseminating the feedback information. In this case, quality standard is necessary so the people

concerned can exchange opinions on the basis of common cognition about the quality.

Present quality of milled rice is very low as it contains a lot of broken rice and immature rice. However, actually the quality of milled rice and the conditions of milling machinery are not so bad as the people of Cambodia think. By removing only small broken rice and immature grain, it is possible to adjust the presently marketed milled rice to the level of 20% or 25% to meet the quality standard of Thailand and Vietnam. It is important to understand that the quality is something that people should make themselves and maintain daily, too.

The rice millers do not have much experience and their technical level is not so high. Furthermore, the technical level of the machinery and equipment is low. However, in neighboring countries, they maintain a market using the rice exported from Cambodia after some processes whose technical level is about same as those in Cambodia. It is necessary to analyze their actual cost and study the situation to see whether the technical level would be improved under the situation.

In Cambodia, sample transactions are still practiced, which are inefficient and are the cause of increased expenses. Because of the fluctuation in the quality, it is difficult to extend the market through maintaining buyer's trust. There must be a quality standard and inspection methodology to make fair dealing (trading) and development of the rice business. Otherwise, the quality control system will never improve.

### **(3) Quality of Milled Rice**

At present, the quality standard is not used as far as physical properties are concerned. In urban area, there is a sign of the work done for removing broken rice but it is not by a fixed method of quality control. There are large fluctuations in the quality. It can not be an object of fair commercial transactions. Although the rice distributed by WFP is seldom resold, it is changed for different (higher) quality rice. A part of milled rice distributed by WFP seems to be at the edge of an edible or resalable range. The milled rice distributed by police and army is of even lower quality. Therefore, they are mostly resold.

### **(4) Quality control system**

#### **Targets for quality control:**

- 1) Targets for improvement of quality: It covers all classes of rice including medium and low grades. The majority of the rice marketed is medium and low-grade rice. The entire rice industry can be improved by implementing a uniform process to ensure medium and low-grade rice as requested by the buyer. Each dealer pursues the (specified) target quality according the set quality standard. Also in the quality improvement, this quality standard can be targets and they can act under the common cognition.
- 2) Promotion of fair transaction with specified quality of rice (there is price information for each quality): Only by enacting the quality standard, it is possible to strengthen the bargaining power of Cambodian dealers indirectly. Simultaneously, it may lead to transactions by milled rice specifications.

**Problems in quality control:** Utilization of proper quality control system (Enactment of Quality Standard) is the key for stabilizing production and for increasing income of any industry. It is considered to be an effective instrument for economic development and stabilization of the whole of Cambodia. Concerning

the quality control in post-harvest processing, dissemination of inspection standard as well as the common language to be owned by many people in the rice industry for transactions is very effective. There is no need of inspection in the ordinary transactions and therefore they have little opportunity to conduct inspection. For regular export/import of rice and rice domestically procured by WFP, Camcontrol carries out inspections. The improvement of inspection techniques and reliability are needed. In introducing the quality standard and the inspection standard, based on the law, "Law on the Measurement of Quality and Safety of Products and Services", which has been enforced since June 2000, the quality standard of rice shall be enacted.

### **3.7 Rural Society / Farmers Organization**

#### **(1) Structure of Rural Society**

Since French colonial rule, artificially created "KHUM" (or Commune) has been functioning as the most basic unit for regional administration. But this actually consists of several PHUM (or Village) that are headed by Village Chiefs. And it is a PHUM that a Cambodian always maintains a traditional sense of belonging to. The chief of a KHUM is supposed to be elected (but is in many cases done so through de facto appointment by the Government), while a Village chief is appointed by the Commune Chief.

It is remarkable for loosely knit rural Cambodian communities to have succeeded in the cooperative movement in the 1960's, when Credit coops in 13 provinces, initiated by the government and named as OROC (Office Royal de Cooperation), were soon followed by a chain of consumer, production and multi-purpose cooperatives including such services as saving and marketing of paddy. The number of membership in the cooperatives reached as many as a quarter of the total farms. But unfortunately, 30 years of warfare destroyed the basis of 'the community' along with most of the farmer organizations including coops, while the Khmer Rouge system of spying spread distrust and suspicion among the people.

The existing rural organizations may be classified into three categories namely:

- 1) Traditional (Voluntary) organization: Pagoda committee (KANNNA KAMA TIKA WAT), Labor exchange group (PROVAS DEI), COLMATAGE (PREK) association, Traditional Saving Club (TONGTIN)
- 2) Modern (or IO/NGO-led) organizations: Since 1991's Paris Accord, many IO/NGOs have been trying to promote village organizations as the vehicles to implement their humanitarian/development projects in such areas as Micro-credit, Rice/Animal banks, support for economical activities of women, and so on (including literacy, environmental education, human rights).
- 3) Administrative (or Government-led) organizations: Village Development Committees (VDC) led by MRD are established in the villages nation wide. But few of them are so far active unless IO/NGOs assist them with supporting projects.

#### **(2) Present Status of Farmer Organizations (FOs)**

According to the Questionnaire Survey and other reports, many farmers tend to be bewildered and quite indifferent about coops or FOs in general. However when they see some benefits in them, they turn quite positive and interested in even participating themselves. At the time of participation, the following services of the FO's are most popularly namely: 1) Credit, 2) Extension of technology, 3) Input supplies, 4)

Marketing and information, and 5) Irrigation. The total number of FOs in Cambodia is unclear. But the total of FOs for agricultural activities can be estimated to be more than 3,000 ~ 4,000 (1 organization per 3 to 4 villages).

**Rural Credit Associations:** After the deregulation and NBC's termination of small/medium loans, formal rural credit services ended until the formation of Rural Development Bank (RDB) in 1998. To fill the gap, NGOs and IOs intervened with grants to help small farmers and woman-headed households who constituted the main body of rural poor without any financial service but moneylenders. Following those examples, bilateral aid organizations also joined in this field by supplying fund through NGOs. NGO's financial services were mainly for micro-enterprises as most of them, especially women who had too little land to invest. Almost all the micro-credit schemes have adopted the structure, namely Village bank : 7 to 9 solidarity groups with about 35 to 50 members in the same village.

Since RDB has signed up for ADB's fresh loan of US\$ 20 millions for it's 5 years Rural Credit project in July 2000, the formal sector rural credit must rise dramatically and can eventually shoulder more than half of the rural credit supply in 5 years. According to NBC, there are 72 NGOs and 2 IOs that are engaged in credit operations now in Cambodia. 49 NGOs out of 72, including almost all of the major operators, had outstanding loans of US\$23millions at the end of 1999, benefiting 334,145 families in 18 Provinces.

The core problem in Village banks such as: a) ability of management, b) weak foundation of budget and insufficient self-management, c) fair management by leaders. In spite of the problems, repayment rate is generally high, and both the loan volume and the number of borrowers are increasing in response to the higher requirement for rural credit. Therefore, it may be possible to expect that Village banks can develop into successful credit unions in future depending on how they can overcome the above problems.

**Paddy/Rice Bank:** As the rice bank is a system to secure the supply of staple food through group activity, it became a popular program for various NGOs to help deficit farmers from falling into "debt trap". As the gaps in rice prices in the lean season and the harvest season were large, the suffering of deficit farmers who rely on moneylenders were double, with the high interest and the price gaps that affected against them.

Due to the increased production and more stabilized rice prices, many rice/paddy banks now have surplus. This surplus can be marketed for profit and used for other cooperative market activities such as bulk purchase/distribution of fertilizer and/or group ownership of a thresher/rice mill as some groups have already tried out. Another important dimension is that a rice bank supplies seeds to the farmers. There are strong needs for quality seeds, but there are few channels to produce and distribute them. So there should be an opportunity for the rice bank to act as a distributor of quality seeds which can be a part of multi purpose coops' functions.

**Other Farmers Organization for Marketing:** Other kinds of farmers organizations that can be found recently are: 1) rice banks who sell surplus paddy/rice and are regarded as primitive marketing coops, 2) farmer groups who collect paddy in return to the fertilizer bought in bulk and distributed among the members, 3) farmer groups who buy agricultural machinery such as a thresher for the use of members as well as for hire. However these are still rare cases and the ones that are functioning are doing so with the

strong support of NGOs. The legislation of the basic laws/decrees seems to be under way to promote coops, and the attentions of the international donors including FAO are increasing while Cambodian agricultural problems including some acute marketing issues are waiting to be tackled as soon as possible. And however little, the experiences in some Village banks as well as in Rice banks are expected to be quite useful in order to develop marketing coops and FOs in general in Cambodia.

### **3.8 Transportation Infrastructure**

#### **(1) Paddy /Rice Transport**

Most paddy and rice is transported by road. Regular use of water transport is limited to some areas in the southern provinces, such as paddy transport to the rice mills and paddy transport to Vietnam through the main/branch streams of the Mekong/Bassac River. The railway was a major mode of rice transportation from the Northwest Provinces to Phnom Penh during the 1960's. Now it is estimated that about 80% of rice are transported by heavy trucks through National Route 5.

For road transportation, various means are used depending on distance and road condition. Paddy transport in rural areas is most often by ox-cart for short distances and for the roughest roads within villages/communes. For medium distances within districts (village to local town/rice mill), tractor and truck are used. For long distances (inter-district/inter-provincial transport mostly for rice), heavy trucks over 10 ton are used. 40-ton heavy trucks with trailers are widely used for rice transport from Bat Dambang to Phnom Penh.

Transport rates for the major destinations are consistent and well known to the users. It is currently reported that there are no illegal fee collection points along the trunk lines of national roads except at town/city areas, border gates and port areas.

#### **(2) Present Conditions and Problems of Transportation Infrastructure**

Inland transportation by trucks has recently become the major mode of transportation. The volume of 3.2 million ton by inland transportation in 1999 was 85 times that of 1993 and is 66 percent of all transportation. Inland transportation volume by road is increasing with the help of up-graded road conditions.

**Inland transportation by road:** The roads in Cambodia are classified as National roads, Other National roads, Provincial roads and Rural roads including farm roads. The total length of the National roads is 4,165 km and its density is 22.9 m/sq.km; and that length of National and provincial roads is 12,220 km and its density is 67.3 m/sq.km. The average density of National roads and Provincial roads in the Study Area is 632.8 m/sq.km and maximum density is 126.3 m/sq.km in Takaev except Phnom Penh and minimum 28.4 m/sq.km in Bat Dambang.

Most of the National roads are paved with asphalt-concrete or laterite; however they are damaged or broken in numerous sections of the road, with big and small potholes. At present, the average driving speed of cars is only 20 to 50 km/hour, excluding RN-4 and some portions of RN-6 & RN-7. Most of the other National roads and Provincial roads paved with laterite are often not drivable after heavy rains. Provincial road density is only 19.6 m/sq.km in average, and restricts resident to act effectively as well as to obtain the

necessary information.

Village / farm road are very poor in quantity and quality. Farm roads are not found in the paddy fields, even in irrigated areas. Paddy transportation is conducted manually or by bullock carts from field to field.

**Railway conditions:** The Royal Railway of Cambodia belongs to the Ministry of Public Works and Transport. The railway in Cambodia with a total length of 648 km consists of the Northern line (L=385km) and the Southern line (L=263km), both originating in Phnom Penh. The Northern line has a longer history and runs to the Thai border. Both of them are single-tracked-railroads and operated by diesel locomotives. Railroad structures such as embankments and bridges have been damaged by civil war.

Railway problems are longer transportation time and un-punctual time schedules. This is caused by poor maintenance of old railway facilities, railway lines, bridges, wagons, locomotives, etc., which lower train speeds.

**Waterways and Ports conditions:** Mekong River and Bassak River as well as the Tonle Sap Lake are located at the center of Cambodia, and their tributaries have been used for inland transportation for many years. Downstream of Mekong River and Bassak River is the border to Vietnam, and many goods have been traded through large and small river ports/piers. Vietnamese boats are found at some ports/piers near the border. Vietnamese small boats with a capacity of 10 to 30 ton transport paddy from small river ports to Vietnam.

Checkpoints for boat transportation are established same as for land transportation. However, regulations and monitoring for the waterways and ports used by many small vessels and ships over the years, have not been conducted regularly. Illegal vessels and ships pass through keeping away from the checkpoints. Although the Cambodian government sets regulations for licensing and registering, illegal vessels and ships belonging to domestic as well as foreign owners sail around conducting paddy trade at the border of Vietnam.

### **(3) Direction of Development**

**Road :** Rehabilitation works for National Roads are planned or being implemented with the assistance of ADB, World Bank and the Japanese government.

**Railway:** Royal Railway of Cambodia has plans of rehabilitation of the Southern line, Northern line, rolling stock, track maintenance & equipment, signaling & communication and building stations. Considering the effectiveness of railway transportation for large volume handling at low cost, railway transportation would be more important in the future, as economic activities become more aggressive.

**Waterways and Ports:** Rehabilitation of Sihanoukville international seaport, where transportation volumes would increase in the near future, is on going, with assistance of the Japanese government. Other rehabilitation plans for inland waterways are not planned. However, it is proposed the strengthening of controls and operation of existing ports, the setting-up of inland waterway regulations, strengthening of vessel & ship registrations, and the improvement of operations technology.

## 4. Development Concept for Master Plan

### 4.1 Development Potentials and Constraints

The development potentials and constraints in the fields of the Study are summarized as follows:

Field	Potentials	Constraints
Rice Production	<ul style="list-style-type: none"> <li>- Natural environment is suitable for lowland rice cultivation.</li> <li>- Various genetic resources of rice exist.</li> <li>- Production is possible to increase.</li> <li>- Traditional paddy cultivation technology exists.</li> </ul>	<ul style="list-style-type: none"> <li>- Rice production is unstable due to flood or drought</li> <li>- Institutions for research and extension of agricultural technology is incomplete.</li> <li>- Access to agricultural materials is limited.</li> <li>- Expanding market is difficult.</li> </ul>
Marketing Infrastructure	<ul style="list-style-type: none"> <li>- Road rehabilitation plan is made up by the assistance from international organizations and foreign countries.</li> </ul>	<ul style="list-style-type: none"> <li>- Road infrastructure is very poor.</li> <li>- Shortage of fund for maintenance work.</li> <li>- Damage by flood.</li> <li>- Scarcity of ability to receive assistance.</li> </ul>
Farmers Organization	<ul style="list-style-type: none"> <li>- Law for agricultural cooperatives is under legislative process.</li> <li>- Active NGOs assistance.</li> <li>- High organizing rate of farmers' organization in the past.</li> </ul>	<ul style="list-style-type: none"> <li>- Experience of past failure in collective farming.</li> <li>- Insufficient understanding on advantages of farmers' group.</li> <li>- Scarcity of competent leader.</li> </ul>
Post-harvest Processing & Quality Improvement	<p><b>Farmers level</b></p> <ul style="list-style-type: none"> <li>- Quantitative loss in customary practices is low.</li> </ul>	<p><b>Farmers level</b></p> <ul style="list-style-type: none"> <li>- Quality consciousness of farmers is low.</li> <li>- Crack of grain by inappropriate drying practice.</li> <li>- Cultivation of many different varieties.</li> <li>- Seed renewal rate is low.</li> <li>- Simple processing tools are lacking.</li> <li>- Access to appropriate technology is limited.</li> </ul>
	<p><b>Custom Milling</b></p> <ul style="list-style-type: none"> <li>- Procurement of parts is easy.</li> </ul>	<p><b>Custom milling</b></p> <ul style="list-style-type: none"> <li>- Low milling yield and high broken rice ratio.</li> <li>- Incentive to improve quality and equipment is lacking (milling fee is paid by by-product).</li> </ul>
	<p><b>Commercial Milling</b></p> <ul style="list-style-type: none"> <li>- Rice Miller's Associations and Federation exist.</li> <li>- Continuous assistance by UNDP / NGO (EDC).</li> <li>- Competition in rice quality among rice millers in Bat Dambang exists.</li> <li>- WFP practices procurement by quality standard.</li> </ul>	<p><b>Commercial Milling</b></p> <ul style="list-style-type: none"> <li>- High-value paddy variety is difficult to procure in quantity.</li> <li>- Many varieties are mixed in material paddy.</li> <li>- Uneven quality of material paddy.</li> <li>- Shortage of capital/technology/information to improve business.</li> <li>- Access to technology and market information is limited.</li> <li>- Expanding market is difficult.</li> <li>- Uniformity in product quality is incomplete.</li> </ul>
	<p><b>Consumers and others</b></p> <ul style="list-style-type: none"> <li>- Rice with different processing qualities is sold in some markets in Phnom Penh.</li> </ul>	<p><b>Consumers and others</b></p> <ul style="list-style-type: none"> <li>- Needs for processing quality of consumers is low.</li> <li>- Quality standard is not yet made.</li> </ul>

Field	Potentials	Constraints
Marketing system & Socio-economic Environment	<ul style="list-style-type: none"> <li>- Rice is marketed by variety and there are clear prices differences among varieties.</li> <li>- There is demands for fragrant broken rice in urban markets.</li> <li>- WFP procures rice.</li> <li>- Traditional border trading with neighboring countries.</li> </ul>	<ul style="list-style-type: none"> <li>- Saturation of domestic market.</li> <li>- Purchasing power in provinces is low.</li> <li>- Domestic market for dry season rice (IR varieties) is limited.</li> <li>- Rice production is mainly for home consumption.</li> <li>- Farmers' consciousness to improve selling methods is low.</li> <li>- Farmers' access to market/information is limited.</li> <li>- Most of marketing agents is small-scale and fund/management ability is insufficient.</li> <li>- Affected by fluctuation of international price of rice.</li> <li>- Communication infrastructure has not developed.</li> <li>- Bank services have not developed.</li> <li>- Informal fee collection by government officials.</li> <li>- Low spirit of law observance of the people</li> <li>- Unclear procurement of rice by army and police.</li> </ul>
Policy & Government Support System	<p><b>Information services</b></p> <ul style="list-style-type: none"> <li>- Price information services exist.</li> </ul> <p><b>Extension &amp; Research</b></p> <ul style="list-style-type: none"> <li>- Continuous assistance by AusAID-IRRI.</li> <li>- CARDI exists as research institute.</li> </ul>	<p><b>Information services</b></p> <ul style="list-style-type: none"> <li>- Means for distributing information in provinces is restricted.</li> <li>- Cooperation between government agencies is lack.</li> </ul> <p><b>Extension &amp; Research</b></p> <ul style="list-style-type: none"> <li>- Seed multiplication and distribution system is not completed.</li> <li>- Extension system for marketing has not developed.</li> </ul> <p><b>General</b></p> <ul style="list-style-type: none"> <li>- Framework to intervene in marketing is unclear.</li> <li>- Capability to implement the policy is restricted (manpower/financial resources).</li> <li>- Motivation to work of the government officials is low.</li> <li>- Enforcement of laws/regulations by the government is weak.</li> </ul>
Food Reserve	<ul style="list-style-type: none"> <li>- MOC Warehouses exist in each province.</li> <li>- GTC exists as public enterprise deals with rice trading and rice reserve.</li> </ul>	<ul style="list-style-type: none"> <li>- Financial condition of the government is very severe.</li> <li>- Government policy for food reserve is unclear.</li> </ul>

## **4.2 Direction of Development**

In Cambodia, rice is not only important as the people's staple food but also important as a key industry accounting for about 13% of GDP. Moreover, as indicated with the facts that agriculture population occupies about 80% of the total population and that rice cultivation takes up nearly 90% of total cultivated area, majority of the people are mainly making their living by rice cultivation. Thus, rice production is the mainstay of Cambodian economy and society, and development of rice industry is very important for the development of Cambodia.

With the yield growth and planted area expansion, the country achieved an overall rice “surplus” in 1995 and this have been sustained until now. Despite Cambodia being in a favorable situation of rice-surplus, the agricultural production system in Cambodia still remains highly vulnerable to weather shocks and pest damage. Stabilization of rice production remains an immediate problem to be solved. From the marketing aspect, it is essential to give incentives to farmers for improving the production. One such is to improve farmer’s income by strengthening their bargaining power and expanding markets.

At present, absorption of the surplus rice is highly dependent on the informal paddy trade with Thailand and Vietnam which are the world leading rice exporters. It is impossible to stop this paddy outflows under the saturation of domestic rice market.

Judging the present situation of marketing system and quality of rice, direct exportation to overseas markets must be considered as a rather future task. With practical viewpoints, it is advisable to tackle the development of rice industry through improving and promoting the present border trade first of all, with regards the strong purchasing power of neighboring countries who are the world No.1 & No.2 rice exporters as a development potential. As for the strengthening food security, improving and promoting the border trade shall ensure the stable and sustainable food supply. Also the situation of steady supply is clearly preferred to stabilize food prices.

To increase the profits of Cambodia in border trade, bargaining power of Cambodian trader's should be strengthened. Conversion of paddy trade to milled rice trade (i.e. increase added value of trade commodity) and improvement of quality also should be achieved. As for improvement of the institution of border trade, paddy trading should be legalized in practical manner. By doing so, traders will pass through formal boarder gates, thus eliminating informal fee collections at border areas, and it will also enable the official recording of trade.

Despite an overall “surplus” situation, many Cambodians lack access to food supply due to insufficient purchasing power, poor roads and due to there are more profitable markets to sell. These poor roads need to be rehabilitated to reduce the marketing cost and the distribution barrier to deficit areas, and to meet the potential demands. Another factor increasing marketing costs is the informal fee collection by police, army and civil servant: this should be eliminated immediately.

Rice processed in Bat Dambang province has an established brand value and dominates the high-quality rice markets in Phnom Penh and in some provincial towns. If the industry develop with foreign capital investment, it is expected that the demand for high-quality rice must increase as incomes of city dwellers improve. Other production areas should consider introducing a fragrant/soft type of rice to fit the

consumer's taste. In Phnom Penh, large amount of imported Thai fragrant broken rice is sold for blending with domestic rice to add fragrant. It is advisable that imported Thai broken rice should be replaced with domestic rice by enhancing the production of fragrant variety.

To compete with Bat Dambang rice in Phnom Penh market, weak marketing capability of rice millers in other provinces should be strengthened. Selection of variety and quality improvement of material paddy is indispensable in order to produce better quality rice which meet the market demand. Rice millers should take an initiative to form a vertical integration of rice production–processing–marketing with farmers for mutual benefit. Competition in high-quality markets among the provinces shall lead the overall quality improvement in the country, and then lead to further possibilities of entering the overseas markets.

The government should strengthen the supporting services to the private sectors through creating a better business environment, more efficient and fair. To eliminate the chances for informal fee collection, legislation and regulation relating to private business such as registrations/permissions for business, tax system, market fees and etc. should be clearly made known to the public. Improving the transparency in procurement of state rice for army/police supply and introducing a supervisory system against unfair dealings such as price-fixing arrangement shall be necessary to achieve the modern (fair) business environment.

### **4.3 Framework of Master Plan**

#### **(1) Strengthening of Food Security**

As stated in the S/W for this study, the master plan is for the improvement of marketing system and post-harvest quality control of rice taking into account strengthening national food security. Achievement of food security for the vulnerable people and disaster sufferers under a free economy system means how to establish social safety net as a nation. This subject shall not be handled directly in the master plan which aims at improvement of rice marketing system under the free economy system, and the contents of tackling with the strengthening of food security in chalking out the master plan are as follows:

<b>Requirement for Food Security</b>	<b>Contents of Tackling</b>
1) Achievement in sufficient food production	Expanding market for surplus rice, Enhancing and maintaining farmers' incentive to produce, Reducing loss in post-harvest processes
2) Improvement in economic access to food	Reducing marketing cost, Reasonable pricing, Reducing quantitative and price gaps among regions
3) Improvement in physical access to food	Smoothing of distribution
4) Achievement in sustainable and stable food supply	Promoting border trade, Increasing food reserve, Modernizing trade form, Strengthening supply/demand adjustment by market mechanism

#### **(2) Development of Rice Industry**

In Cambodia, all nationals relate to rice in any way in the processes between production and consumption. Therefore, economic effect of activating rice industry is large. As the nation level self-sufficiency has

been maintained, next task shall be a development of rice industry through quality improvement, marketing modernization and expanding markets. In the master plan, quality improvement in post-harvest rice processing and improvement of marketing systems for domestic trade and border trade shall be handled.

### **(3) Consistency with the National Plan**

Second Socio-economic Development Plan (SEDP II) and Agricultural Development Plan (2000 - 2005) shall be placed as higher plans of the master plan.

### **(4) Basic Conditions of the Marketing System**

The basic mode of rice marketing system is regulated with socio-economic factors such as development level of transportation/communication infrastructure, transportation business and financial services, national economy, political/social/cultural features, etc. Although taking them into the contents of plan as much as possible, many of these factors shall be categorized as external conditions in the master plan. Following fields shall be treated as external conditions with viewpoints of the scope, scale and the C/P agencies of the study.

- Rehabilitation/development of transport infrastructure
- Development of communication infrastructure
- Fostering banking business and services
- Fields directly concerned with agricultural production (improvement of production infrastructure, research & extension of production technology, etc.)

## **4.4 Development Concept**

### **(1) Development Targets**

Emphasis on strengthening national food security was placed in the S/W of the study because a national level food shortage in the past. Based on the direction of development in preceding section, final goal for the master plan is set at “Strengthening of Food Security and Development of Rice Industry”. In order to achieve this final goal, following four development targets is set.

1. Stable and balanced regional supply-demand
2. Reasonable price mechanism under modern business system
3. Improvement of post-harvest quality control of rice
4. Development of rice border trade

Former three targets are aimed at removing the development constraints and the last is aimed at utilization of the development potential.

### **(2) Targets Year**

The target year of the master plan is set as the year 2010 with period of 10 years.

### **(3) Development Scenario**

As food security is enhanced, rice industry is developing and again it leads to enhanced food security.

This circular interaction between food security and development of rice industry is a principal concept of the master plan. The final goal for the master plan is supported with realization of 4 development targets, and it aims at changing the emphasis being put on quantity aspect into both of quantity and quality aspects gradually.

**(4) Development Targets, Expected Outcomes and Activities**

Final goal - development targets – outcomes -activities are summarized in the following chart.

Final Goal	Strengthening of Food Security and Development of Rice Industry				
Development Target	Stable and balanced regional supply-demand	Reasonable price mechanism under modern business system	Improvement of post-harvest quality control of rice	Development of rice border trade	
Expected outcome	<input type="checkbox"/> Quantitative gap and price gap among regions is reduced <input type="checkbox"/> Seasonal price difference is reduced <input type="checkbox"/> Food reserve for poverty and disaster relief is enhanced <input type="checkbox"/> Food balance is grasped	<input type="checkbox"/> Farmers bargaining power is enhanced by organizing farmer's group <input type="checkbox"/> Marketing cost is reduced <input type="checkbox"/> Trade form is modernized	<input type="checkbox"/> Paddy quality is improved <input type="checkbox"/> Losses in post-harvest practice is reduced <input type="checkbox"/> Rice processing technology is improved. <input type="checkbox"/> Rice quality standard is legislated and introduced	<input type="checkbox"/> Institution of border trade is improved <input type="checkbox"/> Border trade infrastructure is developed <input type="checkbox"/> Commodity value is added <input type="checkbox"/> Market-oriented rice production is enhanced	
Activity	Improvement of Production	Stabilize production and increase rice production in deficit area Prolong harvesting period		Promote rice production based on ecosystem / market Promote seed multiplication and distribution system Improve custom milling system Improve post-harvest practices	Promote strategical rice production
	Promotion of Distribution	Reduce transportation cost Eliminate informal cost	Improve transport infrastructure Improve telecommunication infrastructure Eliminate informal cost Establish public trading places for open price formation	Enhance activities of rice millers' association Improve technology of storage and rice milling	Eliminate informal cost in border trading Develop border trade facility Develop transport infrastructure (road / river) Increase added value Enhance activity of traders / rice miller's association
	Strengthening of Support	Provide market price information	Establish and expand agricultural organization Promote activities of farmer's group Strengthen market information service		Strengthen market information system
	Improvement of Environment		Fully enforce weighting instruments verification system Legislate and introduce quality standard Improve state rice procurement system Modernize trading form	Introduce appropriate price reflecting its quality Legislate and introduce quality standard Improve reliability of inspection and analysis work	Legalize border trade and simplify export procedures

Final Goal	Strengthening of Food Security and Development of Rice Industry			
Development Target	Stable and balanced regional supply-demand	Reasonable price mechanism under modern business system	Improvement of post-harvest quality control of rice	Development of rice border trade
Food Security	<ul style="list-style-type: none"> <li>Intervene in market by using state fund</li> <li>Increase national food reserve</li> <li>Increase food reserve by farmers and traders</li> <li>Improve accuracy of balance sheet of food supply and demand</li> <li>Distribute food to disaster-stricken area</li> <li>Enhance purchasing power in deficit area</li> </ul>			Grasp trade data and prepare measure to control supply-demand

Activity regarded as external conditions in this master plan

## **5. Master Plan**

### **5.1 Identification of Proposed Projects**

In accordance with this conceptual structure for formulating the master plan, project ideas are elaborated and, through the steps of 1) Drawing up the project long lists, 2) Integration of projects, 3) Profiling the proposed projects, 4) Evaluation of the proposed projects, 5) Prioritization of the proposed projects, proposed projects for the master plan are identified. As a result, under-listed 15 projects are finally identified for the master plan.

#### Quality Improvement

##### **No.1 Project on Promotion of Seed Distribution**

By disseminating/extending post-harvest practices for seed processing to farmers, encouraging seed distribution supporters and developing human resource for technical extension, realize; Improvement of physical quality of seed, Improvement of grading (selecting) methodology for seed, and Improvement of quality seed distribution system.

##### **No.2 Project on Improvement of Post-harvest Processing**

By improvement of system and technology for post-harvest practices with the preparation of establishment of MAFF, attain improvement of paddy quality/ milled rice quality/ paddy seed, reduction of losses, improvement of post-harvest practices for paddy and seed, promotion of quality control, improvement of custom milling and pricing system for milling fee.

#### Marketing Improvement

##### **No.3 Open Paddy Market Project**

Through establishment of paddy markets at major rice production areas, achieve; Formation of open index price, Strengthen of Market Information Service, Widen the outlets of farmer and paddy trader, Improvement of quality control of paddy and Introduction of rice standard in paddy trading.

##### **No.4 Project on Improvement of Agricultural Marketing System in Phnom Penh**

To formulate improvement plan for supply-and-distribution system of agricultural products to Phnom Penh City, form an effective scheme of collaboration among the municipality, MAFF and MOC, then implement joint master plan study.

##### **No.5 Project on Enhancement of Rice Millers Association Activities**

In the development of rice industry, improvement of business management of rice millers and improvement of rice quality are the subjects of pressing need. Strengthen the business support services of the RMA (Rice Millers Association) to the members, such as support on better access to financial sources, marketing support/consulting, management consulting, technical advisory services.

#### Supporting System

##### **No.6 Master Plan Study on Establishment of Agricultural Cooperatives**

The support and promotion of agricultural coops is sought after as important measures to secure income for farmers and upgrade their welfare. To formulate the short and medium term plans to organize various kinds of agricultural coops according to the conditions and needs of the communities and provides support services to farmers, conduct a master plan study.

**No.7 Project on Enhancement of the Agencies in Charge of Agricultural Cooperatives**

While the draft Royal Decree for agricultural coops is being prepared by MAFF, there is no independent department/office to be in charge of coops in MAFF. Establish a department of agricultural coop. in MAFF as well as in DAFF and enhance its activity through providing the training and equipment.

**No.8 Project on Improvement of Marketing Extension Service**

Present agricultural extension service is only for the subjects about the production aspects, and it can not provide any marketing advisory services. By developing extension workers who can provide marketing extension services to farmers in DAFF, promote market-oriented production of farmers.

**No.9 Project on Enhancement of Market Information Service**

By improving the communication system with provincial offices, strengthening the field monitoring activity, etc., strengthen the MIS of AMO/MAFF in functions of collecting and disseminating the market information to provide better information to farmers and traders.

**No.10 Project on Enhancement of Collaboration for MIS Institutions**

Create a collaboration scheme among the government institutions, which are collecting market information, to enhance the Market Information System of Cambodia.

Marketing Environment

**No.11 Project on Verification of Measuring Equipment**

Execute the official inspection / verification of weight measuring instruments to prevent the deceptions in paddy/rice trade, which already has started in apart of the country, in each provinces.

**No.12 Project on Improvement of State Rice Procurement System**

Attain the fairness and transparency in the state rice procurement by introducing the improved procurement system based on the market mechanism.

**No.13 Project on Establishment of Rice Quality and Inspection Standard**

Attain the effective and faire trade and quality improvement of rice/paddy, by establishing and introducing the rice quality standard and standard rice inspection methodology. Provide training, equipment, technical advise, etc. to improve the capability of the concern government agencies.

**No.14 Project on Improvement of Rice and Paddy Trade System**

Through Institutionalize and systematize the present paddy cross-border trade, and rationalize the domestic and regional trading system for paddy/rice, attain increase in domestic value-added of paddy/rice, elimination of illegal fee collection, keeping record on paddy/rice trade including cross-

border, and development and promotion of intra-regional paddy/rice trade

## Food Security

### **No.15 Project on Increase of National Rice Reserve**

With utilizing the existing warehouses and milling facilities, increase the volume of the national food reservation. Then, through the paddy procurement and rice distribution, attain stable and balanced food supply to deficit areas and redress the price gaps.

## **5.2 Evaluation of the Proposed Projects**

The contents of evaluation criteria and importance of each criterion were set in accordance with the AHP method by the Study Team. The 15 projects for the master plan were evaluated and it is judged by numerical analysis that there is no significant difference in the scores. That is, there is no project can be given obvious priority or be given remarkably low validity in the 15 proposed projects.

## **5.3 Selection of Priority Project**

As the result of evaluation, the 15 projects are in similar importance and there is no project being given obvious priority. On the other hand, each project has a different prospect of implementation due to the differences in pre-condition, capability of implementing agency, etc. The projects in the following situations were judged having a higher prospect of implementation.

- Assistance of a foreign country or NGO has been performed in the field connecting with the contents of the project.
- The budget measure for some part of the project activities has already taken by the Cambodia government.
- A part of contents of project activity has already performed in limited scale/area.

The Study Team hopes to realize an implementation of 15 proposed projects equally, and has selected the projects with comparatively lower prospect of implementation as the priority project; i.e. select a project with higher necessity of technical assistance in its implementation. The selected priority projects are the following 6 projects.

- No. 2 Project on Improvement of Post-harvest processing
- No. 3 Open Paddy Market Project
- No. 6 Mater Plan Study on Establishment of Agricultural Cooperatives
- No.13 Project on Establishment of Rice Quality and Inspection Standard
- No.14 Project on Improvement of Rice and Paddy Trade System
- No.15 Project on Increase of National Rice Reserve

## **5.4 Implementation Plan**

### **(1) Implementation Schedule**

Based on the prospect of implementation and the implementation order may be specified by correlation

between the projects, overall implementation schedule is prepared as shown in below.

## **(2) Implementation Agency**

Master plan is composed of 15 projects and each project has different combination of implementation agency/section and operating agency. MOC and MAFF concern to the most of the projects. Each ministry should manage/supervise the implementation of concern projects and should clarify the responsible section/person for coordination works and preparation works. Many procedures and time will be required until reaching to the implementation stage. Especially in the project with foreign assistance, a continuous follow-up is indispensable.

In the following projects, cooperation of MOC and MAFF is indispensable. Moreover, a leading/responsible ministry should be clarified in each project.

- Project on Increase of National Rice Reserve
- Open Paddy Market Project
- Project on Enhancement of Collaboration for MIS Institutions
- Project on Improvement of Agricultural marketing System in Phnom Penh
- Project on Improvement of Rice and Paddy Trade System
- Project on Increase of National Rice Reserve

Field Project	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>Quality Improvement</b>										
1 Project on Promotion of Seed Distribution		.....	—————	—————						
2 Project on Improvement of Post-harvest Processing	—————	—————								
<b>Marketing Improvement</b>										
3 Open Paddy Market Project	—————	—————	—————	—————	—————	—————	—————	—————	—————	—————
4 Project on Improvement of Agricultural Marketing System in Phnom Penh				.....	—————					
5 Project on Enhancement of Rice Millers' Association Activities	—————	—————	—————	—————	—————					
<b>Supporting System</b>										
6 Master Plan Study on Establishment of Agricultural Cooperatives		.....	—————	—————						
7 Project on Enhancement of the Agencies in Charge of Agricultural Cooperatives	—————	—————	—————	—————	—————	—————	—————	—————	—————	—————
8 Project on Improvement of Marketing Extension Service	—————	—————	—————	—————	—————	—————	—————	—————		
9 Project on Enhancement of Market Information Service	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —
10 Project on Enhancement of Collaboration for MIS Institutions	—————	—————								
<b>Marketing Environment</b>										
11 Project on Verification of Measuring Equipment	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —	— — —
12 Project on Improvement of State Rice Procurement System	.....	—————	—————							
13 Project on Establishment of Rice Quality and Inspection Standard	—————	—————	—————							
14 Project on Improvement of Rice and Paddy Trade System	—————	—————								
<b>Food Security</b>										
15 Project on Increase of National Rice Reserve	.....	—————	—————							

..... Preparation  
 ————— Project period  
 — — — Continuous activity

## 6. Priority Projects

### 6.1 Project on Improvement of Post-harvest Processing

<b>Development Target:</b>	3. Improvement of post-harvest quality control of rice	
<b>Purpose</b>		<b>Project Area</b>
By improvement of system and technology for post-harvest practices with the preparation of establishment of MAFF, realize: Improvement of paddy quality/ milled rice quality/ paddy seed, Reduction of losses, Improvement of post-harvest practices for paddy and seed, Promotion of quality control, Improvement of custom milling and pricing system for milling fee		Phnom Penh as a main station and whole area in Cambodia for dissemination
<b>Beneficiary</b>	<b>Main Activity</b>	
Direct beneficiary : Farmer Indirect beneficiary : Trader, Commercial rice miller	Extension of post-harvest processing technology. Establishment of a department in charge of collecting information and extension of post-harvest processing technology. Introduction of quality standard of rice and guidance for quality improvement. Information services on rice prices. Sketching out and execution of training program of manpower for the executing organization Guidance on the method of calculating demand/supply balance	
<b>Required Input</b>	<b>Expected Output</b>	
Detailed design/execution: - 3 persons for 8 man-months - Machine/equipment for rice inspection, post-harvest processing and for extension - Modification of existing building Extension and guidance Extension staff: 3 persons for 22 man-months Estimated total Total estimated cost: US\$1,500,000	Improvement of human resource Reduction of losses, Improvement of rice (paddy seed) quality Improvement of custom milling system Better accuracy of data for balance calculation supply-demand	
<b>Implementing Agency</b>	<b>Implementing Schedule</b>	
MAFF (new section/office in DPSC)	Detailed design stage / Study : 5 months Detailed design stage / Implementation : 2 months Extension and guidance : 1.5 years	

### 6.2 Open Paddy Market Project

<b>Development Target:</b>	1. Stable and balanced regional supply-demand 2. Reasonable price mechanism under modern business system 3. Improvement of post-harvest quality control of rice 4. Development of rice border trade	
<b>Purpose</b>		<b>Project Area</b>
Through establishment of paddy markets at major rice production areas, achieve; Formation of Open Index Price, Strengthen of Market Information Service, Widen the Outlets of Farmer and Paddy Trader, Improvement of Quality Control of Paddy and Introduction of Rice Standard in paddy trading.		Rice surplus provinces in the M/P study area and Banteay Mean Chey province

Beneficiary	Main Activity
<p>Direct beneficiary : Farmer, Trader, Rice millers in an area covered by a paddy market</p> <p>Indirect beneficiary : Consumer</p>	<p><u>Phase 1: Feasibility Study</u> Confirm the policy on the contents of the project, and prepare the TOR Implementation of the Feasibility study</p> <ul style="list-style-type: none"> <li>- Examination of the validity of a paddy market with a test case</li> <li>- Determination of operating agency, and planning of personnel training program</li> <li>- Planning of overall program of the open paddy market establishment</li> <li>- Planning of pilot project</li> </ul> <p><u>Phase 2: Pilot project</u> Establishment of operating agency Training of the operating agency Design and Procurement of facility/equipment for pilot paddy market Operation of pilot paddy market Evaluation of the pilot project, and feedback in the overall program of the open paddy market establishment</p> <p><u>Phase 3: Extension of the open paddy market system</u> Establishment of markets facility/equipment in alignment with the overall program of the open paddy market establishment Personnel training of the operating agency Establishment of operating agency Monitoring of implementation of overall program Monitoring and evaluation of the overall program</p>
Required Input	Expected Output
<p><u>Phase 1: Feasibility Study</u> Study cost</p> <ul style="list-style-type: none"> <li>- Study Team : 60 M/M (8 experts)</li> <li>- Estimated required cost : US\$1,870,000</li> <li>- C / P cost</li> </ul> <p><u>Phase 2: Pilot Project</u> Basic Design Study</p> <ul style="list-style-type: none"> <li>- Study Team : 25 M/M (5 experts)</li> <li>- Estimated required cost: US\$600,000</li> <li>- C / P cost</li> </ul> <p>Project Cost : determined in the F/S (include costs for technical cooperation on establishment / personnel training of the operating agency, operation of pilot market and evaluation missions of the pilot project)</p> <p><u>Phase 3: Extension of the open paddy market system</u> Establishment of markets facility / equipment Establishment of operating agency and personnel training of the operating agency (input costs will be determined in the F/S and evaluation result of the pilot project)</p>	<p><u>Phase 1: Feasibility Study</u> Plan for overall program of the open paddy market establishment Plan for pilot project</p> <p><u>Phase 2: Pilot Project</u> Basic/detail design for paddy market pilot project Organization of operating agency Trained persons in operating agency Operation manuals for paddy market Evaluation result of the pilot project Amended plan for overall program of the open paddy market establishment</p> <p><u>Phase 3: Extension of the open paddy market system</u> Through establishment of paddy markets at major rice production areas, achieve; Formation of Open Index Price, Strengthen of Market Information Service, Widen the Outlets of Farmer and Paddy Trader, Improvement of Quality Control of Paddy and Introduction of Rice Standard in paddy trading.</p>

Implementing Agency	Implementing Schedule
MOC and MAFF	Phase 1 : 2 years (including preparation) Phase 2 : 4 years Phase 3 : 4 years
<p><b>Remarks</b></p> <p>This project unifies an idea of “paddy market project” for the domestic circulation and an idea of “border trade market project” for the paddy marketing to neighboring countries. Feasibility study in the phase 1 shall be conducted to fulfill both ideas.</p> <p><b>Feasibility:</b> Open paddy markets are widely dispersed in Thailand and it is judged as an effective means of improving the rice marketing system. But there are many differences between Thailand and Cambodia in social/economical situation, in human/financial resources of governmental institutions. To make sure the feasibility of the project, plan a test case in F/S and a pilot project to monitor and evaluate the validity of a paddy market in Cambodia, and feed back the results into the planning of the next stage.</p> <p><b>Operating agency:</b> The one of the major difficulty of this project aside from the financial difficulty is that market-operating agency has to be newly established in the project. As for paddy market in Thailand, Bank for Agriculture and Agricultural Cooperatives (BAAC), the private enterprise and the agricultural cooperative are the operating agencies. The organization similar to BAAC does not exist in Cambodia. At present, (1) establish a new Public Enterprise, (2) establish a new section in GTC, (3) consignment to private sector/NGO are assumed as an operating agency. In any case, provision of training and technical assistance is indispensable.</p> <p><b>Examination of the validity of a paddy market:</b> Collect the necessary information for examining the possible/effective methods of realizing the required/planned functions, of realizing benefits for market user's, of establishing the operating agency, etc. in the study. A test running of paddy market in very limited scale / functions are considered as effective method of the study. At present, Bat Dambang province is cited as a first proposed site because the conditions of market formation are most ready.</p> <p><b>Study in Thailand:</b> It is considered that application of on-the-job training at paddy market in Thailand and/or utilization of Thai specialist as the instructor/trainer are effective for human resource development in the pilot project. Therefore, in addition to the detailed analysis of paddy markets in Thailand, it will be necessary to create the cooperative relations with the Thai authorities such as Ministry of Trade, Public Warehouse Organization (PWO), etc.</p> <p><b>Additional functions at paddy market:</b> Possibility and practical ways for seed cleaning and distribution at paddy market (cleaning the paddy brought to the paddy market and exchanging this cleaned seed with ordinary paddy) and provision of micro-credit service at paddy market by NGOs shall be examined in the study.</p>	

### 6.3 Master Plan Study on Establishment of Agricultural Cooperatives

<b>Development Target:</b>	2. Reasonable price mechanism under modern business system	
<b>Purpose</b>	<b>Project Area</b>	
To formulate the short and medium term plans to organize various kinds of agricultural coops according to the conditions and needs of the communities and provides support services to farmers.	Whole country	
<b>Beneficiary</b>	<b>Main Contents of Study</b>	
Direct beneficiary : Farmer Indirect beneficiary : Consumer	Survey on existing farmer organization Categorization of rural communities Establishment of pilot coops Support system C/P training	

<b>Required Input</b>	<b>Expected Output</b>
<ul style="list-style-type: none"> <li>- Advisers : 50 M/M, C/Ps : 100 M/M</li> <li>- Operating costs</li> <li>- C/P cost</li> <li>- Estimated total cost : US\$ 1.20 million ( including C/Ps training in foreign countries )</li> </ul>	<ul style="list-style-type: none"> <li>Report of study ( e.g. Basic necessary information about agri-business, training )</li> <li>Master Plan of encouragement of farmers' cooperative</li> <li>Trained staff of DAE</li> </ul>
<b>Implementing Agency</b>	<b>Implementing Schedule</b>
MAFF (DAE)	<ul style="list-style-type: none"> <li>Period of preparing : 6 months</li> <li>Period of study : 1.5 year</li> </ul>
<b>Process of Study</b>	
<ul style="list-style-type: none"> <li>Stage 1: General Survey (Assessment of the current situation, Formulation of FO list)</li> <li>Stage 2: Intensive Survey/Farmer Training</li> <li>Stage 3: Formulation of Plans/Pilot coops and Establishment of Legal System</li> <li>Stage 4: Establishment of Pilot Coops/Circuit Seminars</li> <li>Stage 5: C/P Training</li> <li>Stage 6: Evaluation / Training and formulation of the final National Coop Development Plan</li> </ul>	
<b>Special Remarks</b>	
<p>Legislation of the present agricultural cooperative association law and the organization reform in MAFF corresponding to it are planned by MAFF single-handed efforts. Considering the present condition that training of agricultural cooperatives is key point of solution of the farmers' problem and task including enhancement of group sales, micro credit with secure low interest rate, etc., it is expected that the project is implemented as soon as possible, even the project plan is not perfect.</p> <p>Priority should be given to the practical plan in the side of the system of legislation or an audit system, training of government and people, and system of financing, especially.</p>	

#### 6.4 Project on Establishment of Rice Quality and Inspection Standard

<b>Development Target:</b>	<ul style="list-style-type: none"> <li>2. Reasonable price mechanism under modern business system</li> <li>3. Improvement of post-harvest quality control of rice</li> </ul>	
<b>Purpose</b>	<b>Project Area</b>	
<p>By establishing the rice quality standard, realize:</p> <ul style="list-style-type: none"> <li>Improvement of rice quality, Uniformity of paddy quality,</li> <li>Formation of open index price information to the public,</li> <li>Strengthening of MIS (Market Information System),</li> <li>Improvement of dealing system in the market, Use of standard inspection methodology.</li> </ul>	<p>Whole area in Cambodia (Phnom Penh and other few important points of rice marketing/movement)</p>	
<b>Beneficiary</b>	<b>Main Activity</b>	
<ul style="list-style-type: none"> <li>Direct beneficiary : Farmer, Trader, Rice Miller, Wholesaler/Retailer</li> <li>Indirect beneficiary : Consumer</li> </ul>	<ul style="list-style-type: none"> <li>Provide training for enacting and introducing of rice quality standard and standard inspection methodology.</li> <li>Improve equipment and renovate existing building.</li> <li>Provide the program for persons in the executing organization.</li> <li>Improve the monitoring system on market price reflected in the quality.</li> </ul>	

<b>Required Input</b>	<b>Expected Output</b>
<p>(Part I)</p> <p>Instructing for enacting and introducing rice standard and standard inspection methodology:</p> <ul style="list-style-type: none"> <li>- Manpower : 3 persons for 40 M/M (some program is proceeded in spot during the instruction period)</li> <li>- Equipment : temporary set for standardizing x 1 set</li> </ul> <p>(Part II)</p> <p>Detailed design (research/ design/ execution) for improvement of equipment and renovation of existing building:</p> <ul style="list-style-type: none"> <li>- Manpower : 9 M/M (4 kinds of expertise)</li> <li>- Equipment : A set of equipment for equipment and renovation of existing building</li> </ul> <p>Total estimation : US\$2,400,000</p>	<p>Enacting of rice quality standard and standard inspection methodology</p> <p>Improvement of equipment for rice inspection</p> <p>Decision of inspection method</p> <p>Information of rice price reflected in quality/ grade</p> <p>System of domestic procurement of rice for support and for government distribution</p> <p>Promotion of human resource for standardizing rice quality (paddy/ brown rice/ milled rice)</p>
<b>Implementing Agency</b>	<b>Implementing Schedule</b>
Camcontrol, MOC, MAFF	<p>Part I : 2 - 2.5 years</p> <p>Part II : 8 months ( at the same period of Part I )</p> <p>Execution of Part II : 4 months</p>
<b>Remarks</b>	
<p>The improvement of standards is important, one of the precedent activities would be taken into consideration. ( Part II will start at the beginning of Part I and will complete during the introduction period of Part I, before the monitoring )</p>	

## 6.5 Project on Improvement of Rice and Paddy Trading System

<b>Development Target:</b>	<ol style="list-style-type: none"> <li>1. Stable and balanced regional supply-demand</li> <li>2. Reasonable price mechanism under modern business system</li> <li>4. Development of rice border trade</li> </ol>	
<b>Purpose</b>	<p>Paddy cross-border trade shall be institutionalized and systematized, and the domestic and regional trading system for paddy/rice shall be rationalized through which the following will be expected: increase in domestic value-added of paddy/rice, elimination of illegal fee collection, keeping record on paddy/rice trade including cross-border, and development and promotion of intra-regional paddy/rice trade</p>	
<b>Project Area</b>	Whole Cambodia	
<b>Beneficiary</b>	<b>Main Activity</b>	
<p>Direct beneficiary : Trader, Transporter, Rice millers who are connecting with paddy/rice marketing</p> <p>Indirect beneficiary : Consumer or The nationals</p>	<p>Study on establishment of institutionalized paddy trading system and enact the regulations;</p> <p>Conclude paddy/rice trading treaty with neighboring countries under the concept and the framework of AFTA;</p> <p>Study on improvement of paddy/rice trading system and establish the system</p> <ul style="list-style-type: none"> <li>- Streamlining of procedures</li> <li>- Elimination of illegal and unfair collection of fee</li> <li>- Management of trading volume of paddy/rice including their demand/supply</li> </ul>	

<b>Required Input</b>	<b>Expected Output</b>
<ul style="list-style-type: none"> <li>- Man power: 111 M/M (4 expertise and 10 persons)</li> <li>- Remuneration, out-of-pocket expenses, equipment/machinery cost and C/P expenses</li> <li>- Estimated required cost : US\$ 1.55 million</li> </ul>	<ul style="list-style-type: none"> <li>Paddy trading institutionalizing method</li> <li>Paddy/rice trading treaty with ASEAN member countries</li> <li>Reporting and recording system on export and import of paddy/rice and inspection system</li> <li>Statistics on paddy/rice trading</li> </ul>
<b>Implementing Agency</b>	<b>Implementing Schedule</b>
MOC, MAFF and Ministry of Justice	Study/preparation : 2 years
<b>Special Remarks</b>	
It is prerequisite to obtain cooperation from the international and the regional support agencies.	

## 6.6 Project on Increase of National Rice Reserve

<b>Development Target:</b>	1. Stable and balanced regional supply-demand	
<b>Purpose</b>	<b>Project Area</b>	
<p>By means of increasing the volume of national food reservation, improve stable and balanced food supply to deficit areas and redress the price gaps.</p> <p>Enhancement of national food reservation system, Utilization of existing warehouses, Improvement of quality control of paddy, Utilization of existing milling facility</p>	<p>Study : Whole country Model plan : Surplus provinces and Deficit provinces (e.g. Phnom Penh, Bat Dambang, Prey Veng)</p>	
<b>Beneficiary</b>	<b>Main Activity</b>	
<p>Direct beneficiary : None (enhancement of governmental function and system)</p> <p>Indirect beneficiary : Vulnerable people</p>	<p>Field survey Validity verification of the amount of national food reserve Study on facility for food reserve, make plan, implementation Study on facility for milling, make plan, implementation</p>	
<b>Required Input</b>	<b>Expected Output</b>	
<p>Study : 39 M/M, US\$815,000 Implementation : 37 M/M, US\$760,000 Facility and equipment : US\$3,260,000 Total estimation : US\$4,835,000</p>	<p>Overall plan of national paddy reserve Utilization plan of reserved paddy Effective utilization of state warehouses Effective utilization of milling facility Implementation of the model plan</p>	
<b>Implementing Agency</b>	<b>Implementing Schedule</b>	
<p>MOC and GTC Related organization : NCfDM, MAFF, MIME</p>	<p>Period of study : 0.8 year Period of implementation : 1.2 year Total : 2.0 years</p>	
<b>Special Remarks</b>		
Making a plan with the relief plan for disaster victim which NCfDM have been executing.		

## **7. Recommendation**

### **7.1 Development Subjects outside of the Master Plan**

#### **(1) Rehabilitation of poor road infrastructure**

For rehabilitation of the national road network, demarcation of assistance by the international organizations and the foreign donors has already been determined. Since very poor road conditions are the serious obstacles of smooth distribution, it is urgently need to implement the rehabilitation of the road infrastructure.

#### **(2) Stability of agricultural production, and improvement in productivity**

Increase/stabilize of rice production are essential to attain the development target of “Stable and balanced regional supply-demand”. It is necessary to take necessary actions immediately for rehabilitation/development of irrigation system, modernization of cultivation technology, etc., which are the subjects prioritized in the agricultural development plan.

#### **(3) Importance of the measure against poverty**

Many of the poor people are farmers who are engaged in rice cultivation and they are in the weakest position in the rice marketing system. The development goal is placed in the strengthening of the food security but it can be said that a super goal is in reducing the poor farmers by rice farming. In this line, the development projects for supporting the poor farmers are important.

### **7.2 Recommendation on Implementation of the Master Plan**

#### **(1) Implementation of the priority projects**

To step forward the realization of the priority projects, it is hoped that an action plan for each project is formulated with the opinions/intention of the Cambodia side. In the process of making an action plan, it may necessary to consider about unifying the project contents and parallel implementation.

#### **(2) Technical cooperation**

In terms of improvement of post-harvest quality control, “JICA group seminar course on post-harvest technology” is supposed to be suitable training course, so that it is required to accept Cambodian trainees continually. Unfortunately, the procedure/criteria for selecting the candidates is not very clear. It is required to clarify the procedure/criteria for the selection to maintain the motivation.

The period of dispatching the JICA experts should be a long-term by considering the poor capacity of government institution even if the individual special field of study is short-term.

#### **(3) Realization of candidate projects**

In the cabinet council held on February in this year 2001, the Commercial Minister reported the result of this Master Plan Study to all cabinet members. Consequently, a workgroup for rice marketing system and quality improvement is established under the responsibility of the Commercial Minister, and the continuous cooperation by Japan is requested.

To be concrete, a feasibility study is requested for an immediate promotion of establishing the open paddy market to support farmers. Open paddy markets are operated in Thailand, India and Pakistan and it is considered that possible to introduce it in Cambodia under the necessary and sufficient conditions. The project shall be able to give a large impact to farmers, traders and millers. It is recommended to conduct a feasibility study as soon as possible in order not to lose a right time since the influences of Thai and Vietnam on rice marketing are increasing.