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# Paddy cultivation - the traditional way

by

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## Summary

In many Asian river basins, paddy cultivation is a main provider of livelihoods, and the sector is by far the predominant off-stream water user. In such river basins, water resources management and water-related development planning are not possible without involving the perspective of the paddy farmer, and the socio-economic and technological implications of paddy cultivation.

Paddy cultivation can generate a substantial value '*upstream*' and '*downstream*' of the farm level, in connection with production and supply of inputs, and processing and distribution of outputs. This is particularly the case for irrigated systems where two crops can be raised per year.

Traditional paddy cultivation is developing in response to challenges such as for example a stronger demand for crops other than rice - including vegetables and biofuel crops, as well as meat; a stronger competition for raw water in the dry season; and a stronger exposure to competition, related to improved transport infrastructure and lower trade barriers.

An over-ruling aim in this connection is better revenue generation in the agricultural production systems and related value generation, in support of sustainable rural livelihoods. This can be supported by inter-sector streamlining and inter-agency dialogue, as well as human resources development. Also, a need is seen of appropriate land management of agricultural lands, headwater areas, and aquatic habitats.

## Glossary

- Baray:** An area surrounded by a canal and a bund created by the landfill from the canal. The area may serve as a shallow reservoir in part of the year and may be cultivated in other parts of the year. The West Baray near Angkor Wat was built around 1050. It is rectangular, oriented strictly north-east-south west, and measures 2 by 8 km. It is still in use (while the similar East Baray is not)
- FWUC:** Farmers Water User Community, and organization of water users within an irrigation scheme, initially providing guidance on its operation, and later on owning and operating the scheme
- Paddy:** (1) A field with wet rice, inundated during most of the cultivation cycle; (2) rice in its husk (also called rough rice)
- Rice:** A distinction can be made between paddy, brown rice (produced from paddy by removing the husk by threshing), and white rice (produced from brown rice by removing the bran by milling). This distinction makes a difference: Allowing for other losses, one t of paddy provides 5-600 kg of white rice (plus some hundred kg of husk and bran, and around 2 t of straw). Milling increases the storage time and reduces the cooking time, but removes the protein, fibre, vitamins and minerals
- RLR,** rainfed lowland rice cultivation, the traditional Asian rice cultivation system along with irrigated cultivation. Other systems are deepwater rice and mountain (dry) rice, and 'System of Rice Intensification' (SRI), a recently developed system that requires less water but more labour
- Transplanting:** Traditional lowland paddy cultivation often involves transplanting of seedlings grown in nursery beds. This requires intensive labour within a short period of the cropping calendar. As compared with direct seeding, transplanting provides some control of the cultivation cycle (relative to the weather) and gives a higher yield. The cultivation period becomes somewhat longer, however
- Yield:** Tonne (of paddy) per hectare per crop. In Southeast Asia, the dry season yield is higher than the wet season yield because of less clouds and therefore higher sunlight radiation (but the cultivated area is much higher in the wet season). In Cambodia, in 2005, the wet season yield was 2.3 t/ha and the dry season yield was 3.9 t/ha (MRC Apr 10)
- Subsistence farming:** Farming that serves the household's own needs only

# 1 Introduction

In the Lower Mekong Basin, more than 10 million ha is planted with rice. In this and in many other river basins, the sector is a main provider of livelihoods and by far the predominant off-stream water user.

In such river basins, water resources management and water-related development planning are not possible without involving the perspective of the paddy farmer, and the socio-economic and technological implications of paddy cultivation.

The present paper provides observations on traditional paddy cultivation, with Cambodian practices serving as an example.

Since childhood, the author has been involved in traditional agriculture in general and paddy cultivation in particular, including her PhD thesis about rainfed lowland rice cultivation.

# 2 Background

## ***About rice***

Wet rice is a unique crop in many ways:

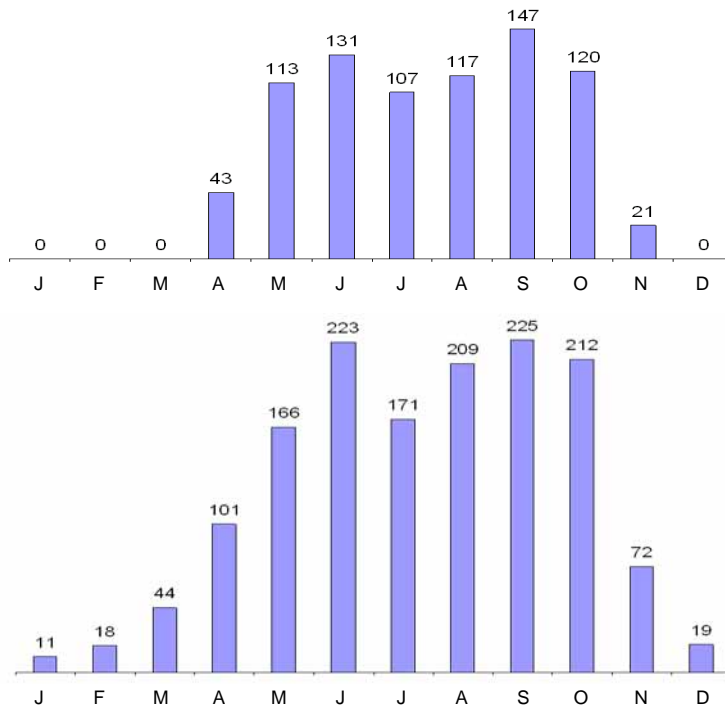
- It is a traditional, reliable and appreciated staple food
- It provides a livelihood for many people (for example some 75 percent of the people living in the Lower Mekong Basin)
- It can grow in places that are unsuited for other crops, including waterlogged or inundated areas
- It can be stored for months - or years, if need be
- It is rather robust towards pests, and very robust towards weeds
- It can be raised within the period of a monsoon rainfall

## ***Water for cultivation***

Having developed in a context of abundant water availability, traditional wet rice cultivation is not water-efficient at all. Production of 1 kg milled rice can require the availability (if not consumption) of 3-6 m<sup>3</sup> of water, including various losses and return flows.

The figure below exemplifies the monsoon rainfall in Cambodia, where most paddy fields are rainfed, with others supplied by seasonal flood water, and/or from irrigation. The seasonal variation is rather predictable, but the cultivation has adapted so closely that small deviations from the normal pattern can have a significant effects. This is particularly the case for the '*small dry season*', a dry spell of perhaps around a couple of weeks not long after the onset of the wet season. A protracted and severe '*small dry season*' after transplanting can seriously affect the annual rainfed crop.

Figure 1: Example of seasonal rainfall distribution (mm/month)



Data: Kampong Cham, Cambodia (1968-1972 & 1981-2002, 25 years); reliable (4 of 5 years) (top) and average (below). The 'small dry season' does not appear fully on a monthly basis because it normally lasts less than a month

### **Perspectives on paddy cultivation**

Paddy cultivation can be seen in different perspectives:

- The cropping system (for a specific crop): The primary paddy production system, with activities such as soil preparation, sowing, transplanting, weeding, application of fertilizers and (sometimes) pesticides, and harvesting. This perspective is important in relation to water resources management and technological development
- The farming system: The whole production at the farm, which can include paddy cultivation, livestock, fisheries, sugar production, fuelwood collection, manufacturing, and many other on-farm activities. This perspective is important to the farmer
- The agricultural value chain: The entire sequence of value generation related to a product (such as paddy), covering production and supply of seeds and other inputs, cultivation, harvesting, threshing, milling, and wholesale and retail distribution, all the way to the end user. This perspective is important to the farmer and to the national economy

Rice farming is part of life for the farmers. Many cultural features, folk songs, ceremonies and public holidays link to rice, in accordance with its role in the traditional identity of Cambodian people.

Figure 2: Transplanting



Photos from Kampong Cham Province, Cambodia, Aug 05

### 3 The traditional cultivation systems

#### 3.1 Rainfed rice cultivation

##### *The cropping system*

Rainfed rice cultivation is linked to the rainfall. Over the centuries, the timing and duration of the cultivation cycle have adjusted accordingly, depending on local soil conditions. Due to uncertain rainfall, risk aversion is a strong consideration in choice of technology and in technological innovation for rainfed lowland rice.

Traditionally, seeds are produced simply by retaining a portion of the harvest. Better seeds can make a visible difference, both regarding yield and robustness, but must be bought from the good seed keepers in the local area at intervals of a few years.

Also, fertilizers can highly improve both the yield and the resilience of the crops. However, the opportunity for its application depends on the rainfall.

The size of the land holding is important to the viability of cultivation of rice as well as many other crops. Land holdings in Cambodia tend to be minimal. One among other reasons is the increasing population combined with generation shifts.

##### *The farming system*

Traditional farming systems provide a balance between the availability of land, water and labour, in response to household needs and market demands.

Paddy cultivation is highly labour-intensive during transplanting and harvest, but less so in other periods, and not at all outside the cultivation season. Therefore, it can conveniently be combined with other occupations. A traditional Cambodian farming system would comprise paddy cultivation, livestock and palm sugar production. Today's farming systems can be more diverse. Examples of their elements are listed below.

<b><i>Examples of occupations practiced along with traditional paddy cultivation</i></b>	
<b><i>On-farm livelihoods</i></b>	Raising cattle, chicken, ducks, pigs Small-scale fish ponds Palm sugar production Manufacturing: Thatch, mats, jars Cultivation of vegetables, fruit and tobacco
<b><i>Village-based livelihoods</i></b>	Fuelwood collection Wage labour during transplanting and harvesting, or for construction works Seasonal fisheries Production of noodles, fish paste, rice wine Leasing draught animals and/or vehicles - perhaps tractors - for ploughing and transport Village-level trading Rice threshing and small-scale milling Leasing portable water pumps, engines and generators Battery charging Hairdressing
<b><i>Distant livelihoods</i></b>	Wage labour in towns, at construction sites or in border areas

A typical Cambodian cultivated landscape is recognised by its sugar palms. A sugar palm can produce 25-50 kg sugar per season (which is 5-7 months), providing a supplementary occupation and cash income. Trees that are unproductive for sugar can supply leaves for thatch-making, mats or rice bins, and can eventually be used for construction and fuelwood. Sugar production is labour-intensive and can compete with labour for other purposes. Also, it requires fuelwood. It is regarded as a hard way to earn an income and is now in decline.

### ***The agricultural value generation***

Cultivation generates a substantial value '*upstream*' and '*downstream*' of the farm level, in connection with production and supply of inputs, and processing and distribution of outputs.

Rice milling is capital-intensive and is provided by specialized operators outside the village. The millers often serve as wholesale buyers. They may provide loans to the farmers with the next crop as collateral, or the rice can simply be sold some time before it is harvested.

Few Asian paddy farmers have direct access to (or exposure to) an open market. Some countries see a rather monopolized distribution at the wholesale level. Many governments try to square the circle between appropriate revenue at the farm level and affordable food to the urban poor, applying gentle or more strict regulation of trade and/or prices. Conditions can be quite different for crops other than rice - an aspect that can favour a certain crop diversification.

## **3.2 Irrigated rice cultivation**

### ***The cropping system***

Small parts of rainfed rice areas have irrigation or supplementary irrigation. A higher reliability of access to water reduces a major risk and provides opportunities for innovation, provided that technology, skills and inputs are available. This requires coordination of the development of irrigation services and agricultural education and services.

Where raw water is available for dry season irrigation, it becomes possible to raise two (or perhaps even three) crops per year - an obvious opportunity, so much more because the dry season yield is much higher than the wet season yield (due to the higher sunlight radiation from clear skies).

A shift from one to two crops require a shift from long-duration to medium- or short-duration varieties. For example, a medium-duration variety can be grown in the wet season and a short-duration variety in the dry season.

### ***The farming system***

Sharing an irrigation system requires an even stronger collaboration than rainfed cultivation, and ability to collaborate is one of the several success criteria for new systems.

Farmers Water User Communities (FWUCs) are promoted by Ministry of Water Resources and Meteorology (MOWRAM) in support of de-central support to operation and maintenance. Some of these work well, while many others are in need of consolidation, faced with complex new challenges and a need of close collaboration.

If water is available but sparse in the dry season, a part of the land can be cultivated with crops other than rice.

The soil quality, taken as a given without irrigation, get a new significance in connection with the new potential cropping opportunities. Soil conditioning becomes a new requirement in connection with crop diversification in areas that are not immediately suited for crops other than rice.

Land becomes an even more precious production factor when irrigation is available, as reflected by a higher price. This makes sense, because of the higher revenue that can be generated, but it also imposes a pressure on the land ownership in case of social shocks, such as failed crops or illness in the family, where households risk to lose their land and turn to sharecropping. This is a visible tendency in newly irrigated areas.

The need for supplementary occupations remains, one reason being the moderate income generated from rice cultivation. Households that combine paddy cultivation and livestock will typically earn more from the latter. Cattle and buffaloes can feed on marginal lands unsuited for cultivation, and on by-products such as straw, husk and bran. They provide manure, and draft animals can generate a cash income from transport and ploughing. Further, cattle and buffaloes provide capital for emergencies (such as medical treatment costs in case of illness in the family).

### ***The agricultural value generation***

A second annual crop will highly benefit from more external inputs - seeds and fertilizer - and will in turn supply much more rice to the market, considering that a substantial part of the first crop from a small land holding is consumed by the household. This amplifies the value (and livelihoods) generated before and after the cultivation - hopefully to the benefit of the farmers as well as society as a whole.

## **3.3 Traditional gender roles**

There are some traditions in connection with the task allocation between the household members. These traditions are not strictly observed, however, and all hands are at work during busy periods.

Figure 2 (in Chapter 2) shows an example of work distribution: Men uproot and prepare the seedlings, and transport them all the way to the row of women doing the transplanting. (The seedlings are trimmed to reduce evaporation until the roots have started to grow, and the cuttings are used as fodder for the cows that pull the cart).

<b>Task</b>	<b>Traditional allocation</b>
<b><i>Rainfed paddy cultivation</i></b>	
Fixing the bunds	Men
Land preparation (ploughing, manure application)	Men
Seedbed preparation	Men
Uprooting and preparing the seedlings	Men and/or women
Transplanting	Women
Weeding and care	Men, women, children
Fertilizer application	Men
Harvesting and threshing	Men, women
Grain cleaning and storage	Women
Transport to rice mill and back	Men
<b><i>Palm sugar production</i></b>	
Sap collection	Men
Sap cooking	Women
Fuelwood gathering	Men, women, children

## 4 Trends

Traditional paddy cultivation is developing in response to challenges, such as for example:

- A stronger market demand for crops other than rice - including vegetables and biofuel crops, as well as a stronger demand for meat;
- a stronger competition for raw water in the dry season, related to development of irrigation infrastructure and intensified cultivation; and/or
- a stronger exposure to competition, related to improved transport infrastructure, porous borders, and regional and international promotion of lower trade barriers.

Also, inevitably, modern lifestyles will reach even remote, traditional farming households. A cash income is needed for clothes and kerosene (or electricity where available), and every household strives to achieve a TV, a handphone, and a motorbike. In many cases, this requires paid off-farm employment by one or several household members - typically young adults, who migrate to the towns in search of work.

## 5 Challenges

An over-ruling challenge is better revenue generation in the agricultural production systems and related value generation, in support of sustainable rural livelihoods.<sup>1</sup>

While a governance framework is pretty much in place in support of these challenges, there are some visible constraints to *'development and management of water, land and related resources'*:<sup>2</sup>

- Inter-sector streamlining and inter-agency dialogue take place at the bottom (commune) level and the top (national economic planning) level of public administration, but to a less extent in between.
- There is an open-ended need of human resources development (including, but not limited to the *'end users'* in the water user communities).
- The knowledge base for decision-making (about states, causes, effects, and management options) is less than ideal in many ways.
- There is a clear scope for strengthened land management of agricultural lands, headwater areas, and aquatic habitats.

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<sup>1</sup> Chapter adapted from from CNMC (Dec 09)

<sup>2</sup> As stipulated in Global Water Partnership's definition of integrated water resources manament (IWRM)

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## Appendix A: History of paddy cultivation in Cambodia

### *Prehistory*<sup>3</sup>

The origin of cultivated rice in Cambodia is not clear. Wet rice might have been introduced in the 4th or 5th century and was well established by the 10th century - perhaps earlier.

### *The Angkor era (9th - 13th century)*

Wet rice cultivation was well established, using techniques that are still seen today: Bunded fields, ploughing by oxen or buffalo, transplanting, and harvesting by sickles, as shown in the beautiful wall carvings of the time. There were large water storage and irrigation systems, such as the impressive Western Baray of the Angkor complex, which is still in use. The food production has been abundant, a requirement for feeding the many people who undertook the huge construction works.

### *Post Angkor period (14th - 19th century)*

This was a period of decline. During the 18th-19th century, Vietnamese rulers tried to promote export-oriented agriculture and to introduce new farming technology, but without much impact.

### *French colonialism and modernisation (1863-1953)*

This period brought peace and stability. The cultivated area was highly expanded, and production increased, with rice remaining the predominant crop. Machinery, new seeds and inorganic fertilizer were introduced, and irrigation systems were improved.

### *The Kingdom of Cambodia (1953-1970)*

The period saw strong government support to the agricultural sector. Cooperatives were promoted and credit provided. New technology was introduced, and irrigation systems were expanded. An agricultural institute and colleges were opened, and research and extension programs were implemented in support of improved seeds, soil amelioration and irrigation. Traditional cultivation techniques prevailed, however, and many farmers remained poor. The rice cultivation area increased to 2.5 million hectares in 1967, but the average yield did not exceed 1.1 tons per hectare. Still, in 1968, Cambodia could export 230,000 t.

### *The Republic of Cambodia (1970-1975)*

In this period, the country was strongly affected by geopolitical turmoil, as well as an emerging civil war. Farming systems became divided between a liberal system under the US-backed Lon Nol government and the collectivisation introduced in 1973 in areas controlled by the Khmer Rouge movement. Irrigation systems deteriorated, and fields became infested with land mines. Some two million farmers fled their land, and the population of Phnom Penh soared from around half a million to about three million. The cultivated area went down from 2.4 million ha in 1969 to about 0.5 million ha in 1974, and the yield went down as well. The country became dependent on food aid from abroad.

### *Democratic Kampuchea (1975-1979)*

In April 1975, the communist Khmer Rouge came into power, headed by Pol Pot, a regime infamous for a huge loss of life. Perhaps a fifth of the population died from exhaustion, starvation, disease and execution.

A Maoist policy was pursued, different from the Marxism-Leninism pursued in Laos and Viet Nam, and a full-scale attempt was made to return the whole society to an agrarian base. The

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<sup>3</sup> Most of this appendix extracted from Mak Solien (Mar 97)

Cambodian poor farmer class was claimed to be the only class. Money was abandoned, together with any private property, including land.

Phnom Penh was literally evacuated, with its population sent to work in the rural areas, but with poor organization and unsupportive and unskilled leadership. Irrigation systems were vigorously expanded, but often without regard to basic hydraulic feasibility considerations. The food production became utterly inadequate, serious starvation became widespread, and the society broke down.

### ***The People's Republic of Kampuchea (1979-1991)***

Civil unrest continued, and the country became infested with land mines. Transport and communications infrastructure had markedly deteriorated.

The country faced a serious shortage of food, and of basic agricultural implements, rice seed, draft animals, agricultural technicians and male work force. People ate all that they found, even seed and draft animals. Food security was the first problem facing the government. Its initial response was collective rice production. The most important elements of agricultural change in this period were collectivisation, its failure, and land reform.

During the 1980s, when one entered a rural village, one would rarely see men of between 18-40 years old, because they might have been conscripted for military service or 'forest clearing' in the northern or western parts of the country, while others might have been hiding from these duties. During military service some men died, some disappeared and some contracted malaria. In 1989, the gender ratio was as uneven as around 64%-36% (according to UNICEF, 1990). In 1994, 65% of all people between the ages of 35-40 were female (MRC 1994). The absence of male adults affected the household economy in many ways, and households led by women became common.

In 1986 the government geared its policy toward the free market economy. Land reform was constitutionally announced in February 1989 and collectivisation was officially abandoned. Land for rice farming, for gardening and houses was distributed to all farm households. This was done roughly in accordance with the land available in the village and the household size. This allowed for returning to the nuclear family orientation which was the traditional social group in Cambodian society. Farmers could decide to work by themselves or to help each other, and to apply the farming techniques they wanted. Farmers could sell rice they grew whenever and anywhere they wanted to. This policy pleased the farmers and the production improved. Still, the farmers faced risks, uncertainty and lack of necessary input. The significant impact in rice agriculture from this period was the direct access to rice land and markets.

### ***Transitional period to democracy (1991-1993)***

The Peace Keeping Settlement was an important historical and political event that brought about the presence of human rights, multiple parties, the UN peace keepers, the overseas investors and the return of Cambodian refugees to every part of the country. This allowed for interaction between 'outsiders' and farmers, which affected the thinking of farmers and the socioeconomic context of the paddy cultivation.

Clearance began of the 4-6 million landmines and unexploded ordinance. Huge progress has been made, but the task is not yet completed.

### ***The Kingdom of Cambodia (since 1993)***

Cambodia adopted a democratic policy, and rice agriculture remained the main important contributor to the national economy. Initially, many farmers found themselves in lack of food, draft animals and financial support. They continued their farming with traditional practices facing uncertainty and adapting to the natural factors and new problems in order to produce enough food.

Cambodian Agricultural Research and Development Institute (CARDI) was established in 1999 with support from Australia. Originally, CARDI focused on increased rice production, including development and commercial supply of better seeds. Today, it also covers crop diversification and crop quality.

A National Poverty Reduction Strategy was prepared in 2002; a National Programme for Household Food Security and Poverty Reduction was prepared in 2006; and a Joint Strategy for Agriculture and Water was prepared in 2007. None of these have been widely implemented, though. A National Rectangular Strategy was promulgated in 2004 and revised in 2008, with enhancement of the agricultural sector as one of its four strategic '*growth rectangles*'.

The national economic development took off, with impressive growth, and TV, mobile phones and motorbikes became common.

The irrigation infrastructure is being rehabilitated and expanded, but many systems are not fully operational, and most of the operational ones are used for supplementary wet season irrigation only. By 2005, some 20 percent of the cultivated area was irrigated in the wet season and some 7 percent in the dry season (CNMC Dec 09). Farmers Water Users Communities are being promoted in support of de-central irrigation management, but progress is slow, for various reasons, including a certain shyness, for historical reasons, of anything that recalls cooperatives.

From 2000 to 2005, the area of rice harvested in the wet season went up from 1.8 to 2.1 million ha, the area harvested in the dry season increased from 0.13 to 0.36 million ha, and the average yield increased from 1.6 t/ha in 1990 to 2.5 t/ha in 2005.<sup>4</sup> Cambodia became a rice exporter in the early years of the 21st century.

The income of traditional rice farming households remains low, due to low yields and small land holdings. By the start of the century, rice farming, processing and marketing occupied 50 percent of the labour force, but represented only 9 percent of the GDP.<sup>5</sup>

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<sup>4</sup> Chea (Jan 04) and MRC (Apr 10)

<sup>5</sup> GDP: Gross domestic product, the total value of goods and services produced per year within a country's borders

## Appendix B: Strategy for Agriculture and Water

Entire appendix extracted from MAFF and MOWRAM (Feb 07)<sup>6</sup>

### **Basis and vision**

The Strategy was in prepared in response to the National Strategic Development Plan 2006-2010 and is fully consistent with this plan.

The vision of the Strategy is

*to ensure enough, safe and accessible food and water for all people, reduce poverty, and contribute to economic growth (GDP per capita), while ensuring the sustainability of natural resources.*

### **SWOT analysis**

The strategy builds on a SWOT analysis (of strengths, weaknesses, opportunities and threats), as summarised below.

#### **Strengths**

- 1 Land resources are available
- 2 Water resources are available
- 3 Abundant manpower is available in rural areas at low labour cost
- 4 MAFF and MOWRAM have good human resources potential
- 5 Policy and/or strategic frameworks are developing for MAFF and MOWRAM
- 6 Stakeholders are committed to and recognise the importance of the sector (Government, external development partners, NGOs and farmers)
- 7 Diverse agro-ecosystems are available, with many land types and cultivated varieties
- 8 Developing focus on community empowerment and engagement, through for example Community Councils, farmers water user communities (FWUCs) and farmer organisations
- 9 Agri-business is developing

#### **Weaknesses**

- 1 Institutional capacity, management and project implementation by MAFF and MOWRAM are weak
- 2 Water resources are highly variable in time and space, and agricultural water management technology is poorly developed
- 3 There is limited investment capacity or interest in investing in agriculture
- 4 Technology transfer is weak and farmers and extension workers have a low level of knowledge, access to technology, and skills
- 5 Soil fertility is low in many areas
- 6 Socio-cultural weaknesses include low community solidarity, vulnerability of farmers to landlessness, and a cultural focus on subsistence agriculture: '*Rice first, fish second*'
- 7 Information asymmetry (inconsistency) among stakeholders

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<sup>6</sup> MAFF: Ministry of Agriculture, Forestry and Fisheries; MOWRAM: Ministry of Water Resources and Meteorology

- 8 The productivity of agricultural labour, land and water is low (resources are used inefficiently)
- 9 There is weak access to markets
- 10 Legal instruments are inadequate

### ***Opportunities***

- 1 Improvement of governance, policy formulation and political stability
- 2 Market development and integration with the regional and global economy
- 3 Strong support from external development partners for investment in agriculture and water resources
- 4 Science and new technologies
- 5 Better exploitation of natural resources (water and land) that are presently under- or un-utilised
- 6 Availability of investment funds, including incentives, private funds, and rural credit services
- 7 Decentralization and de-concentration policy

### ***Threats***

- 1 Market changes, including highly competitive international markets
- 2 High cost of oil and gas
- 3 Political circumstances, including competing demands for public funds from other sectors
- 4 Legal circumstances, including continued failure to enforce laws on land, water, forests etc
- 5 Natural disasters
- 6 Degradation of the environment
- 7 Failure to implement governance, judicial and other reforms
- 8 Social and political changes, such as social conflicts over access to water and land, and labour migration
- 9 Decreasing external support for agriculture and water resources

### ***Strategy components***

The Strategy has the following key components:

- 1 Ensure favourable pre-conditions and build on strengths and opportunities
- 2 Strengthen the enabling environment
- 3 Mobilize natural resources: Water, land and soil
- 4 Mobilize human and financial resources
- 5 Empower people and communities
- 6 Apply a river basin approach to water and land management
- 7 Increase productivity of agriculture
- 8 Extend commercial agriculture

These components are already being implemented, although to varying degrees.

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