CHAPTER I

INTRODUCTION

1.1 Background

Cambodia is one of the small countries in South-East Asia surrounded by Vietnam in the east and south, by Laos in the north and Thailand in the west and covers an area of 181 035 km2 with a population of 14,144,000 people (in 2003) (Research Machines plc, 2006), the Kingdom of Cambodia has a tropical monsoon climate comprising a dry season (November to April), and a rainy season (May to October). Average annual rainfall is between 1,200 to 1,400 mm in the central lowlands, 2,000 mm in the highland regions, and up to 3,000 mm in the coastal areas. The relative humidity varies between 65 and 90 per cent. The average temperature is around 27 °C. The Mekong River and its tributaries dominate the hydrology of the Kingdom. The agricultural lands of Cambodia can be divided into: 1) volcanic upland soils, 2) highlands, 3) coastal soil along sea banks, 4) reddish, and 5) brown soil, along the Mekong delta and around the Tonle Sap River (Vong, 1997).

Maize is the second important crop after rice in Cambodia and serves as staple food in the diet of the Cambodian people (Sarun and Tith., 1996). Agriculture is a major source of employment in the country. 75% of the working populations are employed in agriculture and 35% of gross domestic product (GDP) is contributed by agricultural sector (World Factbook, 2005). A major agriculture production sector was classified into groups, such as cooperative farms, solidarity production groups and community private farms. However, after the government policy has been changed since 1989, the agricultural production tended to be totally privatized. Major crops in Cambodia are rice, maize, cassava, sweet potato, vegetable, mungbean, peanut, soybean, sugarcane, sesame, tobacco, and jute (Table 1.1).

Table 1.1 Crop production in Cambodia, 2004

No.	Description	Cultivated Area (ha)	Production (ton)
1	Rice	2,374,175	4,170,284
2	Maize	91,203	256,665
3	Cassava	22,749	362,050
4	Sweet Potato	7,316	35,138
5	Vegetable	32,604	179,050
6	Mungbean	39,089	45,253
7	Peanut	19,213	21,543
8	Soybean	84,886	110,305
9	Sugarcane	6,788	130,363
10	Sesame	64,470	54,954
11	Tobacco	1,708	2,479
12	Jute	633	880

Source: Department of Planning, Statistics and International Cooperation, 2004

Maize was introduced to Cambodia in the 17th century (Sovann, 1998). Maize area increased by 14.6 per cent (48,000 ha to 55,000 ha) during 1992 to 1996 with an average annual increase of 4.8 per cent (MAFF, 1992-1996). Maize is grown in small patches of land in all provinces. Maize area was increased from 55,000 ha to 91,203 ha, while its production increased from 64,225 tons to 273,000 tons from 1996 to 2004 (Figure 1.1) (MAFF). So, the production of maize has increased mainly through the bringing more land under cultivation.

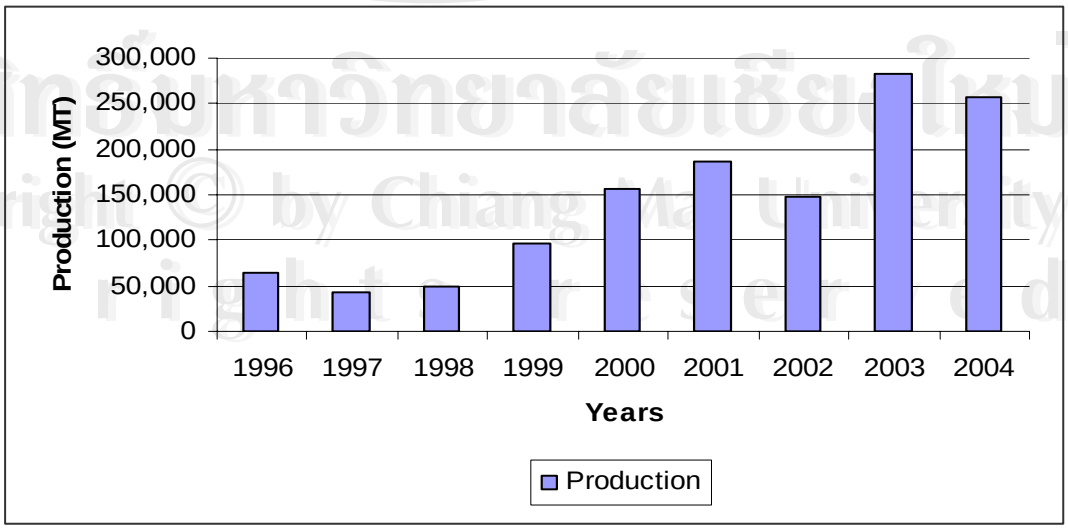

Figure 1.1 Maize productions in Cambodia from 1996-2004
Source: MAFF

Most of the maize farmers in Cambodia grow their crop using seeds saved from previous crop and they usually are not aware of the importance of improved seed or variety. Generally, farmers used the seed of maize varieties differing in kernel color and are simply called white flint, white glutinous and yellow maize. In Cambodia; many of the genetic resources in maize were lost during the war. Maize seed production is limited such that farmers are not aware of improved varieties and where to get them. Due to the lack of human resources, low budget allocation and inadequate infrastructure, seed processing, marketing and distribution of maize seed suffers many problems.

The hybrid seed of maize were introduced formally in Cambodia during 1996 when Department of Agronomy, Ministry of Agriculture, forestry and Fisheries introduced new maize varieties from Vietnam such as: TSB1, HL315, HL36, LVN10, and LVN11. During 1996-97 the Charoen Pokphand group (CP) of Thailand and Pacific Seed Company donated to Cambodia some 20.0 metric tons of hybrid maize seed and these were to be distributed free to maize farmers Vong (1997). Nowadays, hybrid seed is imported to Cambodia at many entries along Cambodian borders with Thai and Vietnam by private companies and traders. In recent years, Ministry of Agriculture, Forestry, and Fisheries has also introduced other varieties from Thailand to contracted farmers in target areas which shared boundary with Thailand: Banteay Mean Chey, Battombong, Oddor Mean Chey, and Siem reap provinces. The yellow flint maize is planted in 76.4% (69,689 ha) of the maize area in the country. Other type of maize grown is 23.6% of the maize area (Department of Planning, Statistics and International Cooperation, 2004). Maize consumption as feed for poultry and livestock in Cambodia is about 60% of the total production, as human food is 20%, as industrial products is 15% and as seed to plant the next crop is 5% (Vong, 1997).

Corn production in Cambodia can be targeted at the Asian markets, which is a net corn-importing region. However, the revival of corn production industry would need concerted efforts by the government as well as the private sectors (Sarith, and Kea, 2003). The productivity of maize in Cambodia is low and farmer's adoption of

hybrid maize varieties is also slow in spite of the good potential to promote maize production as income generating enterprise in some provinces. Maize is grown in all provinces of Cambodia. But the hybrid maize varieties are mostly adopted in some provinces which shared boundary with Thailand and Viet Nam.

Thus, there is a need to investigate the factors affected the adoption of local and hybrid maize varieties and its profitability to increase maize productivity in Cambodia.

1.2 Rationale of study

In Cambodia, both non-governmental organization and public sector are not yet fully involved in the maize production and distribution of maize seed even when the crop is the second important after rice. Only in rice that some efforts are being done to look into the production and the seed needs of farmers. Since, it is very difficult to find document saying about maize production in specific areas in Cambodia.

The productivity of maize in Cambodia is low and farmer's adoption of hybrid maize varieties is also slow in spite of the good potential to promote maize production as income generating enterprise in some provinces. There is an increasing market in Asian countries as these countries are net importers of maize. The recent agreement between Thai and Cambodian governments about maize production in Cambodia shows the better market opportunities for maize growers in Cambodia. The hybrid maize varieties are adopted only in some provinces which shared boundaries with Thailand and Vietnam while farmers in the provinces around Phnom Penh tend to grow local maize varieties. In this context, it is important to know the characteristics of maize based farming system, suitability of local and hybrid varieties in the system. The analysis of farming system is the first step to know the adoption of hybrid maize varieties that is crucial to the increase of the production and productivity of maize in the country.

The production of hybrid maize varieties is supposed to be a profitable enterprise in comparison to local varieties and this study will quantify the profitability of hybrid and the local maize varieties. It is important to know comparative profitability and factors affected the adoption of hybrid maize varieties for all the stakeholders from the policy level to farmer's level concerning the production and marketing of maize to promote maize production to reduce the rural poverty.

1.3 Literature review

Sovann (1998) reported that in Cambodia maize production is still low although the crop is playing an important role in the human food commodity, especially white maize. This year, our country is able to produce an average yield of about 1.37 tons per ha. Therefore, to increase maize production the following strategies are recommended; i) expanding the land cultivation, ii) improvement in the technology of planting, iii) expand research and extension programs in the whole country, iv) establish seed production and distribution program, v) encourage investments, vi) have policies on marketing, processing and production practices, and vii) expanding cooperation with international organization, non-government organizations, International Maize and Wheat Improvement Center (CIMMYT) and others. Hopefully and if possible, introduction of high yielding varieties and pushes the farmers to use proper recommendations of fertilizer and appropriate cultural practices that are beneficial to high maize yields and fill deficit in the total maize requirement for Cambodia. He also noted that there were two most important environmental stresses to growing corn in Cambodia namely; water supply and soil characteristics. About 85% of the corn areas in Cambodia are in rainfed lowlands and consequently, the crop is subject to drought or water excesses that occur during critical growth stages of the crop thereby affecting grain production. Corn planted on podzolic soil characterized by an acid reaction and low organic matter is under similar stress.

Vong (1997) reported that majority of the open pollinated maize seeds grown by farmers were from seeds which they have selected from the previous maize crop. This practices of saving seeds to plant the next crop is common in almost 80% of the maize farmers. Several decades ago, seed production activities were carried out by the government in cooperation with others such as semi-government organizations, private seed growers and farmers' cooperatives. But now such activities are no longer done due to the lack of money to implement the program. A maize research station at Banteay Dek is assigned the main responsibility of varietal improvement in maize including the production of breeders or stock seeds. This station has 54ha of land and located just 20 km from the capital. Although equipped through a grant from the cooperation from Hungary years ago, their research station has been unable to carry out its available in the station. Flooding and theft were the major reasons for low seed output. Therefore, the support facilities to produce maize seeds have been totally neglected. To increase maize production from its present level, it is recommended that maize cultivation should be expanded. The research and extension support from government should be increased to be able to produce and distribute bigger volume of quality maize seeds. Marketing channels for maize grain and seed should be encouraged to develop and if possible subsidy to small scale farmers should be given. Expanded cooperation with non-government organizations and international organizations should be expanded to help solve many problems in the agriculture sector of the country.

Sarun and Tith (1996) noted that irrigation, though not a problem during the wet season can be very important to cropping systems during the dry season especially with the uncertainties associated with a monsoon climate. Higher levels of crop management and use of greater inputs can be justified by farmers only when there is some guarantee of available water. Under such a situation the opportunity can be opened to a great potential for increasing crop intensity as other crops added to a single crop to make a better use of available water. The overall growing season lengthened by irrigation water supply.

A study of the adoption of improved maize varieties in the hills of Nepal has been indicated that 17% yield advantage of improved open-pollinated varieties, in averaged overall village development committees, showed that significant increases in production and productivity could be achieved through the use of improved varieties. But information was more constraining in remote districts than in accessible districts. In these areas, seed constrained adoption. This would suggest that in inaccessible areas, a program of more intensive on-farm demonstrations and testing would be immediately justifiable. On the other hand, actions in accessible districts should focus on improving the availability of improved seed. Community-based seed production programs should be supported until commercial seed enterprises develop to fill the current void (Ransom et all., 2003).

Another study dealing with the adoption of maize seed and fertilizer technologies in Embu District, Kenya shows that many attributes are taken into consideration in varietal selection. In addition, farmers also mentioned that they used recycled seed because of the high price of improved maize varieties and because they find that there is little difference between yields in improved and recycled seed. A greater focus on farmer participatory breeding would help incorporate farmers' assessments of maize varieties in the research process. Further studies on the economics of seed recycling would help in greater understanding of farmers' use of recycled seed. The packaging of maize seed in small and more affordable packages such as the 2-kg bags would also help increase the adoption of certified maize (Ouma et al., 2002).

Logit model has been widely used in different adoption studies (for example, Yahanse et al. 1990; Polson and Spencer 1991, Weingsang 1996). These models not only help to assess various factors that affect adoption of given new hybrid maize varieties, but also provide predicted probabilities of adoption. For example, they can be used to indicate how the likelihood of a farmer adopting a particular technology changes according to his or her level of education, keeping all other factors constant.

Arellances and David (2001) applied logistic regression model as a analysis tool to study the determinants of adoption of sustainable agriculture technologies. The results indicated that plots with irrigation, plots farmed by their owners and plots with steeper slopes were more likely candidates for minimum tillage adoption. Farmer household characteristics were not generally found to represent significant influences on adoption. Importantly, household income did not appear to be a determinant of adoption, suggesting that minimum tillage was an appropriate low-input technology for resource-poor households. The results also indicated that previous use of leguminous cover crops, soil amendments (including chemical fertilizers), and commercial vegetable production are all associated with minimum tillage adoption.

Tshering (2002) employed enterprise budgeting as a tool to study profitability analysis of bean production in Honduras. The results show that among the sample of farmers included in the record keeping surveys, farmers growing modern varieties had higher average yields and earned higher profits or suffered less loss than the farmers growing traditional varieties. However, the difference in yield for the traditional and modern farmers was statistically not significant at 5% significance lever for three out of five of the data sets. The sensitivity analyses on enterprise gross margin showed that for traditional farmers, gross margins were more sensitive to yield and price changes than for modern farmers.

1.4 Objectives of study

This study aims to investigate the factors affection the adoption of local and hybrid maize varieties, so the objectives of this study are as follows.

1. To characterize maize–based farming system, farmers' use of maize, problems and potential of maize production

2. To compare cost and benefit from growing local and hybrid maize varieties.

3. To analyze the adoption of hybrid and local maize varieties.

1.5 Usefulness of study

This study will examine the adoption of hybrid maize varieties in selected localities. It will be helpful for all working in the filed of agriculture development from policy level to the farmer's level. This study will be helpful for the extension workers to understand the maize based farming systems, their characteristics, related problems and potential of maize production that are fundamental information of extension workers. Furthermore, this study will provide information to the farmers about comparative profitability and factors affected the adoption of hybrid and local maize varieties under their own condition. This will help the farmers to grow more profitable varieties. This study will characterize maize–based farming system, farmers' use of the maize, problems and potential of maize production which is the first step to understand poor adoption of hybrid maize varieties which is beneficial for the policy makers, planners and researchers.

At the planning level, it will help planners as it documents existing constraints of hybrid maize production and help them to plan the interventions based on these problems and potential of maize production.

The extension policy and program design based on the characteristics of farming system, farmer's problems constraints and opportunities are pivotal to achieve the momentum in the slow adoption process of hybrid maize varieties. It will be more helpful for the adaptive research on maize for the researchers and private organizations. At the policy level, this study will be useful to promote the existing network of maize production and marketing to increase the production of maize and income of farm families. It will help to know the existing network and related problems for the increased production and marketing of hybrid maize. For the researchers, this study will be helpful to design the adaptive research for the development of suitable maize varieties for the farmers' condition.