

## CHAPTER 1

### INTRODUCTION

The Lao People's Democratic Republic (Laos) lies between 14° 10' and 22° 10' N, and 100° 20' to 107° 50' E. It is a landlocked country with an area of 236,800 square kilometers, and is inhabited by about 5.2 million people. About three quarters of the country is mountainous and forests cover about 40 % of the area. The country is divided into three agro-ecological regions as Northern, Central and Southern regions (Figure 1). The agriculture and forestry sectors have always been regarded as the key sectors of the economy, the subsistence agriculture accounts for 53 % of GDP and provides 80 % of total employment (MAF 2000).

The total area in agriculture production land in Laos is about 1,048,000 ha (Lao Agriculture Census, 1998/99), in which about 963,000 ha of total crops cultivated area in 2000. Cereal crops account for about 787,800 ha, the majority of which is under rice cultivation. Cash crops account for about 70,000 ha, of which maize and soybean account for 49,000 ha and 6,400 ha, respectively. Vegetables and bean crops account for a further 104,700 ha. Total production of maize and soybean in the 1998-1999, production year was approximately 117,000 and 5,400 tons, respectively. Yields for these two crops were 2.25 tons ha<sup>-1</sup> for maize and 0.82 tons ha<sup>-1</sup> for soybean, are among the lowest in Southeast Asia (MAF, 2000).

Oudomxay province is located in the Northern agricultural region (Figure 1). The total area of the province is 15,370 km<sup>2</sup>, of which approximately 38,460 ha is under cultivation (Table 1). The most important crop in the province is rice, which accounts for about 29,430 ha, representing 76.5 % of the cultivated area. Of this, rainfed upland rice accounts for 19,400 ha, and rainfed lowland rice is 9,200 ha. Maize is the most important non-rice crop grown, accounting for 2,300 ha in 2000. Average land holding size in the province is 2.7 ha per household. This compares with the national average of about 1.3 ha per household.

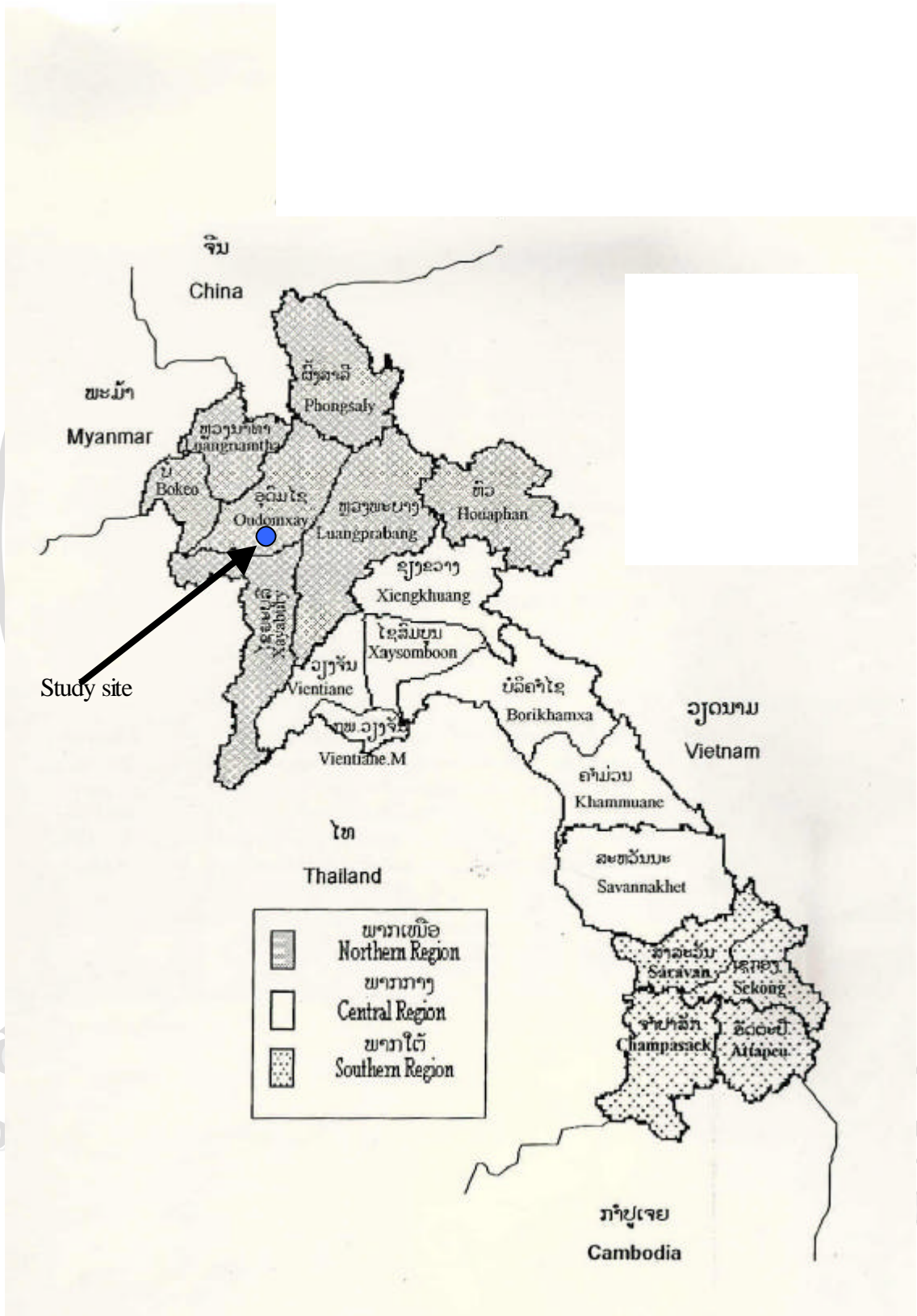


Figure 1. Agro-ecological map in the Lao PDR.

Table 1. Cultivated land use in Oudomxay province in the cropping year 2000.

Crop	Cultivated area (ha)	% total cultivated area
Rice: total	29,430	76.5
- rainfed upland	19,400	50.4
- rainfed lowland	9,200	23.9
- irrigated	830	2.2
Maize	2,300	6.0
Soybean	140	0.4
Vegetables	3,670	9.5
Other bean and cash crops	2,920	7.6
Total	38,460	100.0

Source: Ministry of Agriculture and Forestry (2000).

Weeds are one of the most serious constraints to increasing agriculture production in the humid and sub-humid tropics (Gamble, 1980). Akobundu (1980a) states that “in no other part of the world does uncontrolled weed growth cause as much reduction in crop yields and in no other environment do farmers spend as much time weeding as in the humid and sub-humid tropics. One key factor used to determine the effective time of weed control is the concept of critical time of weed removal” the critical period of weed control is the time during the lifecycle of a crop in which it must be kept weed-free to prevent yield loss.

It is estimated that weeding accounts for more than 40 % of time inputs for agricultural production in smallholder production systems in least developed countries (FAO, 1997). In most of these countries, manual weeding is undertaken by women and children and in most instances, the weeding undertaken does not prevent substantial crop losses as a result of weed competition. Weed management in most developing countries needs to be improved as a basis for increased and more efficient food production.

In Laos, weeds are the most important constraint to rainfed upland cropping, as well as for upland rice production. Farmers generally provide adequate weed control and weeds are thus not a yield constraint but rather a constraint to labor productivity. Weed control is by far the most labor-consuming task in upland rice production. Generally, 2-4 weeding times are required per season with the labor input of 100-180 days per hectare, (Lao-IRRI, 1991). Weeds are major constraints in upland rice, maize and soybean production in rainfed upland area in northern part of country, especially in Oudomxay province, Laos. Weeding is the work peak for the labor force, and higher than other activities. Generally, farmers had only hand weeding with simple tools, (spades, hoes, small draw-hoes and sickles used for last weeding at before the harvest). In duration of maize and soybean planting farmers normally do weed control about 1-2 times. The labor investment per unit area of upland rice was 263 labor-days per hectare, accounted for 32 %, and 103 labor-days per hectare, accounted for 38 % of total labor input to weed control activity for maize (Chen, 1997).

Intercropping is the most common practice among small farmers of the developing countries including Laos, especially in northern part of country, including Oudomxay province, Laos. Generally, cereals and legumes crops are often mixed in their cropping system, probably more for dietary reasons than for any beneficial effect that the nitrogen fixing ability of the legumes convey to the associated cereal crops.

Intercropping can provide substantial yield advantages over sole cropping. Intercropping may give greater stability of yields over different seasons and that is the primary reason for its prevalence in the farming practice. The major advantage for intercropping are reducing risk of crop failure is probably as important to farmers as both the nutritional value of their crops and potential economic return. And also in a farm production practices have the major important for intercrops are: (1) can make better use of resources. (2) reduced pests, diseases, or weeds incidence, and (3) improved nitrogen economy when a legume is present (Willey, 1979a). Intercropping two or more species typically improve the yield of the more competitive species while sole crops (West and Griffith, 1992). There interaction may lead to an overall yield advantage or to no advantage of the intercrop compared with sole crops. Component

crops in an intercropping system must be carefully chosen to minimize competition and enhance the efficient use of water, light, and nutrients.

Maize and soybean play an important role in cropping systems i.e. economic, nutrient and ecological sound component of farming system. Maize and soybean have long been growing in many parts of country, especially in Oudomxay province, Laos. The farmers in this region have been adopting both monoculture and mixed cropping systems. Farmers in this regions, normally practice on continuous cropping, and intensively to land use on their farmland these resulted in degradation soil nutrients, loss in crop yields, as results to low crop yield, low household income of sustainable agriculture and have also weed problems, to difficultly for weed control.

Farmers, in this region had only known for weed control on their farms, but did not understand about techniques and critical timing of weed control. They were considered to weed control, when weeds growth on their crop-farmland and taken weeds out in during crop growths and/or crop development. Thereby, research program was designed to identify critical time of weed control in maize and soybean intercropping systems are necessities both to maintain to high yield of crop and minimized labor cost in term of cropping system. The primary goal is to help growers' crop diversify and their weed management program to reduce labors cost and minimize yield loss. The study comprises the following objectives:

1. To investigate and analyze farmers' practices in order to identify problem related to weed control and other managements for maize and soybean intercropping production systems in Oudomxay province, Lao PDR
2. To identify the critical timing for weed control in the rainfed area of maize and soybean intercropping production systems
3. To evaluate economics of labor use of weed management in maize, and soybean intercropping production systems