CHAPTER 1

Introduction

Longan (*Dimocarpus longen* Lour) is a major cash crop of Chiang Mai Province. In term of cultivated area, longan is second only to rice (Department of Agricultural Extension, 2009). In 2009, the total area for growing longan in Chiang Mai was 318,760 rai out of 1,044,359 rai[1] or 30.52% of the total longan area in Thailand. Of this area, totally 309,985 rai is able to produce 178,861 tons of fruit, or about 29.87% of the total longan production in Thailand (Office of Agricultural Economics, 2009).

In the past, the techniques used for longan production in Chiang Mai were highly unstable due to the adopted extensive production method and the weak marketing strategies. The price of longan fruits was affected by government policy. Although the government was trying its best to assist the growers, there remained ongoing problems. Most significantly, funding and other financial support relied mainly on very basic information on the production in each area. At present, the government assistance policy is more specific and the output statistics is estimated by the responsible offices. However in the past ten years, there have been many difficulties overcoming problems in longan production as longan output has fluctuated from year to year as the result of not only the alternate-year fruiting nature also the response to prices both in domestic and export markets. Therefore, it was not economically worthwhile for longan farmers in some areas to improve their productivity in light of these unstable situations. Every year the amount of harvested longan depended on several factors, especially farmer's management of land in the face of different environmental conditions. In the northernmost areas of longan cultivation, there are quite a few differences in the methods of production depending on climate, fertility and humidity of soil, and availability of water. The management of the longan trees such as pruning,

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[1] 1 rai = 0.16 ha

pollination, and watering, as well as the choice of species, tree spacing and the age of trees affect the yield of flowers and fruits. All of these factors have an influence causing the inconsistent longan outputs. The Thai Ministry of Agriculture and Cooperatives so far has tried to forecast longan yields for each year by sampling and surveying the planted areas, but the human officers were far successful from making the accurate estimates. Moreover, too many man-hours were required in surveying the lands. Therefore, a more accurate way of estimating the yield and output should be developed in order to help reduce the volatility in longan market.

There are two main government agencies that are responsible for overseeing information related to longan production each year, namely; the Department of Agriculture and the Office of Agricultural Economics with the Department of Agricultural Extension. The Department of Agriculture will mainly estimate product yields for technical and research purposes and programs. The Office of Agricultural Economics will use this information to support longan marketing program according to government policy in each year.

The Department of Agriculture estimates longan output in each year by sampling the longan trees and surveying the sampled orchards at three output stages: first at fruit initiation, then at time of 0.5 cm. fruit size, and last at one month before harvest. Each year, eighty longan orchards are sampled. The DOA workers will select 10% of longan trees in each orchard and then collect the production information of the sampled trees by making a grid of one square meter in area under the canopy of the trees. Then they fix the signs in each cluster in the grid before counting the number of fruits. Then, they record the information on the average number of fruits per tree per farm. Four DOA officials were used for such tasks per tree. In one day, they generally are able to conduct the survey in four orchards which is an overly costly operation of time and money.

The Office of Agricultural Economics gathers the information on overall longan production. Point to each longan season, it organizes a conference to plan longan surveys that will be done by the related parties such as the Office of Provincial Agriculture, the Office of Agricultural Extension, the growers, merchants and the representatives of local on Tambon Administration Organizations (TAO). This is to devise a way to forecast the situations expected to occur during the in question year and

set rules on the collection of information from questionnaires and observations by the experienced government officers. The longan growers are required to answer a questionnaire from which the results are then used by the government to manage the expected harvested output in that year.

After that, during the harvest season, the agricultural officers/workers from the Office of Agricultural Economics go to estimate the quantity of output by selecting some of the sampled longan trees and dividing each tree into eight sections and randomly counting the fruits in each section of each tree. Then, they are able to estimate the total output in each area, and use the data to proximate the total quantity of longan supply to market. The resulted figures are consequently used at a conference among those who are concerned with longan production and trade to make a commonly agrees conclusion before submission to the policy making authority.

At the end of the season, all the numbers are published and form the basic statistics on agriculture of the whole country.

Additionally, there are other government agencies that use different methods to help the responsible ones estimate crop production over a large area like the Land Development Department. They use remote sensing method and information to record the fruit production and the average yield per rai of longan trees in each period in each area. They then estimate the total output expected to come out in each year. This method can be used for many other crops such as rice, rubber and durian.

As described earlier, the primary government agencies that are responsible for longan yield and output estimates use questionnaires to survey information from growers and take samples from the trees as their main methods. However, counting fruits on the trees is a method that is far too time and labor intensive. In addition, the larger the tree, the greater the problems. Therefore, this research aims to develop a method to count fruits by sampling the trees within a shorter time. Other goals are to reduce the difficulties working in the orchards and lower the number of people for collecting data while still achieving better results. This research also aims to come up with an information technology to accurately estimate the production in advance by using data from questionnaires with farmers and specialists in longan management throughout the year, and process the information systemically. This tool shall reduce the

number of necessary data collecting workers and help them get quick and accurate information. Consequently, the obtained results shall be information for planning longan production most suitably. For these above-mentioned reasons, this research has the main objectives as follows;

1. To classify longan plantation areas for developing spatial longan production system and estimate longan yield in the target area.
2. To understand the relationship among biological, physical and management factors in affecting longan yield.
3. To develop a model for estimating longan yield using Beyesian Belief Network: BBN method.

The longan yield forecast using the Beyesian Belief Network (BBN) from this research is expected to be used with important cash crops such as longan at the district and provincial levels respectively. The results of the accurate estimates will be beneficial for developing a strategy to protect and solve problems that stem from several risk factors. Moreover, this tool aims to assist in specifying a fair trade rate between the farmers and the merchants. The farmers will have the opportunity to estimate their own product yields in advance and the merchants will be able to realize the increase in production. In other words, the Beyesian Belief Network (BBN) from this research will be a collection of important factors which are related to longan production management and are able to improve the efficiency of the longan orchards practice. The users can try to improve the process of production in steps or try to adjust the levels of other factors. They can then check their results for the possibility of increasing the quantity and quality of the harvest. The BBN is and analytical model that can be applied to monitor agricultural situations and other natural resources management.

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