CHAPTER 1

INTRODUCTION

This study develops time series models for quarterly production of tea per hectare, a measure of yield obtained as the ratio of total quarterly production to average hectareage in production of all tea producing estates in Peninsular Malaysia. These models will be used to generate quarterly forecast yields. A producer can then obtain forecasts of quarterly production of tea by multiplying the yield forecasts with the average hectareage in production in his estate.

1.1 Rationale For Study

Although, tea is not a major industrial crop or revenue earner for the nation, the tea industry is important in Malaysia, as it is able to meet some part of the growing domestic demand. Malaysia can be considered as a tea drinking nation and drinking tea has become part of the Malaysian culture. "Teh Tarik" stalls have become a regular haunt among the young and old. There has also been a noticeable increase in beverage consumption among the younger population with the setting up of cafes and food outlets, which offer a wide variety of tea beverages. Hence, the tea industry has an important role to play in supplying at least part of the expected increase in the consumption of tea.

An active tea industry in Malaysia would make Malaysia less dependent on foreign supply to meet our domestic demand, thereby reducing the import bill and loss in foreign exchange. Malaysia also exports a small volume of tea due to its high quality. Thus, efforts should be directed towards increasing the output so that tea can emerge as an important revenue earner for the nation. Furthermore, an active local tea industry would also provide enhanced employment opportunities.

However, a number of studies (Teng, 1966; Cheaw, 1976; Deanna, 1982 and Tsuruoka, 1993) have predicted that either the production of tea will decline or the local tea industry will not remain competitive. The above studies also show that tea plantations are facing increasing production costs and labour shortages. Nevertheless, over the years, tea statistics show that in spite of a gradual decrease in hectareage, increasing production costs and labour shortages, there has been an increase in tea production and yield per hectare. This suggests that the tea industry in Malaysia is able to increase production to meet part of the increasing demand in domestic consumption. The tea industry is thus likely to continue to be an important industrial crop.

Forecasting is an important aspect in the production of agricultural food products such as tea, coffee and cocoa. These commodities enter the market in the processed or semi-processed form from the raw seeds or leaves harvested from the plantations. The production and yield of tea is very much subject to fluctuations by uncontrollable external events such as climatic and environmental change as well as from controllable internal

factors such as tea varieties, manuring (application of fertilisers in terms of method, frequency and quality), pruning cycles, methods of plucking, control of pests and diseases as well as the method of processing in the factories. These create uncertainty in the production or yield and this makes decision making and planning for the future a difficult task.

However, this does not mean that the future must remain totally obscure. This is because events occurring at one time are often related to other events occurring at other times. The forecaster's goal is to find a useful way to express a time-structured relationship. By so doing, the forecaster can shed light on these interrelated occurrences; while at the same time acknowledging that some element of uncertainty will inevitably remain.

Identifying the pattern and a structure in the time series of production and developing forecasting models to generate forecasts can help to manage uncertainty. Forecast can be used as an input to decision making in the management of production, labour and other factors of production in a more prepared environment.

Forecasted yields or production are an integral part of the decision-making activities of the management such as scheduling, acquiring resources and determining resource requirements for production. Some of the areas in which production forecasting plays an important role are described below:

i. Production Planning: Producers can schedule their production by efficient use of resources and acquisition of resources needed in production since there is a lead time in the acquiring process.

Therefore, efficient use of resources can lower the production costs. The forecast values can assist the decision-maker or producer to decide on their ability to supply or meet the demand for tea. This is important so as to avoid any disruptions in supply to existing distributors and also any failure to meet the demand leads to foregone profits, as well as goodwill losses.

ii. Marketing: If the forecast production indicates foreseeable increase in production, then strategies have to be planned to find new markets, increase sales and market share so as to absorb this increase in production rather than holding in the stock.

iii. Labour recruitment: Currently, tea plantations are facing acute labour shortage due to an exodus of local workers to urban areas (Turuoka, 1993; Deanna, 1981; Tunku Mahmud, 1984). This has led to a brisk demand for migrant workers from neighbouring countries. There is lead-time in recruiting them. The forecast production values can help to estimate the number of workers required in the short or long term. Therefore, prompt action in terms of recruitment and rescheduling work plans ahead of time is possible so that production is not affected by this problem. As for existing workers, rescheduling of their work plans can also be made based on quarterly production forecasts, which can bring about efficient use of human resources.

iv. Import Forecasts: At the national level, the quarterly forecast yield provides information on the ability of all the estates in Peninsular Malaysia to supply tea for domestic demand. Based on expected demand, tea importers can then plan the quantity to be imported.

1.2 Forecasting

In forecasting events that will occur in the future, a forecaster must rely on information concerning events that have occurred in the past. That is, in order to prepare a forecast, the forecaster analyses the data in order to identify a pattern that can be used to describe it. Then this pattern is extrapolated by various forecasting techniques into the future based on the assumption that the pattern that has been identified will continue in the future. There are several methods of forecasting a time series. One that has received most attention from statisticians may be described as auto-projective. It seeks to predict future behaviour from an examination of the previous history of the series itself. According to Kendall (1971), auto-projective methods can themselves be divided into distinct classes.

The traditional method of predictive decomposition seeks to split the series into the sum of components, trend, seasonality, cycle and residuals, and to project each component separately for re-assembly into the final forecast.

More improved methods particularly those known as exponentially smoothing, purports to achieve the same objective by a simultaneous updating of the aimed components. This method is known as Holt-Winters method, in honour of the pioneering work of C. C. Holt and P. R. Winter.

Another popular class of methods is the one advocated by Box and Jenkins (1970) which revert to the concept of a linear auto-regressive series with constant coefficients. But, it differs from the standard method of analysing stationary series in two ways: the error term itself is not a random residual but a moving average of random series; and the items entering into

the auto-regression are not often the original series but differences of the series. In this way Box-Jenkins hope to secure a representation which will allow for autocorrelation in the residuals and also takes into account oscillatory effects. A linear representation of past values of the d^{th} differences of the original series and random residuals, which are independent, is obtained and then used to obtain a final forecast.

An understanding of the regular patterns or components and factors causing them is crucial in the modelling process. Some forecasting techniques require some evidence of the presence of regular patterns in the time series so that appropriate forecasting techniques can be applied to give reliable forecasts. In some modelling techniques the significant factors that cause fluctuations are used as explanatory variable for the predicting variable. Time series forecasting models merely provide forecasts based on the presence of regular patterns but do not explain which factors cause the fluctuations or regular patterns. Therefore, knowledge and understanding of the factors causing the fluctuations that shape the regular patterns or components in the yield series will make the forecast yields more meaningful to the decision-maker. Furthermore, time series forecasting makes an assumption that the regular patterns that shape the series will continue in the future. Thus, knowing the factors that are linked to these fluctuations and regular patterns can provide the decision maker with valuable information so that adjustments can be made to the forecasts or forecasting techniques if a drastic change is expected to the factors in the near future or at the point of forecasting.

Some forecasting techniques require the time series to have constant variance or stationarity in variance. This study will address the need for transformation if the yield series shows non-stationarity in variance as this can improve the forecasting performance. For this purpose, the Box-Cox Power Transformation and the procedure suggested by Victor (1993) for selecting the best or optimal variance-stabilising parameter of the Box-Cox Power Transformation will be considered.

1.3 Specific Objectives Of The Study

The specific objectives of the study are:

(1) To examine the trends in tea production in Peninsular Malaysia,

(2) To identify the probable factors that underlie the observed variations in the yield series,

(3) To determine the basic patterns using classical decomposition method and the need for transformation,

(4) To develop forecasts for quarterly tea production per hectare in Peninsular Malaysia using exponential smoothing and ARIMA models and

(5) To compare the forecasting ability of the models and to recommend the forecast model of choice.

1.4 Format Of Research Paper

This study is organised into six chapters. This chapter includes the rationale of the study, which highlights the importance of the tea industry in Malaysia and the role of forecasting in the tea industry. It also highlights some forecasting issues. In addition, the chapter presents the objectives of the study.

Chapter 2 describes the research methodology, including the forecasting methodology and model selection. The study design in this chapter outlines the steps that need to be carried out to achieve the objectives of the study. The relevant conceptual framework is also provided in the study design.

Chapter 3 examines the origin and varieties of tea, trends in tea production in Peninsular Malaysia, the data of the study and review of literature on factors affecting the tea yield series generally, followed by factors affecting tea in Peninsular Malaysia.

Chapter 4 presents an analysis of the patterns in the data or yield series. The decomposition method is used to determine the regular patterns. It also transforms the data to achieve stationarity in variance.

Chapter 5 describes the derivation of forecasting models, assessment of fit and presents the forecasts of different forecasting models.

Chapter 6 concludes the study by summarising the findings and limitations, followed by a discussion on the further scope of this study.