

Research Title            Forecasting of Rainfall by Means of Meteorological  
                                 Elements in the Area of Amphoe Muang Chiang Mai

Author                    Poonsak Sirisom

M.S.                      Applied Statistics

Examining Committee :

|                                |          |
|--------------------------------|----------|
| Assoc. Prof. Rachanee Tiyaphan | Chairman |
| Lecturer Nopadol Legsawat      | Member   |
| Lecturer Putipong Bookkamana   | Member   |

#### ABSTRACT

The purpose of this study is to establish the best equation for forecasting of the rainfall per month in the area of Amphur Muang Chiangmai by selecting the means of meteorological element which effect to the quantity of rainfall. Those elements are collected from the climatology division office , Department of meteorological from Chiangmai Weather office in the period of 144 months since 2522 to 2533.

From the data about the meteorological element including the means of the rainfall are being analyzed as time series. When we calculate by correlation coefficient. This causes the multicollinearity problem the approximately correlation in the equation for forecasting the multiple regression is lack of the reliability so we abstract the effect of the season by ratio to moving average 4,6 and 12. The abstracted meteorological element are compared in order to select the appropriate data by analyzing the including all possible regression. The result is that abstracted meteorological element by ratio to moving average 4 is the most appropriate model and the best equation in multiple regression should be calculated by the meteorological element, monthly mean temperature, monthly mean relative humidity, monthly mean dew point temperature and monthly mean total cloudiness with equation of multiple regression. Since the monthly rainfall are changing seasonally so we set the seasonal dummy variable and bring this dummy variable in the equation of the multiple regression again in order to establish the equation for forecasting the quantity of the seasonal rainfall in Thailand.

We also study the abstract meteorological element in order to research the relationship of the meteorological element which effect to the quantity of the rainfall by path analysis. From the frame of path hypothesis that we study from the geographical research, we divide our study to the analysis of the direct influence and indirect influence. We can

summarize our finding as follow. The effect of meteorological element on the quantity of the rainfall from high to low are monthly mean dew point temperature , monthly mean relative humidity , monthly mean temperature and monthly mean total cloudiness. The direct influence of the meteorological element on the rainfall from high to low are monthly mean dew point temperature , monthly mean relative humidity , monthly mean temperature and monthly mean total cloudiness. For the indirect influence of the meteorological element on the rainfall from high to low are monthly mean relative humidity , monthly mean temperature , monthly mean total cloudiness and monthly mean dew point temperature. After that, we will compare the correlation coefficient from our study with the correlation coefficient calculated from the hypothetical form of the influence on the quantity of the rainfall. We found that the information from the real circumstance are concordance with the geographical theory.

In order to forecast the monthly rainfall, we bring the monthly mean temperature , monthly mean relative humidity , monthly mean total cloudiness and monthly mean dew point temperature which is not abstract the season variable to set up the forecasting by Box and Jengins methods. We set up the method in analyzing autoregressive integated moving average model which are  $ARIMA(0,1,2)(0,1,1)_{12}$  ,  $ARIMA(0,1,1)(0,1,1)_{12}$  ,  $ARIMA(0,1,1)(0,1,1)_{12}$  and  $ARIMA(0,1,1)(0,1,1)_{12}$  consecutively and then check the residual autocorrelation. The result is that 4 autoregressive integated

moving average models are differences from 0 significantly which we can summarize that those 4 models are appropriate. Then we forecast the meteorological element from these 4 autoregressive integrated moving average models.

From the best equation of multiple regression, we found that the forecasting are concordance with geographical theory and background of Chiangmai in case of the change of the rainfall in each season. When we substitute the meteorological element which we got from forecasting in autoregressive integrated moving average model. We can forecast the approximate quantity of the rainfall in Chiangmai in the future too.