MINIMUM AND MAXIMUM TEMPERATURE EVALUATING BY LINEAR REGRESSION ANALYSIS

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ABSTRACT

Climate prediction is a need of the day and is to be a beneficial issue for local government to rescue their people lives and properties. In this study, it was aimed to be predicted the maximum and minimum air temperature for Loilem by using the variables of temperature and monthly period. Collecting temperature data in five years is used to analyze linear regression model. To be performed the result, the model is a good fit to predict the maximum and minimum temperature based on monthly data. To be performed in the result, it is a good fit model to predict the maximum and minimum temperature based on monthly data.

KEYWORDS: ***Minimum Temperature, Maximum Temperature, Linear Regression Analysis, Monthly data***

1. INTRODUCTION

Besides that agricultural sector has critical prominence for world population, it has an idiosyncratic structure as an area influencing the economic, social, political, technological, and personal risks at a high level. Meteorological data are applied to use in many agricultural areas such as computing the cooling desires of vegetables, planning irrigation, planning the land and air transport, predicting harvest season, arranging fertilization time [1-3]. For future predictions, various methods are used all around the world.

While the people are living, they require the amounts and adequacies of meteorological data such as wind, temperature and humidity in these areas (e.g. agriculture, settling, tourism). Since the measurements of these parameters are kept to make in defined places, using measurements made in some selected places, these parameters are determined by means of experimental correlations [1]. The people, as well as animals, protect to suffer from especially temperature and humidity because of meteorological factors [4].

Myanmar is an agricultural country, while agriculture is totally dependent on the temperature of the growing season. So, prediction of temperatures in the climate change conditions are very important. For developing good relation in forecasting of temperature, a modelling approach is needed [5]. Linear regression is one of the most commonly used methods for determining trends in climate data[2].

In this study, a new approach was used to be the best-fitted model by determining linear regression model with R^2. The dependent variables are mean minimum and mean maximum temperature and the independent variable is monthly period. In this analysis, there are two predicted linear regression models according to the results. These equations are useful tools for agriculture and engineering fields and are to predict climate changes in specified area.

2. DATA AND METHODOLOGY

Monthly data of temperature during 2005 to 2010 were collected from Meteorological Department. Mean minimum temperature (MminT), and mean maximum temperature (MmaxT) from 2005 to 2010 were used to find out the possible changes in temperature of each station. The SPSS software was used to compute the collected data of temperature for the specialized period.

SPSS is a statistical tool that utilizes the tasks of regression analysis (curve fitting) and statistical analysis [3]. The best fit option in the software supplies linear regression models which are classified according to the goodness of the fit. Linear regression requires a linear model where each term is either a constant or the product of a parameter and a predictor variable has a power or index of one [3]. This constrains the equation to just one basic form:

Response = constant + parameter * predictor

$$Y = b_0 + b_1X \quad (1)$$

In equation (1), Y is response/dependent variable, X is independent variable, b_0 is the model intercept, and b_1 is the regression coefficient. While analyzing the data, Y is replaced by annual values of MminT, and MmaxT as a dependent variable while X is the time in years is used as the independent variable.

3. RESULT AND DISCUSSION

The data was collected from 2005 to 2010 in the Meteorological Department. The specificed temperature data was described in Fig 1 to Fig 7. These figure show the mean minimum and maximum data in Loilem Township.

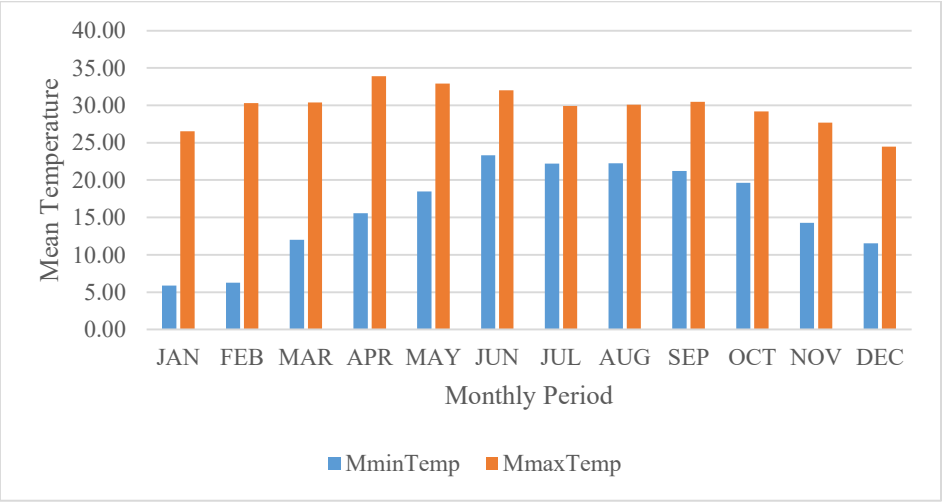

Figure 1. Mean Temperature in 2005 Year

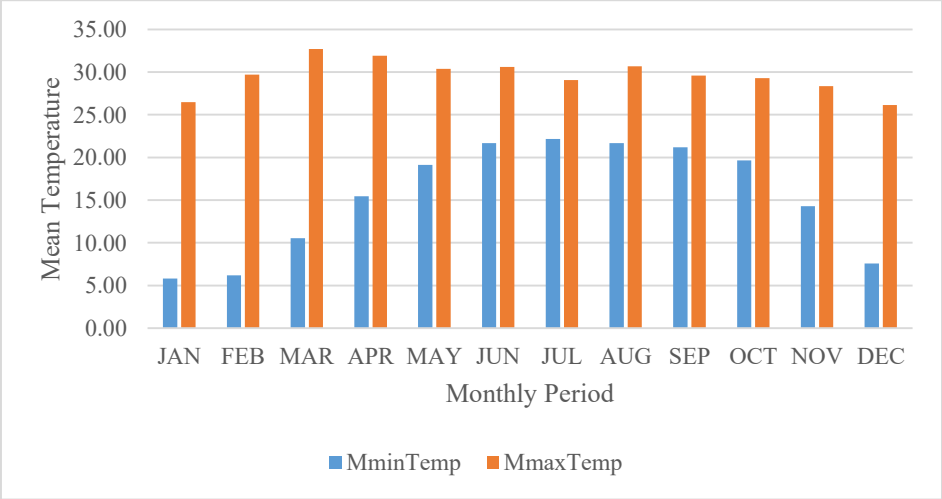

Figure 2. Mean Temperature in 2006 Year

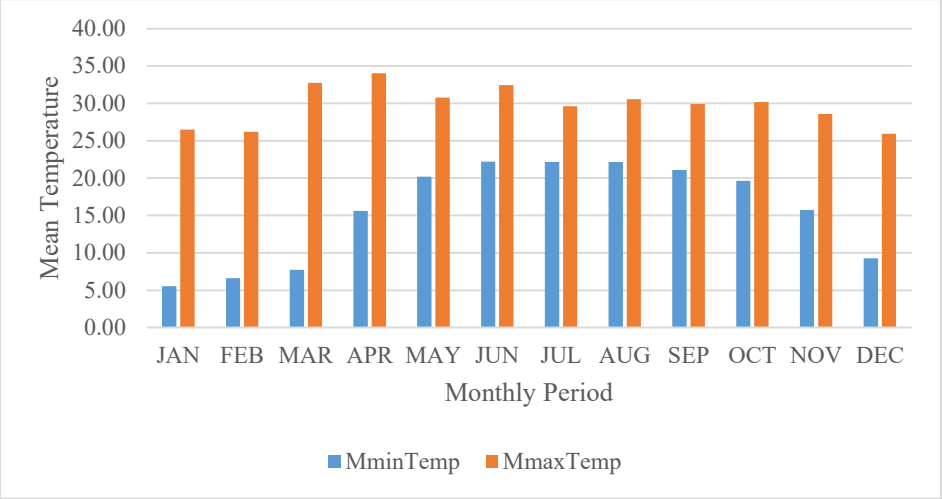

Figure 3. Mean Temperature in 2007 Year

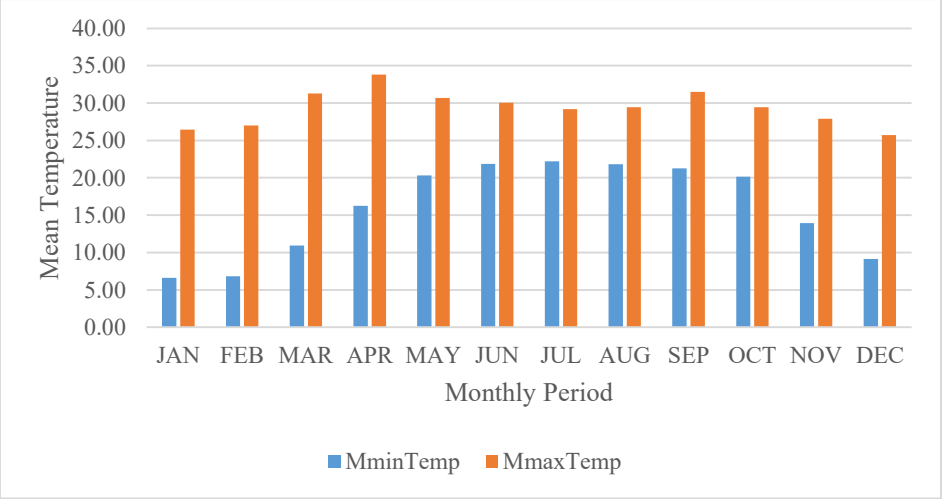

Figure 4. Mean Temperature in 2008 Year

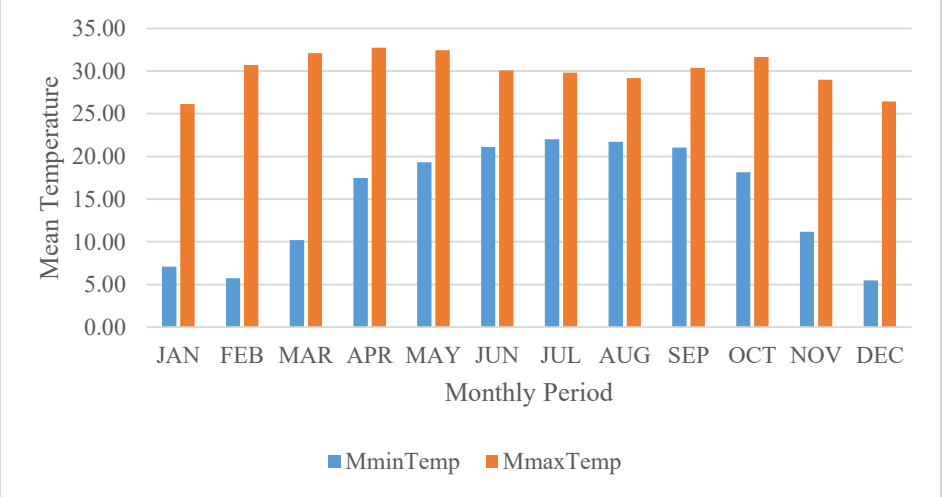

Figure 5. Mean Temperature in 2009 Year

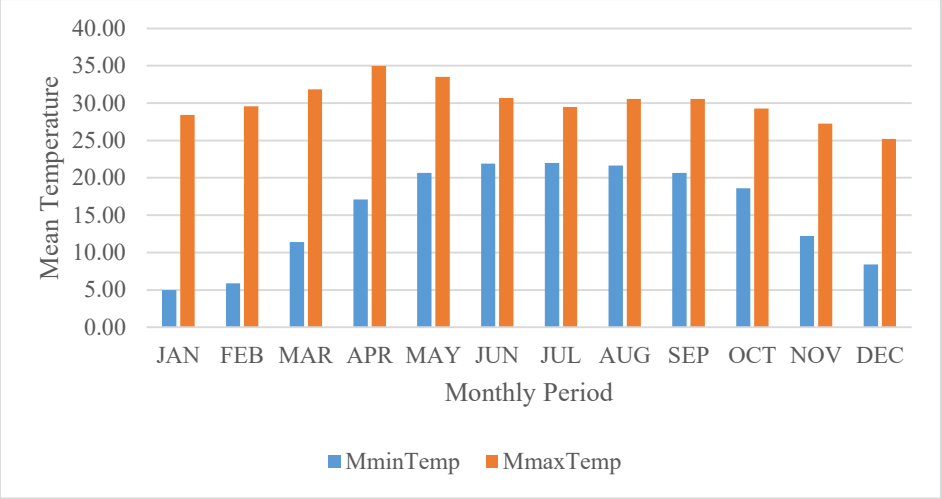

Figure 6. Mean Temperature in 2010 Year

The simple linear regression model is fitted to temperature data to know short-term changes at each location. The parameters calculated for linear equation are shown in Table 1 to Table 6. The independent variable is denoted as Mean Minimum Temperature for first predicted equation in Table 1 to Table 3. In Table 1, the R value represents the simple correlation of min minimum temperature of Loilem Township. Table 2 indicates the statistical significance of the regression model that was run. Here P<0.001, which is less than 0.01, and indicates that, overall the regression model significantly predicts the outcome variable.

The coefficient Table 3 provides that with the necessary information to predict mean minimum temperature of Loilem Township. According to the result, the mean minimum temperature equation is 11+.655 (Monthly period).

Table 1. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.368	.135	.123	5.80007

Table 2. Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	368.130	1	368.130	10.943	.001[b]
	Residual	2354.860	70	33.641		
	Total	2722.990	71			

Table 3. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.342	1.457		7.783	.000

	Monthly Period	.655	.198	.368	3.308	.001

In the second predicted equation, the Mean Maximum Temperature referred to as the independent variable described in Table 4 to Table 6.

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.290	.084	.071	2.24102

Table 5. Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
2	Regression	32.171	1	32.171	6.406	.014[b]
	Residual	351.551	70	5.022		
	Total	383.722	71			

Table 6. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	31.046	.563		55.136	.000
	Monthly Period	-.194	.077	-.290	-2.531	.014

According to the above tables, the models are good fit because the significant error is less than 5% corresponding to 95% confident line interval. In model 1, the monthly period is directly proportional to mean minimum temperature. In model 2, the monthly period is inversely proportional to mean maximum temperature. In these equations, the standard error is less than 2 to be a good fit model. These predicted equations are useful tools for agricultural and engineering fields nowadays.

4. CONCLUSION

From the results, it is concluded that minimum and maximum temperature in the study area is best explained by the linear regression analysis. The mean minimum and mean maximum temperature values were investigated by using linear regression analyses in SPSS Software. In this study, it was considered only for linear regression model. In the future work, the data will be evaluated by using nonlinear regression analysis. The proposed equations are suitable to use for agricultural fields to predict the temperature changes.

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