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Effects of Agro-Metrological Parameters on Production and Farm gate Prices of Principal Crops in Bishnupur District of the Valley Region of Manipur

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ABSTRACT: For the purpose of developing policy on the part of the government, studies on the impact of agro-meteorological parameters on area, production, yield, and prices are highly relevant. The purpose of this study is to concentrate on how agro-meteorological parameters affect agricultural production in the setting of Bishnupur District of Manipur. For a period of twenty years, secondary data on the state of Manipur's area, production, yield, agro-meteorological factors, etc. have been gathered. As a result, crop cultivation has been greatly impacted, which has hampered their growth and ability to produce. Therefore, the right time period should be provided for cultivating either a short-day or long-day crop in order to promote growth, development, and an increase in yield potential and using weather prediction to reduce crop productivity losses that will meet the demands of ensuring food security for a growing population. With the aid of SPSS software, multivariate linear regression models have been used as statistical tools. The main findings of the study show that when production is taken into account as a dependent variable in the Bishnupur District of the valley region of Manipur State, both the area and yield have a significant impact on production in the case of kharif maize, kharif oilseed, kharif paddy, kharif pulses, total maize, total oilseed, total paddy, and total pulses. In the case of kharif maize and kharif paddy, it is found that the temperature, humidity, and production have a substantial impact on farm gate price when farmgate is regarded as the dependent variable. The result reveals that with the consideration of dependent variable i.e. the area, yield, temperature, rainfall and humidity as it show significant on the production of various crops cultivated under Bishnupur district of Manipur.

Keywords: kharif maize, kharif oilseed, kharif paddy, kharif pulses, total maize, total oilseed, total paddy, total pulses, farmgate, regression analysis.

INTRODUCTION

About 80 per cent of the state population is engaged in agriculture and allied activities. Hence, agriculture plays an important role in the social and economic life of people in Manipur, and will continue to do so in the foreseeable future. The gross cropped area is 350,290 ha, which account for 15. 24 per cent of the total land areas. About 65. 93 per cent of the gross cropped area is under rice cultivation. The mean cropping intensity of the state is 145. 66 per cent. The total food grain production in Manipur during 2014–15 was 594. 28 thousand tonnes from an area of 292,950 ha. However, agriculture sector in Manipur is facing the consequences of climate change (Gommes 2006, Jones *et al.* 2003). Climate change is a reality and an increasing trend in temperature, precipitation and emission of greenhouse gases has been observed in Manipur. Trend analysis of weather variables in Imphal under National Innovations on Climate Resilient Agriculture (NICRA) revealed that the mean annual maximum temperature (1954–2014) has been increasing (0.1 degree C per decade). The mean annual minimum temperature has also increased significantly (0. 3 degree C per decade).Total annual precipitation is expected to increase throughout the state. As evident from the last 30 years' climate data analysis, precipitation rate in northern parts is expected to increase by ≥19 per cent. Climatic factors like rainfall and extreme temperature, which are beyond the tolerance capacity of a species, may lead to inevitable distribution changes. Evidences show that many plant species shift their geographical habitats to combat regional climatic variation (Cao Juan, 2021) (Chapagain *et al.,* 2009). Many species are unable to acclimatize to the pace of climatic variations. So, these changes may increase the extinction risk. Climate change alters water availability and the resulting water stress may affect crop productivity. Particularly, under rain-fed ecosystems, altered climatic conditions can expose crops to drought like situation. Timely availability of quality seed/planting material of recommended climate-ready crop varieties and irrigation water are two most important requirements

for CRA in hill (Moonena *et al.* 2002) (Feng, Zhaozhong 2019). Market-driven secondary agricultural activities are of prime importance for sustaining the livelihood of the farming community through additional income generation. Various options for secondary agricultural activities include mushroom production, bee-keeping and honey production, primary processing of horticultural crops, enriched vermin composting, etc. The present investigation was carried out with the following objectives: To find out the effects of area, yield and agro-meteorological parameters in determining the production. To find out the effects of area, production, yield and agro-meteorological parameters in determining farmgate price.

MATERIAL AND METHODOLOGY

A proper methodology is an inevitable and important component of a research study for getting successful research findings. To fulfill the objectives of the present study, a reasonably appropriate methodology has been adopted. In this chapter, the methodology adopted for the present study has been presented under the following heads.

1. Study area and period of study.
2. Sampling design.
3. Collection of data.
4. Analytical technique.

Selection of State. Manipur State of INDIA has been purposively selected.

Selection of Region. Valley region have been purposively selected.

Selection of Districts. Bishnupur district is selected.

Collection of data. Purely time series secondary data have been collected regarding area, production, farm prices and productivity of principal crops and agro-meteorological parameters of Manipur State for a period of last 20 years data (1998-2017).

Analytical Techniques. The study is based on Regression Analysis following Multiple Linear Regression Model.

Regression. The word regression is used to denote estimations of predictions of the averaged value of one variable of a specific of other variable. The estimations is done by means of suitable equations, derived on the basis of available bivariate data. Such an equation is known as a regression equations and its geometrical representation is called a regression curve.

In linear regressions (or simple regressions) the relationship between the variables is assumed to be linear. The estimations of y (say, y′) is obtained from an equations of the form

$$y' - y_{bar} = b_{yx}(x-x_{bar}) \quad (1)$$

and the estimations of x(say, x′) from another equation (usually different from the former of the form

$$x' - x_{bar} = b_{xy}(y-y_{bar}) \quad (2)$$

equations 1 is known as regressions equations of y on x, and equation 2 as regression equations of x on y. the coefficient b_{yx} appearing in the regression equations of y on x is known as regression coefficient of y on x. Similarly, b_{xy} is called the regression coefficient of x on y. the geometrical representations of linear regression equations 1 and 2 are known as regression line these line are best fitting straight line obtaining by the method of least square

Multiple Linear Regression Model. In order to find out the major agro-meteorological parameters affecting area, production and productivity of principal crops in the study area, a multiple linear regression model is used.

The general model of the Multiple Linear Regression is as follows –

General linear regression model for 'k' explanatory variables (*x*i's) and one dependent variable, y for sample is given by

$$y = b_o + \sum_{i=1}^{k} b_i x_i + e_i$$

where $b_0$is the intercept, b_1, b_2……,b_k are partial regression coefficients of the variablesx_1, x_2, ..., $x_k$respectively and $e_i$is the residual which is supposed to follow i.i.d. N(0, σ2). By ordinary least square method one can find the values of a, b_1, b_2…,b_k.

Significance of the model

The significance of the regression model was tested using F statistic. Here the null hypotheses was set as,

H_0: β = 0

Test statistic $$F = \frac{RSS/n-2}{ESS/n-k}$$

Where,

Regression sum of squares (RSS) = $= \Sigma(b_i)(\Sigma x_i y)$

Error sum of squares (ESS) = Σy^2 - SSR

RESULT AND DISCUSSION

Bishnupur

From Table 1 the main results of the study show that in Bishnupur district in the valley region of Manipur state, when production is considered as a dependent variable, it is observed that both area and yield have a significant impact on production in kharif maize (0.997), kharif oilseeds (0.986), kharif rice (0.964), kharif legumes (0.992), rabi legumes (0.996) total maize (0.994), total oilseeds (0.701), total paddy (0.997), total legumes (0.996), this result was in similar with the finding of Lekshmi *et al*. (2013); Smith *et al*. (2018), stated that the accounting for fluctuations in agro-meteorological parameter readings into agriculture, helped to get better yield and quality of produce as well as showed that estimates of likely future adaptations were an essential ingredient in impact and vulnerability assessments impacted system to adapt. Both area and temperature have a significant impact on production in the case of rabi legumes, while looking at the dependent variables on the farm, it is observed that both temperature and production have a significant impact on the farm-gate price for Kharif maize (0.756), and only humidity has a significant impact on the farm-gate -Price in the case of Kharif oilseeds (0.683), Rabi oilseeds (0.782), Kharif legumes (0.775), but the area has a significant impact on the producer price in Case of kharif rice (0.909) and temperature has a significant impact on the producer price in the case of legumes Rabi (0.568) as shown in table 3.2. Liming Ye *et al.* (2012); Zhou and Ismaeel

(2020) also stated that climate change was now affecting global agriculture and food production worldwide, whole rice and legumes and understanding the current relationship between agriculture and climate might help interpret how future climate change will affect local crops and also take necessary measures. Also in Table 2 both moisture and production have a significant impact on the farm price in the case of total corn acreage and temperature has a significant Influence on the operating price in the case of all oilseeds. Similar finding was observed by Lathika *et al.* (2005); Roy *et al*. (2018); Rosenzweig *et al.* (2012); Chattopadhyay *et al.* (2020) showed that overall climate is changing particularly in respect of temperature over the Indian region. Besides, climatic variability leading to extreme events like drought, flood, occurrence heavy rainfall etc results in decreasing the production yield of various crops throughout the country.

Table 1: Productions as Dependent Variable.

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
kharif maize.	.999[a]	.997	.996	.02316	.997	920.087	5	12	.000	2.385
Oilseed Kharif	.993[a]	.986	.980	.11109	.986	170.628	5	12	.000	2.796
Oilseed rabi.	.982[a]	.964	.949	3.29520	.964	64.395	5	12	.000	.666
Pre Kharif paddy	.990[a]	.981	.973	2.89063	.981	122.501	5	12	.000	1.799
Pulses Kharif.	.996[a]	.992	.989	.01776	.992	309.414	5	12	.000	1.754
Pulses rabi.	.998[a]	.996	.994	.13528	.996	569.804	5	12	.000	1.743
Total maize	.997[a]	.994	.991	.09731	.994	375.288	5	12	.000	1.821
Total oilseed.	.837[a]	.701	.576	.79327	.701	5.615	5	12	.007	1.025
Total paddy	.999[a]	.997	.996	1.28836	.997	954.762	5	12	.000	2.282
Total pulses.	.998[a]	.996	.994	.11103	.996	598.899	5	12	.000	1.347
a. Predictors: (Constant), yield, humidity, temp, area, rain										
b. Dependent Variable: production										

Table 2: Farm price as Dependent Variable.

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
kharif maize.	.869[a]	.756	.654	225.44915	.756	7.420	5	12	.002	1.774
Oilseed Kharif	.827[a]	.683	.551	520.93225	.683	5.179	5	12	.009	.909
Oilseed rabi.	.884[a]	.782	.683	414.87705	.782	7.902	5	11	.002	.726
Pre Kharif paddy	.953[a]	.909	.868	114.33411	.909	21.972	5	11	.000	2.742
Pulses Kharif.	.881[a]	.775	.673	979.23420	.775	7.596	5	11	.003	1.402
Pulses rabi.	.754[a]	.568	.372	1357.38889	.568	2.898	5	11	.066	1.263
Total maize	.949[a]	.901	.856	123.64200	.901	19.953	5	11	.000	1.517
Total oilseed.	.847[a]	.717	.588	473.14449	.717	5.567	5	11	.008	.874
Total paddy	.804[a]	.647	.486	232.71469	.647	4.025	5	11	.025	1.054
Total pulses.	.765[a]	.585	.396	1331.08999	.585	3.101	5	11	.055	1.272
a. Predictors: (Constant): humidity, production, rainfall, temp, area										
b. Dependent Variable: farmprice.										

CONCLUSIONS

This study gave us the chance to learn in-depth information about dependent variable and framgate prices of various results in respect to its production technique as well as its impact on production yield of several crops cultivated under Bishnupur district of Manipur. According to the aforementioned regression study, when production is taken into account as the dependent variable, the area, yield, temperature, rainfall, and humidity have a substantial impact on output. However, the agro-meteorological elements, such as temperature, rainfall, humidity, etc., only sometimes have a substantial impact on productivity. According to the aforementioned regression analysis, the area, production, yield, temperature, and humidity all significantly affect farm-gate price when it is taken into account as the dependent variable. However, sophisticated statistical research is advised for explaining the aforementioned effect. So that the production of several crop in respect to its yield can be cultivated according to the aforementioned data analysis that will adds the cropping timing at right period.

FUTURE SCOPE

The author want to conclude that the Agro-Metrological Parameters on Production and Farm gate prices of principal crops has a huge impact as the extension work can be done as well can give farmers an appropriate duration for cultivating and production of several crops under a particular region.

Hence to obtain more accurate and thorough results, more Manipur State districts may be included.

1. In order to have a national context for the research study, more states in India may be considered.
2. To obtain much more accurate information, the study term may be extended.
3. To obtain more specific information regarding the aforementioned research study, even more advanced statistical procedures may be applied.

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Conflict of Interest. None.

REFERENCES

Cao, Juan (2021). Wheat yield predictions at a county and field scale with deep learning, machine learning, and google earth engine. *European Journal of Agronomy, 123*: 126204.

Chapagain. B. K., Subedi, R. and Paudel, N. S. (2009). Exploring local knowledge of climate change: some reflections. *Journal of Forest and Livelihood, 1*: 108-112

Chattopadhyay, A., Hassanzadeh, P. and Pasha, S. (2020). Predicting clustered weather patterns: A test case for applications of convolutional neural networks to spatio-temporal climate data. *Scientific reports, 10*(1): 1-3.

Gommes, R., Das, H., Mariani, L., Challinor, A., Tychon, B., Balaghi, R., and Dawod, M. A. (2010). Agrometeorological forecasting.

Feng, Zhaozhong (2019). Economic losses due to ozone impacts on human health, forest productivity and crop yield across China. *Environment international, 131*: 104966.

Jones, R. J., Spoor, G., and Thomasson, A. J. (2003). Vulnerability of subsoils in Europe to compaction: a preliminary analysis. *Soil and Tillage Research*, *73*(1-2), 131-143.

Lathika, M., and Ajith Kumar, C. E. (2005). Growth trends in area, production and productivity of coconut in India. *Indian Journal of Agricultural Economics*, *60*(902-2016-67454).

Moonen, A. C., Ercoli, L., Mariotti, M., and Masoni, A. (2002). Climate change in Italy indicated by agrometeorological indices over 122 years. *Agricultural and Forestry Meteorology*, *111*(1), 13-27.

Rosenzweig, M. R., and Wolpin, K. I. (1993). Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: Investments in bullocks in India. *Journal of political economy*, *101*(2), 223-244.

Roy S. S., Ansari, M. A., Sharma, S. K., Sailo, B., Devi, C. B., Singh, I. M., Das, A., Chakraborty, D., Arunachalam, A., Prakash, N. and Ngachan, S. V. (2018). Climate resilient agriculture in Manipur. *Current Science*, *115*(7): 1342-50.

Smith, S. M., and Carlton, E. J. (2018). Climate change impacts on waterborne diseases: moving toward designing interventions. *Current environmental health reports*, *5*(2), 272-282.

Ye, L., Xiong, W., Li, Z., Yang, P., Wu, W., Yang, G. and Tang, H. (2013). Climate change impact on China food security in 2050. *Agronomy for Sustainable Development*, *33*(2), 363-374.

Zhou, Q., and Ismaeel, A. (2020). Seasonal Cropland Trends and their Nexus with Agrometeorological Parameters in the Indus River Plain. *Remote Sensing*, *13*(1), 41.

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