A Statistical Analysis on Production of Chili and Its' Prospect in Bangladesh

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ABSTRACT

Chili is one of the most significant marketable crops of Bangladesh. It is grown almost all over the country. There are more than 400 different varieties of Chili's found all over the world. It is also called as hot pepper, sweet pepper, bell pepper, etc. Both chili and capsicum belong to same family as well as same genus that is Capsicum. C. frutescent is used for their small and very pungent fruits in hot sauces and as spices. It contains large amounts of vitamin C, small amounts of carotene (Provitamin A), vitamin B, vitamin B_6, potassium, magnesium, and iron (USDA Nutrient Database). Bangladesh is one of the best producers, but there is no enough industry for preserving this fruit. So, all the production become indeed in consumption. The aim of the research is to know the cultural practices of chili in Bangladesh and how to make sweetened chili dishes that can play a vital role in our economy. This research considers the annual time series data for the period 2001-02 to 2010-11 and over seven divisions of Bangladesh. The data have been collected from various publications of BBS (Bangladesh Bureaus of Statistics) and BARC (Bangladesh Agriculture Research Council), the data of districts have been aggregated for seven divisions namely, Dhaka, Chittagong, Rajshahi, Khulna, Barisal, Sylhet, and Rangpur. Realizing the limitations of data availability, only nine variables are considered in the present research. Total production of Chili is taken as the dependent (endogenous) variable. The price of the Chili and seven divisions are considering as independent (exogenous) variables. The number of variables to be included in the model depends on the nature of the phenomenon under consideration and the purpose of the research.

Keyword: Chili, Production, Prospect, Bangladesh

INTRODUCTION

Bangladesh is one of the least developed countries in the world and facing numerous economic problems. The majority of its people depend on agriculture for earning their living. Agricultural development is still synonymous with the economic development of Bangladesh. All efforts will, therefore, be geared to provide the thrust necessary for boosting agricultural production. So the overall economic development depends on the proper development of our agricultural sector to great extent.

In Bangladesh, most households always keep a stack of fresh hot green chilies at hand and use them to flavor most curries and dry dishes. It is typically lightly fried with oil in the initial stages of preparation of the dish by using spices and chilies (Dasgupta and Reshmi, 2011).

A few years ago, Chili may have been domesticated in our country but not cultivated commercially. In our country we have seen that maximum house had one or two chili plants in their house yard naturally. Now it is cultivated commercially in our country. It is an important fruit in many parts of the world for its production as spices. Mainly two types of Chili are cultured in our country commercially.

- Rabi Chili
- Karif Chili

The present study attempts to do a statistical analysis of current Chili production and its prospect in Bangladesh by considering the various sources of variations. The present study attempts to do a statistical analysis of current chili production and its prospect in Bangladesh but considering the various sources of variations on the time series data for 23 districts of Bangladesh and over a period of 10 years (2001-02 to 2010-11). The study is considered for whole Bangladesh.

OBJECTIVES OF THE RESEARCH

Chili is an important cash crop, which has huge demand in the domestic market as well as over in the world. In the present research, we attempt to construct a market model for Chili in Bangladesh with supply model.

The specific objectives are-

- Considering the importance of the Chili, we want to know the cultural practices of our agriculturists who produce Chili.
- We want to study a market model of Chili in Bangladesh and to identify the best model that may exist for forecasting purpose.

METHODOLOGY

The first and the main step for the econometrician are to study if there is any relationship with the variables and to express this relationship in precise form. That is to specify the model, with which the fiscal incident explore empirically.

Regression analysis

Regression analysis is a branch of statistical theory that is widely used in almost all the scientific disciplines. In economics, it is the technique for measuring or estimating the relationship with economic variables that constitute the essence of economic theory and economic life. With the help of regression analysis, we are in a position to find out the average probable change in one variable given a certain amount of change in another (Gujrati, D.N; 1995).

Reason for using regression analysis

The regression analysis helps in three significant ways:

- It provides estimates of values of the dependent variables from values of independent variables. The device used to accomplish the estimation procedure is the regression line that describes the average relationship existing between x and y variables.
- The second goal of regression analysis is to obtain a measure of the error involved in using the Regression line as a basis for estimations. For this purpose, the standard error of the estimate is calculated. If the line fits the data closely, that is, if there is relatively little scatter of the observations around the regression line, a good estimate can be made

of the y variable. On the other hand, if there is a great deal of scatter of the observations around the fitted regression line, the line will not produce accurate estimates of the dependent variable?

- With the help of regression analysis, we can obtain the measure of the degree of association or correlation that exists between the two variables. The coefficient of determination calculated for this purpose measures the strength of the relationship that exists between the variables. It assesses the proportion of variance by the regression equation.

Hypothesis

A basic economic theory is that for many commodities as price rises; the corresponding quantity supplied rises; as price falls, the quantity supplied also falls. That is there is a direct relationship between the price of the commodity and the quantity supplied.

H_0:   There is no relationship between price and production
H_1:   There is a significant relationship between price and production

Coefficient of determination

The ratio of the unexplained variation to the total variation represents the proportion of variation in y that is not explained by regression on x. Subtraction of this from 1 gives the amount of variation in y that is explained by regression on x. The statistic used to express this proportion is called the coefficient of determination and is denoted by R^2. It may be written as follows:

R^2 =1- (variation in y remaining after regression on x)/total variation in y

R^2 =1- (error sum of squares)/total sum of squares

The value R^2 is the proportion of the variation in the dependent variable y explained by regression on the independent variable x.

Factors affecting the supply model

- The own price of the commodity: Quantity supply is influenced by the own price of the product under consideration. The quantity supplied, and prices are directly related. That is if the cost of a goods increase, quantity supplied increases and vice versa.
- The state of production technology: Any technological chance that decreases (increases) production costs will increase (decrease) the profits be able to earn at any given charge of the commodity under consideration. Since increased (decreased) profitability tends to lead to increased (decreased) production, this change will shift the curve to right (left). Indicating an increased (decreased) willingness or ability to produce the commodity and offer it for sale at each possible price.
- The cost of factors of production: A change in expenses of factors of production changes the Producers willingness to sell because it changes the cost of production and hence profit. A rise (fall) in the costs of factors of production sift supply curve of the commodity to the left (right), indicating that less (more) will be abounding at any given price.
- Price expectation: Expectations concerning the future price of a commodity can also affect the Producers current willingness to supply that product. Farmers might withhold some of their current chili harvests, from the current market or a higher guava price in future, which causes a shift in the supply curve to left.
- The number of buyers in the market: The larger the number of buyers in the market of the goods, the greater will be the market supply for that commodity.

RESULTS AND DISCUSSION

The considered supply model is

$$Y_{it} = \beta_1 + \beta_2 X_t + u_{it} \dots\dots\dots(1)$$

Where, Y_{it} = total production of **chili** for i-th administrative

division by the t-th year in Bangladesh

X_t = prices of **chili** in t-th year

u_{it} = disturbance terms

β_1 and β_2 are known as the regression coefficient. They also called as intercept and slope coefficients, respectively.

EQ.(1) can be written as follows:

$$Yit = \widehat{\beta}_1 + \widehat{\beta}_2 X_t + \widehat{u}_{it} \dots\dots\dots(2)$$

$$= \widehat{Y}_{it} + \widehat{u}_{it} \dots\dots\dots\dots(3)$$

Where $\widehat{Y}_{it}$ is the estimated value of Y_{it}

Now we can write from Eq. (3)

$$\widehat{u}_i = Y_{it} - \widehat{Y}_{It}$$

$$= Y_{it} - \widehat{\beta}_1 - \widehat{\beta}_2 X_t \dots\dots(4)$$

$$\sum \widehat{u}_i^2 = \sum (Y_{it} - \widehat{Y}_i)^2$$

$$= \sum (Yit - \widehat{\beta}_1 - \widehat{\beta}_2 X_t)^2 \dots\dots(5)$$

If $\sum \widehat{u}_i^2$ is as small as possible we know how to estimate the coefficient β_1 and β_2 as follows:

$$\sum Y_{it} = n\widehat{\beta}_1 + \widehat{\beta}_2 \sum X_t \dots\dots\dots(6)$$

$$\sum Y_{it} X_t = \widehat{\beta}_1 \sum X_t + \widehat{\beta}_2 \sum X_t^2 \dots\dots(7)$$

Solving the equations simultaneously, we obtain

$$\widehat{\beta}_2 = \frac{n\sum X_t Y_{it} - \sum X_t \sum Y_{it}}{n\sum X_t^2 - (\sum X_t)^2}$$

$$= \frac{\sum (X_t - \overline{X})(Y_{it} - \overline{Y})}{\sum (X_t - \overline{X})^2}$$

$$= \sum x_i y_i / \sum x_i^2 \dots\dots\dots(8)$$

Where, $\overline{X}$ and $\overline{Y}$ are the sample means of X and Y. We define $x_i = (Xt - \overline{X})$ and $y_i = (Y_{it} - \overline{Y})$.

And $\widehat{\beta}_1 = \frac{\sum X_i^2 \sum Y - \sum X_i Y}{n\sum X_i^2 - (\sum X_i)^2}$

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.892a	.795	.737	221.315
a. Predictors: (Constant), Karif, Rabi				

Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	56299.650	51943.869		1.084	.310
Price	81.998	23.106	.782	3.549	.008
a. Dependent Variable: Production					

Estimation of linear Regression model

Estimating the parameters by OLS, we get

Supply: $\hat{Y}_{it} = 56299.650 \; + \; 81.998 X_t$

$(.310) \qquad (.008) \; ; \quad R^2 = .795$

| Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	129.308	412.670		.313	.763
Rabi	.010	.004	.537	2.728	.029
Karif	.038	.015	.494	2.506	.041
a. Dependent Variable: Price					

Discussion

The coefficient of determination R^2 of the equation is 0.795, which indicates that 80% of the total variation Of the Dependent variable has been explained by the Independent variable. It can be said that the goodness of fit of the supply model is good on the average. A basic economic theory is that as price rises, the corresponding supply rises. Another economic hypothesis is that as production rises, the corresponding supply rises.

This result also suggests that, if the whole sale price increases thousand taka per ton then production/supply of Rabi chili and Karif chili will increase on the average by 537 and 494 metric ton respectively.

GRAPHICAL PRESENTATION OF DATA

**Production of Rabi chili in seven divisions**

It is apparent from the graph below that the production of Rabi chili in seven divisions is increasing year to year. For the Chittagong and Dhaka division, the production has sharply improved in the year 2004-05. Again for Khulna, Barisal, and Rajshahi divisions the production has harshly increased in the year 2003-04. And for the Sylhet and Rangpur divisions' production is rising gradually.
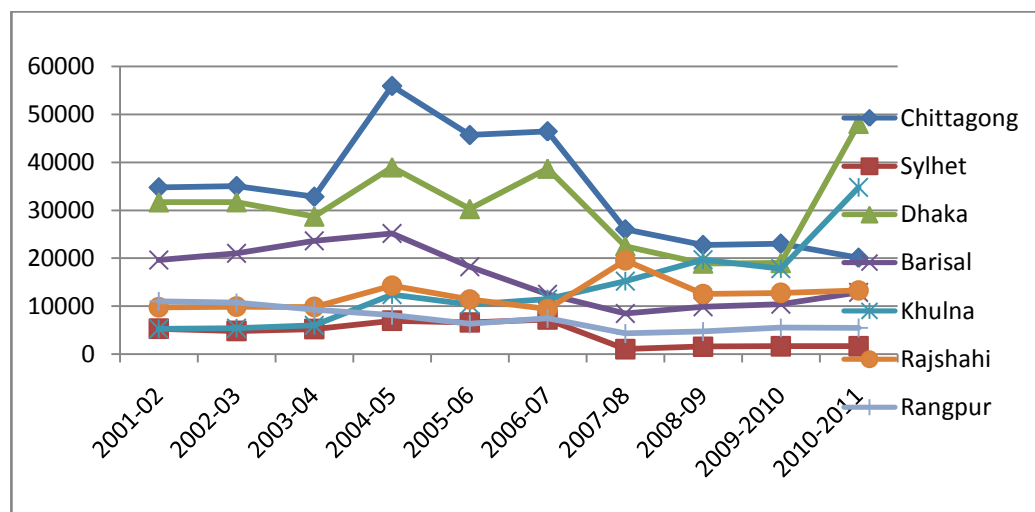
Production of Rabi Chili

Production of Karif chili in seven divisions

From the graph given below it is clear that the production of **Karif chili** in **seven** divisions is increasing year to year. For the Khulna division, the production has sharply augmented in the year 2010-11. Again for Dhaka, Barisal, and Rajshahi divisions the production has harshly increased in the year 2010-11. And for the Chittagong division production **Karif chili** is decreasing gradually.
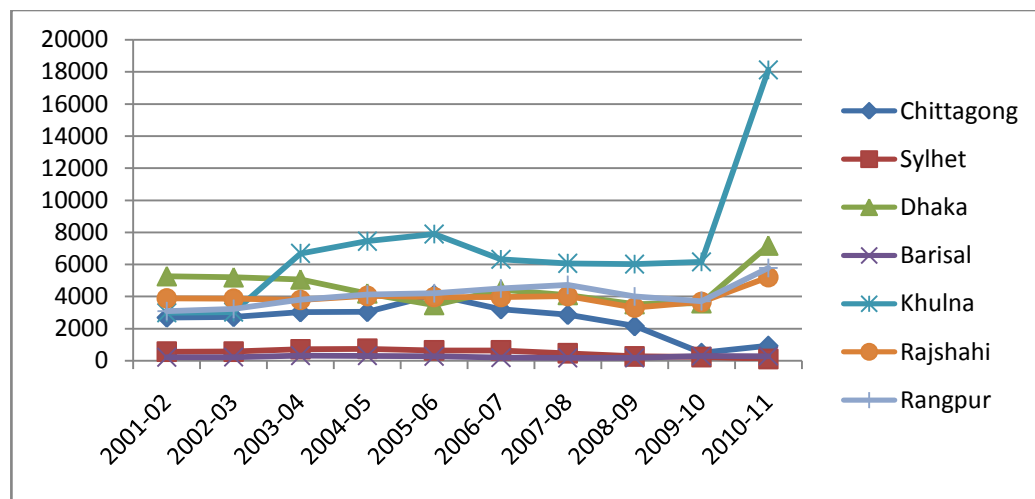
Production of Karif Chili

Overall Production of chili in Bangladesh

From the visual aid, we have seen that the production of **chili** in **Bangladesh** is increasing year to year. Moreover, the highest increase in the production of **chili** is in the year 2010-11, and the lowest was in the year 2008-09.
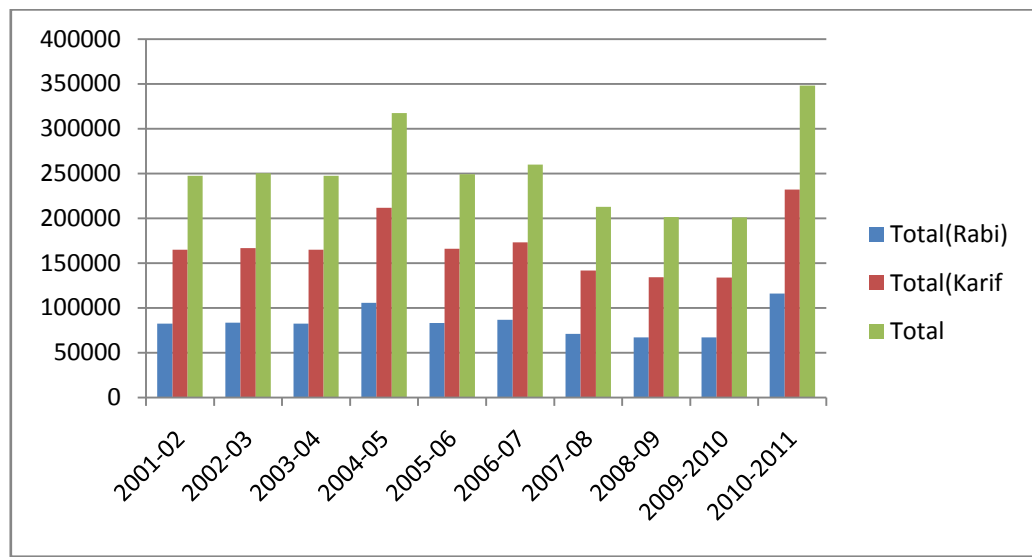
CONCLUSION

Finally, we have concluded that the production of chili in Bangladesh is increasing day by day. The soil and weather condition of our country is good for chili cultivation. From this analysis, it is clear that the quantity supplied is responsive to its price. Economic theory suggests that the coefficient of the price for supply equation is positive. That is, as expected price rises, the corresponding supply rises. This indicates that there is a direct relationship between expected price of chili and the quantity supplied.

REFERENCES

Araya, A., Girma, A., & Getachew, F. (2015). Exploring Impacts of Climate Change on Maize Yield in Two Contrasting Agro-Ecologies of Ethiopia. *Asian Journal Of Applied Science And Engineering, 4*(1), 26-36.

BBS 2007-11: "Statistical year book of Bangladesh", 20007-11.Bangladesh Bureaus of Statistics, Dhaka.

Chile, L., & Talukder, D. (2014). The Paradox of Agricultural Trade Liberalization in Bangladesh and Tanzania.*American Journal Of Trade And Policy, 1*(1), 23-31.

Chili Pepper History & Chili Pepper Glossar". www.thenibble.com. Retrieved 23 October 2013

Chowdhury, M., & Chowdhury, A. (2015). Problems and Prospects of Potato Cultivation in Bangladesh. *Asian Business Review, 5*(1), 28-32.

Dasgupta, Reshmi R (8 May 2011). "Indian chili displacing jalapenos in global cuisine – The Economic Times." *The Times of India*.

Devi, K., Vijayalakshmi, P., Kumar, B., & Talluri, V. (2014). Statistical Optimization of Kojic Acid Production through Response Surface Methodology by Aspergillus Flavus using Sago Starch Hydrolysate as a Carbon Source. *Asian Journal Of Applied Science And Engineering, 3*(5), 53-60.

Gujrati, D.N; 1995. Basic Econometrics, New York: Me Graw-Hill

Hajirostamlo, B., Mirsaeedghazi, N., Arefnia, M., Shariati, M., & Fard, E. (2015). The Role of Research and Development in Agriculture and Its Dependent Concepts in Agriculture. *Asian Journal Of Applied Science And Engineering, 4*(1), 78-80.

History of Chili, Chili Con Carne. whatscookingamerica.net. 2004. Retrieved January 6, 2008.

Hossain, A., Khan, J., & Miah, M. (2015). Distribution Process of Pesticides in Vegetable Production in the Southern Part of Bangladesh. *Asian Business Review, 4*(2), 20-24.

Hossen, S. (2015). Statistical Analysis of Current Guava Production and Its Prospect in Bangladesh. *Asian Business Review, 1*(1), 09-14.

http://www.economicperception.com/ourbusiness/

http://www.eujournal.org/index.php/esj/article/download/5292...

Ilahi, H., Saadaoui, I., Bryant, C., & Rejeb, H. (2014). Anthropized Agrarian Landscape in the Central-west of Tunisia: Attempts to Evaluate the Production's Systems of Apples-trees Orchards in the Delegation of Sbiba. *ABC Journal Of Advanced Research, 3*(1), 34-43.

Katsaruware, R., & Gwembire, J. (2014). Float Trays as an Alternative to Methyl Bromide in Tobacco Production in Hurungwe District, Zimbabwe. *Asian Journal Of Applied Science And Engineering, 3*(2), 119-128.

Khalequzzaman, K. (2015). Management of Anthracnose of Hyacinth Bean for Safe Fresh Food Production. *Asian Journal Of Applied Science And Engineering, 4*(2), 102-109.

Luo, C. (2015). Circular Economy and Urban Waste Resources Recycling. *American Journal Of Trade And Policy, 1*(3), 23-26.

Mekonen, M., Tesfaye, K., & Bayu, W. (2013). Soil Drainage and Nutrient Management to Improve Productivity of Waterlogged Vertisols for Small-scale Farmers. *Engineering International, 1*(2), 27-39.

Mwase, D. (2015). Performance of Floriculture Industry in East Africa: What Lessons can Tanzania Learn from Kenya?. *Asian Business Review, 5*(1), 20-27.

Seid, M. (2013). Community Perception and Indigenous Adaptive Response to Climate Variability at Tehuledere Woreda, South Wollo. *Engineering International, 1*(2), 18-26.

USDA Nutrient Database

APPENDIX

Table 1: Production of Karif Chili

Division	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Chittagong	2695	2730	3025	3040	4105	3210	2860	2156	486	930
Sylhet	555	570	710	740	640	640	460	269	228	106
Dhaka	5260	5190	5055	4185	3460	4415	4085	3516	3571	7169
Barisal	215	225	320	305	280	185	175	173	289	287
Khulna	2990	3025	6685	7445	7895	6320	6065	6016	6162	18117
Rajshahi	3885	3870	3780	4035	3965	3965	4020	3307	3656	5201
Rangpur	3085	3230	3810	4115	4205	4505	4730	3997	3712	5781
Total	18685	18840	23385	23865	24550	23240	22395	19434	18104	37591

- Production of Karif Chili in seven divisions
- Production in Metric ton

Table 2: Production of Rabi Chili

Division	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11
Chittagong	34765	35040	32820	55925	45690	46465	26014	22752	23029	20098
Sylhet	5285	4820	5205	6955	6580	7220	1017	1525	1616	1645
Dhaka	31645	31660	28670	38945	30245	38660	22476	18856	18965	48019
Barisal	19605	21005	23616	25150	18210	12430	8438	9852	10369	12844
Khulna	5265	5400	5985	12410	10365	11475	15205	19678	17819	34768
Rajshahi	9770	9900	9830	14280	11395	9420	19532	12537	12776	13295
Rangpur	10960	10660	9235	8105	6265	7425	4285	4703	5468	5446
Total	117295	118485	115361	161770	128750	133095	96967	89903	90042	136115

- Production of Rabi Chili in seven divisions
- Production in Metric ton

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