JOURNAL OF APPLIED QUANTITATIVE METHODS

OIL SEEDS AREA AND PRODUCTION VARIABILITY IN BANGLADESH

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ABSTRACT

Oil seed is one of the most important sources of vegetable oil. It plays a vital role in agricultural sectors of Bangladesh. However, the production of oilseed cannot meet up its annual demand of Bangladesh. The objective of this study was to measure the change and instability of oil seeds in Bangladesh in the context of area, production, and yields. Data were extracted from the statistical year books of Bangladesh Bureau of Statistics (BBS) and the study period was 1987 to 2010. Our analysis revealed that the production and yield of oil seeds were increased sharply though the cultivable areas were decreased. The growth rate in production and yield of oil seeds were satisfactory over the study period although they were not stable. Moreover, the results showed that it is not sufficient to fulfil the present demand of vegetable oil in Bangladesh. We recommend policy makers and stakeholders can give due attention to improve this sector for the betterment of the vegetable sector sustainable crop security in Bangladesh.

Keywords: *change and volatility; production; area; oilseed; growth rate*

INTRODUCTION

Agriculture is the single most important sector of the economy in Bangladesh. Bangladesh has suitable climate and soil conditions for the production of a variety of oilseed species all the year round. But since her independence to current date there is continuous decline in both acreage and total production of oilseeds except some exceptional years (Rahman, Chowdhury et al. 2009). A comparison between the acreage and production of oilseeds in 2005-06 compared to 2000-2001 shows that reduction in acreage was 18.59%, However, the production was got increased by more than 55% of the same of 2000-2001 (Rahman, Chowdhury et al. 2009). The oil production in Bangladesh is decreasing due to the

replacement of oil crop area by HYV Boro rice and high population pressure (Rahman, Akhtaruzzaman et al. 2001, Amin, Jahan et al. 2009). Less than 2.37% of the total cultivatable lands were used to cultivate oil seeds (Program 2011). The present annual production of oilseed is about 716 thousand metric tons (Bangladesh Bureau of Statistics 2011) this can't satisfy the present demand of consumption. Therefore the country met up it through import. Bangladesh imported 116833.767 metric tons of oilseeds in the fiscal year of 2010-11 which valued Tk. 4960126 (Bangladesh Bureau of Statistics 2011).

In recent year, the department of agricultural extension (DAE) and Ministry of Agriculture, Government of Bangladesh have considered pulses and oilseed as a high priority subsector and have taken a plan titled "Pulses and Oil crops Research and Development Vision: 2030" (Rahman, Chowdhury et al. 2009) to increase the oilseed and pulse production. To fulfill the increasing demand of the country, it is necessary to increase the production of this important cereal crop. The rate of increase in production and yield of oil seeds should be increased and kept stable. However, there is a lack of research to improve this sector and it requires support with effective approach for adoption of the technology along with appropriate market linkage for good price to the producers. Therefore this study aimed to assess the change and instability of oil seed relationship among area, production, and yield as well as the growth rate of oil seeds in Bangladesh.

MATERIALS AND METHODS

Data: We considered secondary data on area and production of oil seeds for a period of 24 years (from 1987 to 2010). Data were collected from different issues of the Statistical Yearbook of Bangladesh published by Bangladesh Bureau of Statistics (BBS) (Bangladesh Bureau of Statistics 2011). The study period was divided into two period's viz., first period from 1987 to 1998 and second period from 1999 to 2010 to compare in area, production and yield of oil seeds.

Statistical analysis: To examine the nature of change, instability and degree of relationship in area, production and yields of oil seeds, various descriptive statistical tools (mean, correlation coefficient, simple linear regression technique, semi log growth model and t-test) were used. These statistics were suggested by Hasan et al (Hasan, Miah et al. 2008) as a better measurement to measure the change and instability. The statistical data analysis was performed by using SPSS 17.0.

REGRESSION ANALYSIS

To estimate the parameter, simple linear regression models were fitted to examine the change of production by the change of area.
The model can be expressed as:

$$y = \alpha + \beta x + e$$

Where, $e \sim N(0, \sigma^2)$, y is the production (in ton), x is the area (in acre), α is the intercept and β is the regression coefficient of the model.

MEASUREMENT OF GROWTH RATE

The growth rates of area, production and yield of oil seed were worked out by fitting a semi-log function of the type: $\log y = \alpha + \beta t$, where, y is the area (in acre) or production (in ton) or yield (ton/acre) and t is the time period (in year).

MEASUREMENT OF INSTABILITY

An index of instability was computed for examining the nature and degree of volatility in area, production, and yield of oilseed and pulse in Bangladesh. The co-efficient of variation (CV) was worked out for area, production, and yield to measure of variability. However, simple CV does not explain properly the trend component inherent in the time series data. Alternatively, the Coefficient of variation around the trend (CV_t) rather than co-efficient of variation around the mean (CV) was suggested by Cuddy and Della[3] as a better measure of variability.

A linear trend $y = \alpha + \beta t + e$ was fitted to the indices of area, production and yield for the period 1987-2010 and trend co-efficient 'β' was tested for significance. Whenever the trend co-efficient was found significant, the index of instability was constructed as follows:

$$cv_t = (cv) \times \sqrt{1 - R^2}$$

Where, $cv = \frac{s}{\bar{x}} \times 100$, $\bar{x}$ and s are the mean and standard deviation of the sample period.

In words, co-efficient of variation (CV_t) around the mean was multiplied by the square root of the proportion of the variation, which was unexplained by the trend equation, $y = \alpha + \beta t + e$.

RESULTS

Change in area, production and yield

The amount of land area of oil seed has decreased in the second period while the production has increased significantly. But interestingly, though the cultivable area of oil seeds has reduced, the yield of oil seeds has increased significantly (Table 1). From the analysis, it is evident that there is a significant change in area, production and yield of oil seed in Bangladesh.

Table 1. Change in area, production and yield of oil seeds in Bangladesh

Field of Measurement	Mean Value		t-Value	P(T<t)
	1st Period (1987-98)	2nd Period (1999-2010)		two tail
Area (in acre)	1317667	916083[a]	5.05	0.000
Production (in ton)	440750	562500	-1.77	0.100
Yield (ton/acre)	0.3365	0.6577 [b]	-3.24	0.008

a and b represents significant at 1% and 5% level of significance

A frequently used technique for measuring the changing attitude of area and production of any crop is correlation. Table 2 shows that the area and production of oil seed is strongly correlated (r= 0.932) for the first period which is significant at 1% level. On the other hand, it is found that the relation between production and area of oil seed is negative for the whole period and second period. The negative value of correlation between production and area may be due to other quantitative and qualitative reason which is beyond this analysis.

Table 2. Relationship between area and production of oil seed in Bangladesh

Criteria	Value of Correlation (r)		P(T<t) two tail
Area Vs production	Whole Period	-0.361[b]	0.042
	1st Period	0.932[a]	0.000
	2nd Period	-0.526	0.079

a and b represents significant at 1% and 5% level of significance

The simple linear regression models were fitted for estimating the response of production of oil seeds due to the change of the respective area. From the regression analysis we found the average production of oil seed has increased 0.276 times for a unit change in area for the first period, but it is in decreasing rate for the second period and whole period by -0.661 and -0.227 times respectively (Table 3).

Table 3. Testing dependency of production on area of oil seed in Bangladesh

Period	Constant Value	Reg. Coefficient	t- Value	P(T<=t) two tail
Whole Period	755138.77	-0.227	-1.814	0.083
1st Period	76619.35	0.276	8.123[a]	0.000
2nd Period	1168000	-0.661	-1.955	0.079

a and b represents significant at 1% and 5% level of significance

GROWTH RATE OF AREA, PRODUCTION AND YIELD

The growth rate of area, production and yield provides a good measure of change in past and acceptable indication of change in future. The semi log model is used to measure the growth rate. From the analysis we found that the growth rates of areas of oil seeds for the whole period and second period is negative which is highly significant at 1% level. In spite of reduction of area, the growth rates of the production and yield of oil seeds are positive. It is also observed that the growth in yield of oil seeds has improved rapidly in second period (Table 4). Therefore it is clear that the yield of oil seed has increased though the cultivable area is reduced.

Table 4. Growth rate of area, production and yield of oil seed in Bangladesh

Field of Measurement	Sample period	Growth Rate (%)	P(T<=t)
	Whole Period	-2.5[a]	0.000
Area	1st Period	2.4	0.172
	2nd Period	-4.5[a]	0.000
	Whole Period	2.[3b]	0.003
Production	1st Period	3.0[b]	0.032
	2nd Period	6.1[b]	0.030
	Whole Period	4.9[a]	0.000
Yield	1st Period	0.60	0.291
	2nd Period	10.6[b]	0.003

a and b represents significant at 1% and 5% level of significance

INSTABILITY OF AREA, PRODUCTION AND YIELD

The agricultural production of Bangladesh is fluctuated by many factors like natural calamities: floods, droughts, cyclon etc. It is more or less common scenery of the country. Our analysis supports this hypothesis. The area and the production of oil seeds during the whole period and second period showed the highest degree of instability, which is significant at 1% level. The area of oil seeds during the second period also fluctuated significantly. The yield of oil seeds during whole period is also showed variation significantly at 1% level (Table 5). Therefore it is clear from the analysis that oil seed has showed instability during the study period.

Table 5. Instability in area, production and yield of oil seed in Bangladesh

Field of Measurement	Measurement Statistics	Whole Period (1987-2010)	1st Period (1987-1998)	2nd Period (1999-2010)
	CV	25	15.57	20
	R-square	0.429	0.157	0.739
	P(T<=t) two tail	0.000[a]	0.203	0.000[a]
Area	D-W	0.692	1.173	0.975
	CV around trend line	17.81	14.30	10.22
	CV	35	13.82	41
	R-square	0.273	0.432	0.254
	P(T<=t) two tail	0.009[b]	0.020[b]	2.192
Production	D-W	1.195	1.558	0.095
	CV around trend line	29.92	10.22	35.4
	CV	8.71	1.76	15.06
	R-square	0.468	0.098	0.414
	P(T<=t) two tail	0.000[a]	0.322	0.024b
Yield	D-W	1.563	0.867	2.074
	CV around trend line	6.35	1.67	11.52

a and b represents significant at 1% and 5% level of significance

DISCUSSION AND CONCLUSION

Our analysis shows that the overall production of oil seed in Bangladesh is satisfactory and the average production and yield of oil seed has increased from first period to second period though the average area has decreased over the study period. The yield has increased almost double from first period to second period where as the area reduced approximately 30%; which gives the evidence of increasing tendency of production and yield of oil seed. This may happen for the development of good quality of seed over time and/or modern cultivations system.. While testing the dependency of oilseed production on cultivatable land area a negative trend was observed for the whole period and the second period. It may be the caused by damage of crops by unfavourable weather (like, floods, droughts, storms etc.)

It can be concluded that the oil seed production in Bangladesh has bright future to mitigate the increasing demand. Through the production trend of oil seed in Bangladesh is satisfactory, it is not sufficient for the country's demand. Therefore, researchers, policy makers, and farmers should give proper attention to increase oil seed production.

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APPENDIX TABLE. Area, production and yield of oil seeds from 1987 to 2010

Year	Cultivable area (in acre)	Production (ton)	Yield (ton/acre)
1987	678000	253500	0.373893805
1988	1351000	448500	0.331976314
1989	1451000	434000	0.299104066
1990	1418000	438000	0.308885755
1991	1407000	448000	0.31840796
1992	1399000	462000	0.330235883
1993	1319000	449000	0.340409401
1994	1381000	471000	0.341057205
1995	1307000	453000	0.346595256
1996	1370000	471000	0.34379562
1997	1344000	478000	0.355654762
1998	1387000	483000	0.348233598
1999	1364000	449000	0.329178886
2000	1078000	406000	0.376623377
2001	1009000	385000	0.381565907
2002	955000	376000	0.393717277
2003	988000	368000	0.372469636
2004	960000	406000	0.422916667
2005	798000	1180000	1.478696742
2006	747000	595000	0.796519411
2007	742000	625000	0.842318059
2008	777000	642000	0.826254826
2009	773000	602000	0.778783959
2010	802000	716000	0.89276808

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