TREND, GROWTH AND INSTABILITY OF AREA, PRODUCTION AND PRODUCTIVITY ANALYSIS OF MUSTARD IN BHIND (MADHYA PRADESH)

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INTRODUCTION

The cultivation of brown sarson which once dominated the entire rapeseed-mustard growing region is now shadowed by Indian mustard. Among various oilseeds cultivated in MP, mustard is the second major oilseed crop, after soybean. Mustard covers nearly 5.5% of net sown area in the state. Morena, Sheopur, Gwalior districts in the state have been registering higher mustard yield rate in the last few years. On the contrary, production has been falling in the districts due to unfavourable weather conditions. Under National Mission on Oilseeds and Oil Palm (NMOOP), various initiatives have been taken up to increase oilseed production in the state, including mustard, to meet domestic as well as global demand. In the state, the district of Morena leads in mustard production, with a share of 27% to the state's total production, followed by Bhind (26%), Sheopur Kala (11%), Gwalior (7%), Mandsaur (6%) and other remaining districts (23%) (Production share calculation has been done for 10 years average i.e. 2005-2014-DES, MoA). India is a major producer of oilseeds, per capita oil consumption in India is only 10.6 kg/annum which is low as compared to 112.5 kg/annum in China, 20.8 kg/annum in Japan, 21.3 kg/annum in Brazil and 48.0 kg/annum in USA. The growth rate of 15 per cent per annum would be required in edible oil production in the country arrantly edible oil growth rate in India is only 4 per cent.

MATERIAL AND METHODS

Descriptive Statistics are used to present quantitative descriptions in a manageable form. In a research study we may have lots of measures. Or one may measure a large number of people on any measure. Descriptive statistics help us to simplify large amounts of data in a sensible way. Each descriptive statistic reduces lots of data into a simpler summary. Descriptive statistics can broadly be categorized into measures ofcentral tendency (CT), measures ofdispersion and measures of association ship. Among these, the arithmetic mean, the standard deviation/error, etc. are widely used to describe the given data for

their obvious merits over other hosts of measures.

Mean

Arithmetic mean or simple mean of a set of observation is their sum divided by the number of observation, *e.g*, the arithmetic mean x of n observation $x_1, x_2, x_3 \ldots\ldots, x_n$ is given by $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$.

In case of grouped data, $\bar{x} = \frac{1}{\sum_{i=1}^{n} f_i} \sum_{i=1}^{n} f_i x_i$ where x_i's are the mid values of the classes and f_i's are the respective frequencies. Among the three means viz. arithmetic mean (AM), geometric mean (GM) and harmonic mean (HM), AM is most widely used for its simplicity in calculation and explanation.

Simple growth rate

This has been calculated using the formula $\frac{X_t - X_0}{X_0 x\, n} x100$, where, X_t is the value of the series for the last period and X_0 is the value of the series for first period and n is the number of periods

Association of the factors of production with yield:

Agricultural production depends not only on climate related variables, but also on use of several factors like fertilizer consumption, irrigation, pesticide consumption and other resources. For the purpose of present study, the following functional model will be assessed:

Y= f (FC, IR, R, Tmx, Tmn)

where,

Y= Crop yield (per hectare)

F = Fertilizer consumption.

IR = Net irrigated area

R = Rainfall

Tmx = Mean maximum temperature

Tmn = Mean minimum temperature

Simple correlation and regression analysis as per the methods already described.

Standard deviation

It is more accurate and detailed estimate of dispersion because an outlier can greatly exaggerate the range. It is expressed by

$$\sigma = +\sqrt{\sum_{i=1}^{n} \frac{1}{n-1}(x_i - \bar{x})^2}$$

where x_i = value of the variable for the i^{th} observation

$\bar{x}$ = the mean or average

N = the number of values

RESULTS AND DISCUSSION

On a average Madhya Pradesh have produced 865'000 tonnes of mustard during the period from 813 million ha of land with average yield of 927 kg/ha. The production of mustard has reached to a maximum of 1275'000 tonnes from a minimum of 536'000 tonnes during the period under consideration. Thus a period of mustard has recorded to double fold increase during the period. A simple growth rate of 5.56% over the period 2005-2016 is recorded almost zero skewness and platykurtic nature of the production of mustard indicate there has been a continuous effort towards enhancing in production of mustard in the whole Madhya Pradesh. In the state, the district of Morena leads in mustard

production, with a share of 27% to the state's total production, followed by Bhind (26%), Sheopur Kala (11%), Gwalior (7%), Mandsaur (6%) and other remaining districts (23%) Production sharecalculation has been done for 10 years average i.e. 2005-2014-DES, (MoA).

Trend analysis of Mustard

Knowing the above overall performance, path of movement of the series was traced through parametric trends models. To workout the trends in area, production and yield different parametric model like polynomial, logarithmic, compound, growth, and exponential models as discussed in material and method section are attempted to. Among the competitive models the best model is selected on the basis of the maximum R^2 value, significance of the model and its coefficients. The following section presents (table 1) the results of these exercises. In most of the cases, non-linear patterns are revealed (Fig.1 and 2). Except for the productivity in Bihar and production of mustered in Bhind and Madhya Pradesh, in all the series cubic models fitted well. Production behaviour of Mustard, as visualized through area, production and yield follow mostly the cubic trend, there by indicating more than one point of inflections. From the Figure 1, anyone can see that in year 2005 year area has increased significantly good in Bhind. The effect of this increment visible in production and productivity in 2005 in Bhind. After that big fluctuation in area of mustard in 2006, so that production and productivity was decline in same year. After that continues fluctuation found in all area production and productivity after 2006 in Bhind, this may be farmer has chosen alternative year for this crop or rain fall, temperature other may cause of this fluctuation. Like Bhind, for whole Madhya Pradesh also big decline in area, production and productivity of mustard. After that production and productivity was stable up to 2013 and small fluctuation is clearly visible in 2014 figure 2.

Table 1: Trends in area, production and yield of mustard in Bhind and Madhya Pradesh.

States	Model	R^2	F	Significance	Constant	b_1	b_2	b_3
Bhind								
A	Cubic	0.520	242.945	0.000	190.52	0.037	-.917	1.528
P	Cubic	0.380	612.715	0.000	262.41	-0.477	7.732	-33.31
Y	Cubic	0.209	624.902	0.000	1332.3	-2.463	41.741	-158.5
Madhya Pradesh								
A	Exponential	0.274	451.707	0.000	680.78	0.015		
P	Cubic	0.626	504.706	0.000	730.04	0.59	4.60	13.01
Y	Cubic	0.704	467.634	0.000	926.79	1.01	14.47	72.35

Fig.1.1: Observed and expected trends of area, production and productive in Mustard in Bhind.

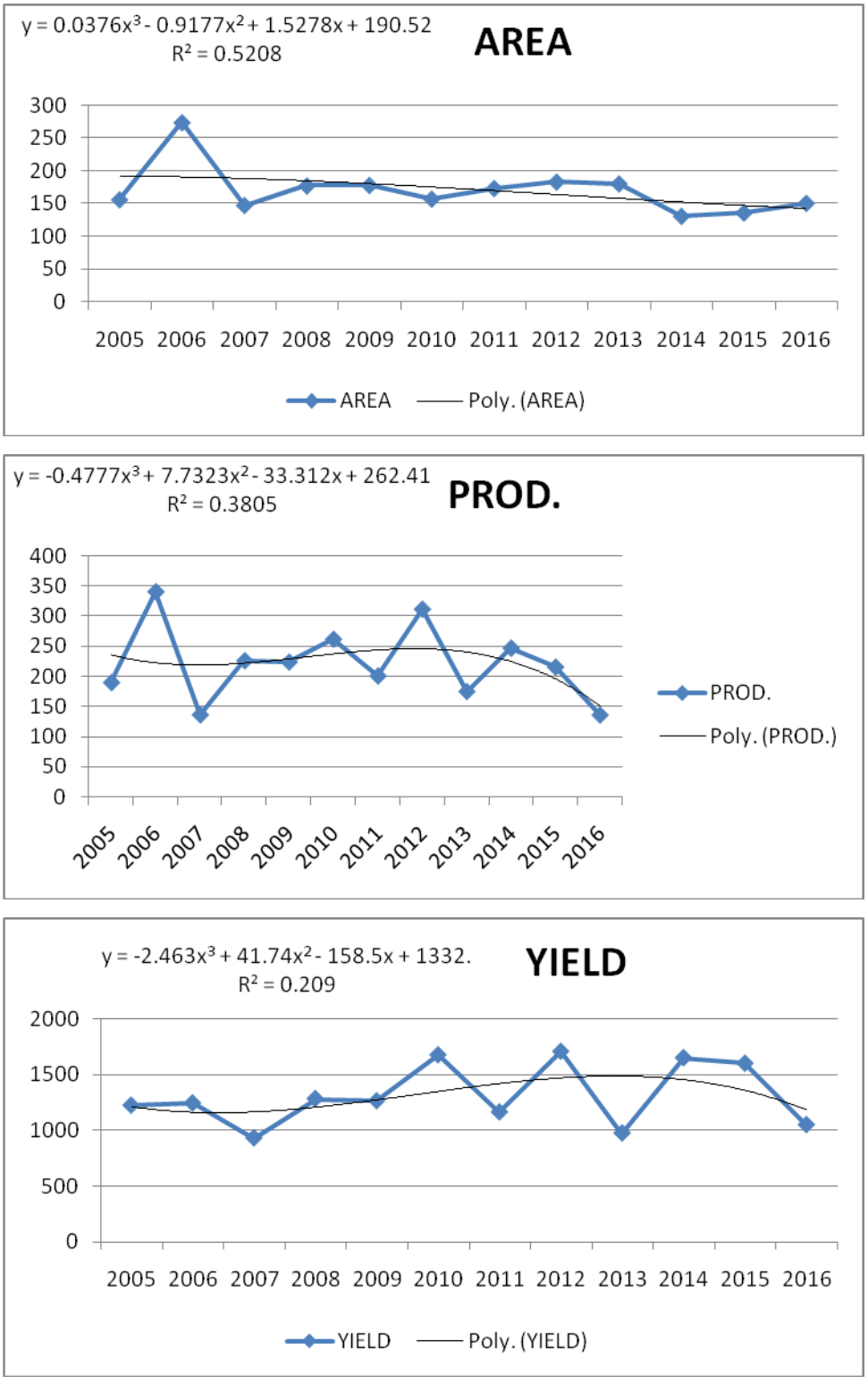
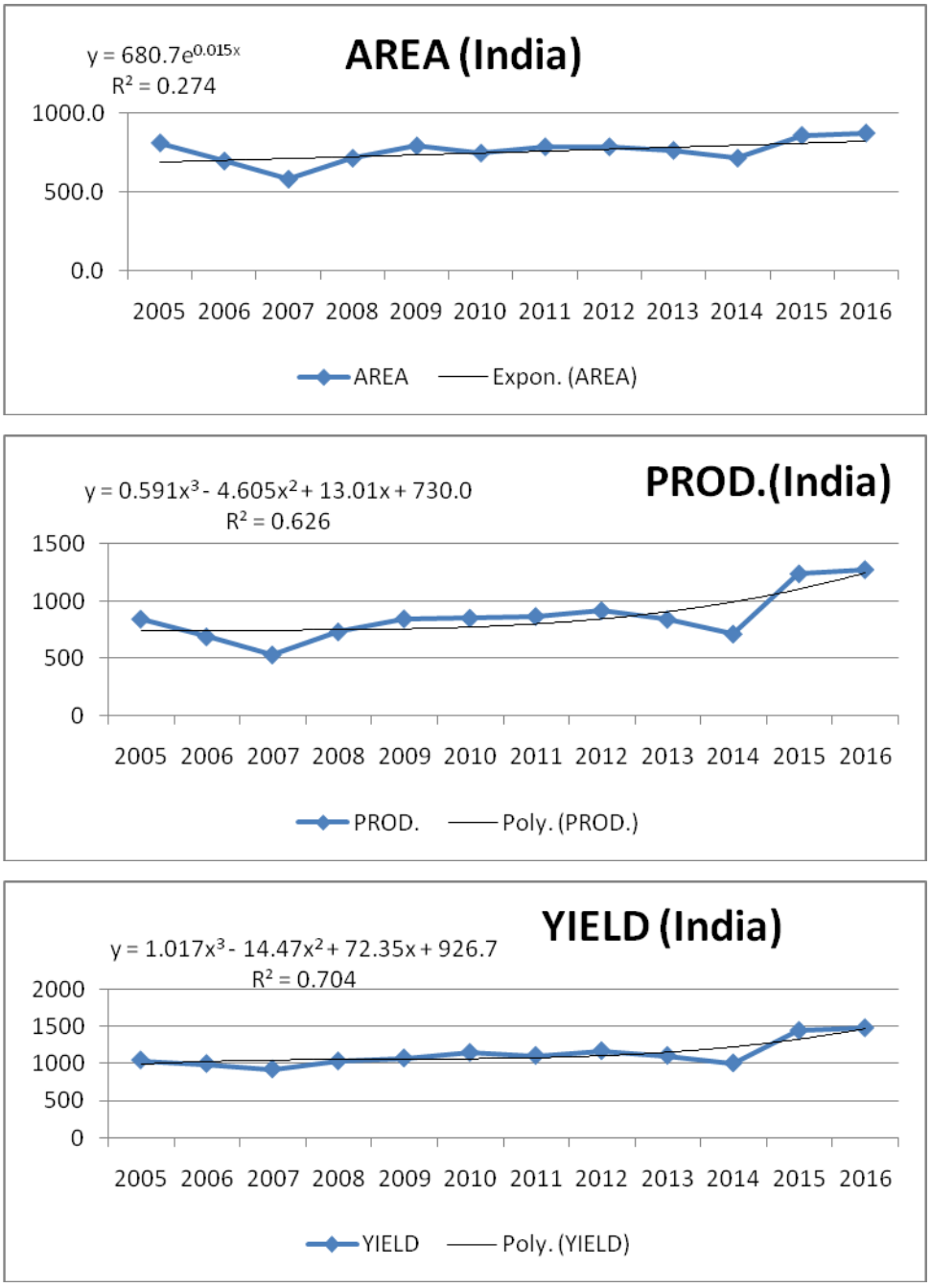


Fig.1.2: Observed and expected trends of area, production and productive in Mustard in Madhya Pradesh.



Rom the graphs of area, production and yield, it is clearly visible due to fluctuation of area and production growth rates are negative during this period for Bhind. But for Madhya Pradesh have increasing trend in production of mustard. In Madhya Pradesh production of mustard shows over all increasing trend with short term fluctuations has recorded increasing trend in productivity.

CONCLUSIONS

The Present study covered a period from the year 2005-06 to 2015-16. In the backdrop, the present study has been under taken to evaluate the trend in area, production and productivity of Mustard of Bhind and Madhya Pradesh. From the analysis of area, production, and yield of mustard in Bhind and Madhya Pradesh since 2005-06 to 2015-16. Their has been sustainable growth in area, production and yield of mustard during the period under investigation for whole Madhya Pradesh. Increased production of would not been possible without a substantial increasing per ha yield of the crop, but here decreasing area and production effect clearly visible in productivity. Starting with only 932 kg of Mustard per ha, it has reached to 1707 during the year 2016 there by registering simple result of -1.56%. The growths and growth rates are not uniform over the mustard in Bhind and its components.

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