Trend Analysis of Mungbean Area and Yield in Pakistan

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Abstract

The present study was planned to analyze mungbean area and yield trends in Pakistan. The findings are based time series data pertaining to the years 1984 to 2011.The quadratic trend model was applied on the basis of best accuracy measures. The results showed that if the present growth rates of area allocated to mungbean remain the same then the area of mungbean in Pakistan would predict to decline from 165,000t in 2012 to 116,000t in 2016. Similarly, yield analysis revealed that that if the present growth rates of mungbean yield remains the same then its yield would be increase from 703.75 kg/h in 2012 to 807.82 kg/h in 2016. Forecasted values show that there is an increasing trend in yield of mungbean in Pakistan, however predicted values of area under this crop show decreasing trend.

Keywords: Mungbean, area, yield, quadratic trend model, Pakistan

Introduction

Pulses; one of humanity's oldest food crops, originated in the fertile crescent of the near east (Webb and Hawtin 1981) Pulses are imperative part of food because it provides proteins and vitamins particularly to the vegetarian societies of almost all the

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developing countries (Kannaiyan 1999), specifically for Pakistan. Mungbean is grown in Pakistan on largest pulse area second only to chickpea. In Pakistan minor crops like pulses occupy .07 % of the total cropped area of 22.8 million hectares in 2011-12(Government of Pakistan 2011). Mungbean, as a crop, is growing both in rainfed as well as in irrigated areas of Pakistan. It is a short duration crop therefore has less water requirement as compared to summer crops (Anjum *et al*. 2006). During

2010-11, this crop was badly affected by rain and flood. As a result, the production of mungbean fell short by 55% to 76,000t as compared with 118,000t produced during 2009-10 while demand was 125,000t which shows gap between demand and supply of mungbean for Pakistan in 2009. Pakistan is spending large amount on pulses imports to fill the gap between supply and demand of pulses (Government of Pakistan 2010).

The area wise share of Mungbean area, production and yield of provinces is given in table 1.

Table 1: Area, production and yield of mungbean

Particulars	Punjab	Sindh	KPK	Balochistan	Pakistan
Area (% of Total)	76.78	7.86	6.18	9.17	100
Production (% Total)	78.74	5.77	6.69	8.79	100
Yield kg/ha	569	407	600	532	555

Economic survey 2010-11

Table 1 show that Punjab province is leading in area and production of mungbean. But it is alarming that yield of Mungbean is lowest than Khyber Pakhtunkhwa, Khyber Pakhtunkhwa average yield per ha is 600 kg and Punjab yield is 569 kg per ha (Government of Pakistan 2011).The mounting pressure on economy to feed more people has increased the importance of utilizing the potential rainfed regions of Pakistan to improve food security through increasing area under food crops (Mahmood et al., 1991).

The main objective of the study was to check past and future trends of mungbean area and yield in Pakistan by using appropriate trend analysis model. Trend analysis studies help policy makers in taking policy decisions keeping in view the future forecast.

Methodology

The study was conducted by using time series data of mungbean area and yield during the years 1984 to 2011 (27 years) of Pakistan. The data was collected from the various issues of Agriculture Statistics and Economic Surveys of Pakistan, published by Government of Pakistan. Data was analyzed by using MINITAB software.

The linear, exponential and quadratic these three models of trend analysis were applied for this study as these were also used by Karim et al. 2010, Finger (2007), Boken et al. (2000) and Rimi et al. (2011). The best model was selected on the basis of three accuracy measures. These accuracy measures were Mean Absolute Percentage Error (MAPE), Mean Absolute Deviation (MAD) and Mean Squared Deviation (MSD). Smaller values of all these measures indicate a good fitted model with minimum forecasting errors (Karim et al., 2010). The best fitted model for this study was quadratic model and applied for forecasting the area and yield of mungbean in Pakistan for the years 2012 to 2016.

Results and discussion

This section deals with time series data and estimated trends in table and figure form of mungbean area and yield in Pakistan.

Selection of forecasting model for mungbean area
The results revealed that all the values of accuracy measures are smaller in quadratic trend model (Table 2), therefore instead of other two (linear trend and exponential trend) models, quadratic trend model was selected for forecasting the future trends of mungbean area in Pakistan on the basis of smaller values of accuracy measures (Karim et al. 2010).

Table 2: Diagnostic of model selection for mungbean area in Pakistan

Measures of Accuracy	Criteria		
	MAPE	MAD	MSD
Linear Trend Model	18.08	28.66	1380.41
Quadratic Trend Model	12.58	19.30	537.27
Exponential Trend Model	19.09	31.38	1630.90

Selection of forecasting model for mungbean yield

All the values of accuracy measures for mungbean yield in Pakistan are smaller in quadratic trend model comparative to linear trend model and exponential trend model. That's why, this study applied quadratic model to estimate the future values of mungbean yield in Pakistan.

Table 3: Diagnostic of model selection for mungbean yield in Pakistan

Measures of Accuracy	Criteria		
	MAPE	MAD	MAP
Linear Trend Model	9.34	47.77	3224.64
Quadratic Trend Model	6.39	34.27	2264.57
Exponential Trend Model	8.75	45.28	3037.34

Previous trends of area and yield of mungbean in Pakistan

The estimated time series parameter of area and yield of mungbean in Pakistan during the year 1984 to 2011 showed the area of mungbean has upward and downward trend but moving towards decreasing trend and while in case of mungbean yield it has increasing trend. Starting from 1984 mungbean area was 94 (000 ha) but with upward downward trend at the end 2011 area occupy by mungbean was 141 (000 ha), area has remained constant or gradually slow growth from 1984 to 2006, but after 2006 there was a sudden decrease of mungbean area in Pakistan. In case of yield in 1984 yield was 476 kg per ha and increased gradually and at the end in year 2011 it reached at 657 kg per ha in Pakistan. These previous trends depict that area of mungbean not much increased comparative to yield.
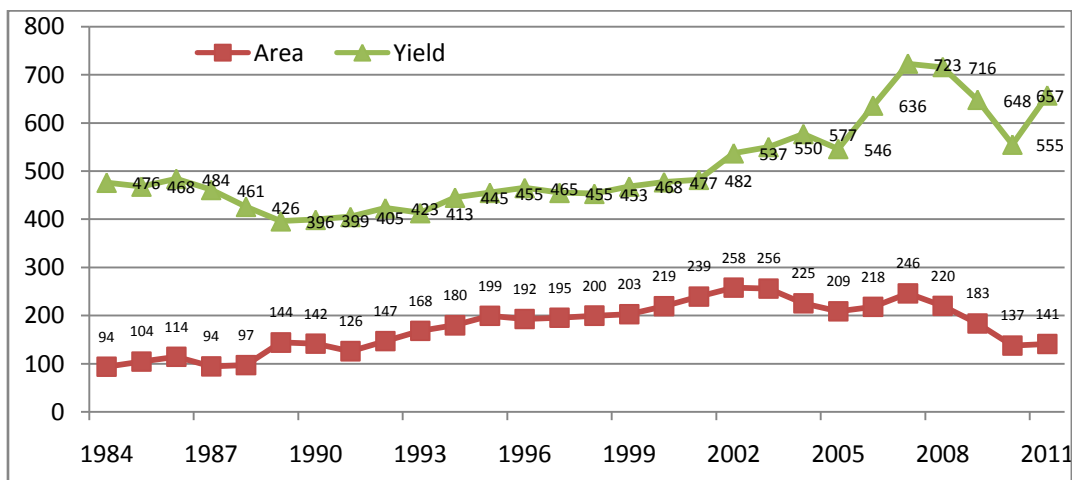

Figure 1: Area and yield of mungbean in Pakistan
Source: Agricultural Statistics of Pakistan

Forecasted mungbean area

After fitted the adequate model next step was to estimate forecasted values for area and yield of mungbean crop in Pakistan. Objective was to predict the future value subject to minimum errors as less as possible (Yaseen *et al.,* 2005). The black, red and green symbols represents the actual, fitted and forecasted values for area at 95% prediction interval in Pakistan(Fig. 2). Results showed that if the present growth rates of mungbean area remain the same then the area of mungbean in Pakistan would be 165.09, 154.32, 142.55, 129.78 and 116.02 (000 h) respectively for the years 2012 to 2016 respectively, with continuous decreasing trend (Table 4). Reasons for decrease in area for mungbean can be due to poor planning and research by Government and policy makers, the return to farmers is far less compared to major crops.

Forecasted mungbean yield

The black line shows actual values, red fitted values and green line is for forecasted values of mungbean yield at 95% prediction interval (Fig. 3). Results illustrated that if the present growth rates of mungbean yield remain the same then yield of mungbean in Pakistan would be 703.75, 728.17, 753.66, 780.20 and 807.82 kgs per ha respectively with continuous increasing trend, for the years 2012 to 2016 respectively, (Table 4). Positive increase in yield is due to availability of high yielding varieties, proper use of inputs and in time availability of inputs for mungbean in Pakistan. These trends show that instead of an incentive for farmers in form of high yielding from mungbean and there is also country demand available for mungbean in Pakistan. The need is that to take such type of policy measures which ultimately increase the area under mungbean in Pakistan
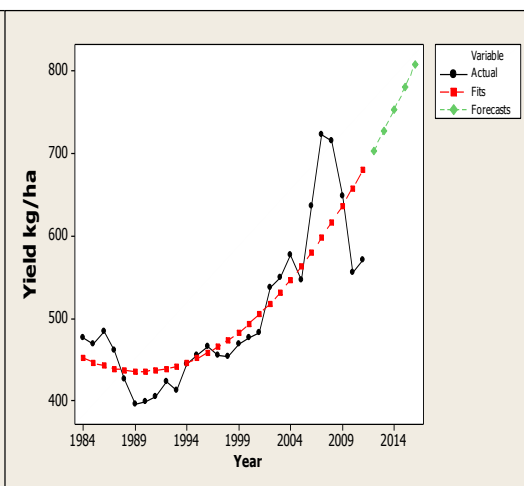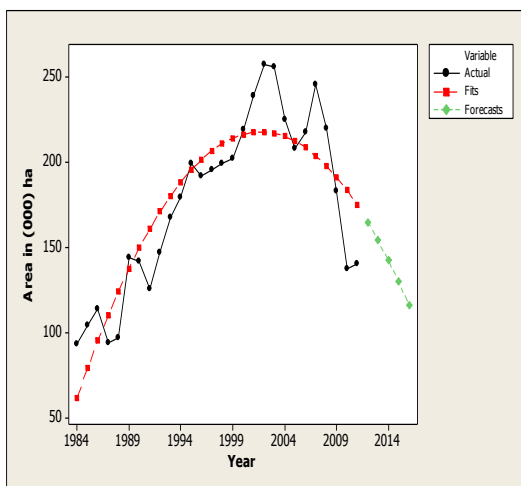

Figure 2: Trend analysis of mungbean area   **Figure 3: Trend analysis of mungbean yield**

Table 4: Forecasted mungbean area and yield

Forecast Years	Area (000 Hectares)	Yield (Kg/ Hectare)
2012	165.09	703.75
2013	154.32	728.17
2014	142.55	753.66
2015	129.78	780.20
2016	116.02	807.82

Conclusion and recommendations

The results showed that quadratic model is appropriate for estimation of mungbean area and yield in Pakistan. The analysis clearly indicated continuous decreasing trends in mungbean are during 2012 to 2016 in Pakistan. But contrary to the area, yield data had shown upward trend which is very encouraging. More specifically, If the present growth rates continue, Mungbean yield during next five years (2012 to 2016) would be increased at the rate of 703.75, 728.17, 753.66, 780.20 and 807.82 kgs per ha respectively. These trends indicated that there is an incentive for farmers to grow mungbean as yield has shown positive trend. Keeping in view the ever increasing trend of population and pulses demand in Pakistan, it is important for the planners and policy makers and other concerned stakeholders to look into the matter that why area of mungbean is decreasing in Pakistan.

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