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Production and Forecasting Trends of Cotton in Pakistan: An Analytical View

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ABSTRACT

Cotton is the mainstay of Pakistan economy. It is an engine of growth for about 1200 ginning factories and over 370 textile mills which solely depend on this silver fibre. It fetches more than 60 percent of the foreign exchange for the country. It adds around 2 percent contribution in the National GDP and 9 percent value in agriculture sector. Textile, ready-made garments and other cotton based industries are generating major employment in the country. Cotton crop is also catering around 35 percent of the total edible oil requirements of the country which is extracted from cottonseed. Considering such a high importance of cotton crop for the economy, any event affecting cotton crop, significantly affects the whole economy. Cotton performance has been analyzed over a period of 47 years starting from 1960 to 2007 which covers fluctuations in area and yield and ultimately the production. The empirical results have shown a positive trend in area, increased production and increasing yield tendency . Based on the compound growth rate of this period, forecasting has been carried out for these components which predict cotton production to 16 million bales by the year 2015.

KEYWORDS: Cotton Forecasting, Cotton Production, Compound Growth Rate, Tendency

INTRODUCTION

Pakistan can truly be called the land of cotton. Cotton fabrics dates 3000 BC and has been excavated in the Indus Valley of Pakistan. It is called silver fiber of the country. Even to this day cotton plays a pivotal role in Pakistan's economy. It accounts for about 60% of export earnings and over 64% of domestic edible oil production. Its share in GDP during 2006-07 remained 1.8 percent and 8.6 percent value addition to agriculture (Govt. of Pakistan, 2007). The by-products of cotton include animal feed and edible oil.

Pakistan ranks fourth amongst the world cotton producing country (Govt. of Pakistan, 2003-04). The major area of the cotton comprises of the Punjab and Sind province contributing 80 percent and 18 percent in total production respectively. The major source of irrigation in the cotton area is canal. Tube-wells also supplement the water requirements of the crop. The historical achievements in cotton production and trade are elaborated as under:

Cotton and Textile Sector Growth in Pakistan

	1947-48	2006-07	% Increase
Area (ml. ha)	1.23	3.072	149.76
Production (ml. bales)	1.1	13.0	1081.82
Yield (kgs/ha)	160	719	349.38
Ginneries	31	>1200	3883.87
Textile Mills	2	461	22950.00
Mill Consumption (ml. bales)	0.04	12.4	30900.00
Yarn Production (ml. kgs)	6.2	2087	33561.29
Cloth Production (ml. sq. mtr)	29.5	925	3035.59

Table 1. *United States, Department of Agriculture, 2007-08*

The above table indicates that the cotton sector right from production to processing industry and trade has made tremendous improvement. Cotton acreage increased from 1.23 million ha (1947-48) to 3.072 million ha (2006-07) showing an increase of 150 percent. The total production during the same period jumped from 1 million bales to 13 million bales, which is 1100 percent increase over 1947-48. In the cotton history of Pakistan, the country

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achieved two peaks with respect to production i. e 12.8 million bales in 1991-92 and 14.6 million bales in 2004-05. The boost was mainly attributed to commercialization of high yielding varieties having higher lint percentage, conducive weather environment, better supply of inputs, regular extension services to the cotton growers and above all the government support in the form of ensured support price mechanism as well as provision of subsidy on fertilizer etc. The increase in production resulted in wider expansion of cotton industry from cotton ginning to weaving, spinning, textile, pesticide and seed industry. This huge expansion of cotton industry provided livelihood to the millions people including skilled as well as non skilled and contributed significantly in fetching foreign exchange (Ali, Mehboob; 2007).

OBJECTIVES

The main objectives of the study are:-

1. Overtime analysis of the cotton area, production and yield trend.
2. Forecasting cotton area and yield to visualize the future trend.

MATERIAL AND METHODS

In order to analyse the over time area and yield trend, a -linear regression model has been used. The factors influencing the area yield and production of cotton have been included in the model area trend in the area, by using EVIEWS (a statistical package). Forecasting has been estimated basing on the calculated compound growth rate.

RESULTS

During the period from 1960-2007,an increasing trend in area, yield and production has been observed. The data related to area, production and yield from 1960 to 2007 is given in Annexure-A.

The data has been analyzed using EVIEWS while forming the following equations for area, production and yield relationships.

Estimation Equation:
==========
PROD = C(1) + C(2)*AREA + C(3)*YIELD

Substituted Coefficients:
==========
PROD = -5289.310456 + 2.069028424*AREA + 16.05529662*YIELD

R2 = 0.99

Statistical tests indicated that R2 of 0.99 indicates that the model above is able to explain 99% of the variation in the cotton area and yields observed in Pakistan from the 1960 to 2007 periods. During these years, area and yield appear to be affected by time of sowing/harvest, the price of cotton, fertilizer price and rainfall. Rainfall showed a negative effect on yields during these periods. These factors contributed in variation in yield as well as cotton acreage. Apparently cotton area and yield have become more responsive to economic variables, although government intervention in the cotton sector was negligible from 19660 to 1990 and improved afterwards. This could be due to the adoption of technologies that have made producers more dependent on external inputs.

The relationship between the independent and dependent variable is positive. This shows that with the increment in area, cotton yields and production enhances.

Anticipated / Projected Trends

In order to forecast the anticipated and projected trends for area, production and yield from the year 2008 to 2015, the following methods have been used.

i) Compound Growth Rate

Compound growth rate have been calculated keeping in view 1960 as base year using the following formulae.

$Y_t = Y_0(1+r)_t$
Where
Y_t = Area/ production/ Yield in year t
Y_0 = base year of Area, Production and yield
r = Compound Growth Rate

Compound Growth Rate = (last year/first year)^(1/No of Years)- 1*100

The calculated compound growth rate over a period of 47 years starting from 1960 to 2007 estimated as under:

Area	=	1.95 %
Production	=	4.04 %
Yield	=	2.05 %

ii) Forecasting
The anticipated / projected area, production and yield from 2008 to 2015, based on their compound growth rates (keeping other variables viz., weather, varieties, market price and other related influencing factors constant) is estimated as under.

$Y_t+1 = Y_t+(Y_t*r)/100$

Y_t = Base Year (i.e. 2007)
r = Calculated compound growth year

Year	Area (000 ha)	Production (000 bales)	Yield (kg/ha)
2008	3313	12148	615
2009	3378	12639	628
2010	3444	13150	641
2011	3511	13681	654
2012	3579	14234	667
2013	3649	14809	681
2014	3720	15408	695
2015	3793	16030	709

Table 2. Forecasted Production, Yield and Production

The graphical presentation of the data being analyzed and projected afterwards is given below:

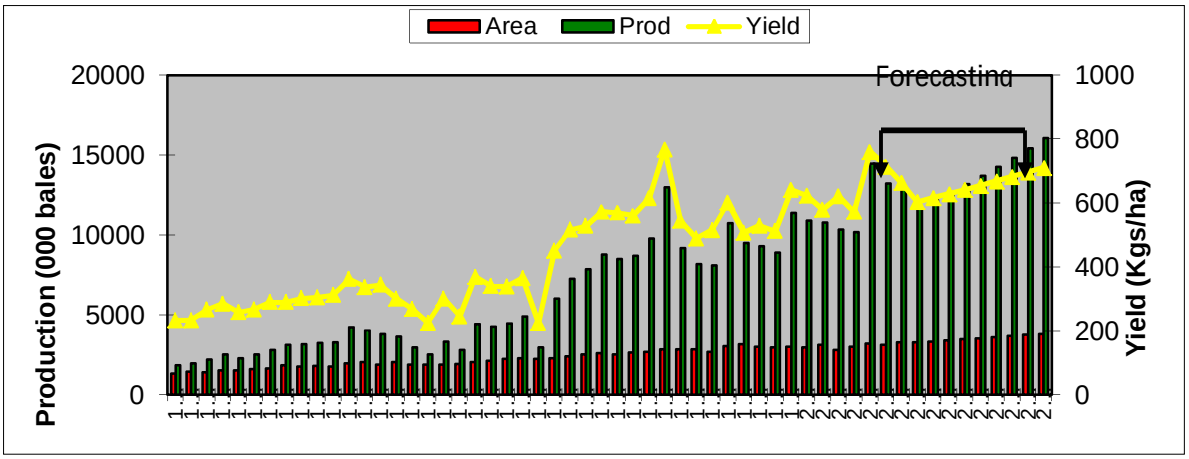

Fig 1. Graphical Representation of Forecasted Area, Yield and Production

Table 2 and Fig 1. given above shows that area, production and yield are anticipated to be increased with the passage of time. E.g. in year 2008, area is supposed to be 3313(000 ha), production is supposed to be 12148 (000 bales) and yield is supposed to be 615 (kg/ha). While in year 2015, area is forecasted to be 3793(000 ha), production is anticipated to be 16030 (000 bales) and yield is forecasted to be 709 (kg/ha).

Conclusion:

The analysis of data shows that cotton production and yield increased with a decreasing trend from 1960 to 1980s. This change in yield can be attributed to lack of support measures by the government, no use of pesticides, lack of farmers' awareness in crop management, low use of inputs. But after 1980s, when the use of pesticides started, the cotton yields and production increased with the increasing trend. Cotton production significantly increased with the combine use of plant protection practices, farmers' awareness campaign, proper supply and use of inputs, properly backed by government support measures. Forecasting also depicts that with an annual compound growth rate of 2 percent in production, the country can achieve production level of 16 million bales by the year 2015 with the increase in area from 3075 thousand hectares (2007) to 3375 thousand hectares by 2016. Hence, it can be concluded that increasing trend were observed in area to be cultivated and production and yield.

Annexure-I

Area, Production and Yield of Cotton in Pakistan

Year	Area (000 hectare)	Production (000 bales)	Yield (kg / ha)	Year	Area (000 hectare)	Production (000 bales)	Yield (kg / ha)
1960	1312	1814	232	1986	2505	7864	527
1961	1412	1952	232	1987	2568	8749	572
1962	1390	2192	265	1988	2508	8499	569
1963	1485	2517	284	1989	2599	8675	560
1964	1481	2266	257	1990	2662	9758	615
1965	1568	2484	266	1991	2836	12973	768
1966	1609	2775	289	1992	2836	9176	543
1967	1800	3099	289	1993	2805	8150	488
1968	1756	3151	301	1994	2650	8108	514
1969	1771	3208	304	1995	2998	10731	601
1970	1748	3243	311	1996	3149	9495	506
1971	1957	4215	361	1997	2960	9308	528
1972	2010	4022	336	1998	2923	8903	511
1973	1845	3774	343	1999	2983	11385	641
1974	2031	3635	300	2000	2928	10870	623
1975	1851	2944	267	2001	3116	10749	579
1976	1865	2492	224	2002	2794	10342	621
1977	1843	3294	300	2003	2989	10177	571
1978	1902	2766	244	2004	3192	14449	760
1979	2023	4433	368	2005	3101	13187	714
1980	2109	4255	339	2006	3250	12843	663
1981	2214	4455	338	2007	3250	11676	603
1982	2263	4906	364				
1983	2221	2946	223				
1984	2242	6006	450				
1985	2364	7248	515				

Source: United States Department of Agriculture

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The authors declare that they have no conflicts of interest in this research.

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