RESEARCH ARTICLE

ESTIMATE THE COMPOUND GROWTH RATES OF AREA, PRODUCTION AND PRODUCTIVITY OF SUMMER BAJRA IN BANASKANTHA DISTRICT OF GUJARAT STATE

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ARTICLE INFO	ABSTRACT

The present study entitled "Estimate the compound growth rates of area, production and yield of summer bajra in Banaskantha district of Gujarat state" was undertaken to calculate the compound growth rates of area, production and productivity of summer bajra. The study is based on data collected from 126 farmers selected from 6 randomly selected villages and 20 market functionaries in two market areas namely Deesa and Tharad of Banaskantha district of Gujarat state. To calculate the compound growth rates by exponential function was fitted to the indices of area, production and productivity. The compound growth rates for area, production and productivity were positive and statistically highly significant in case of Banaskantha district as well as in Gujarat state.

INTRODUCTION

Pearl millet *(Pennisetum glaucum* L.) is the most popular cereal crop grown in tropical semi-arid regions of the world. The common name of Pearl millet over a large part of India is *bajra* or *bajri.* It is the staple food for millions of people in the arid and semi-arid tropics of the world. The nutritive value of bajra grain is fairly higher with carbohydrate (69.4 per cent), fat (5 percent), marginal protein (9-11 percent) and minerals (2.7 percent). It is rich in vitamin A and B. In India, bajra ranks fourth in acreage after rice, wheat and sorghum. Bajra is extensively grown in the dry areas of western and southern India and along southern peripheries of the Sahara desert in Africa. It is also grown as fodder crop in the south-eastern USA, Australia, South Africa and other regions. Bajra is well adapted to production systems characterized by drought, flow soil fertility and high temperature. It performs well in soils with high salinity or low pH.

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Because of its tolerance to adverse growing conditions, it can be grown in areas where other cereal crops, such as maize would not survive. Due to modernization the production has increased manifold, but farmers are not able to produce more food crops because of climatic and other problems. The efficient agricultural marketing system is one of the important means of raising the income levels of cultivators. In our country, marketing of different commodities is still not efficient. There were different intermediates linked in marketing process who take their higher margins; commission and other market fees. Due to this, price received by farmer for his produce is affected adversely. During the last few years due to modernization and commercialization of Indian agriculture, farming was dependent more and more upon purchased inputs supplies such as hybrid seeds, fertilizers, improved technology *etc.* If the efficient marketing system is developed, it will certainly induce farmers and regions to specialize in the production of the crops according to the principle of personal or regional comparative advantage, which in turn will further increase aggregate productivity of agricultural sector and its commercialization.

During the year 2012-13, per hectare average yield of summer bajra in Gujarat was 2,634 kg against all India average of 2,314 kg. Detail regarding district wise area, production and yield of summer bajra of Gujarat State in 2012-13 is given in Table 1.

Table 1. Area, production and yield of summer bajra crop in Gujarat state

Area ("00 ha"), production ("00" M.T.) and yield (kg/ha) (2012-13)

S. No.	District	Area	Production	Yield
1.	Anand	340	937	2752
2.	Banaskantha	1350	3391	2513
3.	Gandhinagar	96	295	3080
4.	Kheda	303	768	2536
5.	Mehsana	529	2783	410
6.	Panchmahal	49	130	2633
7.	Patan	102	270	2644
8.	Sabarkantha	116	318	2757
9.	Vadodara	47	184	4142
10.	Bhavnagar	6	17	2633
11.	Junagadh	13	34	2633
12.	Kutch	11	30	2633
	Gujarat State	2650	6981	2634

Source: Directorate of Agriculture, Gujarat state, Gandhinagar

Important summer bajra growing districts of the state are Anand Mehsana, Panchmahal, Gandhinagar, Vadodara, Bhavnagar, Patan, Kutch, Sabarkantha, Junagadh and Kheda *etc.* Among these Banaskantha district ranks first in terms of production and area cultivation during 2012-13. Hence, it was felt necessary to study the production and marketing system of bajra in Banaskantha district as previously was not undertaken but now it's worth undertaking study.

The total area in which bajra is produced in Gujarat is 2650 ha (2012-13). Gujarat ranks third in bajra yield compared to all other states in India. In Gujarat*,* the highest production is found in the northern plains of Banaskantha (2558 mt). Banaskantha is one of the 33 administrative districts, located in the northeast part of Gujarat. Banaskantha district produces 33.6% of bajra, followed by wheat (6.8%), as per the season crop report of 2013-14 of Gujarat Government.

Details regarding the area, production and yield of summer bajra in Gujarat state and Banaskantha district for the period of 2001-02 to 2013-14 are given in Table 2.

Table 2. Area, production and yield of summer bajra crop in Gujarat and Banaskantha District during 2001-02 to 2013-14 Area ("00 ha"), production ("00" M.T.) and yield (kg/ha)

Year	Gujarat			Banaskantha		
	Area	Production	Yield	Area	Production	Yield
2001-02	1399	2535	1813	646	1055	1632
2002-03	1421	2293	1614	768	1096	1427
2003-04	1705	3656	2145	811	1658	2044
2004-05	1450	3031	2090	649	1314	2023
2005-06	1644	3745	2278	797	1807	2267
2006-07	1834	4285	2337	812	1781	2194
2007-08	1394	4549	2352	790	1705	2157
2008-09	1746	4261	2440	749	1744	2328
2009-10	1742	3964	2276	684	1404	2053
2010-11	3829	9417	2459	1620	3821	2359
2011-12	4325	10947	2531	1620	3937	2431
2012-13	2650	6981	2634	1350	3391	2513
2013-14	3601	9115	2531	1530	3716	2429

Source: Directorate of Agriculture, Gujarat state, Gandhinagar

MATERIALS AND MATHODS

Scientific study of any problem requires a systematic investigation using appropriate method and procedures in order to arrive at reliable, unbiased and practical conclusion. Beginning with a general description of the study area, the indicators to be selected for the study, the data base and the analytical tools and techniques to be used in the present study are discussed.

- Area of study
- Data collection
- Analytical procedure

Area of study

The study was Banaskantha district of Gujarat State. The Banaskantha district was selected purposively because the summer bajra crop become most popularize among the farming community in Banaskantha district as the area under cultivation of summer bajra was increasing day by day in the district. Hence, Banaskantha district was selected for the present study and the reasons for selecting the district are as under.

[1] Banaskantha district has more relative importance of summer bajra crop in the cropping pattern of the Gujarat state.
[2] It has eleven regulated markets in the district.
[3] It ranked first in terms of production and area under summer bajra in the Gujarat state since last decade.

Data collection

The secondary data of area, production and productivity were collected for the period from 2001-02 to 2013-14 year. The secondary data were collected from book published by Office of Directorate of Agriculture Gujarat State, Gandhinagar.

Analytical procedure

The data collections from different sources through various schedules were subjected to statistical analysis for evaluating the objectives of the study. The statistical device such as compound growth rate was adopted.

Compound growth rates

For Banaskantha district and Gujarat state as a whole compound growth rates for area, production and productivity of summer bajra crop have been calculated. The index numbers of area, production and productivity of summer bajra were calculated by taking agricultural year 2001-02 as the base year. The compound growth rates were calculated by fitting the exponential function to the index number of the area, production and productivity. The following form of the exponential function was used.

$$Y = ab^t$$

Where,
Y = Dependent variable for which growth rate is to be estimated

a = constant/intercept
b = Regression coefficient
t = Time variable in year (1, 2, 3,... 13)
The compound growth rate will be obtained using logarithmic from of the equation as below.

$LogY_t = \log a + t \log b$

Then the per cent compound growth rates (g) will be computed by using the relationship:

g = (antilog of log b – 1) X 100

Where,
g = Compound growth rate per annum in per cent

RESULTS AND DISCUSSION

The production trends can be studies by measuring the compound growth rate. The compound growth rates for area, production and productivity of summer bajra for the period 2001-02 to 2013-14 of Banaskantha district and Gujarat state as a whole are presented in Table 3.

Table 3. Compound growth rates (C.G.R.) for area, production and productivity of summer bajra in Banaskantha district and Gujarat state from 2001-02 to 2013-14

S. No.	Particulars	Area	Production	Productivity
	Banaskantha district			
1.	C.G.R. (%)	6.90**	11.11**	3.93**
2.	'b' value	1.06	1.11	1.03
3.	S.E. of bi	2.57	2.86	1.05
4.	Calculated 't' value	2.67	3.88	3.74
	Gujarat state			
1.	C.G.R. (%)	9.39**	13.65**	3.58**
2.	'b' value	1.09	1.13	1.03
3.	S.E. of bi	2.85	2.64	1.36
4.	Calculated 't' value	3.29	5.16	4.70

*Note: * Significant at 1% level of significance*
*   ** Significant at 5 % level of significance*

The results showed that area under summer bajra crop for Banaskantha district and Gujarat state as a whole increased at the rate of 6.90 and 9.39 per cent per annum, respectively. Similar result was found by Pilai (2001).

The compound growth rates for area were found positive and highly significant for both Gujarat state and Banaskantha district (Table 3). The compound growth rates for production were positive for both Banaskantha district and Gujarat state (i.e., 11.11 and 13.65 per cent) and statistically highly significant in case of Banaskantha district and in Gujarat state. In case of productivity, the compound growth rates were also positive for both Banaskantha district and Gujarat state (i.e., 3.93 and 3.58 per cent respectively) and statistically highly significant in case of Banaskantha district in Gujarat state. Singh and Sharma (1993) were observed the similar result.

Conclusion

In order to meet the objectives of the present study, time series and cross sectional data were used. The exponential function was fitted to the indices of area, production and productivity of Banaskantha district and Gujarat state of calculated the compound growth rates.

1. The findings of the study showed that the compound growth rate of production was 11.11 per cent per annum in Banaskantha district which was generally more owing to increase in productivity, the compound growth rate for productivity was 3.93 per cent per annum.
2. The production of bajra increased by 13.5 per cent per annum in the case of Gujarat state.
3. Area, production and productivity increased in Banaskantha district mainly due to introduction of Narmada canal during last four years.

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