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Growth rate analysis in area, production and productivity of barley in the Jaipur district and Rajasthan

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Abstract

The results of compound growth rates of area, production and productivity of barley for Jaipur and Rajasthan state as a whole were revealed that the area, production and productivity of barley were positively increased at a growth rates of 4.02, 10.18 and 6.03 per cent per annum in Jaipur and 3.96, 6.65 and 2.59 per cent per annum in Rajasthan during the 2000-01 to 2015-16 study period, respectively.

Keywords: Compound growth rates, area, production, and productivity

Introduction

Barley (*Hordeum vulgare*) is one of the first domesticated cereals, most likely originating in the Fertile Crescent area of Near East. India has distinct advantage of agro-climatic conditions for the cultivation of barley though it is also successfully grown in France, Australia, The United Kingdom, Turkey, United states and Denmark. It is an important *rabi* cereal crop grown throughout the temperate and tropical regions of the world. Barley is mostly used for feed and fodder besides a significant crop industrially. Barley grain is also used as feed, while, its straw provides an important source of roughage for animals. In India the major barley producing areas are Rajasthan, Uttar Pradesh, Madhya Pradesh, Haryana, Punjab and a part of Bihar.

The major producing areas are also important processing areas of barley and its derivatives. Barley malt is exported from Kandla and Mumbai port.

Barley is grown in India since ancient time and it is an important source of nutrition to both human beings and animals. It is mainly used to prepare 'sattu' (Flour from the roasted gains), 'dalia' (Porridge), barley pops etc. Chapatti (Leavened bread) is also prepared from barley flour alone or mixed with wheat flour for human consumption.

The round kernel pellets are prepared by removing husk and the over portion of kernel is used as baby food and food for patients. Besides being a food grain, it also has immense importance in industries for malting, peeling and brewing etc. The major industrial use of barley grain is in the production of malt, which is used in breweries to make beer, whiskey, malt syrups, malted milk and vinegar.

India is the largest producer of barley with 6.9 million hectare area in the world and annual production of barley is 1.77 million tonnes (Anonymous 2017-18). In Rajasthan occupies second position in India in both area and production. Rajasthan has an area of 2.74 lakh hectare and production of 9.09 lakh tonnes with a productivity of 3316 kg/ha (Anonymous 2017-18). The average productivity of barley in the state is far behind the attainable yield of 40-50 q/ha (Choudhary *et al.* 2014). In Rajasthan, Jaipur district has an area of 51756 hectare and production of 182744 tonnes with productivity of 3531kg/ha (Anonymous 2017-18). Barley is mainly grown in Jaipur, Ajmer, Sikar, Bhilwara, Ganganagar, Hanumangarh, Nagaur and Churu districts. Thus, this crop needs to be promoted as an industrial crop for malting and feed industry in domestic market for better returns to marginal and sub marginal farmers of Rajasthan.

Material & Method

Compound growth rate analysis

To study growth in area, production and productivity of barley in Jaipur district and Rajasthan state, compound growth rates were worked out by using the following formula:

Exponential equation:

$$Y_t = ab^t U_t \dots \dots \dots (i)$$

Where,

Y_t is area/production/productivity of barley in time period t
 t is time element which takes the values 1, 2, 3,----- n
 a and b are parameters to be estimated

Where $b = (1 + g)$; g is the rate at which y grows every year in relation to its value in preceding years.

U_t is the error term

On logarithmic transformation of Equation (i) we get:

$$\text{Log } y_t = \text{Log } a + t \text{Log } b + \text{Log } U_t \dots \dots \dots \text{(ii)}$$

Equation (ii) can be rewritten as

$$Y_t^* = a^* + b^* t + U_t^*$$

Where,

$Y_t^* = \log Y_t$, $a^* = \log a$; $b^* = \log b$ and $U_t^* = \log U_t$ The compound growth rate was obtained as

$$g = (\text{Antilog } b^* - 1) \times 100$$

The 'F' value was used for testing the significance of compound growth rates.

Result and Discussion

Growth rates in area, production and productivity of barley in Jaipur district and in Rajasthan

In this section, growth rates of production, area and productivity of barley crop in the Jaipur district of the state and for the state as a whole has been presented. The estimates of growth rates pertained to the period from 2000-01 to 2015-16. The aggregate production of a crop is the resultant effect of area and productivity of that crop. The estimates of growth rates revealed that barley production increased significantly in Jaipur district at a compound rate of 10.18 per cent per annum (table 1).

Area under the crop in Jaipur increased at a compound growth rate of 4.02 per cent per annum which was significant at 1 per cent level of probability. Productivity of the crop was significantly increased at compound growth rate of 6.03 per cent per annum. The coefficient of determination (R^2) was estimated to be 0.83, 0.81 and 0.76 indicating that 83 per cent, 81 per cent and 76 per cent of variation in area, production and productivity, respectively. The study results revealed that the increase in production of barley was merely due to the increased productivity; through area under the crop also contributed significantly in the Jaipur district.

Table 1: Compound growth rates in area, production and productivity of barley in Jaipur district during 2000- 01 to 2015-16 (Per cent per annum)

Particular	Growth rates	Standard error	R2
Area	4.02**	0.49	0.83
Production	10.18**	1.36	0.81
Productivity	6.03**	0.93	0.76

** Significant at 1 per cent level of probability

The table 2 reveals that barley crop registered a significant growth rate of 3.96 percent per annum in area at 1 per cent level of probability. On the other hand, production increased significant compound growth rate of 6.65 per cent per annum also significant at 1 per cent level of significance. The positive growth rate of productivity for barley crop was registered at 2.59 per cent per annum which was significant at 1 per cent level of significance.

Table 2: Compound growth rates in area, production and productivity of barley in Rajasthan during 2000-01 to 2015-2016 (Per cent per annum)

Particular	Growth rates	Standard error	R2
Area	3.96**	0.78	0.65
Production	6.65**	0.93	0.79
Productivity	2.59**	0.47	0.69

** Significant at 1 per cent level of probability

The coefficient of determination (R^2) was 0.65, 0.79 and 0.69 indicating that 65 per cent, 79 per cent and 69 per cent of variation in area, production and productivity, respectively was due to time. The result indicated that the increased area under the crop could increase the production of barley crop in Rajasthan. The role of productivity in increasing the production, through significant was much than the area. It is inferred from the analysis presented in this section that there has been increase in production of barley crop in the state as well as in the Jaipur district. This increase in production was contributed by the increase in area and productivity of the crop.

This clearly brings that the existing technology has been able to sustain the existing level of productivity of the crop.

Summary and Conclusion

- The compound growth rates of area, production and productivity were 4.02, 10.18 and 6.03 respectively in the Jaipur district during the period of 2000-01 to 2015-16.
- The compound growth rates of area, production and productivity were 3.96, 6.65 and 2.59 respectively in the Rajasthan state during the period of 2000-01 to 2015-16.

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