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RESEARCH ARTICLE :

Compound growth rates of area under soybean crop in Dharwad, Karnataka, India

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SUMMARY : The study was undertaken in Dharwad district of Karnataka State during the year 2013-14. The study covered 15 villages from 3 talukas of Dharwad district to form a sample of 150 respondents. A pre-tested structured interview schedule was used to collect the data from the respondents by personal interview method. The findings of the study reported that, for the country as a whole, the resulting growth rate of soybean area under cultivation was 0.41 per cent per annum for the period 2003-04 to 2012-13, followed by Karnataka 5.64 per cent per annum and 3.12 per cent per annum in Dharwad district respectively. The area under soybean in Dharwad district recorded the positive growth rate in all the taluks except Kalaghatagi. Dharwad taluk recorded positive growth rate of 12.13 per cent followed by Kundagol and Hubli, with an increasing growth rates of 8.53 per cent and 2.91 per cent respectively.

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KEY WORDS :
Compound growth rate, Area, Soybean crop

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BACKGROUND AND OBJECTIVES

Soybean has now become the largest source of vegetable oil and protein in the world, and its large-scale cultivation is concentrated in a few countries such as Argentina, Brazil, Canada, China, India, Paraguay, and USA, which together produce about 96 per cent of the world's 189 million tonnes annual soybean production. The world's average soybean yield has also increased from less than 1 tonnes per hectare to 2.3 tonnes per hectare.

In this scenario of oilseed map of the world, India occupies a prominent position, both in area (26 million hectares) and production (21 million tonnes). India has exhibited a phenomenal growth in agricultural sector after independence. Our country witnessed "Green Revolution" in late sixties onward and it is a landmark in Indian agriculture resulting not only self-sufficiency in food grains but also in export of surplus produce to other countries. Further, "Yellow Revolution" was the result of enhanced pace in the development of Indian agriculture for the last two and half decades which has contributed remarkably due to newly introduced crops like soybean and sunflower (Joshi, 2003).

Soybean cultivation in India has gained momentum in oil front with the steady increase in the area and production. In recent years, it

has become an important oilseed crop of our country, occupying the fourth place next to groundnut, rapeseed and mustard in area and production. This crop has a greater potentiality to substitute different oilseeds and pulses to overcome the shortage of edible oil and protein rich food.

Even though soybean was introduced to India in 1880 A.D., hardly it occupied an area of 9.95 million hectares with production of 10.18 million tonnes and a productivity of 1,234 kg per hectare (Indian. stat 2012). The area and production of soybean in Karnataka is 0.20 million hectares and 0.18 million metric tonnes, respectively, with an average yield of 900 kg per hectare (Directorate of Economics and Statistics). In Dharwad district, soybean crop is grown by large number of farmers on an area of 21,270 hectares and with the production of 8,349 tonnes. Due to its characteristics such as short duration, high yielding potential protein and oil content, good fodder and building soil fertility by fixing atmospheric nitrogen in the soil, it is becoming popular with the farming community. Hence, in this context the present study was undertaken to study the Compound Growth Rates of area under Soybean crop in India, Karnataka and Dharwad.

RESOURCES AND METHODS

The study was an "expost-facto" research carried out in Dharwad district of Karnataka State during the year 2013- 14. Dharwad district comprises of five taluks *viz.*, Dharwad, Hubli, Kalaghatagi, Kundagol and Navalagund. Among these three taluks *viz.*, Dharwad, Hubli and Kalaghatagi were selected based on highest area under Soybean crop cultivation. In selected taluks, seven villages were selected from Kalaghatagi based on highest area under Soybean crop, similarly five villages from Dharwad and three villages from Hubli taluks are selected. From each village, ten farmers were selected randomly.

Hence, the study covered 15 villages from 3 talukas of Dharwad district to form a sample of 150 respondents. A pre-tested structured interview schedule was used to collect the data from the respondents by personal interview method. The data collected from respondents was tabulated and analyzed using appropriate statistical tools such as percentage and Compound Growth Rate. Statistical packages like Excel and SPSS version 16.00 were used for analysis.

Compound growth rate analysis:

Estimation of growth rates helps in measuring the rate of change in area, production and productivity of the crop over years. Thus the compound growth rates of area of soybean for the period 2003-04 to 2012-13 were calculated using the exponential growth function of the form.

$$y_{(t)} = ab^t e^u \quad (1)$$

where, $y_{(t)}$ Dependent variable for which growth rate is estimated

a = Intercept

b = Regression co-efficient

t = Time variable

e = Error co-efficient

u = Disturbance term

The growth rate co-efficient (b's) were computed by transforming the eq. (1) to the log linear form as eq. (2).

$$\ln y_{(t)} = \ln a + t \ln b + u \quad (2)$$

The method of ordinary least squares was adopted to estimate the co-efficients.

The compound growth rates (g's) in percentage were computed using the relationship of eq. (3),

$$g = \{(\text{Antiln of } \ln b) - 1\} \times 100 \quad (3)$$

The significance of the regression co-efficient was tested using the Student's t-test as eq.(4),

$$t = \frac{b_i}{SE(b_i)} \quad (4)$$

where, b_i is the regression co-efficient of the independent variable

SE (b_i) is the standard error of the regression co-efficient b_i

t is the calculated t- value.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Compound growth rates of area in soybean crop in India, Karnataka and Dharwad (2003-04 to 2012-13) :

Table 1 revealed that for the country as a whole, the results showed that growth rate of soybean area under cultivation was 0.41 per cent per annum for the period 2003-04 to 2012-13 indicating a rise over the period. It is

interesting to note that the area under soybean in Karnataka was increased at the rate of 5.64 per cent per annum, and the growth rate was significantly increased over the study period because of good adoptability and might be better returns from the crop. As far as Dharwad district is concerned the area under soybean increased at the rate of 3.12 per cent per annum which shows increasing area adding towards soybean production in the district, however it found to be non significant.

Table 1 : Compound growth rates of area in soybean crop in India, Karnataka and Dharwad (2003-04 to 2012-13)

Area in million hector

Year	India	Karnataka	Dharwad
2003-04	23.66	0.94	0.18
2004-05	27.52	1.59	0.22
2005-06	27.86	1.33	0.21
2006-07	26.51	1.31	0.22
2007-08	26.69	1.13	0.24
2008-09	27.56	1.34	0.27
2009-10	25.96	1.83	0.36
2010-11	27.22	1.68	0.30
2011-12	26.44	1.91	0.23
2012-13	26.76	1.72	0.21
CGR	0.41	5.64*	3.12

Note: * Significant at one percent level
CGR = Compound growth rate
Source: Karnataka at a Glance 2013 and Directorate of Economics and Statistics, India.

Table 2 : Compound growth rates of area in soybean crop in Dharwad taluk wise (2003-04 to 2012-13)

Area in hector

Year	Dharwad	Hubli	Kalaghatagi	Kundagol
2003-04	2296	3580	12004	463
2004-05	3982	5152	12331	1249
2005-06	3065	3047	14415	1084
2006-07	4055	5454	11807	1110
2007-08	4448	6048	13115	1236
2008-09	7442	6222	11853	1954
2009-10	11229	8143	15152	1549
2010-11	8263	6814	14380	1352
2011-12	6216	4724	11182	1097
2012-13	5143	3621	10777	1729
CGR	12.13*	2.91	-0.61	8.53

Note: * Significant at five percent level
CGR = Compound growth rate
Source: Dharwad District at a Glance 2013 and District Statistical Office, Dharwad.

The main reason for slow growth in area may be prevalence of prolonged drought conditions during the study period. Thus, it implied that there was an expansion in the soybean area in the recent years. This could be attributed to shifting cultivation of soybean crop from earlier inter crop to a mono-crop in the recent years due to favourable price in the market in Karnataka.

Compound growth rates of area in soybean crop in Dharwad taluk wise (2003-04 to 2012-13) :

The compound growth rates of area of soybean in Dharwad district is presented in Table 2. It can be observed from the table that the area under soybean in Dharwad district recorded the positive growth rate in all the taluks except Kalaghatagi. Dharwad taluk recorded positive growth rate of 12.13 per cent followed by Kundagol and Hubli, with an increasing growth rates of 8.53 per cent and 2.91 per cent respectively. The negative growth was recorded in Kalaghatagi. *i.e.* -0.61 per cent was observed.

The main reason for increasing growth rate, majority of farmers perceived that high level of relative advantage, compatibility, observability, trialability and low level of complexity in improved soybean production technologies.

The predominant reason for negative growth in Khalagatagi taluk might be bacterial leaf spot disease and alternate wetting and drying of crop during harvesting time because of erratic behaviour of rainfall.

Conclusion :

There was an expansion in the soybean area in the recent years. This could be attributed to shifting cultivation of soybean crop from earlier inter crop to a mono-crop in the recent years due to favourable price in the market in Karnataka. While Dharwad district is concerned area adding towards soybean production in the district, however it found to be non significant. The main reason for slow growth in area may be prevalence of prolonged drought conditions during the study period. However, focus needed to be placed towards enhancing crop area for increasing soybean production in these soybean growing taluks in the district. This could be achieved through strengthening extension approaches for promotion of production technologies and development of high yielding and disease resistant varieties suitable for each agro-climatic condition.

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