International Journal of Agriculture, Environment & Biotechnology
Citation: IJAEB: 6(4): 669-674 December 2013
DOI Number 10.5958/j.2230-732X.6.4.047

Agricultural Economics

Growth Pattern of Soybean Cultivation in Madhya Pradesh: District wise Analysis

Mana Solanki[1], S.C.Srivastava[2] and A.M. Jaulkar[1]

[1]Department of Agril Economics & F.M., RVSKVV College of Agriculture, Gwalior 474 002, India
[2]Directorate of Research Services, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior 474 002, India

Email: sharad_eco@rediffmail.com

Paper No. 167 Received: June 17, 2013 Accepted: August 21, 2013 Published: November 29, 2013

Abstract

An attempt was made to examine the district wise compound growth rate in APY of soybean in Madhya Pradesh. Study found that among out of 39 districts only twenty two districts having the positive growth and two districts namely tikamgarh and sheopur found negative growth in area, production and yield. Four districts namely jabalpur, narsinghpur, shahdol and hosangabad observed that negative CGR area and production but positive growth in yield. The negative growth in area and production was observed in Jabalpur district which was -16.29 and -15.04 per cent respectively. The maximum positive growth in area and production was observed in Anuppur district but it was examined for six years only therefore maximum positive was noted in district shivpuri which was 9.00 and 10.14 per cent respectively. The substantial improvement in production has been noticed due to concerted efforts on soybean development in the state of Madhya Pradesh as well as in the country, resulting in a positive growth rate in area and production of Soybean.

Highlights

- Study finds that out of 39 districts of Madhya Pradesh , twenty two districts having the positive growth and two districts namely tikamgarh and sheopur found negative growth in APY.

Keywords: Soybean, APY, compound growth rate, constraints

Soybean (*Glycine max*), is known as a 'miracle crop' with over 40% protein and 20% oil, originated in China. As early as in 2853 BC, the Emperor Sheng-Nung of China named it as one of the five sacred grains. Thus, soybean has been cultivated in China for more than 4,000 years (Hymowitz, 1970). It is believed that with the development of sea and land trades, soybean moved out of China to nearby countries such as Burma (Myanmar), Japan, India, Indonesia, Malaysia, Nepal, the Philippines, Thailand, and Vietnam between the first century AD and 1100 AD. However, it remained a minor crop everywhere except in China. With its introduction into USA in the 18th century, and its systematic breeding in that country in the 1940s and 1950s, soybean was transformed from an inefficient fodder type crop to a highly productive erect plant type, and USA became the largest producer of soybean in the world ever since (Hymowitz and Harlan, 1983). 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 USA, Brazil, Argentina, China, India, Paraguay, Canada, Europe and Indonesia. India is one among the largest vegetable oil

economies in the world. Soybean plays a major role in the world food trade. It constitutes about 42% and 56% of area and production respectively of total oilseeds. The current global production of soybean is around 260.92 million MT with USA being the largest producer [FAO stat 2011]. Globally India ranks fifth with an annual production of 12.28 million tonnes from 9.96 million. India ranks 4th in the area and 5th in production of soybean in the world after USA, Brazil, Argentina and China. The contribution of India in world soybean area and production is about 9.6 and 4.7 percent, respectively (Table 1). The phenomenal increase in its area and production together with the expansion in processing units has earned a prominent position for India on the world map of soybean industry. In fact, it proved to be a fortune crop in terms of edible oil production, export earnings and rural prosperity. In recent years, soybean has assumed important position in the country, as it is one of the most stable kharif crops yielding cost effective production under varied agro – climatic conditions unlike other kharif pulses and oilseeds. Though soybean crop was introduced in Madhya Pradesh during the later part of 1960's, its spread in the state has been remarkable. The area under the crop in the state during 2010-11 was 5.53 million hectare and the production was 6.67 million metric tons. During 2010-11, productivity in Andhra Pradesh was (1692 kg/ha) highest and Madhya Pradesh with 1200 kg per hectare yield was at fourth position. Average productivity of India was 1327 kg per hectare. In the recent past, soybean cultivation has increased manifold as compared to any other oilseed crop in India and stands next only to groundnut. Though commercial production of soybean began only in 1971-72, soybean production is mainly confined to Madhya Pradesh (also known as soybean bowl of India), Maharashtra, Rajasthan, Andhra Pradesh and Karnataka. Currently Madhya Pradesh state contributes about 58% and 52 % in total area and production of soybean and is called as 'Soya state'. Importance on this present study was undertaken with the objective to examine the compound growth rate area, production and yield of Soybean in Madhya Pradesh

Research Methodology

The state of Madhya Pradesh consisting 11 Agro-climatic zone *i.e.* Chhattisgarh plains, North hill Zone of Chattishgarh, Satpura Plateau Zone, Central Narmada Valley Zone, Kymore Plateau and Satpura Hill Zone, Jhabua hill zone, Nimar valley zone, Malwa plateau zone, Bundelkhand Zone, Gird Zone and Vindhya Plateau Zone. Malwa plateau agro-climatic zone of the state having maximum area as well as production. There are fifty districts in the state of Madhya Pradesh. Out of 50 Districts, nine districts namely balaghat, katni, mandla, sidhi, umaria, morena, bhind, gwalior and datia have the negligible area of soybean cultivation, therefore the compound growth rate of these districts is not estimated. The area and production of the two newly establish districts namely singrauli and alirajpur is estimated with the districts sidhi and jhabua districts respectively. Hence, thirty nine were estimated the compound growth rates of area, production and productivity of soybean for present study.

The present study is primarily based on the secondary data collected from published sources like *Agricultural Statistics at a Glance*, *Estimates of Area, Production and Yield of Principal Crops*, Department of Agriculture and Cooperation, Government of India, New Delhi and Agricultural Statistics, Department of Farmer Welfare and Agricultural Development, Govt. of Madhya Pradesh etc. The compound growth rates (CGR) of area, production and yield were estimated as follows:

Table 1: Area, Production and Yield of Soybean in major Producing country [2010-11]

Si. No.	Country	Area(M ha)	Production(MT)	Yield (Kg/ha)
1.	United States of America	29.79(28.93)	83.17(31.88)	2792
2.	Brazil	23.97(23.27)	74.81(28.67)	3121
3.	Argentina	18.76(18.22)	48.88(18.73)	2606
4.	China	7.65(7.43)	14.485(5.55)	1893
5.	India	9.95(9.66)	12.28(4.71)	1234
6.	Paraguay	2.80(2.72)	8.31(3.18)	2968
7.	Canada	1.54(1.50)	4.25(1.63)	2760
8.	Others	8.51(8.26)	14.73(5.64)	
	World (Total)	102.99(100.00)	260.92(100.00)	2533

Compound Growth Rate

To achieve the objective district wise compound growth rate of area, production and yield during the period 1992-93 to 2011-12 (Over all period) [1992-93 to 2001-02 (Sub Period-I) 2002-03 to 2011-12 (Sub Period-II)] were worked out by fitting exponential function as given below:

$X_t = ab^t$

$\text{Log } X_t = \text{Log } a + t \log b$

Where,

X_t = Area/production/ yield of soybean crops in the year 't'

t = time element which takes the value 1, 2, 3, ……. n

a = intercept

b = regression coefficient.

Compound growth rates were worked out as follows:

Compound growth rate (r) = (antilog b - 1) x 100

Results and Discussion

Present Scenario of soybean in India

Soybean (*Glycine max* L.) is the most important rainy season oilseed crop grown on Vertisols of the semi-arid tropical region of central India. Soybean cultivation in India was negligible until 1970, but it grew rapidly thereafter, crossing over 12 million t in 2010-11 (Fig. 1). The area under soybean has increased eight folds during 1982–1996, the productivity gap between an achievable potential grain yield of 3 t /ha and the current yield levels of 1 t /ha still remains very wide. Presently, in India, 9.60 M ha area is under soybean, producing about 12.74 MT with the average yield of 1327 kg/ha. In recent years, Soybean are the main oilseed crop grown in the country, the important soybean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Andhra Pradesh, and Karnataka which accounts for more than 98 per cent of the cultivated area under soybean in the country (Table 2).

Table 2: Area, Production and Yield of Soybean in major Producing States [2010-11]

Name of the State	Area (M ha)	Production (MT)	Yield (Kg./ ha)
Madhya Pradesh	5.53 (57.92)	6.67 (52.35)	1200
Maharashtra	2.73(28.44)	4.32(33.91)	1582
Rajasthan	0.77 (8.02)	1.12(8.79)	1455
Andhra Pradesh	0.13 (1.35)	0.22 (1.73)	1692
Karnataka	0.17 (1.77)	0.15 (1.18)	882
Others	0.24 (2.50)	0.26 (2.04)	-
All India	9.60(100.00)	12.74(100.00)	1327

Figure on the parentheses of the percentage of total

District wise growth performance of the state

The district wise compound growth rates of area, production and productivity of soybean were estimated and presented in Table 3. It is revealed from the table 3

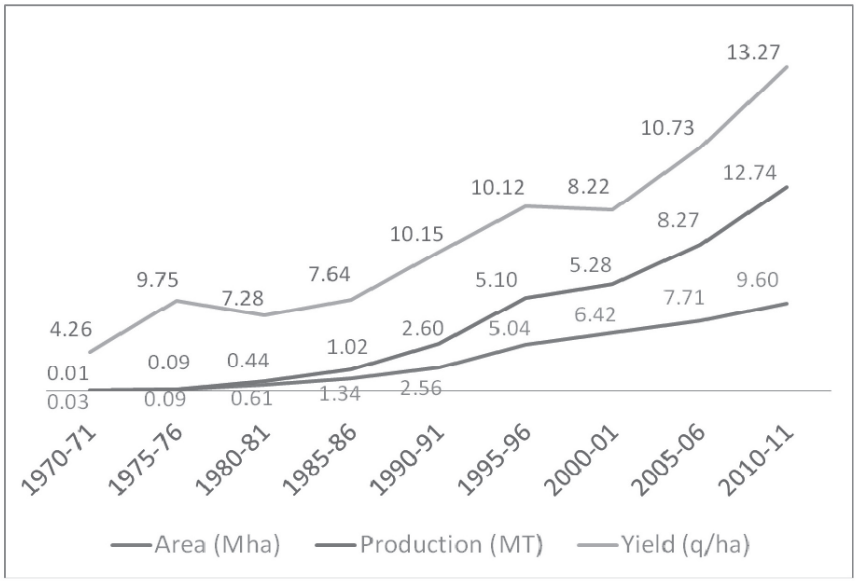

Fig. 1: Trends in Area, Production and Yield of Soybean in India [2010-11]

Table 3: District wise compound growth rate of soybean in Madhya Pradesh [1992-93 to 2011-12]

Si.No.	Districts	1992-93 to 2001-02 (Period-I)			2002-03 to 2011-12 (Period-II)			1992-93 to 2011-12(Over all period)		
		A	P	Y	A	P	Y	A	P	Y
1.	Jabalpur	-8.99	-10.06	-0.91	40.22	40.21	7.26	-16.29	-15.04	0.73
2.	Chhindwada	-4.47	-10.84	-3.94	5.84	14.97	7.82	1.79	3.96	3.25
3.	Seoni	-3.30	-5.65	-2.30	6.57	7.93	1.28	1.53	2.68	0.99
4.	Narsinghpur	3.69	3.41	-0.23	3.69	6.61	2.82	-1.86	-0.31	1.54
5.	Sagar	7.90	5.94	2.42	9.17	15.20	5.52	6.44	7.47	3.28
6.	Damoh	3.49	4.07	-3.58	11.30	19.62	4.60	0.36	4.65	1.99
7.	Panna	8.03	2.25	-5.49	55.84	63.29	5.48	4.27	3.84	-0.53
8.	Tikamgarh	-6.47	-1.50	-4.49	3.40	5.47	2.02	-5.76	-5.28	-2.41
9.	Chhatarpur	8.80	-9.80	-5.99	10.88	13.61	2.43	2.67	-2.71	-2.07
10.	Rewa	3.10	0.31	-2.74	13.21	15.39	1.97	1.55	1.05	-0.51
11.	Satna	-1.59	-4.76	-4.15	24.80	27.05	1.68	1.54	0.41	-1.33
12.	Shahdol	2.11	-0.23	-2.30	14.97	19.41	4.24	-1.94	-1.74	0.01
13.	Indore	1.72	2.30	0.93	0.73	3.85	3.62	1.01	1.69	1.39
14.	Dhar	3.00	1.72	-1.33	1.98	6.74	4.67	1.37	3.90	2.37
15.	Jhabua	7.56	1.25	-6.14	10.80	12.75	1.63	4.51	4.57	-0.35
16.	Khargone	9.68	1.66	-6.09	-0.69	-1.16	-0.44	4.23	4.20	0.52
17.	Khandwa	18.93	14.74	-5.96	0.79	3.07	2.69	6.49	7.48	-0.16
18.	Ujjain	2.55	-0.84	13.91	0.14	10.62	8.65	0.57	2.38	5.64
19.	Mandsaur	3.67	2.15	-1.60	3.91	10.28	5.68	2.31	1.23	-0.63
20.	Ratlam	3.24	1.22	-1.46	2.84	9.53	6.51	1.82	1.49	-0.14
21.	Dewas	5.23	9.05	3.31	2.78	3.26	0.47	2.67	4.08	1.26
22.	Shajapur	4.22	3.19	-1.90	1.46	7.38	5.83	1.92	2.40	0.13
23.	Shivpuri	17.20	18.63	1.06	6.87	16.32	8.84	9.00	10.14	1.15
24.	Guna	6.31	8.71	1.27	4.88	14.29	8.97	3.84	6.25	1.95
25.	Bhopal	5.06	4.85	1.00	3.80	7.72	3.78	3.36	5.15	2.16
26.	Sehore	3.50	5.51	2.43	2.03	7.16	5.01	2.18	4.78	2.73
27.	Raisen	4.88	5.70	-0.27	12.03	13.23	1.08	2.42	3.07	0.24
28.	Vidisa	10.51	11.48	19.33	11.18	16.10	4.42	7.53	9.28	6.28
29.	Betul	0.41	-2.59	-3.36	4.98	11.14	7.06	1.61	4.22	2.80
30.	Rajgarh	5.66	8.22	0.03	2.00	6.93	4.83	3.08	5.37	1.59
31.	Hosangabad	-1.01	-1.12	0.35	0.98	4.96	3.94	-1.02	-0.70	0.49
32.	Dindori*	0.00	0.00	0.00	8.23	7.46	-0.73	5.85	4.54	-1.24
33.	Badwani*	0.00	0.00	0.00	3.69	-0.87	-0.45	1.50	0.47	1.30
34.	Neemach*	0.00	0.00	0.00	2.49	6.93	4.33	1.61	2.92	1.29
35.	Sheopur*	0.00	0.00	0.00	0.55	-2.47	-2.94	-7.35	-7.58	-0.24
36.	Harda*	0.00	0.00	0.00	4.10	10.01	5.67	2.71	6.73	3.92
37.	Burhanpur**	0.00	0.00	0.00	3.29	2.95	-0.30	3.29	2.95	-0.30
38.	Ashoknagar**	0.00	0.00	0.00	2.92	6.38	3.88	2.92	6.38	3.88
39.	Anuppur**	0.00	0.00	0.00	10.62	9.67	-0.44	10.62	9.67	-0.44
	Madhya Pradesh	4.63	3.81	-0.78	3.80	8.73	4.75	2.53	3.62	1.06

* CGR from fourteen years [1998-99 to 2011-12] for over all period because these districts was established in the year 1998.
** CGR from six years only (2003-04 to 2011-12) because these districts established in the year 2003 due to this reason the CGR for the Period II and overall period are same.

that among out of 39 districts only twenty two districts having the positive growth and two districts namely tikamgarh and sheopur found negative growth in area, production and yield during overall period. Four districts namely jabalpur, narsinghpur, shahdol and hosangabad observed that negative CGR area and production but positive growth in yield. The negative growth in area and production was observed in Jabalpur district which was -16.29 and -15.04 per cent respectively. The maximum positive growth in area and production was observed in Anuppur district but it was examined for six years only therefore maximum positive was noted in shivpuri district which was 9.00 and

10.14 per cent respectively. In overall, Out of 39 districts only six districts found negative growth in area and production of the state. Madhya Pradesh found positive growth in area production and yield. The substantial improvement in production has been noticed due to concerted efforts on soybean development in the state of Madhya Pradesh as well as in the country, resulting in a positive growth rate in area and production of Soybean. Similar study was also conducted by Srivastava *et.al.*, (2003 and 2012)

There are several biophysical, technical, and socioeconomic constraints that limit the productivity of soybean which need to be mitigated before any increase in productivity is realized. Dupare *et. al.*, (2010) found that the major problems faced by farmers in Madhya Pradesh in order of priority are the non-availability of quality seed of improved soybean varieties in quantities required by them, adequate guidance on integrated management of biotic stresses from concerned extension agencies, particularly management of insect-pests, non-availability of recommended agro-chemicals at the times of need and non-effective transmission of existing governmental support in agriculture. Farmers were also not satisfied with the existing disposal systems of their produce as the disposal points are at distant places and are a cumbersome. They were little less concerned over other issues like effect of global climatic change on monsoon on set, quantum and distribution, and infrastructural development supporting agriculture. Singh *et. al* (2009) found that the constraints found in procurement and processing in soybean were delay in cash payment, undeveloped means of transportation, lack of storage facilities, forced sale, lack of market information, inadequate financial facilities, poor weighing facilities, untimely supply of bags and inputs, unavailability of raw materials and lack of electricity are major constraints. Resolving the issues mentioned will facilitate farmers to take up production technology in a more effective manner and might ultimately lead to increase in productivity of soybean in the state as well as in India.

Conclusion

It is concluded that the soybean, which play important role in total oilseed production for food and nutritional security of the growing population in state of Madhya Pradesh as well as in India. Study also revealed that subsequent to the introduction of soybean in the state, the farmers have not only been able to point out the constraints/ problems faced by them but have also acquired better grip on cultivation practices for this crop. They were concerned over sustaining their productivity and inquisitive on abridging the gap in knowledge through interaction with scientists and extension personals. More concerned over effect of global climatic change on monsoon on set, quantum and distribution, and infrastructural development supporting agriculture at farmers levels. Efforts should be made in minor soybean producing districts in the state to encourage and identify the specific constraints and efficient execution of soybean development schemes to provide favourable conditions for soybean to increase in APY in these districts.

Future challenges

The average yield of soybean in state is about 1.2 t /ha, compared with 1.7 t /ha in other state. The average yield of soybean in the country [1.3 t /ha], which is comparatively low to other country like USA, Brazil, Argentina, Canada, Paraguay and China compared with 1.8 t /ha to 3.1 t /ha. Therefore, the greatest challenge for scientists and development programs is to increase the average yield of soybean. This would mean doubling of the production to about 12 million t from the same 9 million ha cultivated area. The other challenges include exploitation of biotechnological innovations in crop management using herbicide-tolerant soybeans and diversification of soybean uses through the development of high-value and health-oriented food products.

Acknowledgement

This paper is the part of Ph.D. research of the first author.

References

Agricultural Statistics at a Glance, 2012. Directorate of Economics & Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, GOI, New Delhi. http://www.agricoop.nic.in

Agricultural Statistics, Department of Farmer Welfare and Agricultural Development, Govt. of Madhya Pradesh, http://www.mpkrishi.org.in

Dupare B. U., Billore S. D. and Joshi O. P. 2010. Farmers' Problems Associated with Cultivation of Soybean in Madhya Pradesh, India. *Journal of Agricultural Science and Technology* **4(**6):71-78.

Hymowitz, T. 1970. On domestication of soybean. *Economic Botany* 24:408–421.

Hymowitz, T. and Harlan, J.R. 1983. Introduction of soybeans to North America by Samuel Bowen in 1765. *Economic Botany* 37:371–379.

FAO (Food and Agriculture Organization of the United Nations) STAT. 2011. http://www.fao.org

Singh, H.P., Singh, Rakesh, Jain, M.K. and Singh, O.P. 2009. Coperrative and regulated marketing of soybean in Madhya Pradesh-A comparative Study. *Indian Journal of Agricultural Marketing* 23(2): 125-136.

Srivastava, S.C., Sharma, U.C., Singh, B.K. and Yadava, H.S. 2012. A profile of Garlic production in India: Facts, trends and opportunities. *International Journal of Agriculture Environment and Biotechnology* **5**(4): 407-412.

Srivastava, S. C., Sen, Chandra and Reddy, A.R. 2003. An Analysis of Growth of Pulses in Eastern Uttar Pradesh. *Agricultural Situation in India* **49** (22):771-775.

