

Growth and instability in area, production and productivity of fenugreek in Rajasthan

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Abstract

A study was done to find out the compound growth rates and instability in area, production and productivity of fenugreek crop in selected districts and for the state as a whole for the period I (1991-92 to 2000-01), period II (2001-02 to 2010-11) and overall period (1991-92 to 2010-11). Growth rates of area and production in fenugreek was observed positive and significant in Kota and Jhunjhunu districts of period I and overall period. Growth rates of production in fenugreek was found negative in Sikar district during period I and in Kota and Sikar districts during period II due to negative growth in area of fenugreek seed spice. Growth rate of productivity in fenugreek was recorded positive and significant only in Kota district during all three periods. The magnitude of instability in production of fenugreek crop was higher compared to area and productivity in the selected districts as well as in the state as a whole except Jhunjhunu district during period I and in Kota district during period II and overall period (in all the three measures) where the variation in area was more. It implied that the destabilizing effect was more on production than that of area and productivity of fenugreek.

Key Words: fenugreek, growth, instability, production

Introduction

India is known as the "Home of Spices" and produces a large variety and quantity of spices. About sixty-three spices are grown in the country, which includes pepper (King of Spices), cardamom (Queen of Spices), chillies, ginger, turmeric, coriander, cumin, fenugreek and many others. The spices production in India is 5744 thousand MT from an area of about 3070 thousand hectares in the year 2012-13. Major growing belt of seed spices are spread from arid to semi-arid region covering large area of Rajasthan, Gujarat and parts of Madhya Pradesh. Among these states, Rajasthan and Gujarat have emerged as "Seed Spice Bowl of India" together contributing around 30 per cent of the total seed spices produced in the country. In Rajasthan, area under seed spices was 720.6 thousand hectares and production was 860.9 thousand MT and in Gujarat, area under seed spices was 551.7 thousand hectares and production was 882.1 thousand MT in the year 2012-13.

India is the largest producer of fenugreek in the world. Total fenugreek production in India was 113 thousand MT in the year 2012-13 (Indian Horticulture Database-2012-13, National Horticulture Board, Govt. of India, 5). In India, the major fenugreek producing states where fenugreek is grown on commercial scale are Rajasthan,

Gujarat, Uttarakhand, Uttar Pradesh, Madhya Pradesh, Maharashtra, Haryana and Punjab. Among these states, Rajasthan is the major producer of fenugreek which annually contributes more than 77.33 per cent (87.38 thousand MT) of the total fenugreek output of India in the year 2012-13. During April to September 2013, India has exported around 26622 tonnes of fenugreek valued to of Rs. 10488.12 lakhs (Annual report, 2012-13, Spice Board of India, Cochin, 1). Fenugreek ranked third position among the major seed spices in Rajasthan which accounted for 10.64 % of the total area and 12.66 % of total production of seed spices in the state during 2010-11. Sikar, Kota and Jhunjhunu are the major fenugreek producing districts in Rajasthan which together accounted for 34.14 % of area and 37.02 % of the total production of fenugreek in the state of Rajasthan.

Thus, it is worthwhile to study the past behavior of changes in the area, production and productivity of fenugreek. It helps in planning future strategies and policy decision to stabilize growth under the situation of instability. It also helps to compare actual current performance of fenugreek with the expected ones (on the basis of the past performance) and analyse the causes of such variations, if any.

Materials and methods

The study is based on secondary data on area, production and productivity of fenugreek. To analyse the growth and instability in area, production and productivity of fenugreek in Rajasthan, district wise data were collected for the period from 1991-92 to 2010-11.

Three districts viz. Sikar, Kota and Jhunjhunu were selected on the basis of highest average production of five years i.e. 2006-07 to 2010-11. To estimate the trends of growth in area, production and productivity of fenugreek crop in the state and major producing districts of the state, exponential function of the form $Y_t = ab^t \cdot U_t$ was used. Where Y_t is area/production/productivity of fenugreek in time period t , t is time element that takes the values 1, 2, 3, n, a and b are parameters to be estimated, and U_t is the error term and $b = (1 + r)$, where 'r' is compound growth rate. The logarithmic transformation of above equation we get $\text{Log } Y_t = \log a + t \log (1 + r) + \log U_t$. The compound growth rate was obtained as $r = [(\text{Antilog of } b) - 1] \times 100$. Student's 't' test was used to test the significance of the estimated compound growth rates.

The instability in area, production and productivity of fenugreek in the state and major producing districts of the state for the period of 20 years i.e. from 1991-92 to 2010-11 was worked out through three measures (Purbia, 7). (a) Instability index 1 (I_1) =

$$\frac{SD}{AM} \times 100, \text{ where } SD \text{ and } AM \text{ are standard deviation}$$

and arithmetic mean of area, production and productivity of the crop, respectively, for specified period; (b)

$$\text{Instability index 2 } (I_2) = \frac{SD^*}{AM^*} \times 100, \text{ where } SD^* \text{ and } MD^*$$

are standard deviation and arithmetic mean of detrended area, production and productivity of the crop, respectively, for specified period. Detrended values were worked out by assuming multiplicative model of the form of $Y_{dt} = TSCR/T$, where Y_{dt} is detrended value of area, production and productivity, T is trend, S is seasonal variation, C is cyclical variation and R is random variation; and (c) Instability index 3 (I_3) = $CV_{\sqrt{(1-R^2)}}$, where CV is coefficient of variance of area, production and productivity of the crop and R^2 is coefficient of multiple determination of the trend equation for original time series data on area, production and productivity.

Results and discussion

Compound growth rate

The compound growth rates of area, production and productivity of fenugreek crop in selected districts and for the state as a whole for the period I (1991-92 to 2000-01), period II (2001-02 to 2010-11) and overall period (1991-92 to 2010-11) were worked out and depicted in Table 1 and growth trends are shown in Fig.1, 2, 3 and 4. There has been no significant growth in area, production and productivity of fenugreek crop in Sikar district and state as a whole during period I, period II and overall period except production in the state during period I, which was observed a positive and significant growth of 5.06 per cent per annum. Production of fenugreek crop increased significantly in Kota (64.50 %) and Jhunjhunu (36.22 %) districts, which was due to positive and significant growth in area by 54.09 % and 41.18 % per annum, respectively. In Rajasthan state, positive and significant growth in production was recorded during period I (5.06 %) due to positive growth in area (2.81 %) and productivity (2.19 %). During overall period, there were positive and significant growth rates in production of fenugreek in Kota (25.82 %) and Jhunjhunu (17.41 %) districts which were due to positive and significant growth in area by 20.40 % and 17.62 % per annum in these districts, respectively. Negative growth rates in production of fenugreek was observed in Sikar district (-8.53 %) during period I due to negative growth in area by (-) 13.38 % per annum. During the period II, in Sikar district (-7.55 %), Kota district (-3.29 %) and in Rajasthan state (-0.01 %) have negative growth rates in fenugreek production. Production of fenugreek in Sikar district decreased mainly due to decrease in both area as well as productivity, in the Kota district it decreased due to decrease in area and in the state it decreased due to decrease in productivity. Similar results were observed for coriander by Kumawat and Meena (6) and Chaudhary (4).

Instability in area of fenugreek in selected districts of Rajasthan

The instability estimated through different measures in area of fenugreek in the major producing districts of the state and for the Rajasthan state as a whole is given in Table 2. Kota district had highest instability as 146.87, 111.58 and 104.48 per cent during period I, 98.35, 81.54 and 87.52 per cent during period II and 130.37, 134.89 and 122.16 per cent during overall period by all the three measures of instability in area. The lowest instability was

Table 1: Compound growth rate of area, production and productivity for fenugreek crop
(Per cent per annum)

Districts	Period I			Period II			Overall period		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Sikar	-13.38	-8.53	5.60	-1.67	-7.55	-5.98	2.91	1.16	-1.70
Kota	54.09*	64.50*	6.76*	-6.92	-3.29	3.90**	20.40*	25.82*	4.50*
Jhunjhunu	41.19*	36.22*	-3.52	6.72	11.14	4.14	17.62*	17.41*	-0.17
Rajasthan	2.81	5.06*	2.19	0.44	-0.01	-0.45	4.78	5.20	0.40

*Significant at 1per cent level of significance

** Significant at 5 per cent level of significance

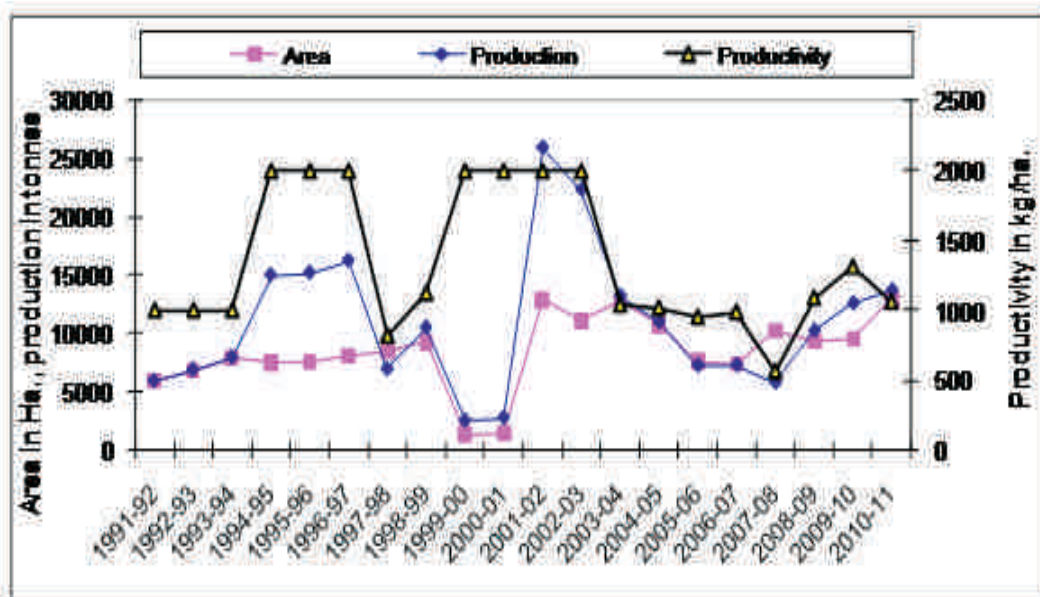


Fig 1: Trend in area, production and productivity under fenugreek over time in Sikar district

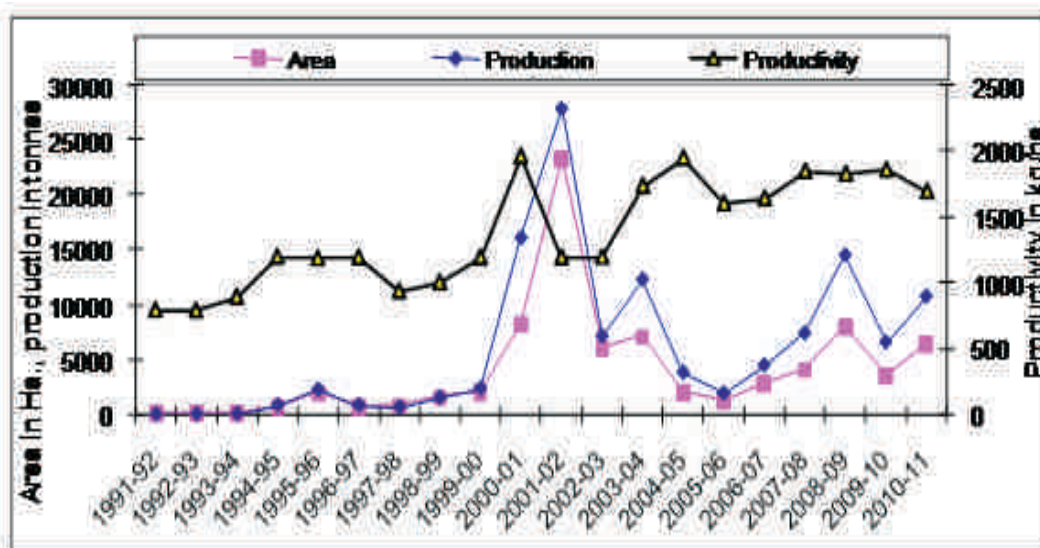


Fig 2: Trend in area, production and productivity under fenugreek over time in Kota district

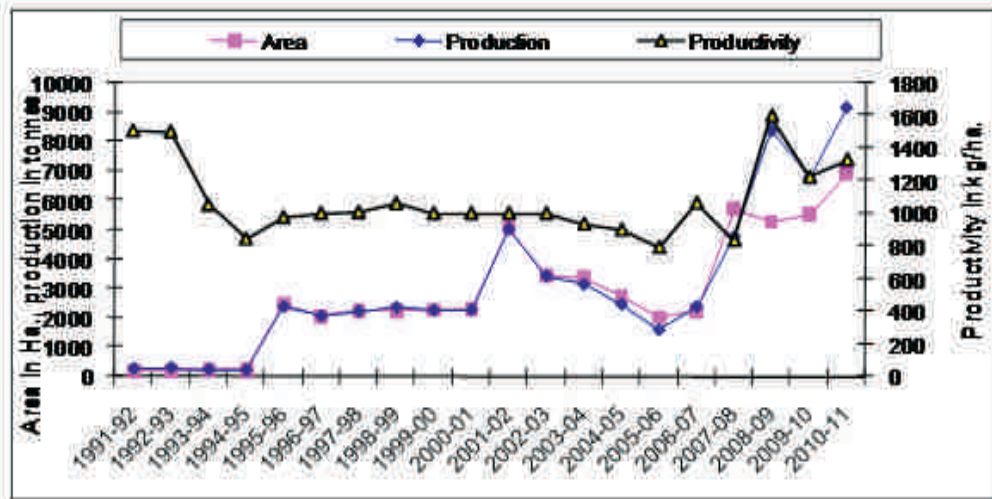


Fig 3: Trend in area, production and productivity under fenugreek over time in Jhunjhunu district

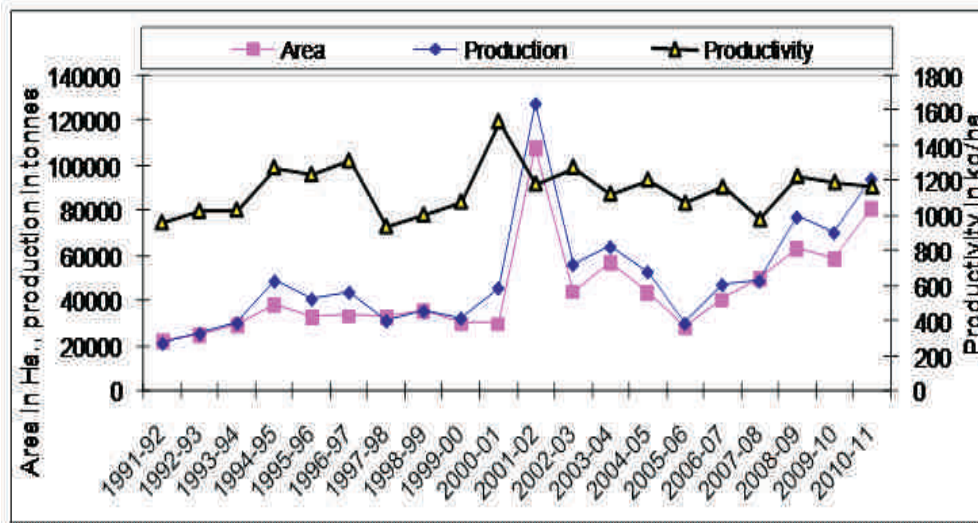


Fig 4: Trend in area, production and productivity under fenugreek over time in Rajasthan

found in Sikar district with 44.18, 47.75 and 38.46 per cent during period I, 19.47, 19.09 and 18.77 per cent during period II and 37.56, 33.93 and 33.97 per cent instability during overall period, with respect to I_1 , I_2 and I_3 measures, respectively. The instability in area under a crop is mainly governed by the profitability of the competing crops grown in that area. Similar results were observed by Chand and Raju (3) in Andhra Pradesh.

Instability in production of fenugreek in selected districts of Rajasthan

The instability estimated through different measures in production of fenugreek in the major producing districts of the state and for the Rajasthan state as a whole are given in Table 3. In case of production instability, Kota district was at the top level with 191.12, 161.09 and 148.54 per cent instability during period I, 76.77, 65.71 and 72.55 per

cent instability during period II and 116.64, 120.77 and 103.08 per cent instability during overall period with respect to I_1 , I_2 and I_3 measures of instability, respectively. During period I, Sikar district had low instability with 56.10 per cent in context of measure I_1 and Jhunjhunu district shown low instability with 52.58 per cent and 37.39 per cent with respect to I_2 and I_3 measures, respectively. The magnitude of instability in production of fenugreek was lower in Sikar district with 50.57, 45.32 and 40.99 per cent with respect to I_1 , I_2 and I_3 measures, respectively during period II. Instability analysis in the overall period revealed that Sikar district had lowest instability with 55.03 and 54.99 per cent in I_1 and I_2 measures, respectively, while Jhunjhunu district had lowest instability with 48.32 per cent in context with I_3 measure. Similar results were observed for cotton by Awaghad *et al.* (2).

Table 2: Instability in area of fenugreek in selected districts of Rajasthan
(In per cent)

Districts	Instability measures								
	Period I			Period II			Overall period		
	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃
Sikar	44.18	47.75	38.46	19.47	19.09	18.77	37.56	33.93	33.97
Kota	146.87	111.58	104.48	98.35	81.54	87.52	130.37	134.89	122.16
Jhunjhunu	73.02	54.21	39.43	39.65	37.08	33.10	69.70	43.88	36.62
Rajasthan	15.69	14.32	13.93	39.93	39.28	39.85	47.87	29.91	39.36

Table 3: Instability in production of fenugreek in selected districts of Rajasthan
(In per cent)

Districts	Instability measures								
	Period I			Period II			Overall period		
	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃
Sikar	56.10	55.87	54.30	50.57	45.32	40.99	55.03	54.99	54.83
Kota	191.12	161.09	148.54	76.77	65.71	72.55	116.64	120.77	103.08
Jhunjhunu	70.79	52.58	37.39	55.66	53.93	41.76	82.86	81.77	48.32
Rajasthan	25.63	23.13	22.24	41.61	40.75	41.45	50.45	40.38	41.75

Measures of instability in productivity of fenugreek in selected districts of Rajasthan

The instability estimated through different measures in productivity of fenugreek in the major producing districts of the state and for the Rajasthan state as a whole are given in Table 4. In the case of productivity of fenugreek, Sikar district was observed highest instability in Rajasthan which was 36.03, 31.98 and 32.27 per cent during period I, 38.24, 31.75 and 31.33 per cent during period II and 37.82, 35.60 and 36.45 per cent during overall period by all the measures of instability. Where as in Jhunjhunu district, it was lowest with 20.38, 15.03 and

16.06 per cent, respectively during period I. While during period II, Kota district was observed lowest instability with 15.89, 12.90 and 12.10 per cent, respectively with respect to I₁, I₂ and I₃ measures of instability. During overall period, Kota district had lowest instability with 16.22 and 15.90 per cent instability for I₂ and I₃ measures, respectively, while Jhunjhunu district showed lowest instability i.e. 21.32 per cent in context of I₁ measure.

Table 4: Instability in productivity of fenugreek in selected districts of Rajasthan
(In per cent)

Districts	Instability measures								
	Period I			Period II			Overall period		
	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃	I ₁	I ₂	I ₃
Sikar	36.03	31.98	32.27	38.24	31.75	31.33	37.82	35.60	36.45
Kota	30.28	18.18	21.41	15.89	12.90	12.10	29.12	16.22	15.90
Jhunjhunu	20.38	15.03	16.06	23.32	18.33	18.97	21.32	21.31	21.30
Rajasthan	16.89	14.62	15.27	7.22	7.11	7.09	12.60	12.50	12.42

Conclusion and recommendations

1. The growth rates of area and production were positive and significant in Kota and Jhunjhunu districts during the study period. It indicates positive impact of production technology and policy measures for fenugreek production in the selected districts.
2. The growth rates in fenugreek productivity was found negative in Sikar and Jhunjhunu districts during overall study period indicated that there is need to improve its productivity by developing production technology, suitable improved varieties and policy based factors.
3. The decline in the area and production growth of fenugreek crop in Sikar and Kota districts during period II was attributed to high prices of competing crop (linseed) as compared to prices of fenugreek crop.
4. Kota district was found highly unstable district in area and production whereas Sikar district was found unstable in productivity for fenugreek.
5. Area under fenugreek should be stabilized through crop insurance scheme to protect the producers from fluctuations in net returns.
6. Larger spread of high yielding varieties, expansion of irrigation facilities, development of crop varieties resistant to insects and pests and technologies to mitigate effect of weather on yield, may help in reducing variability in area, production and productivity of fenugreek in the unstable districts of Rajasthan.

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