



GROWTH RATES OF AREA, PRODUCTION, PRODUCTIVITY OF CHILLIES - A STATE - WISE ANALYSIS

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ABSTRACT

India has recorded an export compound annual growth rate of 12.74 per cent. The compound growth rate of area was 0.15 per cent over the 40 years period. But production growth was 2.94 per cent, which was more driven by productivity growth 2.71 per cent. In the overall period of 1960-62 to 2007-08 the growth in area was more or less stabilized with only Gujarat state recording a negative growth rate of 5.78 per cent. Rajasthan in the recent decade of 2001-02 to 2007-08, stood out as the highest achiever of production growth of 7.58 per cent. It was Andhra Pradesh which recorded the highest growth of 4.98 per cent during the period of 1961-62 to 2007-08 in production. In Andhra Pradesh, the compound growth rate of area was 1.07 per cent, while that of production and productivity were 5.69 and 4.47 per cent respectively.

KEY WORDS: Area, Chillies, Export, Production, Productivity

INTRODUCTION

India is the leading producer of chilli contributing close to 43 per cent of world's production followed by China (8.6 per cent) and Peru (5.6 per cent). Besides India, other major producers and exporters are China, Pakistan, Morocco, Mexico and Turkey. This shows that the bulk share of chilli production is in Asian countries, though it is produced throughout the world. The top 10 chilli producing countries, India, China, Ethiopia, Myanmar, Mexico, Vietnam, Peru, Pakistan, Ghana and Bangladesh accounted for more than 85 per cent of the world's production in 2009. With an estimated global production of 29.6 lakh tonnes in 2009, chilli is grown in an area of approximately 18.3 lakh hectares. Against this background the present study has been taken up to estimate growth rates of area, production and productivity in the country as well as in Andhra Pradesh along with the growth rate in chilli exports.

MATERIAL AND METHODS

For evaluating the trend in area, production and productivity under chillies, the following growth model was employed.

$$Y_t = ab^t u_t \dots \dots \dots (1)$$

where,

Y_t = area/production/productivity in the year 't'

a = intercept indicating Y in the base period (t = 0)

b = Regression coefficient

t = Time period in years

u_t = Disturbance term for the year 't'.

Equation (1) was converted into the logarithmic form in order to facilitate the use of linear regression. Taking logarithm on both sides of the equation (1).

$$\ln Y = \ln a + t \ln b + \ln U_t \dots \dots \dots (2)$$

This is of the following form,

$$Q_t = A + B_t + e_t$$

where,

$$Q_t = \ln Y_t$$

$$A = \ln a$$

$$B = \ln b$$

$$e_t = \ln e_t$$

The linear regression of the above form was fitted separately for area, production and productivity of Chillies.

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The values of 'a' and 'b' were estimated by using ordinary least squares technique. Later, the original 'a' and 'b' parameters in equation (1) were obtained by taking antilogarithms of 'a' and 'b' values as,

$$a = \text{Anti A}$$

$$b = \text{Anti B}$$

Average annual compound rate was calculated as

$$g = b - 1$$

To obtain percentage compound growth rate, the value of g was multiplied by 100.

RESULTS AND DISCUSSION

India is the largest producer, consumer and exporter of chillies in the world. The global area which was 18.81 lakh ha in 2000 slipped slightly to 18.30 lakh ha in 2009 (Table 1). However, the global production increased from 23.87 lakh tonnes to 29.6 lakh tonnes during the corresponding period. This is due to increase in productivity from 1.27 tonnes / ha in the year 2000 to 1.62 tonnes/ha in 2009. The CAGR during the period was estimated at -3.15, -1.33 and 1.02 per cent for area, production and productivity respectively.

Table 1. Global area and production of chilli (2000-2009)

Years	Area (lakh ha)	Production (lakh tonnes)	Productivity (tonnes / ha)
2000	18.81	23.87	1.27
2001	19.06	24.32	1.28
2002	18.83	22.92	1.22
2003	18.32	26.41	1.44
2004	17.97	26.31	1.46
2005	17.42	26.25	1.51
2006	15.81	21.48	1.36
2007	15.18	20.98	1.38
2008	18.30	29.60	1.62
CAGR (%)	-3.15	-1.33	1.02

Source: FAO

Area, production and productivity of chilli in India

The area under chilli in the country in the last 40 years ranged from 7.83 lakh ha in 1971-72 to 8.29 lakh ha in 2003 (Table 2). There after there is a fall in the area till 2006-07 and in 2008-09 the area rose to 8.06 lakh ha. In 2009-10 the area under the crop was 7.67 lakh ha. The

Table 2. Area, production and productivity of chilli in India (1970-71 to 2009-10)

Year	Area (lakh.ha)	Production (lakh.tonnes)	Productivity (Kg/ha)
1970-71	7.83	5.20	664
1980-81	8.35	5.09	610
1990-91	8.16	7.19	881
2000-01	8.37	9.84	1,176
2001-02	8.80	10.69	1,215
2002-03	8.29	8.97	1,082
2003-04	7.74	12.36	1,596
2004-05	7.38	11.86	1,607
2005-06	6.54	10.15	1,551
2006-07	7.58	12.34	1,628
2007-08	8.06	12.97	1,611
2008-09	7.50	13.0	1,550
2009-10	7.67	13.2	1,600
CAGR%	0.15	2.93	2.71

Source: Ministry of Agriculture

production had substantially increased from a minimum of 5.20 lakh tonnes in 1970-71 to a maximum of 12.03 lakh tonnes in 2009-10, which was more than double and it was piloted by the yield increase. It is also evident as yield too increased from 664 kg/ha in 1971 to 1,600 kg/ha in 2010. The steady increase in productivity was on account of hybrids viz., Birds eye chilli (Dhani), Byadagi (Kaddi), Ellachipur (Sannam S4 type), etc. The compound growth rate of area was 0.15 per cent over the 40 years period. But production growth was 2.94 per cent, which was more driven by productivity growth of 2.71 per cent.

Area, Production and Productivity of Chilli in major Producing States of India

Andhra Pradesh occupied about 1/4th of the total area under chillies in the country contributing 57 per cent of production (Table 3) during the triennium ending 2009-10, Karnataka was the next state in terms of area with 14 per cent followed by Maharashtra. The three states found to cultivate more than 50 per cent of the area. Orissa, Gujarat, West Bengal and Tamil Nadu were the other important states.

The productivity was highest in Andhra Pradesh with 3,462 kgs and no other state in the country could achieve even 50 per cent Andhra Pradesh's productivity. The nearest productivity that was traced was 1,502 kg attained by West

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Bengal. The productivity was 1330 kg in Rajasthan, 1,140 in Karnataka and 1,040 in Madhya Pradesh.

State-wise Annual Growth Rates of Area under chillies

Orissa recorded the highest growth of 13.25 per cent in the decadal period of 1961-62 to 1970-71 compared to any other state (Table 4). In the same decade, it is Andhra Pradesh which recorded the next highest compound annual growth rate of 5.24 per cent. In the following decade of 1971-72 to 80-81, it is West Bengal which was the forerunner in achieving the area growth of 14.39 per cent. In the decades to follow i.e., 1981-82 to 1990-91 and 1991-92 to 2000-2001, it is once again, West Bengal which stood out as the highest growth achiever of area with a CAGR of 8.68 per cent and 2.27 per cent respectively. In the overall period of 1961-62 to 2007-08, the growth in area was more or less stabilized with only Gujarat state recording a negative growth rate of 5.78 per cent.

State-wise annual growth rates of production of dry chillies

Regarding production growth, Orissa recorded highest CAGR of 19.04 per cent during the period from 1961-62 to 1970-71, while it was West Bengal in second decadal period of 1971-72 to 1980-81 with a growth rate of 12.75 per cent (Table 5). During 1981-82 to 1990-91 it was Andhra Pradesh with 8.89 per cent and Karnataka in the following decade of 1991-92 to 2000-01 with a CAGR of 11.39 per cent. Rajasthan in the recent decade of 2001-02 to 2007-08 stood out as the top achiever of production growth of 7.58 per cent. During the overall period of 1961-62 to 2007-08 highest growth of 4.98 was achieved by Andhra Pradesh with productivity being the most powerful causative factor.

Area, production and productivity of chilli in Andhra Pradesh

The particulars furnished in Table 6. Indicate that the chilli area in Andhra Pradesh hovered around 2 lakh hectares during the period from 1971-72 to 2009-10 barring the years 1980-81 and 2005-06. On the other hand, the production rose phenomenally from 1,38,730 tonnes in 1971-72 to 8,31,000 tonnes in 2009-10, a productivity induced rise as it spiraled from less than a tonne to about 4 tonnes during the corresponding period. The emergence of hybrids and intensive cultivation, for which the state

is known were the prime factors for such a spectacular growth in productivity.

In Andhra Pradesh, the compound growth rate of area was 1.07 per cent, while that of production and productivity were 5.69 and 4.47 per cent respectively. This amply demonstrates productivity was the more powerful factor for the increased production. Similar findings were reported by Goudra *et al.* (2011)

India's chilli exports

After 1980s India's export performance was excellent and higher international and domestic demand can further push the exports. India exports chilli in the different processed forms like chilli powder, dried chillies, pickled chillies etc. Indian chillies are mostly exported to Sri Lanka, USA, Nepal, Mexico, Malaysia and Bangladesh. Among these countries, Malaysia, Sri Lanka and Bangladesh are the major importers of Indian chillies.

The total export of chilli from India during 1999-00 was 63,591 tonnes valued at ₹ 254.72 crore which increased to 2, 40,000 tonnes valued at ₹ 1535.54 crore during 2010-11 (Table 7). Over the years, exports were increasing at a faster rate, which is evident from high compound growth rates of 14.47 per cent in quantity and 20.90 per cent by value.

Exports of chilli to different countries

Though, almost all items in the spice basket have registered a growth during the past five years, the phenomenal rise in chilli has led boom to exports from India.

Asian countries are the main buyers of chillies and consumption is increasing in these countries with the rising population. Chillies have notched up substantial increase in volume in 2010-11 against the previous year. The exports stood at 2, 40,000 tonnes in 2010-11 against 2, 04,000 in 2009-10 (Table 8). As can be observed that exports during 2009-10 and 2010-11 to the major exporting countries i.e. Malaysia and Srilanka are more or less stable, but the floods in China, Pakistan and Bangladesh have sparked exports to increase in 2010-11 to these countries compared to the previous year. Generally if China's chilli production is good, it stands as a strong competitor to India in terms of exports.

Table 3. Area, production and productivity of chilli in major producing states in India (Triennium ending 2009-10)

States/UTs	Area (lakh.ha)	Per cent total	Production (lakh.tonnes)	Per cent to total	Productivity (kg/ha)
Andhra Pradesh	2.03	26	7.72	57	3,462
Karnataka	1.13	14	1.55	12	1,140
West Bengal	0.56	7	0.93	7	1,502
Orissa	0.76	9	0.63	5	840
Madhya Pradesh	0.45	6	0.44	3	1,040
Maharashtra	0.99	12	0.44	3	440
Tamil Nadu	0.59	7	0.34	3	506
Rajasthan	0.18	2	0.27	2	1,330
Uttar Pradesh	0.16	2	0.15	1	938
Assam	0.15	2	0.10	1	625
Gujarat	0.70	9	0.60	4	1,000
Others	0.32	4	0.30	2	477
India	7.39	100	11.8	100	1,596

Source: Indiatat.com

Table 4. State-wise CAGR of area under chillies

States	1961-62 to 1970-71	1971-72 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2007-08	1961-62 to 2007-08
Andhra Pradesh	5.24	-1.38	3.67	1.00	-1.71	0.99
Karnataka	0.11	6.02	-1.45	0.07	-5.28	0.20
West Bengal	0.16	14.39	8.68	2.27	-1.48	1.50
Orissa	13.25	-0.17	4.19	-1.21	1.01	2.42
Madhya Pradesh	-0.29	3.70	-2.22	-0.11	0.97	0.13
Maharashtra	-0.64	0.51	-1.73	-1.75	-0.35	0.40
Tamil Nadu	-1.24	2.65	-5.37	0.38	0.51	0.09
Rajasthan	0.66	3.90	0.64	-4.14	-7.28	0.75
Uttar Pradesh	1.03	2.21	-1.12	-3.27	-1.38	1.40
Assam	2.40	3.09	3.38	1.89	0.92	0.33
Gujarat	1.97	-0.97	-0.40	0.07	-10.86	-5.78

Table 5. State- wise CAGR of production of chillies

State	1961-62 to 1970-71	1971-72 to 1980-81	1981-82 to 1990-91	1991-92 to 2000-01	2001-02 to 2007-08	1961-62 to 2007-08
Andhra Pradesh	1.58	4.64	8.89	6.84	5.97	4.98
Karnataka	-0.55	5.63	-4.38	11.39	6.20	0.95
West Bengal	-2.62	12.75	7.31	3.51	4.55	1.25
Orissa	19.04	7.69	4.46	-0.39	0.48	3.24
Madhya Pradesh	-1.63	4.36	-3.32	3.41	5.74	0.66
Maharashtra	-0.56	0.61	-1.01	-0.50	-2.03	0.01
Tamil Nadu	-0.82	-5.59	-6.93	3.29	-2.36	1.17
Rajasthan	0.13	0.50	8.25	-0.86	7.58	-0.70
Uttar Pradesh	0.26	6.35	-1.67	-1.23	4.73	1.83
Assam	3.30	1.09	3.40	2.53	0.40	0.40
Gujarat	-2.45	0.37	3.29	1.46	-8.11	0.31

Growth Rates of Area, Production, Productivity of Chillies

Table 6. Area, production and productivity of chilli in Andhra Pradesh (1971-72 to 2009-10)

Year	Area (ha)	Production (tonnes)	Productivity (Kg/ha)
1971-72	2,02,320	1,38,730	686
1980-81	1,62,012	1,49,098	920
1990-91	2,08,167	3,46,592	1,665
2000-01	2,38,003	5,26,171	2,211
2001-02	2,25,000	5,91,000	2,631
2002-3	2,23,000	4,09,000	1,831
2003-04	2,50,000	7,97,000	3,184
2004-05	2,37,000	7,48,000	3,164
2005-06	1,72,000	5,38,000	3,136
2006-07	2,14,000	7,66,000	3,579
2007-08	2,23,000	7,72,000	3,463
2008-09	2,03,000	7,73,000	3,554
2009-10	2,07,000	8,31,000	4,023
CAGR%	1.07246	5.692739	4.47278

Source: Indiastat.com

Table 7. Exports of chillies from India

Year	Quantity (tonnes)	Value (₹ in Cr)
1999 -00	63,591	254.72
2000-01	62,448	229.73
2001-02	69,998	252.44
2002-03	81,022	315.15
2003-04	86,575	366.88
2004-05	1,38,073	499.01
2005-06	1,13,174	403.01
2006-07	1,48,500	807.75
2007-08	2,09,000	1097.50
2008-09	1,88,000	1080.95
2009-10	2,04,000	1291.72
2010-11	2,40,000	1535.54
CAGR (%)	14.47	20.90

Source: Spices Board of India

Chilli exports by value to different countries

Spice exports have risen three-fold in value terms in the last five years. Exports of spices and spice products stood at ₹ 6030.74 crore during the April-February period of 2010-11. They were around ₹ 2,100 crore in the April-February period of 2005-06. The value of chilli exports

stood at ₹ 1,535.55 crore during 2010-11 compared to ₹ 1,291.72 crore in 2009-10 (Table 9).

Growth rates of chilli exports for major exporting countries

Global demand for chilli was pronounced to be increasing as revealed by the export CAGR of 9.42 per cent during the period from 1996 to 2006. Being the lead producer of chillies in the world, India has recorded an export CAGR of 12.74 per cent (Table 10). The same for China, which was the fierce competitor to India, was 10.63 per cent. The growth rates for Peru, Myanmar and Pakistan were 85.92, 28.85 and 27.69 respectively evidently due to lower quantities of exports in the base year.

CONCLUSIONS

Global demand for chilli was pronounced to be increasing as revealed by the export CAGR of 9.42 per cent during the period from 1996 to 2006. Being the lead producer of chillies in the world, India has recorded an export CAGR of 12.74 per cent. The same for China, which was the fierce competitor to India, was 10.63 per cent. The growth rates for Peru, Myanmar and Pakistan were 85.92, 28.85 and 27.69 respectively evidently due to lower quantities of exports in the base year.

CAGR during 2000-2009 was estimated at -3.15, -1.33 and 1.02 per cent for global area, production and yield respectively.

Orissa recorded the highest growth of 13.25 per cent in the area during the decadal period of 1961-62 to 1970-71 compared to any other state. In the same decade, it is Andhra Pradesh which recorded the next highest compound annual growth rate of 5.24 per cent. In the following decade of 1971-72 to 80-81, it is West Bengal which was the forerunner in achieving the area growth of 14.39 per cent. In the decades to follow i.e., 1981-82 to 1990-91 and 1991-92 to 2000-2001, it is once again, West Bengal which stood out as the highest growth achiever of area with a CAGR of 8.68 per cent and 2.27 per cent respectively. In the overall period of 1961-62 to 2007-08, the growth in area was more or less stabilized with only Gujarat state recording a negative growth rate of 5.78 per cent.

Orissa recorded highest CAGR of 19.04 per cent in the production during the period from 1961-62 to 1970-71, while it was West Bengal in second decadal period of

Table 8. Chilli exports from India to different countries (tonnes)

S. No.	Country	2009-10	% to total	2010-11	% to Total
1	Malaysia	45,545	22.33	48,248	20.10
2	Srilanka	34,788	17.05	34,072	14.20
3	Bangladesh	28,173	13.81	32,742	13.64
4	USA	17,744	8.70	17,362	7.23
5	Pakistan	160	0.08	25,712	10.71
6	UAE	23,232	11.39	20,703	8.63
7	Mexico	2,256	1.11	8,500	3.54
8	Indonesia	10,267	5.03	10,242	4.27
9	China	1,769	0.87	6,771	2.82
10	UK	3,205	1.57	3,612	1.51
11	Others	36,861	18.07	32,036	13.35
	Total	2,04,000	100.00	2,40,000	100.00

Source: Spices Board of India

Table 9. Chilli Exports from India by Value (in ₹ crore)

S. No.	Country	2009-10	% to Total	2010-11	% to total
1	Malaysia	323.03	25.01	356.42	23.21
2	Srilanka	199.42	15.44	197.29	12.85
3	Bangladesh	151.58	11.73	182.08	11.86
4	U.S.A	151.37	11.72	138.01	8.99
5	Pakistan	0.81	0.06	134.92	8.79
6	U.A.E	89.98	6.97	84.79	5.52
7	Mexico	18.28	1.42	76.28	4.97
8	Indonesia	55.64	4.31	60.35	3.93
9	China	12.84	0.99	46.99	3.06
10	U.K	32.71	2.53	37.45	2.44
11	Others	256.06	19.82	220.97	14.39
	Total	1,291.72	100.00	1,535.55	100.00

Source: Spices Board of India

Table 10. CAGR for major exporting countries (1996-2006)

S. No.	Country	CAGR (%)
1	Peru	85.92
2	Myanmar	28.85
3	Pakistan	27.69
4	India	12.74
5	Malaysia	11.64
6	China	10.63
7	Mexico	9.12
8	Spain	3.12
World 9.42		

1971-72 to 1980-81 with a growth rate of 12.75 per cent. During 1981-82 to 1990-91 it was Andhra Pradesh with 8.89 per cent and Karnataka in the following decade of 1991-92 to 2000-01 with a CAGR of 11.39 per cent. Rajasthan in the recent decade of 2001-02 to 2007-08 stood out as the top achiever of production growth of 7.58 per cent. During the overall period of 1961-62 to 2007-08 highest growth of 4.98 was achieved by Andhra Pradesh with productivity being the most powerful causative factor.

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