RESEARCH ARTICLE

Growth, instability and price analysis of pigeonpea (*Cajanus cajan* L.) in Marathwada region

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ABSTRACT

In present study an attempt has been made to estimate growth and magnitude of variability in area, production and productivity of pigeonpea, seasonal variation and relationship between market arrivals and prices of pigeonpea in Marathwada region of Maharashtra State. Time series data for the period 1985-86 to 2004-05 regarding area, production and productivity were collected from Epitoma of Agriculture, published by Government of Maharashtra. The data regarding arrivals and prices were collected from four APMCs *viz*., Latur, Udgir, Osmanabad and Paranda for the same period. Compound growth rate, coefficient of variation, ratio to moving average method and double log model were used for achieving the objectives. The result revealed that among the districts Jalna and Nanded showed significant positive growth in area and production of pigeonpea, while all districts and region recorded higher variability in area, production and productivity of pigeonpea. The maximum arrivals of pigeonpea was recorded in month of January in all the selected markets, while significant negative relationship between arrivals and prices of pigeonpea was observed in Latur market.

INTRODUCTION

Pulses are the major food crops from ancient period, which are the rich and cheapest source of dietary protein and valuable animal feed. Among the pulses pigeonpea or arhar or tur (*Cajanus cajan*) is the important pulse crop in India. Because of multiple use as food, feed, fodder and fuel, it has prime position in prevailing production system. Because of high protein content, pigeonpea is exclusively consumed as "Dal."

In Maharashtra nearly one third area of state falls under rain shadow region, where rain is scanty and erratic. As a result, agricultural growth in state remained vulnerable. In spite of hudge investment on irrigation sector, the area under irrigation, production and productivity had practically remained at low level. The seasonal price variation observed for the pulse crops mainly because of wide variation in output of these crops which leads to wider fluctuation in arrivals. In order to device appropriate ways and means for reducing degree of fluctuations in prices, it is necessary to study the seasonal variation in market arrivals and prices of major pulses like pigeonpea. Keeping in the view above importance in relation to growth, instability, seasonal variation and relationship between market arrivals and prices, the present study

has been under taken with following specific objectives : to study performance of pigeonpea in respect of area, production and productivity, to the study variability in pigeonpea over a period of time, to the study seasonal variation in market arrivals and prices of pigeonpea and to the study relationship between market arrivals and prices of pigeonpea.

METHODOLOGY

Marathwad region was selected purposively for the study purpose. All the eight district of Marathwada region were selected for study. The analysis is primarily based on secondary data related to area, production and productivity of pigeonpea. The data were collected from the Epitome of agriculture for the period of 20 years *i.e.* from 1985-86 to 2004-05. To study the performance of pigeonpea exponential trend equation was fitted and the compound growth rate was worked out.

$$Y = ab^t$$

where, Y = estimated area/ production / productivity

a = intercept

b = regression coefficient

t = time variable in year

Annual compound growth rate (CGR) was worked by the formulae:

$$CGR = (\text{antilog } b - 1) * 100$$

The significance of CGR was tested with help of correlation coefficient (r) by using 't' test.

To study the variability with respect of area, production and productivity of pigeonpea coefficient of variation was worked out.

$$CV = \frac{\sigma}{\overline{X}} * 100$$

where, σ = standard deviation
$\overline{X}$ = mean

On the basis of maximum arrivals, four Agricultural Produce Market Committees (APMCs), *viz.,* Latur, Udgir, Osmanabad and Paranda were selected to study the seasonal variation and relationship between market arrivals and prices of pigeonpea. To measure the seasonal variation in market arrivals and prices of pigeonpea, ratio to moving average method was used. This method is most widely used for measuring seasonal fluctuations.

In order to know the relationship between market arrivals and prices of pigeonpea the double log model was fitted.

$$Y = ax^b$$

where, Y = estimated price indices
x = market arrivals indices
a = intercept

The goodness of fit was tested by knowing significance of 'b' by 't' test.

RESULTS AND DISCUSSION

From Table 1 it was observed that the area under pigeonpea showed significant positive growth rates in Jalna (2.05 per cent per annum) and Nanded district (1.47 per cent per annum), which indicated that the area under pigeonpea increased in these districts. The increase in area may be due to shift in area from cereal crops to pulse crops like pigeonpea. In case of Maharashtra State (1.45 per cent per annum), the area under pigeonpea showed increasing trend. The higher prices of pigeonpea attract the farmers to cultivate the crop. The similar results were observed by Kumar *et al.*(2005), Swin and Bhakar (2006) and Tuteja (2006).

Majority of district in Marathwada region recorded positive growth in the production of pigeonpea during the study period. Significant positive growth rates in production of pigeonpea recorded in Latur (6.03 per cent per annum), Osmanabad (4.84 per cent per annum), Nanded (4.73 per cent per annum) and Jalna (3.36 per cent per annum) districts during study period. The rise in production attributed to the increase in area under pigeonpea in Jalna and Nanded districts while the raise in production attributed to the increase in productivity of pigeonpea in Latur and Osmanabad districts. The present results are in the line with the findings of Asthurkar and Kolhal (1993), Kumar (2005) and Tuteja (2006).

The productivity of pigeonpea recorded significant annual positive growth rate in Latur (4.81 per cent) and Osmanabad district (3.76 per cent) which implied that the productivity under pigeonpea was increasing rapidly. The increase in productivity attributed to the use of HYVs, chemical fertilizers and better farming practices in these districts. The rest of districts, region and state except Beed and Parbhani districts, recorded significant positive growth rate which indicated that there was stagnation in productivity of pigeonpea in districts, region and state. Pigeonpea mostly cultivated in rainfed condition on marginal and sub marginal land with poor management practices causes stagnation in productivity.

From Table 2 it was observed that in Marathwada region the average area, production and productivity of pigeonpea recorded to 3.74 lakhs ha, 1.76 lakh tones and

Parameter/ districts	Area		Production		Productivity	
	r	CGR	r	CGR	r	CGR
Aurangabad	0.13	0.41	0.33	2.29	0.33	2.36
Jalna	0.83**	2.05	0.47*	3.36	0.15	0.93
Beed	0.19	0.33	0.02	0.14	0.04	0.32
Latur	-0.02	-0.06	0.57**	6.03	0.49*	4.81
Osmanabad	-0.23	-2.00	0.45*	4.84	0.44	3.76
Nanaded	0.91**	1.47	0.54*	4.73	0.37	2.91
Parbhani & Hingoli	0.20	0.53	-0.15	-1.00	-0.27	-1.77
Marathwada region	0.17	0.32	0.44	3.03	0.35	2.27
Maharashtra	0.81**	1.45	0.58	2.71	0.29	1.15

Table 1 : District wise area, production and productivity trends of pigeonpea in Marathwada region (1985-86 to 2004-05)

* and ** indicate significance of values at P=0.05 and 0.01, respectively
CGR : Compound Growth Rate

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466.05 kg/ ha, respectively. As compared with state level all the districts and Marathwada recorded higher variability in area, production and productivity of pigeonpea. the highest area variability of pigeonpea recorded in Osmanabad district (28.27 per cent) followed by Aurngabad (19.16 per cent) and Parbhani (15.68 per cent). The higher area variability in all districts was found because the crop is grown on small and marginal land. Similar results were obtained by Kumar *et al.* (2005).

The highest production variability was found in Osmanabad district (62.45 per cent) followed by Latur (59.17 per cent) and Nanded district (47.57 per cent). The increase in variability in production is attributed to increase in variability in productivity apart from low variability in area. The fluctuation indicated that stability in pigeonpea production has not been obtained in the selected study region. The highest productivity variability was recorded in Latur district (56.05 per cent) followed by Osmanabad (51.81 per cent) and Nanded districts (43.70 per cent). In Marathwada region the productivity variability was higher and was recorded to 36.00 per cent, due to uncertain rainfall, rain fed cultivation, on small and marginal lands. Similar results were noted by Singh and Gangawar (1986). The higher average productivity accompanied with low variability of productivity indicated that stability in pigeonpea productivity has not been achieved during study period in the state.

Table 3 revealed that the seasonal indices of pigeonpea were higher from January to May in Latur and Udgir market, from December to March in Osmanabad market and from December to February in Paranda market. The highest market arrivels were recorded in the month of January (253.76 per cent), February (286.85 per cent), January (383.96 per cent) and December (484.84 per cent) in Latur, Udgir, Osmanabad and Paranda markets, respectively. Where as lowest market arrivals

of pigeonpea recorded in the month of October in all selected markets during the study period. A bulk of produce reached to a market immediately after harvesting found seasonality in market arrivals causes higher arrivals. Similar results were obtained by Bawaskar (2002).

Table 3 further depicted that the prices were higher from the month of July to November and May to September in Latur and Udgir markets, respectively. The highest prices recorded in the month of November (124.70 per cent) and December (108.31 per cent), respectively. The price indices were lower with higher arrivals in December to June and January to April in Latur and Udgir markets, respectively, which implied that there was inverse relationship between market arrivals and prices of pigeonpea. In Osmanabad, market price indices varied from 93.07 per cent in month of November and 106.46 per cent in month of July. In Paranda market the price indices varied from 63.58 per cent in month of October to 115.21 per cent in month of July. It was observed that when the arrivals were higher the prices were also higher and *vice versa*. The results were in the line with findings of Brahmaprakash and Srivastava (1998).

Table 4 revealed that the Latur market recorded significant negative relationship between market arrivals and prices of pigeonpea which implied that arrivals and prices moving in opposite direction during study period. The regression coefficient 'b' computed to -0.062 per cent indicated that one unit increased in arrivals, the price decreased by 0.062 per cent over the initial arrivals in Latur market. The correlation coefficient for Paranda market was recorded to 0.39 which was positive and significant at 5 % level of probability and implied that there was significant positive relationship between the arrivals and prices of pigeonpea in Paranda market. The significant positive relationship between arrivals and prices attributed to higher arrivals of pigeonpea from the other region due

Table 2 : Area, production and productivity variability of pigeonpea in Marathwada region (1985-86 to 2004-05)						
						(Variability in per cent)
Parameter/	Area		Production		Productivity	
districts	Mean	CV	Mean	CV	Mean	CV
Aurangabad	418.9	19.16	128.8	41.76	306.75	41.37
Jalna	406.06	14.47	172.20	40.22	420.75	35.86
Beed	477.4	10.81	179.55	37.72	376.35	36.08
Latur	620.55	13.28	338.2	59.17	511.55	56.05
Osmanabad	621.55	28.27	285.7	62.45	412.30	51.81
Nanaded	474.5	9.44	314.55	47.57	652.95	43.70
Parbhani and Hingoli	659.05	15.68	324.45	39.05	501.75	36.86
Marathwada region	3746.95	11.44	1765.45	36.13	466.05	36.00
Maharashtra	6929.80	10.79	6106.55	20.81	619.70	22.41

CV : Coefficient of variation

Table 3 : Monthly seasonal indices of market arrivals and prices of pigeonpea in Marathwada region (1985-86 to 2004-05). (Arrivals in qtls, prices in Rs./q)								
Markets/ Months	Latur		Udgir		Osmanabad		Paranda	
	Arrivals	Prices	Arrivals	Prices	Arrivals	Prices	Arrivals	Prices
Oct.	18.55	99.69	6.09	96.28	8.39	98.39	1.35	63.58
Nov.	19.22	124.70	7.43	93.86	11.61	93.07	42.63	91.13
Dec.	78.65	97.25	98.69	108.31	179.78	98.28	484.86	111.91
Jan.	253.76	94.32	264.15	94.16	383.96	101.30	435.10	108.51
Feb.	240.99	94.85	286.85	96.85	281.71	101.99	114.75	111.01
Mar	153.38	95.51	184.44	98.96	121.19	97.01	38.34	109.61
April	148.30	94.81	143.95	98.11	91.71	101.48	28.18	109.69
May	105.46	94.82	111.50	101.71	46.00	101.82	14.34	112.58
June	84.70	96.23	71.57	104.76	40.18	102.82	14.61	112.97
July	48.36	98.19	37.58	105.74	17.64	106.46	11.74	115.21
Aug.	29.33	106.01	21.02	106.78	8.72	94.25	11.30	84.55
Sept.	19.23	103.58	15.98	104.07	9.06	103.99	2.76	69.23

the higher prices in the Paranda market. The regression coefficient 'b' recorded to 0.061, which implied that with one unit increased in arrivals, the prices increased by 0.061 per cent over initial arrivals. Non-significant negative and non-significant positive relationship between market arrivals and prices of pigeonpea were recorded in Udgir and Osmanabad markets, respectively.

Conclusion:

– Significant positive growth in area under pigeonpea was in Jalna and Nanded districts while significant positive growth in production were in Jalna, Latur, Osmanabad and Nanded districts. The productivity of pigeonpea raised significantly in latur and Osmanabad districts.

– Highest area variability of pigeonpea was in Osmanabad district while lowest in Nanded district. All the districts and region recorded higher variability in production and productivity. Osmanabad and Latur districts registered highest variability in production and productivity of pigeonpea.

The maximum arrivals of pigeonpea was recorded in the month of January in Latur, Osmanabad and Paranda markets. High price indices were in the months of November and Decembr in Latur and Udgir market, respectively, while in the month of July in Osmanabad and Paranda market. Significant negative and significant positive relationship between market arrivals and prices were observed in Latur and Paranda market,respectively.

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Table 4 : Relationship between market arrivals and prices of pigeonpea in Marathwada region (1985-86 to 2004-05)				
Parameter	Latur	Udgir	Osmanabad	Paranda
a	129.69	101.61	99.56	81.43
B	-0.062**	-0.004	1.00	0.061*
S.E. (b)	0.018	0.010	0.008	0.027
t (b)	-3.30	-0.37	0.697	2.96
R^2	0.49	0.014	0.019	0.39

* and ** indicate significance of values at P=0.05 and 0.01, respectively

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