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Growth pattern of major pulses in eastern Uttar Pradesh

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ABSTRACT

India is a key player in pulse production contributing 28 per cent to the global basket from an area of about 37 per cent. The country contributes more than 75 per cent to the global production of chickpea and pigeon pea the two major pulses of Indian sub-continent. Chickpea contributes about 10.92 million tonnes of grains to the global food packet from about 11.98 million hectares. The study was undertaken with the objective to work out the compound growth rates of area, production and productivity of major pulses (chickpea and pigeonpea) in eastern Uttar Pradesh. Study observed that the decline in area under chickpea and pigeonpea in eastern Uttar Pradesh is the main reason for decline in production. There is need to bring more area under chickpea and pigeonpea cultivation and improve the productivity to increase production.

Keywords: Chickpea; pigeon pea; compound growth rate

INTRODUCTION

Besides being rich and cheapest source of dietary protein and a valuable animal feed pulses play a key role in improving and sustaining soil productivity on account of biological nitrogen fixation and addition of huge amount of organic matter. In spite of these virtues pulse production has remained almost stagnant over the years. While gradual transformation of Indian agriculture from subsistence to magnificence has made the country food sufficient daily per capita availability of pulses has drastically declined from a comfortable position of 60.7 g/person/day in 1951 to 31.6 g/person/day during TE 2010 (Anon 2011a) against ICMR (Indian Council of Medical Research) recommendation of 40 g/person/day. Indian population is expected to go up to 1.279 million in 2020 and 1.374 million in 2030 and at the present rate of consumption of pulses their demand for pulses would increase annually by 3.3 per cent. It is estimated that the annual requirement of pulses is likely to be around 23 million tonnes in 2020 and 24-26 million tonnes in 2030. This will require about 75 per cent increase in the production of pulses by the year 2030. Thus the present productivity of 0.6 tonnes per hectare will have to be raised up to 0.99 tonnes per hectare.

In India 23.28 m ha area was under pulses producing about 14.66 metric tonnes with an average yield of 630 kg/ha during the year 2009-10 (Anon 2011b). At national level the most important states for pulses are Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra and Andhra Pradesh which together account for 82 per cent of the production from an area of about 74 per cent.

Chickpea is the main pulse crop grown in the country which accounts about 35.10 and 51.03 per cent to the national pulse acreage and production respectively. The important chickpea growing states are Madhya Pradesh, Maharashtra, Andhra Pradesh, Karnataka, Rajasthan and Uttar Pradesh which account for more than 90 per cent of the cultivated area under chickpea in the country (Anon 2011b).

The second most important pulse crop is pigeonpea with production and area concentrating in Maharashtra, Uttar Pradesh, Karnataka, Madhya Pradesh and Gujarat. The maximum area under pigeonpea is in Maharashtra (31.54%) followed by Karnataka (17.43%), Andhra Pradesh (13.36%), Madhya Pradesh (10.45%), Uttar Pradesh (8.80%), Gujarat (7.68%) and Orissa (3.83%) (Anon 2011b).

The common pulses of Rabi season are chickpea, lentil, fieldpea, *Lathyrus* (Khesari) and rajmash and of Kharif season are pigeon pea, mungbean, moth bean, horse gram and cowpea. The area under pulses at present is stagnant (22-24 million hectares) with more or less stagnant production fluctuating between 10-14 million tonnes over the last six decades the exception being one bad year ie 1980-81 when the production declined by nearly 10.6 million tonnes. One of the distributing trends in pulses is that not only has the area under pulses remained static but the total pulse productivity as well as yield per unit area has also not shown any improvement even after four decades of green revolution. The past efforts of pulse research have been directed more towards correcting the defects such as small seed size, pod dehiscence, toxins accumulation in seeds, seed dormancy, branching and growth habits and so on besides making crops amenable to cultivation. However these efforts have generated enough variability for launching the 'second generation research' on yield enhancement and high input response.

Eastern Uttar Pradesh occupies very important place in pulse production in the state. The pulse crops grown are pigeonpea, chickpea, lentil, fieldpea, urdbean and mungbean. Among these chickpea and pigeon pea occupy highest area than other pulse crops. Chickpea was grown on 0.57 lakh ha and production was 0.59 lakh tonnes in the year 2010-11 while the total area and production of chickpea in whole Uttar Pradesh was 6.05 lakh ha

and 5.00 lakh tonnes in the same year respectively. Similarly pigeonpea occupied 1.17 lakh ha area with 1.05 lakh tonnes production in 2010-11 while the total area and production of pigeonpea in whole Uttar Pradesh was 3.05 lakh ha and 1.95 lakh tonnes respectively in the same year. This shows the importance of these two pulse crops in the economy of the farmers of eastern Uttar Pradesh. As such these two crops have been selected for the present study. The study was undertaken with the objective to work out the compound growth rates of area, production and productivity of major pulses in eastern Uttar Pradesh.

METHODOLOGY

The present study was 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 etc. The production pattern of chickpea was investigated using tabular analysis. The compound growth rates (CGR) of area, production and yield were computed according to procedure mentioned below:

The district-wise compound growth rates in area, production and productivity of chickpea and pigeonpea of eastern Uttar Pradesh for the period of 1990-91 to 1999-2000 (Period I) and 2000-01 to 2009-10 (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/productivity of pulse crops in the year 't'

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

a = intercept

b = regression coefficient.

Finally the compound growth rates were worked out as described below:

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

Statistical parameters viz mean medium, standard deviation and regression coefficients were computed by adopting the standard procedures.

RESULTS AND DISCUSSION

Chickpea: The compound growth rates of area, production and productivity of chickpea are presented in Table 1. It is revealed that among the selected districts area declined in all districts except Mirzapur and Sonebhadra which showed an increase of 2.21 and 0.14 per cent per annum during 1990-91 to 1999-2000. The increase in production in particular district was due to increase in area and productivity. Among various districts Deoria recorded highest significant negative growth (-21.20% per annum) and Gonda recorded a lowest negative growth rate (-3.67% per annum). In eastern Uttar Pradesh and state as a

whole area under chickpea was decreased at the compound growth rate of – 6.51 and – 4.02 per cent per annum during Period I (1990-91 to 1999-2000). For the same period production of chickpea declined by 9.26 per cent annually in eastern Uttar Pradesh and 3.84 per cent annually in whole Uttar Pradesh. Productivity also recorded negative growth of 2.94 per cent annually for eastern Uttar Pradesh and positive but no significant growth of 0.10 per cent for entire state.

During the Period II (2000-01 to 2010-11) a significant decrease of 6.69 per cent annually was observed in chickpea area in eastern Uttar Pradesh whereas it was -4.54 in entire Uttar Pradesh. Among various districts all districts showed a negative growth in chickpea area. Similar observation was noted regarding production of chickpea during this period. All districts recorded a negative growth rate including entire eastern Uttar Pradesh and whole Uttar Pradesh. During this period change in productivity whether positive or negative was not significant in all districts as well as eastern Uttar Pradesh and entire Uttar Pradesh.

Pigeonpea: Table 2 depicts the compound growth rates of area, production and productivity of pigeonpea in all the districts of eastern Uttar Pradesh. It was observed that the area under pigeonpea declined in Varanasi, Ghazipur, Mirzapur, Faizabad, Baihraich, Ballia, Azamgarh and Jaunpur district at the rate of -1.7, -4.57, -0.81, -1.88, -5.1, -8.13, -3.92 and -0.13 per cent per annum respectively which resulted in decline in production of the crops during Period I (1990-91 to 1999-2000). Positive growth trends of area and production were observed in few districts of eastern Uttar Pradesh viz Sonebhadra, Mau, Gorakhpur, Deoria, Basti, Sultanpur and Siddarthnagar during above period. The increase in production in these districts was observed due to increase in area. Sultanpur registered a highest positive growth rate of 6.1 per cent annually in pigeonpea productivity whereas Baihraich registered a highest negative growth rate of -4.8 per cent annually. In case of productivity a positive growth was recorded by Azamgarh, Ballia, Faizabad, Gorakhpur, Maharajganj, Mau and Siddarthnagar and other districts have negative growth.

SUMMARY

These results concluded that the main reason for decline in production is the reduction of area under chickpea and pigeonpea in the eastern Uttar Pradesh. There is a need of bringing more area under these crops for enhancing the pulse production. Improving the productivity is also very important to increase the production as there was not much increase in the productivity of these crops during this period.

Table 1. Area, production and productivity of chickpea in eastern Uttar Pradesh

Districts	1990-91 to 1999-2000 (Period 1)			2000-01 to 2010-11 (Period 2)		
	Area	Production	Productivity	Area	Production	Productivity
Ambedkarnagar	NA	NA	NA	-4.91	-5.66	-0.80
				(1.07)	(1.24)	(0.46)
Azamgarh	-8.70**	-11.25**	-2.75	-6.29*	-4.71	1.68
	(15.94)	(3.60)	(0.76)	(2.53)	(1.79)	(1.07)
Baihraich[1]	-9.74**	-14.59**	-5.41	-20.84**	-17.18*	4.62**
	(5.93)	(3.33)	(1.46)	(3.27)	(2.62)	(3.26)
Ballia	-11.33**	-15.68**	6.32	-6.89	-7.05	-0.17
	(9.59)	(4.56)	(1.49)	(2.93)	(2.20)	(0.17)
Balrampur	NA	NA	NA	-8.86	-3.98	5.36
				(2.59)	(1.29)	(3.60)
Basti[2]	-9.3**	-11.8**	-2.7	-6.65	-4.33	2.48
	(6.70)	(3.76)	(0.96)	(1.50)	(0.61)	(0.48)
Chandauli	NA	NA	NA	-13.07	-12.57	0.57
				(2.14)	(1.92)	(0.30)
Deoria	-21.2**	-22.86**	-2.2	-10.74**	-10.85**	-0.12
	(10.35)	(5.98)	(0.66)	(3.98)	(3.45)	(0.11)
Faizabad[3]	-5.84**	-7.80**	-2.08	-11.38**	-11.82*	-0.50
	(5.40)	(3.01)	(0.771)	(4.07)	(2.96)	(0.24)
Ghazipur	-7.58**	-12.60**	-5.43	-8.21	-7.95	0.28
	(20.09)	(4.09)	(1.72)	(2.05)	(1.79)	(0.38)
Gonda[4]	-3.67**	-5.44	-1.84	-21.36**	-17.91**	4.40*
	(3.82)	(1.59)	(0.50)	(4.17)	(3.17)	(2.96)
Gorakhpur	-15.8**	-12.56**	3.8	-8.91*	-9.01*	-0.12
	(9.77)	(3.64)	(1.20)	(2.33)	(2.22)	(0.11)
Jaunpur	-5.16	-9.54*	-4.62	-5.85**	-7.71**	-1.97
	(5.53)	(2.31)	(1.23)	(4.94)	(3.77)	(1.30)

Kushinagar	NA	NA	NA	-19.36*	-18.63*	0.90
				(2.53)	(2.32)	(0.78)
Kushinagar	NA	NA	NA	-19.36*	-18.63*	0.90
				(2.53)	(2.32)	(0.78)
Maharajganj	-20.28**	-17.44**	3.5	-23.95**	-24.05**	-0.14
	(11.84)	(5.74)	(1.034)	(4.55)	(4.09)	(0.13)
Mau	-9.29**	-11.31**	2.23	-6.51	-4.93	1.68
	(17.81)	(3.33)	(0.58)	(1.61)	(1.14)	(1.07)
Mirzapur	2.21**	-5.15*	-3.05	-2.91	-3.01	-0.10
	(3.31)	(3.06)	(1.62)	(1.88)	(1.80)	(0.09)
Sant Ravidasnagar	NA	NA	NA	-7.11*	-6.44*	0.72
				(2.42)	(2.29)	(0.53)
Sant Kabirnagar	NA	NA	NA	-9.31**	-6.87	2.69
				(3.25)	(1.22)	(0.52)
Siddarthnagar	-7.56**	-6.12*	1.5	-33.59**	-31.91*	2.52
	(9.99)	(2.49)	(0.53)	(3.65)	(2.78)	(0.55)
Sonebhadra	0.14	2.49	2.35	-4.50	-1.47	3.18
	(0.26)	(1.67)	(1.64)	(2.18)	(0.65)	(2.17)
Sultanpur	-4.39**	-8.21*	-4.01	-7.21*	-8.32*	-1.20
	(7.86)	(2.99)	(1.41)	(2.36)	(2.65)	(0.68)
Varanasi[5]	-9.01**	-11.38**	-2.60	-3.10**	-4.56*	-1.50
	(6.30)	(4.62)	(1.08)	(4.00)	(2.57)	(0.87)
Eastern UP	-6.51**	-9.26**	-2.94	-6.69**	-6.23**	0.49
	(21.33)	(5.06)	(1.43)	(4.94)	(4.27)	(0.62)
All UP	-4.02**	-3.84**	0.10	-4.54	-5.61	-0.97
	(9.78)	(4.00)	(0.19)	(3.08)	(3.94)	(0.73)

Figures in parentheses are 'T' values; *Significant at 5% level of significance; **Significant at 1% level of significance; NA - Not available

[1]Included Kushinagar [2]Included Sant Kabirnagar; [3]Included Ambedkernagar; [4]Included Balrampur;

[5]Included Bhadohi and Chandauli districts

Table 2. Area, production and productivity of pigeon pea in eastern Uttar Pradesh

Districts	1990-91 to 1999-2000 (Period 1)			2000-01 to 2010-11 (Period 2)		
	Area	Production	Productivity	Area	Production	Productivity
Ambedkarnagar	NA	NA	NA	-2.24	1.79	4.12
				(2.24)	(1.19)	(3.18)
Azamgarh	-3. 92**	-2.347	1.640	-4.16	-9.93	-6.03
	(4. 94)	(0.97)	(0.67)	(2.20)	(3.03)	(1.97)
Baihraich[1]	-5.1*	-9.6*	-4.8*	-7.41	-9.31	-2.05
	(2. 34)	(2.84)	(2.38)	(3.07)	(3.59)	(1.01)
Ballia	-8.13**	-7.09*	1.2	-6.50	-10.39	-4.16
	(3. 82)	(2.57)	(0.69)	(3.07)	(1.82)	(0.82)
Balrampur	NA	NA	NA	0.41	1.44	1.03
				(0.34)	(0.76)	(0.57)
Basti[2]	9. 0**	7.4*	-1.42	-6.80	-5.97	0.89
	(5. 86)	(2. 65)	(0.63)	(4.14)	(1.74)	(0.30)
Chandauli	NA	NA	NA	-3.37	-7.39	-4.16
				(1.94)	(2.97)	(3.49)
Deoria	3.1**	2. 3	-0.76	-11.24	-10.29	1.08
	(4. 92)	(0. 98)	(0.37)	(3.98)	(2.47)	(0.59)
Faizabad[3]	-1. 88	-0. 29	1.6	-3.62	-2.00	1.68
	(1. 66)	(0.09)	(0.67)	(3.93)	(1.26)	(1.01)
Ghazipur	-4. 57**	-5. 56	-1.05	0.10	-8.15	-8.24
	(4. 01)	(1. 02)	(0.19)	(0.02)	(2.39)	(5.21)
Gonda[4]	3.1*	-0.5	-3.5	-5.52	-5.92	-0.42
	(2. 84)	(0.14)	(1.32)	(3.65)	(2.72)	(0.20)
Gorakhpur	0. 8	1. 00	0.2	-11.56	-10.09	1.66
	(0. 28)	(0. 25)	(0.11)	(5.23)	(2.93)	(0.91)
Jaunpur	-0.13	4.01	4.15	-4.52	-10.73	-6.50
	(0.16)	(1.65)	(1.69)	(1.99)	(3.11)	(4.37)

Kushinagar	NA	NA	NA	-7.66	-7.42	0.26
				(4.97)	(4.76)	(0.16)
Maharajganj	-2.1	-2.9	-0.8	-12.85	-11.84	1.16
	(1. 22)	(0.96)	(0.37)	(6.75)	(3.85)	(0.70)
Mau	0.4	3. 5	3.0	-9.93	-15.86	-6.59
	(0.48)	(1. 28)	(1.32)	(3.96)	(3.16)	(1.52)
Mirzapur	-0. 81*	-1. 57	-0.8	-3.43	-8.32	-5.06
	(2. 23)	(0. 60)	(0.33)	(1.98)	(3.52)	(2.14)
Sant Ravidasnagar	NA	NA	NA	-4.36	-11.40	-7.36
				(1.56)	(2.19)	(1.84)
Sant Kabirnagar	NA	NA	NA	-2.66	-0.48	2.24
				(1.99)	(0.21)	(1.13)
Siddarthnagar	4. 3*	4.7	0.3	-6.77	-0.16	7.10
	(2. 53)	(1.76)	(0.21)	(2.55)	(0.03)	(2.14)
Sonebhadra	10.70**	7. 5	-3.0	-6.27	-8.83	-2.73
	(7.64)	(3. 68)	(1.25)	(4.20)	(5.20)	(1.55)
Sultanpur	0. 5	6.7*	6.1	-3.74	-4.30	-0.58
	(1.17)	(2.24)	1.86)	(3.84)	(1.32)	(0.22)
Varanasi[5]	-1.70	-4.4	-2.8	-4.23	-9.79	-5.80
	(2. 18)	(1.77)	(1.01)	(0.85)	(1.76)	(4.58)
Eastern UP	0.1	-0.1	-0.2	-5.35	-7.52	-2.29
	(0.23)	(0.06)	(0.22)	(4.44)	(3.56)	(1.92)
All UP	-1.9	-1.2	0.6	-2.42	-8.06	-5.58
	(2.75)	(1.98)	(0.73)	(3.63)	(6.83)	(5.80)

Figures in parentheses are 'T' values; *Significant at 5% level of significance; **Significant at 1% level of significance; NA - Not available

[1]Included Kushinagar [2]Included Sant Kabirnagar; [3]Included Ambedkernagar; [4]Included Balrampur;
[5]Included Bhadohi and Chandauli districts

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