PATTERN OF GROWTH AND SCENARIO OF PULSE PRODUCTION IN UTTAR PRADESH: A REGIONAL STUDY

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ABSTRACT

The Uttar Pradesh is most populous state of the country. It accounts for about 12 per cent (2003-04) of total area of pulses while 16 per cent (2003-04) of total pulse production in the country. The average yield of pulses has been between 7.00 to 9.29 quintal per hectare since 1987-88. However, the area under pulse crops has declined substantially over years to the extent of 2.7 million hectare in 2003-04 from 3.0 million tonnes in 1987-88. Similarly, the scenario of pulse production has also not been satisfactory since it has witnessed tremendous fluctuations ranging between 2.36 to 2.62 million tonnes since 1987-88.

Uttar Pradesh has four regions i.e. Western, Central, Bundelkhand and Eastern regions. This study is based on the different regions of Uttar Pradesh having important role in term of pulse production. Various statistical tools used to determine the growth rates, instability of variation of area, production and productivity of different pulse crops and total pulse crop for two different periods before and after the launch of technological mission on pulse production in the country. The time series data pertaining to 1960-61 to 2005-06 have been considered, which has been divided into two periods, before (1960-61 to 1989-90) and after (1990-91 to 2005-06) launch of Technology Mission on pulse production. The pulse crops i.e. arhar, pea, gram and lentil alongwith total pulses were taken for the study. It has been found that the area of pea of Bundelkhand region have been more stable in pre technology mission. The same trend follows in the case of production. Increase or decreases in area and production of different regions have been carried out over different decades. The overall results indicate that the Bundelkhand region has been found more stable in respect of all the pulse crops considered under study.

1. Introduction

Pulses are the edible dry seeds of leguminous plants. They are of special nutritional and economic importance due to their contribution to the diets of millions of people worldwide. The main importance of pulses lies primarily in their high protein content (two to three times higher than most cereals) as well as in being a valuable source of energy. The use of pulses as food is concentrated in developing countries, accounting for about 90 percent of global human pulse consumption. In most low income countries, pulses contribute about 10 percent of the daily protein and about 5 percent of energy intakes in the diets of people.

India is the largest producer of pulses in the world, both in quantity and variety. Once a net exporter it is presently one of the largest importers of pulses. Pulses are the primary source of protein for the poor and the vegetarians who constitute the majority of Indian population. While the traditional cropping pattern almost always included a pulse crop either as a mixed crop or in rotation, the commercialization of agriculture has encouraged the practice of sole-cropping. However, India accounts for about 25 percent of global production, 27 percent of consumption, and 34 percent of food use (FAO). It is also the top importer, with an 11 percent share of world imports during 1995-2001, although imports have only accounted for about 6 percent of domestic consumption during the same period. Pulse production in India has fluctuated widely with no long-term trend, leading to a steady decline in per capita availability over the past 20 years. Over

the period from 1951 to 2001, the net per capita per day availability of pulses has fallen from 60.7 grams to 33.40 grams. It is well known that pulses are a rich and major source of protein in Indian food as majority to Indians are vegetarian. The pulses used to serve a low cost food to meet the protein requirement of a large sector of people in India. But, the pulses are becoming out of reach for the common people of country because of its continuing shoring prices.

In view of such situation a Technology Mission on Pulse production was launched by Government of India in 1986-87 as a special drive to increase the pulse production in the country. The vision of Technology Mission of Pulse is attaining self reliance in pulses for household nutritional security and sustainability of the production system. The mission statement is to increase Pulse production from existing (IX plan) 131.4 lakh tonnes to 162 lakh tonnes; Productivity from 594 kg/ha to 702 kg/ha and per capita availability of pulses from 32 g to 40 g per day at affordable price. Unfortunately, the country has not bean able to achieve self-sufficiency in pulse production. During the last 40 years, the acreage under pulse crops and its production remained almost between 21-24 million hectares and 10-15 million tonnes, respectively. Consequently, the country has had to depend on import of pulses every year to meet the part of its shortage. The National Commission of Agriculture had estimated that the country should plan to produce about 25 million tonnes of pulses by the end of 2000, but we could achieve only about 14 million tonnes. Presently the area under pulse crops accounts for about 18.50% (2003-04) of total area under foodgrains while its production accounts for about 7.20 per cent (2003-04) of total foodgrains in the country.

The Uttar Pradesh is most populous State of the country. It accounts for about 12 per cent (2003-04) of total area of pulses while 16 per cent (2003-04) of total pulse production in the country. The average yield of pulses has been between 7.00 to 9.29 quintal per hectare since 1987-88. However, the area under pulse crops has declined substantially over years to the extent of 2.7 million hectare in 2003-04 from 3.0 million.

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In the present article, an attempt has been made to describe the feature of pulse production scenario in Uttar Pradesh since 1960-61 onwards. The entire period 1960-61 to 2005-06 has been divided in two parts, i.e. period I: 1960-61 to 1989-90 (before launch of Technology Mission) and period II: 1990-91 to 2005-06 (after the launch of Technology Mission) to highlight the impact of launch of Technology Mission on pulse production.

2. Cropping Pattern

The decadal cropping pattern since 1960-61 onwards has been worked out and are presented in Table 2.1. It is obvious from the table that technological changes in crop production, particularly in rice, wheat and oilseeds have marginalized the production of other cereal crops and pulse crops as well. Area under total cereals have increased steadily over last sixty years, and presently it constitutes about 69 per cent of the gross-cropped area as compared to that of about 63 per cent in 1960-61. This increase in area under total cereals can evidently be attributed to increase in area under rice and wheat, which together is now about 61 per cent as against about 37 per cent in 1960-61.

The scenario of total pulses during last sixty years has been very gloomy. The area under total pulses has steadily decreased over every decade since 1960-61 onwards, and it has reduced to half, i.e. about 10 per cent at present from about 21 per cent in 1960-61. Among the pulse crops, drastic reduction in the area has been found under arhar (3.00 to 1.30%), pea (4.44 to 1.19%) and gram (11.75 to 2.32%) over last sixty years. In contrast to these pulse crops, lentil has gained its area from 0.84 per cent in 1960-61 to 2.29 per cent in 2010-11. This has been probably due to development of rust-resistance varieties of lentil which has grasped area

of pea which is more sensitive to environmental variation and rust and wilt diseases. The other pulse crops, which mostly constitute the urd and moong, have experienced increasing trend in its area since 1960-61 onwards (from 0.90 to 2.48%). Traditionally the urd and moong were grown during kharif season. But, due to development of short duration varieties of urd and moong and its suitability is summer seasons the farmers started growing urd and moong in summer season, and consequently the area under these crops has started increasing since late seventies onwards.

Table 2.1: Cropping pattern (in % of gross cropped area)

S. No.	Crop	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11
1.	**Total Cereals**	**63.49**	**67.8**	**71.66**	**67.05**	**69.62**	**69.13**
(i)	Rice	19.26	19.04	21.53	22.04	23.34	22.69
(ii)	Wheat	18.13	25.45	33.01	33.63	36.51	38.26
(iii)	Maize	4.85	6.50	4.98	4.3	3.64	3.03
(iv)	Barley	8.50	5.71	3.17	1.67	1.13	0.64
(v)	Other	12.75	11.10	8.97	5.41	4.99	4.50
2.	**Total Pulses**	**20.93**	**15.85**	**11.64**	**11.93**	**10.64**	**9.56**
(i)	Arhar	3.00	2.51	2.13	1.84	1.61	1.30
(ii)	Pea	4.44	3.12	0.91	1.38	1.32	1.19
(iii)	Lentil	0.84	0.72	1.12	2.12	1.32	2.29
(iv)	Gram	11.75	8.75	6.09	5	3.29	2.30
(v)	Other	0.90	0.75	1.39	1.59	3.10	2.48
3.	**Total Oilseeds**	**2.11**	**2.97**	**2.90**	**4.01**	**3.40**	**4.17**
(i)	Mustard & rapeseed	0.58	0.91	1.66	2.72	2.2	2.32
(ii)	Groundnut	0.97	1.47	0.78	0.60	0.46	0.34
(iii)	Linseed	0.32	0.29	0.26	0.37	0.22	0.11
(iv)	Til	0.23	0.30	0.19	0.31	0.43	1.34
(v)	Other	0.01	0.00	0.01	0.01	0.10	0.06
4.	Potato	0.52	0.70	1.08	1.35	1.56	2.07
5.	Sugarcane	6.12	5.80	5.50	7.28	7.66	8.04
6.	**Others**	**6.83**	**6.88**	**7.22**	**8.38**	**7.13**	7.04
Gross cropped area		**21729890**	**21729890**	**23207144**	**24573897**	**25304147**	**25614717**

The area under total oilseeds has increased from 2.11 per cent in 1960-61 to about 3.40 per cent in 2000-01 and onwards. This increase in total oilseeds is found due to increase in area under mustard and rapeseed which has witnessed increasing trends, i.e. from 0.58 per cent in 1960-61 to about 2.32 per cent in 2010-11. Till has also experienced upward trend and has registered steady growth from 0.23 per cent to 1.34 per cent during last sixty years. However, area under groundnut and linseed declined over the same period.

Two cash crops, viz. potato and sugarcane have also showed increasing trend in its area since 1960-61 onwards. The potato registered a continuous growth in its area (from 0.52% to 2.07%), and same case is with sugarcane (from 6.12% to 8.04%) over last sixty years.

It can been visualized from the table that the most of area under total pulses has shifted to wheat, mustard & rapeseeds and potato as these are

competing crops to pulse crops. The change is also found in other crops, which has registered about 9% increase in its area during the period under study. This is probably because of diversification of agriculture in recent years and farmers have shifted the area towards more remunerative crops like vegetable, medicinal and aromatic plants, and fruit crops.

3. Changing pattern in area, production and productivity of pulse crops:

Area

The triennium average of area (in thousand hectares) and its per cent change in different decadal periods, under different pulse crops and total pulses are depicted in Table 3.1. The results of the table reveal that the average area of arhar has steadily declined over the different decadal periods. The maximum reduction has been found to be 24% during nineties. However, it has registered 40% reduction in its area during last forty-five years.

The similar case is with gram which has shown substantial decrease in its average area right from sixties till now. This reduction has been quite extensive, i.e. 21 to 27 per cent during sixties to nineties, with an overall reduction of about 71 per cent during the entire period under study.

In contrast to arhar and gram, lentil has gained the area with an overall about 225 per cent increase since 1960-61 till now. The maximum increase has been found during seventies and eighties, i.e. 87 and 64 per cent, respectively.

The moong picked up the area tremendously during seventies and in early eighties to show 946 per cent increase during 1973-1983. It has however, started declining considerably during mid-eighties to nineties, then after remained almost stagnant till 2005-06.

The area under pea has declined drastically during sixties and seventies, i.e. 32% and 66%, respectively. But it has again gained momentum and showed increasing trend by registering 44% and 28% increase in its area during eighties and 2000 to 2006, respectively. However, as compared to early sixties, its area has declined by 58 per cent in 2005-06.

The urd has been the only pulse crop which area has been found to be in increasing order in all the decades except in sixties where little dip of order 10% was observed. About 238 per cent increase in its area has been reported in 2005-06 since 1960-61. The maximum increase was obtained during eighties (44.00%), followed by nineties (43.00%) seventies (38.00%) and 33.00% during 2003-04 to 2005-06.

The total pulse has registered an overall decline in its area by 39% in 2005-06 since 1960-61. It can be observed from the table that it has almost remained stagnant since eighties with little bit fluctuation of about 100 thousand hectares. It is also obvious from the table that downfall in its area has been observed during sixties and seventies, i.e. 22.00% and 17.00%, respectively, and this feature can be attributed to the impact of green-revolution which started taking place from the mid of sixties. Consequently, a part of the pulse area has gone to cereal crops where impact of green revolution has been more visible as compared to other crops.

Table 3.1: Triennium average area ending at year shown of under different pulse crops and its changing pattern (in thousand hectares)

crop	1963	1973	1983	1993	2003	2006	% change in 1973 Over 1963	% change in 1983 over 1973	% change in 1993 over 1983	% change in 2003 over 1993	% change in 2006 over 2003	% change in 2006 over 1963
Arhar	636.45	538.09	506.08	507.93	386.24	383.49	-15	-6	0	-24	-1	-40
Gram	2532.29	1995.68	1557.68	1148.39	842.65	734.77	-21	-22	-26	-27	-13	-71
Lentil	187.74	176.83	331.14	542.22	615.84	609.65	-6	87	64	14	-1	225
Moong	13.87	12.46	130.26	102.17	70.07	69.52	-10	946	-22	-31	-1	401
Pea	1033.35	705.31	242.63	348.27	335.12	429.09	-32	-66	44	-4	28	-58
Urd	166.07	149.04	205.16	295.62	422.64	561.59	-10	38	44	43	33	238
Total Pulses	4582.96	3585.63	2961.68	2963.31	2672.73	2788.24	-22	-17	0	-10	4	-39

Production

The triennium average of production (in thousand tones) and its per cent change in different decadal periods with respect to different pulse crops and total pulses is presented in Table 3.2. The production of arhar has substantially dipped to the extent of 40.00 % till now since 1960-61. It was only during the period 1963-1973 that arhar production has witnessed positive growth of 11 per cent whereas in other decades it has registered negative growth, the maximum being 23 per cent during nineties.

The production of gram has experienced all the way negative growth with an overall decline of 57 per cent in 2005-06 since 1960-61. The maximum decline of 24.00 per cent has been obtained during nineties followed by eighties and seventies to the tune of 19 to 18 per cent, respectively.

A quite rosy picture of lentil production has been observed in the State during the entire period under study. Its production has accounted for about 559 per cent increase since 1960-61 till now. The maximum increase of 114% was obtained during eighties, followed by seventies (75.00%) and sixties (47.00%). It can be observed from the table that a steep increase in its production from 193.10 thousand tones to 412.59 thousand tones was found from early eighties to early nineties, and this increasing trend continued steadily over rest of the periods till now.

The moong production has also risen by 578 per cent in 2005-06 since 1960-61. Most significant increase of 1939 per cent was found during seventies, but then after it continued to decline by 25 and 39 per cent during eighties and nineties, respectively. However, it has again picked its

production by 6% per cent during the period 2000-01 to 2005-06.

An overall reduction by 42 per cent in the production of pea has been observed during the period 1960-61 to 2005-06. However, it has witnessed the increasing trend during the period 1983 to 1993 and 2000-01 to 2005-06, and registered the growth of 93 and 43 per cent, respectively. The maximum decline of 59% and 41% in the production of pea was found during sixties and seventies, respectively. This trend of decline during the aforesaid period could be possibly due to shifting of its area to wheat as an impact of green revolution, which is obvious from the Table 3.1 where negative growth in the area of pea has been observed during the same periods.

Table 3.2: Triennium average production ending at year shown under different pulse crops and its changing pattern (in thousand tonnes)

crop	1963	1973	1983	1993	2003	2006	% Change in 1973 Over 1963	% change in 1983 over 1973	% change in 1993 over 1983	% change in 2003 over 1993	% change in 2006 over 2003	% change in 2006 over 1963
Arhar	642.28	715.50	649.54	563.19	435.93	388.43	11	-9	-13	-23	-11	-40
Gram	1632.15	1523.89	1248.17	1005.16	761.54	698.52	-7	-18	-19	-24	-8	-57
Lentil	75.14	110.22	193.10	412.59	447.76	494.91	47	75	114	9	11	559
Moong	4.64	3.15	64.32	48.09	29.56	31.47	-32	1939	-25	-39	6	578
Pea	964.32	569.20	232.64	448.60	387.72	555.07	-41	-59	93	-14	43	-42
Urd	54.41	45.68	58.27	127.12	177.13	201.28	-16	28	118	39	14	270
Total Pulses	3377.24	2970.49	2450.28	2602.50	2239.69	2369.72	-12	-18	6	-14	6	-30

Table 3.3: Triennium average productivity ending at year shown under different pulse crops and its changing pattern (q/ha)

crop	1963	1973	1983	1993	2003	2006	% Change in 1973 Over 1963	% change in 1983 over 1973	% change in 1993 over 1983	% change in 2003 over 1993	% change in 2006 over 2003	% change in 2006 over 1963
Arhar	10.09	13.30	12.83	11.09	11.29	10.13	32	-3	-14	2	-10	0
Gram	6.45	7.64	8.01	8.75	9.04	9.51	18	5	9	3	5	47
Lentil	4.00	6.23	5.83	7.61	7.27	8.12	56	-6	30	-4	12	103
Moong	3.35	2.53	4.94	4.71	4.22	4.53	-24	95	-5	-10	7	35
Pea	9.33	8.07	9.59	12.88	11.57	12.94	-14	19	34	-10	12	39
Urd	3.28	3.07	2.84	4.30	4.19	3.58	-6	-7	51	-3	-14	9
Total Pulses	7.37	8.28	8.27	8.78	8.38	8.50	12	0	6	-5	1	15

The moong production has also risen by 578 per cent in 2005-06 since 1960-61. Most significant increase of 1939 per cent was found during seventies, but then after it continued to decline by 25 and 39 per cent during eighties and nineties, respectively. However, it has again picked its production by 6% per cent during the period 2000-01 to 2005-06.

An overall reduction by 42 per cent in the production of pea has been observed during the period 1960-61 to 2005-06. However, it has witnessed the increasing trend during the period 1983 to 1993 and 2000-01 to 2005-06, and registered the growth of 93 and 43 per cent, respectively. The maximum decline of 59% and 41% in the production of pea was found during sixties and seventies, respectively. This trend of decline during the aforesaid period could be possibly due to shifting of its area to wheat as an impact of green revolution, which is obvious from the Table 3.1 where negative growth in the area of pea has been observed during the same periods.

Like lentil, the production of urd has witnessed continuous growth during the entire period under study except during sixties. It has recorded about 270 per cent increase in its production during the entire period. The maximum growth of 118 per cent was found during eighties followed by nineties (39.00%), seventies (28.00%) and during 2001 to 2006 (14.00%).

However, an overall production of total pulses has not been satisfactory in the State as it has declined by 30 per cent over last forty five years. A little solace was observed during eighties and in recent years in which it has registered a positive growth of about 6 per cent.

Productivity

The triennium average of productivity of different pulse crops and total pulses is given in Table 3.3 for different decades. The per cent changes over different decades are also depicted in this table. No change in the productivity of arhar has been observed and it has remained between 10 to 11 q/ha in most of the decades except in sixties and seventies where it has registered 13.30 and 12.83 q/ha, respectively.

There has been increase in the productivity of gram by 47 per cent in 2005-06 as against that of in 1960-61. It can also be observed from the table that the productivity of gram has steadily increased over last forty-five years.

The lentil has recorded 103 per cent increase in its productivity during last forty-five years. There has been almost continuous growth in the productivity of lentil except some down fall of 4 to 6 per cent during seventies and nineties.

The average productivity of moong has risen to 4.53 q/ha in 2005-06 from 3.35 q/ha in 1960-61, and it has registered a growth of 35 per cent during the same period. The most significant increase in its productivity was found during seventies, where it has recorded 95 per cent increase. In other periods, it has witnessed negative growth except in recent years where 7 per cent growth has been observed.

The productivity of pea has stepped to about 13 q/ha in recent years as compared to that of 9.33 q/ha in 1960-61. It has also recorded an overall growth of 39.00 per cent in its productivity over 1960-61 onwards. There has been positive growth in the productivity of pea during seventies (19.00%), eighties (34.00%) and in recent years (12.00%). However, negative growth of 14 and 10 per cent were also found during sixties and nineties, respectively.

The productivity of urd has ranged between 3 to 4.30 q/ha over different decades. The maximum productivity was recorded during early nineties (4.30 q/ha) and the minimum was 3.00 q/ha during early seventies.

The productivity of total pulses has also ranged between 7.37 and 8.78 q/ha. An overall growth in its productivity has been worked out to be 15.00% during last forty-five years.

4. Changes in area, production and productivity of pulse crops between two periods, before and after the launch of Pulse Technology Mission

To study the change is area, production and productivity of pulse corps during the two periods, i.e. before and after the launch of Pulse Technology Mission, the triennium averages of area, production and productivity ending at 1989-90 and 2005-06 have been computed alongwith per cent change between the two periods.

Table 4.1: Change in area of pulse crops between two periods, before and after launch of pulse technology mission

S.No.	Crops	Area (000 hectare)		% Change in area
		Triennium average ending 1989-90	Triennium average ending 2005-06	
1.	Arhar	501.31	383.49	-23.50
2.	Gram	1340.29	734.77	-45.18
3.	Lentil	462.14	609.65	31.92
4.	Moong	99.57	69.52	-30.18
5.	Pea	273.50	429.09	56.89
6.	Urd	264.68	561.59	112.17
7.	Total Pulses	2961.92	2788.24	-5.86

Area

The Table 4.1 provides the triennium average of area. It is obvious from the table that after the launch of Pulse Technology Mission the area of lentil, pea and urd has increased by 31.92, 56.89 and 112.17 percent, respectively. In contrast to these crops, the gram has suffered substantially by showing 45.18 per cent decrease in its area, followed by moong (30.18%) and arhar (23.50%). However, an overall decrease in area under total pulses has been quite marginal to the tune of about 5.86 per cent during the last 16 years.

Production

The triennium averages of production of the different pulse crops for two periods are depicted in Table 4.2. A similar trend like area has also been observed in production. The maximum increase of 112.10 per cent has been found in case of urd followed by pea (76.34%) and lentil (50.00%). However, the maximum decline of 37.50 per cent was found in case of arhar, followed by moong and gram about 34.00 to 35.00%. The marginal reduction of about 4.41 per cent has been recorded in case of total pulses during the last 16 years.

Table 4.2: Change in production of pulse crops between two periods, before and after launch of pulse technology mission

S.No.	Crops	Production (000 tonnes)		% Change in production
		Triennium average ending 1989-90	Triennium average ending 2005-06	
1.	Arhar	621.56	388.43	-37.50
2.	Gram	1064.17	698.52	-34.36
3.	Lentil	330.23	494.91	49.86
4.	Moong	48.73	31.47	-35.42
5.	Pea	314.76	555.07	76.34
6.	Urd	94.90	201.28	112.10
7.	Total Pulses	2479.05	2369.72	-4.41

Productivity

The productivity of moong and arhar has witnessed downfall by 8.85 and 18.19 per cent, respectively, in 2005-06 as against that of in 1989-90 (Table 4.3). On the other hand, the productivity of gram has stepped up by 19.52 per cent. It may be observed that in spite of increase in its productivity, the gram production has suffered most due to sharp decline in its area (see Table 4.1 and 4.2) because of its highly sensitiveness to diseases and environmental fluctuations. The productivity of lentil and pea has also witnessed considerable increase by 13.86 and 12.25 per cent, respectively in 2005-06 as against that of in 1989-90. There has been a little increment to the tune of about 1.50 % in the productivity of urd and total pulses between two points of time under study.

Table 4.3: Change in productivity of pulse crops between two periods, before and after launch of pulse technology mission

S.No.	Crops	Productivity (q/ha)		% Change in productivity
		Triennium average ending 1989-90	Triennium average ending 2005-06	
1.	Arhar	12.42	10.16	-18.19
2.	Gram	7.94	9.49	19.52
3.	Lentil	7.14	8.13	13.86
4.	Moong	4.97	4.53	-8.85
5.	Pea	11.51	12.92	12.25
6.	Urd	3.59	3.64	1.39
7.	Total Pulses	8.37	8.50	1.55

5. Regional share in area and production of pulses in Uttar Pradesh

It has been observed from the Table 3.1 and 3.2 that there has been a lot of changes, positive and negative both, in area and production of different pulse crops during last forty five years. How these changes have taken shape in terms of share of different regions over last four decades is described and discussed in the present section.

Area

The Table 5.1 presents the per cent share of different regions in the area of major pulse crops and total pulses. In case of arhar, western region has witnessed continuous downfall in its share from 30.71 per cent in 1960-61 to 18.59 per cent in 2003-04 indicating thereby drastic reduction in the area under arhar during last forty four years. Share of Central and Bundelkhand regions has fluctuated between 19.18 & 26.16 and 12.12 & 17.64, respectively, and no definite trend was observed during the same period. On the other hand share of eastern region has steadily risen up to the about 47 per cent in 2003-04 as against about 31 per cent in 1960-61. That means about fifty per cent of total area under arhar in Uttar Pradesh currently belongs to Eastern U.P. Therefore, if the production of arhar is to be increased, then attention of policy maker/scientists is required to make efforts for boosting the productivity of this crop in the Eastern region.

In regards to gram, Western region had highest share (31.77%) during 1960-61 among all the regions but over the period of last forty-four years its share has drastically declined and now it is only 3.84 per cent. The Central region has also witnessed downfall almost continuously but the pace of it was slow, i.e. from 20.70 per cent in 1960-61 to about 15 per cent in 2003-04. Most significant changes have been observed in Bundelkahnd where its share has picked up to the tune of about 65 per cent in 2003-04 from 24.51 per cent in 1960-61, and rising of its share was a continuous process during this period. The Eastern region showed some rising trend in its share till 1980-81 but again started declining and at present it is about 16.12 per cent as against about 23 per cent in 1960-61.

Table 5.1: Share (%) of different regions in the pulse area of Uttar Pradesh over different decades

Crops	Regions	Year					
		1960-61	1970-71	1980-81	1990-91	2000-01	2003-04
Arhar	Western	30.71	23.13	20.80	13.91	20.31	18.59
	Central	22.68	23.65	22.30	26.16	20.40	19.18
	Bundelkhad	15.44	16.77	17.64	14.55	12.21	15.77
	Eastern	31.17	36.44	39.26	45.38	47.08	46.46
Gram	Western	31.77	22.13	17.10	11.23	4.59	3.84
	Central	20.78	22.45	18.53	17.32	13.38	14.99
	Bundelkhad	24.51	32.24	36.13	45.26	64.28	65.06
	Eastern	22.94	23.17	28.25	26.20	17.74	16.12
Pea	Western	40.99	36.77	43.83	24.71	7.25	5.28
	Central	11.65	10.20	11.35	10.49	8.16	5.68
	Bundelkhad	1.01	1.69	1.93	33.98	53.02	66.19
	Eastern	46.35	51.34	42.88	30.82	31.57	22.85
Lentil	Western	34.22	28.66	23.05	16.52	10.74	9.89
	Central	11.75	10.53	8.31	12.29	14.34	17.16
	Bundelkhad	8.29	23.94	41.91	37.28	37.28	36.18
	Eastern	45.74	36.87	26.73	33.91	37.64	36.77
Total pulses	Western	33.40	25.45	23.49	18.14	11.96	10.58
	Central	19.81	20.69	18.64	18.53	15.85	15.93
	Bundelkhad	16.54	22.44	27.74	33.50	44.73	49.15
	Eastern	30.25	31.42	30.12	29.83	27.46	24.33

It was a time that the cultivation of pea was more concentrated in Western and Eastern region as they constituted about 41 and 46 per cent of total pea area in the state, respectively, during 1960-61. Its area has, however, declined drastically in both Western and Eastern region but more in former one than latter one over last forty-four years, and at presently their share are 5.28 and 22.85 per cent, respectively. The Central region has also witnessed reduction in its share from 11.65 to 5.68 per cent during the same period. On the other hand, acreage of pea area has stepped up tremendously in Bundelkhand as its share has risen from 1.01 to 65 per cent over the same period.

Similarly, lentil was more prevalent in Western and Eastern regions as their share were 43.22 and 45.74 per cent in 1960-61, respectively, but it continued to decline over period of time and presently it is now 9.89 and 36.77 per cent, respectively. The Central and Bundelkhand region have, however, shown increasing trend of its share but the pace of its rising was more in latter than former region. Presently, their shares are 17.16 and 36.18 per cent, respectively.

The Western and Eastern regions constituted most of the total pulses area in the state during 1960-61 as their shares were 33.40 and 30.25 per cent, respectively. But over the last forty-four years their share declined to 10.58 and 24.33 per cent, respectively. The Central regions has also witnessed downfall in its share from 19.81 to 15.93 per cent over the same period. The area under total pulses has gone up significantly in the Bundelkhand as it share has risen to about 50 per cent from 16.54 per cent over last forty-five years.

Production

The Table 5.2 presents the per cent share of different regions in the production of major pulses of the State. Like in area an, almost similar trend is observed in share of different regions in the production of major pulse crops and total pulses. Share of Bundelkhand has increased almost continuously in the production of arhar (from 10.61 to 18.87%), gram (from 23.25 to 61.02%), pea (from 0.81 to 68.50%), lentil (from 7.70to 38.20%) and in total pulses production (from 13.58 to 48.42%) during last forty-four years. It may also be observed from the table that its share in case of lentil was about 51 per cent during 1980-81 showing thereby that this region has potential to enhance the lentil production.

The share of Western region has gone down over the same period from 33.82 to 16.87%, 33.70% to 4.81%, 37.01 to 6.39%, 35.59 to 9.54% and 35.27 to 10.53 in case of arhar, gram, pea, lentil and total pulses, respectively. It shows that the production of gram, pea and lentil has almost wiped out from Western region.

The share of Central region in arhar production has been almost about 24 per cent during last forty four years with minor upward fluctuation of 1 to 3 per cent. Similar is the case with share of gram, which varied between 18 to 25.80 per cent during the same period. The share of pea has however, gone down from 19.50 per cent in 1960-61 to 5.15per cent in 2003-04. In case of lentil, share has first experienced downward trend till 1980-81 but it has again picked up and increased to about 17.47 per cent in 2003-04 from 6.91 per cent in 1980-81. The share in total pulse production has declined to about 16.42 per cent from about 24 per cent. The result shows that the Central region has still reasonable share in the production of arhar and gram in the State.

Table 5.2: Share (%) of different regions in the pulse production of Uttar Pradesh over different decades

Crops	Regions	Year					
		1960-61	1970-71	1980-81	1990-91	2000-01	2003-04
Arhar	Western	33.82	26.60	22.00	17.89	16.37	16.87
	Central	24.21	26.92	24.91	27.55	26.62	23.39
	Bundelkhad	10.61	14.49	18.43	15.11	13.55	18.87
	Eastern	31.37	31.99	34.66	39.45	43.46	40.86
Gram	Western	33.70	23.12	20.21	13.72	5.86	4.81
	Central	23.44	25.80	18.90	19.98	16.73	17.99
	Bundelkhad	23.25	28.11	32.94	37.68	59.11	61.02
	Eastern	19.61	22.97	27.94	28.62	18.29	16.18
Pea	Western	37.01	44.79	53.79	28.56	10.01	6.39
	Central	19.49	10.77	12.35	10.13	8.62	5.15
	Bundelkhad	0.81	1.74	2.00	34.90	53.20	68.50
	Eastern	42.70	42.70	31.87	26.41	28.17	19.95
Lentil	Western	35.59	27.82	17.44	12.93	12.34	9.54
	Central	11.98	8.80	6.91	10.71	16.31	17.47
	Bundelkhad	7.70	30.06	50.96	42.84	33.48	38.20
	Eastern	44.73	33.32	24.69	33.52	37.87	34.79
Total pulses	Western	35.27	28.19	24.03	18.77	12.02	10.53
	Central	20.03	23.99	19.47	18.95	17.86	16.42
	Bundelkhad	13.58	19.56	26.59	31.51	41.43	48.42
	Eastern	31.13	28.26	29.92	30.77	28.69	24.63

The share of Eastern region in the production of arhar has increased to about 41 per cent from about 31 per cent during last-forty four years. Its share in the production of pea, lentil and total pulses has witnessed downfall i.e. from 42.70 to 20%, 44.73 to 35% and 31 to 25%, respectively, over the same period. However, its share in the production of gram had shown an increasing trend up to 1990-91 (about 29% from 20% during 1960-61) but started declining after nineties and at present it is about 16 per cent.

The overall results show that at present the Bundelkhand and Eastern region are the major contributor towards the pulse production in the State, followed by Central and Western region.

6. Share of Uttar Pradesh in pulse production of India:

Area

The share of area under different pulse crops and total pulses of Uttar Pradesh to that of India is presented in Table 6.1 since 1960-61 onwards on decadal basis. It reveals that the per cent share of area under total pulses has declined from 19.27% in 1960-61 to 12.24% in 2005-06. It is obvious from the table that reduction in per cent share of area of total pulses has been due to sharp decline in the per cent share of area of arhar (from 26.75 to 10.61%) and gram (from 27.48 to 10.68%). However, the per cent share of area of pea, lentil, moong and urd has substantially increased over the last forty-five years, and presently it has been found to be about 21.29, 43.92, 2.60 and 12.62 per cent respectively. The most significant increase in share has been found in case of moong which share has gone more than five times since 1970-71, whereas share of pea has steeped up to three times, and that of lentil and urd has just doubled. One may observe from the Table 2.1 that the area under pea has declined to 1.63% in 2005-06 from 4.44% in 1960-61 as compared to gross-cropped area in Uttar Pradesh, but its absolute area has relatively increased since 1980-81 as compared to all India basis.

Table 6.1: Contribution of U.P. (in %) in area of pulse crop to the country

Crop	1960-61	1970-71	1980-81	1990-91	2000-01	2005-06
Arhar	26.75	21.80	18.31	13.09	11.29	10.61
Pea	27.48	26.53	22.80	16.89	15.99	10.68
Gram	NA	NA	8.87	18.92	21.29	NA
Lentil	NA	22.67	30.11	45.38	43.92	40.40
Moong	NA	0.48	3.89	3.27	2.60	NA
Urd	NA	7.25	7.07	8.33	12.62	NA
Total pulses	19.27	16.50	12.69	12.29	11.74	12.24

Production

The share of production of different pulse crops and total pulses of Uttar Pradesh to that of India is given in Table 6.2. It is evident from the table that the share of pulse production of Uttar Pradesh to the country has just gone almost half (16.65%) in 2005-06 as against 30.00 per cent in 1960-61. This has been due to the drastic reduction in the share of arhar and gram i.e. about three-times, from 42.51 to 13.87% in the case of arhar and from 29.30 to 11.79% in the case of gram. Evidently, as the share of area in case of lentil, pea, moong and urd has increased over the decades, the share of production of these pulse crops has also increased during that

period. The most significant result is that now Uttar Pradesh contributes about forty-five per cent of the total production of lentil in the country.

Table 6.2: Contribution of U.P. (in %) in production of pulses to the country

Crop	1960-61	1970-71	1980-81	1990-91	2000-01	2005-06
Arhar	42.51	35.64	38.27	24.07	22.67	13.87
Pea	NA	NA	5.83	27.91	18.18	NA
Gram	29.28	29.62	29.79	20.90	18.13	11.79
Lentil	NA	27.03	31.91	50.59	43.48	45.26
Moong	NA	0.43	5.10	2.90	2.94	NA
Urd	NA	7.58	5.21	6.06	12.31	NA
Total pulses	30.08	25.89	23.80	19.42	19.49	16.65

7. Status of major pulses growing States

Table 7.1 Ranking of major pulses growing States in term of area, production and productivity of total pulses during 2004-05

Ranks	Area	Production	Yield
I	Madhya Pradesh (4.52)	Madhya Pradesh (3.43)	Uttar Pradesh (847)
II	Rajasthan (3.57)	Uttar Pradesh (2.38)	Madhya Pradesh (759)
III	Maharastra (3.38)	Maharastra (1.66)	Andhra Pradesh (565)
IV	Uttar Pradesh (2.80)	Andhra Pradesh (1.02)	Maharastra (492)
V	Karnataka (2.11)	Rajasthan (1.34)	Karnataka (376)
VI	Andhra Pradesh (1.80)	Karnataka (0.79)	Rajasthan (375)

Note: Area in million hectares, Production in million tonnes and yield in kg/hectare

The present status (reference to year 2004-05) of major pulse growing States is presented in Table 7.1 in terms of their ranking in area, production and productivity of total pulses. Major pulse growing States are Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka and Andhra Pradesh. It is very obvious from the table that Madhya Pradesh is on top in terms of area while U.P. is on the fourth position. In case of production, Madhya Pradesh is again on top followed by U.P. However, U.P. is on top in terms of its productivity followed by Madhya Pradesh.

8. Status of per capita availability of pulses

The per capita availability of pulses per day (in gram) has been worked out since 1960-61 for Uttar Pradesh and All India. The statistics are given in Table 8.1. It is evident from the table that per capita availability of pulse per day was 142 and 69 gram in Uttar Pradesh and India, respectively, in 1960-61.

Table 8.1 Per capita availability of pulses per day (in gram)

Description	Year				
	1960-61	1970-71	1980-81	1990-91	2000-01
Uttar Pradesh	142.04	103.28	62.43	49.31	35.61
All India	69.00	51.20	37.40	40.30	33.4

This availability has continuously decreased during subsequent decades in U.P. and India both due to population pressure and substantial decrease in area and production of total pulses over the years. The per capita availability of pulses during 2000-01 has been computed to be 35.61 gram and 33.40 gram for Uttar Pradesh and India, respectively, which are much below to the requirement of about 65 gram per day per head.

Conclusions

The per cent area of total cereals to the grass cropped area has increased to about 69 per cent in 2010-11 from about 63 per cent in 1960-61. This increment has found due to increase in cropped area of rice and wheat. The per cent area of total pulses to the gross-cropped area has declined to about 10 per cent in 2010-11 from about 21 per cent in 1960-61. However, the per cent area of lentil and others (mostly urd) to the gross cropped area has increased from 0.84 to 2.29% and 0.90 to 2.48%, respectively during 1960-61 to 2010-11. Two cash crops, viz. potato and sugarcane have also showed increasing trend in its area since 1960-61 onwards. The potato registered a continuous growth in its area (from 0.52% to 2.07%), and same case is with sugarcane (from 6.12% to 8.04%) over last sixty years. Average area of Moong, Urd and Lentil has increased by 401, 238 and 225 per cent, respectively in 2006 as against 1963. Similarly, Average production of Moong, Urd and Lentil has increased by 578, 270 and 559 per cent, respectively in 2006 as against 1963. The productivity of Lentil, Gram, Pea, Moong and Urd has increased by 103 47, 39, 35 and 9 per cent, respectively. Arhar productivity has remained almost constant at 10.09 in 1963 from 10.13 in 2006. Per cent change in area of pulse crops between two period has positively highest in Urd (112.17%) followed by Pea (56.89%) and Lentil (31.92%). However, the Arhar, gram, and Moong showed negative change. Same phenomenon has been found in case of production where the production of Urd (112.10%), Pea (76.34%) and Lentil (49.86%). The per cent change in productivity between two periods has been found in case of Gram (19.52%), Lentil (13.86%), Pea (12.25%) and Urd (1.39%). Share of area and production of Arhar has increased in Eastern U.P. Share of area and production of Gram, Pea and Lentil has increased in Bundelkhand. The share of other regions has gone down. Share of area of total pulses of U.P. to the all India acreage under total pulses has gone down to 12.29 per cent in 2005-06 as against 19.27 per cent in 1960-61. This has been due to sharp decline of share of arhar and gram which accounted about 11.00 per cent in 2005-06 as against 27.75 per cent in 1960-61. Similarly, share of pulse production of U.P. to that of India has gone down to 16.16 per cent in 2005-06 as compared to 30 per cent in 1960-61. This is also because of drastic decline of share of arhar and gram production which accounted 12 to 14 per cent in 2005-06 as against 42.50 and 29.30 per cent in 1960-61, respectively. On the basis of ranking, Uttar Pradesh has fourth rank in area; however, in case of production the Uttar Pradesh has second rank. Another major component i.e. productivity, Uttar Pradesh has first rank.

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