

DYNAMICS OF AGRICULTURAL DEVELOPMENT: ISSUES AND CHALLENGES IN MAHOPA DISTRICT OF BUNDELKHAND REGION OF UTTAR PRADESH

Devendra Singh Yadav¹ and G. S. Chauhan²

¹Research Scholar, Department of Geography, M.L.B. Govt. College of Excellence, (Jiwaji University) Gwalior, India Email: devyadavgis@gmail.com

²Deputy Secretary, University Grants Commission, Central Regional Office, Bhopal, India

Abstract: *Agriculture sector plays a pertinent role in the Indian economy particularly in rural economy. Indian agriculture is facing the various issues and challenges mainly fragmentation of land holdings, low yields of crops, land degradation, loss of soil fertility, erratic and irregular rainfall etc. The main objective of this paper is to highlight the cropping pattern in spatio-temporal perspectives and suggests the important programmes and policies for the solution of sustainable agriculture development of the region. Mahoba district of Bundelkhand region is one of the most agricultural backward and rain-fed areas of India. The research study reflects that the whole area has gone through tremendous changes including land use, cropping pattern, crops yields and so on. The findings of target area reveal that the land use has perceptibly changed a lot during the last two decades or so (1991-92 to 2014-15) under various land use categories, particularly the net shown area (204595 hectares to 2,37,217 hectares). The area under Rabi and Kharif crops has also observed the rising trends. The area under Rabi crops was recorded 1,69,562 hectares in 1991-92 to 2,19,045 hectares in 2014-15, under Kharif crops was merely 40,972 hectares in 1991-92 which has grown appreciably around three folds i.e. 1,20,089 hectares in 2014-15.*

Key words: Perception, Degradation, Perspective, Rain-fed, Soil Fertility

Introduction

Agriculture sector plays an important role in Indian economy particularly in rural economy. It is considered as the backbone of rural economy. As per the latest statistical figures, the contribution of agriculture makes up around 15 per cent of the national economy. It has also been observed that the rural economy is facing various challenges and it is in crisis which needs to be addressed at local, regional and national level by applying the various beneficial and innovative schemes to strengthen the rural economy and promote the interest of rural farmers. Fragmentation of land holdings, low crops yield, pest attacks, hail storms, drought, falling market prices, poor irrigation and lack of access to credit, increasing no. of suicidal incidences of farmers, rising debt are the key issues. Land acquisition for infrastructure projects, negative agricultural growth, damages of crops due to increasing heat and temperature, depleting ground water resources, recurrence of flood and droughts, minimum support price (MSP) regarding the development of agriculture especially different types of crops are the important issues. The other issues pertaining to determining the cost of production include elements such as hired labour, expenses on their own rented machinery as well as livestock, cost of seeds and fertilizers, expenses of irrigation including rent of leased land etc. However, the entire global agricultural economies are also confronting with climate change, global warming, frequently recurring disasters, land degradation and soil erosion, as well as rising sea level.

In case of India, the Mahoba district of Bundelkhand region (U.P.) is affected by natural and manmade disasters especially natural disasters predominantly droughts, intensive and illegal quarrying and mining, depleting water resources and land degradation. The key issues are affecting the agriculture system of the country particularly the production and productivity of various types of crops includes the decreasing size of agricultural land holdings, inadequate access to irrigation, imbalanced use of soil nutrients, land degradation, misuse of water resources as well as continuous depleting ground water resources. Consequently, loss of soil fertility, loss of per hectare yield, unavailability of quality seeds, uneven access to modern

technology in different parts of the country, limited procurement of food grains by government agencies and failure to provide remunerative prices of crops to farmers.

It has been observed that Indian population engaged in agriculture sector has declined sharply. As per the statistical figures of 2009-10, 243 million persons were employed in agriculture and its allied activities. The major line share of the country population depends on agriculture for livelihood and survival consists of landowners, tenant farmers who cultivate a piece of land, and agricultural laborers who are employed on these farms. Agricultural output has also been volatile over the past 10 years, with annual growth ranging between 8.6 per cent in 2010-11, to -0.2 per cent in 2014-15 and 0.8 per cent in 2015-16 over the past 10 years (State of Agriculture in India, 2017, Ministry of Agriculture, Govt. of India). It contributes to about 17.5 percent of the GDP (at current prices in 2015-16). Over the past few decades, the manufacturing and services sectors have increasingly contributed to the growth of the economy, while the agriculture sector contribution has decreased from more than 50 per cent of GDP in the 1950s to 15.4 per cent in 2015-16 (at constant prices). The statistical figures of last couple of years clearly reflect that India's production of food grains has been increasing every year. Our country is among the top producers of various crops namely wheat, rice, pulses, sugarcane and cotton as well as the highest producer of milk and second highest producer of fruits and vegetables in the World.

The phenomenal increase in food grains from 196.81 million tonnes in 2000-01 to an all-time high of 265.04 million tonnes in 2013-14 led to a surplus compared to domestic requirements and contributed substantially to overall exports. Although, bad monsoon during 2014-15 affected the production of kharif crops and unseasonal rains and hailstorms during February-March 2015 added to the production of Rabi crops. As a result, food grain production during 2014-15 was 252.68 million tonnes which have further increased to 275.11 million tonnes of major crops as per the second advance estimate of ministry of agriculture, Govt. of India. However, various important studies have been conducted by the agriculturists and subject expert on development of Indian Agriculture in including the various issues related to agriculture of Bundelkhand region such as Brown, D.D. (1971), Chakravarti, A.K. (1973), Mohammad, Ali, Munir Abdul, Rehman Hifzur, et al., etd. (2007), Singh, J. (1974), Arakeri, H.R. (1982), Athavale, R.N. (2003), Abhijit Sen (2016), Agarwal, Anil and Narain, Sunita (1992), Agarwal, Anil and Narain, Sunita and Khurana, Indira (ed) (2001), Agarwal, A., Tinker, J. et al (1980), Bhargava, R.N., Sinha, R.S. Dutta. V. (2010), Biswas, A.K. et. al. (Eds.) (1991) Some of the very important studies which are indeed very relevant and familiar to the present research work are viz. , Athavale, R.N. (2003), , Agarwal, Anil and Narain, , Agarwal, A., Tinker, J. et al (1980), Bhargava, R.N., Sinha, R.S. Dutta. V. (2010), Biswas, A.K. et al. (eds.) (1991).

Aims and objectives

- To study the agricultural development in study region
- To analyze and to evaluate the land use changes in Spatio-temporal dimension
- To examine the production and yield of major agricultural crops
- To investigate and to explain the major impediments in the agricultural development.
- To highlight the people's perception regarding agricultural development & related issue
- To suggest the important policies for solution of sustain agricultural development issues

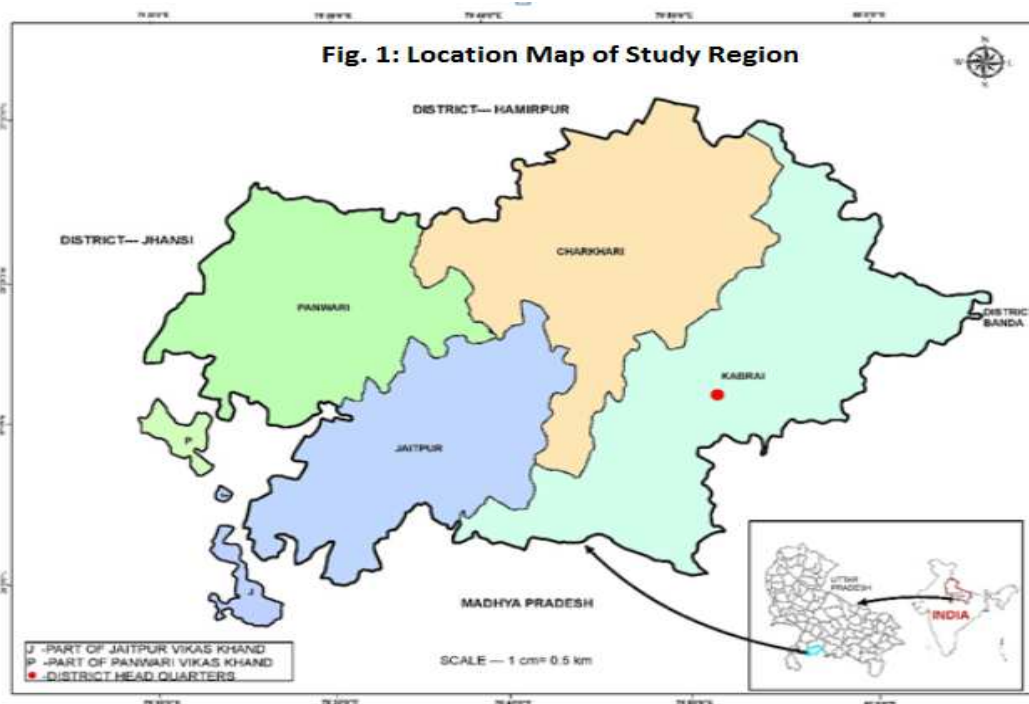
Data Collection and Research Methodology

The research study is based on both primary and secondary data sources. The primary data has been collected by a detailed structured questionnaire. For primary survey, four blocks viz., Jaitpur, Kabrai, Panwari, Charkhari (10 villages from the each block) have been selected of Mahoba district. The interviews have been conducted with 400 respondents to get personal observation and to know their perception regarding the research problem on various dimensions. The secondary data has also been collected from the different types of secondary sources specifically District Census Hand book, District – Wise Land Use Statistics (1998-99 to 2005-06) Directorate of Economics and Statistics, Dept. of Agri. and Co-operation, Ministry of Agriculture, Govt. of India, Identify Gaps in Input Supply, Credit Availability, Dissemination of Appropriate Technology and Other Requirements Relevant for Improvement of Productivity of Field and Horticultural Crops in Rain-fed Areas of Bundelkhand Region, National Rain-fed Area

Authority, NITI AAYOG (2010-13) Govt. of India, Comprehensive - District Agricultural Plan (C-DAP) Mahoba, District Planning Committee, Mahoba (Uttar Pradesh), Technologies for Increasing Production of Rabi Crops in Bundelkhand, National Rain-fed Area Authority (Planning Commission), 2011, Mid – Term Quick Impact Evaluation Study of Special Package for Drought Mitigation and Integrated Development of Bundelkhand Region, Prepared for Rain-fed Area Authority, Erstwhile Planning Commission, now NITI AAYOG, Govt. of India, Land Development and Water Resources Department of Mahoba district etc.

Geo-Physical Profile of the Domain Area

Mahoba is located in the south western part of the Uttar Pradesh and shares geographical boundaries with Hamirpur district in north, Madhya Pradesh state in south, Banda and Jhansi district in east and west respectively. The designated study area is the part of Bundelkhand region which is situated between 25°01'30" to 25°39'40" north latitude and from 79°15'00" to 80°10'30" east longitude. It consists of an area of 3144 Sq.km comprising of 3 tehsils (Kulpahar, Charkhari, Mahoba), 4 development blocks (Jaitpur, Kabrai, Charkhari and Panwari) and 521 villages inhabited by 8, 75,858 people with the population density of 279 persons per sq. km. as per 2011 census which is very low in comparison to the state of 829 persons per sq.km. The rural area covers 3116.1 Sq. Km. and urban recorded 27.9 Sq. Km. There are 247 Gram Panchayats and 521 Revenue villages. The study region ranks 48th in literacy with 65.3 per cent which is below than the state average of 67.7 per cent. The another distinction of the region is that there are 86 uninhabited villages out total 521 villages, whereas Kulpahar tehsil has the highest number of inhabited villages 227 while Charkhari tehsil has the lowest number of inhabited villages (83). In the study area (Mahoba district) has the unique distinction to be the smallest district in terms of population in the state (71th ranks).



Due to small Landholdings and limited irrigation facilities including harsh climatic condition, most of the areas are cropped only once in year. Pulses, wheat, sorghum and oilseeds are the main crops of the region. The research area is famous for its betel leaf (*Paan*). Due to scarcity of water, the district is backward in various agricultural crops production. Geologically, the district comprises Precambrian Bundelkhand massif dolerites, granites and quartz reefs confirmatively overlain by quaternary alluvium. The main and major rivers of the region are Dhasan, Urmil, Birma and Arjun. Physiographically the area has been divided in two parts viz.

1. Southern parts having high reliefs with hillocks and

2. Northern part having relatively low relief with low hillocks.

The average annual rainfall is 864 mm in the study area. The climate is typical subtropical punctuated by long and intense summer. About 87 per cent of the annual rainfall is received from south-west monsoon and the soil has been produced by the weathering of granites. Clay and loamy soil is dominant in entire region. Mahoba district mainly comprises of hard rock formation of Bundelkhand massif. The water of rainfall does not percolate and store subsurface zone since the rocks are of massive & compact nature. However, secondary porosity in the form of joints and fissures allow some water to percolate inside the earth. On the basis of hydro geological information ground water occurs in two forms:(i) Shallow zone- the prelatric conditions are only limited to the overburden of rocks the depth of which is maximum up to 35-40 m., (ii) Deeper fracture zones, the ground water occurs in fractures and joints and the potential fractures are encountered from around 35 m to 96 m in some places. Being the hilly and rugged terrain, the occurrence of ground water in this terrain is highly uncertain. The annual ground water recharge of the region is 47046.58 ha.m (hectare meter), the net annual ground water availability is 42341.92 ha.m (hectare meter). The existing gross ground water draft for all uses is 20978.59 ha.m. The net ground water availability for future irrigation development is 20863.84 ha.m. The stage of ground water development is 49.55 per cent.

Land Use Dynamics

The current land use system of study region is very dynamic and unique in nature. It is rather full of challenges and opportunities consisting of many inconsistencies. Certain parts of study region are very feasible to produce food crops and some are not appropriate for various other important commercial and cash crops including some horticulture crops. To assess and to know the agricultural performance for more than past two decades or so, it is essential to understand the entire land use system and occurrence changes to get the overall result of crops production and productivity. It has been evidently found that the land use system has perceptibly changed a lot and has got a new dimension in more than 24 years and ultimately it indicates that the area under various categories and sub-categories have increased and on the other hand, in some of the categories the related area has gone down tremendously.

Table 1 shows that the net sown area has increased from 2, 04,595 ha to 2, 34,493 ha during 1991-92 to 2009-10 and it has escalated 2, 37,217 ha 2014-15. Simultaneously, the area sown more than once has also recorded highest point of figures from 6173 ha to 103201 during 2009-10. However the area under the same category has slightly declined (1,01,956 ha) in the year 2014-15, due to weak monsoon and scanty rainfall. The area under another important category has also observed the similar trends of transformation and the total cropped area has rose from 2,10,768 ha to 339173 ha. in the same time series. Irrigated area has also depicts some ups and downs in span of some increasing trends from 1991-92 to 2009-10 but in the year 2009-10, the area under the same category has drastically some down up to 86213 ha. However, it has again touched the highest figures i.e. 1,25,420 ha during 2014-15. The overall picture displays that the area under various categories of land use has observed rising trends of transformation with few exceptions within the designated time period.

Table 01: Land use Status of Study Region during 1991-92 to 2014-15 (hectare)

year	Total area reported	Net area sown	Area sown more than once	cropped area sown				Net irrigated area	Gross irrigated area
				Total	Rabi	Kharif	Jayad		
1991-1992	300547	204595	6173	210768	169562	40972	218	64010	64604
1994-1995	300151	209035	16335	225370	181311	43840	216	76890	78005
1999-2000	299947	218117	32872	250989	195974	54680	299	94279	96102
2004-2005	327429	238301	58053	296354	222230	73859	265	111186	113516
2009-2010	327429	234493	103201	337694	212689	124943	62	88213	8991
2014-2015	327429	237217	101956	339173	219045	120089	39	125420	130276

Source: Land Record Officer, Economics & Statistics Department, District Statistical Book

Area under Major Crops

The statistical figures related to area under major crops reveal that it has shown some very interesting pattern. In some of the major crops it has increased many folds whereas area under

some crops has shown the declining trends (Table 2) during the given time series. However, in almost all the major crops area under the various crops has observed pendulum like trends (both upwards and downwards). For instance, area under Sesamum crop was recorded only 5257 ha. In 1997-98 which has enlarged to more than six times i.e. 31808 (2014-15). In case of another important crop Masoor too, the area has swelled to a sizeable quantity from 13344 ha. to 24737 ha in the same period, Whereas in case of the area under the other Jawar crop has substantially gone down from 12750 to 1704 ha crop has also observed the same trends and the area under this crop has drastically gone down from 1012 to 12 hectares in same period. But the area possessed by the Urad crop has touched the maximum mark of 54330 ha. in 2014-15. The area under cash crops like sugarcane has also experienced the expanded area from 1027 to 2545 ha. and is followed by mustard crop.

The area under almost all these pulses has increased in the given time period barring a few. For instance, area under Arhar was recorded 4432 ha which shrunk to 2609 ha in the year 2014-15. Although it has registered positive trend and the area under the same crop was noticed 5718 ha area in 2009-10. In rest of the other pulses, the figures have shown rising trends (Table 2). Among the oilseeds crops, the area under Soyabean and linseed has observed the downward trends (Table 2). The area under Soyabean was 894 ha in 1997-98 which has simultaneous reduced during the designated period and it was recorded 339 ha in the year 2014-15. The same trends have also been observed in case of linseed, where as in rest of the other oilseeds crops, the area has depicted upwards trends namely groundnut, Mustard, and Sesamum (til). The area under other crops especially sugarcane has increased two times from 1027 ha to 2545 ha during the given time period.

Table 02: Area under Major Crops (Hectares)

#	Crops	1997-98	1999-2000	2004-05	2009-10	2014-15
A	Cereals crop					
i	Wheat	69343	67838	63683	66084	69598
ii	Rice	1042	1139	724	212	12
iii	Jawar	12750	8729	5767	6150	1704
iv	Barley	2345	2566	2494	4840	10701
B	Pulses					
i	Arhar	4432	3235	NA	5718	2609
ii	Masoor	13344	25231	NA	20241	24737
iii	Moong	4368	4618	NA	8831	6907
iv	Gram	46394	42935	67115	73161	54605
v	Peas and beans	43662	47993	NA	24086	37842
vi	Urad	16692	17139	NA	54366	54330
C	Oil seeds					
i	Ground nuts	11048	10875	7647	9034	11609
ii	Mustard	3455	2861	3241	4211	5736
iii	Linseed	10753	8875	7578	7503	6222
iv	Sesamum (til)	5297	NA	7783	30922	31808
v	Soya bean	894	593	175	138	339
D	Other					
i	Sugarcane	1027	991	1547	1477	2545

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India

The major cereals crops of the target area are namely (i) Wheat (ii) Rice (iii) Jawar and (iv) Barley which are produced and grown on large scale by the majority of farmers for their survival and to get good output and for better income. Apart from these crops, the other important crops come under the category of pulses are viz., (i) Arhar (ii) Masoor (iii) Moong (iv) Gram (v) Peas and beans. Similarly the crops which are termed as cash crops & fall under the category of oilseeds are (i) ground nuts (ii) Mustard (iii) Linseed (iv) Sesamum (Til) (v) Soyabean, whereas under the category of the other crop is Sugarcane. The overall picture concerned with the area under major crops depicts a very unique position. Such as wheat crop

covers the maximum area under all major crops i.e. 6,90,598 ha. During the years 2014-15 (Table 2). The emerging pattern related to wheat crop has also reflect a certain ups and downs during the given time series. Initially, the area under the same crop was recorded 69,343 ha in 1997-98 which has dropped continuously up to 2009-10 in comparison to the base years (1997-98) and finally performed slightly better achieving 69,598 ha area in 2014-15. The second important crop of the region was Barley, the area under this crop was merely 2345 ha which onwards rose to approximately 5 time between 1997-98 to 2014-15 with exception and it has decreased to 2494 ha in 2004-05 (Table 2) whereas in case of rice crop, there the just reverse trends. The areas has drastically gone down from 1042 ha (1997-98) to merely 12 ha in 2014-15. However, the years 1999-2000, it has increased to 1139 ha. (Table 2). As a result the area under this crop has shown very poor area and if the same trends will continue, the crop area under rice crop may diminish totally. In case of Jawar crop as well, similar types of pattern have also been recorded. The area the crop was registered 12750 ha which has further decreased to 1704 ha in the given time period. However, it has risen to 6150 ha in 2009-10 (Table 2). Precisely, the areas under major crops particularly cereals crops have shown both ups and downwards trends.

Production of Major Crops

In the changing agricultural scenario, the major crops have got the new dimension with positive growth during the mentioned transition period. The data production figures related to agricultural production of various crops reveal that a steady growth is being maintained. Table 3 vividly depict that the production of barley has increased sharply i.e. four-times from 4202 to 18398 tonnes during the period 1997-98 to 2014-15. The wheat production was recorded 118336 in 1997-98 and was lowered by over 67961 in the year 2014-15. Out of these selected crops, sugarcane has achieved the maximum production level i.e. three times from the initial production. Although, the production of other selected crops also increase to the highest mark in the given time but not higher than the already recorded other crops.

Table 03: Production of Major crops (Tonnes)

#	Crops	1997-98	1999-2000	2004-05	2009-10	2014-15
A	Cereals					
i	Wheat	118336	148821	106844	102970	67961
ii	Rice	1173	1238	784	203	19
iii	Jawar	8614	7751	5027	2552	936
iv	Barley	4202	4299	3987	4957	18398
B	Pulses					
i	Arhar	4268	4661	NA	3454	1292
ii	Masoor	9781	NA	NA	10869	3983
iii	Moong	1354	1284	NA	786	2148
iv	Gram	34383	29051	63068	47098	9576
v	Peas and beans	53137	61095	NA	20545	16688
vi	Urad	6176	5690	NA	5219	15634
C	Oil seeds					
i	Ground nuts	7623	6764	3356	1382	4609
ii	Mustard	1423	1227	1309	1668	741
iii	Linseed	4258	3835	4456	3954	3603
iv	Sesamum (til)	609	NA	663	1422	2895
v	Soya bean	721	466	72	146	243
D	Other					
i	Sugarcane	39485	49435	59846	59213	102932

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India

N/A: data not available

Productivity/Yield of Major Crops

The issue of productivity entirely depends on various factors like quality of soil, slope texture, available water resources including means of irrigation & application of modern methods and technology in agricultural operations since the whole area is rain-fed and yield per hectare in agricultural productivity Table 4 clearly depicts the ups and down wards trends consists of limited irrigation facilities and predominantly based on traditional methods of farming. The

productivity scenario of past more than 24 years indicates that there is steady decrease in the average regarding the yield of principal crops. In case of the Arhar crop, the recorded yield was merely 0.96tonnes per hectare in 1997-98 which has declined to 0.50 tonnes per hectare in the year2014-15. The Masoor has also experienced the same pattern of yield per hectare and it has registered a decrease of 0.16 tonnes per hectare from 0.73 tonnes per hectare. The wheat has also recorded the decline yield pattern in comparison to the other principal crops and it has registered nearly two times lesser yield tonnes per hectare during the given transition period. In the year 1997 -98, the wheat crop yield was noticed 1.71 tonnes per hectare. In the same way, a decreasing trend has been noticed in the yields of ground nuts, peas and beans. Slightly better performance made by sugarcane in relation to yield as witnessed in the given time period.

Table 04: Productivity/yield of Major Crops (in Tonnes/Hectare)

#	Crops	1997-98	1999-2000	2004-05	2009-10	2014-15
A	Cereals					
i	Wheat	1.71	2.19	1.68	1.56	0.98
ii	Rice	1.13	1.09	1.08	0.09	1.58
iii	Jawar	0.68	0.89	0.87	0.41	0.55
iv	Barley	1.79	1.68	1.6	1.02	1.72
B	Pulses					
i	Arhar	0.96	1.44	NA	0.6	0.5
ii	Masoor	0.73	NA	NA	0.54	0.16
iii	Moong	0.31	0.28	NA	0.09	0.31
iv	Gram	0.74	0.68	0.94	0.64	0.18
v	Peas and beans	1.22	1.27	NA	0.85	0.44
vi	Urad	0.37	0.33	NA	0.1	0.31
C	Oilseeds					
i	Ground nuts	0.69	0.62	0.47	0.15	0.40
ii	Mustard	0.41	0.44	0.4	0.4	0.13
iii	Linseed	0.4	0.44	0.59	0.53	0.58
iv	Sesamum (til)	0.11	NA	0.1	0.05	0.09
v	Soya bean	0.81	0.79	0.41	1.06	0.72
D	Other					
i	Sugarcane	38.45	49.88	38.69	40.09	40.44

Source: Directorate of Economics and Statistics, Ministry of Agriculture, Government of India
N/A: data not available

Consumption of Fertilizers in Agricultural Operations

The fertilizers use in the agricultural production of various food grains have also shown the enthusiastic rising trends and brought the overall positive development in the existing agricultural productivity of various important crops. The statistical figures reflected in **table 5** obviously display that the fertilizers use in the study area has got new and multiple dimensions. In the initial period (19945) the consumption in the use of fertilizers (NKP) was 3239 metric tonnes which has increased to 50,273 metric tonnes in 2014-15, which was recorded highest figure during the time series. Farmers of the area have started using fertilizers to get more production, better output and good income. It has also been observed that in the use of Nitrogen was maximum (10,874 metric tonnes) followed by Potash (2265 matrix tones) and Phosphorus (2265 metric tonnes) in the target area. The balanced use of fertilizers plays a significant role in raising the production and productivity of various crops. Agricultural productivity depends on the availability and quality of agricultural inputs such as good quality of soil, availability of water resources, irrigation facilities, use of modern methods in agriculture, facilities of crops in the vicinity of production areas, seeds and fertilizers, access to agricultural credit and crop insurance, assurance of remunerative prices for agricultural produce, and storage includes marketing infrastructure as seen in Figure 4. The irrigation facilities under different sources have also played a significant role to increase the production the productivity of various crops.

Table 05: Consumption of Fertilizers, 1994-95 to 2014 -15 (in Metric Tonnes)

Year	Nitrogen	Phosphorus	Potash	Total
1994-95	1439	1795	5	3239
1999-00	3683	4014	28	7725
2004-05	4125	3923	106	8154
1991-2000	1384	880	32	2296
2014-15	37134	10874	2265	50273

Source: Economics & Statistics Department, District Statistical Book, Mahoba (1994 to 2014-15).

People's Perception regarding Agricultural Development

As per the people's perception, the size of land holdings has reduced considerably that is very important factor to diminish the average land productivity. The majority of people's perception reflects that wells (31 per cent) and canals (17 per cent) are the main sources of irrigation whereas it is the opinion of majority of respondents (32 per cent) that they have no irrigation facilities in their concerned areas viz., Charkhari, Jaitpur, Kabrai, and Panwadi.

Table 06: Size of Land holding (in percent)

#	Size of Land holding	Charkhari	Jaitpur	Kabrai	Panwadi	Study Region
1	Land less	21	16	23	19	20
2	Small (0-6 bigha)	35	43	35	35	37
3	Medium (6-13)	22	24	25	24	24
4	Large (above 13)	22	18	17	23	20
	Total	100	100	100	100	100

Source: Personal Survey

Table 07: Major Sources of Irrigation (in percent)

#	Source of irrigation	Charkhari	Jaitpur	Kabrai	Panwadi	Study Region
1	Well	19	51	27	25	31
2	Canal	24	9	12	25	17
3	Pond	4	4	3	1	3
4	Tube well	9	4	6	12	7
5	River	5	4	7	3	5
5	Others (Check Dam, Khet-Talab, Bawari)	6	5	6	5	5
6	No Irrigation Facilities	33	25	40	31	32
	Total	100	100	100	100	100

Source: Personal Survey

Table 08: Most Beneficial and Preference of Farmers Producing Crops (in per cent)

#	Beneficial crops	Charkhari	Jaitpur	Kabrai	Panwadi	Study Region
1	Wheat	25	21	24	20	22
2	Split bangle (gram)	14	18	15	17	16
3	Pea	14	13	13	18	15
4	Peanuts/Groundnuts	14	9	13	12	12
5	Urad	12	14	13	10	12
6	Mustard	4	8	6	13	8
7	Peppermint	12	12	11	2	9
8	Others (Till, Oil Seeds)	5	5	4	7	5
	Total	100	100	100	100	100

Source: Personal Survey

Suggestions

- The fund sharing ratio between the centre and the states is restored to 9:10 for various agriculture development programmes.

- Urgent and concrete steps should be taken for doubling farmer's income to achieve this goal to redirect the focus and prove the essential institutional support.
- Stressing the need to revert to the earlier sharing pattern to improve farm income, make agriculture more sustainable and promote crop diversification.
- On the one hand, growth in productivity a real farm income have materially slowed down; on the other, the very sustainability of rice-wheat cropping system is under threat due to over-exploitation of natural resources.
- Farmers should grow more oil seeds to reduce dependence on imported cooking oil and cut urea consumption by at least half by 2022 (PM).
- The Govt. of India encouraging farmers to adopt suitable technologies and agronomic practices; incentivizing the production of location specific, high yielding varieties, hybrid rice seeds and tolerant varieties against a biotic and biotic stresses; and promoting marketing infrastructure.
- The important schemes of Govt. of India for the agricultural development and production of various crops for the welfare of farming community are viz., i) National Food Security Mission (NFSM), ii) Bringing Green Revolution to Eastern India (BGREI), iii) Impact of Bringing Green Revolution to Easter India, iv) Resources for Agricultural Production System
- Various resources and inputs required for enhancing agricultural production are land and soil, water, energy and farm power, credit and insurance, etc. Therefore, proper management of these resources needs to ensure.
- Efforts should be made to promote contract farming with the consent of farming community.
- To counter these problems, policy emphasis is required on promoting soil test-based balanced and judicious use of chemical fertilizers in conjunction with organic sources of nutrients to protect the deficiency of micronutrients, such as zinc, iron, manganese and boron.
- Like the other agricultural developed states, the Govt. should provide farmers interest-free loans and are charged less rate of interest on money given for buying seeds and fertilizers.
- On the same pattern the UP state including the Bundelkhand region should be covered under Pradhan Mantri Fasal Bima Yojana (PMFBY) and extended additional support to farmers under "Bhavantar Bhugtan Yojana" (Price Deficit Financing Scheme) to compensate the farmers. This Unique Scheme supports the farmers by providing compensation for agriculture produce in times of price fall.
- The continuous deterioration of soil health in the studied region, needs a permanent solution such as balanced use of fertilizer by establishing soil testing laboratory in the Dist. /Tehsil level and the Govt. is taking initiative on this issue from the year 2016-17.
- In order to increase the productivity of Paddy and wheat, improve soil health, creation of irrigation facility and better use of water, farm mechanization, use of Gypsum in saline land, community warehousing and to promote use of progressive farming system for reduction in cost of farming, the govt. of UP has launched a sub-scheme Rastiya Krishi Vikas Yojna (RKVY) for the Green Revolution in Eastern UP.
- Similarly in every block and in a district level agricultural extension center should be established to get the feedback from the farmers and to suggest them various techniques and innovative ideas related to their crops, appropriate methods, more output from their crops, to get more yield from less water, to protect the crops from different types of diseases, maximum use of green manure in agriculture operation, balanced use of fertilizers including diversification of crops to improve the soil health and to get better output.

Conclusion

Agriculture and its allied activities including horticulture have played an important role not only in the country's economic development but also to improve the socio-economic conditions of the rural based farming community. The development of Indian agriculture in the last 68 years or so is no doubt, appreciable and remarkable because India has globally achieved a high rank with regard to certain agricultural crops and got self-sufficiency in various food crops. The role of Green Revolution results in raising the agricultural production and other factors are also liable to get the overall agricultural development in the country like the introduction of improved irrigation facilities, high yielding varieties, use of fertilizers, agricultural development programmes, large scale plant protection measures, pesticides, new methods of farming, introduction of new

agricultural policy and new technological innovations, etc. In the light of the above programmes and policies lunched by Govt. of India as well as the State Govt. to develop and promote the agriculture sector of the state practically and target area of Bundelkand region. However, time to time the Govt. of India also given certain packages for the development of Bundelkand region. As it has been already discussed and explain in the research paper that the study region is predominantly a water deficit and drought prone. Subsequently, the amount of rain fall is less and entire agriculture system depended on monsoon. Therefore, to increase the production and productive of various crops with better output and to develop the agriculture system of the study regions formers are advised to produce only those crapes which are less water consuming with better output. Former should also be suggested to adopted crop diversification. In each and every block, apart from of the dist. headquarters of study region the agriculture extension counters as well as soil testing labs should be established for getting the feedback for the farmers and suggest them the various latest techniques of agriculture innovations as well as to suggest them the proper riming of sowing and harvesting of various crops and proper use of fertilizer in agricultural operations. Similarly the farmers should also advised to adopt the traditional and modern methods of conservation of water resources by creating additional infrastructure to store maximum water for future needs for production of different types of agricultural crops. Precisely, by following the suggestions and adoptions of various prestigious schemes of centre and state Govt., the farmer's income may raise their double income as well as to increase the production and productivity of various crops be increased up to some extent and they can self reliance in their agriculture and livelihood security.

References

1. Brown, D. D. (1971), Agricultural Development in India's Districts, Cambridge, Mass.
2. Chakravarti, A. K. (1973), "*Green Revolution in India*". Annals of A.A.G., Vol.63, pp.319-30.
3. Singh, J. (1974), An Agricultural Atlas of India: A Geographical Analysis, Vishal Publications, Kurukshetra.
4. Arakeri, H. R. (1982), Indian Agriculture, Oxford and IBH Publishing co., New Delhi, p.236,
5. District Mahoba, (Uttar Pradesh), District Statistical book (1993-94 to 2014-15), Block Wise.
6. Athavale, R. N. (2003): Water Harvesting and Sustainable supply in India, Rawat Publication, Jaipur and New Delhi.
7. Mohammad, Ali, Munir Abdul, Rehman Hifzur, et al., (eds.) (2007), Fifty Years of Indian Agriculture, vol.1, Concept Publishing Company, New Delhi,
8. Census of India, 2011, Uttar Pradesh, series 10, Part XII-B District Census Handbook, Mahoba, Village and Town wise, Primary Census Abstract (PCA), Directorate of Census Operations, Uttar Pradesh.
9. Ground Water Year Book, Uttar Pradesh (2014 - 2015), CGWB, Northern Region, Bhujal Bhawan , Lucknow, U. P.
10. Agricultural Statistics at a Glance 2015, http://eands.dacnet.nic.in /PDF/ Agricultural_Statistics_At_Glance-2015.pdf.
11. 29th Report: Impact of Chemical Fertilizers and Pesticides on Agriculture and Allied Sectors in the Country, Standing Committee on Agriculture, August 11, 2016,
12. Abhijit Sen (2016), "*Indian Agriculture Today: Some Reflection on Agrarian Prospects*", Economic and Political Weekly, Vol. 51, No.8, February.
13. De Roy, Shantanu (2017), "*Economic Reforms and Agriculture Growth in India*", Economic and Political Weekly, Vol. 52, No.9, March.
14. DPR 2017-22, Department of Ground Water, Lucknow, Uttar Pradesh.
15. District Sankhyikiya Patrika, Economics Data and Statistics Division.
16. State of Agriculture in India, 2017, Ministry of Agriculture, Govt. of India, New Delhi
17. Department of Ground water, Uttar Pradesh, "State Ground Water Conservation Mission." DPR for Critical Blocks Development Rain Water Harvesting and Ground Water recharge District Mahoba Planning Year (2017-18 to 2021-22)