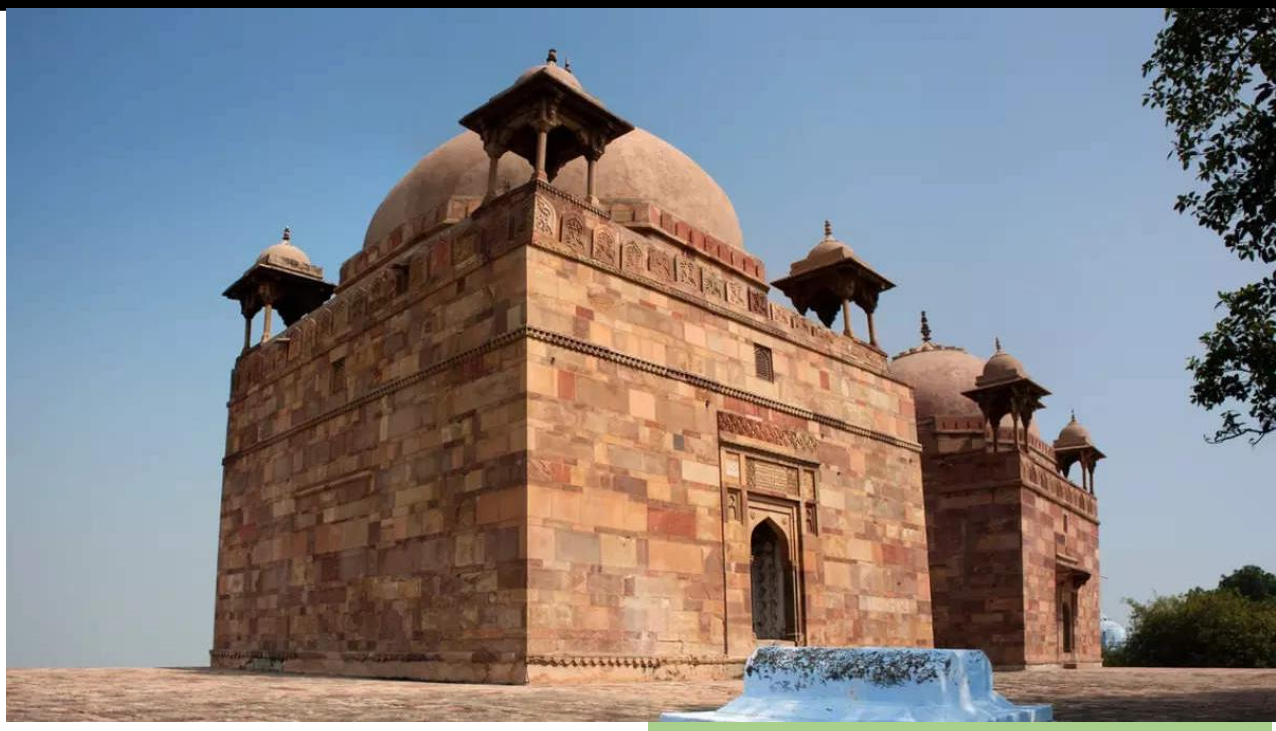
Arth Ganga Project: District



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EXECUTIVE SUMMARY

The ancient city Kannauj, known for its rich culture and history is located in the state of Uttar Pradesh. It is also known as the perfume capital of India. The district is of high archaeological relevance.

Agriculture is the second most important economy. It grew at an average annual growth rate of 5.14% but it's contribution in primary sector decreased. The major crops grown are maize, wheat, rice, potato, vegetables, etc. The area under maize cultivation is highest whereas the highest productivity is that of potato. The major soil types are deep loamy soil (55%) and deep silt soil (45%). The district lies in the Central Plain Agro-climatic zone divided into five Agro-ecological situations (AES); out of these, the AES-II is the highest cultivable region. Of the total geographical area 209000 ha, 13500 is forest land, 21600 ha is non-agricultural land constitutes, etc. The net irrigated area is 130600 ha. The crops are cultivated on 166000 ha area out of which net sown area is 145800 ha resulting in cropping intensity of about 161%. Barren and uncultivable land, area under trees and gardens, share decreased from 2.40 to 1.99% and from 1.13% to 0.34% during 2010-18. The current and other fallow land has also decreased over the years, but the net sown area and area for non-agricultural use has increased from 69.40% to 74.14% and 9.39% to 10.98% during 2010-18. Cropping intensity increased from 150.18% to 170. The use of nitrogen is more than the recommended ratio which decreased in 2017-18, while the phosphorous and potassium ratio is less than the recommended ratio where potassium had decreased but phosphorous has increased in 2017-18. Amongst the livestock indigenous and crossbred cattle, sheep, pigs along with buffalo, goats, and poultry are also contributors to the economy. The livestock share increased from 19.28% to 21.24%. The share of primary sector decreased from 31.31% in 2011-12 to 22.95% in 2018-19, whereas the growth in secondary sector increased from 20.70% to 28.45% during same period with average annual growth rate of 19.39%. The tertiary sector occupies, on average, 45.18% share of the district economy. Mines and quarrying also recorded a remarkable average annual growth rate of 48.60%.

There are no major forests in the district (27.82 km^2); the forests are mainly open type. There are a varied number of species. The share of the forest area has increased from 6.38% in 2010-11 to 9.13% of the total reported area in 2017-18. The district comprises 592 wetlands; most are waterlogged and rivers or streams. The wetlands are small and medium-sized in general. The number of natural wetlands is more than man-made. The district has a good transportation system with well-connected road and rail networks.

There are many tourist attractions such as Archaeological Museum, Lakh Bahosi Bird Sanctuary, Annapurna Temple, Raja Jaichand fort, etc. which are major tourist attractions. There has been a significant increase in tourism in recent years up until 2018 with a less increase in 2019. The increase in several tourists was found to have a positive relationship with the funding spent on tourism. The number of domestic tourists visiting the district is more than foreign tourists. The

fragrance industry is well developed in the district contributing majorly to the economy. Although the ancient way of producing fragrance has been modified by the use of chemicals yet six different varieties of fragrances are produced which are organic and are transported nationally as well as internationally.

Energy used in cooking is mainly used from firewood (53.37%) and crop residue (23.29%) thus the biomass produced and biogas potential is adequate. The main source of lightening is kerosene (76.19%) followed by electricity (22.06%). Electricity consumption in agriculture has increased significantly from 128.98 kWh in 2014-15 to 362.95 kWh (net increase-181.40%) in 2019-20. Various capacity solar power plants are being installed. There have been no hydropower projects assigned.

Thus, planning, monitoring, and taking appropriate measures such as increasing irrigation practices such as drip and sprinkler irrigation, beekeeping, medicinal plant, and fruit production, promoting floriculture and organic farming, polyhouse, and greenhouse establishment and along with the use of technology and involvement of locals will aid in sustainable economy and development.

1 DISTRICT OVERVIEW

1.1 INTRODUCTION

Kannauj district, a part of Kanpur division is a district of Uttar Pradesh with its administrative headquarters located at Kannauj city.The district encompasses a geographical area of 2093 sq. km. and in terms of geographical area it occupies 59th rank in the state and 489th in India. In the year 2019, there was a total 1.33% forest area of the total geographical area.

Administration wise, the district is divided into 3 tehsils namely Chhibramau, Kannauj and Tirwa. There is 1 Lok Sabha seat and 5 assembly constituencies in the district. Moreover, the district comprises 3 sub-districts, 8 towns, and 752 villages. The total population of the district is 1656616 in which 1375775 live in rural areas and rest 280841 in urban parts. Out of the total population of the district Kannauj, 31.67 per cent are workers and the rest of 68.33 percent are non-workers. Among workers 25.29 per cent are main workers and the rest of 6.38 per cent are marginal workers of the total population. The extent of workers in rural parts and non-workers in urban parts is higher. In the district among workers, 45.62 per cent are cultivators and 19.91 per cent other workers.

The economy of the district to some extent is based on agriculture. Some of its chief agricultural crops are rice, maize, jowar, pulses, soyabean, etc. As usual in the doab, agriculture year yields three harvests i.e., Kharif, Rabi and Zaid. The last is of little significance in point of area and consists of vegetables, spices, tobacco, legumes and low grade cereals. Melons, Kakri

and Cucumbers are mostly grown. Jowar, bajra and maize, rice, urad and moong are the principal cereals and pulses. In Rabi wheat leads the most valuable cereals gram, pea, mustard, arhar and masoor are the other produce of Rabi. The area under wheat has considerably increased in the last few decades. The cash crops are groundnut and potato. It is one of the largest producers of potato in the state. The perfume industry of Kannauj district is very famous. Bidi industry is one of the foremost industries of the district. Even it Is the largest bidi supplier in Uttar Pradesh. Now-a – days the essence, flavor and fragrance of Kannauj district are becoming internationally well-known.

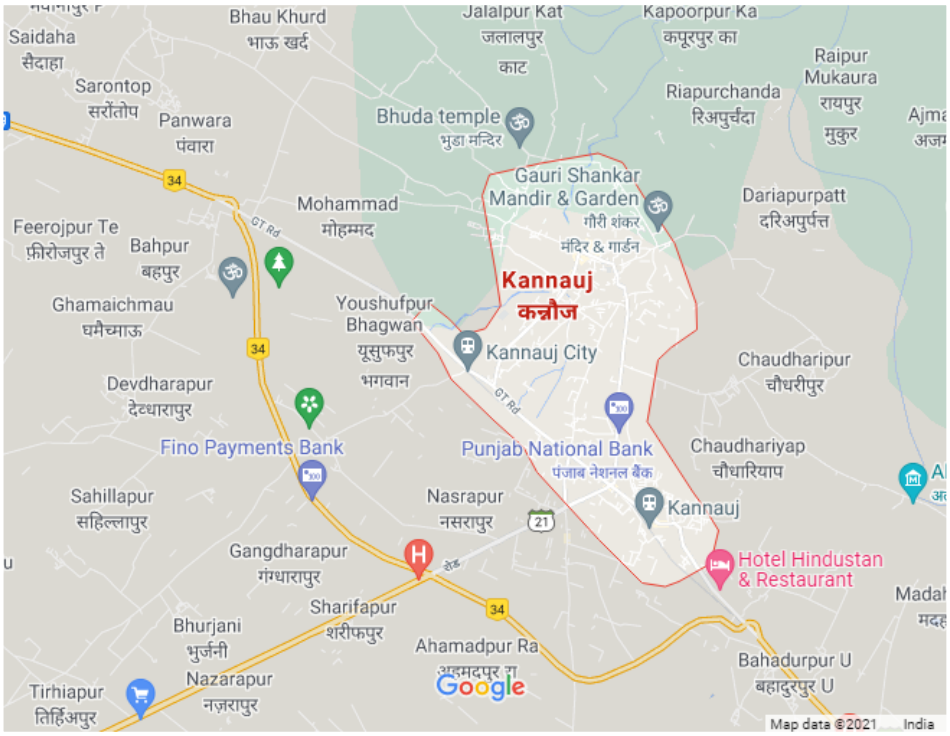


Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF KANNAUJ

1.3 AGRO CLIMATIC PROFILE OF THE DISTRICT

1.4 ECONOMIC PROFILE OF KANNAUJ

The primary sector has a significant impact on the district economy because it contributes, on average, 26.17% share in the district GDP. Moreover, the average annual growth rate in this sector

from 2011-12 to 2018-19 is 8.29%. However, its share decreased from 31.31% in 2011-12 to 22.95% in 2018-19, as the growth in other sectors is greater than growth in the primary sector. The share of the secondary sector increased from 20.70% in 2011-12 to 28.45% in 2018-19. The sector grew with an impressive average annual growth rate of 19.39%. The tertiary sector occupies, on average, 45.18% share of the district economy. Moreover, the sector grew with a remarkable average annual growth rate of 12.7%, with its share increasing from 47.98% in 2011-12 to 48.6% in 2018-19. Overall, the district economy grew with an average annual growth rate of 12.67%. The growth in the primary sector is less than in the other two sectors. Steps should be taken to increase the productivity of the primary sector so that it can grow at a higher rate. This will improve the growth rate of the overall district, and the primary sector has a decent (26.17%) contribution to the district GDP. The secondary and tertiary sectors have performed well during the study period.

Table 1: Trends in Gross District Domestic product in Kannauj at Constant Prices (base 2011-12) in Rs Crore

Year	Sector-wise GDDP (Rs, Crore)				Annual Growth Rates			
	Primary	Secondary	Tertiary	Total GDDP	Primary	Secondary	Tertiary	Total
2011-12	1288.57	852.01	1974.51	4115.10	-	-	-	-
	(31.31)	(20.70)	(47.98)	(100)				
2012-13	1651.75	1076.07	2307.33	5035.14	28.18	26.30	16.86	22.36
	(32.80)	(21.37)	(45.82)	(100)				
2013-14	1581.60	1651.78	2455.84	5689.22	-4.25	53.50	6.44	12.99
	(27.80)	(29.03)	(43.17)	(100)				
2014-15	1571.99	2289.32	2841.95	6703.26	-0.61	38.60	15.72	17.82
	(23.45)	(34.15)	(42.40)	(100)				
2015-16	1641.47	2266.97	3093.54	7001.98	4.42	-0.98	8.85	4.46
	(23.44)	(32.38)	(44.18)	(100)				
2016-17	1914.02	2645.00	3768.34	8327.35	16.60	16.68	21.81	18.93
	(22.98)	(31.76)	(45.25)	(100)				
2017-18	2345.88	2991.91	4204.39	9542.18	22.56	13.12	11.57	14.59
	(24.58)	(31.35)	(44.06)	(100)				
2018-19	2137.20	2648.73	4525.17	9311.09	-8.90	-11.47	7.63	-2.42
	(22.95)	(28.45)	(48.60)	(100)				
Average Growth Rate					8.29	19.39	12.70	12.67

Source: UPDES
Note: Figures in Parentheses are percentage share in the total GDDP

We further break down the primary sector GDP to know which subsector is lagging and which one is driving the primary sector growth. Table 2 shows that agriculture, including the horticulture sector, grew at an average annual growth rate of 5.14% from 2011-12 to 2018-19. However, its share in the primary sector decreased from 76.19% in 2011-12 to 61.86% in 2018-19. On the other hand, the share of livestock increased from 19.28% to 21.24% in the same period as it grew, with a remarkable average annual growth rate of 9.76%. It shows the importance of

livestock in Kannauj District and the increased dependency of citizens on livestock products. The share of forestry and logging in the total agriculture and allied sector is also significant, around 16.08% in 2018-19, as it grew remarkably well with an average annual growth rate of 42.53%. The share of the fishery and aquaculture subsector is very minimal, around 0.82% in 2018-19, but it also grew with a significant average annual growth rate of 14.14% from 2011-12 to 2018-19. Mines and quarrying also recorded a remarkable average annual growth rate of 48.60%. However, its growth is not consistent over the years. This high growth in this subsector can have serious environmental issues like deforestation, soil erosion, etc., with long-term effects on the health of local citizens. Overall, the Primary sector performed well during the time period of the study, with all its subsectors doing well. More work can be done on improving the agriculture (including horticulture) sub-sector as it has the most significant impact on the primary sector.

Table 2: Trends in Gross District Domestic product from Agriculture and allied activities in Kannauj at Constant Prices (base 2011-12) in Rs. Crore

Year	Agriculture	Livestock	Forestry and Logging	Fishery and Aquaculture	Total Agriculture and allied	Mining and Quarrying	PRIMARY SECTOR
2011-12	966.89	244.71	50.18	7.20	1268.97	19.60	1288.57
	(76.19)	(19.28)	(3.95)	(0.57)	(100)		
	-	-	-	-	-	-	-
2012-13	1267.38	269.43	87.57	7.54	1631.92	19.83	1651.75
	(77.66)	(16.51)	(5.37)	(0.46)	(100)		
	[31.08]	[10.10]	[74.52]	[4.75]	[28.60]	[1.16]	[28.18]
2013-14	1102.14	278.74	160.76	7.77	1549.41	32.19	1581.60
	(71.13)	(17.99)	(10.38)	(0.50)	(100)		
	[-13.04]	[3.45]	[83.59]	[3.04]	[-5.06]	[62.33]	[-4.25]
2014-15	1013.05	294.58	208.54	8.30	1524.47	47.51	1571.99
	(66.45)	(19.32)	(13.68)	(0.54)	(100)		
	[-8.08]	[5.68]	[29.72]	[6.91]	[-1.61]	[47.61]	[-0.61]
2015-16	1061.27	283.83	127.18	8.48	1480.75	160.72	1641.47
	(71.67)	(19.17)	(8.59)	(0.57)	(100)		
	[4.76]	[-3.65]	[-39.02]	[2.07]	[-2.87]	[238.25]	[4.42]
2016-17	1228.53	419.19	103.24	10.38	1761.34	152.68	1914.02
	(69.75)	(23.80)	(5.86)	(0.59)	(100)		
	[15.76]	[47.69]	[-18.82]	[22.43]	[18.95]	[-5.00]	[16.60]
2017-18	1401.25	442.51	230.30	11.26	2085.32	260.56	2345.88
	(67.20)	(21.22)	(11.04)	(0.54)	(100)		
	[14.06]	[5.56]	[123.06]	[8.47]	[18.39]	[70.66]	[22.56]
2018-19	1281.39	440.04	333.10	17.03	2071.56	65.64	2137.20
	(61.86)	(21.24)	(16.08)	(0.82)	(100)		

	[-8.55]	[-0.56]	[44.64]	[51.29]	[-0.66]	[-74.81]	[-8.90]
Average Growth Rate	5.14	9.76	42.53	14.14	7.96	48.60	8.29
Source: Compile from UPDES Note: 1. Figures in () are percentage share in the total agriculture & allied GDDP 2. Figures in [] are annual growth rates.							

Table 3 shows the percentage share of subsectors in secondary and tertiary sectors. Within the secondary sector, the manufacturing sector had a share of approximately 84.21% in 2018-19. The share has increased over the years as the average annual growth in this sector is 21.49%. The share of the electricity, gas and water supplies subsector has decreased from 1.93% in 2011-12 to 1.67% in 2018-19. However, this subsector grew with a remarkable average annual growth rate of 15.85%. The share of the construction sub-sector decreased from 20.03% to 14.12% in the same period as the average annual growth rate is although high (11.91%) but less than the other two subsectors. This indicates that the secondary sector in Kannauj is heavily dependent on the Manufacturing sub-sector, but the other two subsectors are also growing at a faster rate.

Within the tertiary sector, Trade and hotel subsector made up the highest share (25.69%) in 2018-19, followed by the Real estate subsector (23.98%), Public administration (22.85%) and transport, storage and communication subsector (9.54%). Average annual growth is observed highest in Public Administration (27.65%), followed by transport, storage and communication (19.08%), trade and hotels (11.74%), financial services (8.64%) and lastly lowest in real estate subsector (6.66%). All the subsectors in secondary and tertiary sectors have performed well during the time period of the study. More work needs to be done to improve construction and real estate subsectors. Public Administration and Transport and Communication and Trade and hotel sub-sectors are the major contributors to the Tertiary sector's growth.

Table 3: Trends in percentage share of non-agriculture sub-sectors in DGDP in Kannauj at Constant Prices (base 2011-12) in Rs Crore

Year	Manufacturing	Electricity, Gas, Water Supply	Construction	SECONDARY SECTOR	Transport, Storage & Communication	Trade and Hotel & Restaurant	Financial Services	Real Estate and Professional Services	Public Administration	Other Services	TERTIARY SECTOR
2011-12	78.03	1.93	20.03	100	7.21	27.94	8.38	35.02	13.93	7.51	100
2012-13	79.93	1.89	18.18	100	8.84	28.37	8.10	32.45	14.67	7.58	100
2013-14	86.28	1.33	12.40	100	7.76	32.42	8.14	32.21	11.18	8.29	100

2014-15	89.12	0.95	9.92	100	8.45	35.71	7.83	29.66	9.91	8.44	100
2015-16	87.61	1.29	11.11	100	12.15	32.48	8.41	28.48	9.40	9.08	100
2016-17	87.74	1.46	10.80	100	10.16	29.57	6.98	24.56	18.45	10.28	100
2017-18	87.56	1.40	11.05	100	9.50	28.40	5.69	24.12	21.56	10.74	100
2018-19	84.21	1.67	14.12	100	9.54	25.69	6.36	23.98	22.85	11.58	100
Average Growth Rate	21.49	15.85	11.91	19.39	19.08	11.74	8.64	6.66	27.65	19.96	12.70
Source: Compiled from District Statistical Handbooks											

2 QUANTITATIVE DATA ANALYSIS

2.1 Agriculture and Allied Activities

2.1.1 Trend in Land Use Pattern

The total declared area of the district is 2089.73 sq. km². The share of the forest area has increased from 6.38% in 2010-11 to 9.13% of the total reported area in 2017-18. The share of cultivable wasteland decreased from 1.76% in 2010-11 to 0.79% in 2017-18, which is a good development indicator. Barren and uncultivable land share has also decreased from 2.40% in 2010-11 to 1.99% in 2017-18. The share of area under trees and gardens decreased from 1.13% in 2010-11 to 0.34% in 2017-18. The current and other fallow land has also decreased over the years, which is good for the district economy. The net sown area (NSA) has increased over the years, from 69.40% in 2010-11 to 74.14% in 2017-18. The area for non-agricultural use increased over the period from 9.39% to 10.98% (Table 4). Overall, the land use pattern shows that the fallow and uncultivable land area has decreased while the NSA has increased over the years.

Table 4: Trends in Land-use Pattern in Kannauj (as % of the total reported area)

Year	Total Reported Area (ha)	Area under forest	Cultivable waste land	Current Fallow	Other Fallow	Barren and uncultivable land	Land other than agriculture	Pasture land	Area under trees and gardens	Net Sown Area

1	2	3	4	5	6	7	8	9	10	11
2010-11	208973	6.38	1.76	5.92	2.62	2.40	9.39	1.00	1.13	69.40
2011-12	208973	6.44	1.58	4.30	2.83	2.82	10.32	1.00	0.94	69.78
2012-13	208973	6.44	1.75	5.71	2.61	2.38	5.93	1.00	1.11	73.07
2013-14	208973	6.44	1.58	2.27	1.67	2.50	10.36	1.00	0.77	73.41
2014-15	208973	6.44	1.55	6.50	2.62	2.49	10.40	1.00	0.77	68.23
2015-16	209079	9.12	0.81	1.09	0.68	2.00	10.87	1.00	0.34	74.10
2016-17	208973	9.13	0.79	1.09	0.34	1.99	10.98	0.98	0.34	74.14
2017-18	208973	9.13	0.79	1.09	0.34	1.99	10.98	0.98	0.34	74.14
Source: Compiled from http://updes.up.nic.in/spiderreports/intialisePage.action										

2.1.2 Trends in Operational Land Holdings

In Kannauj district, the total number of operational farms increased from 257 thousand in 2010-11 to 266 thousand in 2015-16, a net increase of 3.5%. While in the state, their numbers increased from 23,325 thousand in 2010-11 to 23822 thousand in 2015-16, a net increase of 2.13%. Most land positions in the district are marginal and small. These two size categories represented around 95.79% in the district in 2015-16, while the corresponding proportion in the state was 92.81% (Table 5). The two agricultural censuses of 2010-11 and 2015-16 report no significant change in the percentage share across the various categories of landholdings. Marginal land holdings increased in 2015-16.

Table 5: Distribution of Operational Holdings by Size-categories of farms (in %) in Kannauj

	Agri, Census	Marginal Holdings (0-1 ha)	Small Holdings (1-2 ha)	Semi-Medium Holdings (2-4 ha)	Medium Holdings (4-10 ha)	Large Holdings (10 & above, ha)	Total Holdings ('000 No.)
Kannauj	2010-11	83.97	11.90	3.30	0.80	0.02	257
	2015-16	84.29	11.50	3.29	0.89	0.03	266
							[3.50]
Uttar Pradesh	2010-11	79.45	13.01	5.72	1.71	0.11	23325
	2015-16	80.18	12.63	5.51	1.58	0.1	23822
							[2.13]

Source: Compiled from Statistical Diary 2018-19, UPDES. Figures in [] are percentage increase/decrease in 2015-16 over 2010-11.

2.1.3. Trends in Area, Production, and Yield of Principal Crops

i- The Trend in Cropping Patterns

Rice, Wheat, Maize, and Potato dominate the agriculture of the district. Table 6 shows the area devoted to various crops over the last eight years. In 2017-18, Wheat made up the highest share of

GCA (29.06%), followed by Maize (19.18%) and Rice (11.54%). Together these three crops constitute around 60% of the GCA. The area shared by the total cereals has decreased from 63.88% in 2010-11 to 60.47% in 2017-18. The main pulses produced are Urad, Moong, and Arhar, while the rest of the pulses are not significantly produced. The total pulse acreage has decreased from 3.08% in 2010-11 to 1.80% in 2017-18. Thus, the food grains cover a majority (average, 66.40%) of the GCA.

Mustard is the only major oilseeds crop produced, and the total oilseed acreage has decreased from 6.16% in 2010-11 to 3.05% in 2017-18. The area under potatoes has also decreased over the years. In general, there is no significant change in the cultivation pattern reported in the district during the period of the study. The average cropping intensity is 160.0

Table 6: Trends in Cropping Pattern (as % GCA) and Cropping Intensity

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	7.59	7.93	8.56	10.22	13.47	11.55	11.54	11.54
Wheat	33.72	32.77	32.78	32.30	33.92	29.09	29.06	29.06
Maize	20.72	21.44	23.27	23.54	22.39	19.20	19.18	19.18
Other Cereals	1.84	2.05	1.15	1.03	0.80	0.68	0.68	0.68
Total Cereals	63.88	64.20	65.76	67.09	70.58	60.53	60.47	60.47
Urad	0.81	0.74	0.73	0.62	0.57	0.49	0.49	0.49
Moong	0.55	0.49	0.49	0.45	0.56	0.48	0.48	0.48
Arhar	0.75	0.80	0.57	0.52	0.45	0.39	0.39	0.39
Other Pulses	0.97	0.89	0.73	0.65	0.52	0.45	0.45	0.45
Total Pulses	3.08	2.91	2.52	2.23	2.11	1.81	1.80	1.80
Total Foodgrains	66.96	67.10	68.28	69.32	72.69	62.34	62.27	62.27
Mustard	3.86	3.73	3.44	3.30	2.39	2.05	2.04	2.04
Other Oilseeds	2.30	2.51	1.78	1.57	1.18	1.01	1.01	1.01
Total Oilseeds	6.16	6.24	5.22	4.87	3.56	3.06	3.05	3.05
Sugarcane	0.09	0.09	0.08	0.06	0.06	0.05	0.05	0.05
Potato	19.80	19.49	20.37	19.98	17.57	15.07	15.05	15.05
Net Sown Area	66.59	65.68	65.54	64.61	62.99	58.69	58.64	58.64
Gross Sown Area (in 1000 Ha)	217.82	221.99	232.97	237.43	226.36	263.96	264.23	264.23
Cropping Intensity	150.18	152.24	152.58	154.77	158.77	170.37	170.54	170.54

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

ii- Trends in per hectare yield of principal crops

Table 7 shows that the yield per hectare of most crops varies from year to year. However, it has increased in the latter years of the study. It can be due to improved irrigation facilities and the availability of better infrastructure. Wheat, Rice, and Maize are the major crops, and their per hectare yield (44.60 qtls, 21.32 qtls and 31.01qtls, respectively, in 2017-18) are also high. Per

hectare yield of total cereals has increased from 29.20 qtls in 2010-11 to 37.39 qtls in 2017-18. Similarly, per hectare yield of total pulses increased from 10.63 qtls in 2010-11 to 12.24 qtls in 2017-18.

The yield of total oilseeds has increased from 11.21 qtls in 2010-11 to 11.46 qtls in 2017-18. This can be due to the availability of hybrid seeds in the district. However, the rise in the yield of most of the crops is not uniform; in some years, it has decreased as well, but on average, the yield has increased in the latter years of the study. Sugarcane has negligible area under cultivation. Its per hectare average yield is 645.29 qtls. The yield of Potato is also very high, average, 250.21. Since Potato is high-value crop, it can help in doubling the income of farmers if proper marketing and infrastructure support is provided to the farmers. In summary, all crop yields show year-over-year fluctuations, with the lowest in 2014-15. The lack of homogeneity of yields makes farmers' income riskier and more unstable, requiring a solid insurance protection measure.

Table 7: Trends in Per Hectare Yield of Principal Crops in Kannauj District (Qtls)

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	28.01	29.11	29.68	29.88	24.45	23.51	23.51	21.32
Wheat	35.64	40.05	38.37	37.07	14.12	29.87	29.87	44.60
Maize	19.87	22.80	20.88	21.12	17.89	18.31	18.31	31.01
Total Cereal	29.20	32.29	30.79	30.16	17.26	24.88	24.88	37.39
Urad	9.67	8.05	7.72	6.97	6.48	6.69	6.69	6.69
Moong	7.80	5.51	5.84	5.76	5.55	7.28	7.28	4.17
Arhar	8.64	13.98	11.22	10.36	4.94	3.29	3.29	17.29
Total Pulses	10.63	11.29	10.11	8.42	5.38	6.98	6.98	12.24
Total Food Grains	28.34	31.38	30.03	29.47	16.91	24.36	24.36	36.66
Mustard	13.56	9.92	13.88	11.10	8.49	13.55	13.55	16.28
Total Oilseeds	11.21	8.93	11.19	9.47	7.54	10.92	10.92	11.46
Sugarcane	534.22	582.74	606.76	595.93	576.79	664.63	664.63	936.64
Potato	234.58	202.71	313.85	206.20	214.01	218.61	218.61	393.14

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

iii- Trends in Production of Principal Crops

Table 8 shows the trends in the production of the main crops over the years. Rice, Wheat, maize, and Potato dominate the production. In 2017-18, Rice (65.01 thousand tonnes), Wheat (342.45 thousand tonnes), and maize (157.19 thousand tonnes) formed a major part of the total cereal production (597.40 thousand tonnes). Within pulses, Urad, Moong and Arhar occupy the highest production. The production of Urad, Moong, and Arhar was 0.87, 0.53, and 1.78 thousand tons, respectively, in 2017-18. Although there has been a significant variation in the production of these pulses over the years, they still represent around 55% of the total pulse production. Pulses

production in the district was quite low, indicating that pulses are not an important part of the district's agriculture. Improvement in irrigation conditions can improve production.

Mustard production was 11.24 thousand tons, representing around 76% of the total oilseed production in 2017-18. Potato production has also been significant over the years (1563.88 thousand tons in 2017-18). Looking at the annual production data of various crops, we find that their production has increased on average during the period, but at the same time fluctuates year to year, partly due to changes in weather and partly due to market conditions. Proper insurance arrangements are the need of the hour to get assured income and take more risk and diversify their production.

Table 8: Trends in Production of Principal Crops in Kannauj District (in 1000 Tons)

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	46.33	51.28	59.18	72.46	74.56	71.70	71.70	65.01
Wheat	261.75	291.28	292.97	284.31	108.39	229.32	229.32	342.45
Maize	89.70	108.55	113.23	118.05	90.67	92.82	92.82	157.19
Other Cereals	8.44	9.09	6.30	5.66	2.10	3.66	3.66	32.75
Total Cereals	406.21	460.19	471.68	480.47	275.71	397.50	397.50	597.40
Urad	1.70	1.31	1.31	1.02	0.84	0.87	0.87	0.87
Moong	0.94	0.59	0.66	0.61	0.70	0.92	0.92	0.53
Arhar	1.41	2.47	1.49	1.28	0.51	0.34	0.34	1.78
Other Pulses	3.08	2.91	2.47	1.55	0.52	1.20	1.20	2.66
Total Pulses	7.14	7.29	5.93	4.46	2.57	3.33	3.33	5.83
Total Foodgrains	413.35	467.49	477.61	484.93	278.27	400.83	400.83	603.23
Mustard	11.39	8.21	11.12	8.71	4.59	7.32	7.32	11.24
Other Oilseeds	3.64	4.15	2.50	2.24	1.50	1.49	1.49	3.54
Total Oilseeds	15.04	12.37	13.61	10.95	6.08	8.81	8.81	14.78
Sugarcane	10.90	11.48	10.86	8.94	7.73	8.91	8.91	12.55
Potato	1011.91	876.84	1489.63	978.15	851.31	869.61	869.61	1563.88

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

iii- Variability assessment in the area, production, and yield

To understand the variability across the years (Table 9), we calculated the mean, standard deviation (S.D.), and coefficient of variation (C.O.V.) of the area, production, and yield of the main crops. Looking at the variability in cultivated areas under different crops, we observe the lowest variability in Wheat (2.23%), followed by maize (6.66%) and moong (7.31%), and the highest in Rice (24.95%). The variability in the area under total pulses (15.05%) is more than the area under total cereals (5.56%). Since maize and Wheat dominate the production, the variability in the area under total food grains is also relatively low (4.88%).

Table 9: Variability in Area, Production, and Yield of Principal Crops (2010-11 to 2017-18)									
	Area (1000 Ha)			Production (1000 Ha)			Yield (Qtl./Ha)		
Crop/Year	Average	SD	COV	Average	SD	COV	Average	SD	COV
Rice	25.04	6.25	24.95	64.03	10.69	16.70	26.18	3.36	12.82
Wheat	75.80	1.69	2.23	254.97	69.82	27.38	33.70	9.33	27.68
Maize	50.70	3.38	6.66	107.88	22.82	21.15	21.28	4.28	20.12
Total Cereal	154.15	8.57	5.56	435.83	92.14	21.14	28.36	6.03	21.26
Urad	1.47	0.20	13.50	1.10	0.31	28.43	7.37	1.08	14.69
Moong	1.19	0.09	7.31	0.73	0.17	22.66	6.15	1.21	19.62
Arhar	1.26	0.30	23.59	1.20	0.76	63.24	9.13	5.10	55.85
Total Pulses	5.43	0.82	15.05	4.98	1.82	36.52	9.00	2.43	26.95
Total Food Grains	159.58	7.79	4.88	440.82	93.17	21.14	27.69	5.87	21.21
Mustard	6.77	1.47	21.72	9.98	5.03	50.39	15.41	9.84	63.82
Total Oilseeds	10.41	2.60	24.94	12.50	5.58	44.63	12.54	7.22	57.62
Sugarcane	0.16	0.03	19.18	10.03	1.64	16.38	645.29	125.64	19.47
Potato	42.55	3.37	7.92	1063.87	292.03	27.45	250.21	67.85	27.12
Source: http://updes.up.nic.in/spiderreports/intialisePage.action									

The variability of production depends on the cultivated area's variability and the yield's variability. Therefore, the variability in the production of different crops is greater than in the cultivated area of all crops. The highest variability in production is observed in Arhar (63.24%), followed by Mustard (50.39%), Urad (28.43%), Potato (27.45%), and Wheat (27.38%). High variation in the production of pulses and oilseeds is partly due to variation in the land area under them and partly due to the high rate of seeds and non-availability of hybrid seeds. Improvement in crop insurance conditions and better market accessibility can lower this variation. Variability is lowest in sugarcane (16.38%), followed by Rice (16.70 %) and maize (21.15%).

In the case of yield, the greatest variability is estimated in Mustard (63.82%), Arhar (55.85%), and Wheat (27.68%). Yield variability in total cereals (21.26%) and total food grains (21.21%) is lower as compared to that in total pulses (26.95%). Rice, Urad, and Sugarcane are the most consistent crops over the years. Several factors, such as climate change, market prices, rainfall patterns, etc., influence the variability in agricultural production.

2.1.4 Trends in Value of Product of Major Crops

Table 10 compares the share of the main crops in the total GCA. and their share in the total value of agricultural output (VOP). It is significant to note that total pulses, total food grains, and total oilseeds, on average, have a relatively larger share in GCA than their share in VOP, while Potato and sugarcane have, on average, a greater share in VOP than GCA. Kannauj is mainly a food grain production district; therefore, food grains account for around 66.40% of the gross area of the crops. Similarly, total foodgrains account for nearly 46.09% of the total value of the agricultural product.

Three crops - Wheat, paddy, and Potato together accounted for, on an average, around 59.69% of GCA and 85.01% of the total VOP. Overall, the total agricultural GCA has increased in the latter years of the study (average, 241.12 thousand hectares) and the total value of the product has also increased significantly, that is, Rs.1258.64 Cr. in 2010-11 to Rs.2536.58 Cr. in 2017-18.

Table 10: Share of Principal crops Total G.C.A. and Total Value of agriculture products in Kannauj

Crop	% Share in	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Wheat	GCA	33.72	32.77	32.78	32.30	33.92	29.09	29.06	29.06
	VOP	26.00	28.75	19.22	25.89	16.48	28.56	28.56	23.63
Paddy	GCA	7.59	7.93	8.56	10.22	13.47	11.55	11.54	11.54
	VOP	7.36	7.33	5.55	9.68	15.66	12.34	12.34	6.54
Total Cereals	GCA	63.88	64.20	65.76	67.09	70.58	60.53	60.47	60.47
	VOP	40.81	46.43	30.27	44.94	45.45	52.24	52.24	42.54
Total Pulses	GCA	3.08	2.91	2.52	2.23	2.11	1.81	1.80	1.80
	VOP	2.38	2.50	1.14	1.60	1.86	1.79	1.79	1.54
Total Food Grains	GCA	66.96	67.10	68.28	69.32	72.69	62.34	62.27	62.27
	VOP	43.19	48.93	31.42	46.54	47.30	54.03	54.03	44.08
Total Oilseeds	GCA	6.16	6.24	5.22	4.87	3.56	3.06	3.05	3.05
	VOP	4.21	3.02	2.06	2.80	2.39	2.44	2.44	3.35
Potato	GCA	19.80	19.49	20.37	19.98	17.57	15.07	15.05	15.05
	VOP	52.26	47.76	66.32	50.47	51.79	43.33	43.33	52.41
Sugarcane	GCA	0.09	0.09	0.08	0.06	0.06	0.05	0.05	0.05
	VOP	0.30	0.27	0.19	0.19	0.20	0.19	0.19	0.16
Paddy + wheat + potato	GCA	61.12	60.19	61.71	62.49	64.97	55.71	55.66	55.66
	VOP	85.62	83.84	91.09	86.04	83.93	84.23	84.23	82.57
Total Agriculture	G.C.A. (1000 Ha)	217.82	221.99	232.97	237.43	226.36	263.96	264.23	264.23
	VOP (in Cr Rs)	1258.64	1468.81	2133.82	1647.35	1070.46	1284.47	1284.47	2536.58
Per Worker V.O.P. (Rs.1000 at current prices) in **Kannauj**		-	36.60	67.59	41.49	50.38	61.47	68.67	73.58
Per Worker V.O.P. (Rs.1000 at current prices) in **UP**		-	40.66	48.69	52.50	52.11	56.48	61.97	69.69

Source: http://updes.up.nic.in/spiderreports/intialisePage.action
And District-wise Indicator reports

Table 10 shows that the total value of agricultural produce per agricultural worker in Kannauj district increased from Rs.36.60 thousand in 2011-12 to Rs.73.58 thousand in 2017-18, a net increase of 101.02% at current prices, while in UP it increases from Rs. 40.66 thousand to Rs. 69.69 thousand, a net increase of 71.40%. Thus, the total value of agricultural output per agricultural worker is much higher in the state than in the district, and the rate of growth per worker value of output in the district is more than in the state. Thus, Kannauj's per worker V.O.P. exceeds that of the state in 2015-16. The ratio of per worker value of the output of the district to the state average has increased from 0.9003 in 2011-12 to 1.0558 in 2017-18.

2.1.5. Consumption of Chemical Fertilizers

Table 11 shows the trends in the use of chemical fertilizers in agriculture. The recommended nitrogen to phosphorus and potassium ratio is 4:2:1, which is not maintained in the district. For example, in 2010-11, nitrogen represented 70.13% of the total fertilizers used, while the proportions of phosphorus and potassium were 24.98% and 4.88%, respectively. In 2017-18, however, the nitrogen share decreased to 69.72%, while the phosphorus share increased to 27.57%, and the potassium share decreased to 2.69%. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio.

Table 11 also shows that fertilizer consumption varies from year to year, which can be due to several factors, including rainfall patterns, cultivation patterns, etc. Although the overall use of chemical fertilizers has reduced in the district from 330.03 kg/ ha G.S.A. in 2010-11 to 223.31 kg/ ha G.S.A. in 2017-18, still the authorities can take steps to further reduce their consumption as chemicalization of agriculture degrades soils and water resources, requiring the use of organic fertilizers and biofertilizers.

Table 11: Trends in Use of Chemical Fertilizers in Agriculture (Kgs/per ha G.S.A.)

Fertilizer/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Nitrogen	231.45	189.35	216.67	213.44	238.95	188.63	186.70	155.70
Phosphorous	82.44	61.43	77.56	55.25	69.14	70.71	73.43	61.58
Potassium	16.13	5.92	6.33	7.55	14.18	13.07	15.30	6.03
Total	330.03	256.70	300.56	276.23	322.27	272.40	275.43	223.31
Gross Sown Area (Ha)	217818	221989	232971	237425	226356	263957	264232	264232

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

2.1.6. Irrigation Structure and Status

i- Types of Irrigation systems

The types of irrigation systems and the percentage of the net and gross irrigated area to the net and gross cropped area, respectively, are described in table 12. The length of the canal has decreased from 469 kms in 2010-11 to 443 kms in 2018-19. The number of wells has remained constant (57)

over the years. The number of Government tube wells increased from 213 in 2010-11 to 285 in 2018-19. Shallow tube wells have decreased by 23.47%, while medium and deep tube wells increased by 424.34% and 56.27%, respectively, in 2018-19 compared to 2010-11. The district's percentage of the net and gross irrigated areas have shown consistency over the years, with an average of 92.07% and 88.82%, respectively.

Table 12: Types of Irrigation Systems and percentage of the net and gross Irrigated Area

Name/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Length of Canal (K.M.)	469	469	387	387	442	442	442	443	443
No. of Govt. Tube wells	213	236	240	245	262	278	273	285	285
No. of Wells	57	57	57	57	57	57	57	57	57
No. of Ground-level Pump set	17	17	17	17	17	17	17	103	103
Shallow Tube well	32876	33096	33256	33456	33599	33656	33863	35383	25157
Medium Tube well	152	169	281	343	400	400	541	726	797
Deep Tube well	462	484	564	590	601	610	611	669	722
% Of NIA	92.16	89.54	91.62	91.12	91.06	91.89	94.57	94.57	-
% Of GIA	84.64	83.80	87.07	87.73	89.28	92.44	92.78	92.78	-
Source: http://updes.up.nic.in/spiderreports/intialisePage.action									

ii- Source-wise area under irrigation

Canals and groundwater (G.W.) are the main irrigation source in the district. The canal's share in the N.I.A. (average, 6.73%) has decreased over the years, and the share of wells and tube wells in N.I.A. (average, 93.24%) has increased over the years. This shows the increased dependency of the district on the groundwater for irrigation purpose, and it can have serious environmental issues if such a pattern continues in the long run.

Table 13: Source-wise Area under Irrigation in Kannauj (in %)

Source/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Canal (surface Irri.)	8.74	8.74	8.04	6.79	8.01	4.06	4.70	4.70
Wells And Tube-wells (GW Irri.)	91.24	91.24	91.79	93.18	91.95	95.94	95.30	95.30
Others	0.02	0.02	0.17	0.03	0.04	0.00	0.00	0.00
NIA (1000 ha)	133.67	130.56	139.90	139.78	129.83	142.37	146.52	146.52
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

iii- Crop-wise irrigated area

Table 14 shows that a majority area under Rice (average, 99.40%), Wheat (average, 100%), Potato (average, 100%), and Sugarcane (average, 100%) is irrigated. The percentage of irrigated under pulses (average, 74.45%) and oilseeds (average, 77.47%) is relatively less.

Table 14: Trends in Crop-wise Irrigated Area in Kannauj (as % of the cropped area)

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	98.19	97.73	99.51	99.75	100	100	100	100
Wheat	100	100	100	100	100	100	100	100
Total Cereal	82.00	81.47	84.49	85.55	87.88	87.88	87.88	87.88
Total Pulses	71.25	66.68	75.86	76.51	76.32	76.32	76.32	76.32
Total Foodgrains	81.51	80.83	84.17	85.26	87.54	87.54	87.54	87.54
Total Oilseeds	77.89	74.88	78.96	77.26	77.69	77.69	77.69	77.69
Sugarcane	100	100	100	100	100	100	100	100
Potato	100	100	100	100	100	100	100	100

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

2.1.7 Electricity Consumption in Agriculture

Electricity is one of the main energy sources used in agriculture. Table 15 shows that per capita electricity consumption in agriculture has increased significantly from 128.98 KWH in 2014-15 to 362.95 KWH in 2019-20, a net increase of approximately 181.40%. It is a cause of concern that results in an increased burden on non-renewable resources and waste disposal problems. The percentage share of the agriculture sector (average, 39.77%) in the total electricity consumption in the district is quite significant. It indicates the heavy usage of electricity by agricultural farmers. Since electricity consumption has increased over the years, the authorities need to switch to more sustainable modes of electricity production, such as solar panels.

Table 15: Trends of Electricity consumption in Agriculture

Division/ Year	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Per Capita electricity consumption (K.W.H.)	128.98	121.28	256.96	301.62	345.44	362.95
% Of electricity consumed in Agriculture sector to total consumption	37.4	36.94	37.26	43.62	44.25	42.01

Source: District-wise Development Indicators file

2.1.8 Status of Agriculture Market

Table 16 shows the marketing infrastructure in the district. It has two main markets and nine sub-markets. The number of regulated mandis per lakh hectare of Net area sown has increased from 7.17 in 2013-14 to 7.25 in 2018-19, but the increase could have been more significant as it is very

important to increase the number of regulated mandis so that farmers are able to sell their products efficiently.

Table 16: Status of Agriculture Markets in Kannauj

Category/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Main Markets (No.)	2	2	2	2	2	2	2
Submarkets (No.)	9	9	9	9	9	9	9
Total Markets (No.)	11	11	11	11	11	11	11
No. of Regulated mandis per lakh Ha. of net area sown	7.17	5.26	-	1.29	1.4	7.25	-

Source: District-wise Development Indicators file and District-wise Statistical Report

2.1.9 Status of Organic Farming

To promote sustainable agricultural practices and improve the farmers' livelihood, the Government of India launched PKVY and Namami Gange schemes. Under these schemes, farmers are incentivized to form groups to do organic farming and sell their products with PGS certification. Under the programme, the beneficiary farmers get Rs.12000, Rs. 10000 and Rs.9000 per hectare, respectively, in the first, second, and third year of conversion.

The transition period for the full conversion from conventional to organic is considered three years. During this period, crop yield, on average, is expected to decline by 10—15 percent. But after three years, it may reach its original level. Financial assistance received by the beneficiary farmers seems to be adequate to compensate for the yield losses and motivate them to do organic farming. There is a need to set up an integrated processing unit for organic products. Monitoring of the project should be periodically done through M.I.S., Geo-tagging, and monthly physical and financial reports.

However, the policy-related issue is what would be after the three years? Will the government protect their income? There may be a possibility that the beneficiary farmers may revert to conventional farming in the absence of the regulatory framework. In this context, two things need to be thought of—a well-designed regulatory and monitoring framework and introduction of payments for ecosystem services for the organic farmers after the transition period so that they may carry on the activity on a sustainable basis. Organic and zero-budget farming will provide ecological services in terms of soil health, human and animal health, saving of water, protection bio-diversity, etc. There is a need to sustain the organic farming initiative. For that, a long-term system of payments for ecological services may be evolved to retain the existing farmers and motivate others to move towards this sustainable farming system. There is no assured market for these products, and farmers do not get premium prices. They sell their products at the same prices their conventional counterparts do. Certification and quality check and monitoring mechanisms are yet to be set up.

Table 17 shows the details of the establishment of organic clusters under the Paramparagat Krishi Vikas Yojana in the district. The district has 101 groups in four development blocks. The highest number of groups are in Haseran (51), Kannauj (25), followed by Gughrapur (20) and Jalalabad (5). Significantly high variation can be seen in the number of farmers per group in the district. It is reported that the maximum limit of land under a cluster per farmer is 2.00 hectares. Hence, the majority of the beneficiary farmers are small and marginal. No organic cluster under the Namami Gange scheme has been reported till date.

Table 17: Status of Organic Farming PGS Groups under PKVY and Namami Gange Schemes in Kannauj (as on June 30, 2021)

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	Gughrapur	PKVY	20	466	23.3	21	5.61
2	Haseran	PKVY	51	2547	49.94	50	0.31
3	Jalalabad	PKVY	5	127	25.4	27	3.43
4	Kannauj	PKVY	25	735	29.4	27	10.42
5	District Total	PKVY	101	3875	38.36	49	13.22
		Total	101	3875	38.36	49	13.22

Source: https://pgsindia-ncof.gov.in/LGList.aspx

Since per hectare use of chemical fertilizer is quite high in district agriculture, a gradual shift of farmers from conventional to the organic farming system is likely to positively impact water quality and soil health along with farming sustainability. However, being a knowledge-intensive system of farming, farmers need proper training to know the practical details of the integrated sustainable farming system. Since economies of scale in both production and marketing matter in organic farming, some institutional framework may be needed in the forms of S.H.G.s/ farm cooperative/P.F.O.s/contract farming, etc. Organic farming could be an economically viable option in the district if the government builds strong marketing networks linking farmers, processors, and distributors with the easy certification process and minimizes farmers' risk by protecting their farm income through payments of ecosystem services. A long-term system of incentive and regulation needs to be evolved to retain the existing farmers and motivate others to move towards the sustainable farming system in the district.

The major problem for the growth of organic farming observed are:

- The major problem of the farmers was poor marketing of the organic products and not being able to fetch a premium.
- Scaling up organic production is another problem. The problem of marketing is even more serious in the case of perishable vegetable crops. Contract farming companies and Farmer Producers' companies can be encouraged.
- Farmers practice organic farming only on a small part of their land (less than one ha) to get the scheme's benefit.

- Although organic farming clusters are formed, the farmers allocated a part of their lands to organic farming and practiced conventional farming in the rest of the area, which may contaminate the organic produce and fail the purpose of the cluster approach in organic farming.
- The knowledge and awareness level regarding practices under organic farming was inadequate among farmers.

2.2. Livestock Sector

i- Trends in Livestock Population

Livestock forms an integrated part of the rural economy. From Table 18, we can infer that the number of indigenous and exotic male cattle has decreased considerably from 65319 in 1997 to 8571 in 2019 and from 12117 in 1997 to 1254 in 2019, respectively. However, on the other hand, the number of indigenous and exotic female cattle has increased considerably from 65615 in 1997 to 187227 in 2019 and from 8516 in 1997 to 37465 in 2019, respectively. Thus, the total number of cattle increased from 151567 in 1997 to 234517 in 2019, thus, a net decrease of 54.72%. Similar inferences can be drawn from the buffalo data as the number of male buffalo decreased, but the number of female buffalo increased; thus, a net increase of 111.58% in 2019 compared to that in 1997 is observed in the total population of buffalo. A significant reduction in the population of indigenous sheep is observed (63.61%) in 2019 compared to that in 1997, and during the same period, the population of exotic sheep increased slightly, thus, indicating a decrease in the total sheep population by 57.97%. The total population of goats decreased from 208494 in 1997 to 152089 in 2019, a net decrease of 27.05%. The total pig population decreased considerably from 26059 in 1997 to 1576 in 2019.

It is significant to note that the number of female cattle and buffaloes has substantially increased over the period, indicating the growth of livestock products, including milk. The substantial decline in the number of male cattle and male buffaloes also shows the rising farm mechanization and declining relevance of animal power, mainly because of the high maintenance cost of livestock. The livestock subsector has around 19.81% share in the agriculture and allied activities sector and grew at a significant average annual growth rate of 9.76% from 2011-12 to 2018-19.

Table 18: Trends in Livestock population (in numbers) in Kannauj

	Category	1997	2003	2007	2012	2019
Indigenous Cattle	Total Male	65319	56304	55416	35070	8571
	Total Female	65615	61189	63334	66805	187227
	Total	130934	117493	118750	101875	195798
Exotic Cattle	Total Male	12117	2672	3258	7334	1254
	Total Female	8516	5587	6582	20357	37465
	Total	20633	8259	9840	27691	38719
Total Cattle		151567	125752	128590	129566	234517

Buffalo	Total Male	63234	72482	88793	91712	32217
	Total Female	140444	161997	212278	230952	398737
	Total	203678	234479	301071	322664	430954
Sheep	Total Indigenous Sheep	18070	13497	15108	11818	6574
	Total Exotic Sheep	1465	218	157	562	1635
	Total Sheep	19535	13715	15265	12380	8209
Goat	Total	208494	269687	320943	254803	152089
Pig	Total Indigenous Pig	24376	21509	16827	17936	1263
	Total Exotic Pig	1683	454	198	240	313
	Total Pig	26059	21963	17025	18176	1576
Total Livestock		614826	670170	784880	81080	-
Total Poultry		101829	81625	75835	84077	-
Source: http://updes.up.nic.in/spiderreports/intialisePage.action And http://dahd.nic.in/animal-husbandry-statistics						

ii- Cattle Care Centre

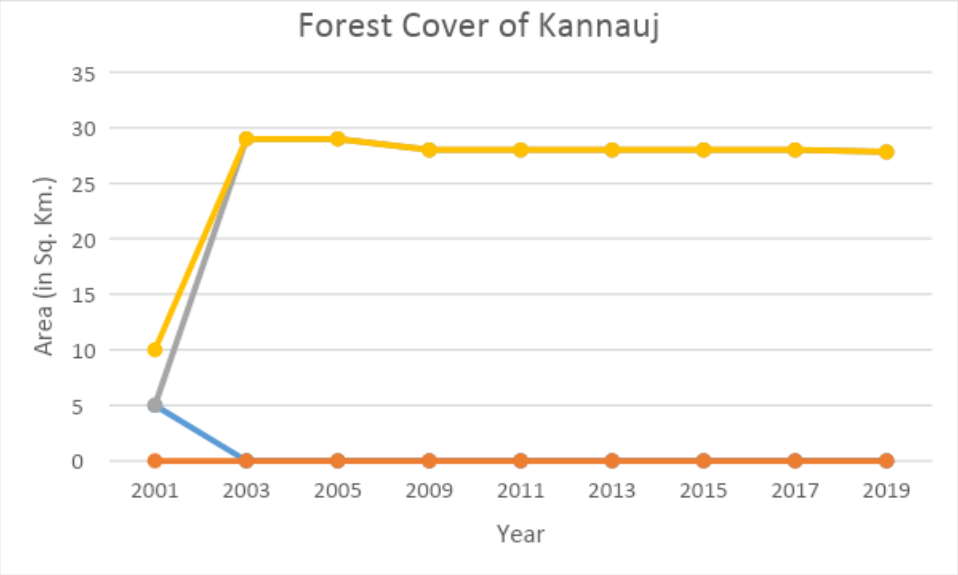
Table 19 shows that the Kannauj district has an active network of cattle hospitals and development centres which are very necessary for the livestock sub-sector to grow. The number of cattle hospitals has increased from 18 in 2010-11 to 19 in 2018-19. The number of cattle development centres has also increased from 11 in 2010-11 to 12 in 2018-19, and the number of man-made reproduction centers has also increased from 33 in 2010-11 to 35 in 2018-19.

Table 19: Year-wise number of Cattle Hospitals and Development Centers

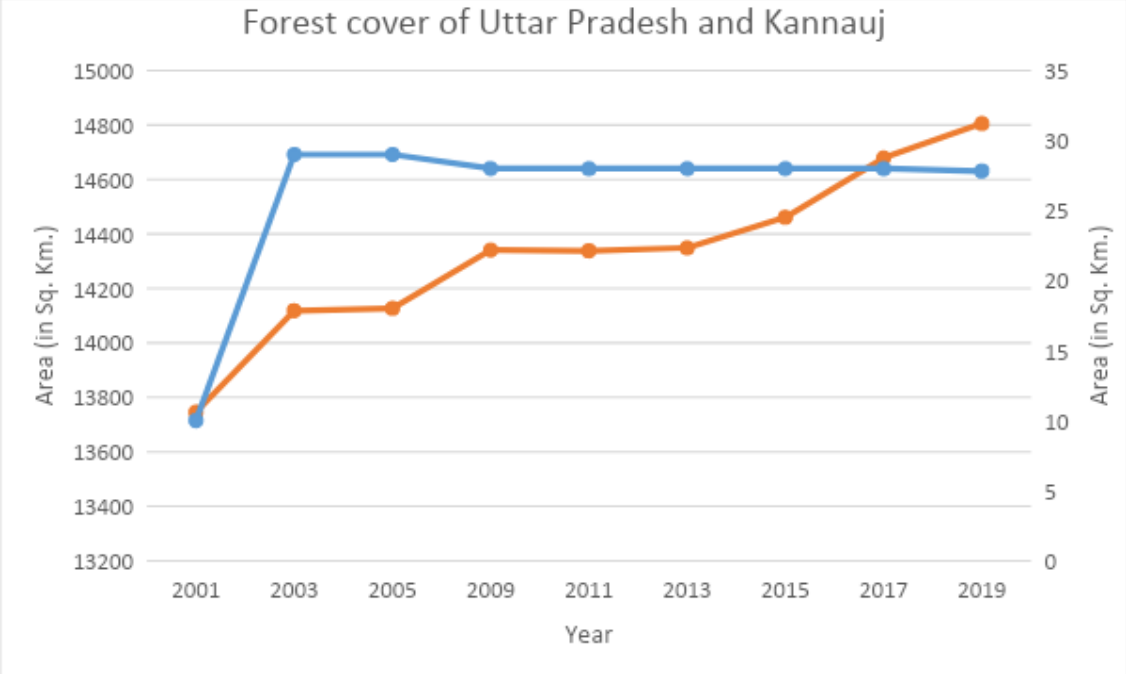
Category	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cattle Hospital	18	18	18	19	19	19	19	19	19
D- category Cattle Dispensary	4	4	4	4	4	4	4	4	4
Cattle Development Centre	11	11	11	11	11	12	12	12	12
Man-Made Reproduction Centre	33	33	33	34	35	35	35	35	35
Source: http://updes.up.nic.in/spiderreports/intialisePage.action									

2.2 Trends in Livestock

2.3 Forestry



According to FSI report, there are no major forest are found in the Kannauj district. Kannauj district has 27.82 Sq. Km. area of forest. Only open forest type of forests are found.



The forest cover of Uttar Pradesh has increased significantly between 2001 and 2019. There is no major forest found in Kannauj, only open forest is found in the district, approx.. 27 – 29 sq. km. of forest.

2.4. Biodiversity:

The district's biodiversity includes various crop production, livestock population, bird species, and forest cover. The crop production trend shows a reduction in the non-grain crop but increases in all other crops. Forest data shows that forest cover was decreased by 0.18% in 2019.

Table 3 Bird species recorded in the district.

Number of species	352
Number of rare/accidental species	5

Forest cover (in sq. km.)

Geographical area	**Very dense forest**	**Mid dense forest**	**Open forest**	**Total**	**% of Geographical area `**	**Change with respect to 2017 assessment**	**Scrub**
2093	0	0	27.82	27.82	1.33	-0.18	0

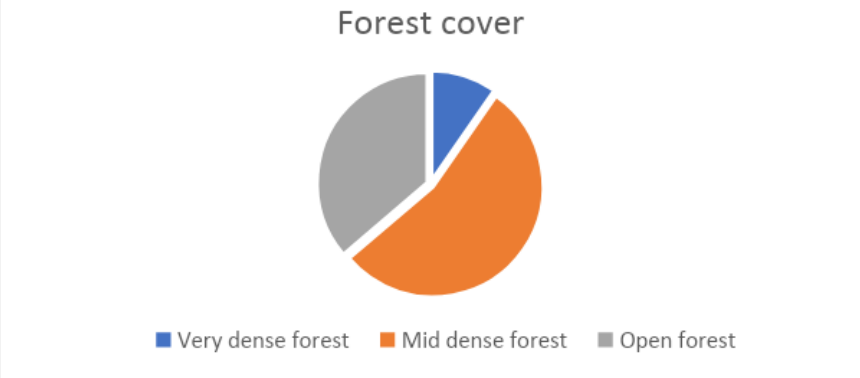


Table 4 Biodiversity in the district.

District	**No. of flora species**	**No. of fauna species**
Kannauj	168	294
Source: https://upsbdb.org/pdf/2016/09/PBR-Kannauj.pdf		

2.4 Tourism

2.4.1. Domestic/foreign visitors in different years in Kannauj

ANNUAL TOURIST VISITS STATISTICS- KANNAUJ- Uttar Pradesh				
Year	**Tourist- Domestic**	**Tourists- Foreigner**	**Total**	**% Increase**
2013	87544	338	87882	
2014	102845	373	103218	17.45%
2015	283845	725	284570	175.70%
2016	288710	900	289610	1.77%
2017	557122	1767	558889	92.98%
2018	891695	1923	893618	59.89%
2019	1001262	665	1001927	12.12%
2020	107811	211	108022	-89.22%

Table-1; Source: Dept. of Tourism, Uttar Pradesh Government

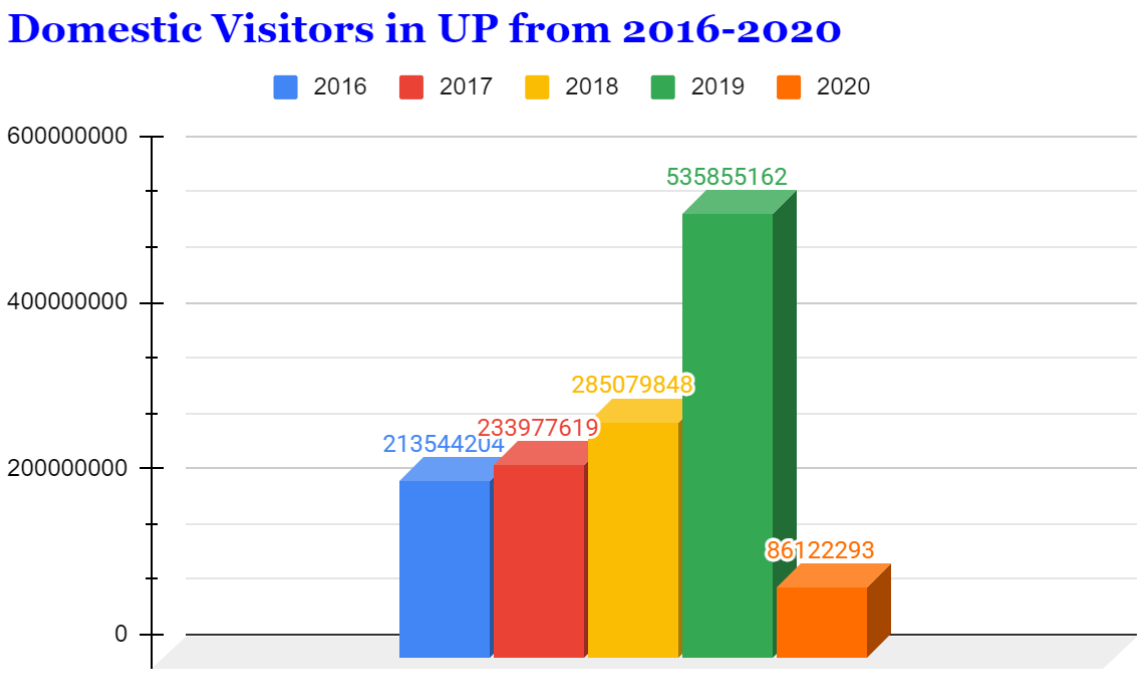
- The above given Table 1 is prepared on the basis of data recovered from the official website of the Department of Tourism Government of Uttar Pradesh. Calculations are being done manually based on the values, taken from the tourism report of Uttar Pradesh.
- The above given Table- 3 shows the number of domestic and foreign tourists in years from 2013 to 2020 in Kannauj.
- In the year 2014 Kannauj encountered 17.45% growth in the number of tourists. In this data the contribution of domestic tourists is much more than foreign tourists. The number of foreign tourists is insignificant in Kannauj.
- In the year 2015 Kannauj encountered huge growth in the number of tourists. Number in 2015 increased 175% compared to the number of tourists in 2014. Number of foreign tourists also doubled this year.
- In the year 2016 Kannauj encountered flat growth in number of tourists; the number of tourists increased 1.77% this year, which is good because Kannauj successfully contained the number of tourists it received the previous year and showed a growth on that too.
- In the year 2017 Kannauj encountered huge growth in number of tourists. Number of tourists in 2017 showed 92.98% growth which means that the number doubled this year compared to the data of 2016 tourists. The number of foreign tourists also increased significantly.

- In the year 2018 Kannauj experienced growth in the number of tourists. Number of tourists in 2018 showed 59.89% growth this year compared to the data of 2017 tourists. The number of foreign tourists does not show significant growth this year.
- In the year 2019 Kannauj experienced flat positive growth in the number of tourists. Number of tourists in 2019 showed 12.12% growth this year compared to the data of 2018 tourists. The number of foreign tourists showed significant negative growth in this year; the number decreased from 1923 to 665. The number of foreign tourists remains 1/3 in the year 2019.
- In the year 2020 Kannauj encountered exponential negative growth in the number of tourists. Number of tourists in 2020 showed -89.22% (negative growth) growth compared to the data of 2019 tourists. 2020 has been a disruptive year for the hospitality and tourism sector because of pandemic situations and lockdown.

2.4.2.Domestic and foreign visitors in different years in Uttar Pradesh

The Indian and Foreign Tourist visits in Uttar Pradesh from 2016 to 2020						
				Percentage increase/ reduce in comparison to previous year		
Year	**Indian**	**Foreigner**	**Total**	**Indian (%)**	**Foreigner (%)**	**Total**
2016	213544204	3156812	216701016	3.4	1.69	3.37
2017	233977619	3556204	237533823	9.56	12.65	9.61
2018	285079848	3780752	288860600	21.84	6.31	21.6
2019	535855162	4745181	540600343	87.96	25.5	87.14
2020	86122293	890931	87013224	-83.92	81.92	-83.9

Table-2; Source: Dept. of Tourism, Uttar Pradesh Government



Graph-1; Source: Dept. of Tourism, Uttar Pradesh Government

- The above given Table 2 is prepared on the basis of data recovered from the official website of the Department of Tourism Government of Uttar Pradesh. Calculations are being done manually based on the values, taken from the tourism report of Uttar Pradesh.
- The above-given Table 2 shows the number of visitors who visited Uttar Pradesh from 2016 to 2020. In 2016 the number of domestic tourists increased to 3.4% compared to 2015, and foreign tourists increased to 1.69%.
- In the year 2017, the growth rate increased to 9.56% in domestic tourists and 12.65% in foreign tourists.
- Data shows that 2018 has been a fruitful year for Uttar Pradesh tourism. Uttar Pradesh encountered a 21.6% increase in tourist numbers from the previous year, a significant change in numbers. However, the pattern is not similar in Kanpur
- 2019 was a year when the global event Kumbh Mela 2019 was organized in Prayagraj (a District in Uttar Pradesh). The results are visible in the numbers (given in the data table above), 87.14% increase in the number of tourists compared to 2018. The data also shows foreign visitors increased to 25% in 2019. The enhanced response of tourists shows the consumer behavior, which majorly depends on advertisements. A commodity that has been presented to be associated with the emotions of consumers has a high potential to sustain and perform better than its competitors.
- The surge in the number of tourists in Kumbh Mela 2019 is attributed to expensive advertisements, extra-standard facilities, and a political campaign. All this together made the event a mega event. Security aspect in such an organization is a significant factor which influences the success and failure. Kumbh Mela 2019 witnessed extra tight security and surveillance to prevent stampedes and violence in the Mela.

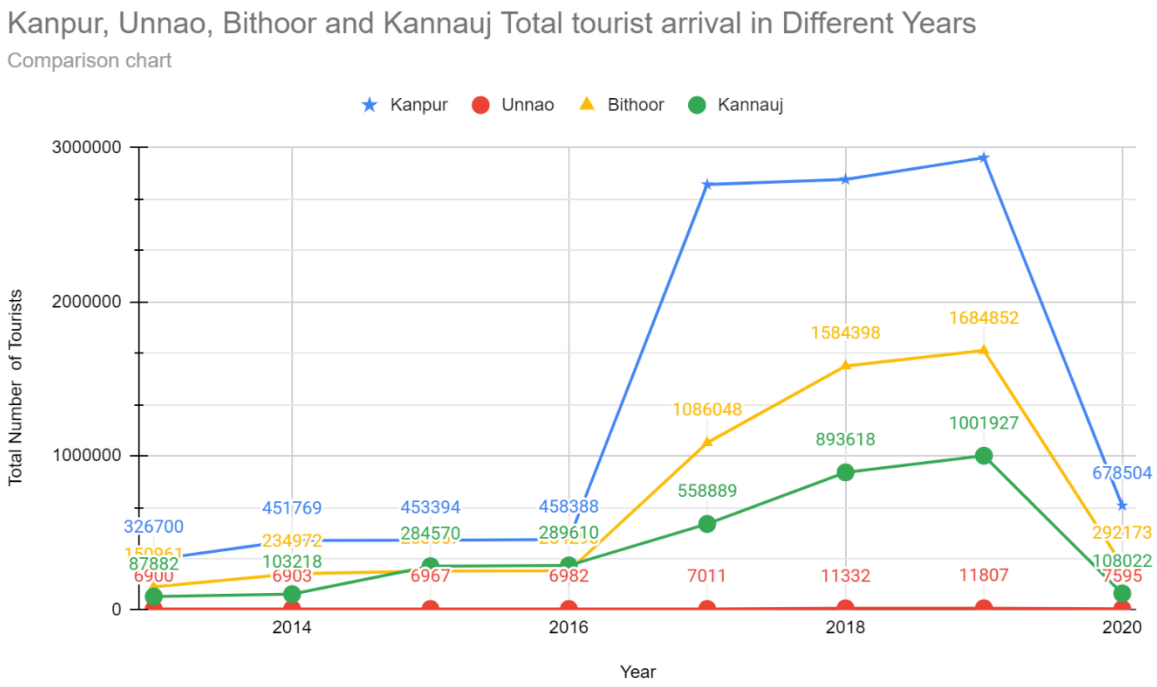
- Such grand organization of events are also a factor on which the number of tourists to other districts (especially domestic tourists) and states (especially foreigner tourists) depend. Although the number of tourists did not significantly increase in Kannauj during Kumbh Mela 2019.
- The scenario of foreign tourists is worse compared to state data. Even the mega event Kumbh mela could not increase the number of foreign tourists in Kannauj. This signifies the lack of transfer of information.
- The district witnessed the increased growth in number of domestic tourists but not in foreign tourists. It is necessary to understand the shortfalls before working on upcoming policies and agendas.

2.4.3. Visitors in different years in neighboring tourist spots.

The below-given table 3, shows the number of tourists at four different Tourist sites Kanpur, Unnao, Bithoor and Kannauj in years from 2013 to 2020.

	Kanpur	Unnao	Bithoor	Kannauj
2013	326700	6900	150961	87882
2014	451769	6903	234972	103218
2015	453394	6967	253567	284570
2016	458388	6982	254290	289610
2017	2762672	7011	1086048	558889
2018	2795181	11332	1584398	893618
2019	2935935	11807	1684852	1001927
2020	678504	7595	292173	108022

Table-3; Source: Dept. of Tourism, Uttar Pradesh Government



Graph-2; Source: Dept. of Tourism, Uttar Pradesh Government

- The above given data is taken from the official website of the tourism government of Uttar Pradesh. The above-given data shows the number of tourists (total tourists which comprises domestic and foreign tourists) in different years from 2013 to 2020, in four different tourist sites; those located in the vicinity of Kannauj.
- The graph 2, given above shows tourist visits in your eight consecutive years; different color lines show different cities. Blue for Kanpur, Yellow for Bithoor, Green for Kannauj and Red for Unnao. All these four sites share ganga ghats and are located near to each other. The graph shows that three cities which are Kanpur, Bithoor and Kannauj shares similar pattern in number of tourists in different years.
- The number of tourists grew every year in Kanpur, Kannauj and Bithoor from 2013 to 2016. The slope of these three tourist sites seems similar. In the case of Unnao the graph line follows a different pattern; also, the number of tourists is not significant in comparison to the other three sites. The Unnao graph is flat and does not show and change in the given years.
- Kanpur, Kannauj and Bithoor in the year 2017 encounter skyrocketing in the number of tourists. The graph of Unnao does not encounter any skyrocketing and continues a similar growth rate as it was in the previous years.
- From the year 2017 to 2018, Kanpur, Kannauj and Bithoor show a flat curve in terms of growth in number of tourists. Although Unnao's growth curve follows a flat growth curve.
- Similar to previous years, from 2018 to 2019, Kanpur, Kannauj and Bithoor show a flat growth curve. Although Unnao's growth curve follows a flat growth curve.
- From the year 2019 to 2020, the tourist growth graph in Kanpur, Kannauj and Bithoor shows a similar pattern; all the three lines tend to meet x-axis in the graph, which means

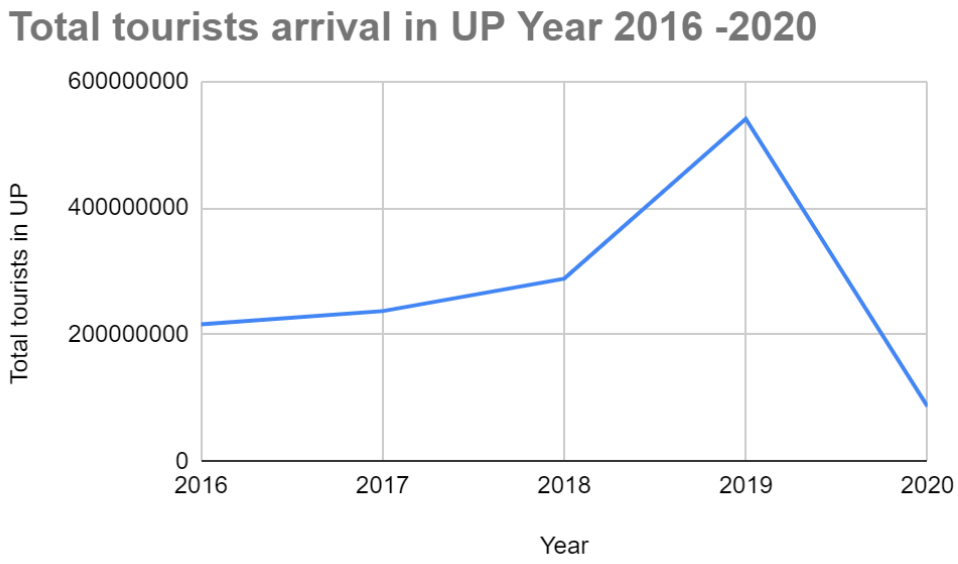
the number of tourists in 2020 reduced drastically. The number of tourists also decreased in case of Unnao.

2.4.4. Budget allotted/ Expenditure in different years by tourism dept.

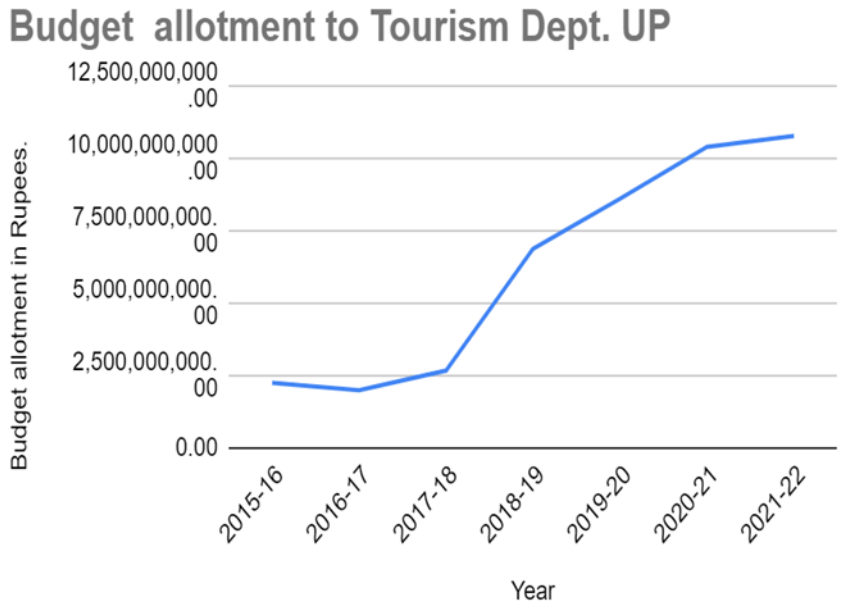
Budget -Department of Tourism, in Different Years		
Year	**Budget in Rupees**	**Percent increase or decrease**
2015-16	2,245,098,000.00	
2016-17	1,992,912,000.00	-11.23%
2017-18	2,671,016,000.00	34.03%
2018-19	6,870,209,000.00	157.21%
2019-20	8,596,205,000.00	25.12%
2020-21	10,382,037,000.00	20.77%
2021-22	10,759,153,000.00	3.63%

Table-4; Source: Dept. of Tourism, Uttar Pradesh Government

The above-given table 4 shows the budget sanctioned for the Department of Tourism, Uttar Pradesh, from the Financial Year (FY) 2015-16 to 2021-22. In the initial FYs, which are 2015-16, 2016-17, 2017-18, the amount sanctioned to the department is significantly low. In the FY 2018-19 Department received a 157.21% increased budget. Which followed a 25% increase in the next FY-2019-20. A similar trend is visible in the number of tourists, a skyrocketing of tourists is found in the same years. This directly implies that the money spent is directly proportional to the tourists in particular FY.



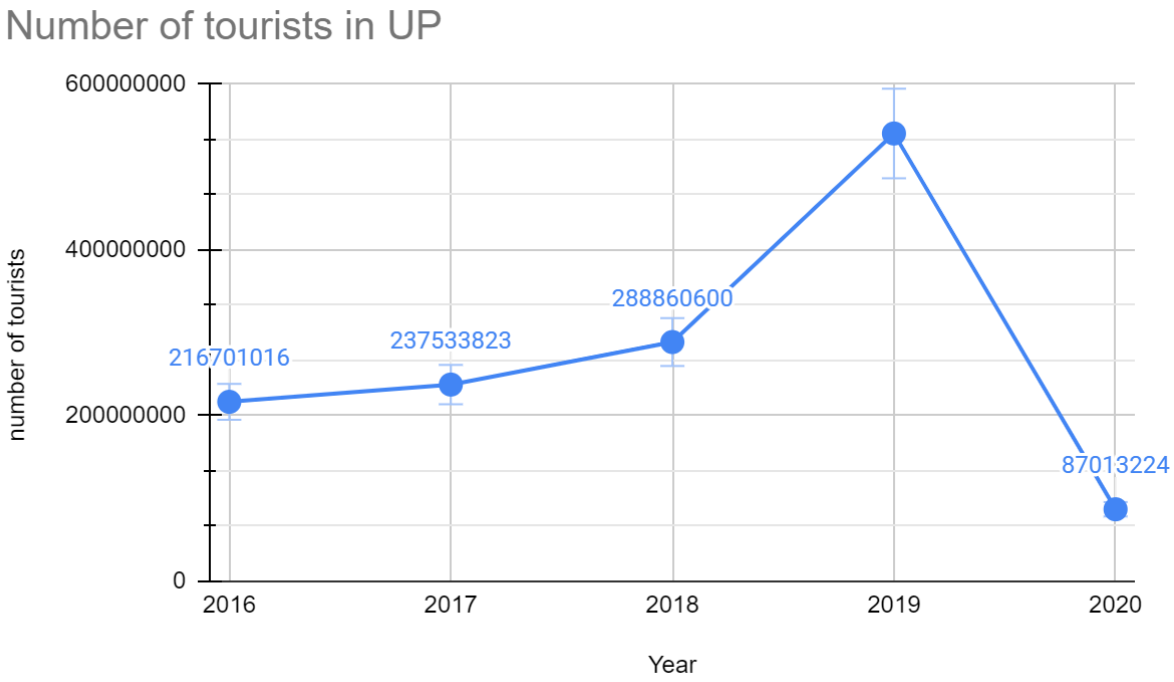
Graph-3; Source: Dept. of Tourism, Uttar Pradesh Government



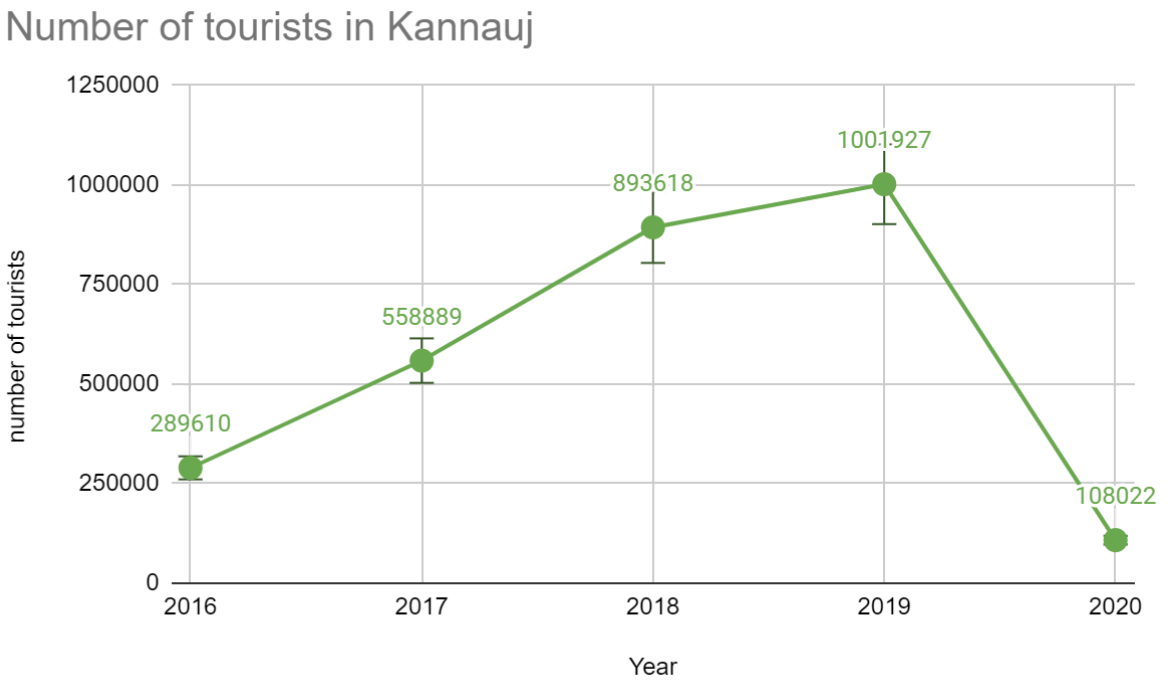
Graph-4; Source: Dept. of Tourism, Uttar Pradesh Government

The trend lines graphs 3 and graph 4; mentioned above, show the trend of budget allotment to the Tourism and increase in tourist arrivals. Before 2020 the trendlines follow a similar pattern: the money allotted to the Department is directly proportional to the Tourist arrival in the State. 2020 is an exception during which a pandemic seized the tourism activities.

2.4.5. Comparison of tourists



Graph-5; Source: Dept. of Tourism, Uttar Pradesh Government



Graph-6; Source: Dept. of Tourism, Uttar Pradesh Government

- The above given Graph 3 and 4, is prepared on the basis of data recovered from the official website of the Department of Tourism Government of Uttar Pradesh. Calculations are being done manually based on the values, taken from the tourism report of Uttar Pradesh.
- The above given graph 4 and 5 in comparison shows that both the graphs follow a similar trend line in growth in number of tourists from 2016 to 2020.
- The Graph 4 and 5 shows positive slope, from year 2016 to 2019 and a steep and negative slope in the year 2020. Graph 4 and 5 follows similar trendlines from 2019 to 2020, and before that.

2.5 Wetlands

The district is blessed with a large number of wetlands. The district consists of lakes like the Nigoh lake (156.65 Ha), Kaint Lake (73.72 Ha), Dader lake (57.37 Ha), which are some of the large size lakes present in the district. Table 1 represents the number of wetlands and their area representation in the district. Around 224 wetlands were sized greater than 2.25 Ha and 368 less than 2.25 Ha areas. The region consists of large wetlands only, generally less than 200 Ha in the area.

Table 1: Wetland Data of Kannauj District

Wetland Types	Total Number of												
	Wetlands:			Area (ha)									Aquatic Vegetation
Natural Wetlands	**NRCD**	**NWIA**	**Diff.**	**<2.25**	**<5**	**<10**	**<20**	**<50**	**<200**	**<500**	**<1000**	**>1000**	
Lake/ponds	27	32	5	0	4	3	4	5	10	1	0	0	19
Ox-bow lakes/cut off meanders	9	10	1	0	1	1	4	2	1	0	0	0	7
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	4	9	5	0	0	1	2	0	1	0	0	0	0
Waterlogged	32	43	11	0	8	6	7	10	1	0	0	0	19
River/Stream	0	65	65	0	0	0	0	0	0	0	0	0	0
Man-made Wetlands	**NRCD**	**NWIA**	**Diff.**	**<2.25**	**<5**	**<10**	**<20**	**<50**	**<200**	**<500**	**<1000**	**>1000**	**AV**
Reservoirs/Barrages	1	1	0	0	0	0	1	0	0	0	0	0	0
Tanks/ponds	10	10	0	0	10	0	0	0	0	0	0	0	3
Waterlogged	52	54	2	0	9	12	10	11	10	0	0	0	36
Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (592)	**135**	**224**	**89**	**368**	**32**	**23**	**28**	**28**	**23**	**1**	**0**	**0**	**84**

Source: (National River Conservation Directorate, 2008), (Space Application Centre-ISRO, 2007)

- The district comprises 592 wetlands; most are waterlogged and rivers/streams.
- The wetland size is small and medium-sized in general.
- The number of natural wetlands is more than man-made.
- Many wetlands both man-made and natural are waterlogged one's.
- Many wetlands have aquatic vegetation.

2.6 Energy

2.6.1 Biomass Energy

Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) is the nodal agency which makes efforts to develop the capacity in renewable energy sources such as solar energy, small-scale hydro-electricity and biomass-based electricity production in the state. Biomass-based co-generation in the state sugar mills and rice husk based-electricity generation projects are being encouraged. The net sown area of the district is 145800 ha and the gross sown area is 222000 ha. This therefore leads to the district's cropping intensity as 145.8%. The district has 3300 ha of cultivable waste land and 9000 ha of fallow land. The major crops and their productivity in the district Kannauj has been recorded as- maize: 15.75 q/ha, rice: 24.08q/ha, wheat: 34.90q/ha, potato: 254.28q/ha.

The district's biomass generation from agro-residues is 528.0 kT/Yr and that from forest and waste land is 36.3 kT/Yr [Kumar et. al. (2017)]. A biomass gasifier at Bharat Cold storage has been reported in the district from the available resources. According to the 2011 census (as depicted in figure), in the district Kannauj 53% households use firewood, 23.29% use crop residue and 10.55% use cowdung cake as cooking fuel.

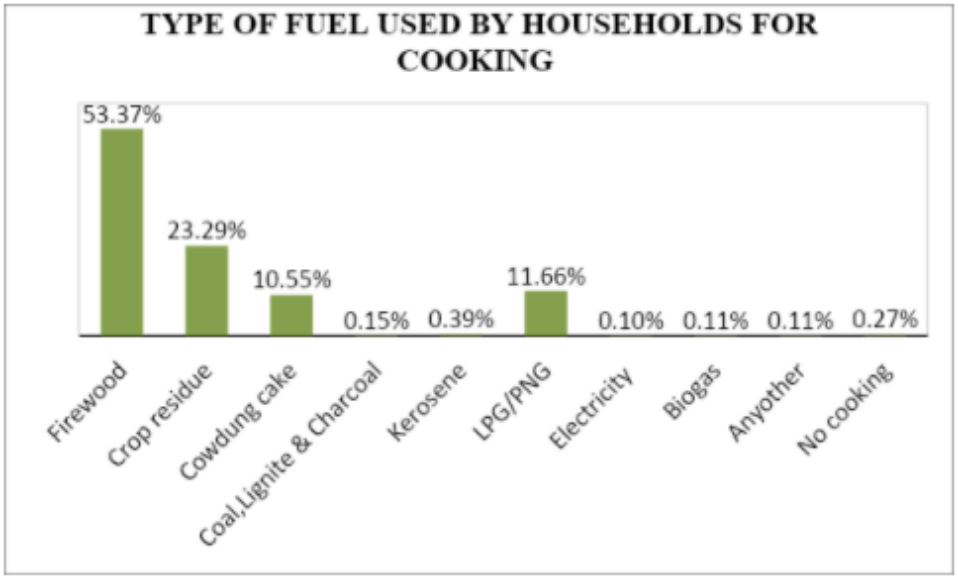


Fig.

2.6.2 Biogas Energy

As existing biogas plant data is unavailable for the district, biogas potential has been evaluated by average livestock and agricultural waste production. Biogas potential from animal waste is

calculated as approximately one crore m^3/year and thirty-one crores m^3/year. This amount of biogas generation can efficiently complete the energy demand of the district.

2.6.3. Hydropower

Available data shows that no hydropower plant exists in the district, and no site has been investigated for future projects. The main river in the district is Ganga (north-east part) and then Kali and Ishan river. Ganga canal present in the district can serve the purpose of electricity generation by constructing small hydropower plants.

2.6.4. Solar Energy

The Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) is the nodal agency which looks after the growth and expansion of renewable energy in the state. UPNEDA takes efforts to develop the capacity in renewable energy sources such as solar energy, small-scale hydro-electricity and biomass-based electricity production in the state. Various capacity solar power plants are being installed for electricity generation from solar energy. According to the 2011 census (as depicted in figure), 76% households used kerosene as the main source of lightning followed by 22% using electricity.

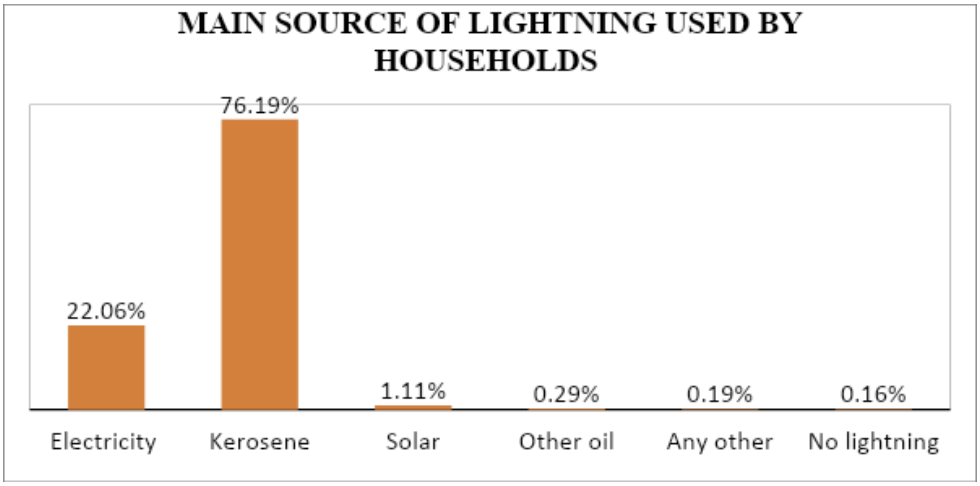


Fig. 1

The UPNEDA website provides with the data of the work done in solar energy sector in the state. The state government installs Solar R.O water plants in the primary schools in Uttar Pradesh. Under this the government installs a solar panel of 1.1 kW, 5 fans, a R.O. water with 100 liter storage tank, a water pump and an overhead tank of 1000 liters. The government has installed a

total of 40 these plants in the district. The data also mentions installation of a 50kW plant in Vikas Bhawan, Kannauj. There is not more data about the installation of solar plants in Kannauj.

3 QUALITATIVE DATA ANALYSIS

3.1 AGRICULTURE, ALLIED ACTIVITIES, FORESTRY

3.2 ENERGY

3.2.1. Biogas Energy

The district has a high potential to generate biogas from agricultural, animal, and human waste. A national program such as the New national Biogas and organic manure program (NNBOMP) and Biogas power generation and thermal energy application program (BPGTP) are running by the State and should be applied to this district generation decentralized energy source.

3.2.2. Biomass Energy

Kannauj is an agrarian district and hence its main source of biomass is in form of agro wastes. But unfortunately there has been no mention of any kind of biomass plants in the available sources. The district is going on through the problem of stubble burning about which it has often been in news. Stubble burning especially 'parali' causes a lot of pollution. An article's headline in Amar Ujala reads - There have been police complaints against those burning parali in the district.

The problem is probably because farmers don't have an alternative other than burning it. At present the need is to develop a system which includes in itself utilization of all forms of biomass wastes in the district.

3.2.3. Hydropower Energy

For hydropower generation, the National level program, such as the small hydropower project program, runs in the State. The implementation of small hydropower in the State is carried out by

Uttar Pradesh New and Renewable Energy Development Agency and Uttar Pradesh Jal Vidyut Nigam. Neither sites have been investigated so far nor exist at present in the district.

3.2.4. Solar Energy

The district has done quite well in the solar energy sector. An article in Amar Ujala mentions about the establishment of a solar park in the district in an area of 3000 acre. It is to be established under central government's Solar policy of 2017. The district has been installed with other smaller solar plants in the past. Another news article in Amar Ujala mentions that how a recently installed 250 kW solar power plant went off only after 34 days of its start. There has been a problem of power cut off as well in the district.

It is evident that the district has potential and there have been constant efforts for making Kannauj solar power hub. The data collected from various sources suggests that solar energy is least utilized for agriculture purposes. The need is the make the main economic activity i.e. agriculture solar powered. Solar plants are being installed in primary schools, government institutes, at homes and solar high masts which is a great thing.

3.3 FOREST

Uttar Pradesh has forest and tree cover of 21720 sq. km, which is 9.01% of its geographical area. The existing flora in Uttar Pradesh can be classified into three categories-

- Wet tropical desiduous forests.
- Dry tropical desiduous forests.
- Tropical throny forests.

To increase forest resources in the country, Ministry of Environment, Forest and Climate Change is implementing a number of Schemes under which financial assistance is provided to State/UT Governments. Some of major schemes of the Ministry are National Afforestation Programme (NAP) and Green India Mission (GIM), Integrated Development of Wildlife Habitat (IDWH), Intensification of Forest Management Scheme (IFMS), Project Tiger and Project Elephant including funds under Compensatory Afforestation Fund Management and Planning Authority (CAMPA).[1]

3.3.1. Biodiversity

The Lakh Bahosi Bird Sanctuary was established in 1988 to protect and conserve the wetlands, with a focus on local and migratory birds and aquatic flora and animals. The Lakh Bahosi Bird

[1] https://pib.gov.in/newsite/PrintRelease.aspx?relid=148508

Sanctuary is made up of two major lakes, Lakh and Bahosi, which are named after respective villages. Every year, between November and March, about 50,000 waterfowls visit this sanctuary. Some birds use this wetland as a nesting and breeding ground. As a result, this sanctuary has been a popular destination for both bird lovers and visitors for many years.

As per the Hindustan Times and Times of India report, the state administration planned to elebrate 'Van Mahotsav' in the summer of 2021 to avoid soil erosion along the Ganga bank and prevent river water from evaporating. During the Van Mahotsav in the first week of July this year, 27.9 crore trees were planted throughout the State. Around 1.3 crore trees were planted along the Ganga and its tributaries by the forest department. Plant species in each area were chosen based on the environment and the preferences of the region's residents, especially farmers. The forest department has planted more than 120 species and 26 by other government departments.

3.4. TOURISM

During the summers, the northern section of India faces high temperatures, and Kannauj is no exception. The temperature can reach 48 degrees Celsius during the summer months, but it cools down to around 28 degrees Celsius at night. Kannauj has a moderate amount of rainfall. The wintersfrom October to March, are the finest time to visit Kannauj.

3.4.1. How to reach

By Rail - Kannauj railway station is connected to major cities of Uttar Pradesh and the country, via regular trains. Kanpur is the nearest Central railway station which gets trains from all over India.

By Road - Kannauj city is tied to the other districts of the state such as Unnao, Kanpur etc., by road. Private and government run buses are available from nearby city stations. Although roads are busy and traffic jams are common, it also gives an authentic Indian texture to your visit.

By Air - The nearest airport to Kannauj is Kanpur Airport (Ganesh Shankar Vidyarthi Airport - Domestic Airport)is 76 km away from the city. The next closest airport is Amausi Airport in Lucknow(Chaudhary Charan Singh Int. Airport). Taxis are available from the airports to reach Kannauj. Amausi is located on the Kanpur-Lucknow highway, where tourists can find AC and Non-AC buses round the clock.

3.4.2. Perfume (attar) Industry

Kannauj is also known as India's perfume capital and is known for its natural and amazing perfumes. Since ancient times, creating perfume, or ittar, has been mentioned in the scriptures of Ayurveda. The Vedas provide the first written description of scent. The art of extracting aromas from various things emerged and became popular inKannauj.. However, the ancient way of making perfume in Kannauj never become outdated because people have been producing perfume for over 5000 years with no alterations to the technique, giving it an authentic texture and aroma Although

the chemical-based perfume industry has disrupted the natural fragrance industry, but there is also a niche market lying for original fragrances.

Perfumes are made in Kannauj using hydro-distillation technology, which uses a nickel-plated copper tank to prevent rusting. Flowers are soaked in water and boiled in containers, while condensers are filled with oil. When the flower vapor boils, it flows via hollow bamboo pipes into the condenser. The oil in the condenser absorbs the vapors' scent; this process takes about 5 hours, after which surplus water is removed from the oil when the condenser has cooled fully. This procedure is repeated, and it is a continuous procedure using the same oil, depending on the scent quality. In Kannauj, six different varieties of fragrances are produced, and fragrances are a part of the city's heritage.

Perfumes created in Kannauj are distributed throughout India since it is natural and harmless. It is also used in cosmetics and medications. Around 20 lakh liters of organic perfume are produced here throughout the bloom season, and substantial volumes are sold to fifty countries.

3.4.3. Places of interest :

Archeological Museum Kannauj - Kannauj's archaeological museum is known for its large collection of clay idols, demonstrating that the city was formerly known for its culture and arts. It was a fully developed locality from the Mayura period forward, as evidenced by clay models, indicating that Kannauj was a very progressive area in ancient times. It is one of the most renowned tourist attractions in Kannauj. We can see the antique art and idols, as well as historical structures and patterns, in the archaeological museum in Kannauj. However, this location has been rebuilt by the government and is one of the top locations to visit in Kannauj.

Lakh Bahosi Bird Sanctuary - It was established in 1989 and is located near lakhbahosi hamlet in Uttar Pradesh's Kannauj district. This bird sanctuary is one of India's largest sancturies, comprising 80 square kilometres and incorporating a big lake as well as a section of the upper Ganga canal.

According to the survey, India has a total of 97 bird families, with 49 of them being found at the lakh bahosi bird sanctuary. Lakhbahosi is located off the road leading to Tirwa, a tiny village 15 kilometres from Kannauj city. It is one of the greatest sites to visit in Kannauj due of its natural beauty, or we might say that this location is a gift from nature to Kannauj. November to March is the best season for bird watching.

This location reaches its full potential in the months of December, January, and February. Animals seen here include the jackal, blue bull, mongoose fishing cat, and monkeys. Because the bahosi lake, which occupies a 3 square kilometre area, attracts the most different sorts of birds throughout this season. And, during this season, you may view up to 49 different bird families at this location.

Gauri Shankar Temple- Gauri Shankar temple is a Kannauj temple located in Kannauj, about 6 kilometres from the Kannauj railway station. It is one of the most well-known temples in the city; many people visit this Kannauj temple every day; it is Kannauj's most well-known religious site.

One may see portraits of many demi-gods and goddesses on the temple's walls, as well as wonderful arts and design within the temple.

One visit to the Kannauj temple reveals old idols and antique art. There are three temples in all, two of which are modest and one of which is in the center is large and houses the shivling. People visit this temple to worship Lord Shiva by conducting Hindu rituals; it is a spiritual and sacred site in Kannauj, and one of the top locations to visit in Kannauj. This temple is incredibly old; some claim it dates back to before Christ. It was established in the 7th century by Emperor Harsha of Kannauj and was finally destroyed by Mahmud Ghazni in 1018 AD.

Annapurna Temple - This temple is likewise a Kannauj temple, and it is located in the area of Tirwa ar Kannauj. It is also one of Kannauj's oldest temples. This temple is dedicated to Hindu deity Maa Annapurna Devi. The most intriguing aspect of this temple, according to native people, is its elephant statues, which no one can count correctly due to some illusion or anything else. This temple is roughly 500 years old, according to locals, and there is a gold gummbat at the temple's pinnacle. This temple has antique artwork and idols, and it is incredibly large. Video recording and photography of the inside are prohibited. Because of its architecture and historic Kannauj history, Annapurna Temple is one of the top locations to visit in Kannauj. If you visit Kannauj, you must go to Annapurna Temple at least once.

Raja Jaichand fort - Raja JaiChand fort Kannauj belongs to its king Jai Chand of Kannauj, it is also called Lakhan Kila of Kannauj. Between 1170 and 1194 CE, Jai Chand or Jayachandra was a Rajput monarch from the Gahadavala dynasty who governed the antarvedi nation on the Ganga plains, including Kanyakubja and Varanasi.

Jaichand's daughter, Samyukta, eloped with Prithviraj Chauhan against his desires, and he collaborated with the ghurids to bring him down. Aside from history, look at the current Raja Jaichand fort Kannauj, which is located in Kannauj city and has a large monument of Jaichand at the entrance. This is one of the great locations to see in Kannauj; you can witness shattered walls and old constructions in the fort; if you want to visit Kannauj city, then this fort is a must-see.

3.4.4. Data analysis

- According to Graph2, the number of tourists in three different tourist sites, Kanpur, Kannauj, and Bithoor, follows a similar pattern. The graph shows the number of tourists in Kannauj increases in the same year at the same rate as it is in Kanpur and Bithoor. This means input to any of these cities can influence the number of the other two tourist sites. It also shows a tendency of tourists to visit nearby tourist spots.
- In the year 2014, Kannauj encountered a considerable growth in the number of tourists. 175.7% increase in the number of total tourists denotes a considerable revenue generation for the tourism sector. It is required to find out the appropriate reason for the surge in the number of tourists this year. If some organizations or celebrations pump the number of tourists in this particular year, it is necessary to find the factors for this through research.
- A similar scenario is visible in the years 2017 and 2018 (92.98% and 59.89% growth, respectively), in which Kannauj experiences a huge increase in the number of tourists. Factors that are helping in attracting more tourists in these years need to be studied.

- 2019 is when Kumbh Mela was organized in Allahabad (neighboring district), although in 2019, Kannauj experienced only 12.12% growth in the number of tourists. It is needed to find out the reason why Kannauj failed to attract tourists from Kumbh Mela. Also, it should be noted that in 2019 the number of foreign tourists in Kannauj decreased to 1/3rd compared to the 2018 number of foreign tourists. Kumbh Mela attracted a huge number of foreign tourists, whereas Kannauj failed to do so. Research is needed to find out the reason which restricted tourists from visiting Kannauj.
- Graph 5 and Graph 6 shows that the number of tourists in Uttar Pradesh and Kannauj follow a similar trendline. If something is happening in Uttar Pradesh, that will affect the tourism activity in Kannauj. For example, political instability in Uttar Pradesh may decrease the number of tourists in Kannauj and overall Uttar Pradesh at the same time.

3.4.5. SWOT analysis:

S. N	Strength	Weakness	Opportunities	Threat
●	● Embraces cultures from Mughals, Hindus and Buddhists. ● Lakh Bahosi Bird Sanctuary is a great space of eco-tourism.	● Failed to attract tourists in 2019 from Kumbh Mela ● Number of tourists in not consistent and keeps on increasing and decreasing	● Lakh Bahosi Bird Sanctuary can be developed along with ganga ghats as eco-tourism spots for all demography of tourists. ● Ittar/Perfume industry can be associated with tourism and local economy such as *atmanirbhar bharat.*	● Rapid development projects can harm Ganga and cause pollution. ● Bird Sanctuary is at threat due to Global warming and climate change.

3.5. WETLAND

The wetlands are the source of many ecosystems and habitats for various species. The wetlands create a unique ecosystem that supports many species simultaneously like aquatic, terrestrial, and human beings. The district has many potential sources and opportunities to harness valuable products using the scheme and start the pilot project. Local stakeholders directly or indirectly depend on the wetland for their income and small-scale business. These businesses can be a great opportunity can be turned into a large-scale production hub using the right approach. The region

has a good amount of production of maize and rice. The region is known for the perfume and bidi industry. The data collected and analyzed shows the region's production and possible product derived from the raw product. The list of sources and the possible products are mentioned below:

- Sugarcane, maize, and tobacco production are recommended as commercial crops in the region, leading to products like sugar, maize flour, and tobacco products.
- Production of sunnhemp is reasonably high, which can turn into the products like sunn fibre which is as durable as jute products.
- The district stats show a good amount of finger millet, pearl millet, bajara in the region, which can be promoted.
- Also, this region is a belt of large varieties of oil production in the region like mustard, linseed, castor seeds which can turn into a valuable market for oil production in the region.
- The district is famous for its perfumes, fragrance products
- The region has a large production of dairy products, leading to an increase in animal husbandry. Wetlands can support the growth of fodder for the animals in the region.

4 ACTION PLAN DEVELOPMENT

4.1 AGRICULTURE

4.2 FORESTRY

The state of Uttar Pradesh announced its new State Forest Policy in October, 2017 in place of State Forest Policy, 1998.

The objectives of State Forest Policy, 2017 are as follows:

- Improvement of existing natural and planted forest by conservation, development and scientific and thoughtful management.
- Formulation and implementation of schemes of afforestation and soil conservation in different types of degraded land of state viz. usar, khadar, ravines and blank forest.
- Special emphasis on forest dweller centric forest management.
- Increase of tree cover by social and agroforestry plantation on private land.
- To get carbon credits on the plantations which are planted according to international standards.
- To endeavor for the reduction of siltation of water and reservoirs and effects of floods and droughts through controlled measures over soil-erosion.
- To promote plantation over non-forest land.
- To prepare and implement strategies for conservation and improvement of biodiversity and wildlife in the state.

- To develop eco-tourism destinations.

In July 2019, the government of Uttar Pradesh took the initiative to plant 22 crore saplings. The Forest Department involved the farmers as stakeholders to plant seedlings in their fields. Farmers are expected to sow quality planting material such as clonal plants, which are not available in the UP forest department nurseries. There is also the need to have a minimum support price (MSP) for the timber produced by farmers with a buy-back arrangement. This in turn will motivate them to plant more trees, which would benefit the economy as well as the environment.[2]

Projections & Monitoring Matrix

Outcome indicators can be forest produce, buyback of products by the state, annual gross income generated by these outputs, contribution of the forest output in the district domestic product.

4.2.1. Biodiversity

The district is located in Uttar Pradesh's drought-prone area. When the water supply sources, such as dug wells, tanks, and ponds, run empty owing to monsoon failure, the residents' lives become miserable. These problems can be solved by making check dams or big nalas to recharge the groundwater body.

4.3 TOURISM

4.3.1. Ecotourism Projects

Traveling to places where flora, wildlife, and cultural legacy are the main attractions is ecotourism. Ecotourism aims to provide visitors with a better understanding of how humans affect the environment and create a greater appreciation for our natural ecosystems. There is a huge opportunity to develop ecotourism projects in the Kannauj district. The project will minimize the negative aspects of conventional tourism on the environment and enhance the cultural integrity of local people. Also, this project will boost the tourist inflow in the district. Lakes, Ponds, forests and protected ranges can be saved to give Kannauj a new face in tourism.

4.3.2. Sustainable Tourism

It is a type of tourism in which all the needs and desires of a tourist/ and other stakeholders of the tourism industry are fulfilled without compromising the ability of the future generation to utilize the tourism. Several goals of Sustainable Developments Goals are also seen associated with sustainable tourism. Life below water and life on land are impacted by human activities if the tourism place is a water body or forest area; hence it is the duty of all of us to take care of the sustainability aspect in tourism. Sustainability for locals/natives can be provided by including them in trade and business activities. There is a sense of responsibility of different stakeholders associated with tourism to develop sustainable tourism. In which each stakeholder takes care of

[2] https://www.teriin.org/article/special-drive-tree-plantations-uttar-pradesh-faces-several-challenges

other stakeholders and biotic and abiotic factors. For example, reducing the Carbon footprint per visitor, using eco-friendly vehicles to roam around, supporting local businesses.

One example of sustainable tourism is promoting tourists to travel off-season. It will reduce the impact of seasonal unemployment on the marginal traders and other workers in the tourism sector. Offering eco-friendly services is another example of sustainable tourism. Providing tourists with a cycle to roam around nearby places with help in reducing carbon footprint and it economical. It is aimed at the minimum negative impact on the environment created by tourism activities.

Ghats can be given shape to support the economy of local natives and the environment simultaneously.

- **UP Tourism Policy, 2018**
  The vision of this policy is to establish Uttar Pradesh as a preferred tourism destination in India by 2023, achieve the country's highest tourist arrival and tourism receipts, and ensure the best visitor experience.

  Targets
  - To attract investments with a target of INR 5,000 Crore per year
  - To provide employment to approximately 5,00,000 people per year
  - To impart training to 10,000 tourism service providers over the next five years.
  - To convert 10 heritage buildings (Buildings with heritage value) to heritage hotels per year.
  - To attract 1,00,000 tourists to national parks and wildlife sanctuaries in Uttar Pradesh per year.

  Incredible India- Bed & Breakfast Scheme
  - The essential feature of this scheme is the invention of the 'Home Stay' facility.
  - This scheme aims to provide accessible, relaxed and low-cost accommodation to tourists in tourist places and cities.
  - The scheme was launched in 2008.
  - This scheme applies to all Cities in Uttar Pradesh.
  - The scheme is categorized into "Silver" and "Gold" based on Quality of service provided, status accommodation, facilities provided.
  - The registration fees for the silver category are Rs.1000/- and Rs.2000/- for gold category accommodation.

Projections and Monitoring matrix:

Sector	Intervention	Strategy	Total cost	Expected Outcomes
Tourism	**Research**	• Based on various data and matrices, it is		A well-researched

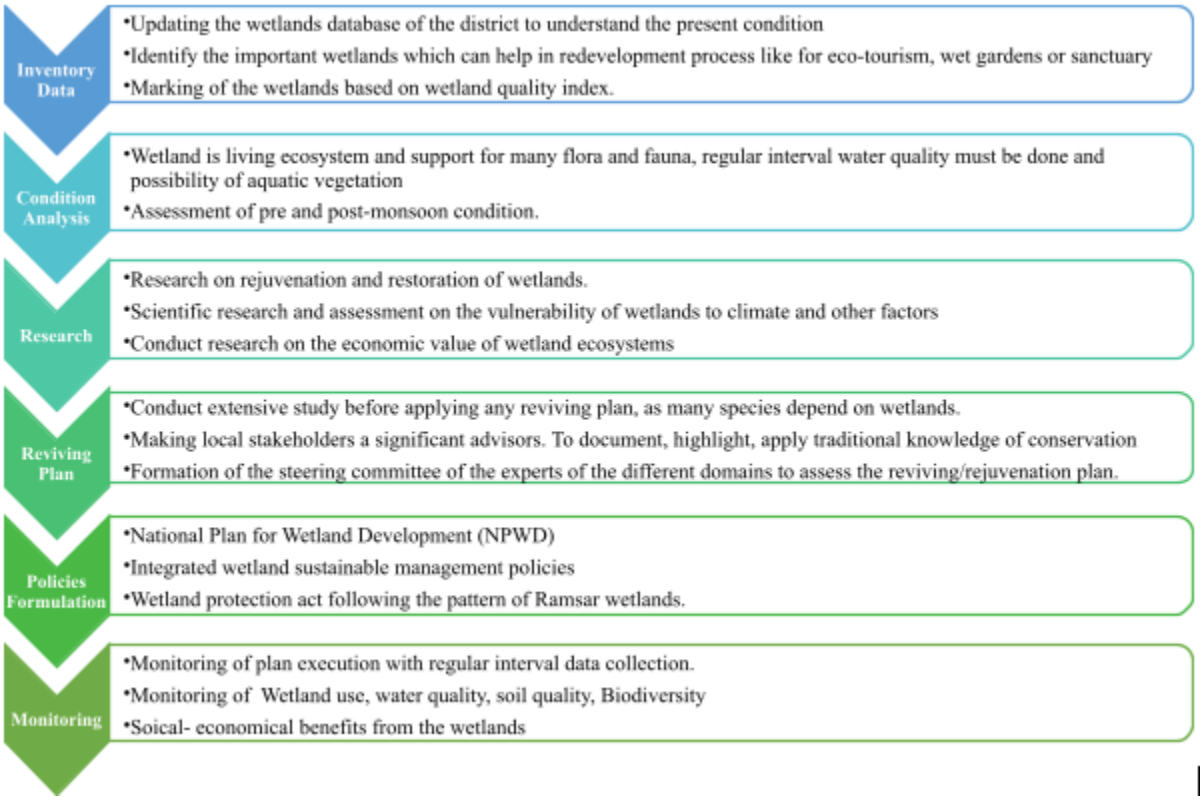
		possible to predict the reason and motivation for tourism. Through extensive qualitative and quantitative research, it is also possible to determine the variables affecting tourism in Uttar Pradesh. ● Research must be free from all the political pressures and influences. ● The researchers must ensure that the field data and secondary data are correct and not modified while entering the new records. ● Need to involve unbiased researchers.		document as a reference for other processes. Factors that affect tourism in Uttar Pradesh. Define the determinant of tourism activity.
	Planning	● Action plans can be developed for intervention based on the research and analysis of different data and reports. ● Developing an Action plan is vital because results depend on how it is planned. ● Planning must consider the social status of the State and the image in the tourists' minds. ● No place should be given to non-practical projections. ● Planning about when to organized Mahotsav/ festivals/		Planning to be based on research and previous lessons. Realistic planning for successful implementation . .

		fairs to pump the local economy. ● Separate planning for different demographics of tourists for comfort and leisure tours. For example, while planning the tour packages and tariffs, it is crucial to consider the demography of tourists. Foreign tourists ask much for hygiene while local tourists ask much for discounts. Hence these concerns must be included. ● Need to develop the sites as per a set of standards to attract a wide range of tourists. ● Brand Manufacturing to increase tourism activity. ● Organizations of grand events. ● Use of allocated budget.		
	Implementations	● Various schemes can be developed, such as tourist packages, tariff plans etc., to attract more and more tourists. ● Mahotsav and Fairs to be organized to rejuvenate the local economy and attract tourists. ● Developing tourist circuits		To attract more number of tourists and maximize the revenue from tourism. To improve the image of the State and not let the other social factor affect the

		• Developing eateries • Connecting tourism with local culture and food. • Extensive marketing for advertisement. • Famous face as brand ambassador. • Extensive branding and marketing. • Development of tourism spots and heritage sites. • Availability of information on government websites along with tour packages. • An extensive market research for the development of strategies • Ganga arti tradition • Ganga Festivals to boost eco-tourism activities • Tree plantation drives near River.		revenue of tourism.
	Impact Assessment of results	• Calculating what the touchpoints are. • The reason for failure • The reason for the success • Lesson for next planning		To learn the lesson and find out the root cause of success and failure, to be used further with modification

4.4 WETLANDS

The district comprises some of the healthy and wealthy wetland ecosystems. They directly or indirectly support millions of people and provide goods and services. They support all life forms through extensive food webs. They are habitat to aquatic flora and fauna and numerous species of birds, including migratory species. They mitigate floods and recharge the groundwater. They need to be taken care of, and action must be taken on different fronts. The action plan below gives a glimpse of the action and development required to protect, conserve, rejuvenate the wetlands existing and extinct.



4.5 ENERGY

4.5.1 Solar Energy

The district Kannauj needs to work on the installed solar power plants. The district requires a good technical support so that whatever work is being done in the district is fruitful for the district. This is important because the reports in the news articles have been mostly about that how the solar power plant that was set up in the district didn't work at all.

The district is dependent on agriculture for its income. Kusum Yojana provides solar water pumps at subsidized rates and for installation of solar energy plant farmers have to give 10% of the price. This way farmers will not have to depend on monsoons and also they will not have to pay electricity bills. The solar energy technology will boost the agricultural sector and will help the

farmers to use advanced equipments for various activities. Also they can sell the extra electricity produced if proper arrangements are made by the government. Hence they can have more than one source of income which will provide them with the financial security.
Other than farmers, the small cottage industries and MSMEs should be provided with subsidy for solar panel installations, this will help them cut down their expenses in long run.

Projection and monitoring

The first step that should be taken is to make farmers aware about Kusum Yojana and its various components. The government should work on solar segregation in the district so that small farmers are not devoid of benefits of solar energy. The panchayats in the villages should be encouraged to plan solar power plants in the fallow lands available in the village area. These power plants should be of the capacity specific to the village. In urban areas people should be encouraged for more and more grid connected solar panel installations under the National Solar Mission. In schools and colleges solar panels should be installed so that not only the school gets the benefit of solar energy but also the students get live demonstration of the solar energy production.

4.5.2 Biomass Energy

The district Kannauj depends on agriculture hence its main source of biomass is from the agricultural sector. The major setback in the district is that people are not aware of the bioenergy due to which no investments have been made by the residents of the district in this sector. The district also suffers the problem of stubble burning. Other than making the farmers aware of biomass energy they should also be made aware of the ill effects of stubble burning especially ‘parali’.
A basic transportation system needs to be planned for the district which connects all the sources of biomass wastes and the biomass energy plants. The rice mill and the cold storage owners should be encouraged to set up biomass energy plants. Small or the new businessmen should be encouraged to start up biomass energy plants and bring in the new technologies. These people should be encouraged by the district administration.

The district cultivates both the rabi and the kharif crops hence the availability of biomass is sustained round the year.The rest requirement can be fulfilled from the municipal solid wastes, food wastes, forest wastes etc. The land requirement can be fulfilled from the fallow land available in the district.

Projection and monitoring

The very first step that should be taken by the authorities is to create awareness about bioenergy and the harmful effects of stubble burning. Followed by this should be creating a comfortable business friendly environment so that start-ups get inclined towards setting up biomass plants. This can be done by maintaining a transportation system which solely works for biomass waste transfer. Also, the process of the biomass wastes should be fixed in such a way that neither the buyers nor the sellers are at loss. It should be made obligatory for the rice mills to have their own biomass energy plants, if not possible then a group of them can together own one.

District oriented research work is required hence the government should provide financial assistance for the research so that small and low cost biomass plants could be easily set up.

All these steps would give rise to the employment opportunities in the district and uplift their living standards.

4.5.3 Biogas Energy

A biogas plant of 1-2 m^3 capacity near Goshala, such as Rohini Goshala, should be constructed.

4.5.4 Hydropower

A small hydropower plant of a capacity of 2 MW should be constructed on the lower Ganga canal in the district.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

- Groundwater shares over 95% of NIA in the district and number of medium and deep tube-wells increased substantially during the study period, indicating the depletion of water table. Therefore, Drip and Sprinkler irrigation systems should be encouraged, especially for vegetable and fruits cultivations. It will help to increase the water use efficiency and productivity of crops. To reduce groundwater exploration, the district needs to construct more tanks and ponds under MGNREGA. Moreover, conjunctive use of surface water and groundwater should be enhanced.
- Farmers should be sensitized to the overuse of fertilizer and pesticides application. They should be trained on the uses of fertilizer and chemical pesticides applications.
- It is significant to note that the number of female cattle and buffaloes has substantially increased over the period, indicating the growth of livestock products, including milk. The substantial decline in the number of male cattle and male buffaloes also shows the rising farm mechanization and declining relevance of animal power. Dairy farming need to be promoted through creating an efficient marketing network, adoption of cross-breed and setting up dairy and dairy-based processing units. Goats and poultry farming can be promoted to improve local livelihood.
- The fishery & aquaculture and agro-forestry are the emerging sub-sector. Fishery & aquaculture has a huge scope for raising income and livelihood through effective implementation of PM Matsya Yojana. The fishery cultivation should be promoted by providing proper training and institutional support. Agro-forestry can also improve farmers' income.
- Food grains constituted about 62% of the GCA in 2017-18, while their share in the total value of agricultural output was 44 percent. In contrast, Potato comprised 15 percent share in GCA and 52 percent share in total value of agricultural output. Although Potato is high-value crop, it is riskier than food grains and need better marketing and insurance system.

The government can promote Potato micro and small units of Potato processing in the district.

- Organic farming should be encouraged to boost soil health, reduce water-use and ensure ecological, economic and social sustainability of agriculture. It could be an economically viable option if the government builds strong marketing networks linking farmers, processors, and distributors with the easy certification process and minimizes farmers' risk by protecting their farm income through payments of ecosystem services. A long-term system of incentive and regulation needs to be evolved to retain the existing farmers and motivate others to move towards the sustainable farming system.
- Training to prepare the Vermicomposting and Green manuring should be organized for the farmers. Moreover, salt-tolerant crops varieties and gypsum application should be promoted in the salt-affected areas.
- Farmers should follow the crop advisory under the drought condition and adopt techniques like drought resistance variety and maintaining moisture of soil by covering the soil. More farmers should join the Agromet Advisory Services provided by the K.V.K. for crop production
- About 96% of farmers in the district are small and marginal with landholdings less than two hectares. They can contribute substantial to livestock, vegetables and other labour-intensive allied farm activities.
- Poly house and greenhouse could be commercially used for the high revenue crops, like capsicum, chili, onion, garlic, and strawberry, flower like rose and marigold for much returns to the farmers. Medicinal crops like tulsi, mentha, lemongrass, etc. and fruits like papaya, mango, guava, and banana should also be promoted by establishing local market, processing units and cold storage.
- Since electricity consumption in agriculture has increased over the years, there is a need to promote the use of solar energy in agriculture.
- Agriculture production is vulnerable to natural and market risks. A compulsory and subsidized crop insurance system must be adopted to protect farmers' livelihood and income.
- A new institutional framework needs to be set up at the district level where the concerned line departments' technical, human and financial resources may be pooled or converged together to provide customized solutions to the farmers related to technology, training, marketing needs and advisory services.
- The use of a ferti-seed drill needs to be enhanced for wheat to achieve proper fertilizer use efficiency. Resource conservation technologies like zero tillage can be extensively applied for wheat maize to reduce the cost of production and sowing time.
- Fruit cultivation, such as guava and mango, has a scope and should be encouraged among farmers through I.P.M. (Integrated Pest Management) and post-harvest management training. Besides the guava and mango orchards, there is also has the scope for introducing banana and papaya cultivation. Using efficient harvesting management strategies, post-harvest losses can be reduced.
- The district has scope for introducing beekeeping for local youth by providing proper training and knowledge.

5.2 FORESTRY

Kannauj is located on the bank of river Ganga. According to ISFR 2019, 27.82 Sq. Km. the area of Kannauj is covered with forest. As discussed above, the forest cover of Kannauj has decreased slightly from the previous assessment in 2017. Only open forest is found in the district. There is a wide scope of Afforestation on waste land, trees outside forest (on the sides of the roads, banks of rivers etc.). Government can promote the afforestation, agroforestry activities by providing output based incentives

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5.2.1. Biodiversity

- Environmental programs like Van Mahotsav should be celebrated regularly in the district, and the state government should employ local or rural people to protect those trees. This could protect trees and generate employment.
- The importance of biodiversity can be communicated through posters in tourist attractions like the Lakh Bahosi bird sanctuary.

5.3 ENERGY

5.4 Biogas Energy

Govansh shelter in the Rampur Manjhila village has 140 cows, and a biogas plant of 5 m^3 capacity can be constructed in that village.

5.5 Hydropower Energy

Hydropower potential should be investigated in the village area near the river Ganga.

5.6 Biomass Energy

The district requires awareness about the bioenergy and the environmental loss caused by stubble burning. Biomass based gasifier plants are best suited for the district. The cold storages and rice mills should be encouraged to set up biomass plants. If biomass energy is sector is developed wisely then there will be development in the district in a sustainable manner improving the livelihood and economy.

5.7 Solar Energy

Kannauj is an agrarian district hence Kusum Yojana best suits the district. Other than Kusum Yojana grid-connected solar plants should be set up mainly in urban areas to add to the utility production if possible and lessen the burden of utility suppliers as well as the use of fossil fuels. Also schools and colleges should be encouraged for solar energy so that students get aware about it and also develop their research interests towards solar energy sector.

5.4. WETLANDS

The wetlands need to be intact, but at the same time, they need to be planned wisely to support the district economically, socially and environmentally, which will lead to indirectly relieving of stress from the Ganga River to a large extent. It will also lower the local people's dependence on the Ganga River for their small-scale industry or basic daily needs. The following recommendations and interventions are required to get valuable products and solve the issues/ challenges faced by the local people of that region.

- Tobacco producing farmers need to switch to other occupations slowly. As people become aware and health conscious, tobacco demand may slow down with time.
- It is recommended to promote animal husbandry, sugarcane and perfume in the area. This provides a boost to the economic growth of the local people. Sustainable development of industries will lead to minor exploitation of the wetlands as these are water-intensive industries.
- It is recommended to promote the production of flowers in the region to support the perfume industry and wetlands can support the water supply for the cultivation.
- It is recommended to promote eco-tourism in the region as the region can develop with flower gardens around the wetlands area and biodiversity. It will attract visitors and help in the economic growth of the region. The economy generated by eco-tourism must be utilized to maintain the hotspot.

5.5. TOURISM

5.5.1 Restoration of Historic Places

All the historical places need timely maintenance and up-gradation to remain beautiful and attractive.

5.5.2. Upgradation of Visitors' Amenities

Tourists step out of their homes to enjoy the places and beauty in the world; hence, special arrangements to support tourism activities are necessary. For example, the availability of sanitiser and masks in the times of covid-19 at tourist spaces allows them to follow the protocols.

Toilets –Repair of all the toilets will be taken up. Each bathroom has a facility for handicapped persons. Enough number of male and female toilets at every tourist space is mandatory with a proper water, soap and cleanliness supply.

3) Hand pumps –Taps are available in various places, but these are in miserable shape, and the pipelines are old. These have to be repaired and renovated. Powercut is a recurring problem. The power cut will be for about 6 to 8 hours a day.

4) Rainwater shelters – Four new rainwater shelters will be constructed. More dust bins and benches are to be built. The dust bins should be placed so that at least one dust bin is available

every three hundred meters so that the visitors can properly dispose of waste materials without littering the Zoo

5.5.3. Beautification of Ghats

Ghats are always a tourist spot; hence good beautification and cleanliness are required to attract tourists. Benches to sit and shadow spaces with the availability of drinking water are necessary because Kannauj lies in a Hot region in Uttar Pradesh, and the temperature usually remains around 30 degrees Celsius. Changing rooms for males and females who want to take a dip of Holy Ganga is required. Sewages should not be allowed without proper treatment of wastewater.

5.5.4. Maintaining heritage buildings

Regular maintenance of tourist spots and the different roads connecting it with the city's center is necessary to provide tourists with an enjoyable experience. Information and contact details of authentic tourist guides on the government tourism website may be helpful for tourists and encourage them to visit more places and eventually more business. Acquiring a license by local tourist guides from government bodies is generally a complex process that discourages genuine candidates from getting the license. Easy to apply and get the license can benefit tourism.

5.5.5. Accessibility

There is an immediate need to improve road infrastructure. The traffic flow will be boosted by good highways and approach points to a specific tourist site.

5.5.6. Safety and security

The system should undoubtedly make provisions that the policies and procedures designed to ensure the safety and security of tourists are implemented effectively. For all travelers, Uttar Pradesh's image must be promoted as a safe and secure tourism destination.

5.5.7. Promotion and selling

Cross-selling tourism hotspots in neighboring states can assist boost tourist inflows. Package deals should be devised and implemented for the benefit of both tourists and the government. Discounts and special offers on group travel are one way to encourage visitors to bring their families along on business trips.

5.5.8. Appointing brand ambassador

Appointing a brand ambassador can help promote Kannauj tourism even more. It is critical to capitalize on their celebrity and fan base for UP tourism to get traction and warmly receive visitors.

5.5.9. Upgrading the skills

The hospitality business should be appropriately groomed and capable of offering the best service possible to tourists. Investing in training schools will assist the young generation in concentrating

on their work and acquiring the necessary skills to make the experience worthwhile. Also, training sessions for guides can benefit individual guides and help them earn livelihood and the tourism sector to embrace more tourism. These training sessions can also help know the actual number of available tourists guides in the city. And the same information can be uploaded on the website for customer support.

- Tourists are a source of income for the natives; developing local marketplaces such as specialized malls for locally made handicrafts/ perfume can give a place to sellers and buyers simultaneously. Usually, local markets (selling original articles) are scattered throughout the city; a specialized marketplace will help the sellers showcase their product at excellent places, and buyers can find a wide variety of ranges at the same site.
- Because Kannauj is famous for its authentic native perfume industry, the local economic activity can be associated with tourism to experience symbiotic relationships and growth. Supporting tourism can also help flourish other sectors such as local handicrafts, restaurants and eateries, travel agencies, local vendors, and many more as all of these are in one manner dependent on each other.
- Letting tourists know about community-based initiatives such as women-led Self-Help Groups and Social Enterprises will support tourism and such industries. As it can bring business to enterprises.
- Development of COVID 19 protocol friendly tourism packages to boost the tourism sector economy after the pandemic.
- Because the number of tourists increases/decreases according to the increase and decrease in the number of tourists in adjacent tourist spots. A circuit can be created which allows the tourist to explore the sites through a common tourist package. One package lets them visit all the important places in the adjacent districts. Transportation services can also be developed in the same manner to support tourism in neighboring cities simultaneously. So that tourists do not have to think about dropping nearby stations because of the inaccessibility of transportation facilities.
- Ghats can be developed on the verge of international standards to attract more and more foreign tourists.
- Promoting Food trail - India is known for its cuisine and there are a lot of food lovers across the world. Promoting Indian cuisine along with tourism can reap benefits in leaps and bounds.

6 Discussion during the Report Presentation

- Kanuaj is famous for manufacturing of scents (Itra) which can be associated with Jalaj Model.
- It has a great architectural assets. INTACH has mapped Kannauj in its project on tourism.
- The INTACH study report has been shared with Kannuaj, DM office which will be taken further for the action.
- Organic Farming has been taken up on a large scale.
- The IIML Report for Arth Ganga should be a regular Agenda item for next 6-8 DGC meetings.
- Hon'ble PM during the post-Budget webinar on Tourism had spoken about market potential of destination weddings. It was suggested that suitable Ashrams in Ganga Basin may be identified for such purpose to promote blissful experience, cost reduction, livelihood opportunities and better upkeep.
- Allocate separate space for Namami Gange Awareness and Jalaj Marketing kiosk in Melas/Congregatios/Fairs for providing better marketing opportunities to the Jalaj products.
- As Dilli Haat Centre – Namami Gange Awareness and Marketing Centre – is being launched soon, it was requested that every district to identify niche products with a creative story and link it with Jalaj in their area.
- To identify Arth Ganga Tourist Trails and organize Ganga Guide training
- Promotion of Natural Farming in Ganga Basin and training workshops should be organized on a regular basis. NMCG is supporting this initiative in coordination with MoA& FW and NCOF.
- Make plans for reuse of treated waste water for agriculture, industrial etc. purpose and also the sludge.
- Training of volunteers for Ganga awareness & Aarti workshops to promote regular aartis on Ghats.

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6 APPENDICES

Table 1 Crop production in the district.

Crop/Year	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Non-grain crops (Metric Tonnes)	19247	22171	19659	19542	15406	8650	12139	12139	14646
Grain crops (Metric Tonnes)	346458	406214	460193	471678	480473	275708	397502	397502	597398

Sugarcane (Metric Tonnes)	9314	10898	11480	10861	8939	7729	8906	8906	12551
Potato (Metric Tonnes)	1020989	1011908	876836	1489626	978151	851310	869605	869605	1563879

Table 2 Livestock population in district.

Livestock	**2003**	**2007**	**2012**
Cattle (Cow)	125752	128590	129566
Buffalos	234479	301071	322664
Sheep	13715	15265	12380
Goat	269687	320943	254803
Pigs	21963	17025	18176
Chicken	81625	75835	81080
Other Poultry	1197	80464	84077
Horses and Ponies	1468	315	704
Others	3106	1671	8806

Table 5 Biogas potential from animal waste.

Livestock	**Residue type**	**Total population as of 2012**	**Manure yield* (kg/day)**	**Total manure generation annually (kg)**	**Average collection (75%)**	**Dry manure after removing Moisture content**	**Manure required for biogas* (kg/m^3)**	**Biogas potential (m^3/yr.)**
Cattle	Manure	1,29,566	10	47,29,15,900	354686925	70937385	25	2837495.4
Buffalo	Manure	3,22,664	15	1,76,65,85,400	1324939050	264987810	25	10599512.4
Sheep	Manure	12,380	1	45,18,700	3389025	677805	25	27112.2
Goat	Manure	2,54,803	1	9,30,03,095	69752321.25	13950464.25	25	558018.57
Pig	Manure	18,176	2.5	1,65,85,600	12439200	2487840	25	99513.6
Poultry	manure	1,65,157	0.1	60,28,231	4521172.875	904234.575	25	36169.383
Total		9,02,746						14157821.55

Table 6 Biogas potential from agricultural waste.

Crop	residue type	Total crop production (tons) (2017-18)	Residue production ratio	Residue amount (tons)	Average collection (70%)	Moisture content	Residue amount after removing moisture (tons)	Biogas potential [m3/(tons of dry matter)]	Overall biogas potential (m3)
Maize	straw	157186	1.5	235779	165045.3	15	140288.505	800	112230804
Wheat	straw	342450	1.5	513675	359572.5	30	251700.75	800	201360600
Sugarcane	Bagasse	12551	0.33	4141.83	2899.281	80	579.8562	750	434892.15
Total		5,12,187							314026296.2