Arth Ganga Project: District Sambhal

Submitted to:

National Mission for Clean Ganga (NMCG)

Submitted by:

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EXECUTIVE SUMMARY

Sambhal, a city with old and rich architecture and religious spirit is located in the state of Uttar Pradesh. The city is situated on the bank of the river Ganga.

The total geographical area of the district is 2277 km^2. The primary sector's average annual growth rate from 2011-12 to 2018-19 is 5.50% with its share decreasing from 36.24% in 2011-12 to 33.65% in 2018-19. The share of the secondary sector increased from 19.74% in 2011-12 to 24.05% in 2018-19 with a significant average annual growth rate of 8.04%. The tertiary sector occupies, on average, a 44.46% share of the district economy with a low average annual growth rate of 4.56%, with its share decreasing from 44.03% in 2011-12 to 42.30% in 2018-19. Overall, the district economy grew with an average annual growth rate of 5.19%.

In 2017-18, the net sown area and the gross irrigated area represents 192676 ha and 275786 ha. The cropping intensity of the district is 182.92%. The total actual irrigated area is 180467 ha. Major crop types are wheat, rice, maize, barley, tide, millet, pulses like a variety of gram, black pulse, pigeon pea, lahi mustard, etc. along with sugarcane, potato, pea, tobacco, etc. The total food grains along with pulses account for the production of 1719719 MT. The livestock consists of cattle (indigenous and crossbred), buffalos (indigenous and crossbred), pigs (indigenous and crossbred), sheep; poultry, and fisheries. Agriculture with the horticulture sector grew at a significant average annual growth rate of 7.10% from 2011-12 to 2018-19 with its share increasing from 69.79% in 2011-12 to 72.91% in 2018-19. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 82.46% and 82.33%, respectively. In 2017-18, The net sown area (NSA) has decreased over the years, from 81.86% in 2010-11 to 78.54% in 2017-18. The area for non-agricultural use increased over the period from 11.54% to 15.00%. In 2017-18, the nitrogen share decreased to 64.34%, while the phosphorus share increased to 31.35%, and the potassium share decreased to 4.31%. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio. The overall use of chemical fertilizers has decreased in the district from 194.32 kg/ ha GSA in 2011-12 to 118.64 kg/ ha GSA in 2017-18.

The share of the livestock subsector decreased from 26.53% to 24.93% from 2011-12 to 2018-19 growing with a remarkable average annual growth rate of 10.20%. The fishery and aquaculture subsector share is very minimal, around 0.39% in 2018-19, but it grew with a significant average annual growth rate of 19.87% from 2011-12 to 2018-19. Mines and quarrying also recorded a remarkable average annual growth rate of 28.47%.

The total forest cover of the district is 232 km^2. The share of forest area in the total reported area decreased from 0.25% in 2010-11 to 0.09% in 2017-18. There is no major forest cover in the district.

Out of total forest cover, the maximum area is covered by Open Forest (3.12 km^2). The district's forest cover in 2001 was 0 km^2. The share of area under trees and gardens increased from 1.13% in 2010-11 to 1.33% in 2017-18. The share of forestry and logging in the total

agriculture and allied sector is small, around 1.76% in 2018-19, as it grew with a negative average annual growth rate of 1.59%.

Sambhal is known for its historical heritage. The district is well connected through roads and a railway network. In the year 2019, the district received 1839599 domestic tourists and 106 foreign tourists. In 2020, the number of Indian visitors increased yet the number of foreign visitors fell. The district has touristic attractions such as Maa Kela Devi Mandir, Manokamna Mandir, Shri Kalki Vishnu Mandir in Sambhal, Ghanta Ghar, etc.

It can be seen that almost all households have been electrified. To reduce the burden of electricity production, solar energy should be promoted in the district. The district does not have many solar power units installed although there are many proposed and few ongoing installations. Electricity consumption in agriculture has increased significantly from 202.85 KWH in 2016-17 to 304.53 KWH in 2019-20, a net increase of approximately 50.12%. The percentage share of the agriculture sector in the total electricity is around 38.05%. A very small number of wetlands are present in the district. The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover with 351 bird species and 28 threatened/rare species of bird in the district. Biogas potential from animal waste and agricultural waste was calculated approximately as ninety-six lakh m^3/year and eleven crores m^3/year. No hydropower present or plans exist.

The promotion of ecotourism and sustainable tourism could be highly beneficial in the district. Maintenance of building like temples, forts, reserves, parks, etc. along with hygiene and safety should be taken into account. To reduce dependency on electricity and create pollution enhancing the use of renewable energy especially by creating awareness and supporting the locals. Being a dark zone area there should be a strict implementation and check on overexploitation along with the construction of tanks and ponds under MGNREGA. A well-designed regulatory and monitoring framework and introduction of payments for ecosystem services for the organic farmers after the transition period to carry on the activity on a sustainable basis. Use of high-yielding seeds, micro-irrigation, constructing and maintaining harvesting structures, adopting greenhouse farming with organic farming, Vermicomposting, and Green manuring, Poly house and greenhouse, high revenue crops cultivation, tackling the arsenic problem, quality food processing units, and encouraging farmers for adapting different crop cultivation and various irrigation methods. Along with focusing on agriculture practices Bee culture, dairy, poultry, fisheries, etc. needs encouragement as they have high economic potential. Monitoring of the project should be periodically done through MIS, Geo-tagging, and monthly physical and financial reports.

1. DISTRICT OVERVIEW

1.1 INTRODUCTION

Sambhal district lies 28º 35' N to 280 59' Nlatitude and 78º 33' E to 78º 55' E longitude The district of sambhal is part of the Moradabad division of Uttar Pradesh. It was announced on 28 september 2011 as one of three new districts in the state. It was formely named “Bhimnagar” in honour of Bhimrao Ambedkar but changed after long protests to Sambhal . It lies 158.6 km due east from New Delhi, past Ghaziabad, Noida and Hapur district and 355 km northwest from the state capital Lucknow. Sambhal features a typical version of the humid subtropical climate. The warm season lasts from 9 April to 8 August with an average daily high temperature above 36 °C (97 °F).

The district of Sambhal is part of the Moradabad division in the state of Uttar Pradesh. Bahjoi town serves as its district headquarters. The districts which adjoin Sambhal are (clockwise from north) Amroha, Moradabad, Rampur, Badaun, Aligarh and Bulandshahr. Administratively, the district is divided into three tehsils: Sambhal, Chandausi, and Gunnaur. Sambhal district has a single Lok Sabha constituency, the Sambhal constituency. Sambhal district has four Uttar Pradesh Legislative Assembly constituencies: Sambhal, Asmoli, Chandausi and Gunnaur.

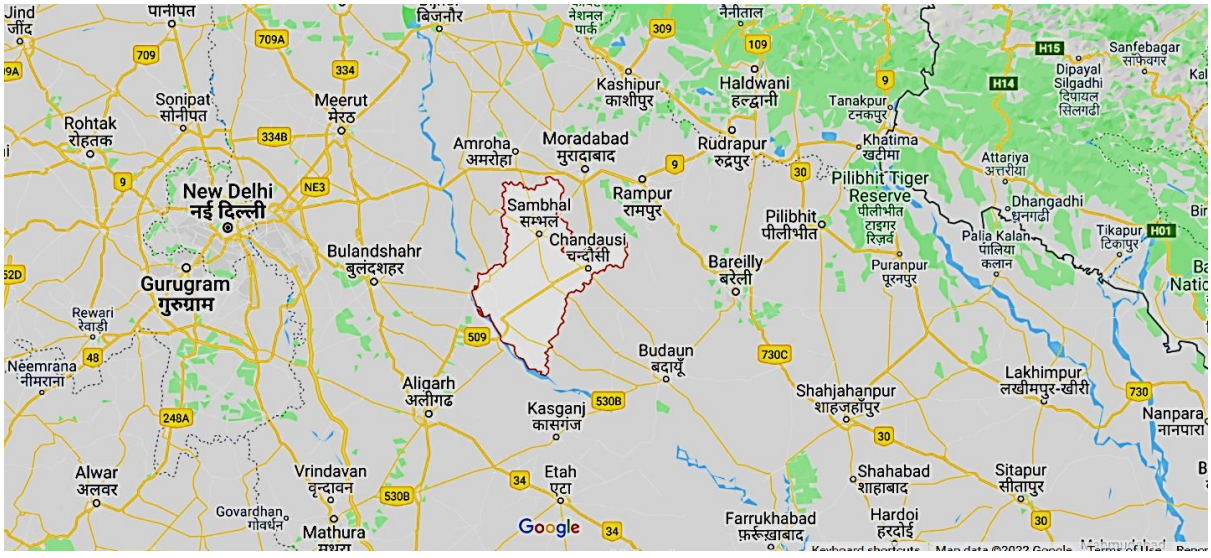

Image-1; source- images.google.com

During the 12th century, Prithviraj Chauhan, Delhi’s last Hindu ruler is said to have engaged in two fierce battles here which were both fought against Ghazi Sayyad Salar Masud, who was the nephew of the ruler of the Ghazni empire-Mahmud Ghazni. Chauhan gained victory over the latter in the first war and vice versa is said to have occurred in the second war. There nevertheless is no circumstantial evidence to prove the same and is regarded as a legend.

Qutub-ud-din Aibak, the first Muslim sultan of Delhi, seized Sambhal and included it under his empire. That was in the early 14th Century and subsequently, Firoz Shah Tughlaq, another sultan of Delhi, raided the town of Sambhal as one of the Hindu rulers from there was responsible for the killing of several of his men. He, therefore, administered a Muslim rule in Sambhal to try and vanquish all of the Hindu ruler's forces and enslave him for the rest of his life.

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Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF SAMBHAL

1. Economy and Livelihoods

- Geographical Area: 2453.30 Sq. Km.
- Administrative Divisions:

District Headquarters: Bahjoi town

No of Municipalities: 3

No of Tehsil: 3

No of Blocks: 8

No. Of Villages: 993/1022

No. of Gram Panchayat: 556

No. of Nagar Palika/Parishad: 3/5

- Demographic and socio-economic indicators:

  Population: 21,92,933 (Census 2011)

- Occupation/ other Livelihood source: Menthol production
- Major Rivers: Ganga
- Forest Area: 232 ha. (No major forest)

1.3 ECONOMIC PROFILE OF SAMBHAL

The primary sector has a significant impact on the district economy because it contributes, on average, 33.07% share in the district GDP. Moreover, this sector's average annual growth rate from 2011-12 to 2018-19 is 5.50%. However, its share decreased from 36.24% in 2011-12 to 33.65% in 2018-19. The share of the secondary sector increased from 19.74% in 2011-12 to 24.05% in 2018-19. The sector grew with a significant average annual growth rate of 8.04%. The tertiary sector occupies, on average, 44.46% share of the district economy. However, the sector grew with a low average annual growth rate of 4.56%, with its share decreasing from 44.03% in 2011-12 to 42.30% in 2018-19. Overall, the district economy grew with an average annual growth rate of 5.19%. Steps should be taken to increase the productivity of the tertiary sector to grow at a higher rate. This will improve the growth rate of the overall district, and the tertiary sector has a decent contribution to the district GDP. The secondary sector has performed well during the period of the study.

Table 1: Trends in Gross District Domestic product in Sambhal 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	2430.26	1323.79	2952.74	6706.79	-	-	-	-
	(36.24)	(19.74)	(44.03)	(100)				
2012-13	3093.04	1392.16	3238.59	7723.79	27.27	5.16	9.68	15.16
	(40.05)	(18.02)	(41.93)	(100)				
2013-14	2861.95	1609.78	3483.86	7955.59	-7.47	15.63	7.57	3.00
	(35.97)	(20.23)	(43.79)	(100)				
2014-15	2149.30	1636.51	3511.24	7297.05	-24.90	1.66	0.79	-8.28
	(29.45)	(22.43)	(48.12)	(100)				
2015-16	1937.34	1837.44	3731.82	7506.60	-9.86	12.28	6.28	2.87
	(25.81)	(24.48)	(49.71)	(100)				
2016-17	2385.46	1962.21	3385.84	7733.51	23.13	6.79	-9.27	3.02
	(30.85)	(25.37)	(43.78)	(100)				
2017-18	2745.29	2142.21	3548.55	8436.05	15.08	9.17	4.81	9.08
	(32.54)	(25.39)	(42.06)	(100)				
2018-19	3163.27	2261.35	3976.82	9401.44	15.23	5.56	12.07	11.44
	(33.65)	(24.05)	(42.30)	(100)				
Average Growth Rate					5.50	8.04	4.56	5.19

Source: UPDES

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

We further break down the primary sector GDP to determine which subsector is lagging and which is driving the primary sector growth. Table 2 shows that agriculture with the horticulture sector grew at a significant average annual growth rate of 7.10% from 2011-12 to 2018-19. Moreover, its share increased from 69.79% in 2011-12 to 72.91% in 2018-19. On the other hand, the share of the livestock subsector decreased from 26.53% to 24.93% in the same period despite it growing with a remarkable average annual growth rate of 10.20%. This shows the importance of livestock in Sambhal District and the increased dependency of citizens on livestock products. The share of forestry and logging in the total agriculture and allied sector

is small, around 1.76% in 2018-19, as it grew with a negative average annual growth rate of 1.59%. The fishery and aquaculture subsector share are very minimal, around 0.39% in 2018-19, but it grew with a significant average annual growth rate of 19.87% from 2011-12 to 2018-19. Mines and quarrying also recorded a remarkable average annual growth rate of 28.47%. 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 study period as the majority of the subsectors have done 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: Gross District Domestic Product Trends from Agriculture and allied activities in Sambhal 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	1675.96	637.14	84.03	4.33	2401.45	28.80	2430.26
	(69.79)	(26.53)	(3.50)	(0.18)	(100)		
	-	-	-	-	-	-	-
2012-13	2357.84	624.82	86.56	3.24	3072.46	20.58	3093.04
	(76.74)	(20.34)	(2.82)	(0.11)	(100)		
	[40.69]	[-1.93]	[3.02]	[-25.23]	[27.94]	[-28.56]	[27.27]
2013-14	2226.39	487.97	106.55	5.18	2826.10	35.85	2861.95
	(78.78)	(17.27)	(3.77)	(0.18)	(100)		
	[-5.57]	[-21.90]	[23.09]	[60.01]	[-8.02]	[74.23]	[-7.47]
2014-15	1505.41	521.04	66.54	5.54	2098.53	50.77	2149.30
	(71.74)	(24.83)	(3.17)	(0.26)	(100)		
	[-32.38]	[6.78]	[-37.55]	[6.88]	[-25.74]	[41.62]	[-24.90]
2015-16	1420.03	334.21	69.06	5.65	1828.95	108.39	1937.34
	(77.64)	(18.27)	(3.78)	(0.31)	(100)		
	[-5.67]	[-35.86]	[3.77]	[2.10]	[-12.85]	[113.48]	[-9.86]
2016-17	1449.03	713.68	101.65	6.92	2271.27	114.19	2385.46
	(63.80)	(31.42)	(4.48)	(0.30)	(100)		

	[2.04]	[113.54]	[47.20]	[22.39]	[24.18]	[5.36]	[23.13]
2017-18	1804.75	649.35	88.98	7.33	2550.41	194.87	2745.29
	(70.76)	(25.46)	(3.49)	(0.29)	(100)		
	[24.55]	[-9.01]	[-12.47]	[5.92]	[12.29]	[70.66]	[15.08]
2018-19	2274.53	777.67	55.02	12.24	3119.46	43.81	3163.27
	(72.91)	(24.93)	(1.76)	(0.39)	(100)		
	[26.03]	[19.76]	[-38.17]	[67.00]	[22.31]	[-77.52]	[15.23]
Average Growth Rate	7.10	10.20	-1.59	19.87	5.73	28.47	5.50

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 39.04% in 2018-19. The share has increased over the years as the average annual growth in this sector is 19.92%. The electricity, gas, and water supplies subsector share has increased from 3.62% in 2011-12 to 5.00% in 2018-19. Moreover, this subsector grew with a remarkable average annual growth rate of 14.56%. The share of the construction decreased from 75.89% to 55.96% in the same period as the average annual growth rate is low (3.45%). It indicates that the secondary sector in Sambhal is heavily dependent on the manufacturing and construction sub-sectors, and the electricity subsector is also growing at a faster rate.

Within the tertiary sector, the Real estate subsector made up the highest share (33.68%) in 2018-19, followed by Trade & Hotel (27.51%), transport, storage, and communication (15.14%), and financial services (9.12%). Average annual growth is observed highest in financial services (9.85%), followed by transport, storage, and communication (7.38%), trade & hotel (6.80%), and real estate (4.89%). All the subsectors in the tertiary sector have performed well during the study period. More work needs to be done to improve Construction and Public Administration subsectors. Trade & hotel and Transport and Communication and Financial services 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 Sambhal 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	20.48	3.62	75.89	100	12.66	24.33	6.49	32.50	11.93	12.09	100
2012-13	24.52	3.27	72.21	100	12.35	25.35	6.79	31.54	12.34	11.63	100
2013-14	33.81	3.32	62.87	100	11.10	25.00	6.42	30.54	15.53	11.40	100
2014-15	30.90	3.38	65.72	100	12.61	21.90	6.84	31.85	12.80	13.99	100
2015-16	34.10	4.84	61.06	100	14.51	19.90	7.88	30.89	12.40	14.41	100
2016-17	39.84	5.27	54.89	100	15.76	26.33	8.68	35.21	0.71	13.31	100
2017-18	39.12	5.14	55.74	100	15.24	25.60	8.56	35.95	0.71	13.93	100
2018-19	39.04	5.00	55.96	100	15.14	27.51	9.12	33.68	0.75	13.80	100
Average Growth Rate	19.92	14.56	3.45	8.04	7.38	6.80	9.85	4.89	-5.25	6.95	4.56

Source: Compiled from District Statistical Handbooks

2. Quantitative Data Analysis

2.1 Agriculture and Allied Activities

The total declared area of the district is 2453.30 sq. km². The share of forest area in the total reported area decreased from 0.25% in 2010-11 to 0.09% in 2017-18. The share of cultivable wasteland decreased from 0.88% in 2010-11 to 0.43% in 2017-18, which is a good indicator of development. Barren and uncultivable land share decreased from 0.93% in 2010-11 to 0.03% in 2017-18. The share of area under trees and gardens increased from 1.13% in 2010-11 to

1.33% 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 decreased over the years, from 81.86% in 2010-11 to 78.54% in 2017-18. The area for non-agricultural use increased over the period from 11.54% to 15.00% (Table 4). Overall, the land use pattern shows that the NSA decreased and land area under non-agricultural activities increased over the years.

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

Year	Total Reported Area (ha)	Area under forest	Cultivable wasteland	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	248372	0.25	0.88	2.05	1.21	0.93	11.54	0.15	1.13	81.86
2011-12	245330	0.05	0.69	1.84	1.55	1.79	10.82	0.15	1.18	81.92
2012-13	245330	0.00	0.41	1.89	0.66	0.03	14.31	0.14	0.69	81.88
2013-14	245240	0.00	0.57	1.17	0.79	0.03	14.34	0.12	0.91	82.07
2014-15	245330	0.00	0.42	0.80	0.56	0.03	14.39	0.16	0.81	82.82
2015-16	245330	0.09	0.42	4.25	0.90	0.02	14.89	0.16	0.80	78.48
2016-17	245330	0.09	0.43	3.38	1.04	0.03	15.00	0.16	1.33	78.54
2017-18	245330	0.09	0.43	3.38	1.04	0.03	15.00	0.16	1.33	78.54

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

2.1.2 Trends in Operational Land Holdings

In Sambhal district, the total number of operational farms increased from 191 thousand in 2010-11 to 311 thousand in 2015-16, a net increase of 62.83%. 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 93.65% 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 Sambhal							
	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.)
Sambhal	2010-11	77.06	14.51	6.80	1.58	0.06	191
	2015-16	82.32	11.33	5.39	0.93	0.03	311
							[62.83]
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

2.1.3.1 The Trend in Cropping Patterns

Rice, Wheat, and Bajra dominate the agriculture of the district. Table 6 shows the area under various crops over the last seven years. In 2017-18, Wheat made up the highest share of GCA (37.31%), followed by Bajra (20.32%) and Rice (10.86%). Together these three crops constitute around 68.49% of the GCA. The area shared by the total cereals has increased from 70.52% in 2011-12 to 73.91% in 2017-18. The main pulse produced is Urad, while the rest of the pulses are not significantly produced. The total pulses acreage has decreased from 4.36% in 2011-12 to 3.10% in 2017-18. Thus, the food grains cover a majority (average, 75.69%) of the GCA. Mustard is the only major oilseeds crop produced, and the total oilseed acreage has increased from 3.24% in 2011-12 to 3.33% in 2017-18. The area shared by Sugarcane has remained more or less stable over the years, but at the same time, the area shared by Potato has increased. Moreover, it is very important for the welfare of farmers to further increase the area under them as both of them are high-value crops. In general, there is no significant change in the cultivation pattern reported in the district during the study period, except that the NSA has decreased over the years, from 54.80% in 2011-12 to 51.62% in 2017-18. The average cropping intensity in the district is 187.92.

Table 6: Trends in Cropping Pattern (as % GSA) and Cropping Intensity							
Crop/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	10.33	10.76	10.21	10.86	10.88	10.86	10.86
Wheat	38.11	37.81	36.99	37.34	37.41	37.31	37.31
Bajra	20.39	19.76	19.88	20.34	20.38	20.32	20.32
Other Cereals	1.69	1.65	1.64	5.42	5.43	5.42	5.42
Total Cereals	70.52	69.99	68.72	73.97	74.11	73.91	73.91
Urad	3.96	3.22	3.89	2.75	2.76	2.75	2.75
Other Pulses	0.40	0.44	0.38	0.35	0.35	0.35	0.35
Total Pulses	4.36	3.66	4.27	3.10	3.11	3.10	3.10
Total Foodgrains	74.88	73.65	72.99	77.07	77.22	77.01	77.01
Mustard	2.92	3.27	3.05	3.05	3.06	3.05	3.05
Other Oilseeds	0.32	0.04	0.30	0.29	0.29	0.29	0.29
Total Oilseeds	3.24	3.31	3.35	3.34	3.34	3.33	3.33
Sugarcane	7.73	7.36	7.90	7.13	7.14	7.12	7.12
Potato	2.36	2.61	2.55	2.58	2.58	2.57	2.57
Net Sown Area	54.80	54.73	53.82	54.47	51.71	51.62	51.62
Gross Sown Area (in 1000 Ha)	366.77	367.08	373.94	372.98	372.28	373.29	373.29
Cropping Intensity	182.49	182.73	185.80	183.57	193.37	193.74	193.74
Source: http://updes.up.nic.in/spiderreports/intialisePage.action							

2.1.3.2 Trends in per hectare yield of principal crops

Table 7 shows that the yield per hectare of most crops varies across years. However, it has increased in the latter years of the study. Wheat and Rice are the major crops in the district, and their per hectare yield (36.05 qtls and 24.05 qtls respectively, in 2017-18) are also high. Per hectare yield of total cereals has increased slightly from 25.65 qtls in 2011-12 to 25.93 qtls in 2017-18. On the other hand, per hectare yield of total pulses has decreased slightly from 10.09 qtls in 2011-12 to 9.26 qtls in 2017-18. The yield of total oilseeds has increased from 12.02 qtls in 2011-12 to 13.43 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. The per hectare yield of sugarcane is high, average 689.01. Similarly, the yield of Potato is also high, average, 251.84. Since both sugarcane and Potato are high-value crops, they can help in doubling farmers' income if proper marketing and infrastructure support is provided to the farmers. In summary, all crops yields show year-over-year fluctuations. 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 Sambhal District (Qtls)

Crop/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	22.69	24.01	23.04	21.88	19.37	20.55	24.05
Wheat	32.87	32.19	33.85	19.79	29.98	34.22	36.05
Bajara	14.26	12.51	13.82	13.66	13.64	13.47	13.39
Total Cereal	25.65	24.92	26.08	18.36	23.12	24.55	25.93
Urad	10.10	9.23	8.40	8.58	11.17	13.80	9.24
Total Pulses	10.09	17.29	8.76	8.20	10.75	13.36	9.26
Total Food Grains	24.74	24.54	25.07	17.95	22.62	24.10	25.26
Mustard	13.01	13.36	13.49	9.41	13.23	14.32	14.45
Total Oilseeds	12.02	13.23	12.43	8.76	12.51	13.23	13.43
Sugarcane	582.05	595.60	615.32	634.00	690.79	755.73	949.56
Potato	261.92	213.99	179.56	280.17	254.61	284.25	288.39

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

2.1.3.3 Trends in Production of Principal Crops

Table 8 shows the trends in the production of the main crops over the years. Rice, Wheat, Bajra,Ssugarcane, and Potato dominate the production. In 2017-18, Rice (97.46 thousand tons), Bajra (101.57 thousand tons), and Wheat (502.10 thousand tons) formed a major part of the total cereal production (715.30 thousand tons). Coming to pulses, Urad occupied the highest production. Urad had a production of 9.48 thousand tons in 2017-18. Although there has been a significant variation in the production of Urad over the years, it still represents around 88.35% of the total pulse production. Mustard production was 16.44 thousand tons, which represented around 98.38% of the total oilseed production in 2017-18. Sugarcane is another important crop whose production has been significant in the district (2523.84 thousand tons in 2017-18). Potato production has also been significant over the years (277 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 so that they get assured income and can take more risk and diversify their production.

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

Crop/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	86.00	94.86	87.95	88.68	78.49	83.28	97.46
Wheat	459.36	446.72	468.24	275.68	417.50	476.57	502.10
Bajara	106.63	90.75	102.75	103.64	103.45	102.19	101.57
Other Cereals	11.36	7.77	11.35	38.48	38.40	15.15	14.17
Total Cereals	663.35	640.11	670.29	506.48	637.84	677.19	715.30
Urad	14.67	10.90	12.22	8.81	11.46	14.16	9.48
Other Pulses	1.47	12.32	1.77	0.69	0.99	1.31	1.25
Total Pulses	16.14	23.22	13.99	9.49	12.44	15.47	10.73
Total Foodgrains	679.49	663.32	684.28	515.97	650.29	692.66	726.02
Mustard	13.94	16.04	15.40	10.70	15.05	16.29	16.44
Other Oilseeds	0.34	0.05	0.17	0.20	0.51	0.18	0.28
Total Oilseeds	14.28	16.09	15.58	10.90	15.57	16.47	16.71
Sugarcane	1649.17	1609.61	1817.84	1685.11	1836.05	2008.65	2523.84
Potato	226.69	205.28	171.28	269.10	244.55	273.02	277.00

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

2.1.3.4 Variability assessment in the area, production, and yield

To understand the variability across the years (Table 9), we calculated the mean, standard deviation (SD), and coefficient of variation (COV) of the area, production, and yield of the main crops. Among different crops, the lowest variability in the area is observed in wheat (0.33%), followed by bajara (1.68%) and Rice (2.97%), and the highest in Urad (17.24%). The variability in the area under total pulses (15.88%) is more than the variability in the area under total cereals (3.67%). Since Rice and wheat dominate the production, the variability in the area under total food grains is, therefore, also relatively low (2.85%).

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	39.67	1.18	2.97	88.10	6.50	7.38	22.23	1.75	7.89
Wheat	139.14	0.46	0.33	435.17	75.01	17.24	31.28	5.40	17.27
Bajara	75.02	1.26	1.68	101.57	5.04	4.96	13.54	0.53	3.94
Total Cereal	268.01	9.83	3.67	644.36	66.10	10.26	24.09	2.72	11.30
Urad	11.70	2.02	17.24	11.67	2.20	18.89	10.08	1.89	18.80
Total Pulses	13.10	2.08	15.88	14.50	4.53	31.28	11.10	3.21	28.91
Total Food Grains	281.11	8.02	2.85	658.86	67.37	10.23	23.47	2.58	11.02
Mustard	11.38	0.37	3.26	14.84	2.02	13.58	13.04	1.69	12.96
Total Oilseeds	12.34	0.23	1.89	15.09	2.01	13.30	12.23	1.61	13.20
Sugarcane	27.32	1.17	4.29	1875.75	316.52	16.87	689.01	129.72	18.83
Potato	9.46	0.35	3.75	238.13	39.60	16.63	251.84	40.73	16.17

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

The variability of production depends on the variability of the cultivated area and the variability of the yield. 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 Urad (18.89%), followed by Wheat (17.24%), Sugarcane (16.87%), Potato (16.63%), and Mustard (13.58%). 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 Bajra (4.96%), followed by Rice (7.38%) and Mustard (13.58%).

In the case of yield, the greatest variability is estimated in sugarcane (18.83%), Urad (18.80%), and wheat (17.27%). Yield variability in total cereals (11.30%) and total food grains (11.02%) is lower as compared to that in total pulses (28.91%). Rice, Bajra, and Mustard 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.

118 **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 cereals, total Foodgrains, 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. Total food grains accounted for around 75.69% of the GCA and 62.75% of the total value of the agricultural product. Three crops – Wheat, Paddy, and Sugarcane together accounted for 55.29% of GCA and 79.34% of the total VOP. Overall, the total agricultural GCA has increased in the latter years of the study (average, 371.38 thousand hectares). The total value of the product has also increased significantly, that is, Rs.1378.27 Cr. In 2011-12 to Rs. 2537.82 Cr. In 2017-18.

Table 10: Share of Principal crops Total GCA and Total Value of agriculture products in Sambhal

Crop	% Share in	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Wheat	GCA	38.11	37.81	36.99	37.34	37.41	37.31	37.31
	VOP	42.49	38.08	37.80	25.51	33.72	38.44	37.25
Paddy	GCA	10.33	10.76	10.21	10.86	10.88	10.86	10.86
	VOP	11.19	15.04	14.43	16.54	12.97	11.39	12.26
Total Cereals	GCA	70.52	69.99	68.72	73.97	74.11	73.91	73.91
	VOP	61.72	58.95	59.23	52.52	56.15	56.57	55.63
Total Pulses	GCA	4.36	3.66	4.27	3.10	3.11	3.10	3.10
	VOP	6.30	6.64	4.73	5.13	5.23	6.30	3.95
Total Food Grains	GCA	74.88	73.65	72.99	77.07	77.22	77.01	77.01
	VOP	68.24	65.59	63.96	57.64	61.38	62.87	59.58
Total Oilseeds	GCA	3.24	3.31	3.35	3.34	3.34	3.33	3.33
	VOP	2.61	3.13	2.91	2.10	2.69	2.46	2.32
Potato	GCA	2.36	2.61	2.55	2.58	2.58	2.57	2.57
	VOP	6.17	7.98	6.33	11.83	8.60	8.77	8.19
Sugarcane	GCA	7.73	7.36	7.90	7.13	7.14	7.12	7.12
	VOP	22.73	23.11	26.51	28.26	27.17	25.81	29.83
Paddy + wheat + Sugarcane	GCA	56.17	55.93	55.1	55.33	55.43	55.29	55.29
	VOP	76.41	76.23	78.74	70.31	73.86	75.64	79.34

Total Agriculture	GCA (1000 Ha)	366.77	367.08	373.94	372.98	372.28	373.29	373.29
	VOP (in Cr Rs)	1378.27	1671.66	1919.80	1729.18	1993.51	2334.58	2537.82
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.5 Consumption of Chemical Fertilizers

Table 11 shows the trends in the use of chemical fertilizers in agriculture. The recommended ratio of nitrogen to phosphorus and potassium is 4:2:1, which is not maintained in the district. For example, in 2011-12, nitrogen represented 75.53% of the total fertilizers used, while the proportions of phosphorus and potassium were 17.60% and 6.87%, respectively. In 2017-18, however, the nitrogen share decreased to 64.34%, while the phosphorus share increased to 31.35%, and the potassium share decreased to 4.31%. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio. The table also shows that fertilizer consumption varies from year to year, which can be due to several factors, including rainfall patterns, cultivation patterns, etc. The overall use of chemical fertilizers has decreased in the district from 194.32 kg/ ha GSA in 2011-12 to 118.64 kg/ ha GSA in 2017-18, which is a good sign. However, the authorities still need to 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 GSA)

Fertilizer/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Nitrogen	146.77	121.28	104.08	111.16	103.22	101.29	76.33
Phosphorous	34.20	34.84	26.68	32.08	38.68	39.66	37.20
Potassium	13.35	4.03	3.66	6.56	7.10	8.34	5.11
Total	194.32	160.16	134.41	149.79	148.99	149.29	118.64
Gross Sown Area (Ha)	366771	367075	373941	372984	372284	373291	373291
Source: http://updes.up.nic.in/spiderreports/intialisePage.action							

2.1.6 Irrigation Structure and Status

2.1.6.1 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. Canal irrigation is not available in the district. The number of Government tube wells decreased from 593 in 2011-12 to 586 in 2018-19. Shallow tube wells decreased by 98.7% in 2018-19 compared to 2011-12, which is not a good indicator of the district's development. The district's percentage of the net and gross irrigated areas has increased over the years with 93.84% and 73.79%, respectively.

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

Name/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
No. of Govt. Tube wells	593	593	593	593	593	593	586	586
Shallow Tube well	65906	53954	620	620	620	830	855	855
% Of NIA	97.99	98.11	98.09	97.64	93.66	93.66	93.66	-
% Of GIA	73.00	74.41	73.56	74.04	73.86	73.88	73.88	-
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.6.2 Source-wise area under irrigation

Groundwater irrigation is the main source of irrigation in the district. The share of wells and tube wells in NIA (average, 95.04%) has decreased slightly over the years. This shows the increased dependency of the district on the groundwater for irrigation purposes, and it can have serious environmental issues if such a pattern continues in the long run.

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

Source/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Wells And Tube-wells (GW Irri.)	97.25	96.41	96.61	89.83	94.09	94.09	94.09
Others	2.75	3.59	3.39	10.17	5.91	5.91	5.91
NIA (1000 ha)	196.93	197.09	197.42	198.39	180.32	180.47	180.47
Source: http://updes.up.nic.in/spiderreports/intialisePage.action							

2.1.6.3 Crop-wise Irrigated Area

Table 14 shows that a majority area under Rice (average, 100%), wheat (average, 100%), Potato (average, 100%), and sugarcane (average, 100%) is irrigated. Percentages of the irrigated area under pulses (average, 6.47%) and oilseeds (average, 87.42%) are relatively less.

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

Crop/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	100	99.73	99.99	100	100	100	100
Wheat	100	100	100	100	100	100	100
Total Cereal	69.86	70.54	69.82	71.42	71.42	71.42	71.42
Total Pulses	5.07	6.50	5.13	7.14	7.14	7.14	7.14
Total Foodgrains	66.09	67.36	66.03	68.83	68.83	68.83	68.83
Total Oilseeds	90.88	98.87	91.18	82.76	82.76	82.76	82.76
Sugarcane	100	100	100	100	100	100	100
Potato	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 202.85 KWH in 2016-17 to 304.53 KWH in 2019-20, a net increase of approximately 50.12%. This is a cause of concern as this can result in an increased burden on non-renewable resources and create waste disposal problems. The percentage share of the agriculture sector (average, 38.05%) in the total electricity consumption in the district is quite significant. This indicates the heavy usage of electricity by agricultural farmers. Since electricity consumption has increased over the years, it is very important for the authorities 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 (KWH)	-	-	202.85	260.27	286.05	304.53

% of electricity consumed in Agriculture sector to total consumption	31.78	36.07	37.43	35.61	40.42	47.01
Source: District-wise Development Indicators file.						

2.1.8 Status of Agriculture Market

Table 16 shows the marketing infrastructure in the district. It has four main markets and zero sub-markets. The number of regulated mandis per lakh hectare of Net area sown has increased from 1.49 in 2013-14 to 2.08 in 2018-19. However, the authorities still need to further increase the number of regulated mandis so that farmers are able to sell their products efficiently.

Table 16: Status of Agriculture Markets in Sambhal

Category/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Main Markets (No.)	3	3	3	3	3	4	4
Submarkets (No.)	0	0	0	0	0	0	0
Total Markets (No.)	3	3	3	3	3	4	4
No. of Regulated mandis per lakh Ha. of net area sown	1.49	1.22	-	1.56	1.48	2.08	-
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 MIS, 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 to 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. To sustain the organic farming initiative, 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 Namami Gange scheme in the district. The district has 89 groups in three development blocks. The highest number of groups are in Rajpura (33), followed by Gunnor (29) and Junawai (27). 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 Paramparagat Krishi Vikas Yojana is reported till date.

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

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	Gunnor	Namami Gange	29	714	24.62	25	3.33
2	Junawai	Namami Gange	27	635	23.51	24	2.54
3	Rajpura	Namami Gange	33	812	24.6	24	4.7
4	District Total	Namami Gange	89	2161	24.28	24	3.71
		Total	89	2161	24.28	24	3.71

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 SHGs/ farm cooperative/PFOs/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 as well as 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:

1. The major problem of the farmers was poor marketing of the organic products and not being able to fetch a premium.
2. 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.
3. Farmers practicing organic farming only on a small part of their land (less than one ha) to get the scheme's benefit.
4. 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.
5. The knowledge and awareness level regarding practices under organic farming was inadequate among farmers.

2.1.10 Livestock Sector

2.1.10.1 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 126726 in 2007 to 29816 in 2019 and from 18347 in 2007 to 5092 in 2019, respectively. Similarly, indigenous female cattle have decreased considerably from 158222 in 2007 to 103297 in 2019. However, on the other hand, the number of exotic female cattle has increased considerably from 26639 in 2007 to 36708 in 2019. Thus, the total number of cattle decreased only slightly from 329934 in 2007 to 174913 in 2019, thus, a net decrease of 46.98%. Similar inferences can be drawn from the buffalo data as the number of male and female buffalo decreased. A net decrease of 37.31% in 2019 compared to that in 2007 is observed in the total population of buffalo. A significant reduction in the indigenous sheep population is observed (80.34%) in 2019 compared to that in 2007. During the same period, the population of exotic sheep also decreased, thus, indicating a decrease in the total sheep population by 80.93%. The total population of goats decreased from 323605 in 2007 to 84709 in 2019, a net decrease of 73.82%. The total pig population decreased considerably from 44902 in 2007 to 3261 in 2019.

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

	Category	2007	2012	2019
Indigenous Cattle	Total Male	126726	54230	29816
	Total Female	158222	58130	103297
	Total	284948	112360	133113

Exotic Cattle	Total Male	18347	19350	5092
	Total Female	26639	39241	36708
	Total	44986	58591	41800
Total Cattle		329934	170951	174913
Buffalo	Total Male	297739	152388	61489
	Total Female	836533	426218	649504
	Total	1134272	578606	710993
Sheep	Total Indigenous Sheep	10366	3290	2037
	Total Exotic Sheep	336	366	3
	Total Sheep	10702	3656	2040
Goat	Total	323605	127239	84709
Pig	Total Indigenous Pig	40238	9305	3192
	Total Exotic Pig	4664	803	69
	Total Pig	44902	10108	3261
Total Livestock		1859393	896410	-
Total Poultry		172258	126391	-

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

And http://dahd.nic.in/animal-husbandry-statistics

2.1.10.2 Cattle Care Centre

Table 19 shows that the Sambhal 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 (18) has remained constant. The number of cattle development centres has increased from 38 in 2011-12 to 40 in 2018-19. The number of man-made reproduction centres increased from 52 in 2011-12 to 60 in 2018-19. There are very few sheep and pig development centres which might be one reason for the declining sheep and pig population in the district.

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

Category	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Cattle Hospital	18	18	18	18	18	18	18	18

D- category Cattle Dispensary	2	2	3	3	3	3	3	3
Cattle Development Centre	38	38	38	38	38	39	40	40
Man-Made Reproduction Centre	52	52	56	56	56	60	60	60
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.2. FORESTRY

1. **Baseline Data Analysis/ Quantitative Data Analysis**

   According to Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India, the forest cover of Hapur is 232 ha. No major forest are found in the district.

2.2.1. Biodiversity

The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover. The crop production trend shows an increase in crop production. No forest data is available for the district. There are 351 bird species and twenty-eight threatened/rare species of bird in the district.

Table 1 Bird species recorded in the district.

Number of species	351
Number of rare/accidental species	28

2.3 TOURISM

Baseline data/Quantitative Data
Total number of tourists visiting Mirzapur

1	Area	2453.30 Sq. Km
2	Population	2192933
3	Language	Hindi
4	Village	1022

5	Male	1161093
6	Female	1031840

Table-1; Source: sambhal.nic.in

2. **Domestic/foreign visitors in different years in particular city**

Year	Domestic tourists	International tourists	% Change in domestic tourists
2013	1433300	20	
2014	1473267	27	2.79%
2015	1477549	36	0.29%
2016	1523030	59	3.08%
2017	1708516	67	**12.18%**
2018	1772407	87	3.74%
2019	1839599	106	3.79%
2020	571607	38	-68.93%

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

a. The above-given data table-2 is taken from the Uttar Pradesh tourism website. The data table shows the number of tourists visiting Prayagraj for tourism from 2013 to 2020. The tourist visits are bifurcated into two different groups – Domestic and Foreign tourists.
b. From the data it is evident that Sambhal has witnessed steady growth in the number of tourists from 2013 to 2018. From 2016 to 2017 the city has seen 4 times growth in the number of tourists compared to previous year.
c. In 2018 the district has seen 3.74% growth in the number of tourists and similarly in the year 2019, 3.79%; when compared to previous year's data.
d. In the year 2020 the district has seen shrunken growth to negative 68.93 % reduction in the number of tourists.
e. The number of international tourists is not significant as compared to domestic tourists in the district.

3. Domestic and foreign visitors in different years in particular state

The Indian and Foreign Tourist visits in Uttar Pradesh from 2016 to 2020						
Year	Indian	Foreigner	Total	Percentage increase/ reduce in comparison to previous year		
				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-3; Source: Dept. of Tourism, Uttar Pradesh Government

a. The above-given graph shows the number of visitors who visited Uttar Pradesh from 2016 to 2020. In the year 2016 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.

b. Data shows that 2018 had 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 patten is not similar in Kanpur

c. 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 behaviour, which majorly depends on advertisements. A commodity that has been presented to be associate with the emotions of consumers has a high potential to sustain and perform better than its competitors.

d. 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 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.

e. 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.

f. 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 Kanpur. This signifies the lack of transfer of information.

g. 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.

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 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, 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.

2.4. WETLANDS

The district has a smaller number of wetlands.

2.5. ENERGY

2.5.1. Solar

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.

As per the Census 2011, there are 77.37 % of rural households in the state, out of which 76.23% are unelectrified. In Uttar Pradesh state, there are 2.89 crore rural households. Of these, 0.92 crore rural households already exist in distribution company's records and there are around 1.12 crore un-electrified households in the state. Since the launch of Saubhagya Yojana, 74.4 Lakh willing households have been electrified and the state government has declared saturation of all 75 districts, as stated in Sharma et. al. (2021).

According to the revised definition in the Electricity Act - 2003, a village is said to be electrified, if the public places like schools, Panchayat offices, health centers and 10 percent of the total households are connected to the grid i.e., it needs only one out of 10 households to

have electricity supply for a village to be considered "electrified". Table 1 is a list of number of electrified households in in the district as on January 2019 (Sharma et. al. 2021). It can be seen that almost all households have been electrified so we can say that efforts are required in providing electricity, moreover its generation. In order to reduce the burden of electricity production, solar energy should be promoted in the district.

Total households	206047
Electrified Households as on 10th Oct,2017	114210
Balance Unelectrified Households as on 10th Oct, 2017	91837
Progress from 10th Oct, 2017 to 31st Jan, 2019	92869
Additional Households progress from 1st Feb 2019 till date	8179

Table 1

2.5.2. Biomass

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.

Majority of population in the district is mainly dependent on agriculture as their primary source of income. Rice, bajra, wheat, rapeseed mustard, sugarcane and potato are some of the major cultivated in the district.

The net sown area of the district is 200900 ha with the cropping intensity of 171%. The gross cropped area of the district is 366800 ha out of which 165800 ha is sown more than once a year. The district has 100 ha of forest land. A total of 1700 ha of cultivable wasteland, 4400 ha of barren and uncultivable land is there in the district.

Table.1 gives an account of area under major crops in the district.

CROPS	AREA ('000 ha)
Rice	37.9
Bajra	74.8
Wheat	139.8
Rapeseed mustard	10.7
Sugarcane	28.3
Potato	8.7

Table 1

2.5.3 Biogas

Biogas data is not available for the district. Based on the livestock population and agricultural waste biogas potential calculated. Biogas potential from animal waste and agricultural waste was calculated approximately as ninety-six lakh m^3/year and eleven crores m^3/year. This amount of biogas generation can efficiently complete the energy demand of the district.

2.5.4. Hydro Power

No hydropower plant exists, nor the site has been identified in the district. The Ganges River lowlands, which define the district's southern boundary, are home to this district. The primary rivers are the Ganges, Varuna, and Morva. A survey or identification of the site must require for the construction of hydropower plants.

3 QUALITATIVE DATA ANALYSIS

3.1 FORESTRY

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]

The use of timber in house construction, furniture and agricultural implements etc. is around 61.38 million cum. By using alternatives we can reduce this which in turn will result in reduction in tree felling. In the context of State of Uttar Pradesh 10.495 million people are using fuel wood from forests. Taking an average family size of 5 persons per family it can be concluded that 2.1 million families are directly dependent on forests for fuel wood. By giving them alternative sources of energy it will be possible to reduce Carbon dioxide to the tune of 2.1 million tonnes annually.[2]

[1] https://pib.gov.in/newsite/PrintRelease.aspx?relid=148508
[2] State Action on Climate Change, Uttar Pradesh

3.1.1. Biodiversity

Sambhal lost 8ha of tree cover and 2.73kt of CO2e emissions between 2001 and 2021, a 43 percent decline in tree cover since 2000. Between 2001 and 2012, Sambhal increased 0.340 hectares of tree cover, accounting for 0.1% of total tree cover gains in Uttar Pradesh. The main fire season in Sambhal usually starts in mid-January and lasts for around 12 weeks. There were no VIIRS fire alarms recorded between June 14th and June 6th, 2022, when only high confidence alerts were considered. When compared to prior years dating back to 2012, this is a low number. So far in 2021, 0ha of land has burnt in Sambhal. This amount is typical when compared to other years' totals dating back to 2001. The year with the most fires was 2006, at 480ha. Between June 10th, 2019 and June 6th, 2022, there were a total of 193 VIIRS Alarms fire alerts in Sambhal.

3.2. ENERGY:

As per the data of the year 2013, Sambhal district energy consumption is around 713 TJ/year and 3.2 GJ/capita/year. GHG emission of 50,396 Ton CO_2 equivalent and 0.228 Ton CO_2 equivalent/capita has been evaluated for the district.

3.2.1. Solar

In the district Sambhal, installed solar power units have been in low number. According to a local daily, the Ministry of Railways has started work on a plan to generate electricity by installing solar power plants on the roofs of its station buildings. Due to which the railway stations will get electricity round the clock, as well as the electricity bill of the stations will also be reduced by seventy to eighty percent. More than five thousand units of electricity will be generated daily by setting up a 990 kilowatt plant on the roofs of 17 railway stations including Chandausi (Sambhal), Bahjoi, Moradabad, Bareilly, Aonla, Farrukhabad, Hardoi, Shahjahanpur falling in Moradabad division. With this, the railway stations will not only be illuminated, but the electricity that is left will be sold to the Electricity Board. 450 units of electricity will be generated at Chandausi Railway Station. On an average, 4.2 to 5.6 units of electricity is produced by installing one kilo watt solar power plant. Taking this as the basis, the working organization is installing solar energy plates at all railway stations. The designing of Chandausi railway station has been done like this. In which 40 KW plant will be installed on the roof of platform, 40 KW on the roof of ticket house and RCC, 25 KW ie 135 KW plant will be installed on the roof of Railway Training Center. Due to which 400 to 450 units of electricity will be produced. Solar plant installation work will be completed in one and a half to two months.

Another article in a local daily, 'Amar Ujala' mentions that in Sambhal's Hallu Sarai, more than five thousand population is suffering in summer. Electricity problem happens every day. People are troubled by law voltage and tripping. The transformer of 400 kVA capacity is not able to take the load. This problem persists for several days. People say that the number of connections is increasing but the power department is not increasing the capacity of the transformer. This is what is causing problems for people. There is anger among the people regarding the electricity problem. This problem is getting worse during the hot summer. Due to this people are facing problems from water to air.

3.2.2. Biomass

The district Sambal is yet to adapt biomass energy in order to grow and prosper. The district faces the problem of stubble burning as well. As news article in The Quint mentions that Uttar Pradesh government has issued notices to District Magistrates of 26 districts where stubble burning has not been effectively checked. UP Chief Secretary R.K. Tiwari has asked the District Magistrates to explain why stubble burning has increased in their respective districts, despite orders to check it. The notices have been issued to District Magistrates of Sambhal, Meerut, Bulandhshahr, Gautam Buddha Nagar, Baghpat, Hapur, Shamli, Ferozabad, Hathras, Agra, Moradabad, Badaun, Jyotiba Phule Nagar, Farukkhabad, Kanpur Dehat, Lalitpur, Banda, Jalaun, Kannauj, Amethi, Hamirpur, Bhadohi, Chitrakoot, Mahoba, among others.

3.2.3 Biogas:

Livestock and agricultural data show a great potential of biogas in the district. However as per the authors knowledge, no data of biogas plant is given for Sambhal district.

3.2.4. Hydropower:

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. There is no information on the district's hydropower future.

3.3 TOURISM

Some tourism backgrounds

Sambhal is a small town but has its fair share of tourist spots that one can visit to get an insight into the town's glorious past and colourful present. Religion weighs heavy in this small town, and it is hence thickly laden with mosques and temples aplenty. Some of these monuments are as old as time itself and have stayed the same for several centuries efficiently withstanding the test of time.

The first ever Babri Masjid to have built stands tall in the town of Sambhal, making it a true testament of how the Mughals had a lasting bearing on the shaping up of this small town. Sambhal also has the famous Kalki Vishnu Mandir whose entrance reads "Pracheen Sri Kalki Vishnu Mandir" meaning the ancient Vishnu Temple. Places of interest.

Maa Kela Devi Mandir

Kaila Devi temple has a long history. Mother Kaila has two temples in the country. First in Rajasthan and the other in the Bhangra area of Sambhal. Here in the Navaratri, it is said that the Goddess Darshan of the lion is coming. The banyan tree located in the temple premises is also of great significance. It is said that this banyan tree is seven hundred years old. Philosophy of Yaduvansh Kuldev's mother Kaaladevi on Monday is of particular importance.

Manokamna Mandir

This is a very popular temple in Sambhal. The Manokamna Mandir houses the samadhi or the final place of rest of Baba Ram Mani. Baba Ram Mani is considered to be a great saint by the locals and he is said to have cured people of many illnesses and lived the life of a selfless and an extremely kind being. Several legends are associated with Baba Mani such as the stories of how he was capable of being in two places at the same time and is considered by many as being a messenger of God. He is said to have appeared whenever one of his devotees was in need of help and was widely worshipped as a sadaguru is now visited by hundreds of people from far and wide, on a daily basis, to offer prayers and wish for a boon.

The temple complex also includes a pond that is surrounded by several other small temples such as the Hanuman Mandir, the Ram Sita Mandir and the Deviji Mandir. One can, therefore, visit all these temples at one go.Every year, a big 'BHANDARA' takes place at the temple to honour the life and times of Baba Ram Mani where people throng to take part in it. It is held on the 8th of January every year and one can plan their trip to Sambhal accordingly to coincide with this event and take part in the bhandara.
Manokamna Mandir, Manokamna Mandir Marg, Sambhal, Uttar Pradesh 244302

Shri Kalki Vishnu Mandir in Sambhal

Hinduism no doubt has several gods, but three of them are considered as being the main ones, with those being – Lord Shiva, Lord Vishnu and Lord Brahma. Of these, Lord Vishnu is considered as being one of the creators of the world and one who preserves it. He is worshipped in various forms or 'Avatars' . All throughout history, Lord Vishnu has donned several incarnations and re-incarnations which is related to the theory of Vishnu's Dashavataram.

Right from his first avatar viz. Vaman avatar and leading up to his last avatar viz. Buddha, he is said to have walked on Earth during one yuga (epoch) or the other and brought about deliverance to all the deserving people in the world. It might sound a bit mythical, but the belief is still very much rife and Lord Vishnu is still devotedly worshipped, all across the world, as he is said to don his tenth incarnation called 'Sri Kalki' avatar very soon.

He will apparently take on this avatar by taking birth in the town of Sambhal and put an end to all the evils of Kalyuga and usher in deliverance. This event is said to have been predicted a very long time back by historical soothsayers and is included in the Hindu epic, Mahabharata. In this avatar, Vishnu is shown to be riding a white horse and wielding a sword in the air to effectively wipe out all the evils from this world. This Kalki Vishnu Temple was one of the first ones to be built in India and is a place that houses immense sanctity and great religious significance.

Ghanta Ghar

From Big Ben to Mecca clock tower, the Victorian and Elizabethan style of displaying time has always been a very popular concept. One such clock tower is present in Sambhal that is said to have existed since a very long time. It's a red and white building with the top hosting the clock on all four faces of the building. Although it has undergone a lot of exterior deterioration, the tower is still a great architectural piece that adds glitz to this small town.

Data analysis

- **a.** The number of tourists is uniform throughout 2013 to 2019; in the year 2020 there is a drop of 68.993% tourists which is accredited to lockdown due to pandemic.
- **b.** Year 2017 had been the most fruitful year for Sambhal because the district witnessed highest number of tourist visit..
- **c.** The number of international tourists is uniform throughout 2013 to 2019, however the number of international tourists is not significant in comparison to domestic tourists.
- **d.** The number of international and domestic tourists had shrunken due to pandemic in 2020.

3.4. WELANDS:

The wetlands create a unique ecosystem that supports many species simultaneously like aquatic, terrestrial, and human beings. Local stakeholders directly or indirectly depend on the wetland for their income and small-scale business. The region is known as the city of saints. The data collected and analyzed shows the region's production and possible product that can be derived from the raw product. The list of sources and the possible products are mentioned below:

- Wheat production is high in the region.

4 ACTION PLAN DEVELOPMENT

4.1 FORESTRY

Culturable Waste Land includes land available for cultivation, whether taken up or not taken up for cultivation once, but not cultivated during the last five years or more in succession including the current year for some reason or the other. This area is about 440 thousand hectares and can be taken up for plantations by Forest Department. Scrub forest area 74500 ha should also be taken up for plantations. Similarly, Fallow Lands other than Current Fallows include all land which was taken up for cultivation but is temporarily out of cultivation for a period of not less than one year and not more than five years. The total of such area available is 540 thousand hectares. This area can be brought under plantations by the land owners or by forest department by taking recourse under section 8 and 9 of UP Tree Protection Act, 1976.

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.

4.1.1. Biodiversity –

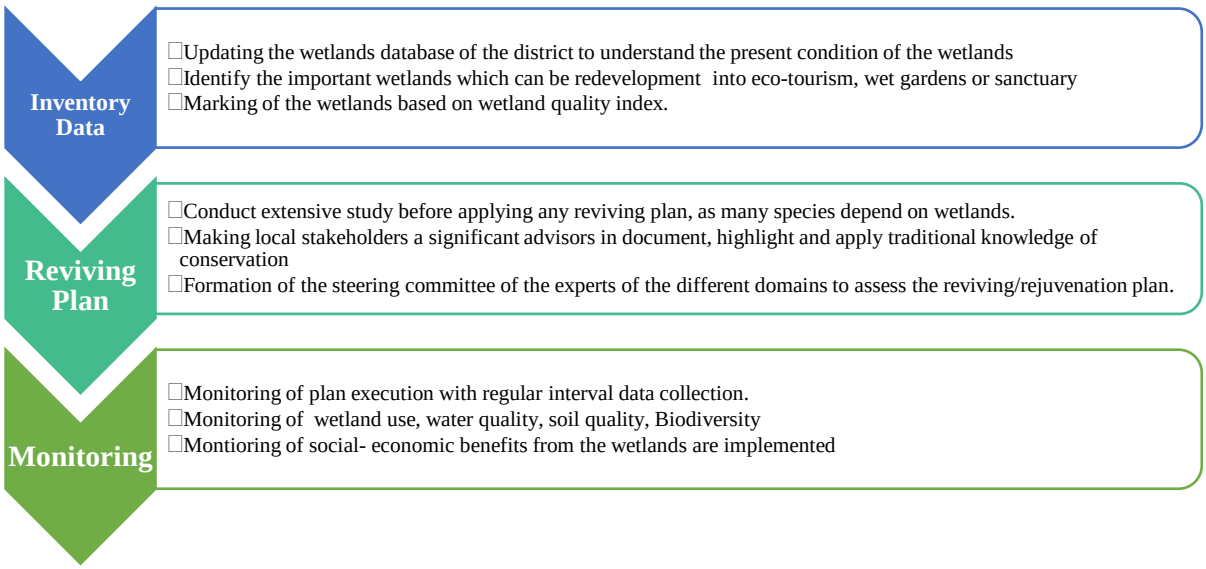
Strict laws and green belts should form as illegal green trees cutting.

4.2 TOURISM

- Strict laws and green belts should form as illegal green trees cutting.

4.3. WETLANDS

Some of the known wetlands in the district need to be taken care and action on different fronts must be taken. The action plan below gives a glimpse of the action and development required to protect, conserve, rejuvenate the wetlands existing and extinct.



4.4. ENERGY

4.4.1. Solar

The district does not has many solar power units installed. Moreover the district deals with the problem of regular power cutoffs. One thing that should be done is to make more and more people aware of the solar energy and the related schemes provided by the government. This can be done by organizing awareness camps etc. at smaller levels so that people are able to get knowledge at personal levels. Also the schemes of the government related to solar energy should be popularized. Farmers should be made acquainted with the Kusum Yojana. The DISCOMs should work towards developing infrastructure required for solar segregation. This would help the DISCOMs in providing uninterrupted power supply to the farmers at low costs without facing any losses. Attention should also be paid on encouraging more and more people for installing solar roof panels under the National Solar Mission, Phase II.

Example can be taken from one of the villages in the Amroha district which is totally managing its need from the solar energy. The solar-powered village in Chakanwala Panchayat named 'Mandironwala Bhuddi' has no electricity poles but is completely lit up using solar power. Development in other villages in solar energy sector can be made on similar lines.Installation of solar power units at public places should also be taken up by the district administration as solar panels are being installed at the Chandausi railway station of the district.

4.4.2. Biomass

The problem of stubble burning is very common in the district and hence to divert the farmers away from this, it becomes important to make them aware of the biomass energy. The first thing which should be done is to make people aware of the biomass energy and its benefits. Farmers should be educated about the importance of the bio-waste produced in their fields.

Moreover new entrepreneurs should be encouraged to develop and work on the technology that would utilize all types of field biowaste produced from agricultural lands. . The district cultivates sugarcane, rice and wheat mainly, so the best suited projects for the district can be husk based biomass gasifier and the bagasse based biomass plants. The husk based biomass plants can be developed on the lines of the Husk Power Systems from Champaran, Bihar. Community based biomass plants should be encouraged in the district, so that the investment is divided among the group of people.

There should be provision for the rice mill owners to set up biomass plants in the district. These could also be opened in a group of two to three, so the infrastructural cost would get reduced. The biomass plants should be established at such places which are on the mid way to urban and rural areas for this a district based survey should be conducted so that the barren lands could be utilized. Biofuel production should also be promoted in the district as it cultivates sugarcane on large scale. Research is also required to develop technology which can not only produce energy from rice husk alone but also wastes from other crops can be used alongwith, such as wheat, etc.

4.4.3. Biogas:

- The government is pushing businesses to build biogas facilities. The federal government is also providing financial incentives. The state government will supply all the required infrastructure for the biogas plant to be built.

4.4.4. Hydropower:

- No significant irrigation scheme and bulk of irrigation is present in the district; hence the government should build a canal or dam on river Ganga that can also serve electricity purpose in future.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

1. The district has been declared a dark zone area and observed a significant decline in the water table. Groundwater shares over 94% of NIA in the district. 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.

2. Three crops—Wheat, Rice and Sugarcane together consisted of 55.29% of GCA and contributed 79.34% to the total value of agricultural products. These are water guzzling crops and also require relatively more chemical fertilizers for productivity enhancement. Sugarcane is most profitable among all the crops. The government should adopt two-fold strategy—first promote organic farming in these crops and second incentivize the farmers to shift to less water intensive and high-value horticulture crops. The government can promote micro and small units for horticulture products processing.

3. 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. 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.

4. The fishery & aquaculture is an emerging sub-sector. It recorded a magnificent average annual growth rate of 20% from 2011-12 to 2018-19. Fishery & aquaculture has a huge scope for raising income and livelihood through effective implementation of PM Matsya Yojana.

5. 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.

6. 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.

7. 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.

8. About 94% 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.

9. 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.

10. Since electricity consumption in agriculture has increased over the years, there is a need to promote the use of solar energy in agriculture.

11. 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.

12. Sugarcane is one of the major cash crops in the district; the farmers must follow scientific cultivation methods to increase productivity and quality production.

13. There is a scope for expanding high revenue crops cultivation like strawberry, Potato and menthe. Mentha is the district's most important medicinal plant and cash crop; some processing units (oil extraction) should be installed.

14. Rajpura block has an arsenic problem; the measure should be taken.

15. Banana is solely fruits cultivated in the district on a large scale, others fruits like guava citrus can be cultivated by the farmers.

16. The district should have quality food processing units for millets and Bajra. Bajra constitutes more than 20% of the GCA of the district.

17. Beekeeping can provide good earnings for small landholding farmers.

18. The farmers should use resources conservation technologies such as zero-tillage, laser land leveler, mulching, etc.

5.2 FORESTRY

Sambhal located on the banks of Ganga. 232 Sq. Km. area of Sambhal is covered with forest. There is a wide scope of Afforestation on waste land, trees outside forest (on the sides of the roads, banks of river etc.). Government can promote the afforestation, agroforestry activities by providing output based incentives.

5.2.1 Biodiversity

- Non-timber forest produce-based income-generating initiatives should be identified and promoted.
- Forest areas need to be protected, treated, and regenerated.
- Government should support/ promote local people to build communities and NGOs for afforestation programs.
- To successfully organize, implement, and monitor operations, provide trainings, meetings, and exposure visits to communities, village volunteers, and employees.

5.3. WETLAND

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 indirect relief to 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 recommendation and interventions are required to get valuable products and solve the issues/ challenges faced by the local people of that region.

- It is recommended to support fishing production
- It is recommended to rejuvenate and restore the wetlands under MNREGA schemes.
- It is recommended to develop the outer periphery of the wetlands with shrubs, flower gardens or medicinal plants. These wetlands can be turned into an eco-tourism site.

5.4. ENERGY

5.4.1. Solar

- ❖ The people of the district should be made aware of the solar energy scheme of the government.
- ❖ Kusum Yojana should be popularized among the farmers of the district.
- ❖ Solar rooftop installations should be popularized under the National solar Mission-Phase II.

5.4.2. Biomass

- ❖ People should be made aware of the biomass energy.
- ❖ Rice husk based biomass plants should be developed and promoted in the district.
- ❖ Biofuel production should also be promoted in the district as it cultivates sugarcane on large scale.

5.4.3. Biogas

- It is recommended to connect existing gaushala in Kail and Saimala Gunnaur of the village of Gunnaur tehsil area with biogas plant.
- Promotion of household biogas plant and different incentive scheme should be spread through posters, or slogans. Tourist attraction places should be targeted to conduct this activity.

5.4.4. Hydropower

- It is recommended to build Ganga canal and investigate hydropower potential on the villages that are badly affected by floor.

5.5. TOURISM

S. No.	Broad objectives / recommendations	Key activities / interventions to be planned			Monitoring & Evaluation	Impact
		2022	2023	2024		
	Encourage tourism related startups and ideas. Incubation centers to develop prototype and working model with the assistance of industry leaders (tourism industry). Training of skilled manpower to work in tourism sector (through earn while you learn programs). Upgradation of UP state tourism corporation	Research to figure out the factors impacting the tourism in the district. Development of strategies to address the issues. Development of policies to protect the ecosystem. Adopting PPP (Public Private Partnership) model in the tourism sector to reduce the burden on government spendings	Implementation of strategies. Training and Incubation Centre support to innovative ideas Structural developments	Sampling for analysis. Evaluation of interventions. Redesigning of strategies based on Impact analysis	Intervention impact- RCTs, regression analysis, propensity scores, econometrics, structural equation modelling, Contribution analysis, process tracing, Bradford Hill criteria. Through Participatory approaches and impact evaluations use the standard OECD-DAC criteria. Based on satisfaction of pre	Performance of interventions. Working model and scalability of ideas from incubation Centre. More tourist footfall. Trained youth to be a part of Tourism industry. Upgraded staff and facilities associated with UP State Tourism Corporation

	policies, the hotels and integration of PPP. Resort hub for NCR population. Focussing on international tourists	Structural developments.			decided key questions.	

6 Discussion during the Report Presentation

- The interventions shared in the presentation were well noted.
- The DM, Sambhal appreciated the idea shared by Advisor, NMCG of developing ashrams into wedding venues.
- The report shared by the IIM-IIT Consortium will taken up as a base for a regular discussion in the further DGC meeting.
- Support from Nmami Ganga will be contacted regrading few tourism aspects such as developing Arth Ganga Trail, Boat Safaris, Cycling trail, Ganga Aarti sites etc.
- Also, steps such as assigning a stall on in the upcoming fairs will be assured for the promotion of Jalaj and other local produce.
- 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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7 APPENDICES

AUXILLLARY DATA

Table 2 Biogas potential from animal waste in the district.

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)**	**m3/day**	**Dry matter per day**

Manure	170951	10	62,39,71,150	467978362.5	93595672.5	25	3743826.9	10257.06	256427
Manure	578606	15	3,16,78,67,850	2375900888	475180177.5	25	19007207.1	52074.54	1E+06
Manure	3656	1	13,34,440	1000830	200166	25	8006.64	21.936	548.4
Manure	127239	1	4,64,42,235	34831676.25	6966335.25	25	278653.41	763.434	19086
Manure	10108	2.5	92,23,550	6917662.5	1383532.5	25	55341.3	151.62	3790.5
manure	1,29,199	0.1	47,15,764	3536822.625	707364.525	25	28294.581	77.5194	1938
	10,19,759						**23121329.93**		

Table 3. Biogas potential from agricultural waste in the district.

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	12108	1.5	18162	12713.4	15	10806.39	800	8645112
Wheat	straw	564047	1.5	846070.5	592249.35	30	414574.545	800	331659636
sugarcane	bagasse	2273006	0.33	750091.98	525064.386	80	105012.8772	750	78759657.9

Total		**2849161**							**419064405.9**