Arth Ganga Project: District Badaun

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

The historically rich Badaun district located on the banks of River Ganges anciently also known as Bedamooth is a religious western Uttar Pradesh district located to the left bank of the Sot River. The current name of the district is based on prince Budh. The agrarian economy district is bestowed with rich biodiversity and aesthetics.

Agriculture and animal husbandry form a major part of the economy. The neutral to moderately alkaline and medium in organic content, adequate amount of rainfall along with other physiological characteristics aids in a variety of agricultural, horticultural crops are grown namely Wheat, Mustard, Lentil, Potato, Paddy, Sugarcane, Guava, Mango, Papaya, Capsicum, Brinjal, etc. Animal husbandry includes buffalo, cow, and goat along with this poultry and fisheries are also practiced. An integrated approach or mixed farming is prevalent in the region involving agriculture, livestock, horticulture, and poultry. In 2017-18, the cultivable wasteland, Barren and uncultivable land, the area under trees and gardens, the net sown area has decreased to 0.49%, 1.20%, 1.0%, and 81.33% respectively. The area for non-agricultural use increased over the period from 8.46% to 12.03%. The average cropping intensity is 176.46. The production for most of the crops has increased in 2018-19. Also, net and gross irrigated areas have increased over the years with an average of 91.11% and 74.04%, respectively. The growth rate of the agriculture sector has decreased whereas livestock percentages have increased. The crop production trend shows a reduction in the non-grain crop but increases in all other crops. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio. The use of chemical fertilizers has decreased in the district from 139.96 kg/ ha in 2010-11 to 130.55 kg/ ha in 2018-19. The tertiary sector has the highest share in the economy with increasing primary sectors' contribution in recent years. The district economy grew with an average annual growth rate of 5.27% in 2018-19.

There is no presence of a very dense forest. The share of forest area increased to 1.62% in 2017-18. Majorly open forests, followed by moderately dense forests are found in the district. The scrub area decreased and then increased drastically in the years 2003 and 2005 respectively and then reduced further until became almost constant up until 2019. Also, the forest cover although increased in the early 2000s yet has decreased in recent years. The presence of a few historical places along with good connectivity of transportation but lack of facilities had led to a slow, yet positive growth has been observed since 2015 in the tourism sector. The wetlands in the district are mostly small and medium-sized in general (total of 1285) and the number of natural wetlands is more than those of man-made.

The energy assets in the district give hope as solar energy use had shown a positive increase and with biomass having viable potential, due to high agriculture and animal waste; the increase in biogas production has also been looked upon but the implementation of hydropower projects have yet to be investigated to aid the renewable energy resource utilization. Cow dung cakes (46.74%)

followed by firewood (30.95%) are the two main contributors of energy whereas kerosene (81.01%) contributes to power for energy. The electricity consumption in agriculture has increased to 238.91 kWh in 2019-20 (approximately 96.92%). Thus, drip and sprinkler irrigation, organic farming, Poly house and greenhouse, sericulture and mushroom cultivation, eco-forestry, Agro-forestry, eco-tourism, Miyawaki plantation, etc. are the practices that need attention along with the innovative advertisement and better maintenance of the tourist places, renewable energies, etc.

1 DISTRICT OVERVIEW

1.1 INTRODUCTION

Badaun, previously Vodamayuta, is a city in Uttar Pradesh, India, and the seat of the Badaun district. It's in the middle of Western Uttar Pradesh, near the Ganges river. During Sultan Iltutmish's reign from 1210 to 1214 CE, Badaun served as the capital of the Delhi Sultanate. During the Mughal reign, it was the most important post on the Northern Frontier. Badaun is a large market city with a long history and religious significance. On the globe, Badaun City is located near the Holy River Ganga, at 28 degrees 02 minutes 30 seconds east and 79 degrees 01 minutes 20 seconds north. The district is 144 kilometres long and 60 kilometres wide. It is Rohilkhand's beating heart. Badaun is 229 kilometres from New Delhi and 311 kilometres from Lucknow. The town is located on the left bank of the Sot River.

Badaun is a popular Holi destination in India. This city was titled BEDAMOOTH in an ancient inscription (stone writing) that is currently in the Lucknow Museum, according to Prof. Goti John. This pradesh was known as “Panchal” during the time. There was a settlement called "Bhadaunlak" near there, according to a statement in that Stone Writeup. Mr. Roz Khan Lodhi, a Muslim historian, claims that King Ashoka built a Buddh Vihar and Quila, which he named BuddhMau.

Badaun was named after Ahir prince Budh, according to legend. Badaun was created in 905 AD, according to legend, and an inscription from the 12th century lists twelve Rathore rulers who reigned at Badaun, then known as Vodamyuta. After pushing out the Rshtrakta lord, Mahmd, the son of the Ghaznavid Sultan, invaded Kanauj in 1085. The Rshtrakta chiefs then moved their capital to Vodamyuta, where they ruled until Qutb-ud-din Aibak vanquished them.

However, the first legitimate historical event associated with it was its capture by Qutb-ud-din Aibak in 1196, following which it became a vital garrison on the Delhi empire's northern frontier. A mosque with an outstanding size and a dome was completed in 1223. Two of its governors, Shams-ud-din Iltutmish, the builder of the mosque mentioned above, and his son Rukn ud din Firuz, ascended to the imperial throne in the 13th century. The town was burned down in 1571,

and the governorship was relocated to Sahaspur-Bilari a century later, under Shah Jahan. The Nawab of Oudh gave Badaun and its territory to the British administration in 1801.

Badaun was a British India town and district in the Rohilkhand division of the United Provinces in 1911. There were many girls' schools and a high school for males run by an American Methodist mission at the time.

Figure 1 Map of the district

1.2 ECONOMIC PROFILE OF BADAUN

The primary sector has a significant impact on the district economy because it contributes, on average, 34.05% share in the district GDP. Moreover, this sector's average annual growth rate from 2011-12 to 2018-19 is remarkably high (5.64%). However, its share decreased marginally from 33.93% in 2011-12 to 33.68% in 2018-19. The share of the secondary sector also decreased slightly from 22.86% in 2011-12 to 21.60% in 2018-19. The sector grew with an average annual growth rate of 4.98%. The tertiary sector occupies, on average, 43.14% share of the district economy. Moreover, the sector grew with an average annual growth rate of 5.74%, with its share increasing from 43.21% in 2011-12 to 44.72% in 2018-19. Overall, the district economy grew with an average annual growth rate of 5.27%. The growth in the secondary sector is less than in the other two sectors. Steps should be taken to increase the productivity of the secondary sector so that it can

grow at a higher rate. This will improve the growth rate of the overall district. The primary sectos has performed well during the study period.

Table 1: Trends in Gross District Domestic product in Badaun 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	3405.78	2294.07	4337.12	10036.97	-	-	-	-
	(33.93)	(22.86)	(43.21)	(100)				
2012-13	4064.72	2927.14	4647.37	11639.23	19.35	27.60	7.15	15.96
	(34.92)	(25.15)	(39.93)	(100)				
2013-14	4630.86	2541.96	4620.22	11793.04	13.93	-13.16	-0.58	1.32
	(39.27)	(21.55)	(39.18)	(100)				
2014-15	4050.93	2481.74	5194.00	11726.67	-12.52	-2.37	12.42	-0.56
	(34.54)	(21.16)	(44.29)	(100)				
2015-16	3725.69	2723.15	5499.78	11948.61	-8.03	9.73	5.89	1.89
	(31.18)	(22.79)	(46.03)	(100)				
2016-17	4206.92	3085.12	5693.69	12985.72	12.92	13.29	3.53	8.68
	(32.40)	(23.76)	(43.85)	(100)				
2017-18	4267.22	3098.29	5766.81	13132.33	1.43	0.43	1.28	1.13
	(32.49)	(23.59)	(43.91)	(100)				
2018-19	4797.78	3077.02	6370.83	14245.63	12.43	-0.69	10.47	8.48
	(33.68)	(21.60)	(44.72)	(100)				
Average Growth Rates					5.64	4.98	5.74	5.27

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, including the horticulture sector, grew at a significant average annual growth rate of 5.52% from 2011-12 to 2018-19. However, its share decreased slightly from 77.86% in 2011-12 to 75.25% in 2018-19, as the growth in other subsectors is more. On the other hand, the share of the livestock subsector increased from 16.74% to 21.01% in the same period as it grew, with a remarkable average annual growth rate of 10.14%. It shows the importance of livestock in Badaun 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 2.82% in 2018-19, but it grew with a significant average annual growth rate of 8.67%. The fishery & aquaculture subsector share is very minimal, around 0.91% in 2018-19, but it also grew with a remarkable average annual growth rate of 84.26% from 2011-12 to 2018-19. Mines and quarrying also recorded a remarkable average annual growth rate of 20.87%. 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: Trends in Gross District Domestic product from Agriculture and allied activities in Badaun 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	2619.80	563.40	176.53	5.19	3364.91	40.87	3405.78
	(77.86)	(16.74)	(5.25)	(0.15)	(100)		
	-	-	-	-	-	-	-
2012-13	3375.84	536.90	115.09	3.87	4031.70	33.01	4064.72
	(83.73)	(13.32)	(2.85)	(0.10)	(100)		
	[28.86]	[-4.70]	[-34.80]	[-25.29]	[19.82]	[-19.22]	[19.35]
2013-14	3573.12	810.33	187.30	4.57	4575.32	55.54	4630.86
	(78.10)	(17.71)	(4.09)	(0.10)	(100)		
	[5.84]	[50.93]	[62.74]	[17.99]	[13.48]	[68.25]	[13.93]
2014-15	2894.53	849.24	229.22	4.89	3977.87	73.06	4050.93
	(72.77)	(21.35)	(5.76)	(0.12)	(100)		
	[-18.99]	[4.80]	[22.38]	[6.89]	[-13.06]	[31.54]	[-12.52]
2015-16	2812.88	729.07	73.04	4.99	3619.97	105.71	3725.69
	(77.70)	(20.14)	(2.02)	(0.14)	(100)		
	[-2.82]	[-14.15]	[-68.13]	[2.07]	[-9.00]	[44.70]	[-8.03]
2016-17	3085.03	916.49	69.74	6.10	4077.37	129.55	4206.92
	(75.66)	(22.48)	(1.71)	(0.15)	(100)		
	[9.68]	[25.71]	[-4.52]	[22.37]	[12.64]	[22.54]	[12.92]
2017-18	2995.54	965.72	78.30	6.58	4046.14	221.08	4267.22
	(74.03)	(23.87)	(1.94)	(0.16)	(100)		
	[-2.90]	[5.37]	[12.28]	[7.83]	[-0.77]	[70.66]	[1.43]
2018-19	3564.57	995.12	133.70	43.31	4736.70	61.08	4797.78
	(75.25)	(21.01)	(2.82)	(0.91)	(100)		
	[19.00]	[3.04]	[70.76]	[557.96]	[17.07]	[-72.37]	[12.43]
Average Growth Rate	5.52	10.14	8.67	84.26	5.74	20.87	5.64

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 34.16% in 2018-19.

The share has decreased slightly over the years, but the average annual growth in this sector is 8.89%. This is because the growth in other subsectors is more. The share of the electricity, gas and water supplies subsector has increased from 2.97% in 2011-12 to 4.20% in 2018-19. Moreover, this subsector grew with a remarkable average annual growth rate of 9.82%. The share of the construction sub-sector decreased from 62.14% to 61.64% in the same period and the average annual growth rate is low (4.23%). This indicates that the secondary sector in Badaun is heavily dependent on the Manufacturing and construction sub-sector and the electricity subsector is also growing at a faster rate.

Within the tertiary sector, the Real estate subsector made up the highest share (29.83%) in 2018-19, followed by Trade & Hotel (26.05%), transport, storage and communication (11.07%) and public administration (9.50%). Average annual growth is observed highest in transport, storage and communication (9.50%), trade and hotel (6.35%), followed by public administration (5.13%), financial services (5.10%), and lastly lowest in the 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 financial services subsectors. Transport and Communication, and trade & hotel are the major contributors to the growth of the Tertiary sector.

Table 3: Trends in percentage share of non-agriculture sub-sectors in DGDP in Badaun 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	34.89	2.97	62.14	100.	9.36	25.71	6.32	31.39	13.66	13.55	100
2012-13	48.97	2.35	48.68	100	9.55	29.20	6.34	31.19	12.20	11.53	100
2013-14	40.27	3.18	56.56	100	8.12	32.29	6.65	32.68	8.03	12.23	100
2014-15	35.02	3.38	61.61	100	8.91	28.15	6.66	30.55	12.28	13.45	100
2015-16	37.67	3.69	58.64	100	11.99	25.87	6.55	29.74	11.94	13.90	100
2016-17	44.46	3.61	51.92	100	12.04	27.74	6.20	29.71	8.00	16.31	100
2017-18	38.79	4.10	57.11	100	11.99	24.90	5.51	31.39	9.23	16.98	100
2018-19	34.16	4.20	61.64	100	11.07	26.05	5.95	29.83	9.50	17.59	100

Average Growth Rates	8.89	9.82	4.23	4.98	9.50	6.35	5.10	4.89	5.13	10.15	5.74

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 4267.68 sq. km². The share of forest area in the total reported area increased from 1.01% in 2010-11 to 1.62% in 2017-18. The share of cultivable wasteland decreased from 0.78% in 2010-11 to 0.49% in 2017-18, which is a good indicator of development. The share of Barren and uncultivable land decreased from 2.16% in 2010-11 to 1.20% in 2017-18. The share of area under trees and gardens decreased from 1.66% in 2010-11 to 1.0% 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 82.23% in 2010-11 to 81.33% in 2017-18. The area for non-agricultural use increased over the period from 8.46% to 12.03% (Table 4). Overall, the land use pattern shows that the NSA has decreased while the land for non-agricultural use has increased over the years.

Table 4: Trends in Land-use Pattern in Badaun (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	425466	1.01	0.78	1.73	1.91	2.16	8.46	0.07	1.66	82.23
2011-12	426768	1.15	0.69	2.04	1.67	1.67	9.26	0.08	1.43	82.01
2012-13	426768	1.62	1.11	2.12	2.35	2.46	6.32	0.08	1.98	81.96
2013-14	426768	1.62	0.50	1.03	0.87	1.31	11.49	0.07	0.98	82.13
2014-15	426768	1.62	0.50	0.94	0.80	1.20	11.49	0.07	1.00	82.37

2015-16	426768	1.62	0.49	1.47	0.79	1.20	12.03	0.07	1.00	81.33
2016-17	426768	1.62	0.49	1.47	0.79	1.20	12.03	0.07	1.00	81.33
2017-18	426768	1.62	0.49	1.47	0.79	1.20	12.03	0.07	1.00	81.33
Source: Compiled from http://updes.up.nic.in/spiderreports/intialisePage.action										

2.1.2 Trends in Operational Land Holdings

In Badaun district, the total number of operational farms decreased from 581 thousand in 2010-11 to 504 thousand in 2015-16, a net decrease of 13.25%. 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 landholdings position in the district are marginal and small. These two size categories represented around 93.32% 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 Badaun

	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.)
Badaun	2010-11	77.84	14.92	5.86	1.31	0.05	581
	2015-16	79.45	13.87	5.39	1.23	0.05	504
							[-13.25]
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	0.10	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, and Bajra dominate the cereal crops of the district. Table 6 shows the cultivated area under various crops over the last eight years. In 2017-18, Wheat made up the highest share of GCA (41.51%), followed by Bajra (19.82%) and Rice (13.64%). Together these three crops constitute around 74.96% of the GCA. The area shared by the total cereals has decreased from 79.84% in 2010-11 to 76.78% in 2017-18. Urad is the main pulse produced, while the rest of the pulses are not significantly produced. The total pulse acreage has increased from 4.53% in 2010-11 to 4.64% in 2017-18. Thus, the food grains cover a majority (average, 80.51%) of the GCA. Mustard is the only major oilseeds crop produced, and the total oilseed acreage has decreased from 4.29% in 2010-11 to 3.52% in 2017-18. The area under Sugarcane and Potato has increased over the years.

In general, there is no significant change in the cultivation pattern during the study period, except that the NSA has decreased over the years, from 60.71% in 2010-11 to 55.04% in 2017-18. The average cropping intensity in the district is 176.46.

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

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	12.12	13.23	12.68	13.61	13.90	13.64	13.64	13.64
Wheat	45.03	40.04	37.72	39.89	42.30	41.51	41.51	41.51
Bajara	20.64	16.73	16.21	18.23	20.19	19.82	19.82	19.82
Other Cereals	2.05	1.86	1.41	1.64	1.86	1.82	1.82	1.82
Total Cereals	79.84	71.86	68.02	73.36	78.25	76.78	76.78	76.78
Urad	3.44	5.91	6.14	4.58	3.71	3.64	3.64	3.64
Other Pulses	1.09	0.96	0.87	0.79	1.02	1.00	1.00	1.00
Total Pulses	4.53	6.86	7.01	5.36	4.73	4.64	4.64	4.64
Total Foodgrains	84.37	78.73	75.03	78.73	82.98	81.43	81.43	81.43
Mustard	3.68	4.03	5.69	4.57	3.32	3.26	3.26	3.26
Other Oilseeds	0.61	0.46	0.48	0.32	0.26	0.26	0.26	0.26
Total Oilseeds	4.29	4.49	6.17	4.89	3.59	3.52	3.52	3.52
Sugarcane	3.78	3.83	4.37	4.42	4.17	4.09	4.09	4.09
Potato	2.23	2.07	1.96	2.05	2.34	2.30	2.30	2.30
Net Sown Area	60.71	57.90	56.78	56.46	56.81	55.04	55.04	55.04
Gross Sown Area (in 1000 Ha)	576.28	604.55	616.00	620.77	618.76	630.58	630.58	630.58
Cropping Intensity	164.72	172.72	176.12	177.11	176.02	181.67	181.67	181.67

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

ii- Trends in per hectare yield of principal crops

Table 7 shows that the per hectare yield of most crops varies across years. However, the yield for the major crops has decreased in the latter years of the study. It is a cause of concern as lesser yield results in less total production. Wheat, Rice and Bajara are the major crops and their per hectare yield (31.44 qtls, 17.61 qtls and 11.54 qtls, respectively, in 2017-18) are also high. Per hectare yield of total cereals has decreased from 33.20 qtls in 2010-11 to 23.51 qtls in 2017-18. Similarly, per hectare yield of total pulses decreased from 12.98 qtls in 2010-11 to 10.38 qtls in 2017-18. However, the yield of Pulses is less than that of cereals, following which the total production of pulses is less. The yield of total oilseeds has increased from 13.80 qtls in 2010-11 to 27.14 qtls in 2017-18. It can be due to the availability of hybrid seeds in the district. However, the fall in yield of most of the crops is not uniform. In some years, it has increased as well, but on average, the yield has decreased in the latter years of the study. The per hectare yield of Sugarcane is averaging 659.39 qtls/ha. Similarly, the yield of Potato is averaging 194.84 qtls/ha. In summary, all crop

yields show year-over-year fluctuations, with the lowest in 2014-15. The volatility in 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 Badaun District (Qtls)								
Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	20.75	21.33	22.82	22.01	20.56	14.31	17.24	17.61
Wheat	41.34	35.69	33.24	35.12	21.05	27.18	31.32	31.44
Bajara	23.62	17.12	18.62	18.98	17.13	16.09	14.08	11.54
Total Cereals	33.20	28.31	27.56	28.36	19.93	21.91	24.40	23.51
Urad	13.10	10.03	8.82	8.05	6.63	9.76	14.22	10.69
Total Pulses	12.98	10.54	9.53	9.04	7.55	9.82	14.71	10.38
Total Foodgrains	32.11	26.76	25.87	27.04	19.23	21.22	23.85	22.76
Mustard	15.48	13.16	14.95	12.73	12.21	16.53	20.67	28.74
Total Oilseeds	13.80	12.18	14.09	12.19	11.52	15.67	19.73	27.14
Sugarcane	646.60	628.40	580.16	613.00	590.04	560.75	742.33	913.87
Potato	234.45	198.74	177.35	175.83	199.15	288.91	136.57	147.74
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, Bajra, Sugarcane, and Potato dominate the production. In 2017-18, Rice (151.44 thousand tons), Bajra (144.24 thousand tons) and Wheat (822.87 thousand tons) formed a significant part of the total cereal production (1138.39 thousand tons). Coming to pulses, Urad occupies the highest production. Urad had a production of 24.54 thousand tons in 2017-18. Although there has been a significant variation in its production over the years, it still represents around 80% 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 59.11 thousand tons, which represented around 98% of the total oilseed production in 2017-18. Sugarcane is another important crop whose production has been significant in the district (2358.70 thousand tons in 2017-18). Potato production has also been significant over the years (213.90 thousand tons in 2017-18).

Table 7: Trends in Production of Principal Crops in Badaun District (in 1000 Tons)								
Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	144.91	170.60	178.25	185.95	176.81	123.03	148.24	151.44
Wheat	1072.88	863.96	772.35	869.48	550.97	711.50	819.78	822.87
Bajara	280.95	173.14	185.96	214.73	214.04	201.08	175.94	144.24
Other Cereals	28.90	22.22	18.05	21.26	23.21	25.33	37.62	19.84
Total Cereals	1527.63	1229.91	1154.61	1291.42	965.02	1060.94	1181.58	1138.39
Urad	25.95	35.82	33.34	22.88	15.22	22.41	32.65	24.54

Other Pulses	7.96	7.94	7.79	7.23	6.88	6.34	10.41	5.84
Total Pulses	33.91	43.76	41.12	30.11	22.10	28.74	43.06	30.37
Total Foodgrains	1561.54	1273.67	1195.73	1321.52	987.12	1089.68	1224.64	1168.77
Mustard	32.82	32.07	52.42	36.13	25.12	33.99	42.52	59.11
Other Oilseeds	1.26	1.00	1.14	0.89	0.46	0.80	1.30	1.15
Total Oilseeds	34.09	33.07	53.56	37.01	25.58	34.80	43.81	60.26
Sugarcane	1407.40	1453.99	1560.11	1680.42	1522.89	1447.29	1915.94	2358.70
Potato	300.90	248.11	214.66	224.13	288.33	418.29	197.72	213.90
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

iv- 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. In the case of variability in the area under different crops, we observe it the lowest in wheat (4.53%), followed by Rice (7.09%) and Sugarcane (7.50%) and the highest in Urad (24.95%). The variability in the area under total pulses (19.30%) is higher than the area under total cereals (5.54%). Since Rice and Wheat dominate the production, the variability in the area under total food grains is, therefore, also relatively low (4.12%).

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	82.05	5.81	7.09	159.90	21.40	13.39	19.58	2.90	14.82
Wheat	253.57	11.48	4.53	810.47	148.34	18.30	32.05	6.05	18.87
Bajara	116.62	10.79	9.25	198.76	40.64	20.45	17.15	3.57	20.83
Total Cereals	463.21	25.67	5.54	1193.69	167.77	14.05	25.90	4.27	16.47
Urad	26.70	6.66	24.95	26.60	6.89	25.91	10.16	2.52	24.75
Total Pulses	32.65	6.30	19.30	34.15	7.80	22.83	10.57	2.27	21.50
Total Foodgrains	495.86	20.40	4.12	1227.83	170.63	13.90	24.86	4.01	16.12
Mustard	23.91	5.30	22.17	39.27	11.39	29.01	16.81	5.52	32.86
Total Oilseeds	26.13	5.66	21.65	40.27	11.56	28.70	15.79	5.29	33.47
Sugarcane	25.31	1.90	7.50	1668.34	323.78	19.41	659.39	116.94	17.74
Potato	13.51	1.06	7.82	263.25	72.64	27.59	194.84	48.89	25.09
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 Mustard

(29.01%), followed by Potato (27.59%), Urad (25.91%), Bajra (20.45%), and Sugarcane (19.41%). 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 cost of seeds and non-availability of hybrid seeds. Improvement in crop insurance conditions and better market accessibility can lower this variation. Variability in production is lowest in Rice (13.39%), followed by Wheat (18.30%) and Sugarcane (19.41%).

In the case of yield, the greatest variability is estimated in Mustard (32.86%), Potato (25.09%), and Urad (24.75%). Yield variabilities in total cereals (16.47%) and total food grains (16.12%) are lower as compared the total pulses (21.50%). Rice, Wheat, 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 cereals and total food grains, on average, have a relatively larger share in GCA than their share in VOP, while total oilseeds, Potato, and Sugarcane have, on average, a greater share in VOP than GCA. Badaun is mainly a food grain production district; therefore, food grains account for around 80.51% of the gross area of the crops. Similarly, total foodgrains account for nearly 68.36% of the total value of the agricultural product. Three crops - Wheat, Paddy, and Potato together accounted for, on average, around 56.69% of GCA and 63.44% of the total VOP. Overall, the total agricultural GCA has increased in the latter years of the study (average, 616.01 thousand hectares). The total value of the product has also increased significantly, that is, 2477.79 Cr. Rs. in 2010-11 to 3608.05 Cr. Rs in 2017-18.

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

Crop	% Share in	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Wheat	GCA	45.03	40.04	37.72	39.89	42.30	41.51	41.51	41.51
	VOP	49.19	44.86	41.15	45.19	32.70	36.83	37.82	41.05
Paddy	GCA	12.12	13.23	12.68	13.61	13.90	13.64	13.64	13.64
	VOP	9.54	11.17	12.73	12.65	15.09	10.33	13.68	13.43
Total Cereals	GCA	79.84	71.86	68.02	73.36	78.25	76.78	76.78	76.78
	VOP	70.36	63.41	61.81	68.07	57.97	55.68	60.04	61.31
Total Pulses	GCA	4.53	6.86	7.01	5.36	4.73	4.64	4.64	4.64
	VOP	6.04	6.11	5.47	4.09	5.52	6.16	9.16	5.66
Total Food Grains	GCA	84.37	78.73	75.03	78.73	82.98	81.43	81.43	81.43
	VOP	76.40	69.52	67.28	72.16	63.49	61.84	69.20	66.97
Total Oilseeds	GCA	4.29	4.49	6.17	4.89	3.59	3.52	3.52	3.52

	VOP	3.95	4.45	5.90	3.97	3.33	3.97	5.22	6.42
Potato	GCA	2.23	2.07	1.96	2.05	2.34	2.30	2.30	2.30
	VOP	5.56	8.92	10.42	7.21	14.71	17.99	6.99	8.30
Sugarcane	GCA	3.78	3.83	4.37	4.42	4.17	4.09	4.09	4.09
	VOP	13.63	16.45	15.86	16.66	18.47	16.20	18.56	18.30
Paddy + Wheat + Potato	GCA	59.38	55.34	52.36	55.55	58.54	57.44	57.44	57.44
	VOP	64.29	64.95	64.30	65.05	62.49	65.15	58.49	62.78
Total Agriculture	GCA (1000 Ha)	576.28	604.55	616.00	620.77	618.76	630.58	630.58	630.58
	VOP (in Cr Rs)	2477.79	2474.78	2852.78	2924.31	2473.82	2859.28	3251.16	3608.05
Source: Compiled from 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 nitrogen to phosphorus and potassium ratio is 4:2:1, which is not maintained in the district. For example, in 2010-11, nitrogen represented 79.73% of the total fertilizers used, while the proportions of phosphorus and potassium were 16.12% and 4.15%, respectively. In 2017-18, however, the nitrogen share decreased to 71.97%, while the phosphorus share increased to 23.26%, and the potassium share increased to 4.77%. 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 across years, which can be due to several factors, including rainfall and cultivation patterns, etc. The overall use of chemical fertilizers has decreased in the district from 139.96 kg/ ha GSA in 2010-11 to 130.55 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 the chemicalization of agriculture degrades soils and water resources and creates non-point source pollution in water bodies.

Table 11: Trends in Use of Chemical Fertilizers in Agriculture (Kgs/per ha GSA)

Fertilizer/ Year	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18
Nitrogen	111.59	112.25	116.85	114.16	121.93	111.15	109.11	93.96
Phosphorous	22.57	34.12	35.07	29.17	35.15	41.64	42.66	30.37
Potassium	5.80	14.32	3.73	4.00	7.18	7.62	8.99	6.22
Total	139.96	160.70	155.65	147.33	164.26	160.42	160.76	130.55
Gross Sown Area (Ha)	576284	604545	615995	620771	618755	630575	630575	630575
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 increased from 10 kms in 2010-11 to 11 kms in 2018-19. The number of Government tube wells decreased from 1367 in 2010-11 to 1225 in 2018-19. Shallow, Medium and Deep tube wells increased by 2.82%, 30.24%, and 107.03%, respectively, in 2018-19 compared to 2010-11. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 91.11% and 74.04%, 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 (KM)	10	10	10	10	10	11	11	11	11
No. of Govt. Tube wells	1367	1221	1221	1209	1209	1201	1225	1225	1225
Shallow Tube well	106814	82905	84165	84635	85816	109448	109730	109830	109830
Medium Tube well	205	201	205	244	289	260	267	267	267
Deep Tube well	128	169	177	241	321	243	261	265	265
% of NIA	86.36	74.42	96.18	96.54	97.11	92.76	92.76	92.76	-
% of GIA	72.53	74.08	74.98	74.92	74.68	73.70	73.70	73.70	-

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

ii- Source wise area under irrigation

Groundwater (GW) irrigation is the main source of irrigation in the district. The share of wells and tube wells in NIA (average, 95.61%) has decreased over the years. But, still, the district is heavily dependent on the groundwater for irrigation, and it can have serious environmental issues if such a pattern continues in the long run.

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

Source/Year	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18
Wells And Tube-wells (GW Irri.)	98.89	91.05	94.95	97.56	96.94	95.17	95.17	95.17
Others	1.11	8.95	5.05	2.44	3.06	4.83	4.83	4.83
NIA (1000 ha)	302.13	260.48	336.39	338.40	341.36	321.95	321.95	321.95

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

iii- Crop wise irrigated area

Table 14 shows that a majority area under Rice (average, 99.94%), Wheat (average, 100%), Potato (average, 100%), and Sugarcane (average, 99.60%) is irrigated. The percentage of irrigated under pulses (average, 13.05%) and oilseeds (average, 90.68%) is relatively less.

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

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	99.58	100	100	99.93	100	100	100	100
Wheat	100	100	100	100	100	100	100	100
Total Cereal	72.15	74.93	74.72	73.82	73.86	73.86	73.86	73.86
Total Pulses	14.80	8.78	8.78	10.38	15.42	15.42	15.42	15.42
Total Foodgrains	69.07	69.16	68.56	69.50	70.53	70.53	70.53	70.53
Total Oilseeds	84.63	88.61	91.52	92.85	91.95	91.95	91.95	91.95
Sugarcane	99.10	98.85	99.23	99.60	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 121.32 KWH in 2014-15 to 238.91 KWH in 2019-20, a net increase of approximately 96.92%. It is a cause of concern as this can result in an increased burden on non-renewable resources and create problems for waste disposal. The percentage share of the agriculture sector (average, 58.23%) 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, 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)	121.32	103.99	151.29	195.56	197.2	238.91
% Of electricity consumed in Agriculture sector to total consumption	56.14	56.92	57.06	60.51	58.99	59.76

Source: Compiled from District-wise Development Indicators file.

2.1.8 Status of Agriculture Market

Table 16 shows the marketing infrastructure in the district. It has eight main markets and eight sub-markets. The number of regulated mandis per lakh hectare of NSA has increased from 3.99 in

2013-14 to 4.61 in 2018-19, which is a good sign. However, it is still very important to further increase the number of regulated mandis so that farmers may sell their products efficiently.

Table 16: Status of Agriculture Markets in Badaun

Category/Year	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19	2019 -20
Main Markets (No.)	8	8	8	8	8	8	8
Submarkets (No.)	6	6	6	6	6	8	8
Total Markets (No.)	14	14	14	14	14	16	16
No. of Regulated mandis per lakh Ha. of net area sown	3.99	3.75	-	2.3	2.28	4.61	-

2.1.9 Status of Organic Farming

To promote sustainable agricultural practices and improve the farmers' livelihood, the Government of India launched PKVY and the Namami Gange schemes. Under these schemes, farmers are incentivized to form organic farming groups 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 years of the conversion period.

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 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. 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 Paramparagat Krishi Vikas Yojana in the district. The district has 89 groups in seven development blocks. The highest number of groups are in Usawan (26), followed by Ujhani (21), Sahaswan (19), Dahgavan (11), Qadar chowk (10), Asafpur (1), and Jagat (1). Significantly high variation can be seen in the number of farmers per group. 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.

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

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	Asafpur	PKVY	1	50	50	50	0
2	Dahgavan	PKVY	11	371	33.72	32	7.7
3	Jagat	PKVY	1	40	40	40	0
4	Qadar Chowk	PKVY	10	359	35.9	38	9.15
5	Sahaswan	PKVY	19	508	26.73	24	5.9
6	Ujhani	PKVY	21	748	35.61	37	6.98
7	Usawan	PKVY	26	801	30.8	31	6.53
8	District Total	PKVY	89	2877	32.32	32	7.84
		Total	89	2877	32.32	32	7.84

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

Since per hectare use of chemical fertilizer is quite high, a gradual shift of farmers from conventional to organic farming systems is likely to positively impact water quality, soil health, and farming sustainability. However, being a knowledge-intensive farming system, 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 and regulation needs to evolve 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 generally practice organic farming only on a small part of their land (about 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 male cattle has decreased considerably from 221358 in 1997 to 50099 in 2019, but the number of exotic male cattle has increased from 8119 in 1997 to 15273 in 2019. However, on the other hand, the number of indigenous and exotic female cattle has increased considerably from 138806 in 1997 to 162069 in 2019 and from 6601 in 1997 to 52349 in 2019. Thus, the total number of cattle decreased only slightly from 374884 in 1997 to 279790 in 2019, thus, a net decrease of 25.36%. 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 120.40% 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 (13.76%) in 2019 as compared to that in 1997, but during the same period, the population of exotic sheep increased. Still, the total sheep population decreased by 9.78%. The total population of goats decreased from 230506 in 1997 to 176402 in 2019, a net decrease of 23.47%. The total pig population decreased considerably from 48212 in 1997 to 8327 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 19.57% share in the agriculture and allied activities sector and grew at a significant average annual growth rate of 10.14% from 2011-12 to 2018-19.

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

	Category	1997	2003	2007	2012	2019
Indigenous Cattle	Total Male	221358	222601	165813	116789	50099
	Total Female	138806	139191	190344	121444	162069
	Total	360164	361792	356157	238233	212168
Exotic Cattle	Total Male	8119	4861	5849	7787	15273

	Total Female	6601	6729	8418	15956	52349
	Total	14720	11590	14267	23743	67622
Total Cattle		374884	373382	370424	261976	279790
Buffalo	Total Male	133420	185920	217656	208978	103828
	Total Female	368918	535855	533377	593034	1003342
	Total	502338	721775	751033	802012	1107170
Sheep	Total Indigenous Sheep	12826	10853	10722	13726	11061
	Total Exotic Sheep	1403	288	171	185	1776
	Total Sheep	14229	11141	10893	13911	12837
Goat	Total	230506	231831	243514	205595	176402
Pig	Total Indigenous Pig	40440	25440	4245	16700	7591
	Total Exotic Pig	7772	4104	4226	2065	736
	Total Pig	48212	29544	8471	18765	8327
Total Livestock		1183252	1380072	1392293	1312444	-
Total Poultry		111137	85542	100234	228965	-
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 Badaun 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 (26), cattle development centres (40), and man-made reproduction centres (6) have remained constant over the years. There are very few development centres for sheep (1) and pig (2), which might be one of the reasons for the declining sheep and pig population in the district.

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	26	26	26	26	26	26	26	26	26
D- category Cattle Dispensary	4	4	4	4	4	4	4	4	4
Cattle Development Centre	40	40	40	40	40	40	40	40	40
Man-Made Reproduction Centre	6	6	6	6	6	6	6	6	6
Sheep Development Centre	1	1	1	1	1	1	1	1	1

Pig Development Centre	2	2	2	2	2	2	2	2	2
Source: http://updes.up.nic.in/spiderreports/intialisePage.action									

2.3 Forestry

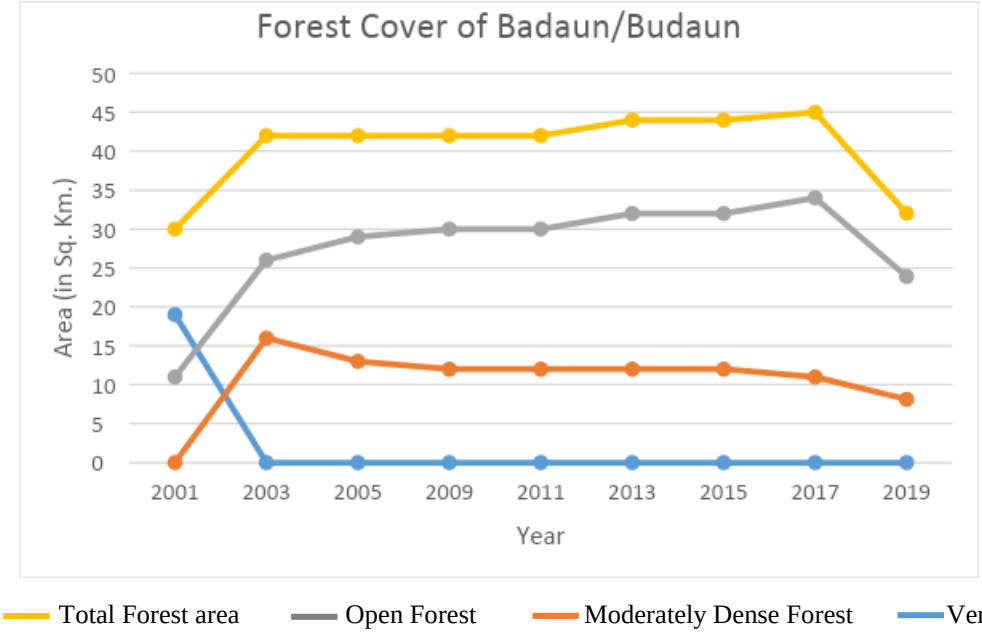


Figure 1 ISFR (2001-2019)

According to Forest Survey of India assessment reports, there's no major forest found in the Badaun district, the total forest cover is approx.. 32 Sq. Km. (ISFR 2019). There is no extent of

very dense forest. Majorly open forest, followed by moderately dense forest are found in the region.

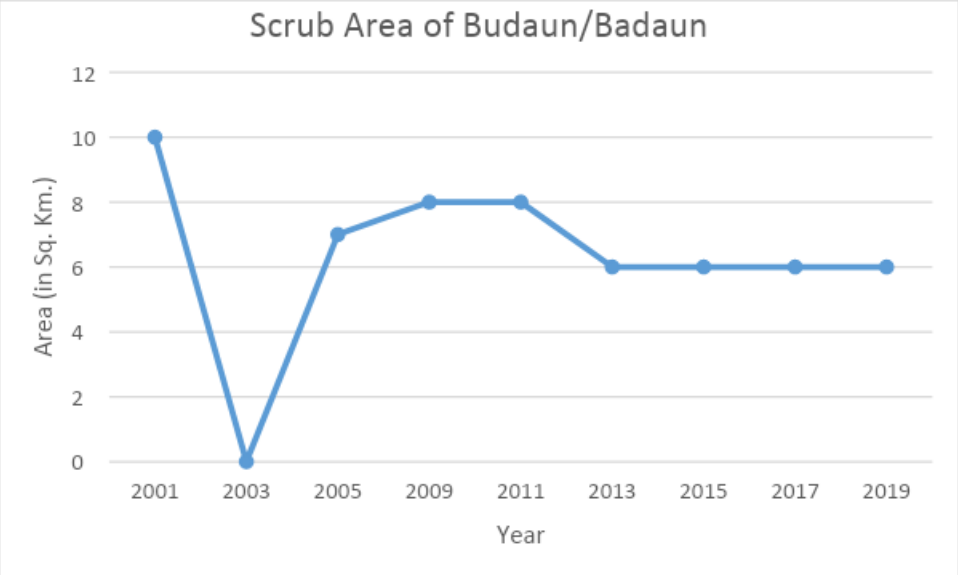


Figure 2 ISFR (2001-2019)

Between 2001 and 2019, the scrub area has decreased from 10 Sq. km. to 6 Sq. Km.

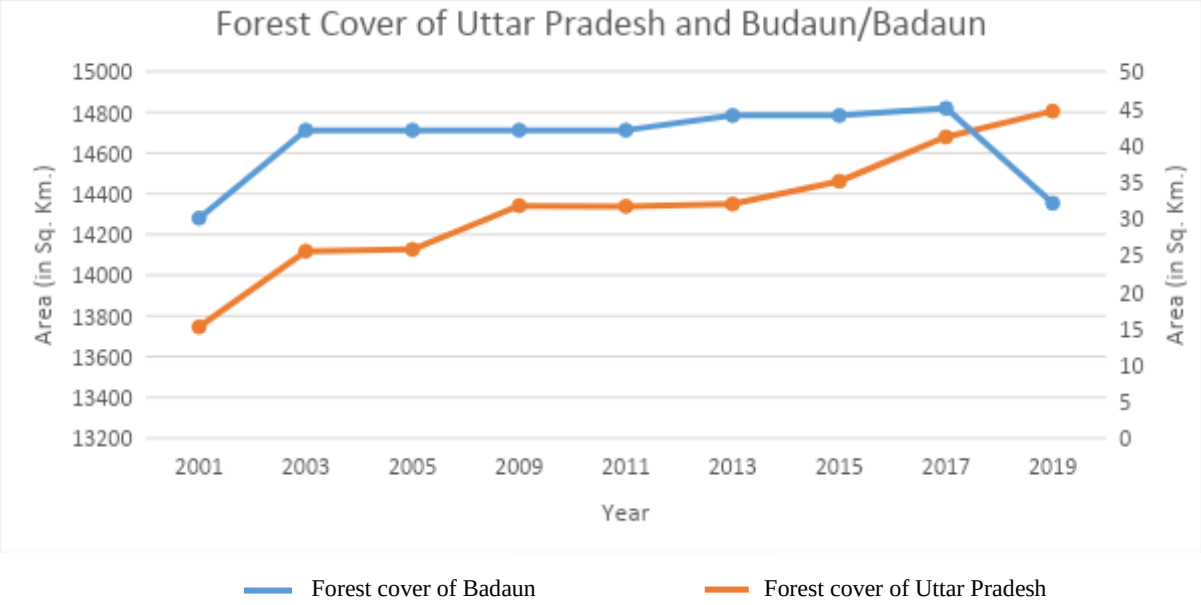


Figure 3 ISFR (2001-2019)

Between 2001 and 2019, the forest cover of Uttar Pradesh has increased, and the forest cover of Badaun has increased, but at a slow rate between 2001 and 2017, and it decreases by approx.. 28 % of total forest cover compared to the preceding assessment.

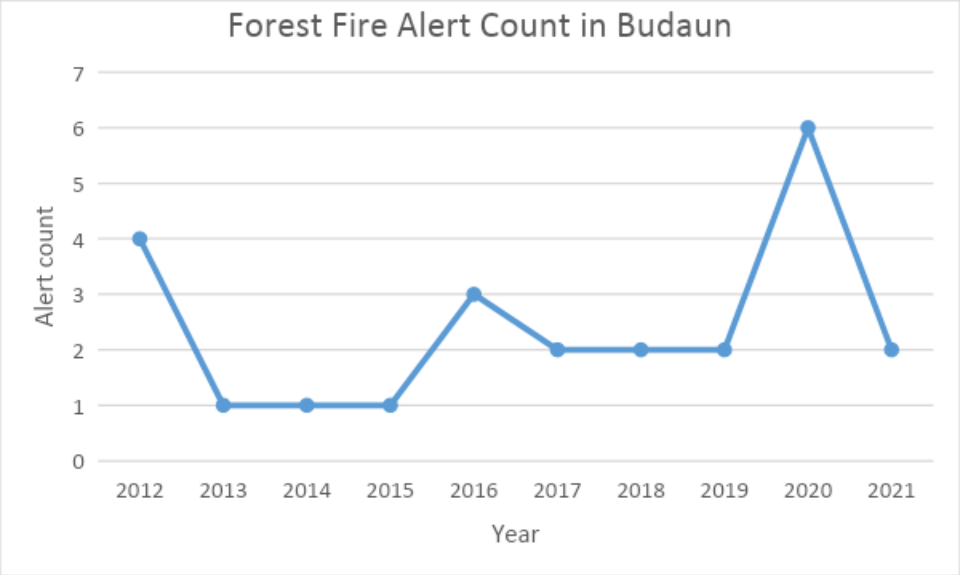


Figure 4 Forest Fire Alerts
Source: Global Forest Watch

In Badaun, the peak fire season typically begins in mid-November and lasts around 24 weeks. There were 4 VIIRS fire alerts reported between 5th Oct 2020 and 27th Sep 2021 considering high confidence alerts only. This is high compared to previous years going back to 2012[1].

2.3.1. Biodiversity

The district's biodiversity data 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 decreased by 12.96 in 2019. A study was conducted in 2011 to observe the diversity of plant species in the district. Over the course of the investigation, 58 species from 32 families were identified, including 34 trees, 19 shrubs, 3 herbs, and 2 grasses[2].

Table 3 Bird species recorded in the district

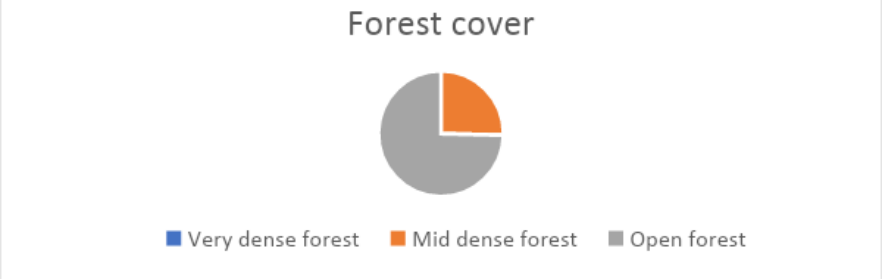
Number of species	378
Number of rare/accidental species	6

Forest cover (in sq. km.)

[1] https://www.globalforestwatch.org/dashboards/country/IND/

[2] [Hukum Singh, Amit Verma, Rajesh Kumar, Bhavana Joshi and Desha Meena. Diversity of Woody and Non Woody Forestry Species in Badaun District of Uttar Pradesh, India]. Researcher. 2011;3(12):1-7]. (ISSN: 1553- 9865). http://www.sciencepub.net

Geographical area	Very dense forest	Mid dense forest	Open forest	Total	% of Geographical area `	Change with respect to 2017 assessment	Scrub
5168	0	8.13	23.91	32.04	0.62	-12.96	6.00



2.4 Tourism

Domestic/foreign visitors in different years in Badaun

	Indian	Foreign	Total	% Change
2015	1992055	281	1992336	
2016	2152716	306	2153022	0.08065205869
2017	2443184	327	2443511	0.1349215196
2018	2528865	402	2529267	0.03509540166
2019	2614819	469	2615288	0.03401024882

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

a. The above-given data table-1 is taken from the Uttar Pradesh tourism website. The data table shows the number of tourists visiting Badaun for tourism from 2015 to 2019. The tourist visits are bifurcated into two different groups – Domestic and Foreign tourists.

b. In the year 2015 Badaun received a total **1992336** tourists out of which 0.014% were international visitors. Total number of Domestic travellers were 1992055 and total international travellers were 281.

c. In the year 2016 Badaun received a total **2153022** tourists out of which 0.0142% were international visitors. Total number of Domestic travellers were 2152716 and total international travellers were 306. The district experienced a total growth of 0.080 % in total number of tourists compared to the previous year.

d. In the year 2017 Badaun received a total **2443511** tourists out of which 0.0133% were international visitors. Total number of Domestic travellers were 2443184 and total international travellers were 327. The district experienced a total growth of 0.13% in total number of tourists compared to the previous year.

e. In the year 2018 Badaun received a total **2529267** tourists out of which 0.0158% were international visitors. Total number of Domestic travellers were 2528865 and total international travellers were 402. The district experienced a total growth of 0.035% in total number of tourists compared to the previous year.

f. In the year 2019 Badaun received a total **2615288** tourists out of which 0.0179% were international visitors. Total number of Domestic travellers were 2614819 and total international travellers were 469. The district experienced a total growth of 0.034% in total number of tourists compared to the previous year.

Data analysis

- From table-1 it is evident that the number of total tourists in Badaun increased from 2015 to 2019.
- The Badaun tourism encountered the highest percentage change in tourists in the year 2017, which was 0.13% increase compared to previous year.
- The growth in the number of total tourists in Badaun is not constant in these years, although the range lies less than 1% which is very less.

2.5 Wetlands

The district is known for a large number of small and medium wetlands. This district is known for some lakes like Abra Lake (15.6 Ha). Table 1 represents the number of wetlands and their area representation in the district. Around 372 wetlands are greater than 2.25 Ha and 913 less than 2.25 Ha areas. The region consists of wetlands generally less than 200 Ha in the area, and there are around 2 wetlands with size for than 200 Ha and 1 above 500 Ha.

Table 1: Wetland Data of Badaun 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	37	45	8	0	14	9	8	3	3	0	0	0	17
Ox-bow lakes/cut off meanders	50	57	7	0	5	16	15	12	2	0	0	0	18
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	42	59	17	0	1	5	7	11	15	2	1	0	15

Waterlogged	60	68	8	0	19	14	16	7	4	0	0	0	31
River/Stream	0	85	85	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	1	0	0	0	0	0	0	0	0
Tanks/ponds	24	25	1	0	19	3	2	0	0	0	0	0	4
Waterlogged	31	32	1	0	15	10	5	1	0	0	0	0	3
Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (1285)	**245**	**372**	**127**	**913**	**74**	**57**	**53**	**34**	**24**	**2**	**1**	**0**	**88**

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

- The district comprises 1285 wetlands, which are waterlogged and ox-bow lakes.
- The wetland size is small and medium-sized in general.
- The number of natural wetlands is more than man-made.
- Many wetlands (man-made and natural) are waterlogged.
- Many wetlands have aquatic vegetation.

2.6 Energy

2.6.1. 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. Various capacity solar power plants are being installed for electricity generation from solar energy. According to the 2011 census, the majority of households in the district, i.e. 81%, depend on kerosene for lighting purposes followed by 18% using electricity and only 0.25% using solar (Fig.1).

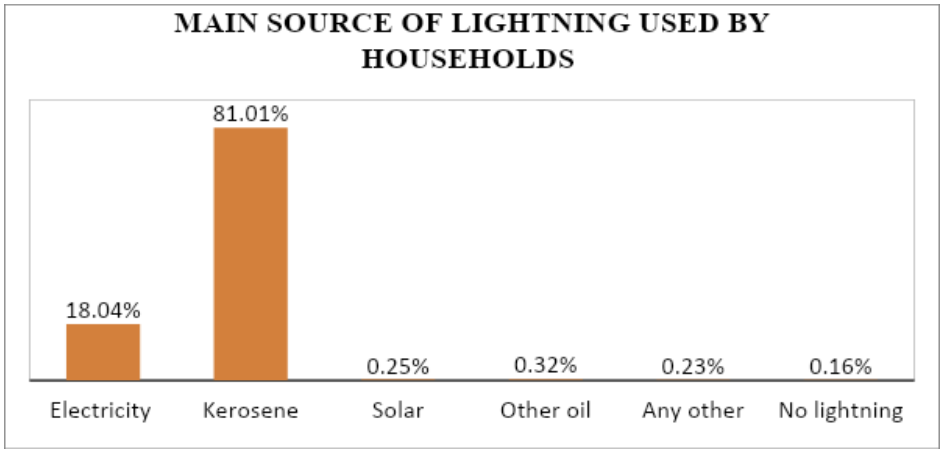


Fig. 1

There is no specific data available giving an account of the installed plants or units generating power from solar energy in the district.

2.6.2. Biomass

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 main source of income for the district Badaun is agriculture. With 172.21% of the cropping intensity, the district's net sown area is 417063ha and gross sown area is 718ha. There is 15096 ha of current fallow land and 5350 ha of cultivable waste land. The productivity of the major crops in the district has been recorded as – rice: 2008 kg/ha, wheat: 3197 kg/ha, sugarcane:63316 kg/ha, maize: 1868 kg/ha, and pearl millet: 1890kg/ha. The crop residue used as fodder has also been recorded for the district as 168905 tons from rice, 1048790 tons from wheat, 257100 tons from sugarcane, 3192 tons from maize and 162420 tons from pearl millet. According to Kumar et. al. (2017). Badaun has fairly good agro residue potential and forest & wasteland potential as 1736.3 kT/Yr and 5.6 kT/Yr of biomass is generated in the district respectively. Biomass gasifiers have been reported in the districr at Madhur food industries;Tikaitganj and Shree Ram Rice mill; Dataganj. According to the 2011 census, a very few households, approximately 10%, use LPG/PNG for cooking. 46.74% use cow dung cakes, 30.95% use firewood and 11.19% use crop residue as fuel for cooking.

The above discussed facts and figures indicate that Badaun has a good potential of biomass energy production, the need is to develop infrastructure and policies in such a way that they encourage setting up of biomass plants.

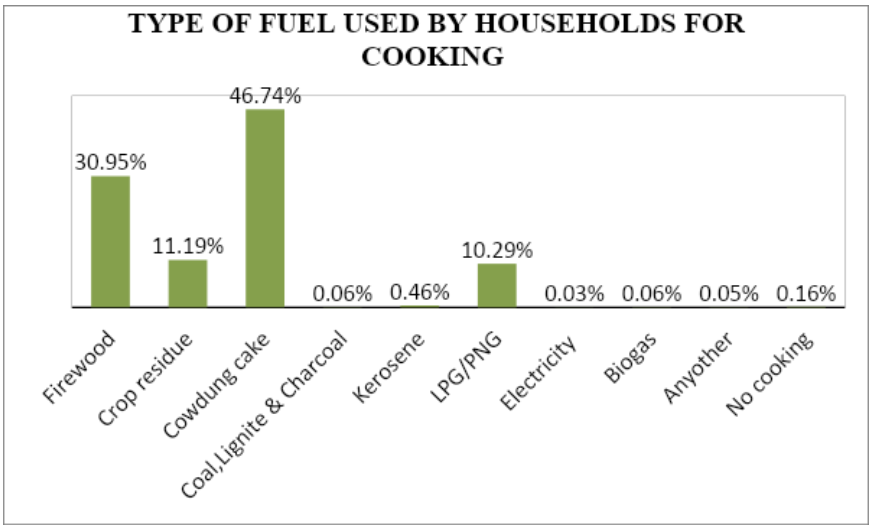


Fig. 1

2.6.3. Biogas

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 calculated as 32,717,974.97 m^3/year and 5,78,873,393.7 m^3/year. This amount of biogas generation can efficiently complete the energy demand of the district.

2.6.4. Hydro Power

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.

3 QUALITATIVE DATA ANALYSIS

3.1 AGRICULTURE, ALLIED ACTIVITIES

3.2 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).[3]

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 the 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.[4]

3.2.1. Biodiversity - Important land covers in the district including forest area, pastures and total area. Also, net sown area, gross sown area and area sown more than once are also sown. NSA is around 82% of the total district area which is highest among other districts. Primary focus by the government should be on employment generation and energy solutions in the agriculture sector.

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

[4] State Action on Climate Change, Uttar Pradesh

This is a high grain and high sugarcane producing district. Average grain crops in the decade went up to 12 lakh tonnes. High sugarcane means high availability of bagasse and bagasse-based biogas plants should be set up. Also, gasification aspects of bagasse should be experimented upon in the district. Cattle population showed a decline of 29% in the district in 2012 and buffalo population increased by 6% in the same year. Sheep and goat populations do not show many fluctuations in the decade. Chicken population almost doubled in the decade and other poultry birds are just 4% of the chicken population.

3.3 ENERGY

As per the data of the year 2013, Badaun district energy consumption is around 598 TJ/year and 3.8 GJ/capita/year. GHG emission of 40768 Ton CO_2 equivalent and 0.256 Ton CO_2 equivalent/capita has been evaluated for the district.

3.2.1. Solar

Currently the district is showing a progressive trend in the solar energy sector. Quite a few business groups have proposed to invest in solar energy in the district. A news article in Business Standard with the heading 'Adani Green Energy commissions 100 MW solar project in Uttar Pradesh' reports ASE4PL, a subsidiary of Adani Green Energy, commissioned 100 MW (2x50 MW) Solar Power Plants at Jalalabad in Shahjahanpur district and Sahaswan in Badaun district of Uttar Pradesh. Both the plants have Power Purchase Agreements (PPAs) with Uttar Pradesh Power Corporation (UPPCL) at Rs. 3.22/kWh and 3.19/kWh, for a period of 25 years.

Another article in Saur Energy International reads 'SolarArise commissions 75MW Solar Plant in Uttar Pradesh'. According to the article Thomas Lloyd, an investor in Gurugram based SolarArise announced that SolarArise India Projects has commissioned a 75 Megawatt (MW) solar PV plant in Khera village, Badaun District, Uttar Pradesh. Jakson Limited was given the mandate to build by SolarArise. The new solar plant operates under Talettutayi Solar Projects Five Private Limited has a 25-year Power Purchase Agreement (PPA) with the state government Uttar Pradesh Power Corporation Limited (UPPCL). The plant is expected to generate approximately 120 million kilowatt-hours per year of clean energy in Uttar Pradesh. Tony Coveney, Managing Director, Co-Head of Infrastructure Asset Management at ThomasLloyd said: "This new solar energy plant will provide clean energy to more than 100,000 people in the Uttar Pradesh region. This development is in line with the ThomasLloyd ethos of investing in projects that have a positive impact on the environment, society and communities. We are proud to be part of another project that realises the universal goal for a clean-energy future.

3.2.2. Biomass

The district Badaun has a good potential of producing biomass energy as it has a good amount of raw materials available in the form of crop residues of rice, wheat, sugarcane, etc. The reason why the district lags in biomass energy production is because of lack of awareness. Because there is

production of rice and sugarcane on a large scale but there is no proper utilisation of the crop residue in the district. Hence the problem of stubble burning also persists.

HPCL proposes to set up a Second generation (2G) Ethanol bio-refinery at Badaun, U.P. HPCL is in the process of acquiring 20 ha (50 Acres) from UPSIDC on a long term lease in the Village Sainjani, Tehsil-Dataganj, District Badaun. The estimated production capacity of the project is 2G Ethanol – 100 KLD and other By-products. The total project cost for the Proposed Installation of 2G Ethanol bio-refinery is around Rs. 865 crores. This includes the cost of land and land development, on lease from UPSIDC as per lease rentals/terms & conditions. The proposed project also helps in reducing one of the serious issues with respect to the environment. i.e. stubble burning of harvested crops, additionally, income for the farmers through purchase of their agriculture residues. Thus, the project acts positively in reducing the CO_2 emissions generated due to the burning of ligno cellulosic based agri waste (i.e. paddy & rice straw etc.). Further an article in Echemi.com mentions that Praj bags a contract from HPCL for a 2G ethanol plant in UP.

Initiatives have been taken to utilize the crop residue from paddy fields but the residue from sugarcane fields needs also to be managed. Not only 2G ethanol but attention should also be paid on power production by using the biomass produced.

3.2.3. Biogas:

A compressed biogas (CBG) facility will be built at Badaun in Uttar Pradesh by Hindustan Petroleum Corporation Limited (HPCL), a central public sector enterprise. The PSU has entrusted the plant's construction to a private business located in Pune. The facility will be able to process 35,000 tonnes of rice straw as a feedstock, resulting in 5,250 tonnes of compressed biogas. Agricultural waste, sugarcane press mud, and municipal trash are decomposed anaerobically to generate compressed biogas, or CBG. It may be used as a vehicle's fuel.

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.

3.4 TOURISM

- *How to Reach*

Roadways Bus Route : The Badaun district is well connected to other Uttar Pradesh cities by road. Meerut Badaun State Highway connects Meerut, Hapur, Guaothi, Bulandshahr, Shikarpur, Dibai. Narora and Badaun. The Uttar Pradesh State Road Transport Corporation's bus stop is also located here. Bus services are offered on a regular basis for cities like Delhi, Aligarh, Shahjahanpur and Bareilly.

Indian Railway Route: There are regular trains from other major cities of the country to Badaun. Badaun railway station is well connected to Ujhani, Bareilly, Gonda, Soron, Bahraich, Ramnagar, Agra, Pilibhit, Kasganj, Lakhimpur, Sitapur, Gola Gokarannath, Tanakpur etc.

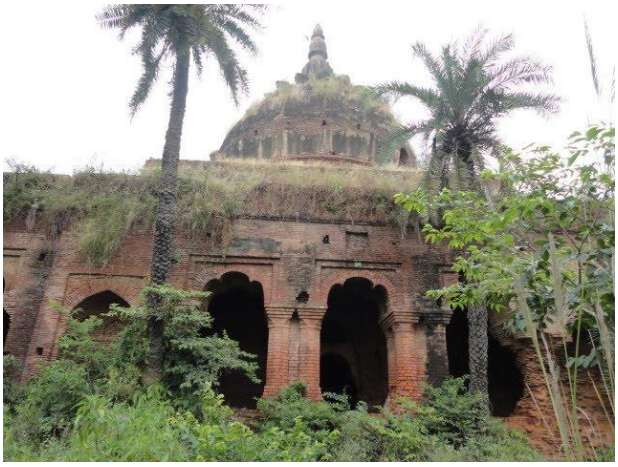
Airway Route: The nearest airport is Kheria Airport Agra, which is 149 kilometres distant from Badaun, the next closest airport is Gwalior Airport, which is 220 kilometres away. In both airports, daily flights to Delhi are available.

Cities Near Badaun

There are a few big cities in Uttar Pradesh that are near to Badaun including Agra, Aligarh, Bareilly. A huge city has a population of at least 200,000 people, and tourists can usually fly into one of the main airports by finding the nearest airport to Badaun, India if you need to book a flight. Tourists can also check for cities 4 hours (or 3 hours, 2 hours, or 1 hour) away from Badaun, India, or just search for cities near Badaun, India in general. Major cities in Uttar Pradesh are approximately 150-200 km from Badaun. This includes Bareilly which is 51 kilometres away and Mathura which is 165 and Delhi is 234 kilometres away from Badaun. The famous city of Tag, Agra is 172 kilometres away.

Places to see in Badaun-

- **Mausoleum-** Mrs Parwar Bano, Mougal Empress Mumtaj Mahal's sister, is buried in the Mausoleum, Shekhupur district of Badaun.



Source: Badaun.nic.in

- **Roza -** In 1094 Hijri, Roza Ikhlas Khan was built (1690). This Roza is 152 feet long and 150 feet wide, and it is made of bricks. This tomb is a well-known Mughal structure. In memory of her husband, Nawab Ikhlas Khan's wife built a Roza (Ikhlas Khan). Ikhlas Khan's Roza is what it's called. This monument in Badaun district is a tiny duplicate of the Taj Mahal, which was built by the widow of Nawab Ikhlas Khan, the administrator of Bengal during the reign of Aurangzeb. "After the death of Ikhlas Khan in 1071 hizri (1660-1661 AD), his widow had the monument created in his memory," Shadab Zaki, a writer with a PhD in Badaun's local history, remarked. Khan's wife was Shahjahan's distant

cousin." Khan's grandfather, Qutubuddin, was a cousin of Jahanagir, the fourth Mughal emperor who reigned from 1605 to 1627, according to Zaki. The mausoleum of Ikhlas Khan has been declared a protected monument by the Archaeological Survey of India (ASI). The tomb is located in Jawaharpuri, Badaun district, and contains the mortal remains of Ikhlas Khan, his wife, and their son Shahwaz Khan in five graves. The identities of the other two people buried here are unknown to historians. It's a different storey that this mausoleum did not achieve the same level of fame as the Taj Mahal. When Ashoka The Great visited the region around 240 BCE and dubbed it BudhhMau, he built the Badaun Fort in the ancient city of Badaun. According to historian Roz Khan Lodhi, it was the initial settlement of the present-day city of Badaun.

Source: Badaun.nic.in

- **Bankhandi Nath Temple -** It is the temple of lord shiva, known as Bankhandi Nath temple which is situated at Suresh sharma naga, Badaun. It is a holy and a very beautiful place to visit. It is said by the natives that this temple is the part of seven nath temples of Bareilly, that's why it is also known as Nath Nagri. People here believe that this temple is a shield and prevents natural disasters. The history of Bankhandi temple is thousand years old. The Pandit of Bankhandi mandir says, The Mugal emperor Aurangzeb had tried invading the temple like other temples of India but he could not displace a single brick of temple.

- **Alakhnath Temple -** Alakhnath Temple is a significant Hindu shrine and one of Badaun's famed four Natha temples. This temple is devoted to Lord Shiva and serves as the district's main akhaara for Naga Sadhus. The primary deity of Alakhnath Temple is Lord Shiva, however there is a large statue of Lord Hanuman in the temple's enormous courtyard. The idol, which rises 51 feet tall, is a prominent structure in the area.Alakhnath Temple is one of the four Natha (Shiva) temples located in Bareilly's four corners. This temple is dedicated to the Naga Sadhus' most important akhaaras. During the Maha Kumbha Fair, Maha Shivaratri, and other festivals, this temple sees a lot of visitors. There are many shelters for cattle such as cows, buffaloes, and goats in the area of this temple. Alakhnath

Temple is a popular tourist and pilgrimage destination in Badaun. Throughout the year, it attracts a large number of worshippers. It sees a large number of devotees, as well as sadhus and yogis, during the Maha Kumbha. It is excellent to visit during the Maha Shivaratri festival, which is a prominent Hindu holiday observed here.

- **Boond Water Park -** At the Pilibhit bye pass, there's Funcity and Boond is the largest amusement and water park in Uttar Pradesh. With cutting-edge amusement attractions, gorgeous green lawns, a video games arcade, a restaurant plaza, and an open-air Amphitheatre. The Fun City, located on the Pilibhit Road Bypass, is frequently referred to as Northern India's top amusement destination. The recreation complex offers a variety of entertainment options, including a water stop called Boond, a number of daring rides, a thrill ride, and a discotheque. Boond is one of Northern India's first parks to have an artificial wave pool. The Fun City Park is one of the best water parks in Bareilly, featuring a variety of land and water attractions, as well as other daring sports to participate in. It also features a Kids Zone where you can play a variety of video games.

- **The Jama Masjid** - Great Mosque, is a large mosque in Badaun, Uttar Pradesh's historic centre. Iltutmish, the king of the Delhi Sultanate at the time, erected the mosque. The architecture of this mosque is influenced by Persian and Afghan styles. It has three gates: the main gate, which faces Shakeel Road and stands 100 feet tall, is built of red marble. Farshori Tola has the second gate, and Sotha has the third. It has a centre dome encircled by two more domes, as well as five further domes. White marble is used for the floor (SangeMarMar). Its grounds include a "Hauz" (pond) and three "WuzuKhana" (washrooms and sitting rooms). The Jama Masjid Quarters, on two sides of the mosque, are filled by residential structures. The mosque is located on an elevation region known as Sotha Mohalla, and it is the highest structure in Badaun. After Delhi's Jama Masjid, this mosque is the country's third oldest and seventh largest mosque, with a regular capacity of 23500 people. The mosque's central dome is thought to be the largest dome of any mosque in the country. It is also a National Historic Monument and a National Heritage Site.

Source: https://jama-masjid-Badaun.business.site/

SWOT Analysis

S. N	Strength	Weakness	Opportunities	Threat
1.	Geographically located nearby two very important cities of Uttar Pradesh that is Bareilly and Aligarh. The district has significant Tourist spots. Tourism needs to be developed more. Also systematic planning can help tourists reach their destinations early.	Having no adequate system is a problem here. Local craft and heritage can be promoted more so that it attracts tourists. Lack of proper hotels and accomodation in Badaun and nearby areas.	Many local research needs to be done to identify more and more opportunities that can further be utilised in bringing more tourists both local and foreign. Badaun is home to heritage sites and Mughal era's live visual through architecture.	Lack of a good budget by the government is a big barrier in tourism. Covid 19 mutating and coming back again. .

- **3.4 WETLANDS**

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. Local stakeholders directly or indirectly depend on the wetland for their income

and small-scale business. These businesses can be a great opportunity to be turned into a large-scale production hub using the right approach. The region has a good amount of wheat, rice, and bajara. The region is known as the city of saints. The data collected and analysed shows the region's production and possible product derived from the raw product. The list of the possible products are mentioned below:

- Bajara and wheat production is recommended as commercial crops in the region, leading to products like flour and finished products.
- India Govt. has proposed a mission like India's Millet Mission, which creates an opportunity for the district to become a production hub. The district stats show a good amount of finger millet, pearl millet, in the region, which can be promoted in the scheme.
- Also, products like oil, finished pulses can be derived from the crops and millets grown in the region.
- Also, this region is a belt of large varieties of oil production like mustard seeds which can turn into a valuable market for oil production in the region.
- The region has a large production of dairy products, leading to increased animal husbandry. Wetlands can support the growth of fodder for animals.

4 ACTION PLAN DEVELOPMENT

4.1 AGRICULTURE

4.2 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 the 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 landowners or by the forest department by taking recourse under section 8 and 9 of UP Tree Protection Act, 1976. If the target period is 20 years the target of plantations should be as follows:

	Target for 20 Years	**Target per year**

Plantation by Forest Department	514,500 ha	52725 ha
Plantation by Private Land Owners	540,000 ha	27000 ha

Figure 5 Targets to increase forest and agro-forestry plantation
Source: State Action on Climate Change, Uttar Pradesh

Plantations along canals embankments and roadsides, Conversion of Moderately Dense Forest, Open Forest and Scrub into Very Dense Forest up to maximum possible extent, Agroforestry, afforestation, etc. are some of the ways that should be adopted for the development of forestry in the district.

4.2.1 Biodiversity - Strict laws and green belts should form as illegal green trees cutting is active in the village Anandipur.

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.

4.3 TOURISM

4.3.1 Tourism planning- The expansion and upkeep of the tourism sector in a certain location is referred to as tourism development. Tourism planning is, of course, a critical component of this and is very essential for rural tourism in India. Tourism development can be described as the creation of strategies and plans to increase and develop as well as encourage tourism for a destination at its most basic level. Tourism planning aids in problem solving and decision making, allowing planners to achieve their desired goals. Tourism is managed by governments at the national, local, and organisational levels, and planning is an important element of that process.

4.3.2. Sustainable tourism- Sustainable Development Goals Sustainable tourism is also related with goals when keeping in mind sustainable tourism and its development. If the tourism destination is a water body or a forest region, human activities have an impact on life below water and on land; thus, it is our collective responsibility to ensure that tourism is sustainable. Locals/natives can be included in trade and business activities to ensure their long-term sustainability. Different tourists share an equal sense of responsibility for the development of sustainable tourism. Every person is responsible for the factors including many elements. For example, lowering the carbon footprint per visitor by employing environmentally friendly practises.

Projections and Monitoring matrix

Sector	Intervention	Strategy	Total cost	Expected Outcomes

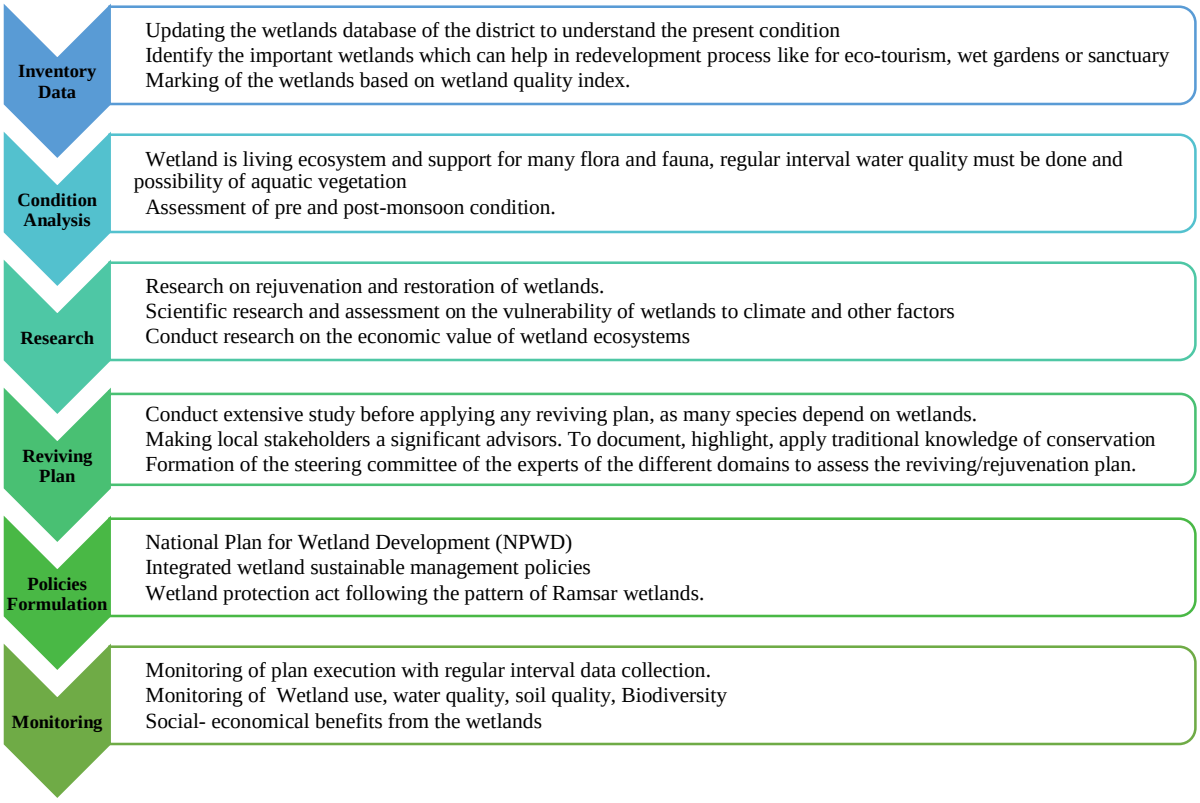
Tourism	**Research**	● The cause and motive for tourism can be predicted using various data and matrices which are available on various government official websites as well as private organizations have done their bit too. It is also feasible to discover the elements affecting tourism in Uttar Pradesh through significant qualitative and quantitative research. ● All political pressures and influences must be removed from research to bring as much transparency as one can. ● When adding new records, the researchers must ensure that the field data and secondary data are correct and unaltered. This would allow us to articulate a precise conclusion in the long run for the upcoming projects. ● It is necessary to enlist the help of unbiased researchers.		As a reference for other processes, a well-researched document. Tourism in Uttar Pradesh is influenced by a number of factors. Define the factor that influences local tourism activity. To be able to understand and work upon all the listed factors and create a need for travel for people within and outside the country! For a successful implementation, realistic planning is required.
	Planning	● Research and analysis of various data and reports can be used to generate action plans for intervention. ● Developing an active action plan sustainably to create a long term goal. ● Planning must take into account the Badaun's social position as well as the impression that tourists have, including it with Bareilly, Aligarh and Agra. ● Connecting with National parks and sanctuaries which seek to improve the		

		ecosystem in a long-term sustainable manner. Topographical environment is rich in flora and wildlife, with many rare and endangered species found throughout the country, though within the vicinity of 200km. ● Separate comfort and leisure trip planning for diverse tourist demographics. It is critical to consider the demographics of travellers while creating tour packages and fares, for example. Foreign tourists expect a lot of hygiene, whereas local tourists expect a lot of deals. As a result, these problems must be addressed and also considered for improvement. ● Sites must be developed according to a set of requirements in order to attract a diverse variety of tourists. Brand Manufacturing to increase tourism activity throughout the state. Including UP Tourism and other social media platforms. ● Organisations of grand events related to heritage, art, history and architecture events and local art fairs which hold meaning and significance as it is home Mughal's architecture. ● Complete use of allocated budget.		
	Implementations	● To attract more tourists, various schemes such as tourist packages, tariff plans, and so on can be devised.		To increase the number of tourists and increase tourism earnings from all possible tangents.

		• Mahotsavs and fairs will be held to boost the local economy and attract visitors. • Creating tourism circuits including nearby cities like Bareilly, Aligarh and Agra. • Creating dining establishments • Establishing a link between tourist and local culture and cuisine by employing local people of Badaun. • Advertorial promotion that has an overall extensive approach to capture travellers who might interested in Badaun's history, art and architecture. • A well-known figure serves as a brand ambassador. • A significant amount of branding and marketing. • The development of tourist attractions and historical sites. • Information and travel packages are available on government websites. • Conducting thorough market research in order to build strategies		To boost the state's image while ensuring that no other social issue has an impact on tourism earnings. Create a flowchart to constantly maintain the set standards of tourism and consider feedback of tourists.
	Impact Assessment of results	• Figuring out where the touchpoints are and to keep a track of patterns of tourists who travel frequently. • They understand the cause of failure and work upon it. • The reason behind the achievement • Planning for the future considering all aspects of that can be covered.		• To learn the lesson and establish the root cause of success and failure, which will be applied in the future with modifications.

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 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.



○ 4.5 ENERGY

4.5.1. Solar

The district Badaun is presently quite progressive in the solar energy sector. If the pace is maintained both by the government and the residents it can soon become a hub of solar energy. The district mainly depends on agriculture along with some medium to small scale industries. Attention should be paid in making these economic sectors solar powered, so that they lessen their expense on electricity in the long run.

For the farmers Kusum Yojana is the best at present. The villages with more small-scale farmers should be introduced with the component C of Kusum Yojana. Subsidy should be provided for the off grid connection as well.

Projection and monitoring - The farmers should be made to understand various components of Kusum Yojana and then they can choose the one which suits them the most. Next the small scale industries and firms should be given the benefit of subsidy. This would strengthen the economy of the district. The off-grid connections can be provided with low cost utility supply if there is decrease in the units used by them. This would incline more and more people towards solar energy.

A friendly environment for the business firms should be created so that they can work easily and establish more and more solar plants providing employment to the people in the district.

4.5.2. Biomass

It is a big developmental step for the district Badaun, where 2G ethanol production from the residue at the paddy fields has been started. The concerned authorities should keep the price of the residues sold for the ethanol production under check. This is important so that neither the farmers nor the company is at the loss. Other than rice cultivation, wheat, sugarcane, etc. is also cultivated so the government should take steps in promoting power from other types of agricultural residues as well. It should be made regulatory for sugar mills to use the sugarcane residue for power production. Government should make it feasible for them to set up bagasse based biomass plants. If in any way the small sugar mills are unable to set up individual power plants then a group of them can plan a power plant together. This way individual costing for construction would be cut off.

Other than this it is also important to make people aware about the resources in their district. Then only these biomass resources could be wisely utilized. Also the fallow land available in the district should be put to use for setting up these plants. Municipalities and panchayats should come forward and promote policies according to the available resources in their area.

Projection and monitoring - The district already has a good foundation for bioenergy, in the form of a 2G ethanol production plant. The need is to take this forward, for this the first thing that should be done is to regulate and keep a check on the price of agricultural residue being sold. In addition to this, power production by biomass plants should also be encouraged, so that it lessens the burden on the discoms. This can be grid connected, especially by the sugar mills.

Next thing which should be done is to make people aware about the various ways in which biomass energy could be produced and accordingly small start-ups should be encouraged towards it.

4.5.3. Biogas: Suryakund Gurukul Sanskrit Mahavidyalaya is an old Gurukula school located on Dataganj road in Badaun. The Mahavidyalaya is located on an 8-acre plot of ground that includes

an ancient Suryakund and Goshala. Gurukul Mahavidyalaya's management is growing many cows in this Goshala, and near these Goshalas, biogas plants can be constructed.

4.5.4. Hydropower: Most of the villages in Badaun are badly affected by the rise in the Ganga water level, and no significant irrigation scheme and bulk of irrigation is present in the district; hence the government should build a canal or damn on river Ganga that can also serve electricity purpose in future.

- **4.6 INTERGRATED MODEL FRAMEWORK**

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

- Groundwater shares over 90% of NIA in the district and number of deep tube-wells increased substantial during the study period, indicating the depletion of watertable. 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.

- Salt-affected areas of the district could be efficiently utilized with salt-tolerant varieties after proper gypsum treatment.

- Farmers should be sensitized to the overuse of fertilizer and pesticides application.

- Food grains constituted about 81% of the GCA in the district, while their share in the total value of agricultural output is about 67 percent, indicating the district agriculture dominated relatively less remunerative. There is need to diversity the agriculture from low-value food grains to high-value non-food grains crops to enhance agricultural GDP and farm income,

- 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.

- There is a scope for the commercial cultivation of Tulsi as a medicinal plant which should be encouraged.

- About 93% 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.

- There is a huge scope for mushroom cultivation for the rural youth and farm women to enhance the farmer's income. Poly house and greenhouse could be commercially used for the high revenue crops, like capsicum and strawberry, for much returns to the farmers.

- There is ample scope for Amla and Guava plantation in barren soil.

- The district has scope for beekeeping and Sericulture. It should be encouraged among the farmers.

- Per capita electricity consumption in the district agriculture increased significantly from 121.32 KWH in 2014-15 to 238.91 KWH in 2019-20, a net increase of approximately 96.92%. Since electricity consumption has increased over the years, there is a need to promote the use of solar energy use 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.

- There is a need to set up an integrated pro

5.2 FORESTRY

- Mass awareness programs should be conducted in rural areas for water management, forest conservation, and wildlife protection. These programs should be held from places like Gurukul Sanskrit Mahavidyalaya, Great mosque, and Nizamuddin auliya.

- Most of the families in rural areas depend on agriculture. Therefore, excessive use of fertiliser should be discouraged.

- Badaun is located on the bank of river Ganga. According to ISFR 2019, 32.04 Sq. Km. The area of Badaun is covered with forest. As discussed above, the forest cover of Badaun has decreased sharply as compared to previous assessment of ISFR 2017, 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.

5.3 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 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.

- Besides wheat and rice like oilseeds, bajara needs to be turned into finished products.
- Need for the introduction of improved cultivars and production technologies of turmeric.
- Diversification through introducing vegetable, mushroom, beekeeping, fruits, medicinal plants, dairy, poultry etc. for nutritional security
- It is recommended to promote the production of medicinal plants in the region to promote ayurvedic medicine, and wetland can support the water supply for the cultivation.
- India Govt. has proposed a mission like India's Millet Mission, which creates an opportunity for the district to become a production hub. The district stats show a good amount of finger millet, pearl millet, in the region, which can be promoted in the scheme.

5.4 ENERGY

5.4.1. Solar

It can be concluded that the district Badaun is presently in the developmental phase of setting up a solar energy sector. There are business firms wanting to set up solar plants in the district. If they get support from the government and the localites then there will be a boom in the solar energy sector in the district. Farmers should be made acquainted with the Kusum Yojana and its various components. Thus will lead to an overall development of the district and improve the livelihood of the people.

5.4.2. Biomass

It can be concluded that the district has made its way to get rid-off stubble burning which is quite appreciable. Attention should also be paid on Bagasse Based Co-Generation Project's in Sugar Mills as the district largely cultivates sugarcane. This can be done by making friendly environment

for the entrepreneurs to set up biomass plants. All this will lead to development of the district's economy and livelihood in a sustainable manner.

5.4.3. Biogas

- Wood and cow dung cake are two primary sources of cooking fuel in rural areas of the district. Due to the district's low forest cover, biogas plants need to be constructed as an alternative energy source, especially in rural areas.

5.4.4. Hydropower

- A small hydropower plant capacity of 2 MW can be constructed on the river Ganga to provide electricity in rural areas as electricity connections at the village level are relatively low.

5.5. Tourism

Weekend trips can be planned at many destinations in major cities of Uttar Pradesh. The maximum distance to such weekend destinations is about 200 km. A round trip over the weekend to these places can be a perfect getaway.

5.5.1. Cultural Diversity - Badaun is revered by Hindus and Muslims alike for its sacred significance. It appears to be nothing more than a lonely tiny town at first glance, with its dusty avenues and peaceful streets. However, there are various ruins and structures that reveal many historical legends. Badaun transports tourists to a period of great monarchs and mystic Sufi saints like Nizamuddin Auliya, a Sufi saint, by casting a nostalgic enchantment. An atmosphere of spirituality pervades the town, adding to its attractiveness. A variety of ruins dating back to the Mughal Empire may be seen at Badaun. The Badaun Fort and the renowned clock tower Ghanta Ghar, as well as the tombs of monarchs such as Iltumish and Ala Ud Din Alam Shah, the final emperor of the Sayyid dynasty, are among the main attractions. The Jama Masjid, built by Iltumish in the 13th century, and the Qadri Dargah are two of Badaun's most prominent shrines.

Culturally rich cities such as Badaun, have many significant tourism potential. These cities are located in the vicinity of big cities such as Agra, Aligarh and Bareilly. One way to do this is to combine districts with limited tourism potential with a tour package that includes nearby popular locations as a bonus. Using regions with fewer tourist attractions as a supplemental destination will undoubtedly enhance tourist traffic of the entire state of Uttar Pradesh as these can be clubbed with existing travel plans. There's also a chance that some of the district's hidden characteristics or possibilities will surface.

5.5.2. Ecotourism- A type of sustainable travel that attempts to assist and uplift the environment rather than deplete its resources and put strain on it. Badaun is approximately 200km away from 4 major wildlife sanctuaries including Sur Sarovar Sanctuary (Agra), National Chambal Sanctuary (Dhaulpur), Pilibhit Tiger Reserve (Pilibhit) and Dudhwa National Park (Lakhimpur) . These are protected areas in northern India for the Critically Endangered gharial, the Endangered Ganges river dolphin, and the Critically Endangered red-crowned roof turtle. Sur Sarovar provides refuge to resident and migratory birds, and more than 60 species of fish. Ecotourism is the preservation of travel to natural regions in order to appreciate the cultural and natural history of the environment while also offering economic opportunities.

5.5.3. Hub for Architecture, History and Art- Badaun is a historical treasure and lies between Agra, Aligarh and Bareilly. Agra and Aligarh are one of the oldest cities with timeless beauty that transports back to a time when the area was favoured by mighty monarchs and mysterious Sufi saints. A hidden tiny village at first glance can be clubbed with these 3 cities to make a concrete travel plan for tourists and a destination venture for history and architecture students to create tranquil sense of spirituality that reverberates throughout the village adds to its attraction. Heritage walks can be amalgamated together with this hidden gem of Uttar Pradesh, located on the banks of the Ganga River. Keeping alive Ganga Aarti as done in other cities like Haridwar and Varanasi. It is a pleasant vacation because of its rugged and rural scenery, as well as its rich culture.

6. Discussion during the Report Presentation

- The district is famous for zari work and the same will be explored for the suitability at Delhi Haat.
- The temples, forts and makbaras holds a great importance for locals and also can be explored for tourism opportunities.
- 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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8 APPENDICES

a. AUXILLLARY DATA

….(Meeting details, photographs, additional data, note)….

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 Tonne)	62182	67991	76825	94683	67118	47676	63540	86878	90634
Grain crops (Metric Tonne)	1577764	1527632	1229912	1154609	1291417	965022	1060935	1181578	1138393
Sugarcane (Metric Tonne)	1381312	1407395	1453992	1560108	1680417	1522893	1447291	1915941	2358698
Potato (Metric Tonne)	334037	300895	248107	214664	224131	288329	418288	197721	213897

Table 2 Livestock population in district.

Livestock	2003	2007	2012
Cattle (Cow)	373382	370424	261976
Buffalos	721775	751033	802012
Sheep	11141	10893	13911
Goat	231831	243514	205595

Pigs	29544	8471	18765
Chicken	85542	100234	228965
Other Poultry	5814	106856	4596
Horses and Ponies	8871	6592	9584
Others	3528	1366	601

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	2,61,976	10	95,62,12,400	717159300	143431860	25	5737274.4
Buffalo	Manure	8,02,012	15	4,39,10,15,700	3293261775	658652355	25	26346094.2
Sheep	Manure	13,911	1	50,77,515	3808136.25	761627.25	25	30465.09
Goat	Manure	2,05,595	1	7,50,42,175	56281631.25	11256326.25	25	450253.05
Pig	Manure	18,765	2.5	1,71,23,063	12842296.88	2568459.375	25	102738.375
Poultry	manure	2,33,561	0.1	85,24,977	6393732.375	1278746.475	25	51149.859
TOTAL		15,35,820						32,717,974.97

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	18624	1.5	27936	19555.2	15	16621.92	800	13297536
Wheat	straw	822869	1.5	1234303.5	864012.45	30	604808.715	800	483846972
Sugarcane	Bagasse	2358698	0.33	778370.34	544859.238	80	108971.8476	750	81728885.7
Total		3,200,191							578873393.7

b. LIST OF TABLES AND FIGURES