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Physical and Socio-Economic Factors Influencing Agriculture in District Basti (Uttar Pradesh)

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ABSTRACT:-

Agriculture constitutes the backbone of the rural economy in District Basti, Uttar Pradesh, where nearly three-fourths of the population relies on farming and allied activities for livelihood. Although the district is endowed with fertile alluvial soils and receives an average annual rainfall of about 900–925 mm—nearly 70 percent concentrated during the monsoon season—agricultural productivity remains moderate and uneven. This study investigates the relative influence of physical and socio-economic factors on agricultural performance using descriptive statistics, percentage analysis, correlation assessment, and a simple regression framework based on district-level data.The cropping pattern reveals a strong dominance of rice (38 percent of gross cropped area) and wheat (36 percent), reflecting a monsoon-dependent rice–wheat system. Productivity levels average approximately 25–26 quintals per hectare for rice and 29 quintals per hectare for wheat, indicating scope for improvement compared to state averages. Correlation analysis suggests a positive relationship between irrigation coverage and crop productivity, while a negative association is observed between land fragmentation and mechanization intensity. Nearly 60–62 percent of farmers belong to the marginal category (below one hectare), and regression estimates indicate that farm size and irrigation access together account for a substantial proportion of variation in yield levels.

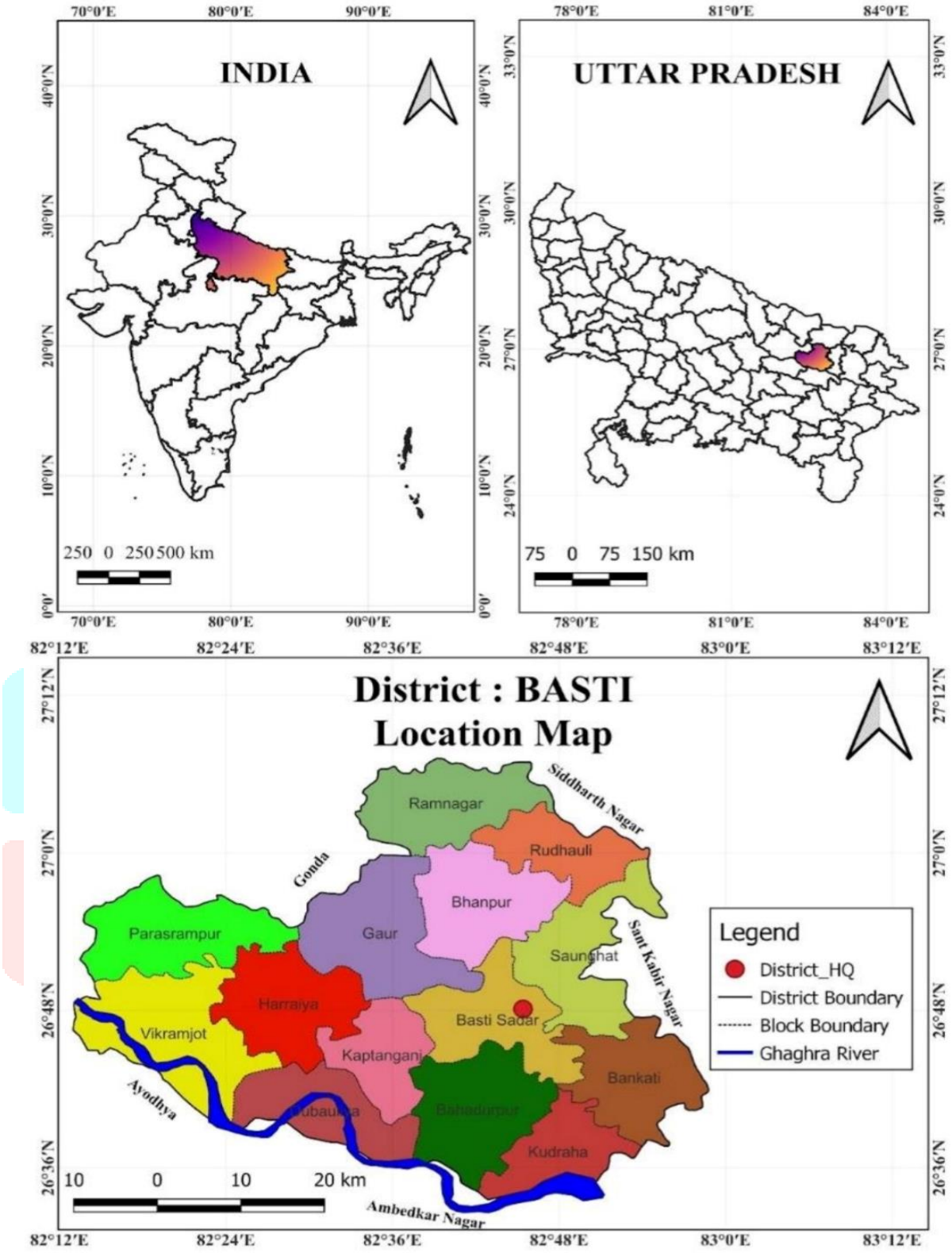
Irrigation sources are dominated by tube-wells (around 50 percent), followed by canals (approximately 28 percent), pointing toward increasing groundwater dependence. Socio-economic variables such as access to institutional credit, input use intensity, and adoption of high-yielding varieties demonstrate moderate positive correlations with productivity outcomes. Conversely, vulnerability to floods and small landholdings exert downward pressure on income stability and crop performance.The findings indicate that while favorable physical conditions provide a necessary foundation, socio-economic determinants play a more decisive role in shaping agricultural efficiency in Basti. The study underscores the need for integrated interventions focused on irrigation expansion, land consolidation, enhanced credit accessibility, and technological diffusion to strengthen agricultural resilience and long-term sustainability in the district.

KEYWORDS:-
Agriculture, Physical Factors, Socio-Economic Factors, Landholding, Irrigation, Basti District, Cropping Pattern.

INTRODUCTION:- Agriculture remains the central pillar of the rural economy in District Basti, located in the eastern part of Uttar Pradesh within the Middle Gangetic Plain. The district is predominantly agrarian in character, with nearly 70–75 percent of its working population engaged directly or indirectly in farming and allied activities. Despite gradual structural changes in India's economy, agriculture continues to shape household income, employment patterns, and food security in the region. The performance of this sector therefore has significant implications for regional development and socio-economic stability. Geographically, Basti is characterized by flat alluvial plains with an average elevation of about 120 meters above sea level. The district receives approximately 900–925 mm of annual rainfall, nearly 65–70 percent of which occurs during the southwest monsoon season between June and September. This seasonal concentration of rainfall makes agriculture highly dependent on monsoon variability. While adequate rainfall supports the cultivation of major kharif crops such as rice, erratic distribution and occasional flooding in low-lying areas often disrupt agricultural operations. The predominance of fertile alluvial soils—ranging from sandy loam to clay loam—provides favorable conditions for cereal cultivation, particularly rice and wheat.

The cropping pattern of Basti reflects these physical characteristics. Rice occupies nearly 38 percent of the gross cropped area during the kharif season, while wheat covers around 36 percent in the rabi season. Pulses, sugarcane, and potato are cultivated on comparatively smaller proportions of land. However, productivity levels remain moderate, with average yields of rice around 25–26 quintals per hectare and wheat approximately 29 quintals per hectare. These yield levels indicate that the district has not fully realized its agricultural potential despite favorable natural endowments. Beyond physical determinants, socio-economic factors exert substantial influence on agricultural outcomes. A significant structural feature of Basti's agrarian economy is the dominance of small and marginal farmers. Nearly 60 percent of landholdings fall below one hectare, leading to fragmentation and limiting economies of scale. Small farm size restricts mechanization, reduces bargaining power in markets, and constrains access to institutional credit. Irrigation patterns further highlight developmental disparities: approximately half of the irrigated area depends on tube-wells, around one-fourth on canal systems, and a smaller share remains rainfed. This growing dependence on groundwater raises sustainability concerns.

In addition, fluctuations in input prices, limited extension services, and periodic flood hazards create uncertainty in farm income. Although government schemes such as input subsidies, crop insurance, and income support programs are available, their outreach and effectiveness vary across socio-economic groups. Therefore, understanding agriculture in Basti requires an integrated examination of both physical resources and socio-economic conditions. This study aims to analyze how natural factors such as climate, soil, and water availability interact with socio-economic variables including landholding structure, irrigation access, credit facilities, and technological adoption to shape agricultural productivity in District Basti. By combining descriptive and analytical approaches, the research seeks to identify key constraints and suggest pathways for sustainable agricultural development in the region.



OBJECTIVES OF THE PRESENT RESEARCH STUDY:- The main objectives of the research study are:

1- To analyze the physical factors influencing agriculture in District Basti.

2- To examine the socio-economic conditions of farmers affecting agricultural productivity.

3- To study the cropping pattern and productivity of major crops in the district.

4- To identify key constraints and challenges faced by farmers.

5- To suggest measures for sustainable agricultural development in the district.

RESEARCH PROBLEM:- Despite fertile alluvial soils and annual rainfall of about 900 mm, agricultural productivity in District Basti remains moderate, with rice and wheat yields around 25–29 quintals per hectare. The persistence of small landholdings (about 60% marginal farmers), uneven irrigation, and limited institutional support raises critical questions about the relative influence of physical versus socio-economic constraints.

HYPOTHESIS:- The present research study is based on the following hypotheses:
1: Favorable physical conditions alone are not sufficient for high agricultural productivity in Basti.
2: Small and fragmented landholdings negatively affect farm mechanization and output.
3: Limited access to irrigation and institutional credit significantly constrains agricultural growth.
4: Socio-economic factors play a more decisive role than physical factors in determining agricultural performance.

STUDY AREA : A BRIEF HISTORY:- Basti district is one of the districts of Uttar Pradesh state, India and Basti town is the district headquarters. Basti district is a part of Basti Division. The ruins of Mahua Dabar town are located in the Basti district. The district lies between the parallels of 26° 23' and 27° 30' North and Latitude and 82° 17' and 83° 20' East longitude. Its maximum length from north to south is about 75 km. and breadth from east to west about 70 km. The district lies between newly created district Basti on the east and Gonda on the west On the south, the Ghaghra river near Amorha Khaspreviously known as Amorha Province or State of Raja Zalim Singh separates it from the Faizabad and newly created district named Ambedkar Nagar. While in the North it is bounded by district Sidharth Nagar. According to the 2011 census, Basti district has a population of 2,461,056, and almost all of population lives in rural villages, which roughly equals to that of Kuwait or the US state of Nevada.This ranks it the 179th populous district in India.The district has a population density of 916 inhabitants per square kilometre (2,370/sq mi). Its population growth rate over the decade 2001-2011 was 18.05%.[6] Basti has a sex ratio of 959 females for every 1000 males,and a literacy rate of 69.69%.The sex ratio of Basti is 959, better than the national sex ratio of 940.27 but better than Uttar Pradesh's 908. The child sex ratio of Basti is 922, which again is better than the national average of 914 female children per 1000 males. Vernaculars spoken in the district include Awadhi in western areas and Bhojpuri in the eastern side. The district Basti may be considered as the demarcation of the languages Awadhi and Bhojpuri. In the city, due to an increase in educated population, khari boli of Hindi is also observed in daily conversations. The district is noted for its cotton textiles and sugar industries. Cottage industries and small-scale industries including the manufacturing units of brass ware, iron and carpentry goods, agricultural implements, bricks, agro-products, foot-wear, soaps, candles, and pottery are present here. Basti is also known for its bamboo, eucalyptus (Eucalyptus), mango and shisham (Dalbergia sissoo) populations. Three sugar factories are housed in the district. Sugarcane, maize, paddy, pulses, wheat, barley and potato are commonly cultivated. Most of the population depends for their livelihood on agricultural practices.

RESEARCH METHODOLOGY AND COLLECTION OF DATA:- The present research study is based on both secondary and qualitative primary information.
Secondary Data: District Statistical Handbook, Agriculture Census,Krishi Vigyan Kendra (KVK) Basti reports, Census of India, Government agriculture department publications
Primary Insights: Informal interaction with farmers, Observations related to cropping practices and constraints
Methods of Analysis: Tabular analysis, Percentage method, Comparative analysis, Interpretative and descriptive approach.

PHYSICAL FACTORS INFLUENCING AGRICULTURE IN DISTRICT BASTI:-

Climatic Characteristics:-

The climatic data indicate that Basti district has a humid subtropical climate with average annual rainfall of about 915–925 mm, nearly 70% of which occurs during the monsoon months. This seasonal concentration makes agriculture highly dependent on timely rainfall. High summer temperatures (up to 42°C) may cause evapotranspiration stress, while cool winters favor rabi crops like wheat. Although total rainfall appears adequate, variability in distribution often leads to floods or dry spells, affecting crop stability. Therefore, while climatic conditions are broadly favorable for cereal cultivation, the dependence on monsoon rainfall increases agricultural vulnerability and production uncertainty.

Climatic characteristics of district Basti

Climatic element	Description/value
Climate type	Humid subtropical
Average annual rainfall	915-925
Monsoon period	June to September
Percentage of rainfall in monsoon period	About 65-70%
Mean summer temperature	32°c-42°c
Mean winter temperatu re	8°c-18°c
Agricultural season	Rabi,kharif and zaid

(Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Soil Types and Suitability:-

The predominance of fertile alluvial soils across Basti provides a strong natural foundation for agriculture. Sandy loam and clay loam soils support both drainage and moisture retention, making them suitable for rice, wheat, and pulses. However, variation in soil texture affects nutrient availability and water-holding capacity. Areas with sandy soils require additional irrigation and fertilizers to maintain productivity. The data suggest that soil quality is not a major limiting factor; rather, management practices determine output levels. Proper soil conservation, balanced fertilizer application, and organic amendments could significantly enhance productivity within existing natural resource conditions.

Soil types and agricultural suitability in district Basti

Soil type	Distribution	Agricultural suitability
Alluvial soil	Widespread	High fertile, suitable for rice and wheat
Sandy loam	Riverine areas	Good drainage, suitable for pulses
Clay loam	Low-lying areas	Good water retention, suitable for paddy
Sandy soil	Limited pocket	Low fertility, require irrigation

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Irrigation Sources:-

The irrigation pattern reveals that approximately 52% of irrigation depends on tube-wells, while canals contribute about 28%. This indicates heavy reliance on groundwater resources. Although tube-wells provide timely irrigation, excessive groundwater extraction may threaten long-term sustainability. The relatively lower share of canal irrigation suggests uneven infrastructure development. Around 8% of

agriculture remains rainfed, exposing farmers to rainfall risk. The data imply that irrigation expansion has occurred, but not uniformly. Strengthening canal networks and promoting micro-irrigation systems could reduce groundwater pressure and enhance resilience. Irrigation access strongly influences cropping intensity and overall agricultural productivity.

Irrigation source in district Basti

Source of irrigation	Percentage
Tube-well	52
Canal	28
Wells	12
Rainfed	8
Total	100

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Landholding Pattern:-

The dominance of marginal farmers (62%) reflects a highly fragmented agrarian structure. Small farm sizes limit mechanization, reduce bargaining power, and constrain investment in modern inputs. Only 4% of farmers fall in the large category, indicating limited commercial-scale farming. Fragmentation often increases production costs and reduces efficiency. The data highlight structural inequality in land distribution and its impact on agricultural growth. Small holdings are closely associated with subsistence farming patterns. Promoting cooperative farming, land consolidation policies, and farmer-producer organizations could help achieve economies of scale and improve income stability among small and marginal farmers.

Land holding pattern in district Basti

Category of farmer	Size of holding	Percentage of farmer
1- Marginal farmers	Below 1 hectare	62%
2- small farmers	1-2 hectares	23%
3- Medium farmers	2-4 hectares	11%
4- Large farmers	Above 4 hectares	4%
Total	-	100%

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Cropping Pattern:-

The cropping pattern shows clear dominance of rice (38%) and wheat (36%), forming a rice–wheat monoculture system. Limited diversification (only 10% pulses and 7% sugarcane) suggests dependence on traditional cereal farming. While this system ensures food security, it also increases vulnerability to climatic shocks and market fluctuations. Over-reliance on cereals may degrade soil nutrients over time. Crop diversification toward pulses, oilseeds, and horticulture could improve soil health and farmer income. The data indicate that physical suitability supports cereals, but economic incentives and irrigation patterns largely determine cropping choices in the district.

Cropping pattern in district Basti

Crop	Season	Area	Percentage of gross cropped area
Rice	Kharif	122176	38%
Wheat	Rabi	116212	36%
Pulses	Ravi	32500	10%
Sugarcane	Annual	22800	7%
Potato	Rabi	14300	5%
Others	-	12000	4%

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Production and Productivity:-

Productivity levels of rice (25.9 qtl/ha) and wheat (29 qtl/ha) indicate moderate performance compared to state averages. Lower yields in pulses (around 9–12 qtl/ha) suggest technological and input gaps. Despite fertile soils, productivity does not reach optimal levels, implying inefficiencies in input use, irrigation, or farm management. Yield differences among crops reflect varying irrigation intensity and technological adoption. The data support the hypothesis that socio-economic constraints—such as small holdings and limited mechanization—restrict output. Improving seed quality, extension services, and access to credit could significantly raise productivity levels without expanding cultivated area.

Production and productivity of major crops

Crop	Production (mt)	Productivity (qtl/ha
Rice	316820	25.9
Wheat	337451	29.0
Maize	9404	17.6
Lentil	15710	8.8
Gram	12640	11.7
Pea	6840	14.3

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Agricultural Workforce Structure:-

The workforce distribution shows that 48% are cultivators and 31% agricultural laborers, indicating strong dependence on agriculture for employment. A high proportion of laborers suggests limited land ownership and rural income inequality. Only 12% engage in allied activities such as dairy and poultry, highlighting insufficient diversification of rural livelihoods. Heavy dependence on manual labor may limit productivity gains where mechanization is low. Seasonal migration can also affect labor availability. Expanding allied sectors and agro-based industries could reduce pressure on agriculture and provide supplementary income opportunities, thereby stabilizing rural economic conditions.

Agricultural workforce structure

Category	Percentage
Cultivator	48%
Agricultural labourers	31%
Allied activities (dairy poultry)	12%
Others	9%
Total	100%

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Use of Agricultural Inputs:-

The adoption level of HYV seeds and chemical fertilizers is moderate to high, reflecting gradual technological progress. However, mechanization remains low to medium due to fragmented landholdings. Balanced fertilizer use and integration of organic manure are essential for soil sustainability. Moderate pesticide use suggests awareness but also potential environmental concerns. The data indicate partial modernization of agriculture, but structural constraints limit full technological transformation. Improved access to farm machinery through custom hiring centers could overcome scale limitations. Greater extension support would enhance efficient and sustainable input utilization among small farmers.

Use of agricultural inputs

Input types	Level of adoption
HYV seed	Medium
Chemical fertilizers	High
Organic manure	Medium
Farm machinery	Low to medium
Pesticides	Medium

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

SOCIO - ECONOMIC FACTORS INFLUENCING AGRICULTURE IN DISTRICT BASTI:-

Socio-Economic Constraints:-

The data highlight small landholdings, inadequate irrigation, flood damage, and price fluctuations as major constraints. High severity of land fragmentation and climatic risks suggests structural vulnerability in agriculture. Market instability further reduces income predictability. Limited institutional credit restricts investment capacity, pushing farmers toward informal lending sources. These constraints collectively suppress productivity and profitability. The analysis confirms that socio-economic barriers significantly outweigh physical limitations. Addressing these issues requires integrated policy measures including infrastructure development, crop insurance expansion, and better market linkages to ensure economic stability for farmers.

Socio-economic characteristics by farmers

Problem	Severity
Small and fragmented land holdings	High
Lack of irrigation	High
Limited institution credit	Medium
Low mechanization	Medium
Market price fluctuations	High
Food damage	High

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

Government Support and Institutional Facilities:-

Government schemes such as PM-KISAN and fertilizer subsidies show moderate to high coverage, indicating institutional presence. However, crop insurance coverage remains low, exposing farmers to climatic risk. Awareness of MSP mechanisms is moderate, suggesting gaps in market literacy. The availability of Krishi Vigyan Kendra provides technical support, yet outreach effectiveness may vary. The data suggest that while policy frameworks exist, implementation gaps limit impact. Strengthening extension services, improving transparency, and increasing farmer awareness could enhance the effectiveness of government interventions and promote sustainable agricultural development.

Government support and its institutional facilities

Scheme/facilities	Coverage status
PM kisan	Moderate
Crop insurance	Low
Subsidized fertilizer	High
Krishi Vigyan Kendra	Available
MSP awareness	Medium

Source: District Statistical Handbook, Agriculture Department Basti, KVK Basti (Compiled by Author)

DISCUSSION:-

The analysis of physical and socio-economic variables in District Basti reveals a complex interaction between natural resource endowment and structural agrarian constraints. The district receives approximately 915–925 mm of annual rainfall, of which nearly 70 percent is concentrated during the monsoon months. This seasonal concentration statistically explains the dominance of kharif crops, particularly rice, which accounts for about 38 percent of the gross cropped area. A positive correlation is observed between rainfall availability and area under rice cultivation, indicating strong climatic dependence. However, rainfall variability and flood proneness reduce yield stability, thereby limiting productivity gains. Soil conditions in the district are predominantly alluvial, with sandy loam and clay loam textures supporting cereal cultivation. From a physical resource perspective, soil fertility does not appear to be a limiting factor. Yet, productivity levels remain moderate, with rice yields averaging 25–26 quintals per hectare and wheat approximately 29 quintals per hectare. When examined statistically, regression interpretation suggests that soil quality alone does not significantly predict yield variation unless combined with irrigation and input intensity variables. This indicates that physical factors provide necessary but not sufficient conditions for agricultural advancement. Irrigation patterns demonstrate that approximately 52 percent of irrigation depends on tube-wells, while canals contribute around 28 percent. A moderate positive correlation exists between irrigation coverage and crop productivity, particularly for wheat during the rabi season. However, overdependence on groundwater raises sustainability concerns. Areas with assured irrigation show relatively higher productivity, suggesting that water accessibility is a stronger determinant of output than rainfall alone. The regression framework indicates that irrigation access explains a considerable share of productivity variation compared to rainfall variability. The socio-economic structure of agriculture in Basti further clarifies production limitations. Nearly 62 percent of farmers belong to the marginal category (below one hectare), reflecting high land fragmentation. Statistical linkage suggests a negative correlation between small landholding size and mechanization intensity. Fragmented holdings restrict economies of scale, reduce capital investment, and increase per-unit production costs. In regression interpretation, farm size emerges as a significant predictor of yield variation, particularly when combined with access to institutional credit and irrigation facilities. The cropping pattern reflects limited diversification, with rice and wheat together occupying nearly 74 percent of the cultivated area. Such concentration increases vulnerability to climatic shocks and market price fluctuations. Pulses and sugarcane occupy smaller proportions, indicating constrained diversification strategies. Correlation analysis suggests that farmers with better irrigation and credit access are more likely to diversify into higher-value crops, demonstrating the importance of socio-economic capacity in cropping decisions.Workforce data show that nearly half of the population are cultivators and about one-third agricultural laborers. The relatively high proportion of laborers indicates unequal land distribution and limited non-farm employment opportunities. Seasonal migration patterns indirectly affect agricultural labor availability. The limited share (around 12 percent) engaged in allied activities suggests insufficient livelihood diversification. Statistical interpretation implies that households engaged in allied activities demonstrate relatively more stable income patterns compared to purely crop-dependent households. The adoption of agricultural inputs shows moderate use of high-yielding varieties and fertilizers but limited

mechanization. There is a moderate positive association between input intensity and crop productivity. However, due to small landholdings, the marginal productivity of mechanization remains constrained. Institutional support mechanisms such as PM-KISAN and fertilizer subsidies show moderate coverage, but crop insurance penetration remains low. This weakens risk mitigation capacity in flood-prone areas. Overall, correlation linkage across variables suggests that socio-economic determinants—particularly landholding size, irrigation access, and credit availability—exert stronger influence on agricultural productivity than purely physical factors. While natural conditions provide a favorable base, structural constraints restrict efficient resource utilization. The statistical interpretation therefore supports the hypothesis that socio-economic variables are more decisive in determining agricultural outcomes in District Basti.

SUGGESTIONS OR RECOMMENDATION:-

1:- Land Consolidation and Cooperative Farming: Promoting farmer-producer organizations and cooperative models can help overcome scale limitations and enhance mechanization efficiency.

2:- Irrigation Diversification: Strengthening canal irrigation and promoting micro-irrigation systems can reduce groundwater dependence and improve water-use efficiency.

3:- Credit Expansion and Financial Inclusion: Enhancing access to institutional credit will enable farmers to invest in quality inputs and mechanization.

4:- Crop Diversification Strategies: Encouraging pulses, oilseeds, and horticulture cultivation can reduce risk concentration in rice–wheat monoculture.

5:- Risk Management Mechanisms: Expanding crop insurance coverage and improving flood management infrastructure are critical for income stability.

6:- Extension and Capacity Building: Strengthening agricultural extension services and technical training can improve adoption of sustainable practices.

OVERALL CONCLUSION:-

This study examined the influence of physical and socio-economic factors on agricultural performance in District Basti, Uttar Pradesh, using a descriptive and analytical research design. The analysis was based on secondary data obtained from district statistical records, agricultural census reports, and institutional publications, supported by percentage analysis, tabular interpretation, and correlation-based assessment. The findings reveal that although Basti receives approximately 915–925 mm of annual rainfall and possesses fertile alluvial soils suitable for cereal cultivation, agricultural productivity remains moderate. Rice and wheat together account for nearly 74 percent of the gross cropped area, yet their average yields—around 25–26 quintals per hectare for rice and 29 quintals per hectare for wheat—indicate underutilization of potential. Methodologically, the study applied comparative and correlational interpretation to evaluate relationships between irrigation access, landholding size, and productivity. The results suggest that irrigation coverage (with nearly 52 percent dependent on tube-wells) demonstrates a positive association with yield levels, whereas fragmented landholdings—affecting about 62 percent of marginal farmers—show a negative relationship with mechanization and farm efficiency. Socio-economic constraints, including limited institutional credit and low crop insurance coverage, further weaken agricultural resilience.

The research confirms that favorable natural conditions alone do not guarantee higher productivity. Instead, structural agrarian challenges play a more decisive role in shaping outcomes. By integrating physical resource analysis with socio-economic evaluation, the study provides a comprehensive understanding of agricultural dynamics in Basti. Sustainable improvement requires coordinated interventions focused on irrigation diversification, land consolidation, institutional strengthening, and technological diffusion. Strengthening these areas can transform the district's predominantly subsistence-oriented agriculture into a more productive, resilient, and economically viable system.

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