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Land Use and Change in Cropping Pattern of District Pilibhit Uttar Pradesh: A Decadal Analysis

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Abstract

Land use and cropping pattern is an important aspect of any economy studies particularly relevant to terai region. Given the fixed amount of land available on the earth and the simultaneous increases in population and the pressure on land has been increasing extremely that's why the leads to change in land use and cropping pattern. In the last few decades, changing market conditions as well as policy environments and climate variability has reshaped land use patterns in Pilibhit. However, there has been a transition from traditional subsistence to more market-dependent and diversified cropping systems due to these changes. The analysis finds principal forces of change behind these trends, such as cash crop subsidies from government, and enhanced irrigation systems, as well as the increasing power of mechanization and agricultural innovation. At the same time, these changes have also presented opportunities as well as problems for small and marginal farmers, who are normally disadvantaged in switching to other crop options by their limited resources and fragmented landholdings. These changes have significant socio-economic effects, including income variability, employment and food security. It also reports the environmental implications of increased farming practices, including soil degradation and water depletion. Based on interviews, and secondary data, the study analyses the implications of these changes on the sustainability of agricultural practices in Pilibhit.

Keywords: Land Use, Change Cropping Patterns, Agricultural Transformation, Cropping intensity.

INTRODUCTION

Change in land use and cropping pattern has emerged as a critical research area in rural India particularly in agriculture dependent districts such as the Pilibhit of Uttar Pradesh. Given the fixed amount of land available on the earth and the simultaneous increases in population and the pressure on land has been increasing extremely that's why the leads to change in land use and cropping pattern. Cropping pattern have traditionally been dominated by food needs. Commercial crops were confined to some regions and on relatively larger farms. Over the past few decades, more diversified cropping, more closely linked to market processes, has emerged, and was often the result of government intervention, market forces and deterioration in environmental quality (Chand & Raju, 2009). Based on the literature, these shifts are commonly attributed to government policies on promotion of high value crops (HVCs), expansion of irrigation facilities, and technology transfer and diffusion for increasing productivity (Sharma *et al*., 2018). But these changes also pose challenges posed for small and marginal farmers, who lack access to other resources required to engage in commercial agriculture and face higher economic and environmental risks (Birthal 2014). Research on change in cropping patterns has shown that, while diversification can add to incomes, it usually gives resources. Singh and Sidhu (2021) highlight that intensive cropping systems and a reduction in fallows have resulted in degradation of soil and water depletion which are important for sustainability. (Joshi 2019) showed similar trends in districts with the same socio-economic settings, where shifts in cropping patterns were largely driven by market signals, although sometimes at the expense of food security and ecological sustainability. The present study contributes to the literature by narrowing it down to Pilibhit, comparing land use and cropping patterns of the recent past three decade, as well as socio-economic and environmental effects.

Objective of the study:

1. To analyse historical trends in land use and cropping patterns in Pilibhit district.
2. To assess the impact of these structural changes on small and marginal farmers**.**

Review of Literature

The change in land use and cropping patterns were studied extensively as it relates to the rural economy in India. According to Chand and Raju (2009), the rapid changes in cropping patterns are the result of changing market developments and government policies and the resulting shift toward an early maturational impact of technology to bring about commercial agriculture and crop diversity. Similarly, Sharma *et al*., That said, Duflo (2018) highlight the importance of state subsidies for high-value crops and irrigation systems for getting farmers to transition away from traditional staple crops. But it is well known that the transition these changes pose are significant notably for small and marginal farmers who are resource poor and have limited access to money and capital to grow high value crops for commercial production (Birthal, Jha, & Joshi, 2014). According to Singh and Sidhu (2021), diversification increases income, but it frequently results in unsustainable practices and overexploitation of water resources and soils. Joshi, Gulati, and Cummings Jr. (2019) emphasise that intensive cropping can lead to ecological imbalance and is detrimental for long-term agricultural productivity this compounds the environmental issues discussed above. The literature calls for policies that would both cater to the sustainability of agricultural processes and offer smallholder farmers the degrees of freedom to readjust their actions to the development of agricultural practices. According to Birthal, Jha, and Joshi (2014), there are widening patterns of crop diversification across the Indian states, with socio-economic drivers, notably market access, credit, and agricultural input accessibility, having a significant influence on cropping patterns. Their results have particular implications for smallholder farmers in areas like Pilibhit, where limited resources discourage diversification.

RESEARCH METHODOLOGY

This study uses a secondary data-based research methodology to examine structural changes in land use and agricultural patterns in Pilibhit District, Uttar Pradesh. Data is gathered from government publications, agricultural census reports, and databases including the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, and Economic Survey of India. Historical data on cropping patterns, land use, and crop yields are examined to discover trends and shifts in previous decades. Furthermore, academic studies, policy documents, and reports from organisations such as the Food and Agriculture Organisation (FAO) and the Indian Council of Agricultural Research (ICAR) shed light on socioeconomic aspects affecting these developments. Statistical methods are used to evaluate patterns and relationships, with an emphasis on understanding how these changes affect small and marginal farmer's livelihood. The methodology ensures a comprehensive understanding of the district's agricultural transformation by synthesizing data from multiple reputable sources.

$$\text{Cropping Intensity} = \frac{\text{Gross Cropped Area}}{\text{Net Sown Area}} \times 100$$

RESULT AND DISCUSSION

Table 1: Changes in the land Use Pattern (2000-01 to 2020-21) (Area in '00'ha)

Land utilization Pattern	2000-01	2010-11	2020-21	Change in land use pattern over base year 2000-01	
				2010-11	2020-21
Total Reported Area for Land utilization	357224	378384	378384	5.92%	5.92%
Forest	80156	80010	84076	-0.18%	4.89%
Area put for non-agriculture use	3544	3159	2785	-10.86%	-21.42%
Barren and uncultivable land	7825	6835	5577	-12.65%	-28.73%
Gross cropped area	368178	394301	394906	7.10%	7.26%
Net sown area	222908	236525	231010	6.11%	3.63%
Area sown more than once	145270	160914	163896	10.77%	12.82%
Rabi	158794	170078	166674	7.11%	4.96%
Kharif	202344	209460	222219	3.52%	9.82%
Zaid	5859	5821	5762	-0.65%	-1.66%
Gross irrigated area	348637	383727	389991	10.06%	11.86%
Net irrigated area	197177	203985	229100	3.45%	16.19%
Pastureland	317	250	241	-21.14%	-23.97%
Cropping intensity (Percent)	165.17	166.7	170.94	0.93%	3.49%

Source: Sankhyakiya Patrika Pilibhit District

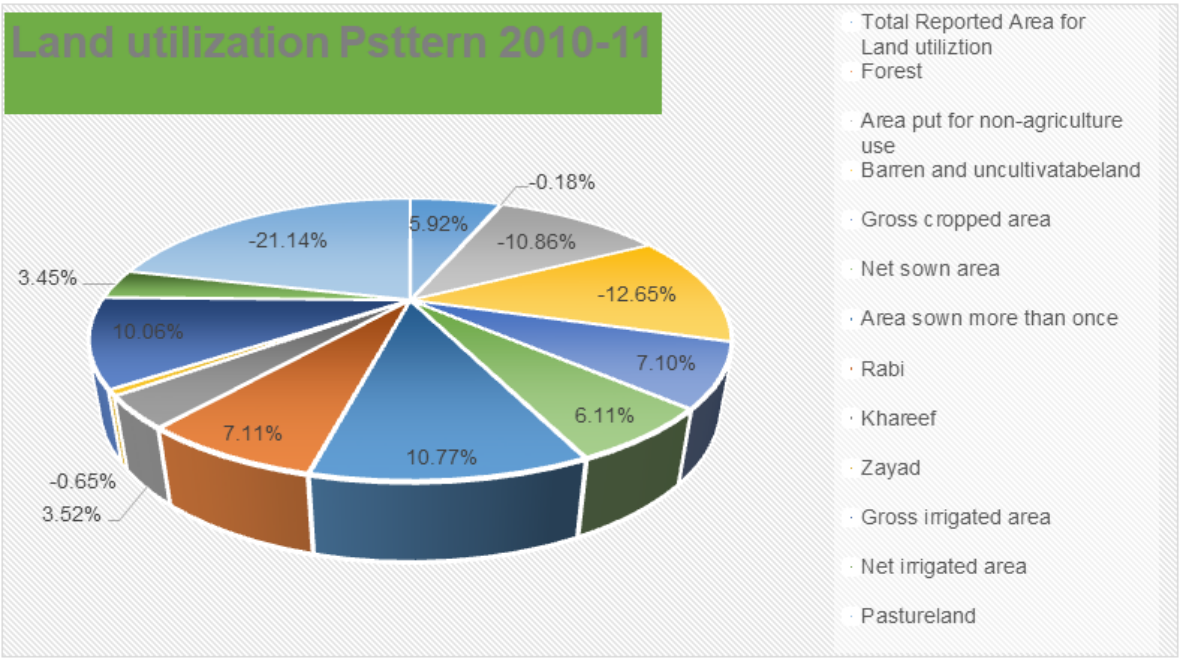

Fig. 1: Changes in the land Use Pattern (2010-11)

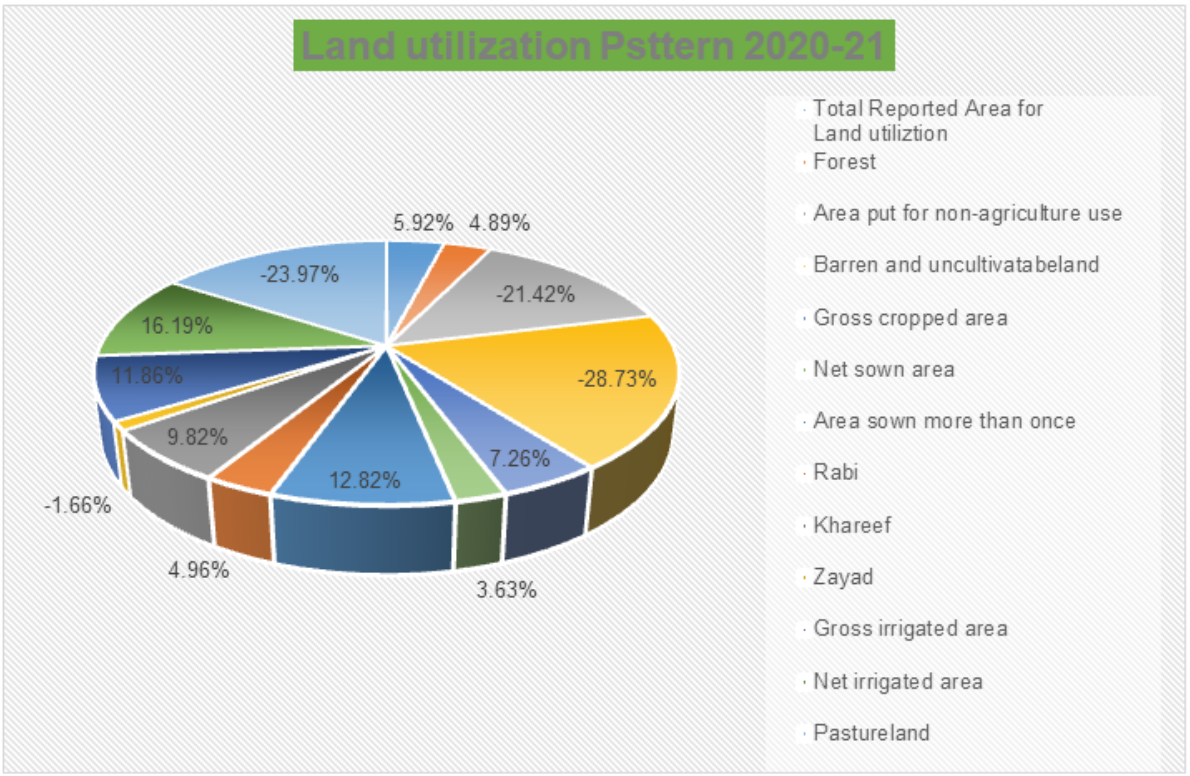

Fig. 2: Changes in the land Use Pattern (2020-21)

Table 1 show that how land was used in Pilibhit District in three different time periods: 2000–01, 2010–11, and 2020–21. The "Land Utilization Pattern" column groups the types of land use into groups, and the numerical columns show land use statistics for each decade. There are also columns in the dataset that show how land use trends have changed since the base year of 2000–2001. Total Area Reported for Use of Land From 2000-01 to 2020-21, the area grew from 357,224 hectares to 378,384 hectares, which is a rise of about 5.92%. This means that a bigger area is being thought about for land use, which could mean better land management or a change in how reports are made. From 2000 to 2010, the forest area went down from 80,156 hectares to 80,010 hectares. This could be because of cutting down trees, cities growing, or farms moving into forests. But from

2010–11 to 2020–21, the forest area grew by 4.89 percent, from 80,156 hectares to 84,076 hectares. This shows that steps are being made to protect forests or plant new ones, but it may mean less land for farming. Area Used for Things Other Than Farming A big drop of 21.41% was seen, from 3,544 hectares to 2,785 hectares, which suggests that farming or other land uses are becoming more important. Barren and Uncultivable Land went down by 28.73%, from 7,825 hectares to 5,577 hectares. This shows that work is being done to turn land that was not previously usable into something useful. Gross Cropped Area grew by 7.26 percent, from 368,178 hectares to 394,906 hectares, showing that farming activities got busier. Net Sown Area went up by 3.63 percent, from 222,908 hectares to 231,010 hectares, which shows a modest rise in farming. More than Once a big jump of 12.82 percent, from 145,270 hectares to 163,896 hectares, showing more crops because of better farming and watering methods. Rabi and Kharif crops both grew, Rabi grew by 4.96 percent and Kharif grew by 9.82 percent, which suggests that growth was even during the main growing seasons. Zayad Crops went through changes that led to a net loss of 1.66% from the base year. Gross irrigated area increased by 11.86% and net irrigated area increased by 16.19%, which shows that the equipment for irrigation got better. Pastureland dropped by 23.97%, which means there was less land for grazing. Cropping Intensity Increased from 165.17% to 170.94%, imitating more intensive farming practices.

Environmental and Land Management Impact:

The rise in forest area and decrease in barren land indicate beneficial environmental effects and better land management methods. The decrease in non-agricultural land usage and growth in agricultural areas suggest a desire to improve agricultural production. The conversion of non-agricultural land to agricultural use may have an impact on local industry and infrastructure development. Improved irrigation and planting intensity indicate advances in agricultural technology and techniques, which could lead to improved yields, a boost to the local economy, and increased food security. A loss in pastureland may have an influence on cattle husbandry, necessitating alternate fodder production practices. Decrease pastureland and more cropping intensity may put pressure on natural resources, and in future sustainability issues may rise. The changes suggest that increasing agricultural productivity should be prioritized, but with careful management to achieve an economic sustainability and environmental needs balance. The implications of reduced pastureland and land used for intensive grazing emphasizes the importance of sustainable practices for optimum resource utilization for continued agricultural production in the future. All in all, such changes represents a larger phenomenon of sustainable land use practice in Pilibhit district with enhanced productivity in agriculture with simultaneous rise or at least retention in forest cover.

The factors that may have contributed to the consistency in the land use pattern were found. Consider the socioeconomic, environmental, and policy-related impacts. Despite population growth, non-agricultural land usage is decreasing, indicating controlled urbanisation or good land-use planning. There is an increase in gross cropped area and net seeded area, indicating an emphasis on agriculture. This implies improved agricultural techniques and more access to resources, reflecting the district's emphasis on agriculture as its principal economic sector. A modest increase in forest area between 2010-11 and 2020-21 shows reforestation efforts or natural regeneration, implying beneficial environmental factors or policy measures focused at preserving or growing forest cover. The decrease in barren and uncultivable land reflects efforts to reclaim and use such lands for productive uses, whether through soil treatment techniques or irrigation development. The rise in both gross and net irrigated areas reflects good water management policies and infrastructure development, which promotes agricultural productivity and sustainability. Land use patterns with a focus on agriculture may be altered by government policies favouring agricultural development, subsidies, and farmer support. Policies aiming at environmental conservation and sustainable land management may have contributed to the growth in forest area and decrease in barren land.

The district's emphasis on agriculture as a key economic sector, combined with improved agricultural methods and limited urban expansion, helps to ensure continuity in land use patterns. Positive environmental activities and successful legislative measures, such as reforestation and sustainable land management, are critical to ensuring consistent land use patterns.

The dataset in table 2 analyses the change in cropping patterns in Pilibhit over the course of three decades: 2000-01, 2010-11, and 2020-21. Crop types ('Particulars'), crop production values for each decade, and the percentage change in cropping patterns over the base year 2000-01 are all key columns. The crops categories explored were potato, rice, sugarcane, total oilseeds, total pulses and wheat. The cultivation pattern of rice recorded a percentage change of 7.53% in 2010-11 and 3.02% in 2020-21 which is considered as a moderate increase. Wheat saw a similar gradual rise of 8.89% in 2010-11 and 6.21% in 2020-21. The sugarcane industry experienced the most considerable positive change, with a 15.03% increase in 2010-11 and a substantial 50.40% increase in 2020-21. This suggests a change towards commodities that may be more economically advantageous or that are more resilient to climate change. A considerable decline was indicated by the percentage change of Total Pulses, which was -46.99% in 2010-11 and -65.25% in 2020-21. A significant positive change was observed in Total Oilseeds, with a 38.49% increase in 2010-11 and a 45.45% increase in 2020-21. The potato experienced a

negative change, with a percent change of -18.42% in 2010-11 and -28.27% in 2020-21. The most significant growth in cropping patterns has been observed in Sugarcane and Total Oilseeds, suggesting a trend towards these commodities in recent years. Potatoes and total pulses have experienced a decline, which implies that these commodities are experiencing unfavourable conditions or a diminished focus. Over the years, rice and wheat have maintained a relatively stable cultivation pattern, despite experiencing moderate changes.

Table 2: Changes in the cropping pattern 2000-01 to 2020-21 (Area in '00' ha)

Particulars	2000-01	2010-11	2020-21	Percent change in cropping pattern over base year 2000-01	
				2010-11	2020-21
Rice	151391	162786	155964	7.53%	3.02%
wheat	141609	154193	150403	8.89%	6.21%
Sugarcane	43675	50239	65689	15.03%	50.40%
Total pulses	6973	3696	2423	-47.00%	-65.25%
Total oilseeds	7500	10387	10909	38.49%	45.45%
Potato	467	381	335	-18.42%	-28.27%

Source: Sankhyakiya Patrika Pilibhit District

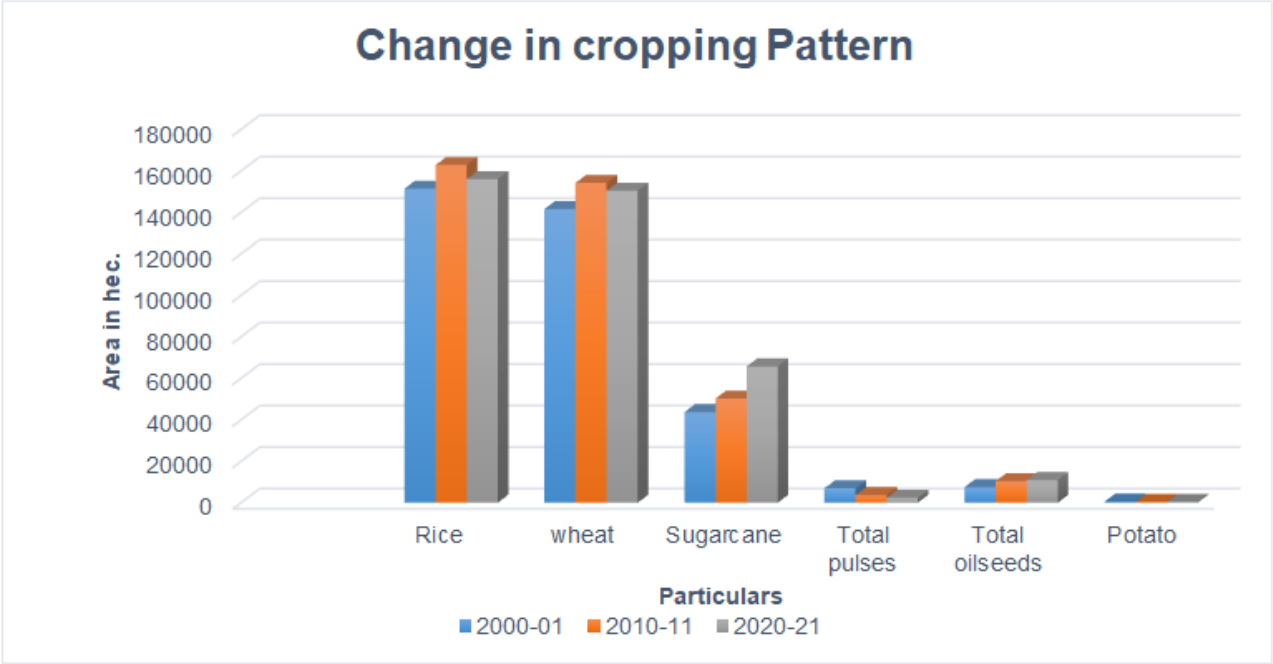

Fig. 3: Changes in Cropping Pattern

Factors Influencing Changes in Cropping Patterns

Economic Factors

Sugarcane cultivation increased by 50.4% between 2000-01 and 2020-21, most likely due to increased market demand and higher sugar and related product prices. This shows that farmers may have changed to sugarcane due to its higher profitability over other crops. Farmers switched to crops that were more profitable for them, which could have contributed to the decline in the overall amount of pulses and potatoes being grown, whether due to increased costs or lower profits. Record 45.45% increase in oilseeds area indicates that the farmers are shifting their crops to those which will provide them fair income security or adequate return. Cropping patterns can be changed by policies that support certain crops with subsidies, minimum support prices, or other benefits. More sugarcane might be grown because the government is supporting it more. Changes in the price of things like seeds, fertiliser, and labour can affect the crops that are grown. Farmers might choose crops that have lower costs to grow or better returns on investment.

Environmental Factors

Changes in temperature, patterns of rainfall, and the frequency of extreme weather events can all have an effect on the viability of different crops. Farmers may choose to cultivate crops that are more resistant to these changes, such as sugarcane, if rice and wheat are less resistant to these changes. Changing cropping patterns might be caused by a decline in the quality of the soil or by variations in the amount of water that is available. There may be an increase in the cultivation of crops that have a lower water requirement or are more tolerant of soil conditions that are less than ideal.

Technological Factors

The selection of crops can be influenced by the implementation of new agricultural technologies, including irrigation techniques, mechanisation, and improved seed varieties. The rise in sugarcane cultivation may be attributed to the introduction of novel sugarcane varieties that exhibit disease resistance or higher yields. Enhanced access to agricultural knowledge and training will enable farmers to decide on crop choice with awareness, therefore influencing possible changes in cropping patterns. Changes in cropping patterns are probably the outcome of a complicated interaction among environmental circumstances, financial incentives, and technical developments. Every one of these factors greatly affects the choices of farmers about the crops to grow. Further changes in cropping patterns are envisaged as these elements change, therefore stressing the need of adaptive solutions in agricultural planning and policy making.

CONCLUSION AND RECOMMENDATIONS

The findings suggest need for effective policies that support to sustainable agricultural practices, especially support to small farmers and sustainable cropping patterns. The study through secondary data collected over three decades concludes that Pilibhit District experienced major agricultural change in terms of cropping intensity (167.17% in 2010-11 to 170.94% in 2020-21) largely due to a significant increase in sugarcane cultivation (50.4%) in contrast to crop pulses and potatoes which declined by 65.25% and 28.27%, respectively with an increase in oilseeds by 45.45% in Pilibhit. Better irrigation up by 16.19 percent in net irrigated area and encouragement by policies has aided this change. But sustainability has been exposed by issues like soil degradation, depletion of water resources, and 23.97% of pastureland lost which particularly burdens small and marginal farmers with limited resources. The findings highlight the need for policies that encourage sustainable practices, equitable access to resources and resilience in agricultural systems in a manner that balances economic development with the need to protect biodiversity.

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