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# Industrial Growth And Agricultural Transformation: A Case Of Pune District

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***Abstract:***
*Pune district has witnessed rapid industrial growth in recent years, which has significantly influenced its agricultural and socio-economic environment. The present study attempts to analyse the impact of industrialisation on agriculture with specific reference to land utilisation, cropping patterns, agricultural productivity, and the livelihood of farmers. Primary data was collected from 55 respondents through structured questionnaires and personal interviews, comprising farmers and stakeholders affected by industrial expansion. The analysis reveals that industrial growth has led to a decline in cultivable land, alterations in cropping practices, and increasing dependence of farmers on non-agricultural sources of income. Although industrialisation has generated employment opportunities and facilitated infrastructural development, a considerable proportion of respondents reported adverse effects such as depletion of soil fertility, shortage of irrigation resources, and reduced agricultural profitability. The study concludes that industrialisation exerts a dual influence—providing economic opportunities while simultaneously posing challenges to agricultural sustainability. It highlights the necessity of formulating balanced policies that ensure industrial progress without undermining the agricultural base of Pune district.*

***Keywords:*** *Agricultural, Industrial growth, Industrialization, Agricultural Sustainability*

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## I. Introduction:

Industrialisation has emerged as a crucial driver of economic development in India, contributing significantly to employment generation, infrastructural advancement, and regional growth. However, the expansion of industries has also exerted considerable influence on traditional sectors, particularly agriculture, which continues to remain the backbone of the Indian economy. The delicate balance between industrial progress and agricultural sustainability is an area of growing concern, especially in regions where rapid industrial growth is observed alongside fertile agricultural land.

Pune district, situated in Maharashtra, presents a unique case in this regard. Over the past few decades, the district has transformed into one of the leading industrial hubs of the state, attracting investment in automobile, information technology, manufacturing, and allied sectors. This industrial expansion, while creating economic opportunities, has also resulted in notable shifts in land use, cropping patterns, and the socio-economic conditions of farming communities. With agriculture employing a significant section of the population in the district, the interplay between industrialisation and agriculture becomes vital to study in order to understand its long-term implications.

The present study seeks to examine the impact of industrial growth on agriculture in Pune district with specific attention to land utilisation, crop productivity, farmers' income sources, and sustainability of agricultural practices. Data for the study has been collected from 55 respondents including farmers and local stakeholders, thereby providing empirical insights into the transformations taking place at the ground level. By analysing both the opportunities and challenges posed by industrialisation, this study aims to contribute to the discourse on formulating balanced developmental policies that safeguard agricultural interests while promoting industrial progress.

## II. Literature Review:

Industrialisation and agriculture have always maintained a close yet complex relationship. Several scholars have examined the economic, social, and ecological consequences of industrialisation on agriculture and rural livelihoods.

Pallala Vyshnavi, Sravanthi, and Vasavi (2024) noted that most sociological studies on industrialisation have concentrated on labour processes. However, some important works have also studied its effects on rural

communities, particularly in terms of production and agricultural practices. Pawar and Gosavi (2024) focused on the development of agricultural markets in Pune, highlighting the role of infrastructure, technology, and policy in strengthening supply chains under industrial influence.

Patil et al. (2023) worked on machine learning applications for crop prediction in the outskirts of Pune. Though technological in nature, their work shows how industrial growth indirectly shapes agricultural practices. Similarly, Dighavkar (2016) in his doctoral research highlighted the ecological and biochemical effects of urbanisation and industrialisation on water quality in the Bhima River, underlining the importance of clean water for agriculture.

Vasudevan, Jaybhaye, and Panicker (2023) studied shifting cultivation in Junnar Tehsil and its effect on soil health and microbial diversity, which is relevant for resilience in semi-industrialising areas. Chipade et al. (2024) analysed how climate variability affects crop yield in Pune District, noting that climate changes linked with industrialisation add further stress to agriculture. Shinde, Tipe, and Mane (2024) studied agricultural growth and environmental productivity in Maharashtra, providing a wider state-level perspective.

Research in other parts of Maharashtra and India also provides useful insights. Anita Chorey et al. (2025) studied integrated farming systems in dryland regions of Akola, showing how farmers adopt new strategies to cope with industrial pressure. Ghosh, Mukhoti, and Sharma (2025) modelled rainfall risk on rice production across Maharashtra, highlighting climatic risks under changing land use. Aggarwal and Garg (2024) examined land-use change in Sri City, Andhra Pradesh, offering comparative lessons for Pune. Similarly, Rajguru, Kamble, and Nanaware (2024) analysed land-use changes in Western Maharashtra between 2010 and 2023, projecting the trend up to 2030.

At a broader level, Mayya and Shetty (2015) discussed industrialisation as a driver of social and economic change in developing countries, but also pointed to negative outcomes such as rural–urban migration, housing shortages, groundwater depletion, and environmental pollution. Holkar et al. (2018) acknowledged the positive role of industrialisation in employment generation and modernisation of farming but warned of reduced soil fertility due to continuous use of industrial inputs. Hatami and Shafieardekani (2014) reported destructive effects of unplanned industrial growth on biodiversity, while Zhang et al. (2015) highlighted soil contamination challenges in China caused by rapid industrialisation.

Globally, Isiksal (2016) examined the relationship between agriculture, industry, services, and GDP in Nigeria using Johansen's co-integration approach. The findings showed a long-term interdependence among these sectors, stressing that strengthening agriculture alongside industry is essential for balanced economic growth.

To summarise, the reviewed studies confirm that industrialisation has both positive and negative effects on agriculture. On one hand, it supports technological progress, market expansion, and infrastructure growth. On the other, it creates ecological challenges, affects land-use patterns, and reshapes rural livelihoods. For Pune District, where rapid industrial growth coexists with traditional farming, these insights provide a significant foundation for further research.

## III. Research Methodology

The present study is exploratory in nature and is based on primary as well as secondary data. Primary data was collected through a structured questionnaire from 55 respondents comprising farmers from selected areas of Pune district. The respondents were chosen using purposive sampling, with an emphasis on those directly affected by industrial growth.

The secondary data was collected from reputed national and international journals, published research papers, government publications, and authentic online repositories such as Shodhganga, which provides access to doctoral theses and scholarly works. These sources were carefully chosen to ensure reliability, academic credibility, and relevance to the present research problem.

## IV. Objectives:

1. To study the impact of industrial growth on agricultural land use and cropping patterns in Pune district.
2. To analyse the effect of industrialisation on the livelihood and income sources of farmers.
3. To examine the challenges faced by the agricultural sector due to industrial expansion in Pune district.

## V. Hypothesis

1. $H_0$: There is no significant impact of industrial growth on agricultural practices in Pune district.
2. $H_1$: There is significant impact of industrial growth on agricultural practices in Pune district.

## VI. Analysis And Interpretation

**Table No 1:**

The analysis of gender-wise distribution shows that out of the total 55 respondents, 38 (69.1%) are male while 17 (30.9%) are female. This indicates that the participation of men in agricultural and allied activities is

comparatively higher in Pune district. However, the presence of nearly one-third female respondents suggests that women too are increasingly contributing towards agriculture and related occupations, either directly through farming activities or indirectly through supportive roles. This reflects a gradual change in gender participation in rural economic activities.

**Table No 1: Distribution of Gender**

| Gender | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Male | 38 | 69.1 | 69.1 | 69.1 |
| | Female | 17 | 30.9 | 30.9 | 100.0 |
| | Total | 55 | 100.0 | 100.0 | |

**Table 2:**

The age distribution of the respondents indicates that most of them belong to the younger and middle-aged groups. The largest group is 31–40 years, which constitutes 45.5% of the total respondents, followed by the 20–30 years group at 40%. Together, these two groups make up 85.5% of the respondents, showing that the majority of the sample falls in the 20–40 years age range. The older age groups are much smaller, with only 9.1% in the 41–50 years group and 5.5% in the 51 and above category. This suggests that the data primarily reflects the views of younger adults, while the representation of older respondents is limited. Overall, the sample is clearly dominated by the younger population.

**Table 2: Distribution of Age**

| Age | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 20-30 | 22 | 40.0 | 40.0 | 40.0 |
| | 31-40 | 25 | 45.5 | 45.5 | 85.5 |
| | 41-50 | 5 | 9.1 | 9.1 | 94.5 |
| | 51 and above | 3 | 5.5 | 5.5 | 100.0 |
| | Total | 55 | 100.0 | 100.0 | |

**Table 3:**

The above table and graph represent the distribution of respondents based on their occupation. Out of a total of 55 respondents, the majority, 21 individuals, are farmers, which constitutes 38.2% of the total respondents. This indicates that a significant portion of the sample belongs to the agricultural sector. The next major group comprises individuals classified under "Others," accounting for 19 respondents or 34.5% of the total. This category may include occupations not specifically listed in the survey. Local government officers represent 13 respondents, making up 23.6% of the sample, showing a moderate representation of administrative personnel. Industrial workers are the smallest group, with only 2 respondents, which is 3.6% of the total, reflecting minimal participation from the industrial sector. Interestingly, there were no respondents categorized as environmental experts. The cumulative percentage shows that together, farmers, industrial workers, and local government officers constitute 65.5% of the total respondents, while adding the "Others" category completes the 100% distribution. This analysis highlights that the sample is dominated by farmers and other miscellaneous occupations, with limited representation from industrial workers and none from environmental experts..

**Table 3: Distribution of Occupation**

| Occupation | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Farmer | 21 | 38.2 | 38.2 | 38.2 |
| | Industrial Worker | 2 | 3.6 | 3.6 | 41.8 |
| | Local Government officer | 13 | 23.6 | 23.6 | 65.5 |
| | Environmental Expert | 0 | 0 | 0 | 0 |
| | Others | 19 | 34.5 | 34.5 | 100.0 |
| | Total | 55 | 100.0 | 100.0 | |

**Table 4:**

The table represents the distribution of respondents based on their location, which has been categorised into Urban Area, Rural Area, and Semi-Urban Area. Out of the total 55 respondents, a majority of 31 respondents, accounting for 56.4% of the sample, belong to Urban Areas. This indicates that more than half of the respondents reside in cities or towns, suggesting a higher urban representation in the study. In contrast, 24 respondents, representing 43.6% of the total, are from Rural Areas, showing that nearly two-fifths of the participants are from villages or countryside regions. Notably, there are no respondents from Semi-Urban Areas, which means this

category has a 0% share in the survey. The cumulative percent column shows that after including Urban and Rural Areas, the total reaches 100%, confirming that all respondents fall within these two categories. Overall, the graph indicates a higher concentration of participants from Urban Areas, while Rural Areas also have significant representation, and Semi-Urban Areas are absent in the dataset.

**Table 4: Distribution of Location**

| Location | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Urban Area | 31 | 56.4 | 56.4 | 56.4 |
| | Rural Area | 24 | 43.6 | 43.6 | 100.0 |
| | Semi Urban | 0 | 0 | 0 | 0 |
| | Total | 55 | 100.0 | 100.0 | |

**Table 5:**

The graph represents the distribution of employees based on their work experience. From the data, it is observed that a significant portion of the workforce, i.e., 32.7%, has less than 5 years of experience, indicating a relatively young and possibly fresh talent pool in the organization. Employees with 5 to 10 years of experience constitute 30.9%, which shows that nearly one-third of the staff have moderate experience, contributing to stability and continuity in work processes. The segment with 11 to 20 years of experience accounts for 23.6%, representing a group of experienced professionals who likely provide guidance and expertise. Finally, employees with more than 20 years of experience make up 12.7% of the workforce, indicating a small but valuable group of highly seasoned professionals. Overall, the cumulative percentage shows that over 63% of employees have up to 10 years of experience, reflecting a workforce that is largely early to mid-career, while the remaining 37% bring significant experience and maturity to the organization.

**Table 5: Distribution of Experience**

| Experience | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Less Than 5 years | 18 | 32.7 | 32.7 | 32.7 |
| | 5-10 years | 17 | 30.9 | 30.9 | 63.6 |
| | 11-20 Years | 13 | 23.6 | 23.6 | 87.3 |
| | More than 20 years | 7 | 12.7 | 12.7 | 100.0 |
| | Total | 55 | 100.0 | 100.0 | |

**Table 6:**

The graph represents the distribution of sources of income among a sample of 55 respondents. According to the data, the highest proportion of respondents, 40% (22 individuals), earn their income from agriculture. This indicates that a significant number of people are dependent on agricultural activities for their livelihood. The second-largest group, comprising 32.7% (18 respondents), earns through non-agricultural sources, such as business, services, or daily wage labour, reflecting a moderate level of diversification in income sources. Additionally, 27.3% (15 respondents) have combined sources of income, meaning they earn from both agriculture and non-agriculture activities. The cumulative percentage shows that by including the first two categories, nearly 72.7% of the respondents have either agriculture or non-agriculture as their primary source of income. Overall, the graph highlights that agriculture remains the predominant source of income, but a notable portion of the population is also engaged in non-agricultural or combined income activities, suggesting economic diversification among the respondents.

The study shows that agriculture is the main source of income for 40% of respondents, followed by non-agriculture (32.7%) and combined sources (27.3%). Most respondents have completed secondary or higher secondary education, while few have professional or post-graduate qualifications. Occupation-wise, farming dominates, with fewer people in business, services, or government jobs. Household sizes are mostly 4–6 members, indicating small to medium families. Annual income is moderate for the majority, with fewer households in low or high-income brackets. Landholding patterns reveal that most own small to medium plots, limiting agricultural productivity. The data highlights a reliance on traditional occupations, with some diversification into non-agricultural activities. Education levels influence employment opportunities and income. Overall, the respondents show moderate economic stability but face resource limitations. The findings suggest the need for enhanced education, income diversification, and livelihood development.

**Table 6: Distribution of Source of Income**

| Source of Income | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Agriculture | 22 | 40.0 | 40.0 | 40.0 |
| | Non Agriculture | 18 | 32.7 | 32.7 | 72.7 |
| | Combine | 15 | 27.3 | 27.3 | 100.0 |
| | Total | 55 | 100.0 | 100.0 | |

## VII. Hypothesis Testing

We used the Chi-square test because both industrial growth and changes in agricultural practices are categorical variables, and the test helps to check if there is a significant association between them.

| Chi-Square Tests | | | |
|---|---|---|---|
| | Value | df | Asymptotic Significance (2-sided) |
| Pearson Chi-Square | 21.008a | 9 | .013 |
| Likelihood Ratio | 16.112 | 9 | .065 |
| Linear-by-Linear Association | .526 | 1 | .468 |
| N of Valid Cases | 55 | | |
| a. 11 cells (68.8%) have expected count less than 5. The minimum expected count is .13. | | | |

The Chi-square test was conducted to examine the impact of industrial growth on agricultural practices in Pune district. The Pearson Chi-square value is 21.008 with 9 degrees of freedom, and the p-value is 0.013. Since the p-value is less than 0.05, we reject the null hypothesis, indicating that industrial growth has a significant impact on agricultural practices. However, it is important to note that 68.8% of the cells have expected counts less than 5, which may affect the reliability of the test. Therefore, while the results suggest a significant association, they should be interpreted with caution, and it may be advisable to combine categories or use an alternative test like Fisher's Exact Test for more robust conclusions.

## VIII. Findings

1. Agriculture remains the main source of income, but a notable proportion of respondents have non-agricultural or combined income sources.
2. Level of industrialization in Pune district is perceived as high to moderate by most respondents.
3. Industrial growth has contributed to urbanization, infrastructure development, and economic changes in surrounding areas.
4. Agricultural land has been reduced or converted for industrial purposes in several regions, affecting farm sizes and land ownership patterns.
5. Crop patterns have changed due to industrialization, including introduction of new crops, shift to profitable crops, and altered crop rotation.
6. Agricultural profitability has been affected, with many respondents reporting decreased income due to reduced land holdings, higher production costs, and market fluctuations.
7. Labor migration to industrial jobs has caused shortages in the agriculture sector, impacting productivity.
8. Industrial activities have affected environmental factors, such as air, water, and soil quality, influencing land fertility and crop yields.
9. Education and occupation patterns show reliance on traditional farming, though some diversification into non-agricultural work is observed.
10. Overall, industrial growth has a significant impact on agricultural practices, highlighting the need for policies that balance industrial development with sustainable agriculture.

## IX. Suggestion

Based on the study, it is recommended that authorities ensure a balanced approach between industrial growth and agricultural land preservation to prevent excessive farmland conversion. Farmers should be supported through subsidies, training, and awareness programs to improve productivity, adopt sustainable and modern farming practices, and diversify crops. Labor shortages in agriculture due to migration to industries can be managed through mechanization and skill development programs. Strict monitoring of industrial pollution is necessary to protect soil, water, and crop quality. Additionally, policies should integrate industrial development with rural agricultural growth, and market support should be provided to help farmers maintain profitability despite industrial pressures.

## X. Future Scope

The study on industrial growth and its impact on agriculture in Pune district opens several avenues for future research and policy planning. Future studies can focus on longitudinal analysis to track changes in agricultural productivity and land use over time as industrialization progresses. Detailed investigations on environmental impacts, such as soil fertility, water quality, and air pollution, can provide deeper insights into sustainable development. Research can also explore technological interventions, such as precision farming and mechanization, to mitigate the negative effects of labor migration and land conversion. Additionally, comparative studies across different districts can help identify best practices for balancing industrial growth with agricultural sustainability, contributing to effective policymaking and rural development strategies.

## XI. Conclusion

The study on the impact of industrial growth on agricultural practices in Pune district reveals that agriculture remains a major source of income, but industrialization has significantly influenced land use, crop patterns, and productivity. Many respondents reported changes in crop types, reduced farm sizes, and conversion of agricultural land for industrial purposes. Labor migration to industries has caused shortages in agriculture, affecting productivity, while industrial activities have also contributed to environmental changes like air, water, and soil quality, further impacting farming. Education and occupational patterns show that while most people are engaged in traditional agriculture, some have diversified into non-agricultural activities. Overall, the data indicates a significant association between industrial growth and changes in agricultural practices, highlighting the need for balanced planning to support both industrial development and sustainable agriculture.

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