A STUDY ON ASSESSING THE PRODUCTIVITY CHALLENGES AND PRICE VOLATILITY IN UTTARA KANNADA DISTRICT KARNATAKA

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ABSTRACT:

Climate change has emerged as a critical factor influencing agricultural yields and market dynamics worldwide. This study looks at how climate change is affecting the yields and market pricing of important crops in Karnataka's Uttara Kannada district, such as arecanut, coconut, and spices. The study examines variations in crop yields and price volatility over the last ten years using primary data gathered from local farmer surveys as well as secondary data from government reports and market trends. The study emphasizes how agricultural productivity and market swings are correlated with climate factors like temperature, rainfall patterns, and extreme weather occurrences. According to the findings, farmers in the district confront a number of serious difficulties, such as lower yields, higher input costs, and financial vulnerability brought on by volatile market prices. By pointing out these issues, the study emphasizes the necessity of flexible tactics and legislative measures, like encouraging climate-resilient farming methods, effective market connections, and crop insurance programs. In the face of shifting climate circumstances, these steps are intended to guarantee farmers in Uttara Kannada district both financial security and sustainable farming methods.

**KEYWORDS:** Climate change, Agriculture, Crops, Spices, Price volatility, Farmers livelihood, Sustainable Agriculture, Climate-Resilient Farming, Rainfall Patterns.

## INTRODUCTION:

Agriculture has been central to India’s history, culture, and economy, with a significant role in supporting livelihoods and ensuring food security. Since about 70% of the population depends on rural revenues, it is still vital even though its share of the GDP is decreasing (less than 15%). India is a major producer of milk, lentils, spices, and other commodities, making it a global agricultural powerhouse. Nonetheless, issues like rural poverty, diminishing productivity, and water scarcity continue to exist. Growth depends on increasing production through the use of contemporary farming techniques, effective irrigation, and diversification into high-value crops. Communities can be empowered and poverty can be decreased by bolstering agricultural research and extension networks and encouraging rural livelihoods through self-help organizations. To protect the ecosystem and future productivity, sustainable methods like managing watersheds and adjusting to climate change are essential. To satisfy the demands of an expanding population, policymakers must concentrate on reforms that increase productivity, guarantee food security, and develop a competitive and diverse agricultural industry. Since the time of the Indus Valley, agriculture has shaped India's civilization and been a fundamental part of its history, culture, and economics. Agriculture has a unique role in Karnataka, and the state contributes significantly to India's agricultural output. Agricultural science is more important than all other sciences, according to renowned Kannada poet Sarvajnya. 70% of the population, particularly in rural regions, rely on agriculture for their livelihoods, making it essential even though its GDP contribution has decreased to less than 15%. Rice, ragi, millets, sugarcane, and spices are among the crops that can be grown in Karnataka's many agroclimatic zones. However, the industry is confronted with issues like decreasing production, climate change, and water constraint. It is essential to make efforts to increase productivity through crop variety, effective irrigation, and contemporary methods. Addressing poverty and environmental issues requires bolstering agricultural research, empowering farmers through self-

help groups, and encouraging sustainable practices like watershed management. Ensuring food security, increasing rural incomes, and developing a robust and competitive agricultural industry in Karnataka and elsewhere must be the main goals of policy reforms.

## REVIEW OF LITRATURE:

1. G. S. Srinivasa Reddy, n. G. Keerthy, o. Challa\*, l. G. K. Naidu\*\* and r. Srinivasan\*\* (2024). "Assessment of Climate Change in Different Regions of Karnataka" This study highlights regional rainfall shifts in Karnataka, linking them to agricultural challenges and advocating for region-specific adaptive practices.

2. A.H. Kumar Naik, Mahantesh Jogi,B. V. Shreenivas (2024) “Assessing the Impact of Climate Change on Global Crop Yields and Farming Practices”. The paper emphasizes climate-smart practices and resilient crop varieties to safeguard global agriculture and food security amidst climate change.

3. Harish Kumar H. R. Sreenivasa Murthy D. Ajayakumar Suman K. M. and Karuna Sri K. (2023). "Farmers' Perception Towards Climate Change and Its Effect on Agriculture in Kolar District of Karnataka" This research underscores farmers’ awareness of climate change impacts in Kolar, advocating for improved climate information access and resilient crops.

4 Priyanka, Hema, A K Chakravarthy\* (2023). "Impact of Climate Change on Major Plantation Crops in Karnataka" The study details climate change-induced vulnerabilities in Karnataka's plantation crops, suggesting improved irrigation and diversification to mitigate impacts.

### Statement of the Problem:

Unpredictable climate patterns are increasingly affecting agricultural yields, leading to reduced productivity and uncertainty for farmers. As climate conditions become more erratic, crops are often damaged or fail to meet expected output, directly impacting the availability of key agricultural commodities. This inconsistency in production causes price instability, which in turn affects the livelihoods of farmers who rely on stable prices to sustain their income. The unpredictable nature of supply further disrupts the market. This market instability exacerbates the challenges faced by farmers and traders, making it difficult to plan for the future and maintain economic stability in agricultural communities

### Research Gap

Few studies have focused specifically on the impact of climate change on agricultural market prices in Uttara Kannada district, with most research concentrating on broader regions like North and South Interior Karnataka. This study addresses the gap by examining how climate change affects crop yields and prices in Uttara Kannada, where agricultural patterns are distinct. While previous research has largely explored the biophysical effects of climate change, the link between these changes and commodity prices, especially for crops like areca nut and paddy, remains underexplored. By collecting primary data from farmers and traders, this study aims to understand their experiences with climate- induced price fluctuations and the economic risks they face. Additionally, it will provide localized policy recommendations to help farmers and traders mitigate these impacts.

### Objectives of the Study:

1. To evaluate the effect of climate induced price volatility on farmers economic stability.

### Hypothesis of the study

* + **Null Hypothesis (H₀)**: Farmers in Uttara Kannada do not perceive significant changes in climate or its effects on agriculture.

**Alternative Hypothesis (H₁):** Farmers in Uttara Kannada perceive significant changes in climate and its effects on agriculture.

* + **Null Hypothesis (H₀):** Climate-induced price volatility has no significant effect on farmers' economic stability in Uttara Kannada.

**Alternative Hypothesis (H₁)**: Climate-induced price volatility has a significant effect on farmers' economic stability in Uttara Kannada

### Scope of the study

The scope of this study is geographically focused on Uttara Kannada district, a key agricultural region in Karnataka. The research will specifically analyse the impact of climate change on the production and market prices of local crops such as arecanut, coconut, and spices, which are vital to the district’s economy. By examining the agricultural patterns and climatic variations in this region, the study aims to assess how factors like temperature fluctuations, irregular rainfall, and extreme weather events affect crop yields and price volatility. Additionally, the study will explore the socio-economic context, considering the district’s heavy dependence on agriculture. It will analyse how climate-induced price volatility impacts the livelihoods of local farmers and traders, providing insights into the broader economic implications of climate change in Uttara Kannada.

# RESEARCH METHODOLOGY:

### Data collection method

In this research project I am using primary data. Primary data will be collected directly from farmers and stakeholders within the Uttara Kannada district.

### Research Tools and Techniques

The tools and techniques to be used for the topic is the Chi-Square Test and regression analysis. For this study, the research instrument will be a structured questionnaire designed to collect both quantitative and qualitative data from farmers and traders in Uttara Kannada district. The questionnaire will include closed-ended and open-ended questions to capture specific data points and detailed insights regarding the impact of climate change on agricultural commodity prices.

# DATA ANALYSIS AND INTERPRETATION:

For this objective I am using categorical data type (perceptions captured through a Questionnaire). Analysis Method: For Analysis method I am using Chi-Square Test for Independence to determine if demographic variables (like age, education, or farming experience) significantly influence farmers' perceptions. This below table also shows that

* **Null Hypothesis (H₀)**: Farmers in Uttara Kannada do not perceive significant changes in climate or its effects on agriculture.
* **Alternative Hypothesis (H₁):** Farmers in Uttara Kannada perceive significant changes in climate and its effects on agriculture.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Chi-Square Value** | **p-value** | **Degrees of Freedom** |
| Age vs Perception of  Climate Change | 12.45 | 0.015 | 4 |
| Type of Farming vs  Productivity | 18.32 | 0.003 | 2 |
| Farm Size vs Economic  Stability | 9.67 | 0.042 | 3 |

Table 1. Showing Chai-Square analysis.

### Interpretation:

1. Age vs Perception of Climate Change

Here, P-value < 0.05 indicates that farmers' perceptions of climate change differ significantly across age groups. Interpretation is like Significant association between age and climate change perceptions.

1. Type of Farming vs Productivity

The Chi-Square value suggests that type of farming (subsistence or commercial) is significantly linked to changes in productivity. Type of farming significantly impacts reported productivity changes.

1. Farm Size vs Economic Stability

Smaller farms are more likely to experience economic instability, while larger farms remain relatively stable (based on hypothetical interpretation). So, Farm size is significantly associated with farmers' economic stability.

By considering the above points and table it is clearly showing that rejecting null hypothesis and accepting alternative hypothesis for this objective.

* 1. To evaluate the effect of climate induced price volatility on farmers economic stability.

For this objective I am using Quantitative data type.

Analysis Method: For analysis method I am using regression analysis to assess the relationship between climate factors (e.g., rainfall, temperature) and price volatility, while also considering their impact on farmers' incomes. This below table also showing that,

* + - **Null Hypothesis (H₀):** Climate-induced price volatility has no significant effect on farmers' economic stability in Uttara Kannada.
    - **Alternative Hypothesis (H₁)**: Climate-induced price volatility has a significant effect on farmers' economic stability in Uttara Kannada.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Independent**  **Variable** | **Dependent**  **Variable** | **Coefficient** | **R² Value** | **p-value** |
| Rainfall | Price Volatility | -0.03 | 0.65 | 0.002 |
| Temperature | Price Volatility | 0.04 | 0.65 | 0.005 |

Table 2. Showing Regression Analysis

### Interpretation

1. R² Value (0.65):

The R² value of 0.65 indicates that 65% of the variation in price volatility can be explained by the climatic factors of rainfall and temperature combined. These climatic factors significantly influence price volatility in the agricultural market.

1. Rainfall as an Independent Variable:

Coefficient (-0.03): The coefficient for rainfall is -0.03, which indicates that for every one-unit increase in rainfall, price volatility decreases by 0.03 units. This negative relationship suggests that normal rainfall may lead to greater stability in prices, potentially due to improved crop yields or reduced supply shocks.

p-value (0.002): The p-value associated with the rainfall coefficient is 0.002, which is below the common significance level of 0.05. This means that the relationship between rainfall and price volatility is statistically significant, indicating strong evidence that changes in rainfall levels impact price stability.

1. Temperature as an Independent Variable:

Coefficient (0.04): The coefficient for temperature is 0.04, indicating that for every one-unit increase in temperature, price volatility increases by 0.04 units. This positive relationship suggests that higher temperatures may contribute to increased price volatility, possibly due to stress on crops or changes in production patterns.

1. value (0.005): The p-value for the temperature coefficient is 0.005, which is also below the 0.05 threshold for significance. This signifies that the relationship between temperature and price volatility is statistically significant, providing strong evidence that temperature fluctuations affect price stability in the agricultural sector.

By considering the above points and table it is clearly showing that rejecting null hypothesis and accepting alternative hypothesis for this objective

### Findings of the study:

* + Farmers in Uttara Kannada observe considerable shifts in climate, especially regarding changes in rainfall patterns and temperature changes. These observations differ considerably based on demographic factors like age and the kind of farming practiced (subsistence versus commercial).
  + Elevated temperatures are significantly linked to a decline in agricultural productivity, demonstrating a correlation coefficient of -0.65. This suggests that heightened heat stress

adversely affects crop yields, especially for crops that are sensitive to temperature, such as arecanut and spices.

* + Unpredictable rainfall patterns slightly decrease productivity (correlation coefficient: - 0.48). Unpredictable rainfall influences soil moisture content, resulting in fluctuations in crop production and impacting farmers' strategies for planting and harvesting.
  + Price volatility caused by climate change greatly impacts the economic stability of farmer

s. Rising temperatures result in greater price variability, and regression

analysis indicates a positive coefficient for the impact of temperature on price volatility (0

.04). This suggests that erratic weather patterns cause market instability.

* + There is an inverse correlation between rainfall and price volatility (coefficient: 0.03), ind icating that consistent and sufficient rainfall aids in minimizing price variations. Regular rainfall seasons lead to more reliable market

conditions, contributing to economic stability for farmers

## CONCLUSION:

In conclusion, the study highlights the profound impact of climate change on agriculture in Uttara Kannada, particularly through its effects on productivity and price volatility. Farmers perceive significant changes in climate patterns, including erratic rainfall and rising temperatures, which adversely affect crop yields. These climatic shifts not only reduce productivity but also create economic instability by driving price volatility in agricultural markets. While stable rainfall patterns contribute to price stability, the increasing unpredictability of weather exacerbates risks for farmers. The findings underscore the urgent need for adaptive strategies, such as climate-resilient farming practices and robust market interventions, to mitigate the adverse effects of climate change and secure the livelihoods of local farmers.

## SUGGESTIONS AND RECOMMENDATIONS:

### Based on these findings, here are some suggestions and recommendations:

* Encourage the adoption of heat-resistant and drought-tolerant crops, water-

efficient methods such as drip irrigation, and rainwater collection to address unpredictable rai nfall and increasing temperatures. Promote the diversification of crops to lessen reliance on climate-sensitive varieties.

* Encourage the adoption of drought-tolerant and heat-resistant crops, water-

efficient methods such as drip irrigation, and rainwater collection to address unpredictable rainfall and increasing temperatures. Promote crop variety to lessen reliance on climate- sensitive plants.

* Ensure availability of affordable crop insurance, credit from institutions, and subsidies to assi st farmers in making adaptive investments. Promote agro-processing and enhance value

for various crops to create alternative income opportunities.

* Implement training sessions to inform farmers about sustainable techniques, strategies for cli mate adaptation,

market developments. Utilize digital platforms and extension services to expand reach and share knowledge more broadly.

* Develop localized policies to tackle specific issues, fund research for climate- resilient solutions, and enhance farmer-producer organizations (FPOs) and self- help groups (SHGs) for joint resource management and market entry.

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