ACROPOLIS INSTITUTE OF TECHNOLOGY AND RESEARCH

Computer Science & Engineering (Data Science)

Synopsis on

"Weather Impact On Crop Yield"

1. INTRODUCTION

1.1 Overview

    i.   Investigate the impact of weather patterns(temperature, extreme events) on crop yields.

    ii.   Analyzes historical data and develops predictive model for future yield trends.

    iii.   Provides insights and recommendations for climate-resilient farming practices.

1.2 Purpose

    i.   Understand how weather patterns influence crop yield and agricultural productivity.

    ii.   Analyze historical data to identify trends between climate variables and crop performance.

    iii.   Develop predictive model to forecast crop yield under different climate scenarios.

    iv.   Offer practical recommendations for climate adaptation and resilience in farming.

    v.   Support policymakers, farmers, and stakeholders with data-driven insights for sustainable agriculture.

2. LITERATURE SURVEY

2.1 Existing problem

    i.   **Unpredictable Climate Patterns**
Increasingly variable and extreme weather conditions (droughts, floods, heatwaves) make it difficult for farmers to predict crop outcomes.

ii. Crop Yield Decline

Many regions are experiencing reduced yields due to adverse weather impacts, threatening food security.

iii. Data Gaps

Lack of accurate, localized weather and yield data hampers the ability to make informed agricultural decisions.

iv. Inadequate Climate Adaptation

Farmers and policymakers lack actionable tools and strategies to effectively mitigate the negative effects of climate change.

v. Economic Losses

Unstable crop yields due to weather variability result in significant financial losses for farmers and the agricultural sector.

2.2 Proposed Solution

Develop machine learning-based model to predict crop yield under various weather scenarios, helping farmers make informed decisions. Create accessible application for farmers and policymakers that offer real-time weather forecast and yield prediction based on historical and current data.
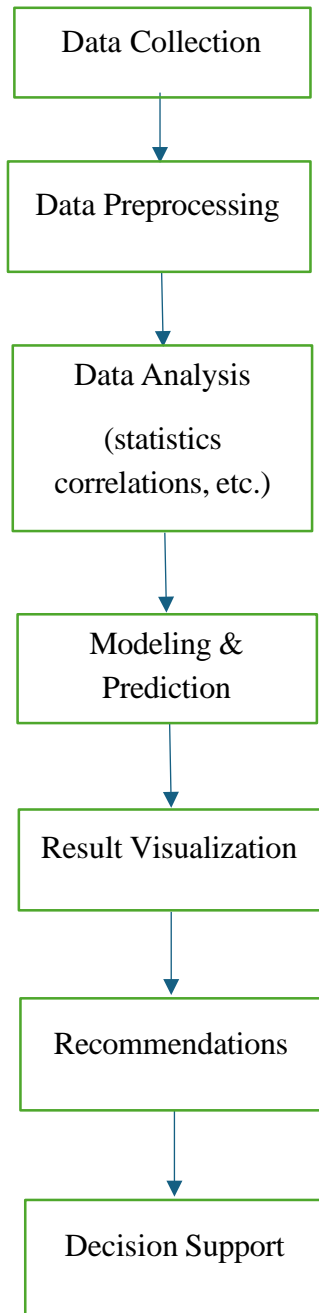
3. THEORETICAL ANALYSIS

3.1 Block Diagram

Data Collection

Data Preprocessing

Data Analysis

(statistics
correlations, etc.)

Modeling &
Prediction

Result Visualization

Recommendations

Decision Support

Fig.1. Block Diagram of Weather Impact on Crop Yield

3.2 Hardware/Software Designing

i.   **Hardware Requirements -** List of all the hardware components necessary for the project, including their specifications.

Hardware Component	Minimum Specifications	Recommended Specifications
Processor	Intel i5 (2.5Hz) or equivalent	Intel i7 (3.0 GHz) or higher
RAM	4 GB	16 GB
Hard Disk	500 GB	1 TB SSD
Graphics Card	Integrated Intel HD Graphics	Dedicated 4 GB NVIDIA/AMD GPU
Monitor	15-Inch LED	24-inch Full HD
Other Accessories	Keyboard, Mouse etc.	External storage(optional)

ii.   **Software Requirements -** List of all the software tools, platforms, and versions needed for the project.

Software	Purpose	
Operating System	System environment	Windows 10 / Linux Ubuntu
Programming Language	Development	Python 3.8+
Code Editor	Writing and testing code	Vs code (version 1.94)
Data Analysis Tools	Data manipulation, numerical computations.	Pandas, NumPy.
Data Visualization Tools	For data visualization	Matplotlib/Seaborn
Other Python's Library	For machine learning model	Scikit-learn
Other Python's Library	For build a web application	Stream lit

4. APPLICATION

i. **Agricultural Planning**

Farmers can use predictive models to plan planting and harvesting schedules based on expected weather conditions, improving efficiency and yield.

ii. **Risk Management For Farmers**

Farmers can reduce financial losses by using real-time decision-support tools to anticipate climate risks and implement preventive measures.

iii. **Sustainable Farming Practices**

The project promotes the adoption of climate-resilient techniques, such as crop rotation, drought-resistant seeds, and optimized water use.

iv. **Investment and Insurance Planning**

Financial institutions and insures can use the yield forecast and climate data to assess risks and structure agriculture loans or insurance products.

REFERENCES

1. Books

i. "Climate Change and Agricultural Food Production" by Golam Kibria

This book explores the implications of climate change on crop production and agricultural systems.

ISBN: 978-8190957704

ii. "Agricultural Adaptation to Climate Change" by Christopher Rosenzweig & Anthony Iglesias

This book focuses on potential adaptation strategies in agriculture for mitigating the negative effects of climate change.

ISBN: 978-1617260963

2. Websites

i. Climate Change Knowledge Portal (World Bank)

Provides tools and data on how weather and climate variables affect crop yields in different countries and regions.

Link to portal - https://climateknowledgeportal.worldbank.org/

ii. Agricultural Model Intercomparison and Improvement Project (AgMIP)

Offers insights into crop modeling, climate data, and projections of how changing weather patterns will impact crop yields.

Link to AgMIP - Home - agmiporg

3. Datasets For Analysis

i. NOAA's National Centers for Environmental Information

Provides historical weather and climate data that can be used to analyze trends affecting crop yields

NOAA link - https://www.ncei.noaa.gov/

ii. FAOSTAT (FAO)

Access global data on agricultural production, including crops, which can be correlated with weather data.

Link to FAOSTAT - FAOSTAT

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