

Developing a Scalable Data Analytics Framework for Tailored Agronomic Recommendations Integrated with Climate Information Services







Introduction

- Objective: To explore and discuss the essential components and requirements of a comprehensive framework aimed at delivering tailored agronomic recommendations. This framework will be integrated with climate information, farm/farmer typology, and scalable to support smallholder farmers.

Importance of Tailored Agronomic Recommendations

- Smallholder farmers face unique challenges
- Need for precise and localized advice
- Benefits of integrating climate information:
  - **Better risk management**
  - **Improved crop yields**
  - **Enhanced resilience to climate variability**



Key Components of the Framework

1. Data Collection and Integration
2. Data Storage and Management
3. Data Processing and Analytics
4. Integration with Climate Information Services
5. Farmer Interface and Engagement
6. Scalability and Sustainability
7. Monitoring and Evaluation
8. Training and Capacity Building

1. Data Collection and Integration

- Climate Data: Real-time and historical data (temperature, precipitation, etc.)
- Soil Data: Soil composition, moisture, nutrient levels
- Crop Data: Crop types, growth stages, yield data
- Farm/Farmer Typology: Farm size, location, socio-economic factors

Sources: Weather stations, Satellites, Soil sensors, Farm records, Field surveys.

2. Data Storage and Management

- Centralized Database: Robust systems (e.g., PostgreSQL)
- Data Integration Layer: Data cleaning, normalization
- Data Security and Privacy: Compliance with regulations

3. Data Processing and Analytics

- Big Data Analytics: Technologies like Hadoop, Spark
- Machine Learning Models:
  - **Predictive models for weather, yield, pests, and soil health**
- Decision Support Tools/Systems (DST/DSS):
  - **User-friendly tools providing actionable insights**

4. Integration with Climate Information Services

- Real-Time Weather Updates: Timely forecasts and alerts
- Climate Risk Analysis: Assessing risks of climate variability
- Seasonal Climate Predictions: Long-term forecasts for planning

5. Farmer Interface and Engagement

- Mobile Applications: Real-time recommendations, weather updates
- SMS and Voice Services: Accessibility for farmers without smartphones
- Local Language Support: Ensuring comprehension and adoption

6. Scalability and Sustainability

- Cloud Infrastructure: Services Google Cloud for scalability
- Modular Architecture: Ease of updates and integration of new features
- Partnerships and Collaborations:
  - **Government bodies**
  - **NGOs**
  - **Agritech companies**
  - **Academic institutions**

7. Monitoring and Evaluation

- Performance Metrics: Impact on yield, income, climate resilience
- Feedback Mechanisms: Channels for farmer feedback
- Continuous Improvement: Refining the system based on feedback

8. Training and Capacity Building

- Farmer Training Programs: Educating on digital tools and recommendations
- Extension Services: On-ground support and advice

Case Study: Fertilizer advice for farmers growing maize in Nigeria

- Overview of the framework deployment
- Data collection methods used

  IvanaAlexML/carob_ML (github.com)

- Impact on local smallholder farmers:
  - **Yield improvement**
  - **Risk reduction**
  - **Farmer feedback**



Challenges and Solutions

- Challenges:
  - **Data accessibility and quality**
  - **Digital literacy among farmers**
  - **Scalability issues**
- Solutions:
  - **Partnerships for data sharing**
  - **Comprehensive training programs**
  - **Leveraging cloud technologies**



Conclusion

- Summary:
  - **Essential components and benefits of the framework**
  - **Future Directions: Potential for expanding and refining the framework**
  - **Q&A Session: Open floor for questions and discussion**



Thank you!

- Ivana ALEKSOVSKA
  - **(1) Ivana Aleksovska, Ph.D. | LinkedIn**
  - **(2) Aleksovska Ivana (@AleksovskaI) / X**
  - **(3) email: ivanaaleksovska@gmail.com**