

Digital Solutions to Crop Pests and Diseases Management in West Africa Using Multidimensional Big Data and Artificial Intelligence: A Case Study of Burkina

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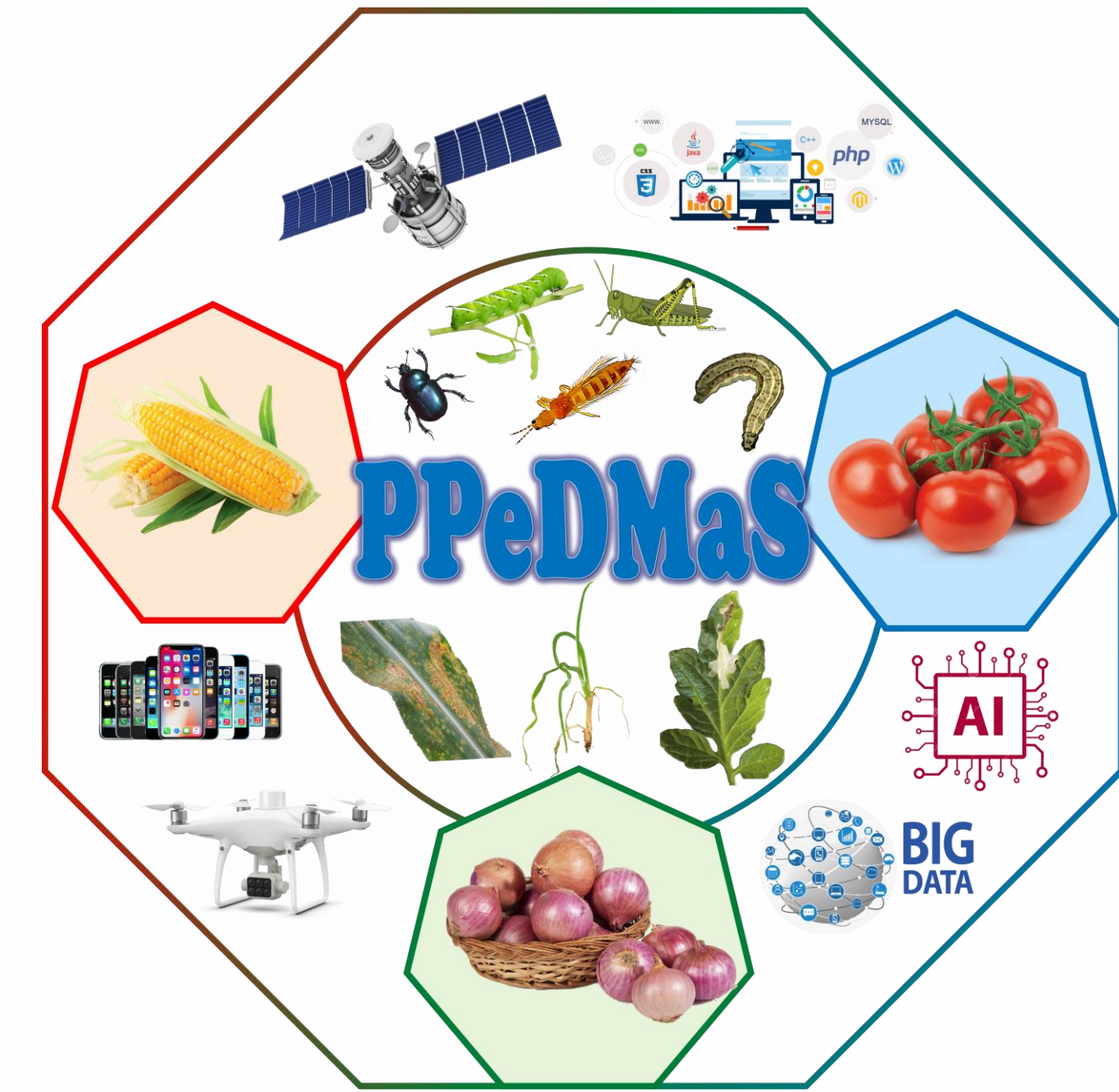
1 Introduction

Crop farmers in Burkina Faso still rely solely on their indigenous knowledge to manage pests and diseases. Though extension officers are available to provide technical support, they do not have the required tools to provide efficient solutions. Like other countries in West Africa, advanced digital solutions for pest and disease management are not available. With the emergence of new pests such as the fall army worm in the country, farmers are at risk of losing entire farms. This has great implications for food security in the country.

2 Objectives

To develop pests and diseases management and decision support tools comprising:

- A mobile application
- An early warning web application



3 Methodology

- 1 Creation of dataset for training of AI models (19,000 out of 30,000 images of pests and diseases pre-processed).
- 2 EfficientNet Deep Learning (DL) model is adopted, trained, and integrated into a mobile application developed using Android Studio.
- 3 Processing of high high-resolution UAV images together ground truth incidence data to map the distribution of pests and diseases.
- 4 Determine the key influencing bioclimatic and environmental factors of pest and disease outbreaks.
- 5 Develop an early warning system for pest and disease outbreaks on maize, tomato, and onion farms.

5 Expected results

Mobile Application

The mobile application is expected to have, among other things, the following functionalities.

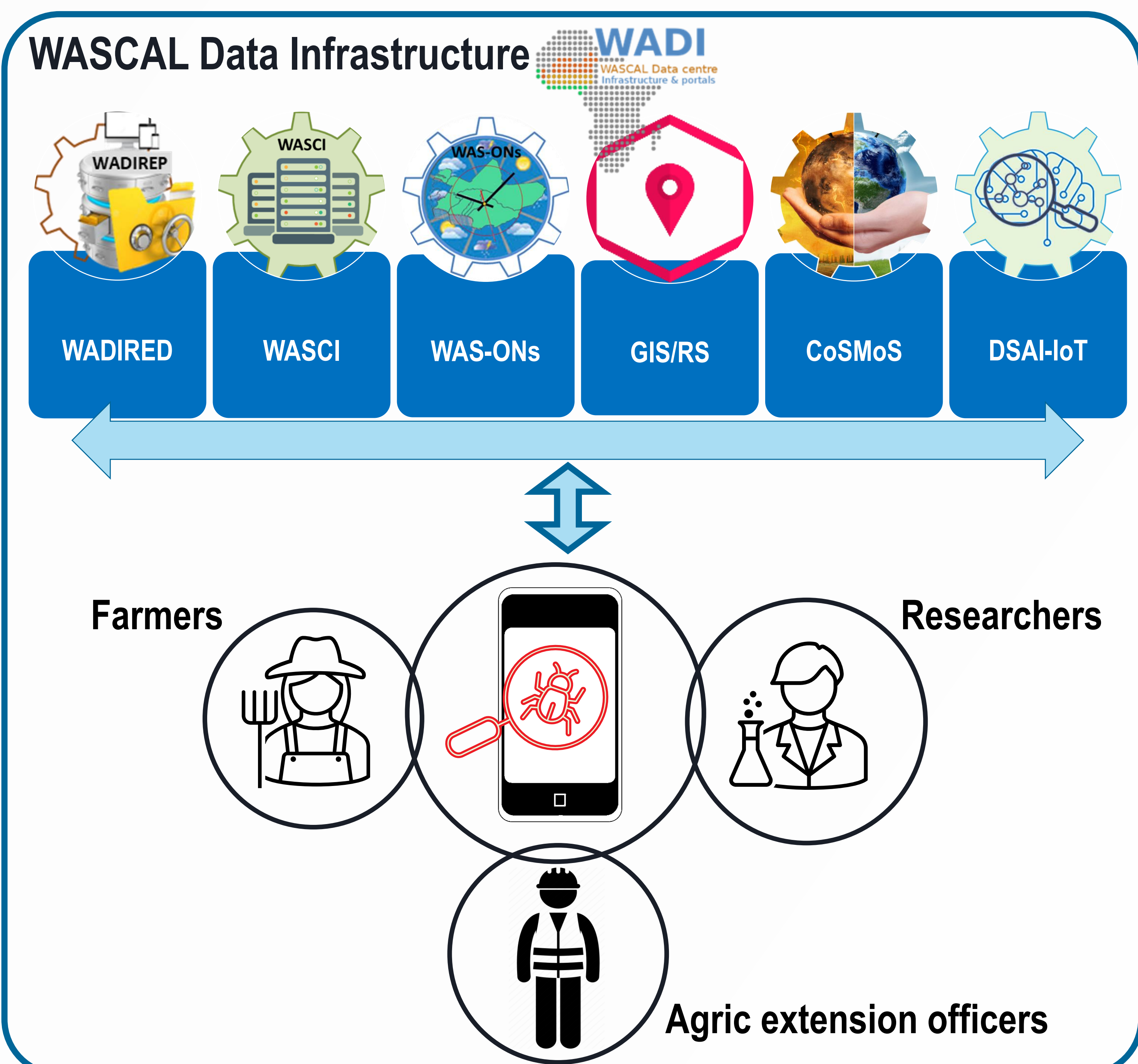
- **Registration:** Users can register farms' details including GPS location as well as the crops cultivated.
- **Diagnosis:** Users can request the application to diagnose a case or incident of a disease or a pest.
- **Incidence record:** After each diagnosis, the incident details are stored in the server for further analysis by plant entomologist and pathologist.

Early Warning Application

The Early Warning System (to be developed) will be a web application with the following functions.

- Provision of spatial information (maps) about disease and pest outbreak probabilities.
- Provision of alert to users on locations of disease and pest outbreaks.
- Provision of daily updates.

4 Operational framework



6 Conclusion

Our prototype mobile app can predict diseases and pests with over 90% accuracy. The app's ability to provide incidence information to nearby registered farmers can significantly contribute to combating diseases and pest outbreaks in maize, tomato, and onion farming systems in Burkina Faso, hence helping improve food security.

