Crowd Sourcing of Diseases and Pest Information

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Abstract - This paper explores the design and implementation of a crowd-sourcing mobile application that would help farmers identify and solve crop diseases and pest problems. The application allows farmers to report issues by uploading images of affected crops, which are then reviewed by agricultural experts who provide tailored solutions. The app also allows for the creation and sharing of articles related to crop management, seasonal planting, and disease predictions. The admins manage the approval of expert accounts and oversee the publication of articles. This paper describes the architecture, implementation, and evaluation of the application's impact on agricultural problem-solving and knowledge dissemination. The study has integrated user-friendly features, expert validation, and scalable technology for improving agricultural productivity. It also discusses existing research and how this solution builds on these efforts.

Keywords: Crowd-Sourcing, Agriculture, Pest Management, Mobile Application, Disease Identification, Farmer Assistance, Expert Advice, Image Recognition

1.INTRODUCTION

Agriculture is one sector that supports many people's livelihood. Crop diseases and pests are leading causes of agriculture productivity setbacks, often requiring huge economic compensation. Many are the farmers especially in some remote or disadvantaged area whose access to crop-related information through timely and credible advice is at a premium. This research would bridge this gap by developing the mobile application and facilitating the crowdsourcing and expert collaboration about crop-related reporting, analysis, and resolution issues.

The application allows users to report crop diseases by posting images and descriptions, which will be reviewed and advice provided through experts. There is also knowledge repository on articles on seasonal crops, prevention against diseases, and best practices available to users, with the sole purpose of being able to use the information as tools for actionable decision-making that yields improved production, lessened loss, and even profit.

2. LITERATURE SURVEY

Mobile technology has had rapid advancement in agriculture such as providing tools to help farmers improve productivity and address issues such as the control of pests and diseases. Applications, for example, Plantix and Agrio have been designed to make diagnoses over plant diseases through AI-based image recognition that delivers results quickly and automatically, but usually, lack the precision required and have comparatively weaker value where human input is valued more in order to provide a more accurate diagnosis. Current researches in the area are focusing on how to make it more reliable by integrating expertise with automated tools.

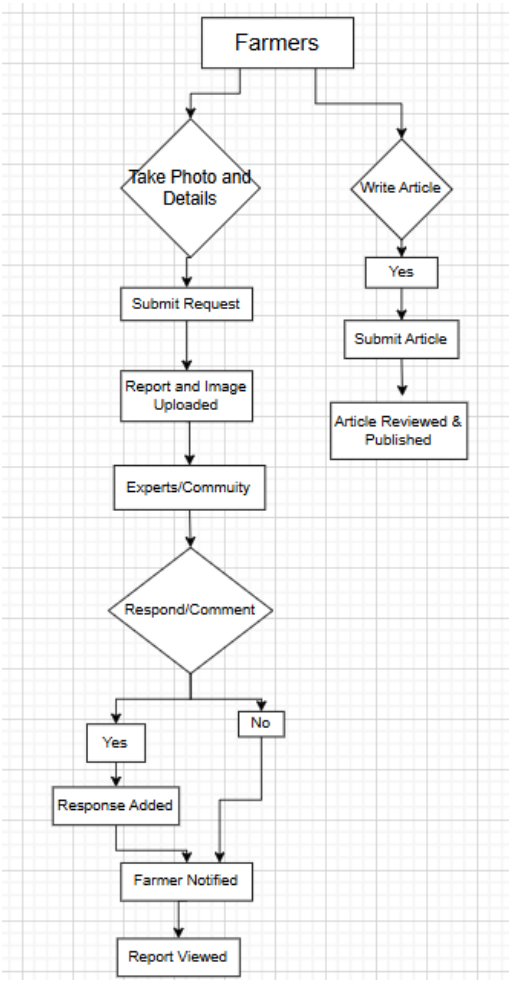
It has been observed that crowd-sourcing is very efficient in collecting big data across diverse fields, including agriculture. Information-sharing platforms, which rely on collective intelligence, allow farmers to share information in real time regarding pest infestations and crop diseases. However, the lack of validation by experts results in low quality and accuracy in the data being collected. Experts have pointed out that crowd-sourced information may be integrated with expert systems to efficiently overcome these drawbacks.

Artificial intelligence has emerged as a core component in disease identification, as models are trained to recognize patterns in crop images. However, the success of these systems is often limited by the diversity of crops and diseases in different regions. This limitation underlines the need for hybrid approaches that combine AI capabilities with human expertise to ensure better accuracy and contextual understanding.

The spread of agricultural knowledge through digital platforms has proven to empower farmers, especially in areas with minimal access to conventional extension services. Researches reveal that the benefitting of expert-validated content tailored to their local conditions for farmers is critical; hence, it is essential to make information available in native

languages and formats. Such insights point to the need to design platforms that offer not only immediate solutions but also foster a learning and collaborative culture among users.

3.METHODOLOGY



3.1 Data Collection

Farmers upload images and descriptions of affected crops through the app. The data collected is stored in the SQLite database for use when offline and synchronized with the Firebase database to provide real-time updates. Reports are tagged with metadata, which includes crop type, suspected disease, and location.

3.2 Expert Review

Process Reports submitted by farmers are queued in the expert dashboard. Experts analyse the images and descriptions, cross-reference existing knowledge, and provide detailed solutions. This review process ensures that recommendations are accurate and context-specific.

3.3 Knowledge Sharing

Farmers and experts can write articles on seasonal crop planning, common diseases, and preventive measures. The two steps are reviewing, that is admins for quality and relevance and validation for accuracy, which has to be done by the experts themselves.

3.4 Testing and Feedback

The app was iteratively tested with a pilot group of farmers and experts. Feedback was collected from surveys and analytics on the usage of the app to improve the user interface, performance, and functionality.

3.5 Architecture

The system architecture has three main user roles:

- **Farmers:** Users who report crop issues by uploading images and descriptions.
- **Experts:** Agricultural professionals who review reports, provide solutions, and validate articles.
- **Admins:** System administrators who approve expert accounts and monitor the quality of content.

3.6 Modules

The application architecture consists of the following modules:

- **Frontend:** An Android-based mobile application with a user-friendly interface.
- **Backend:** A Firebase-based real-time database for synchronization and storage.
- **SQLite:** Local storage for offline functionality**.**
- **AI Integration:** Optional future integration of image recognition for disease pre-diagnosis.

3.7 Features

- **Report Submission:** Farmers can upload images and describe crop issues, with optional tags for suspected diseases.
- **Expert Dashboard:** Experts can view and respond to reports, ensuring personalized solutions.
- **Knowledge Repository:** Articles on crop management, disease prevention, and seasonal guidelines.
- **Approval Workflow:** Admins validate expert accounts and articles to maintain content credibility.

4.EXCEPTED OUTCOME

The crowd-sourcing application for disease and pest information is designed to bring tangible benefits to farmers, experts, and the broader agricultural community. The following outcomes are expected from this project:

4.1 Improved Disease and Pest Management

- Farmers will have timely access to expert advice for diagnosing and treating crop diseases and pests.
- By uploading images and descriptions of affected crops, farmers can receive personalized solutions that help reduce crop losses and improve yields.

4.2 Increased Knowledge Sharing

- The platform will foster a collaborative environment where farmers and experts can share articles and insights about crop management, seasonal planting, and disease prevention.
- Farmers will gain access to reliable and validated information, empowering them to make informed decisions.

4.3 Enhanced Community Collaboration

- By leveraging crowd-sourced data, the platform will create a community-driven ecosystem where users can contribute to solving agricultural challenges collectively.
- The application will promote interactions between farmers and experts, bridging the knowledge gap.

4.4 Scalability and Accessibility

- The application will support offline functionality through SQLite, ensuring that farmers in remote areas with limited internet connectivity can still benefit from the platform.
- A user-friendly interface will make the application accessible to a diverse user base, including those with minimal technical expertise.

4.5 Data-Driven Insights

- Aggregated data from reports will help identify trends and patterns in crop diseases and pest outbreaks.
- This information can be used by researchers, policymakers, and agricultural organizations to develop targeted interventions and preventive measures.

4.6 Improved Expert Validation

- The inclusion of an expert review process ensures that solutions and shared articles are accurate and reliable.
- This feature addresses the shortcomings of purely AI-driven platforms, which may lack contextual understanding.

4.7 Empowerment of Farmers

- The application will empower farmers by providing them with tools to proactively address agricultural challenges, leading to increased confidence and self-reliance.
- By participating in the knowledge-sharing process, farmers can also contribute their experiences, fostering a sense of community and shared purpose.

5.CHALLENGES

5.1 Data Quality and Accuracy

- **Inconsistent Reporting**: Participants may lack the expertise to accurately identify diseases or pests, leading to errors in data.
- **Misidentification**: Images or descriptions submitted may misrepresent the issue due to poor-quality photos or incomplete descriptions.
- **Noise in Data**: High levels of irrelevant or low-quality contributions dilute the usefulness of the dataset.

5.2 Lack of Standardization

- **Varying Formats**: Data submission methods (text, images, videos) may vary, complicating integration and analysis.
- **Diverse Terminology**: Regional languages and local naming conventions for pests and diseases can hinder classification.

5.3 Data Validation Challenges

- **Scalability of Verification**: Validating large volumes of user-submitted data is time-consuming and requires automated tools or expert intervention.
- **Bias and Fraud**: Deliberate misinformation or user biases can lead to skewed results.

5.4 Participant Engagement and Retention

- **Low Participation**: Sustaining user engagement, especially in rural or underprivileged areas, can be challenging.
- **Demotivation**: Lack of immediate feedback or tangible benefits may deter contributors over time.

5.5 Technological Barriers

- **Access to Technology**: Limited availability of smartphones or internet access in remote areas restricts participation.
- **Usability Issues**: Poorly designed interfaces may alienate users, especially those with low technological literacy.

5.6 Privacy and Ethical Concerns

- **Sensitive Data Handling**: Information about contributors' locations, health, or agricultural practices may raise privacy concerns.
- **Regulatory Compliance**: Ensuring adherence to data protection laws like GDPR adds complexity.

5.7 Language and Cultural Diversity

- **Language Barriers**: Participants may struggle to communicate observations due to language differences.
- **Cultural Variations**: Diverse interpretations of disease symptoms or pest impact may reduce the consistency of submissions.

5.8 Geographic and Environmental Variability

- **Localized Issues**: Diseases and pests vary by region, requiring tailored data collection and analysis.
- **Environmental Factors**: Seasonal variations affect the prevalence and reporting of certain pests or diseases.

5.9 Integration with Expert Systems

- **Limited Expert Support**: Collaborating with experts to analyse crowdsourced data is often resource-intensive.
- **Data Compatibility**: Aligning crowdsourced data with existing scientific datasets and models can be challenging.

5.10 Scalability and Cost

- **Infrastructure Needs**: Scaling up a crowdsourcing platform requires significant investment in technology and human resources.
- **Sustainability**: Maintaining the platform and ensuring long-term viability without external funding is a challenge.

6.CONCLUSION

This new way of information gathering through crowdsourcing regarding diseases and pests transforms the methodology in the direction of fast-scale collection, potentially helping to develop more efficient research, monitoring, and mitigation strategies. Still, the challenge remains because problems include data quality, standardization, user engagement, technological barriers, and even privacy concerns that have to be resolved. Success will be derived from developing rigorous validation mechanisms and using machine learning for data analysis, as well as encouraging active participation by using intuitive platforms, incentives, etc.

These challenges can be addressed to make crowdsourcing a powerful tool in fighting the growing diseases and pests, especially in agriculture and public health. Future efforts include improving access, fostering trust among contributors, and integrating crowdsourced data within the expert systems for reliability and accuracy. A well-designed crowdsourcing system can bridge the gap between local knowledge and global action, fostering innovative solutions to complex, real-world problems. Crowdsourcing offers an innovative and inclusive means of collecting information on diseases and pests, and thus allows researchers and policymakers to tap into collective intelligence. The capacity of collecting real-time data from various regions in the world makes it a very effective tool in tracing outbreaks and pest infestations. This method will prove particularly more useful in the areas where the classical monitoring systems are not found or are in a poor state. However, data reliability, standardization, and access to the technological infrastructure provide an opportunity to implement strategic interventions and make crowdsourcing more effective by using user-friendly interfaces, localization in language, and strong data validation techniques.

Crowd sourcing of disease and pest surveillance in the future is expected to be aligned with advanced technologies such as artificial intelligence and machine learning. These are solutions that eventually automate data processing and increase the accuracy rate in pattern identification for actionable insights at scale. Most importantly, collaboration among

researchers, the government, and local communities will be key to sustainability and scalability. When these challenges are addressed, crowdsourcing will be able to revolutionize how we monitor and respond to diseases and pests, making a more resilient and informed global ecosystem.

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REFERENCE

[1] Pethuraj, S., & Selvaraj, R. (2019). *A review on the role of crowdsourcing in plant disease and pest management. Agricultural Systems, 177, 102717.* https://doi.org/10.1016/j.agsy.2019.102717

[2] Ramcharan, M., MacDonald, A., & Moosavi, N. (2019). *Crowdsourced data for pest and disease detection in agriculture: A review of applications and techniques. Precision Agriculture, 20(4), 706-726.* https://doi.org/10.1007/s11119-019-09631-9

[3] Carranza, J. C., Pratap, A., & Goldstein, A. (2021). PlantVillage: A mobile app for disease diagnosis using image recognition. Computers and Electronics in Agriculture, 181, 105924. https://doi.org/10.1016/j.compag.2020.105924

[4] Goel, R., Rani, R., & Chauhan, S. (2020). A mobile-based approach to pest surveillance using real-time data and image recognition techniques in agriculture. Computers and Electronics in Agriculture, 173, 105396. https://doi.org/10.1016/j.compag.2020.105396

[5] Haklay, M. (2013). Citizen science and the role of crowdsourcing in environmental monitoring. Journal of Environmental Management, 129, 265-276. https://doi.org/10.1016/j.jenvman.2013.05.030

[6] Freitag, M., & Tullis, R. (2016). Enhancing user engagement in crowdsourcing platforms: Challenges and opportunities. International Journal of Human-Computer Studies, 96, 104-121. https://doi.org/10.1016/j.ijhcs.2016.04.002

[7] Yadav, R., Jha, M., & Ghosh, D. (2018). Impact of video tutorials on knowledge transfer for sustainable farming practices: A case study in rural India. Sustainable Agriculture Research, 7(1), 70-84. https://doi.org/10.5539/sar.v7n1p70

[8] Goel, P., & Sharma, D. (2020). Multilingual agricultural applications: Improving accessibility and inclusiveness through localized platforms. International Journal of Agricultural Technology, 16(1), 191-201. https://doi.org/10.5897/IJAT2020.1060

[9] Rajendran, A., & Bhatnagar, P. (2017). Emerging technologies in agricultural mobile applications for real-time disease and pest management. Journal of Agricultural Informatics, 8(3), 7-15. https://doi.org/10.17700/jai.2017.8.3.344