

Capacity Building for Farming System Digitalization Using Farming Management System

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ARTICLE INFO

Article history

Received October 21, 2023

Revised November 7, 2023

Accepted December 18, 2023

Keywords

capacity building

farming management system

digitalization

ABSTRACT

Agriculture is one of the most important areas of human activity around the world. As the population increases, it is necessary to increase agricultural production. In the age of information technology, information plays a key role in people's lives. Agriculture is rapidly becoming a highly development-intensive industry where farmers need to collect and evaluate a large amount of information in their business processes to become more efficient in production and communicate information accordingly. Modernizing agriculture requires technological know-how for the efficient use of agricultural inputs. It deals with factors such as ecological footprint, product safety, labor welfare, nutritional responsibility, plant/animal health and welfare, economic responsibility and local market presence. They cover almost all stages in the production chain concerning day-to-day agricultural tasks, transactional activities for all stakeholders involved, and support for information transparency in the food chain. The use of information technology and network infrastructure currently enables the application of technology in agricultural business processes, but there is no standardized solution to enable interoperability and integration among services and stakeholders. Farming Management System (FMS) is expected to be a solution and standard in the use of technology in agriculture. Farming management system is a management system specifically designed to assist farmers or farm managers in managing their farming operations more efficiently and effectively. This system usually consists of integrated software and hardware to monitor and collect data from various aspects of agriculture, such as irrigation, fertilization, pesticide spraying, etc.

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1. Introduction

Agriculture is one of the most important areas of human activity around the world. As the population increases, it is necessary to increase agricultural production. Modernizing agriculture requires technological know-how for efficient use of agricultural inputs. In the age of information technology, where information plays a key role in people's lives, agriculture is rapidly becoming a highly data-intensive industry where farmers need to collect and evaluate a large amount of information in their business processes to become more efficient in production and communicate information accordingly. This relates to factors such as ecological footprint, product safety, labor welfare, nutritional responsibility, plant and animal health and welfare, economic responsibility and local market presence. The efforts cover almost all stages in the production chain concerning day-to-day agricultural tasks, transactional activities for all stakeholders involved, and support for information transparency in the food chain. The use of information technology and network infrastructure currently enables the application of technology in business processes in agriculture and

farming, but there is no standardized solution to enable interoperability and integration among services and stakeholders.

Farming Management System (FMS) is expected to be a solution and standard in the use of technology in agriculture and farming. Farming management system is a management system specifically designed to assist farmers or farm managers in managing their farming operations more efficiently and effectively. This system usually consists of integrated software and hardware to monitor and collect data from various aspects of agriculture, such as irrigation, fertilization, pesticide spraying, and so on.

By using FMS, farmers can make better and faster decisions in managing their farms, as they have access to real-time data on field conditions, weather forecasts, and various other factors that affect crop growth and agricultural production. As such, farming management systems can help improve overall farm productivity and efficiency, and help farmers reduce operational costs and increase their income. The solution can also expand in functionality by combining with existing service systems, connecting with stakeholders and product promotion. In order to improve agricultural efficiency and productivity, the use of information technology for agriculture continues to grow and many new innovations are being made. With the advancement of IT, it is hoped that agriculture can become more efficient and productive so that it can help meet the increasing demand for food around the world.

2. Material and Method

To be able to achieve the targets and outcomes, it is necessary to plan several methods of implementing activities. The existing problem is to develop an information technology-based agricultural and farm management solution that helps farmers and breeders to increase production and promotion. Each party, both from the proposing team and the partner group will play an active role and work together so that the planned program can run well. Several methods of implementing activities to achieve predetermined targets and outcomes.

- [1]. This service activity on the Application of International Cooperation Science and Technology (PIKI) began with initial discussions with partners. This discussion is carried out to determine the schedule for implementing activities and determine the details of the activities carried out. The agreement obtained will determine the achievement of this proposed activity.
- [2]. Provide training in the form of an explanation of the Farming Management System that is integrated with partners
- [3]. Holding a follow-up discussion between the proposing team and partners regarding the implementation of this activity. This discussion aims to receive feedback from partners about the implementation of community service activities.
- [4]. Activity monitoring method. This monitoring is carried out to monitor the extent to which the results of this training provide benefits to service partners.



Figure 1. Photo of the Service Team at Maejo Natural Farming Research and Development Center

3. Result and Discussion

The activities proposed in this Service on the Application of International Cooperation Science and Technology (PIKI) have solutions and output targets. From the problems we find, several solutions are needed that can overcome these problems. So it is proposed to hold a socialization activity and the application of digitalization of agricultural management systems at Chiang Mai University. The training that will be provided is as follows:

1. Farming Management System Workshop
2. Workshop on food and feed price information system
3. Introduction to sensor technology and the Internet of Things that can be applied in agriculture.

FMS is an innovative system that uses information and communication technology to improve agricultural management, including crop monitoring, fertilizer use, irrigation, and pest management. The system has the potential to increase crop yields, reduce production costs, and provide long-term benefits to farmers. FMS is an integrated farm management system to help farmers manage their farming activities more effectively and efficiently. FMS usually includes features such as weather monitoring, inventory management, production management, post-harvest management, financial management, and data analysis.

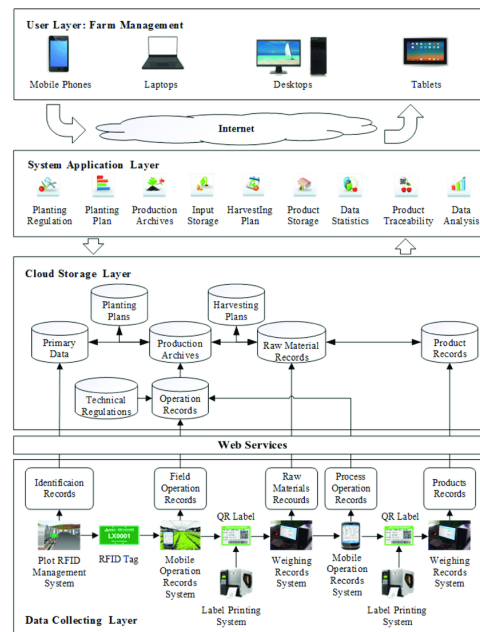


Figure 2. Digital Farming Management System Framework

This community service has involved agricultural experts, software developers, and local farmers from both countries. This collaboration provides an opportunity to learn from each other and share knowledge and experience in dealing with the challenges faced in the agricultural sector.

During the community service, the community service team has conducted a series of activities, such as training, knowledge-sharing and socialization to farmers regarding the implementation of FMS. The initial results of this community service show a positive impact. Both parties can learn from each other in developing agricultural technology in the future



Figure 3. Farming Management System Workshop and Discussion Activities in Thailand

At the end of the PIKI service activity, the signing of the MoU between the Padang State Polytechnic and various universities in various countries was attended by the Director of PNP (Dr. Surfa Yondri, ST., S.ST, M.Kom) and the Indonesian Embassy in Bangkok for Education and Culture Mr. Ahmad Wicaksono, PhD



Figure 4. Signing the MoU between the Director of PNP and various universities in various countries

4. Conclusion

Instagram filter is a design product that can be developed to optimize promotion and increase Visual Complexity A collaborative step between Indonesia and Thailand resulted in a promising community service in the field of agricultural processing systems. This activity aims to improve agricultural efficiency and productivity through the application of Farming Management System (FMS).

This research and service is expected to be sustainable and conducted annually. Because the importance of cooperation between countries in improving the agricultural sector and technology can provide direct benefits to farmers in both countries, sustainable cooperation will provide long-term benefits in expanding collaboration in agriculture and information technology.

Acknowledgments

Thank you to Politeknik Negeri Padang, P3M and Department of Information Technology, who were directly involved in the implementation of this activity.

References

- [1] Kabir, A. T., Debnath, N., Ta-sin, A. J., Zinnurayen, N., & Haider, M. T. (2020, August). IoT based low cost smart indoor farming management system using an assistant robot and mobile app. In 2020 10th Electrical Power, Electronics, Communications, Controls and Informatics Seminar (EECCIS) (pp. 155-158). IEEE.
- [2] Walter, A., Finger, R., Huber, R., & Buchmann, N. (2017). Smart farming is key to developing sustainable agriculture. *Proceedings of the National Academy of Sciences*, 114(24), 6148-6150.
- [3] Mohamed, E. S., Belal, A. A., Abd-Elmabod, S. K., El-Shirbeny, M. A., Gad, A., & Zahran, M. B. (2021). Smart farming for improving agricultural management. *The Egyptian Journal of Remote Sensing and Space Science*, 24(3), 971-981.
- [4] Triantafyllou, A., Tsouros, D. C., Sarigiannidis, P., & Bibi, S. (2019, May). An architecture model for smart farming. In 2019 15th International Conference on Distributed Computing in Sensor Systems (DCOSS) (pp. 385-392). IEEE.
- [5] S. P. Nabila and H. Amnur, "Rancang Bangun Sistem Informasi Desa Menggunakan Framework Codeigniter 4 Bagian Kelahiran dan Kematian pada Desa Cageur", *jitsi*, vol. 2, no. 2, pp. 56 - 62, Jun. 2021.
- [6] Hamisi, N.Y., Mvungi, N.H., Mfinanga, D.A. and Mwinyiwiwa, B.M.M., "Intrusion detection by penetration test in an organization network", *ICAST 2009*.
- [7] A. Triantafyllou, P. Sarigiannidis, and T. D. Lagkas, "Network protocols, schemes, and mechanisms for internet of things (iot): Features, open challenges, and trends," *Wireless Communications and Mobile Computing*, 2018.
- [8] D. Vasisht, Z. Kapetanovic, J. Won, X. Jin, R. Chandra, S. Sinha, A. Kapoor, M. Sudarshan, and S. Stratman, "Farmbeats: An iot platform for data-driven agriculture," in 14th USENIX Symposium on Networked Systems Design and Implementation (NSDI 17). USENIX Association, 2017, pp. 515-529.
- [9] J. Anzola, V. Garca Daz, and A. Jimnez, "Wsn analysis in grid topology for potato crops for iot," 07 2017, pp. 1-7.
- [10] P. Sarigiannidis, T. Lagkas, S. Bibi, A. Ampatzoglou, and P. Bellavista, "Hybrid 5g optical-wireless sdn-based networks, challenges and open issues," *IET Networks*, vol. 6, no. 6, pp. 141-148, 2017.
- [11] S. K. Y. Donzia, H.-K. Kim, and H. J. Hwang, *A Software Model for Precision Agriculture Framework Based on Smart Farming System and Application of IoT Gateway*. Springer International Publishing, 2019, pp. 49-58