Digital extension and the development of agricultural performance in Indonesia

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Abstract. The agricultural sector plays an essential role in providing foodstuffs for the population of every country. However, the lack of innovation in agricultural technology and the limited distribution channels for crop yields have caused farmers' welfare levels to be relatively low in various regions. Meanwhile, Smart Agriculture and 4.0 Technologies play a considerable role in increasing the agricultural sector's efficiency. Digitalization has had a significant influence on transforming traditional agricultural systems into data management-based approaches. The Desa Apps is an open access agricultural extension platform developed in Indonesia that facilitates farmers to interact with other farmers to share ideas, innovations, and solutions to face various farm and off-farm obstacles. This paper aims to describe the development platform and identify opportunities related to developing the Desa Apps platform. The results showed that Java and Sumatra islands have good potential for developing the Desa Apps platform. Besides, the registered members with the most significant reporting level are farmers, extension agents, and traders.

1. Introduction

Digitalization is one of the innovations that is widely used in the agricultural sector. In the agricultural sector, digitization can be applied in various forms, both in the production system, supply chain, and food system [1]. Currently, the use of digitalization or digital machines has been widely applied in the agricultural sector, as evidenced by the increase in review articles in the fields of smart farming, extensive data analysis, artificial intelligence, and IoT [2,3]. Digitalization has had a massive influence in transforming traditional agricultural systems into data management-based approaches [4]. Besides, digitization can change the gender structure in the agricultural sector [5].

Digitalization in the agricultural sector is currently considered more comfortable to do in line with mobile phones. The development of smartphones is currently able to support various applications based on virtual tools, which are considered capable of increasing productivity in the agricultural sector [6]. Besides, the application of digitization in the agricultural sector can also overcome sustainability challenges [7]. Increased productivity and sustainability in the agricultural sector can be caused by
optimizing various resources through various innovations such as sensor technology, digital image processing, positioning systems, etc.

In this paper, we choose to focus on digitization to promote agricultural extension approaches in Indonesia. The digitization of the extension system has advantages in reaching several simultaneous actors [8]. The extension approach can connect various agricultural sectors with different background knowledge and know-how (farmers, credit and input providers, buyers, researchers, and development organizations). This approach can become a medium for various agricultural sector needs, such as crop varieties, animal breeds, planting seasons, quality seeds, disease, pest control mechanisms, the best market prices, and favorable credit providers [9]. On the other hand, traditional extension approaches have a lower capacity to connect various agricultural sectors to solve problems and increase farmers' access to information to markets and credit [10,11].

This paper examines Desa Apps (Digital Extension Society for Agriculture) platforms in Indonesia as an integrated agricultural extension media platform. The paper analyzes the characteristics of the user and actual platform usage. This paper aims to describe platform development and identify opportunities related to platform development.

The rest of the paper is structured as follows. Section 2 provides results and a discussion and overview of the Desa Apps as an agricultural extension application. Section 3 will present the conclusions.

2. The Desa Apps as an Agricultural Extension Application
Desa Apps is a Mobile Application developed to help farmers from planting, maintaining, harvesting to selling. Farmers can interact directly with experts for question and answer and consultation and share information with other farmers [12]. Desa Apps applies a machine learning algorithm where farmers can be registered into the platform to ask questions regarding various on-farm and off-farm activities, which will then get feedback in the form of an online chat service. Desa Apps is an open-access platform where farmers can interact with other farmers to share ideas, innovations, and solutions to face various obstacles on-farm and off-farm.

![Figure 1. Growth in the Number of Registered Members of Desa Apps.](image)

Based on Figure 1, it is known that the number of registered members of Desa Apps has increased from November 2016 to September 2020. Since its inception, Desa Apps has several registered members of 12,509 people nationally. The most significant number of registered members of Desa Apps occurred in July 2019, which reached around 1,303 people. On the other hand, the lowest increase in the number of registered members occurred in December 2016 and May 2020. The increasing number of registered
members implies that this extension application is quite attractive to the public. Figure 2 shows that there are around 5,454 discussions that have been elicited. The most significant number of discussions per month occurred in August 2018, which reached 810 cases. The dominant theme is the problem of rice plants' pests and diseases, with a complete discussion of 77 cases. Meanwhile, the dominant discussion time took place in August 2018, which reached around 173 cases.

![Figure 2. Number of Discussions at Desa Apps.](image)

Based on Figure 3, Figure 4, and Figure 5, It is known that Java Island is the area with the most considerable discussion level in Desa Apps, with the main actors being farmers, extension agents, and traders. This condition means that Java Island has the potential to develop adequate digitalization of agricultural extension. Besides, Java Island can be used as one of the areas with the potential for platform development. Java Island is the region with the most extensive reporting rate because it has a substantial proportion of businesses in the agricultural sector, especially food crops in rice. The island of Sumatra is the region with the second-largest reporting rate after Java, which implies that this area can be developed into one of the areas with the potential for developing Desa Apps, which is quite potent.

![Figure 3. Desa Apps Member Report (Farmer).](image)
3. Conclusion
This paper aims to describe platform development and identify opportunities related to platform development. Java Island and Sumatra Island are areas with good potential for the development of Desa Apps. The registered members with the most extensive reporting level are farmers, extension agents, and traders.

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