CAKA Journal of Applied Community Services (CJACS) 2025 Vol. 1(2): 34-44
Available online http://www.cjacs.cakajournals.id
ISSN XXXX-XXXX (Online)

Training on Smart Farming-Based Agricultural Technology to Improve Agricultural Productivity in Villages in Konawe Regency, Southeast Sulawesi

Asrul[1*], Sarinah[2], Muh. Rijal[3], La Ode Agus Said[4]

[1,2,3,4]Faculty of Social and Political Sciences, Universitas Halu Oleo, Kendari, Indonesia.

*E-mail: asrul@akba.ac.id

Abstract
Konawe Regency, Southeast Sulawesi, is one of the agricultural centers with great potential in rice, corn, and horticulture commodities. However, agricultural productivity in rural areas still meets various challenges, including limited use of technology, low efficiency in the use of production inputs, and dependence on traditional farming methods. This Community Service activity aims to increase the productivity and efficiency of farming businesses through the application of Smart Farming-based Agricultural Technology that is suitable for the local conditions of villages in Konawe Regency. The implementation methods include socialization, training, field drilling (demonstration plots), and assistance in the implementation of appropriate agricultural technology. The activity content includes the concepts of Smart Farming, water-efficient irrigation, precision fertilization, the utilization of digital agricultural applications, along with harvest and post-harvest management. The results of the activities show an improvement of farmers' knowledge and skills in adopting agricultural technology, increasing the efficiency of water and fertilizer use, and the potential for increased agricultural productivity. This activity is envisioned to become a model for sustainable Smart Farming Village development that can be replicated in other areas within Konawe Regency.

Keywords: Agricultural Productivity, Agricultural Technology, Konawe Regency, Smart Farming, Village

Introduction

The agricultural sector remains the backbone of the rural economy in Indonesia, especially in Eastern Indonesia. Agriculture not only plays a role in providing national food supplies, but is also the main source of livelihood for rural communities and contributes to poverty reduction and regional food security. Konawe Regency, Southeast Sulawesi Province, is known as one of the main agricultural centers with leading commodities such as rice, corn, and horticulture. The vast land potential, tropical climate, and availability of human

Received: 12 November 2025
Revised: 12 November 2025
Accepted: 18 November 2025
Available Online: 19 November 2025

resources are important assets for the development of the agricultural sector in this region.

However, these potentials have not been fully optimized. Agricultural productivity in rural areas in Konawe Regency still meets various structural and technical problems. Most farmers still depend on traditional farming methods, inefficient use of production inputs, and land management that is not yet data-based. These conditions cause fluctuating harvests, relatively high production costs, and suboptimal farmer income. In addition, climate change, weather uncertainty, and limited access to information and technology further exacerbate the challenges faced by rural farmers.

Technological developments in the digital age have brought significant changes to several sectors, including agriculture. The concepts of Agricultural Technology (AgriTech) and Smart Farming are present as innovative approaches that integrate information technology, automation, and data-based management into the agricultural process. Smart Farming enables farmers to manage their farms more precisely through the use of technologies such as simple sensors, water-efficient irrigation systems, digital farming applications, and small-scale agricultural mechanization. The implementation of these technologies has been proven to increase the efficiency of production inputs, improve crop quality, and enhance agricultural productivity in a sustainable manner.

In Indonesia, the implementation of Smart Farming is still dominated by industrial-scale or modern agriculture in certain regions, while its adoption at the village level remains relatively limited. This is due to various factors, such as farmers' limited knowledge, low technological literacy, and the perception that modern agricultural technology is costly. In fact, the concept of Smart Farming can be adapted in the form of appropriate technology that is simple, inexpensive, and suited to local village conditions. This approach is highly relevant for implementation in Konawe Regency, which has small to medium-scale peasant agriculture.

Community Service Activities (PkM) play a strategic role in bridging the gap between scientific and technological developments and the real needs of the community. Through PkM activities, universities can transfer knowledge, technology, and innovation to rural communities in an applicable and sustainable manner. The application of Smart Farming-based Agricultural Technology in PkM activities in Konawe Regency is expected to increase the capacity of farmers, encourage changes in cultivation practices, and strengthen village agricultural systems to be more efficient and adaptive to environmental changes.

Besides the technical aspects, the implementation of Smart Farming also has social and economic dimensions. Increased agricultural productivity will have a direct impact on increasing farmers' income and the welfare of rural

households. On the other hand, the introduction of modern agricultural technology can attract the younger generation to get involved in the agricultural sector, thereby supporting the regeneration of farmers and the sustainability of the rural agricultural sector. This is in line with the national agricultural development agenda, which emphasizes agricultural modernization, rural digitalization, and the empowerment of millennial farmers.

Konawe Regency has a great chance to become a model for Smart Farming-based agricultural development in Southeast Sulawesi. Support from the local government, the presence of agricultural extension workers, and the potential for collaboration with universities are the main factors supporting the success of this program. However, for the application of technology to be effective, a participatory, contextual, and sustainable approach is needed. Community service activities must be designed not only as short-term training but also as a mentoring process that encourages farmers to be able to adopt and develop technology independently.

Based on the above description, the Community Service activity with the theme "Application of Smart Farming-Based Agricultural Technology to Increase Agricultural Productivity in Villages in Konawe Regency, Southeast Sulawesi" is very relevant and strategic. This activity is hoped to provide real solutions to rural agricultural problems, increase the productivity and efficiency of farming businesses, and encourage the realization of modern, competitive, and sustainable agricultural villages.

Materials and methods

The implementation method for this Community Service activity is designed with a participatory, applicable, and sustainable approach, so that it can improve the capacity of village farmers in independently applying Smart Farming-based Agricultural Technology in accordance with the local conditions of Konawe Regency. This activity uses the following approaches:

1. Participatory, involving farmers, farmer groups, and agricultural extension workers from the planning stage to the evaluation stage.
2. Appropriate technology, namely the implementation of Smart Farming that is simple, inexpensive, and easy to adopt.
3. Learning by doing, through hands-on practice in the field.
4. Sustainable mentoring, to ensure the continued adoption of technology.

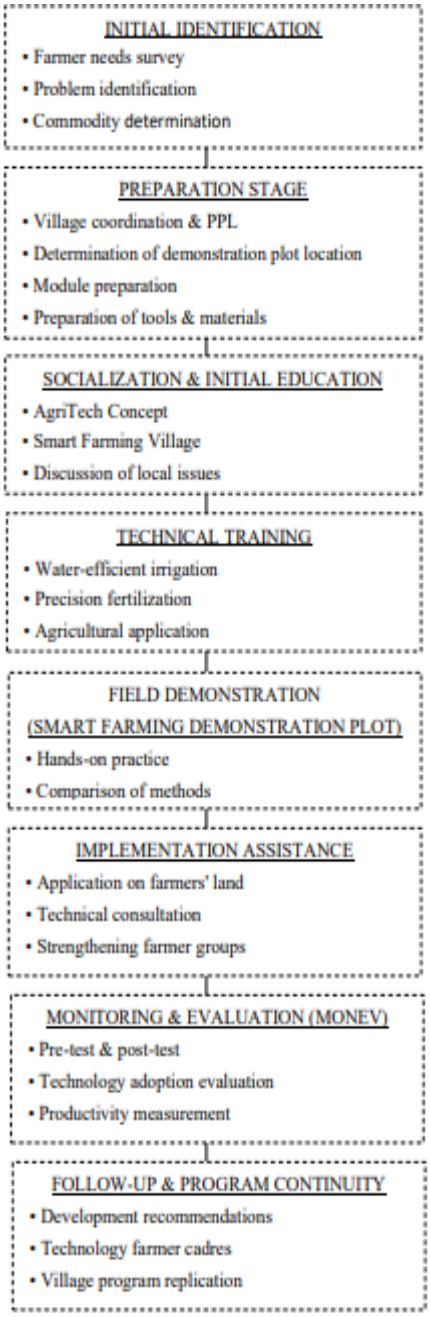

Figure 1. Stages of community service implementation

From figure 1, the activity consists of 8 stages, with the following details:

Preparation Stage

1. The preparation stage aims to ensure that activities run according to needs and field conditions. Activities carried out include:
2. Surveying and identifying farmers' needs related to cultivation, irrigation, and productivity issues.
3. Initial coordination and socialization with village governments, farmer groups, and Field Agricultural Extension Workers (PPL).
4. Determination of the location and commodities to be used as demonstration plots (demplots).
5. Development of contextual Agricultural Technology training modules based on Smart Farming.
6. Preparation of facilities and infrastructure, including simple agricultural tools and field practice materials.

Implementation Stage

The implementation stage is the main activity that focuses on transferring knowledge and skills to farmers. Activities carried out include:

Socialization and Education

a. Introduction to the concepts of Agricultural Technology and Smart Farming.
b. Presentation of the benefits and opportunities of applying agricultural technology for rural farmers.
c. Interactive discussion on the challenges and opportunities of local agriculture.

Smart Farming Technical Training

a. Training on the use of appropriate agricultural technology (water-efficient irrigation, precision fertilization).
b. Introduction to digital agricultural applications for planting and fertilization scheduling.
c. Simple data-based farm management.

Field Demonstration (Demplot)

a. Creation of Smart Farming-based demonstration plots.
b. Hands-on practice using technology in agricultural fields.
c. Comparison of traditional methods and technology-based methods.

Implementation Assistance

a. Intensive assistance to farmers in applying technology on their respective land.
b. Technical consultation related to obstacles faced by farmers.
c. Strengthening the role of farmer groups as agents of change.

Monitoring and Evaluation Phase

Monitoring and evaluation are conducted to assess the effectiveness of activities and the level of technology adoption, with the following steps:

a. Periodic monitoring of technology implementation on farmers' land.
b. Evaluation of knowledge and skills through pre-tests and post-tests.
c. Measurement of success indicators, such as water and fertilizer use efficiency, as well as changes in productivity.
d. Evaluation of participant participation and satisfaction with the activities.

Follow-up and Sustainability

To ensure the sustainability of the program, the following actions are taken:

a. Preparation of technical recommendations for the development of Smart Farming in the village.
b. Formation of a local team or technology farmer cadres as follow-up drivers.
c. Collaboration with the village government and agricultural office for program replication.
d. Limited post-activity assistance through consultation and follow-up monitoring.

Results

The results of the Community Service activities show an increase in farmers' knowledge and skills related to the application of Smart Farming-based Agricultural Technology. This can be seen from the comparison of pre-test and post-test results, where most participants experienced an increase in their

understanding of the concepts of Smart Farming, the use of appropriate technology, and simple data-based farm management.

Previously, farmers relied solely on their ancestral knowledge, but now they are beginning to understand the importance of planting schedules, efficient fertilization, and more measured irrigation water management. This increase in capacity is an early indicator of the success of activities to transfer knowledge and technology to rural communities.

Implementation of Smart Farming Technology in Demonstration Fields

Through field demonstrations (demplots), farmers can see firsthand the application of Smart Farming technology on agricultural land. The technologies applied include water-efficient irrigation management, precision fertilization according to plant growth phases, and the use of simple digital agricultural applications for recording planting schedules and maintenance.

The results of the demonstration plots show that the application of technology can increase the efficiency of water and fertilizer use compared to conventional methods. The plants look more uniform, growth is more optimal, and the potential for harvest yields has increased. The existence of demonstration plots also serves as a means of shared learning for other farmers in the village, thereby encouraging a natural process of innovation diffusion.

Changes in Farming Practices and Farmer Behavior

One important outcome of these activities is a change in farmers' mindsets and behavior in managing their farms. Farmers are beginning to realize that agricultural technology is not always synonymous with high costs and complicated tools. On the contrary, simple, appropriate technology can provide real benefits when applied consistently.

Farmers have also become accustomed to keeping simple records of their farming activities, input use, and crop yields. This change in behavior is an important foundation for the development of sustainable Smart Farming-based agriculture in villages.

Strengthening the Role of Farmer Groups

The assistance activities encourage the strengthening of the role of farmer groups as a forum for mutual learning and a driver for technology adoption. Farmer groups play an active role in organizing training activities, maintaining demonstration plots, and holding discussions to evaluate results. Several members of farmer groups who are more adaptable to technology have begun to serve as technology farmer cadres, who are expected to continue providing assistance independently after the PkM activities end.

Effectiveness of the Participatory Approach in PkM

The participatory approach applied in this activity has proven effective in increasing farmer involvement and motivation. The involvement of farmers from the problem identification stage to the evaluation stage has made the introduced technology more suitable for the needs and local conditions of Konawe Regency. This approach is in line with the principle of community service that emphasizes collaboration and empowerment, not just a one-way transfer of technology.

The Relevance of Smart Farming as a Solution for Village Agriculture

The results of the study show that the concept of Smart Farming is highly relevant for implementation in the agricultural villages of Konawe Regency, provided that it is adapted to the scale of farming operations and the capabilities of farmers. Smart Farming does not have to be based on advanced technology, but can start with the use of simple technology that focuses on efficiency and data-driven decision making. These findings reinforce the view that the modernization of rural agriculture can be carried out in a gradual and inclusive manner.

Social and Economic Impact

Increased efficiency in the use of production inputs has the potential to reduce farming costs, which in turn can increase farmers' incomes. In addition, the introduction of modern agricultural technology also opens up opportunities for young farmers to become involved in the agricultural sector. Thus, this activity not only has an impact on the technical aspects of production, but also has positive social and economic implications for the sustainability of rural agriculture.

Challenges and Lessons Learned

Although the results of the activities showed positive achievements, there were still several challenges, such as differences in the level of technological literacy among farmers and limited supporting facilities. This shows the importance of continuous assistance and support from the village government and related agencies so that technology adoption can continue to develop.

Implications for Future Program Development

The results and discussion of this activity show that the application of Smart Farming-based Agricultural Technology through PkM activities has great potential to be replicated in other villages in Konawe Regency. With policy support, long-term assistance, and multi-stakeholder collaboration, this program

can be developed into a Smart Farming Village model that contributes to improving food security and farmer welfare.

Figure 2. Documentation of Farmer Group Training

Discussion

The Community Service activities shows that the application of Smart Farming-based Agricultural Technology has a positive impact on the capacity of farmers in Konawe Regency (Fajri, 2025; Halawa, 2024). The improvement in farmers' understanding is not only reflected in the results of knowledge evaluations, but also in changes in cultivation practices in the field. The application of water-efficient irrigation and more measured fertilization has resulted in more uniform crop growth and more efficient use of inputs (Lakhiar et al., 2024). These findings indicate that simple data-based agricultural technology can be integrated into smallholder farming systems without drastically changing farmers' working patterns (Janssen et al., 2017).

A participatory approach through training, field demonstrations, and ongoing mentoring has proven to be instrumental in encouraging technology adoption (Eitzel et al., 2018). The active involvement of farmer groups accelerates the learning process and diffusion of innovation, while strengthening institutional capacity at the village level. However, variations in technological literacy among farmers and limited supporting facilities remain challenges in the

implementation of Smart Farming. This situation emphasizes that the successful application of agricultural technology is determined not only by technical aspects, but also by social readiness, institutional readiness, and policy support (Dasipah et al., 2021).

Overall, the results of the activities show that the concept of Smart Farming, adapted to local conditions, has great potential as a solution for increasing rural agricultural productivity (Walter et al., 2017). The implementation of simple and economical appropriate technologies can be a gateway to inclusive and sustainable agricultural modernization (Ogemah, 2017). To strengthen the long-term impact, continued assistance, strengthening the role of farmer technology cadres, and integration of the program with regional agricultural development policies are needed. With this strategy, the Smart Farming Village model has the opportunity to be replicated in other areas with similar characteristics to support food security and improve farmer welfare (Ilham et al., 2022).

Conclusions

The Community Service Activity with the theme of Implementing Smart Farming-Based Agricultural Technology to Increase Agricultural Productivity in Villages in Konawe Regency, Southeast Sulawesi, has been carried out successfully and has had a positive impact on village farmers. This activity has increased farmers' knowledge and skills in understanding and applying appropriate agricultural technology that is suited to local conditions.

The implementation of Smart Farming through training, field demonstrations, and mentoring shows that simple data-based agricultural technology can improve the efficiency of water, fertilizer, and labor use, and has the potential to increase agricultural productivity. In addition, this activity encourages a change in the mindset and behavior of farmers from traditional cultivation methods to more modern and planned farm management.

This activity also contributes to strengthening the role of farmer groups as agents of change and a forum for shared learning. Although there are still challenges in adopting technology, the results of this activity show that a participatory approach and continuous assistance are key to the successful implementation of agricultural technology at the village level.

Overall, this activity has the potential to become a model for the sustainable development of Smart Farming Villages in Konawe Regency and can be replicated in other villages with similar characteristics, in order to support food security and improve the welfare of farmers.

Acknowledgements

The authors would like to thank the Halu Oleo University for its support in implementing this community service program. Appreciation is also extended to the local government, farmer groups, and agricultural extension officers in Konawe Regency, Southeast Sulawesi, for their cooperation and participation.

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