International Seminar on Student Research in Education, Science, and Technology
ISSN 3047-1532 | Volume 1 April 2024, pp. 297-306

https://www.issrestec.id/
http://journal.ummat.ac.id/index.php/issrestec
Universitas Muhammadiyah Mataram, Indonesia

Extension Performance in Agricultural Development: The Urgency of Integrated Agricultural System Education for Farmers

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Abstract: The important role of agricultural development as a production factor is greatly influenced by extension services as a means of education in the sustainable use of natural resources. Extension performance is considered important regarding the role of farmer education, technology adoption aimed at community welfare. This research is empirical research on various supporting literature, accompanied by descriptive observational actions regarding the important role of extension in assisting farmers' understanding of smart farming which leads to farming efficiency and agricultural sustainability. The discussion includes strengthening extension performance, education on integrated agricultural systems and development policies through agricultural extension. There needs to be an important formal management role, not only in putting farmer education through extension services on the agenda and allocating resources for the change process, but also by acting as role models. An integrated system that promotes low input, integrated agriculture increases productivity, reduces operational costs, optimizes the use of resources such as water and fertilizer, and reduces the environmental impact of agricultural activities. Extension is not only about completing tasks but also about responsibility for income and welfare as well as increasing awareness in preserving the function of the environment.

Keywords: Development, agricultural education, extension.

Article History:
Received: 14-03-2024
Online : 07-04-2024

A. INTRODUCTION

Agricultural development directs agricultural land to be viewed as an industry with all production factors that produce the main food products (Nyamweru et al., 2023). Development is basically an effort to improve community welfare (Iyoega et al., 2020). In line with the aim of agricultural extension which directs community empowerment towards prosperity (Mardikanto, 2009). Various concrete efforts for agricultural development can be carried out through coaching and mentoring activities for farmer groups through increasing the role of extension (Wardani, 2018). This explains that differences in policy making and use of information technology by various extension organizations will influence differences in the results in their decision making with farmers (Owolabi & Yekinni, 2022). Knowledge of agricultural resource management has become an important issue in ecological sustainability amidst the dilemma of farmers' adaptability in their management, as is the case in several countries in the world, especially Indonesia (Biswas et al., 2021; Lecoutere et al., 2023; Li et al., 2021). As vital elements, agricultural knowledge and information contribute to the growth of the agricultural sector and meet the goals of sustainable agricultural development through

assisting farmers to undertake new agricultural activities(Salehi et al., 2021). Most of the current research revolves around collaborative governance of the ecological environment, issues related to ecological restoration, and coordination of the development of the ecological environment and social economy, adaptation, resilience, and low-emission development should be carried out by all countries (Zahar, 2023; Zhao & Zhang, 2021). Farmers' access to agricultural technology has long been recognized as critical to farmers' livelihoods, learning and education, citing the 'innovation paradox' (Cook et al., 2021).

The delivery of conventional agricultural extension is mainly carried out by extension workers who visit farmers on the land or in farmer field schools through quality extension services, improved technology, and good agronomic practices are development goals (Danso-Abbeam, 2022; Olayinka & Taofeeq, 2022). Farming activities carried out for generations are faced with the problem of decreasing land productivity, especially on sloping rainfed agricultural land (Wulan Ayu et al., 2020). In empowerment, PPL provides motivation and reminds the community regarding the correct procedures for managing agricultural land. This approach has not been widely implemented on a regional and subregional scale to continue to strengthen the feedback loop between data, management systems, and learning outcomes and evaluation of sustainability policies and programs to increase agricultural income (Kurian, 2020).

Problems generally occur globally. Therefore, currently countries that are members of the Organization for Economic Co-operation and Development (OECD) have started to develop technology that can support increased agricultural productivity. Precision agriculture and smart farming are important principles in realizing sustainable agriculture. Precision agriculture and smart farming have an important role in maintaining food security amidst rapid population growth. With the global population continuing to grow, traditional agriculture that relies on conventional methods is no longer efficient and sustainable. This is why the adoption of modern technology such as precision agriculture and smart farming is very important. The use of modern agricultural technology is one way to achieve sustainable agricultural development because it increases the efficiency of using agricultural resources, increases productivity, increases farmers' income and increases the competitiveness of their income in domestic and global markets (Angela, 2021). By implementing increased productivity by combining precision agriculture and smart farming technology, farmers can increase agricultural productivity, efficiency and sustainability. This is important to meet food demand which continues to increase along with population growth. By maintaining food security, we can ensure that the world's food needs can be met in a sustainable manner.

B. METHOD

This research is empirical research on various supporting literature, accompanied by descriptive observation measures. The aim of using this method is to describe a phenomenon and its characteristics, especially related to agricultural extension in terms of smart farming education for learning for farmers. The important role of extension in assisting farmers' understanding of smart farming which leads to farming efficiency and agricultural sustainability. In presenting the resulting data, research analysis uses a qualitative descriptive approach, with several process stages, namely the stages of collecting information or data, reducing data, presenting data, and drawing conclusions. This data acquisition process is a combination of secondary data and observation results which are then compared and presented.

C. RESULTS AND DISCUSSION

1. Strengthening Extension Performance

An research believes that the role of the agricultural sector can be seen from its contribution to industrial growth and economic structural transformation (Suci, 2018). Even in the new paradigm of agriculture for development, the role of the agricultural sector is multi-functional, spurring economic growth, reducing poverty, reducing income gaps, providing food and providing environmental services. In the Strategic Plan of the Ministry of Agriculture 20 20 - 20 24 it is stated that the strategic role of the agricultural sector is shown through the contribution of the agricultural sector in providing food and industrial raw materials, contributing to GDP, earning foreign exchange, absorbing labor, the main source of income for rural households, providing materials feed and bioenergy, as well as playing a role in efforts to reduce greenhouse gas emissions. This explains that differences in the use of information technology by various extension organizations will influence differences in the results in their decision making with farmers (Olayinka & Taofeeq, 2022).

Good human resource management is shown to increase the contribution that workers in the organization can make towards achieving organizational goals (Siagian Sondang, 2019). Some researchers stated that the implementation of agricultural extension will run well if there is a common perception between extension agents and farmers as well as interested parties. Agricultural extension carried out jointly by the Provincial and Regency/City governments must clearly have harmony and the same goals between these government structures. so that it can solve all the problems faced by farmers so far. The main function is to change farmer behavior with non-formal education so that farmers have a better life in a sustainable manner.

Agricultural extension activities are a continuous process to convey information and technology that is useful for farmers and their families. Extension activities are sought not to cause farmers to become dependent on extension workers, but to empower farmers so as to create farmer independence as agribusiness entrepreneurs (Virginia Nona & Ayu, 2020). Based on a combination of agribusiness approaches and the philosophy and principles of agricultural extension, the definition of extension is formulated "agricultural extension is a learning process for main actors and business actors so that they are willing and able to help and organize themselves in accessing market information, technology, capital and other resources, as an effort to improve productivity, business efficiency, income and welfare as well as increasing awareness in preserving environmental functions.

Performance is work achievement or work results (output) both quality and quantity achieved over a period of time in carrying out work duties in accordance with the responsibilities given to him (Mangkunegara, 2019). Good performance of extension agents is necessary to convince policy makers and development budgets to continue to allocate sufficient funds to finance extension so as to continue to allocate sufficient funds to finance extension to support regional development. Agricultural instructors must strive to develop extension programs that are appropriate to regional potential and market demand to meet various community needs. The good performance of agricultural instructors has an impact on improving farmer performance in increasing Bahua farming production (Ali et al., 2018). The performance of these extension workers is focused on solving problems faced by farmers in carrying out farming.

Agricultural extension is the involvement of someone in consciously communicating information with the aim of helping farmers provide opinions so they can make the right decisions. Apart from farmers, another main requirement in agricultural development is technology which is constantly changing. Through the role of extension workers, farmers are expected to be aware of their needs, improve their abilities, and be able to play a better role in society (Wulandari, 2020). Therefore, innovation plays an important role in agricultural development. The diffusion and adoption of innovation in a farming community is greatly influenced by the characteristics of the innovation itself. Rogers (Budi, 2018) suggests several characteristics of innovation, namely: (1) relative advantage, (2) harmony, (3) complexity, (4) can be tried, and (5) can be observed.

Bahua according to the performance of agricultural instructors is influenced by internal factors, namely: age, length of service, number of assisted farmers, ability to plan extension programs, leadership abilities of instructors, development of personal potential, need for affiliation, intellectual independence and social independence (Roza & Restuhadi, 2018). External factors that support the performance of extension workers in carrying out their main duties and functions are government policy in the midst of the quantity of extension workers not yet matching the number of assisted farmers. The extension performance was also assessed based on the frequency of meetings between extension workers and farmers and farmer groups between extension workers and farmers on a regular or scheduled basis for education and assistance to farmers regarding cultivation technology and farming .

The integration system is the application of integrated farming through a low external input approach between agricultural crop commodities and livestock. Through this integration system, efficient use of production inputs can be achieved as well as the risk of failure in business can be minimized. An integrated farming system was introduced based on the results of studies and research, then gradually cropping patterns and farming patterns emerged until the term farming system emerged. One of the farming systems that supports agricultural development in rural areas is the livestock crop integration system. The main characteristic of integrating crops with livestock is the existence of a mutually beneficial relationship between crops and livestock. This connection can be seen from the integrated distribution of land and the utilization of waste from each component. The interconnection of various components of the integration system is a triggering factor in encouraging the growth of farming community incomes and sustainable regional economic growth.

The application of food production principles in practice and sustainable improvement depends on farmers' adaptive capacity to climate change and appropriate technology (Kassem et al., 2021). Empowerment can be carried out through developing coaching and increasing their effectiveness, both as household members and as independent entrepreneurs, protecting female workers, increasing the effectiveness of counseling accompanied by training, improving regulations, facilities and wage levels, training and developing home industry skills, as well as employment opportunities to be balanced between genders. Under this line of thinking, sustainable agriculture can be understood through various innovative agricultural farming practices and approaches that have recently been introduced in an attempt to address agricultural challenges (Nyamweru et al., 2023).

2. Integrated Agricultural System Education

The concept of integrated agriculture has been implemented in Indonesia since farmers became familiar with agriculture. In the 1970s, an integrated farming system was introduced which was based on the results of studies and research and then gradually the terms cropping pattern, cropping system emerged until finally the term farming system emerged. and finally the term crop-livestock system (Crop-Livestock) emerged System). Crop-livestock integration is a farming activity that combines agricultural and livestock business activities. In a farming activity, farmers place and cultivate a number of livestock in the planting area without disturbing the activity and productivity of the plants and livestock themselves, in fact the presence of plants and livestock can increase the productivity of each.

One technology that can be applied is the LEISA (low external input and sustainable agriculture) system. This system combines plant, animal, soil, water, climate and human components in a production system so that they complement each other and synergize. LEISA can take the form of an integrated agricultural system that is economically and ecologically viable. So that the utilization process can occur effectively and efficiently, integrated agricultural production should be located in one area. In this area there should be a crop production sector for livestock. The existence of these sectors will result in the area having a complete ecosystem and all production components will not become waste because they will definitely be utilized by other components and tend to be closed to external input. Apart from this, there will be an increase in yields and reduced production costs so that the effectiveness and efficiency of agricultural cultivation production will be achieved. Integrated farming reduces the risk of crop failure, because dependence on a commodity can be avoided and production costs are saved. An integrated crop and livestock agricultural system is an agricultural system characterized by a close relationship between plant and livestock components in a farming activity or within an area (Siswati & Nizar, 2012; Utami & Rangkuti, 2021).

The aim of integrating crops with livestock is to obtain additional products of economic value, increase business efficiency, improve the quality of land use, increase business flexibility in facing global competition, and produce a clean and comfortable environment. Efficient allocation of resources, utilization of comparative advantages and planting patterns will produce a synergistic relationship between farming branches. Apart from that, this integrated farming system pattern has several benefits from economic, social and environmental aspects. The environmental aspect is efforts to utilize waste, land efficiency and minimize waste. In line with the opinion of (Rosilawati & Risvansuna, 2022), by using smart farming, farmers can increase productivity, reduce operational costs, optimize the use of resources such as water and fertilizer, and reduce the environmental impact of agricultural activities. Apart from that, smart farming also helps farmers face challenges such as climate change and commodity price fluctuations.

Sustainable agriculture has emerged as an alternative agricultural system to address the many obstacles faced by farmers who are poor in resources and time, as well as ensuring environmental sustainability. This refers to the capacity of agriculture to contribute to overall prosperity by providing food and other goods and services that are efficient and economically

profitable, socially responsible and environmentally appropriate. This system involves an interrelated combination of land, crop and livestock production that corresponds to the non-use or reduced use of external inputs that have the potential to harm the environment and/or the health of farmers and consumers. Another alternative is using smart farming technology for farming efficiency (Said et al., 2021). Optimizing the use of agricultural resources, increasing crop productivity, reducing excessive use of fertilizers and pesticides, and reducing the negative environmental impacts of conventional agricultural practices. The application of local resources in improving land and can be beneficial in that increased incomes can reduce barriers to adopting sustainable resource use practices . The results of data analysis provide important information for farmers to make smarter decisions.

3. Development Policy Through Agricultural Extension

Agricultural Extension Officers are agricultural service officers whose job is to help farmers run farming businesses through an extension system as a form of learning activity for farmers and agricultural entrepreneurs so that they can help and organize themselves when searching for and using information about markets, capital, technology and other resources to be able to developing business efficiency, productivity, welfare and income, as well as developing the level of awareness to preserve the environment (Darmawan & Mardikaningsih, 2021). Agricultural instructors must have technical and managerial competencies because agricultural instructors must have technical capabilities related to agriculture, and managerial capabilities include the ability to manage work to carry out extension services.

Future agricultural development can contribute more to reducing disparities and expanding employment opportunities, as well as being able to take advantage of all economic opportunities that occur as a result of globalization and liberalization of the world economy (Virginia Nona & Ayu, 2020). In order to realize these hopes, quality and reliable human resources are needed with the characteristics of being independent, professional, entrepreneurial, dedicated, work ethic, disciplined, moral, mastering information technology and having a global perspective, so that farmers and other agricultural business actors will be able to build competitive farming businesses. high and improve the welfare of farmers. One effort to improve agricultural human resources, especially farmer human resources, is through agricultural extension activities .

Delivery of rural extension services in developing areas where the adoption of agricultural technology and rural development increases agricultural growth as well as rural development (Amadu, 2023). The progress of the agricultural sector can be seen to what extent the progress of agricultural development is a process that is intended to increase agricultural production while increasing the productivity income of farmers' businesses. Gender-sensitive training can improve women's business skills so that they can solve problems more effectively and become successful entrepreneurs (Dhehibi et al., 2022). Adoption of modern agricultural technology, increasing efficiency and diffusion processes, as well as improving the limited capabilities of farmers through agricultural extension services, productivity has increased substantially (Biswas et al., 2021). The role of agricultural instructors as agents of change is to encourage and help farmers to make innovative technological changes that are more focused and

advanced in developing farming businesses through changes in the farmers themselves, as well as providing markets for farmers. For this reason, it is better not only to provide education but also to the instructors. need to carry out every role given responsibly (Angela, 2021).

SDGs exist to overcome various global challenges, such as poverty, hunger, inequality, climate, environmental degradation and justice. Then it became a global agenda for achieving targets in 2030. It is integral to the 2030 Agenda for sustainable development, the aim is to realize a more sustainable future so that the UN, including Indonesia as one of the member countries, agreed to implement the SDGs or Sustainable Development Goals (TPB) as stated in the document Transforming Our World: The 2020 Agenda for Sustainable Development is a global collective plan to overcome extreme poverty, reduce inequality and protect the planet on the 2030 agenda. These Sustainable Development Goals were prepared by 194 countries, civil society and various economic actors from various parts of the world under the auspices of the United Nations (UN). The Sustainable Development Goals or SDGs have been established since September 25 2015 and consist of 17 goals covering the global environment. Through these 17 goals, there are 169 targets that will guide policy and funding for the next 15 years and are expected to be completed by 2030. SDGs goal number 2 is to end hunger, achieve food security, improve nutrition and promote sustainable agriculture. This goal is in line with Indonesia's development priorities which are included in the priorities of food security and job creation. Women represent about half of the total agricultural workforce in developing countries. As farmers and farmworkers, horticulturists, entrepreneurs, entrepreneurs and community leaders, they play an important role in agriculture and rural economic development.

Another option for measuring farmer welfare was proposed where farmer welfare can be calculated using regular BPS data, namely food and nutrition insecurity status, poverty status and the human development index of farming families. It was also added that there is a need to study the farmer asset index and farmer happiness index in the future. A clearer opinion that clearly/explicitly states the characteristics of a sovereign producer are:

a. Firstly, creating harmony between farmers and farmers with nature.
b. Second, there is government protection and encouraging the role of local markets.
c. Third, food sovereignty is also anti-patent and communal.
d. Fourth, environmentally friendly (green rationalism) where the essence of food sovereignty is to humanize Indonesian food producers.

Wellfare emphasized that food sovereignty is one of the pillars determining the success of programs to achieve food security which leads to national resilience and national independence. In order to realize food sovereignty, it is absolutely necessary to humanize food producers, namely farmers, who are the main pillar in realizing food security. Before farmers become sovereign, food production will not be optimal. As a consequence, food security certainly cannot be achieved. As vital elements, agricultural knowledge and information contribute to the growth of the agricultural sector and meet the goals of sustainable agricultural development through assisting farmers to carry out new environmentally friendly agricultural activities (Salehi et al., 2021). The stimulus referred to in this study is government support through extension services in implementing sustainable agricultural systems (Virianita et al., 2019).

D. CONCLUSIONS AND SUGGESTIONS

The agricultural sector needs attention from various parties regarding the delivery of extension services to farmers. Agriculture is still a source of income and world food security. Agricultural development in rural areas has led to economic growth, but has not been fully balanced by awareness of the importance of sustainable agriculture as expected by development goals. There needs to be an important formal management role, not only in putting farmer education through extension services on the agenda and allocating resources for the change process, but also by acting as role models. An integrated system that promotes low input, integrated agriculture increases productivity, reduces operational costs, optimizes the use of resources such as water and fertilizer, and reduces the environmental impact of agricultural activities. The role of extension to change farmers to know, want and be able to carry out farming according to cultivation techniques is an important thing that needs to be considered as a strategic step in achieving these goals. Counseling is not just about completing a task but also a responsibility income and welfare as well as increasing awareness in preserving environmental functions. In accordance with sustainable development goals which require environmental aspects to improve nutrition and promote sustainable agriculture. There needs to be a study regarding the collaboration of supporting elements that support agricultural development.

ACKNOWLEDGMENTS

We would like to express our thanks to our supervisor and the entire Hasanuddin University academic community for their guidance and support as well as the Bima City Agriculture Service for sending us to continue our studies.

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