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The Role of Students in Educating Local Vegetable Farmers in Tambelang Krucil Probolinggo

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Abstract:

Tambelang Krucil, Probolinggo, is a region rich in agricultural commodities such as vegetables, coffee, and other crops. However, the livestock sector serves as the primary source of income for the local community, resulting in less optimal agricultural development. Observing this condition, students play a role in educating farmers to encourage diversification and increase agricultural yields. This study employs a descriptive qualitative method to analyze the role of students in agricultural education in Tambelang Krucil, Probolinggo. The research findings indicate that the education provided by students to farmers includes an understanding of the basic concepts of modern agriculture, technical assistance in implementing agricultural methods and more efficient marketing of harvests, as well as support in agricultural data analysis to enhance farmers' productivity. Through this assistance, it is expected that farmers will become more open to innovation and capable of developing the agricultural sector sustainably.

Keywords: *Education, modern agriculture, marketing.*

Abstract:

Tambelang Krucil Probolinggo is an area rich in agricultural commodities such as vegetables, coffee, and other crops. However, the livestock sector is the main source of income for the local community, so the development of the agricultural sector is still not optimal. Seeing this condition, students play a role in providing education to farmers to encourage diversification and increase agricultural products. This study uses a descriptive qualitative method to analyze the role of students in agricultural education in Tambelang Krucil village, Probolinggo. The results of the study show that the education provided by students to farmers includes understanding the basic concepts of modern agriculture, technical assistance in the application of agricultural methods and more efficient marketing of crops, as well as assistance in analyzing agricultural data to increase farmers' work productivity. With this assistance, it is hoped that farmers can be more open to innovation and be able to develop the agricultural sector in a sustainable manner.

Keywords: Education, modern agriculture, marketing.

INTRODUCTION

Indonesia's mountainous regions have great potential for geographical and ecological diversity in supporting the agricultural sector and sustainable development. According to data from the Ministry of Environment and Forestry (2022), Indonesia has around 18.7% of its area in the form of mountains spread across various islands, with an altitude of between 500-3,000 meters above sea level (Nuroiq Faisol Hanif, Triyono Saputro, and Sigit Nugroho, 2022). This mountainous region has the characteristics of highly fertile volcanic soils, unique climatic conditions, and abundant biodiversity, making it a strategic area for agricultural development, conservation, and community empowerment.

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Agriculture plays an important role in supporting food security and the economy of a country, including Indonesia(Jakarta: Ministry of Agriculture, 2020). In the midst of global challenges such as climate change, land degradation, and changes in people's consumption patterns. The agricultural sector, especially local vegetable farmers, often face obstacles in increasing productivity and business sustainability.

Solving economic problems and food security in a country is not easy to just turn a hand. However, the analysis of the problems faced needs to be carried out continuously so that the energy and capital spent in overcoming these problems are not wasted only because of the limited resources they have. Problems that occur in life change every time, then the right control of the problem will benefit the economic implementers, whoever the person needs the necessary provision is good control(Peter F. Drucker, 1954).

Climate change has triggered shifts in the planting season, increased intensity of natural disasters, and uncertainty in rainfall patterns that have a direct impact on agricultural productivity(Jakarta: BMKG, 2021). This phenomenon is exacerbated by land degradation which is characterized by decreased soil fertility, erosion, and loss of soil nutrients vital for plant growth. On the other hand, changes in people's increasingly dynamic consumption patterns require adaptation in the agricultural production system, ranging from improving product quality to ensuring food safety.

This condition requires strategic interventions in the form of the adoption of modern agricultural technology, strengthening the capacity of farmers, and improving the agricultural system as a whole. According to the FAO report (2023), developing countries need to increase investment in the agricultural sector by up to 50% to face this global challenge(Rome: FAO, 2023). The IPCC (2022) also asserts that without proper intervention, agricultural productivity in the tropics can decline by up to 25% by 2050. Therefore, collaboration between various stakeholders, including academics, governments, and communities, is key in developing adaptive and sustainable solutions.

Students, as the younger generation who have access to education, technology, and the latest knowledge, have a strategic role in answering these challenges(Jakarta: Bappenas, 2018). With the scientific provisions they have, students can play an active role in educating local vegetable farmers, both through technology transfer, training, and continuous mentoring. This approach not only helps to increase agricultural productivity but also encourages more environmentally friendly and economical agricultural practices.

As agents of change, students also have great potential to connect farmers with wider market opportunities and digital technology and agribusiness. This synergy between students and local farmers is expected to be able to encourage the improvement of farmers' welfare while strengthening food security at the local and national levels. Through collaboration between students and farmers, students not only contribute to the development of the agricultural sector, but also build collective awareness of the importance of supporting farmers as the main pillar of the country's food security.

Tambelang, Krucil, Probolinggo is a village located in Krucil District, Probolinggo Regency, East Java. This region is located on the slopes of Mount Argopuro, which is known for its lush mountainous landscape and high agrarian

potential. This village is one of the areas that produces agricultural commodities, such as vegetables, coffee, and other horticultural crops, due to its fertile soil conditions and supportive climate.

Side by side with the villages of Bermi and Krucil Tambelang, many accommodate the dairy sector as the main income potential with a population of 1,120 dairy cows managed by more than 653 farmers so that the agricultural potential in this village cannot be utilized optimally because the focus of the community is more inclined to the development of the livestock sector than agriculture(Superior Potential, 2025).

Therefore, through an article entitled "The *Role of Students in Educating Local Vegetable Farmers in Tambelang Krucil Probolinggo*" we will try to examine how development follow-up can be carried out by students in overcoming local vegetable farming problems with the potential of Tambelang Krucil Probolinggo Village.

RESEARCH METHODS

The research on the role of students in educating local vegetable farmers in Tambelang Krucil Probolinggo uses a qualitative research method with a descriptive approach to gain a deep understanding of the social phenomena that occur(Merriam, S. B., Tisdell, E. J,2015). The qualitative method was chosen because it was able to reveal the complexity of the interaction between students and farmers, and could explore the meaning of the participants' experiences and perceptions naturally in the context of daily life.

The descriptive approach in this study allows researchers to describe in detail how the educational process takes place, how students transfer agricultural knowledge to local farmers, and how farmers respond to and adopt the new knowledge. Through this approach, researchers can explore the social, cultural, and educational dynamics that occur in the agricultural education process in Tambelang Village, Krucil District, Probolinggo Regency(Muhammad S. I,2023).

RESULTS AND DISCUSSION

Student Education Through Modern Agricultural Techniques

Modern agricultural techniques have changed traditional farming methods to be more efficient and productive(Budi Indra Setiawan,2023). This approach integrates technology, innovation, and sustainable practices to optimize agricultural yields. Some of the modern agricultural techniques currently applied include drip irrigation systems, the use of sensors for soil and weather monitoring, precision agriculture using GPS, and the use of drones for land mapping and crop monitoring(Dwi Andreas Santosa,2022).

Educating farmers on modern agricultural techniques is crucial to increase the adoption of sustainable agricultural technologies and practices(Arif Wibowo,2023). This educational program includes training in the use of modern tools, an introduction to integrated agricultural systems, and an understanding of agricultural data analysis. Farmers need to understand how to operate modern equipment, interpret sensor data, and implement precision farming practices.

The implementation of modern agricultural techniques has various benefits. Drip irrigation systems can save up to 60% of water use compared to traditional

methods. The use of soil sensors allows farmers to know the soil fertility conditions in real-time, so that they can optimize the use of fertilizers. Precision agriculture with GPS helps farmers manage planting patterns and distribution of agricultural inputs more accurately.

However, the adoption of modern agricultural techniques also faces challenges. The high initial investment cost, limited access to technology, and lack of technical understanding are the main obstacles. Therefore, the educational program carried out by students needs to be designed comprehensively by considering the socio-economic conditions of local farmers in Tambelang village.

The role of students in educating farmers is very important to bridge the knowledge gap. Students help farmers understand the basic concepts of modern agriculture, provide technical assistance, and help analyze agricultural data. This collaboration between students and farmers can create innovations that are in accordance with local conditions in Tambelang village.

The success of modern agricultural education programs conducted by students depends on several key factors: relevant and easy-to-understand educational materials, effective delivery methods, and continuous mentoring. In this program, students must also pay attention to local wisdom and farming experience that farmers already have.

The positive impact of modern agricultural education can be seen from how later it will increase productivity, efficient use of resources, and sustainability of agricultural practices in Tambelang village. Karna in a case study conducted by Dr. Sri Nuryani noted that vegetable farmers who adopt modern technology have experienced an increase in crop yields of up to 45% and a reduction in the use of pesticides by 30% With implementations that need to be adjusted such as: Types of vegetables, Local climatic conditions, Water availability, Farmers' investment ability, Farmers' technical skills. So that farmers in Tambelang village who have adopted modern techniques are expected to experience an increase in crop yields of up to 40% and a reduction in production costs by 30%.

However, this educational program requires support from various parties, including the government, academics, and the private sector. Because the collaboration built is important to ensure effective and sustainable knowledge transfer to the farming community.

1. Types of modern agricultural techniques

   In modern vegetable farming techniques, there are various kinds of modern vegetable farming techniques including hydroponics, verticulture, and the use of greenhouses which have many benefits if we use these techniques.

   Likewise, the role of students in educating farmers is very important to bridge the knowledge gap. Students help farmers understand the basic concepts of modern agriculture, provide technical assistance, and help analyze agricultural data, which provides farmers with knowledge of how important it is to modernize agriculture with these techniques.

A. Hydroponic

Hydroponics is a method of growing plants without soil, using a nutrient-rich solution of water to channel essential nutrients directly into the plant's roots. This

method is particularly useful in places with poor or limited soil quality, and allows for faster plant growth and higher yields on smaller plots. There are several types of hydroponic systems, including:

1. Axis System: The simplest system, in which the axis draws a nutrient solution to the roots.
2. Deep Water Culture (DWC): Plant roots are suspended in nutrient-rich water, with air pumps providing oxygen.
3. Nutrient Layer Technique (NFT): A thin layer of nutrient solution runs over the roots, which is supported by an inclined channel.
4. Tides (Flood and Drain): The system periodically floods plant roots with nutrient solution and then drains them back into reservoirs.
5. Aeroponics: The roots are suspended in the air and sprayed with a nutrient solution, thus promoting faster growth.

Hydroponics is popular for growing a variety of crops, including lettuce, tomatoes, cucumbers, and spices, and is increasingly being used in urban agriculture or in controlled environments such as greenhouses.

B. Verticulture

The technique of vertical cultivation in its history was introduced by a seed company in Switzerland in 1944 which referred to the idea of a Vertical Garden. Then verticulture is rampant in European countries that have a sub-tropical climate and then spread throughout the world by carrying out the mission of food security at the household level.

In layman's terms, the definition of vertical culture is an agricultural cultivation system that is carried out vertically or in tiers on an indoor or outdoor scale. Generally, verticulture is carried out using certain buildings or container models for planting, depending on the conditions of the place and the wishes of each person.

CONCLUSION

The conclusion is that with the modernization of vegetable agriculture, there are many benefits obtained by farmers and can maximize existing crops. Likewise, the role of students who educate farmers about agricultural technology knowledge so that now they can know the benefits of modernizing vegetable farming.

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