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# Application of LEISA (Low External Input Sustainable Agriculture) for Vegetable Cultivation in Balunijuk Village

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## ABSTRACT

Balunijuk Village is one of the centers of vegetable production on Bangka Island. Almost all of the farmers in Balunijuk Village depend on chemical fertilizers and chemical pesticides which are not environmentally friendly. The implementation of the LEISA (Low External Input Sustainable Agriculture) system is a form of concern for the environment, but its implementation is still hampered by the readiness of human resources. This study aims to: (1) find out the strengths, weaknesses, opportunities, and threats faced by farmers in crop cultivation in Balunijuk village, (2) alternative strategies to empower millennial farmers to increase farmers income. This research was conducted in March-June 2022. The community empowerment strategy applied in this study was the application of the LEISA concept. The research was conducted using the methods of observation, interviews, and experiments. The respondents involved were 25 farmers. The results showed that the application of the LEISA concept could reduce the use of chemical fertilizers and chemical pesticides. The use of organic fertilizers, biological pesticides and LEISA cultivation techniques has a positive influence and raises awareness of farmers to produce safe agricultural products. The implication is that there is an increase in the number of millennial farmers in vegetable cultivation referring to the LEISA concept.

**Keywords:** LEISA, milenial farmer, organic fertilizer, hayati pesticide.

## 1. INTRODUCTION

Balunijuk village is a horticultural production center in Bangka Regency. The majority of the people work as farmers. The government's efforts to maintain the icon of Balunijuk Village as a horticultural production center are carried out through fostering young farmers or what are known as Millennial farmers. Balunijuk village currently has two millennial farmer groups, one of which is an independent cadet farmer group. The independent cadet farmer group was established in 2019. The farmer group manages the cultivation of horticultural crops. Farmer groups are still having problems with cultivation techniques and integrating businesses in the upstream system. Technical competence and mastery of technology for the procurement of agricultural materials is still low. Cultivation techniques are still conventional. Farmers are still dependent on chemical fertilizers and chemical pesticides that are not environmentally friendly.

This Agricultural development in Bangka Belitung is currently directed towards sustainable and environmentally friendly agriculture. Optimization of land potential can be done through the application of the LEISA (Low External Input Sustainable Agriculture) system [1]. The implementation of the LEISA system is a form of concern for the environment. The implementation of LEISA is still constrained by the readiness of human resources. The majority of the agricultural system adopted is conventional agriculture which has been carried out for generations. In the system of LEISA, ecological risks generated by the external inputs are avoided; and reversally, the farm system performance is enriched by the use of internal inputs (including by products) produced in the agro-ecosyste [2]. How about the readiness of millennial farmers, their competencies and entrepreneurship encourage them to be able to apply the LEISA system in agricultural activities. Massive assistance for the implementation of this system

is not only the responsibility of the government. Universities also need to be present to assist farmers through community service activities. Several efforts to overcome this problem include education, and regular assistance to farmers. Formulation of the right strategy with SWOT analysis (*Strengths, Weaknesses, Opportunities, Threats*). Based on the existing problems, this study aims to implement a strategy for implementing the LEISA technology package to increase farmers' income in Balunijuk Village.

## 2. MATERIAL AND METHODS

The research method used is survey method and experimental method. The survey method was carried out using purposive sampling data collection techniques. The respondents who were determined were 25 people with the criteria of millennial farmers. The experimental method is carried out by making a pilot project with an area of 100 m<sup>2</sup>. Interviews were conducted on 25 respondents using a questionnaire containing questions related to the strengths, weaknesses, opportunities, and threats faced when cultivating plants in Balunijuk village. This research was conducted in March-June 2022. This research is located in Balunijuk Village, Merawang District, Bangka Regency, Bangka Belitung Islands Province, Indonesia. The results of the questionnaire were analyzed in the form of a SWOT analysis.

## 3. RESULT AND DISCUSSION

Balunijuk village is a vegetable center, but the potential of the surrounding nature has not been optimally utilized by the local community due to the many challenges and obstacles faced by the community in vegetable cultivation. Based on the questionnaire, the data obtained in Table 1 are as follows.

The land in Balunijuk village is suitable for vegetable cultivation. Pests and diseases that often attack vegetable crops in Balunijuk village are pests (fleas, caterpillars, grasshoppers, snails) and diseases (rot, leaf rust, spotting) and weeds (narrow leaves and broad leaves). Farmers deal with pests and diseases as follows 1) pests (using pesticides); 2) disease (using pesticides); 2) weeds (using pesticides). Farmers' losses due to pests and diseases are an average of IDR 1,000,000 (Table 1). The internal problem of farmers in Balunijuk village in cultivating vegetable crops is the lack of ability to overcome attacks by plant pest organisms such as lice, caterpillars, grasshoppers, and rot disease, leaf rust, spotting and narrow leaf weeds. External problems for farmers in Balunijuk village are conventional vegetable cultivation, dependence on chemical fertilizers and pesticides, high production costs. [4] The sheep development in Desa Citalaksana could not support to LEISA concept because the index value is a critical category.

**Table 1.** Questionnaire results to respondents

No	Question	Answer
1.	Land ownership	alone 0%; parent 100%
2.	Farmer's capital	IDR 500.000 – IDR 2.000.000
3.	Type of vegetables grown	kale 30%; spinach 30%; mustard green 30%; other 5%
4.	Type of rhizome planted	ginger 1%; tumeric 1%; galangal 1%; other 1%
5.	Vegetable seed source	buy 90%; alone 10%
6.	Type of pests	Fleas 30%, caterpillars 30%, grasshoppers 30%; other 10%
7.	Pest control	Pesticide 100%; nature 0%
8.	Type of disease	rot 30%; leaf rust 30%; spotting 30%; other 10%
9.	Disease control	Pesticide 100%; nature 0%
10.	Type of weed	Narrow leaves 80%; Broad leaves 20%
11.	Weed control	Pesticide 100%; nature 0%
12.	Yield marketing	collector 100%; market 0%; food stalls 0%
13.	Source of fertilizer	chemical 90% ; organic 10%

Based on the results of the SWOT analysis (Table 2), the way to overcome this problem is to provide counseling and assistance to millennial farmers in Balunijuk village. Problems in increasing crop yields are caused by the application of inappropriate cultivation techniques. The successful implementation of LEISA needs to be disseminated to farmers through counseling and assistance. Counseling is expected to change the knowledge and behavior of farmers who have not implemented the use of environmentally friendly fertilizers and pesticides. [5] Social factor of profession level share to adjustment of technology of LEISA, while for the factor of age did not share to adjustment of technology of LEISA.

The application of LEISA through polyculture and duck farming techniques in the farmer's garden of Balunijuk village (Figure 1). The application of farmer cultivation techniques carried out by polyculture can be carried out in the LEISA system. Cultivation of polyculture crops includes vegetables interspersed with rhizome cultivation such as ginger, turmeric, laos, kencur and lemongrass. Leaf vegetable crops such as kale, spinach and mustard greens which are generally harvested without entering the generative period also show relatively good growth. Leaf vegetable plants that are planted can be harvested before the age of 60 days. [3] The results showed that shallot plantation without organic matters combined with 375 kg/ha NPK (15-15-15) could improve fresh and dry crop weight.



**Table 2.** SWOT analysis for Balunijuk village farmers

STRENGTH	WEAKNESS
<ol style="list-style-type: none"> <li>Balunijuk village is vegetable center.</li> <li>Vegetable cultivation is a family business.</li> <li>Farmers have joined farmer group.</li> </ol>	<ol style="list-style-type: none"> <li>Cultivation of plants in monoculture</li> <li>The emergence of plant-disturbing organism</li> <li>Farmers are dependent on chemical fertilizer and chemical pesticides.</li> </ol>
OPPORTUNITY	THREAT
<ol style="list-style-type: none"> <li>The growing demand for vegetable.</li> <li>Farmers own land</li> <li>There is farmer cooperation.</li> </ol>	<ol style="list-style-type: none"> <li>Vegetables that contain pesticide</li> <li>The presence of pests that are resistance to pesticide doses.</li> <li>Increased production cost.</li> </ol>
PROGRAM	
STRENGTH-OPPORTUNITY	WEAKNESS-THREAT
<ol style="list-style-type: none"> <li>There is a spirit of melenial farmer</li> <li>Cooperation with farmer groups in reducing pest attack.</li> <li>Increased production through the application of cultivation techniques</li> </ol>	<ol style="list-style-type: none"> <li>Conducting integrated farming through the application of LEISA</li> <li>Implementing an efficient farming system.</li> <li>Conduct counselling on how to reduce the use of chemical fertilizer and pesticide.</li> </ol>
WEAKNESS-OPPORTUNITY	WEAKNESS-THREAT
<ol style="list-style-type: none"> <li>Milennial farmers cooperate with field extension officer to reduce pesticide.</li> <li>Utilization of plants around the garden to reduce pest attack.</li> <li>Utilization of various agricultural wastes for composting and POC.</li> </ol>	<ol style="list-style-type: none"> <li>Farmers need to be given knowledge and skills through training assistance on pesticide free product.</li> <li>Implementation of the LEISA system to restore the health of soil and its product.</li> <li>Application of polycultural cultivation technique to prevent pests.</li> </ol>

**Figure 1** Application of LEISA through polyculture and duck farming techniques.

Sources of organic fertilizer are expected to come from duck droppings which are kept by the farmers themselves. Duck is a type of poultry that is usually kept by the people of Bangka. Duck manure is one of the organic fertilizers that can improve the physical, chemical and biological properties of the soil. This duck livestock will greatly benefit the community if it is developed in conjunction with polyculture cultivation of vegetables with rhizome plants.

**Figure 2** Training on making liquid organic fertilizer (POC) and compost

Training on making liquid organic fertilizer (POC) and compost by utilizing materials and waste around the gardens of farmers in Balunijuk village (Figure 2). The use of chemical fertilizers and chemical pesticides continuously is now a habit of farmers in vegetable cultivation techniques in Balunijuk village. The use of chemical fertilizers and pesticides in the long term will cause an increase in soil residue and damage the properties of the soil. This condition needs to be handled by using organic materials that are environmentally friendly, and able to improve soil properties.

We can reduce the use of chemical fertilizers by using organic fertilizers such as liquid organic fertilizer (POC) and compost. POC and compost are organic fertilizers

used in agriculture to reduce the use of inorganic fertilizers. The manufacture of POC and compost comes from organic materials such as vegetable waste, animal waste and activators around the garden. Activators can be divided into two, namely natural activators and chemical activators. Natural activators come from organic materials and are often called local microorganisms (MOL) such as papaya fruit, banana weevil, fruit and vegetable residues.

The composting and POC training activities were carried out in the farmer's garden of Balunijuk village. Activities in the training invite participants to directly practice making compost and POC. The active ingredient of microorganisms used is EM-4. The training activities are as presented in Figures 1 and 2. The training participants generally gave a positive response to these activities.

#### 4. CONCLUSION

The results of the application of the LEISA technology package by combining polyculture vegetable cultivation techniques, duck farming and intensive assistance. Through the community empowerment program, we can reduce the use of chemical fertilizers and chemical pesticides that endanger health and damage the environment. The use of chemical fertilizers can be replaced with compost, liquid organic fertilizer (POC), while chemical pesticides can be replaced with vegetable pesticides.

#### ACKNOWLEDGMENTS

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