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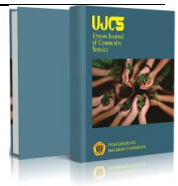

Shallot Agrotourism Based on Local Resources (Mulch and Organic Fertilizer) to Achieve Sustainable Agroecosystem in Sigerongan Village

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Abstract: The Farming in Sigerongan Village is highly intensive, potentially leading to chemical residues such as pesticides and fertilizers, which pose a problem for the biological, physical, and chemical balance of the soil and the environment. Sigerongan Village, with its "Sumber Hidup" Farmers Group, is a popular destination for local tourism, necessitating the development of a farming system that is both economically valuable and environmentally friendly. Shallot farming offers an alternative for developing agrotourism through the use of local resources such as rice mulch and organic fertilizer. Researchers have collected several superior shallot varieties and utilized mulch and manure to increase the productivity of small plots. To achieve this goal, direct extension activities and demonstration plots (action research) have been conducted with farmers. The training method used is adult education (POD) using participatory techniques. These activities aim to improve the skills and knowledge of partner farmers. The results of the activity showed that the development of shallot agrotourism based on local resources has been carried out in the "Sumber Hidup" farmer group in Sigerongan Village. Partner farmers have been very responsive to the community service activities. The technological transformation process of using rice straw mulch and cow manure in shallot cultivation has been implemented. Partner farmers are expected to experience behavioural changes in knowledge, skills, and attitudes to develop shallot agrotourism. 3. The chemical-free shallot cultivation technique that has been developed has the potential to promote agro tourism in Sigerongan village.

Keywords: Agrotourism, Plot Demonstration, Participatory, Sustainable Agriculture.

Introduction

National shallot production is still very fluctuating (unstable) so shallots are still imported. The average productivity of shallots in Indonesia is only 10.23 tons/ha, while the genetic potential is 20 tons/ha. In addition to the productivity gap, the use of pesticides, fungicides, herbicides, and chemical fertilizers is a challenge to achieving a healthy agricultural system.

One of the efforts to increase shallot production is to expand shallot planting in non-shallot center areas, including in the technical irrigation land area of Sigerongan Village. Sigerongan Village, Lingsar District, covers an area of 470 hectares and has a population of 6,198, with a population density of 1,319 people per square kilometer. Most of the residents work in the agricultural sector, either as farmers or livestock breeders, particularly as sharecroppers and farm labourers. This village has agricultural areas consisting of technical irrigated rice fields (225 Ha), semi-technical (32 Ha), and non-technical (10%) (Lingsar District in Figures, 2021).

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To improve the development of farming businesses at the farmer level, Farmer Groups have been formed and one of the farmer groups in Sigerongan village is "Source of Life". This farmer group mostly carries out farming in technically irrigated rice fields with land ownership for farming being classified as very low narrow (5-10 are) per farmer and most farmers are sharecroppers and farm labourers with low levels of farmer income.

The farmers cultivate rice, secondary crops, and vegetables. Vegetable cultivation in Sigerongan Village is still very limited to local varieties commonly grown by local farmers, such as chilies, eggplant, tomatoes, and long beans. Onions have never been planted, despite the fact that shallots are well-suited to growing conditions in Sigerongan, where the soil is loose, the water is sufficient, and the presence of onion pests and diseases is still very low.

On the other hand that effort Farming in Sigerongan Village is carried out very intensively, utilizing technological inputs such as chemical (inorganic) fertilizers, insecticides, and other inorganic materials, such as fungicides and herbicides. There are concerns that this type of farming will leave chemical residues, such as pesticides and chemical fertilizers, in the farming environment, which will disrupt the biological, physical, and chemical balance of the soil and environment. Agro ecosystems that rely on chemicals will cause biotic and abiotic environmental degradation in soil, water and air (Nining et al., 2019).

Possible efforts to cultivate shallots in an environmentally friendly manner include the use of mulch and organic fertilizer. These efforts aim to maintain the quality of shallots and avoid chemical residues, achieving environmentally healthy and energy-efficient farming. Kartinaty et al., 2018; Kasim et al., 2021; Yeshiwas et al., 2023). Organic mulch is a ground cover material derived from plant remains and animal waste which functions to increase soil fertility, protect the soil surface from erosion, soil security, soil structure, and inhibit weed growth (Tandi et al., 2024). The use of organic materials as a nutrient source is growing, in line with increasing consumer demand for organic products and environmental issues such as climate change. The use of organic materials helps plants mitigate and adapt to environmental changes (Murtiningsih et al., 2023). The addition of organic materials (organic soil conditioners) such as manure can improve the physical, biological, and chemical properties of the soil (Sugiono, et al., 2020; Vinolina et al., 2024).

Sigerongan Village, with its "Sumber Hidup" Farmers Group, is a popular local tourist destination, necessitating the development of a farming system that is both economically valuable and environmentally friendly. Shallot farming offers an alternative for developing agrotourism through the use of local resources such as mulch and organic fertilizer.

On community service program which is implemented this approach utilizes local resources such as rice straw mulch, corn straw mulch, cow manure, or goat manure. Utilizing local resources in shallot cultivation is expected to increase productivity on small plots of land while simultaneously providing healthy and environmentally friendly agriculture. Chemical-free shallot cultivation techniques can foster agro tourism in Sigerongan Village. Sigerongan Village, with its "Sumber Hidup" Farmers Group, is a popular local tourist destination, so it is necessary to provide an economically valuable and environmentally friendly farming system. Therefore, this activity is being implemented. What is done is aimed at helping partner farmer groups "Source of Life" in Sigerongan Village to develop ashallot agrotourism based on local resources (mulch and organic fertilizer) to achieve a sustainable agro-ecosystem.

Method

The implementation method that will be applied in this activity is to helping partner farmer groups ""Source of Life" in Sigerongan Village to develop shallot agrotourism on a small plot of land in Sigerongan Village. This implementation method also uses the following achievement indicators:

1. There was an increase in shallot productivity after applying mulch and organic fertilizer in narrow land.
2. There has been an increase in farmers' understanding of red onion agrotourism based on local resources to achieve sustainable agriculture.
3. There has been an increase in understanding among partner farmers to utilize local resources such as mulch and organic fertilizer in shallot cultivation on narrow land.
4. Coordination was carried out to increase the capacity of farmer groups with PPL, Village Heads and other farmer groups.

To ensure the success of this outreach activity, there are several stages of activities that will be carried out, namely:

1. Preparation.
   This preparatory stage is carried out to develop proposals and follow-up plans for activity implementation. The preparatory stages include:
   a. Needs analysis
      Information is collected through observation, interviews, and participation in farmer activities. Data collection includes key issues faced, the state of the farming community, both

in terms of economics and education, as well as their perspectives on new innovations.

b. Analysis of the creation of productive activities
Data collection is carried out simultaneously with activity stage, covering the problem of agricultural resource products (potential, production, etc.) in connection with the creation of productive business activities and the selection of agricultural product technology packages to be developed.

c. Program socialization
This activity is an approach and delivery of program plans to farmer groups regarding the objectives and benefits of the activities, activity plans, program sustainability and its impact on community income levels.

d. Determination of participants
The selected participants are those who process the spirit of being motivators, movers, facilitators, and innovators related to the activity's objectives. The selected participants will consist of: Farmer Group Leaders, farmer group members, and PP (Regional Leadership Team). L, Youth Leader, Female Farmer Leader, Local Entrepreneur and active member of farmer group.

2. Implementation of Activities.
The problem-solving approach involves implementing a sustainable agro-ecosystem through the development of shallot agrotourism through the use of local resources (mulch and organic fertilizer). To increase shallot productivity, the Proposing Team's knowledge and technology are required to be applied through direct training/dissemination and plot demonstrations (action research) for members and administrators of the farmer group. The stages of the activities implemented include:

a. Training
The training method used was adult education (POD) with participatory techniques. Technical training participants included farmer group leaders and members, field extension workers (PPL), youth leaders, women farmers, local entrepreneurs, and active farmer group members. Training activities included material explanations, discussions, and a question and answer session. The training materials were as follows:
- Economic prospects of shallots
- Sustainable management of shallot agro ecosystems
- Cultivation of shallots
- The role of mulch and organic fertilizer for shallot productivity
- Superior varieties and quality red onion seeds
- Harvesting and post-harvesting of shallots
- Production of quality red onion seeds.

b. Demonstration plot (demplot)
The demonstration plot was conducted in the form of action research. The demonstration plot that was conducted was to compare the planting of shallots with local resource-based planting, namely the use of mulch (rice straw) and organic fertilizer (cow manure) and comparing the farmer's method (using plastic mulch and NPK compound fertilizer). Farmers were involved participatively together from planning, implementation and evaluation of harvest results. Superior shallot seeds came from the collection of the UNRAM Legume and Horticulture Genetic Resource Management Research Group.

Demonstration plot arrangement follows the design Randomized Block Design (RBD). The treatments to be tested are:

B0 = shallot cultivation using no mulch and NPK fertilizer

B1 = shallot cultivation using rice straw mulch and cow dung fertilizer

The implementation of the demonstration plot is carried out based on the following stages:

1) Seed preparation. The seed bulbs used must be sufficiently mature, approximately 70-80 days after planting. The shallot seeds used must be those that have been stored for two months, healthy, shiny, and free of decay and skin damage. The seeds used are sized according to the bulb size (small, medium, and large) and the variety used.
2) Land preparation and plotting. The experimental plot was tilled once until smooth and plotted. The plot size was 100 x 80 cm.
3) Organic fertilizer treatment. The manure used is manure that has undergone 2 months of fermentation. The dosage of cow and goat manure used is 10 tons/ha, and is applied 2 weeks before planting. Inorganic fertilization is carried out by providing NPK compound fertilizer (15-15-15) at a dose of 300 kg per hectare. Fertilization is carried out three times: base fertilizer before planting, follow-up fertilizer at 10-15 days and at 30-35 days. Fertilizer is applied by spreading and mixing evenly to the depth of the tillage layer.

4) Mulching treatment. The plastic mulch used is black and silver. The rice or corn straw mulch used is 8 tons per hectare. Mulching is done one week before planting.
5) Planting shallot seeds. Before planting, cut the shallot seeds into 1/3 pieces. The seed bulbs are cut one day before planting. Planting is done with a spacing of 20 cm x 15 cm, with two seed bulbs per hole. The shallot bulbs are placed into the holes previously dug with a dibble. The planting holes are made to the same depth as the bulbs. Each planting hole is sprinkled with Furadan 3G. The bulbs are inserted into the soil like turning a screw.
6) Watering is done according to the age of the plant: 1-10 days old, 2 x/day (morning and evening); 11-35 days old, 1 x/day (morning); 36-50 days old, 1 x/day (morning or evening).
7) Weeding. Weeding is done every 10 days by removing all weeds and weighing the dry biomass of the weeds.
8) Pest and disease control is carried out physically and is not carried out by spraying insecticides and fungicides.
9) Harvest. Harvesting is carried out 70 days after planting orred onion plants after showing signs of 60% of the stem neck being soft, plants falling over and leaves turning yellow.
10) Parameter observation and data analysis. The parameters that will be observed are the number of tubers per cluster, fresh weight of tubers per cluster, diameter of tubers, and dry weight of tubers per cluster.

Result and Discussion

The transformation of agricultural technology results in the use of superior shallot varieties, namely Bali Karet and Super Philip, and the use of local resources such as straw mulch and cow manure. The technological transformation methods developed here include training (extension) and demonstration plots.

Training (counselling) activities

Agricultural training is provided to improve agricultural management knowledge and skills, particularly in utilizing local resources (straw mulch and cow manure) for the development of shallot agrotourism. Furthermore, the training and extension activities also influence the attitudes and motivation of farmers and even practice the knowledge gained in the field to participate in farmer group activities (https://ugm.ac.id/id/berita/8954-pelatihan- grup-tani-penting-untuk-tingkatkan-penerapan-materi-penuruhan/).

Harinta (2011) states that extension is the process of conveying information in a face-to-face setting; one person, through their expertise, helps another overcome the difficulties they face. Therefore, the success of the guidance is largely determined by how the extension is conducted. Extension workers must be able to improve farmers' knowledge and skills in adopting the extension learning process, so that farmers can apply it to the farming systems they develop.

Training is conducted to deliver extension materials relevant to the activity topic. For research results to be successfully adopted, a technology needs to be heard, demonstrated, and implemented. Therefore, the training should be followed up with practical activities in the form of demonstration plots. Training is a form of communication media used to develop information for the dissemination of agricultural research results (Indraningsih, 2011).

Theoretically, agricultural extension is an effort to change the behavior of farmers so that they have broader knowledge, have a progressive attitude to make changes and be innovative towards something new (information) and are skilled at carrying out various activities that are beneficial for increasing agricultural business productivity, income/profits, as well as for the welfare of families and communities (Mardikanto, 1996).

The process of transforming the technology for developing shallot agrotourism based on local resources (rice straw mulch and cow manure) has been carried out by the community service team of the University of Mataram. This community service activity was carried out to improve the knowledge and skills of the farmers who are partners of "Sumber Hidup" in Sigerongan Village. In this activity, the communication technique used by the extension team was direct extension, namely face-to-face communication between the extension workers and farmers. The direct method was used so that farmers heard and provided a direct and quick response to the extension material presented. The extension team delivered the extension material in the experimental demonstration plot. According to Martanegara (1993), the direct method is considered more effective in convincing and familiarizing the relationship between the extension workers and farmers and in speeding up responses or feedback from the target. Figure 1 describes the face-to-face lecture activity between the extension workers and members of the "Sumber Hidup" group.

Figure 1. Farmers are following an explanation about red onion agrotourism towards a sustainable agroecosystem

The results of the community service activities indicate that the extension participants were very responsive to the extension activities. This can be seen from the presence of participants and their involvement during the extension. The attendance of participants was in accordance with the target of 15 people with the composition of participants including members of the "Sumber Hidup" farmer group, Pekasih, community leaders, and women farmers. The extension participants were deliberately selected directly from the farmer group, because they are considered effective in directly implementing shallot agrotourism technology. Judging from the involvement of participants during the extension, it was clear that the participants were very earnest in listening and directly involved in the question and answer session.

This lecture activity has been conducted to teach about the economic prospects of shallots, sustainable management of shallot agro-ecosystems, shallot cultivation, the role of mulch and organic fertilizer for shallot productivity, superior varieties and quality shallot seeds, and shallot harvesting and post-harvest. Farmers were more enthusiastic about practicing by observing the realities in the field, including planting, the growth of two varieties of shallots, the effect of rice straw mulch, and the effect of cow manure on shallot growth. Participatory techniques were primarily used to directly address issues related to shallot cultivation and to engage farmers in collaborative solutions to improve yields (Figure 2).

Figure 2. Observation of the effect of using rice straw mulch and cow manure on the growth of shallots

Business Farming in Sigerongan Village is carried out very intensively, utilizing technological inputs such as chemical (inorganic) fertilizers, insecticides, and other inorganic materials such as fungicides and herbicides. There are concerns that this type of farming will leave chemical residues, such as pesticides and chemical fertilizers, in the farming environment (Nining et al., 2019).

Possible efforts to cultivate shallots in an environmentally friendly manner include the use of rice straw mulch and organic cow manure fertilizer. These efforts aim to maintain the quality of shallots and avoid chemical residues, achieving environmentally healthy and energy-efficient farming (Kartinaty et al., 2018; Kasim et al., 2021; Yeshiwas et al., 2023). Organic mulch is a ground cover material derived from plant remains and animal waste which functions to increase soil fertility, protect the soil surface from erosion, soil security, soil structure, and inhibit weed growth (Tandi et al., 2024).The use of organic materials as a nutrient source is growing, in line with increasing consumer demand for organic products and environmental issues such as climate change. The use of organic materials helps plants mitigate and adapt to environmental changes (Murtiningsih et al., 2023).

Plot Demonstration

The knowledge and technology produced by researchers needs to be transferred to farmers. Farmers' access to information on technological innovation is relatively limited, so socialization and understanding are necessary. Understanding a technological innovation necessarily goes through a mental process, from the individual farmer to the decision to adopt it (Mardikanto, 1993).

Adoption of shallot agro tourism based on local resources (rice straw mulch and cow manure) It's not enough to just lecture or discuss, but rather to practice directly through demonstration plots (demplots). Demonstration plots are a form of extension media that involves direct practice in the field, comparing farmer methods and the use of mulch and cow manure for the development of shallot agrotourism.

The demonstration plot that has been carried out is the development of shallot agrotourism based on local resources (the use of rice straw mulch and cow manure). The demonstration plot is a field extension method to demonstrate/prove in real terms the methods and/or results of applying agricultural technology that has been proven to be profitable for farmers. The adoption of this technology is expected to result in behavioral changes in the form of knowledge, attitudes, and skills of farmers after receiving the "innovation" conveyed by the Extension Team to partner farmers of the "Sumber Hidup" Farmer Group. Acceptance of innovation here

means not just "knowing" but actually being able to implement or apply it correctly and internalizing it.

In this activity, after the theoretical explanation, the demonstration plot was explained. This explanation then covered planting shallots using straw mulch and cow manure, including soil preparation, plot creation, spacing, planting, weeding, irrigation, and harvesting (Figure 3).

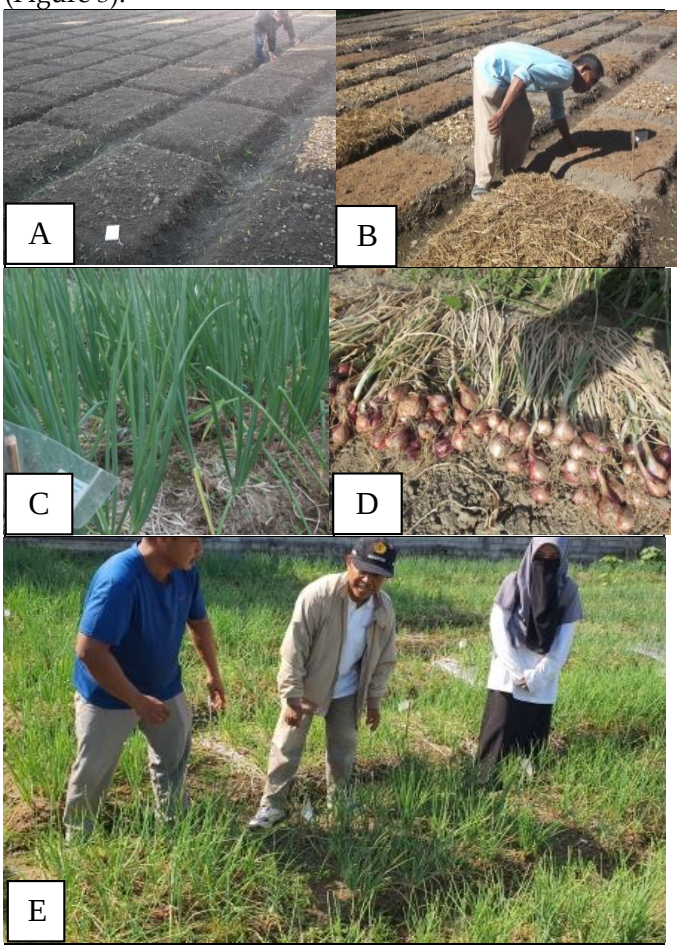

Figure 3. Demonstration plot activities from (A) making experimental plots, (B) use of straw mulch and cow manure, (C) growth of shallots, (D) shallot harvest results, and (E) observation of plant growth with the Head of the Farmer Group

In this demonstration plot activity, the team conducted an experiment by comparing the planting of shallots using rice straw and cow manure compared to the planting of shallots using chemical fertilizers, without mulch and without fertilizer.

During harvest, several parameters were also observed, such as the dry weight of tubers per plot, the number of tubers per clump, and tuber diameter. The results of the demonstration plot testing can be seen in Table 1.

Table 1. Dry weight of tubers per plot (0.8 m2), number of tubers per cluster and tuber diameter

Treatment & Varieties	Dry weight of tubers Per plot (g)	Number of tubers per clump	Tuber diameter (mm)
Straw mulch and cow manure			
Bali Rubber	617.6 b 1)	5.3 b 1)	20.9 a 1)
Super Philip	421.1 c	7.7 a	19.6 a
Without mulch and NPK fertilizer			
Bali Rubber	1058.0 a	4.6 b	14.2 b
Super Philip	424.2 c	7.7 a	18.6 a

1)Note: Numbers followed by the same letter in the same column are not significantly different in the 5% Duncan test.

Table 1 shows that the use of NPK fertilizer is still higher than the use of cow manure in Bali Karet, but the use of straw mulch and cow manure tends to produce a larger diameter of shallot bulbs compared to the use of NPK fertilizer and without mulch.

This chemical-free shallot cultivation technique is being developed as a promotional tool for agrotourism in Sigerongan village. Sigerongan Village, with its "Sumber Hidup" Farmers Group, is a popular destination for local tourism, necessitating the development of an economically and environmentally friendly farming system. Members of the Mataram Bada Family Association (IKABAMA) conducted the visit, promoting traditional Dompu clothing, "rimpu" and "saremba."

Figure 4. Socialization of shallot agrotourism to mothers of the Bada Mataram Family Association (IKABAMA)

Conclusion

1. The development of shallot agrotourism based on local resources has been carried out by the "Sumber Hidup" farmer group in Sigerongan Village. Partner farmers have been very responsive to the community service activities.
2. A technological transformation process involving the use of rice straw mulch and cow manure for shallot cultivation has been implemented. Partner farmers are expected to experience behavioral changes in

knowledge, skills, and attitudes to develop shallot agro tourism.
3. This chemical-free shallot cultivation technique has the potential to promote agro tourism in Sigerongan Village.

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