Indonesian Journal of Community Engagement
Jurnal Pengabdian kepada Masyarakat
Vol. 10, No. 4, December 2024, Page. 210-214
DOI: http://doi.org/10.22146/jpkm.90339

# Diversification of Home Garden with Avocado Trees Planting in The Karst Area of Karangasem Village, Paliyan District, Gunungkidul Regency

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Submitted: November 02nd 2023; Revised: September 26th 2024; Accepted: November 01st 2024

**Keywords:**
Avocado
Diversification
Gunungkidul
Home garden
Karst

**Abstract** Home garden productivity can be enhanced by managing plant diversity, optimizing stand arrangements, and selecting species suited to local land conditions. Avocado trees, in particular, have strong potential to thrive in the karst regions of Karangasem Village, Paliyan, Gunungkidul. Some trees planted spottily by local people in their home garden have been able to bear fruit. The avocado trees have also been grown intensively in the Semanu District, adjacent to Paliyan District. These factors indicate that avocado trees are well-adapted to the local area. To promote optimal growth, stand management should incorporate appropriate silvicultural practices. The objective of this community service program was to increase the tree species diversification of home gardens in Karangasem Village by planting avocado trees by assisting the Forest Farmer Group of Lestari Mulyo, as a potential driving group to the community. In the future, local communities can hopefully establish avocados as a new commodity to help boost household incomes.

## 1. INTRODUCTION

Avocado (*Persea americana* Mill.) is a potential crop commodity and has a very high economic value (Shubhi et al., 2024). The demand for avocados is increasing both for the domestic and the export markets (Helyanda et al., 2020; Shubhi et al., 2024). The Special Region of Yogyakarta Province has the number of trees that produce avocados as many as 30,610 trees in 2019 and increased to 110,758 trees in 2023 (Kementerian Pertanian, 2024). Based on field observations in the Karangasem region, the avocado trees are relatively adaptive to growing in this region. This species can potentially be developed as a new commodity to increase the community's income in addition to the existing commodities (corn, cassava, and peanuts). The avocado trees in this area can be developed by diversifying plant species grown in the home garden, especially the less productive ones.

The high demand for avocados in Yogyakarta City, Sleman Regency, and surrounding areas necessitates a steady, large-scale supply to meet the needs of restaurants, cafes, hotels, supermarkets, and households. With a sizable land area of 12.86 km² (BKSDA Yogyakarta, 2018), Karangasem Village has strong potential to be developed as a key supplier of fruit commodities, such as avocados, to tap into these market opportunities. As a major tourist destination, attracting both domestic and international visitors, the hospitality industry, including hotels and restaurants, often incorporates avocados into their menus to cater to diverse tastes and dietary preferences. The avocado market in Yogyakarta also presents several promising opportunities since the growing demand on avocado by the consumers becoming more health-conscious are growing. This initiative can begin with an avocado planting movement that employs appropriate silvicultural practices. Observations in Karangasem and nearby areas,

ISSN 2460-9447 (print), ISSN 2541-5883 (online)
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such as Semanu District, indicate that avocado trees are well-suited to grow and thrive in karst environments.

A set of sustainable activities is needed for the implementation of the program, namely variety selection, evaluation of stand conditions in the home garden, determination of appropriate planting points, planting activities, and maintenance and monitoring of plant growth. With this approach, the community in Karangasem Village can produce new commodity products resulting from the diversification of tree species in the home gardens, especially those that are less productive with a community-based planting movement. For this reason, the pattern of stand management in the garden area needs to be considered through the application of appropriate silvicultural approaches.

For the implementation of this planting program, assisting a local farmer group is needed through the Forest Farmer Group of Lestari Mulyo. The Lestari Mulyo is a forest farmer group whose members consist of women from Karangasem Village, Paliyan District, Gunungkidul Regency, Special Province of Yogyakarta. In the community, the members of Lestari Mulyo actively involved in local activities such as maternal and child health center (Posyandu), micro, small, and medium enterprises (UMKM), family welfare and empowerment ('PKK'), Qur'an recitation and other community gatherings. The intensity of this media of communication has the potential to support the movement of the implemented program. The skills possessed and enthusiasm of the group members can be developed such as plant propagation and differentiated products of avocado as raw materials which can be an opportunity for new business commodities in the future. This new business opportunity can absorb labor and increase local people's income. It is hoped that the Lestari Mulyo can play a strategic role in driving the economy of the people of Karangasem Village and the surrounding areas.

The assistance to the Lestari Mulyo is important to do with some considerations as follows: (1) the Lestari Mulyo already have skills from previous activities such as training experiences in procuring seedlings and planting forest tree species (*Acacia auriculiformis*, *Falcataria moluccana* etc.), (2) most members of the Lestari Mulyo are actively involved in village activities. The intensity of these meetings and communications can be useful in supporting the distribution of information continuously during the implementation of the program.

The condition of the land of Karangasem village is mostly covered by karst rocky, hilly areas, which are part of the Sewu Mountain range in the south-central part of Java Island. The main products of agriculture are corn, cassava, soybeans, peanuts, and others (BKSDA Yogyakarta, 2018). In the home garden, the community has planted tayuman (*Bauhinia purpurea*), gamal (*G. sepium*), lamtoro (*Leucena leucochepala*), mango (*Mangifera indica*), guava (*Psidium guajava*), bamboo (*Bambusa* sp.) and banana (*Musa paradisiac*a), jackfruit (*Arthocarpus integra*) with a combination of plant species that vary for each resident's home garden. However, the plant species arrangement has so far not been managed optimally.

The initial discussion with the Lestari Mulyo group identified several priority issues within the program area: (1) members of the Lestari Mulyo group lack skills in applying silvicultural techniques for effective home-garden management, (2) assistance is needed with administrative tasks and post-harvest management of avocado cultivation, (3) the area in Karangasem Village and its surroundings is predominantly hilly, rocky, and has shallow soil, with existing home gardens that are not fully optimized, (4) limited diversification of tree species in home gardens restricts income generation, particularly from sustainable sources such as fruit commodities, (5) job opportunities for the working-age population are limited, (6) economic drivers at the community level remain underdeveloped, and (7) there is a need for tree species that can serve as alternative livestock fodder, as more than 70% of the community raises animals, including goats (1,038 head), sheep (57 head), cattle, chickens, and ducks (BPS, 2022). Fodder becomes scarce during the dry season, making the introduction of evergreen species essential. Avocado leaves show promise as a fodder source (Pazla et al., 2022) and are also valued in traditional medicine for their active compounds, such as flavonoids and quercetin (Anggorowati et al., 2016). The peels and seeds can also be used for fodder mixtures (Sagaf et al., 2022).

The objective of this program was to increase the diversification of home gardens in Karangasem Village, Paliyan District, Gunungkidul Regency through planting avocado trees which were mobilized by the Farmer Forest Group of Lestari Mulyo.

## 2. METHOD

The program was conducted in Karangasem Village, Paliyan District, Gunungkidul Regency, Special Region of Yogyakarta, over a period of 6 months (October 2022 to April 2023). The UGM Team assisted the Lestari Mulyo Forest Farmer Group in mobilizing the community to plant avocado trees. The program was implemented in several stages: (1) program communication, (2) a survey of community home gardens and determination of planting feasibility points, (3) training on seedling procurement, planting, plant maintenance, and a comparative study, (4) distribution of seedlings and planting activities, (5) training on plant monitoring and maintenance, and (6) monitoring and data collection.

## 3. RESULT AND DISCUSSION

### *3.1 Program communication*

Consolidation of activities was carried out by the UGM Team together with the Lestari Mulyo and The Karangasem Village's officials with representatives of village elders before communicating the program. The information session was carried out by UGM Team together with the Lestari Mulyo by involving participation from member representatives of the Farmer Groups in Karangasem

Village (the Ngudi Makmur, the Ngudi Boga, the Ngudi Barokah). The purpose of this meeting was to inform the program including an explanation of land survey plans, data collection for planting preferences by the community, distribution of seedlings, planting assistance, training and comparative studies, plant maintenance, and monitoring. The information session was held on October 29, 2022, and was attended by representatives of the farmer groups (20 participants), UGM Team (4 participants), and students (4 participants).

### 3.2 A survey of community home garden land and determination of feasibility of planting points

The surveys were conducted in the Hamlets of Namberan, Banjaran, and Trowono A/B in Karangasem Village. Neighboring villages located surrounding the Karangasem were also surveyed as those communities proposed to the Team that their home gardens also to be planted. The determination of planting points was carried out by directly visiting residents' home gardens, meeting with landowners, discussing planting plans, confirming planting preferences, and determining the appropriate number of seedlings to plant, based on land conditions. This activity was implemented by Lestari Mulyo in collaboration with the UGM Team and involved the Ngudi Boga, Ngudi Makmur, and Ngudi Barokah groups. This approach aimed to facilitate the data collection process for residents interested in or willing to plant avocados in their home gardens. A total of 426 planting points were determined based on the survey. However, 20 planting points were removed by the owners for erecting livestock sheds and other purposes. The number of 406 planting points spread out in the Hamlet of Namberan 264, Banjaran 100, Trowono 8 and others 34 (surrounding areas of Karangasem Village). These were appropriate and have the potential for planting avocados. The land survey was carried out on October 30, November 2, 5, 6, 2022.

### 3.3 Training on seedling procurement, planting, plant maintenance, and comparative study

The seed procurement training aimed to enhance the skills of farmer groups in sourcing avocado seeds, enabling them to independently procure seeds in the future. The training was attended by the Lestari Mulyo group, along with other farmer groups from Karangasem Village and surrounding areas, including Ngudi Makmur, Ngudi Boga, Ngudi Barokah (Karangasem, Paliyan District), Ngudi Makmur (Bendungan, Karangmojo District), Bentolo (Bleberan, Playen District), Tunas Lestari, Mekarsari (Dondong), and Buluredjo (Mongol), Saptosari District (Figure 1). Through this training, the farmer groups learned to propagate plants vegetatively using avocado shoot cuttings. A total of 122 plants were propagated during the training, with 68% (83 plants) surviving as plant reserves. A visit to an avocado plantation in Semanu District, Gunungkidul, was organized to provide the farmer groups with insights into managing avocado trees that were beginning their productive period, specifically trees aged 3-4 years from vegetative propagation of several avocado cultivars. During the visit, topics discussed included planting techniques, the introduction of different avocado cultivars, strategies for managing land inundation during the rainy season, controlling aphid pest infestations, and managing flowering and fruiting. The training and comparative study were conducted on December 3, 2022, with 32 participants in attendance.

Figure 1 . Training on vegetative propagation in Namberan Hamlet, Karangasem, Paliyan and visiting an avocado plantation in Semanu District, Gunungkidul Regency

### 3.4 Distribution of seedlings and planting activities

The distribution of avocado seedlings was carried out by visiting each home garden and meeting with the landowners who had registered their planting preferences based on the survey results (Figure 2). The planting was done using ready-to-plant seedlings obtained through both vegetative (grafting) and generative propagation. This activity was implemented by Lestari Mulyo with the participation of Ngudi Boga and Ngudi Barokah groups. During the process, several issues were noted, including planting delays and cancellations by some landowners. The delays were caused by landowners not being at home, prompting rescheduling to another day with confirmation from Lestari Mulyo. Planting cancellations occurred on the scheduled planting day due to changes in landowners' planting preferences.

Figure 2 . Distribution of avocado seedlings

Planting activities were carried out in Namberan, Banjaran, and Trowono Hamlets. Given the interest

from residents of neighboring villages, some seedlings were distributed and planted outside the target area, beyond Karangasem Village. In total, 406 avocado seedlings were distributed and planted in Karangasem Village and the surrounding areas. Of these, 268 seedlings were sourced from vegetative propagation, and 136 from generative propagation. Each seedling was labeled with the landowner's name, neighborhood unit, hamlet, and avocado cultivar.

### 3.5 Training on plant monitoring and maintenance

Training on plant monitoring and maintenance was held on March 19, 2023, with 25 participants from the Lestari Mulyo group, Ngudi Makmur, Ngudi Boga, Ngudi Barokah, and farmer groups from neighboring villages. During the training, participants learned how to properly maintain and monitor the growth of avocado seedlings, both in the nursery and once planted in home gardens.

### 3.6 Monitoring and data collection

Monitoring was conducted at each planting point in Namberan, Banjaran, and Trowono Hamlets by the UGM Team and Lestari Mulyo, with assistance from Ngudi Boga, Ngudi Makmur, and Ngudi Barokah. The team collected data on plant growth conditions, including pest and disease occurrences. These activities took place on February 5, 6, 7, 11, 18, and 26, 2023. The results revealed no dead plants. Issues identified included three plants with leaves eaten by goats, though these plants remained healthy, and new leaves had begun to grow. This issue was reported by a landowner in Neighborhood Unit 1, Namberan Hamlet, and fencing was installed as a precaution against future damage. Another problem involved a plant with withered leaves due to its proximity to a water sewage path. To address this, the plant was relocated and replanted. Additionally, maintenance was carried out on the 86 seedlings raised in the nursery from previous training. The activity was conducted by Lestari Mulyo with the participation of Ngudi Boga in Namberan Hamlet.

The total number of 406 plants grown by 128 landowners has been monitored.

### 3.7 Discussion

Community preferences played a key role in the implementation of the avocado planting program aimed at diversifying and increasing the productivity of home gardens in Karangasem Village. Several issues were identified in the management of stands, including the misconception that planting more trees would automatically result in higher fruit yields. To address this, it was essential to provide clear understanding through both oral communication and hands-on implementation in the field. One effective approach was through training sessions and comparative studies. These activities helped participants realize that optimal fruit plant growth requires careful consideration of factors such as planting spacing, proper hole preparation, fertilization, and managing the development of plant crowns for adequate sunlight exposure. Additionally, selecting the right avocado cultivars was emphasized. As a result of this program, the community has become more mindful of the importance of proper tree species selection and stand management, recognizing their potential to increase productivity. The number of seedlings planted in the home garden was adjusted to the preferences of landowners, the availability of land, and the condition of existing stands. The target farmer group, Lestari Mulyo, played a crucial role throughout the program implementation, acting as a mediator between the UGM Team and landowners. They facilitated the process from determining planting points to distributing seedlings, planting, maintaining plants, and addressing issues that arose during the program. Therefore, continued assistance for the farmer group is essential until the avocado fruits are ready for harvest, including post-harvest management.

The avocado seedlings planted were sourced from both vegetative and generative propagation. This approach was intended to enable the community to propagate avocado plants independently by grafting scions from vegetatively propagated seedlings onto seedlings grown from seeds. The vegetative seedlings were propagated using selected improved cultivars to ensure better quality and yield.

The compilation of creativity derived from the knowledge of landowners during the process of planting and maintaining avocado plants can also be a source of inspiration for other landowners. For this reason, the creation of role models is needed to support the success of the program. Related to this, giving appreciation to the role models is needed to spur more enthusiasm for them and benefit other landowners.

Most people in the Karangasem Village raise livestock (>70%). The use of organic fertilizers available in the local area can be managed more intensively for fertilizing avocado plants. Likewise, it can also be a consideration in producing organic avocado products in the future. This approach is needed to produce fruit commodities with higher economic value during the post-harvest.

Due to the high interest of people from neighboring villages in planting avocados, the procurement of seedlings from farmer groups can be developed for the next pilot model. The need for training in post-harvest fruit management and product diversification with avocado base ingredients is also needed further. This is to anticipate the harvesting of abundant amounts of fruit at the same time so that with the diversification of these products there are options for the community in the use of post-harvest fruit, in addition to the option of distributing the harvest in the form of fresh fruit managed by farmer groups. With this strategy, people have choices according to their individual preferences. In addition, the potential for animal feed development by utilizing avocado leaves, especially to overcome animal feed problems during the dry season needs to be studied further.

## 4. CONCLUSION

A total of 406 avocado seedlings were planted, consisting of 268 seedlings from vegetative propagation and 138

from generative propagation. The planting was carried out with the assistance of the Lestari Mulyo Forest Farmer Group, along with the participation of other farmer groups. The determination of planting feasibility was based not only on the growing space conditions but also on the preferences and agreements made with landowners, in collaboration with the Lestari Mulyo and the UGM Team. Trainings were held for the farmer groups on avocado seedling procurement through grafting, planting, plant maintenance, and monitoring. A comparative study was conducted through a visit to an avocado plantation in Semanu District, Gunungkidul, to provide insights into avocado plant management and the growth stages of avocado plants in home gardens. Monitoring of avocado plant growth has been carried out, with minor issues identified. Ongoing plant maintenance and monitoring will be necessary, including post-harvest management. The abundance of manure could also be integrated with organic avocado production in the future. Additionally, the potential use of avocado leaves as alternative fodder, particularly during the dry season, could be explored.

## ACKNOWLEDGMENT

We would like to thank the Head of Karangasem Village together with the community for supporting the implementation of this program. We would also like to thank the Forest Farmer Group of Lestari Mulyo and the participation of the Farmer groups of the Ngudi Makmur, the Ngudi Boga, and the Ngudi Barokah for all the efforts that have been made during the implementation process of this program. This Community Service Program was funded by the Public Service Agency, Environmental Fund Management Agency (BPDLH), Directorate General of Treasury, Ministry of Finance of the Republic of Indonesia, and the Ford Foundation, through The Community Resilience and Welfare (Dana TERRA) Project.

## CONFLICT OF INTERESTS

The authors declare there is no conflict of interest.

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