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In Review: The Effect of Yard Size on Farmers' Household Productivity

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ABSTRACT

Food issues are crucial today, with the focus on food security, self-sufficiency, and food safety. Food production is often limited by our ability to increase production. One aspect of maximizing food production is land. Land is a significant determinant of sustainable food production. This study aims to analyze land production factors, including land area, which in turn determines consistent and sustainable food production. Traditionally, food management is carried out by farmers, referred to in this analysis as farming households. Current food productivity by farmers can be considered commercial or subsistence. The current increase in local food demand is determined by the stability of local food production. Consistent food production naturally impacts current food prices. Food produced by farming households on large or small plots of land is also influenced by many factors. The dynamic nature of local food production discussed in this study focuses more on the influence of land area on local food production. The increasing demand for local food is a crucial factor in increasing local food production, making farming households a crucial agent in increasing food production to meet community needs

INTRODUCTION

Home gardens are a form of household farming system with unique characteristics because they are located around the residence and are managed directly by members of the farming household. In modern agroecology literature, a home garden is understood not simply as an open space around the house, but rather as a micro-scale agroecological system that integrates biotic and abiotic components in a complex and dynamic manner (Hansen et al., 2023). This system combines various types of food crops, fruit trees, medicinal plants, ornamental plants, and in some cases, small livestock, which are managed to meet the household's consumption, economic, and social needs.

Conceptually, home gardens serve functions beyond mere food production. Ogutu et al. (2023) emphasize that home gardens are part of a household livelihood strategy that plays a role in improving food security, income, and nutritional quality. The presence of home gardens allows farming households direct access to fresh food, reduces dependence on markets, and mitigates the risk of price fluctuations and food supply disruptions, especially for small-scale and vulnerable households.

Within an agroecological framework, yards are characterized by species diversity and a multi-stratified structure. Annual crops such as vegetables are often planted alongside perennial crops such as fruit trees, creating a vegetation layer that resembles a natural ecosystem. This structure allows for more efficient utilization of light, water, and nutrients and increases the stability of the production system (Shrestha et al., 2025). This diversity also contributes to natural pest and disease control, reduces dependence on chemical inputs, and supports the principles of agroecological sustainability.

Yards, as household agroecological systems, also function as providers of ecosystem services. Hansen et al. (2023) showed that yards contribute to local biodiversity conservation, microclimate improvement, and organic material recycling through the use of household waste as compost. These ecosystem services not only support sustainable production but also improve the quality of the residential environment and household health.

In the context of developing countries, yards often play a strategic role in supporting food security and sustainable development agendas. Shrestha et al. (2025) noted that yard development has proven effective in increasing household food availability, especially in rural areas with limited access to large-scale agricultural land. Therefore, yard development is a form of household adaptation to structural pressures such as land constraints, climate change, and economic instability.

In Indonesia, the concept of the yard has strong social and cultural dimensions. The yard is not only interpreted as a production space, but also as a social space that reflects the values, customs, and structure of household life. Adityo & Shibata (2025) explain that traditional yards in rural Indonesia developed as part of the home's spatial layout, integrated with domestic and social activities. Therefore, their management is strongly influenced by household dynamics and socioeconomic changes. Transformations in the yard's structure due to modernization and changes in land use can impact its productive and ecological functions.

From a household economic perspective, the yard serves as an important economic buffer. Food production from the yard can reduce household expenditures on food purchases while providing a surplus that can be sold to supplement income. Ogutu et al. (2023) show that households with actively managed yards tend to have higher levels of food consumption diversity and higher incomes than households that do not utilize their yards optimally.

The yard also has important relevance in the context of gender and the roles of household members. Several studies have shown that home gardens are often dominated by women, making them a strategic space for women's empowerment and strengthening their role in decision-making regarding family food and nutrition (Hansen et al., 2023). Thus, home gardens impact not only production but also the social dynamics of farming households.

In contemporary agroecological studies, home gardens are viewed as living laboratories for sustainable small-scale agricultural practices. (Baliki et al., 2022) show that home gardens-based interventions, such as crop management training and commodity diversification, can have positive, lasting impacts on household production and food security over the medium to long term. These findings reinforce the home gardens' position as adaptive systems with the potential to be developed through approaches based on local knowledge and science.

Thus, the home garden, as a household agroecological system, can be defined as an integrated production unit that combines ecological, economic, and social functions at a micro-scale. The successful utilization of the home garden is largely determined by the physical characteristics of the land, including the area of the yard, as well as by human factors such as knowledge, labor, and input management. A comprehensive understanding of the concept of the home garden as an agroecological system provides an essential foundation for analyzing the influence of yard size on the productivity of farming households.

METHODS

Problem Solving Methods

RESULTS AND DISCUSSION

Farming Household Productivity

Farming household productivity is a central concept in the study of agricultural economics and agroecology because it reflects the household's ability to manage its resources to produce outputs that are valuable for their well-being. In the context of small-scale farming, productivity cannot be understood narrowly as yield per unit area, but rather as the aggregate achievement of the household production process, encompassing biophysical, economic, and consumption dimensions (Ogutu et al., 2023). This multidimensional approach is important because farming households generally implement production strategies integrated with their daily consumption and livelihood needs.

Conceptually, farm household productivity refers to the level of efficiency and effectiveness of resource utilization, such as land, labor, capital, and knowledge, in producing agricultural output that contributes to household income, food security, and quality of life (Msengana et al., 2025). At the household level, productivity is often contextual and influenced by socioeconomic conditions, the environment, and access to production resources.

In studies of home gardens and household agriculture, productivity is generally divided into several main dimensions. Biophysical productivity refers to the quantity and continuity of production, such as the number of harvests, the frequency of harvests, and the sustainability of food supply over time (Shrestha et al., 2025). This dimension is directly related to the system's production capacity and is strongly influenced by physical factors of the land, climate, and cultivation practices. The use of organic fertilizers in land management systems can also increase land productivity, enabling sustainable production (Aprisal et al., 2024).

Furthermore, economic productivity describes the economic value of production, both in the form of cash income from sales and savings from household expenses through self-consumption (subsistence value). Ogutu et al. (2023) showed that actively managed home gardens and agricultural enterprises can contribute significantly to household income, although this contribution is often supplementary. However, for low-income households, this additional contribution can have a significant impact on economic stability and the ability to meet basic needs.

Furthermore, consumption productivity and nutrition are important dimensions in assessing the productivity of farming households. Food production from one's own land, including home gardens, contributes to increased food availability and household consumption diversity, which in turn impacts the nutritional status of family members (Shrestha et al., 2025). Several studies have shown that households that actively produce their own food tend to have higher dietary diversity scores than

households that rely entirely on markets (Ogutu et al., 2023).

From a household economics perspective, productivity is also closely related to the concept of efficient resource allocation. Small-scale farming households often face limitations in land, capital, and labor, so their production strategies are geared toward maximizing the benefits of available resources (Baliki et al., 2022). Therefore, productivity is determined not only by the amount of inputs, but also by the household's ability to combine these inputs efficiently and adaptively to local conditions.

Farming household productivity is also significantly influenced by production diversification. Diversification allows households to reduce the risk of crop failure and income fluctuations, while increasing the stability of food consumption throughout the year (Adeosun et al., 2025). In the homestead context, diversification is often achieved by planting various types of food crops, vegetables, fruits, and medicinal plants on a single plot of land, so that output is not dependent on a single commodity.

In addition to internal production factors, household farming productivity is also influenced by external and structural factors, such as access to water, information, technology, and markets. Hansen et al. (2023) emphasized that limited access to water and technical knowledge are major obstacles to increasing the productivity of home gardens and household farming in many rural areas. Training and mentoring-based interventions have been shown to increase household capacity to manage their production systems more productively and sustainably (Baliki et al., 2022).

In the context of sustainable agricultural development, household farming productivity is also understood as an indicator of well-being and livelihood resilience. Stable and sustainable productivity reflects a household's ability to meet food needs, maintain income, and adapt to external pressures such as climate change and economic uncertainty (Msengana et al., 2025). Therefore, increasing household farming productivity is often a primary objective in various agricultural development and food security programs.

Therefore, household farming productivity in this study is positioned as a multidimensional concept that reflects the results of integrated household resource utilization. Productivity is measured not only by the volume of production, but also by its economic value, contribution to consumption and nutrition, and household livelihood stability. This conceptual understanding provides an important foundation for analyzing the influence of yard size on household productivity, as land area is a key factor determining production capacity and diversification opportunities within household farming systems.

Yard Size as a Production Resource

Yard size is a key production resource in household farming systems, particularly in the context of small-scale farmers who have limited access to large agricultural land. In agricultural economics and agroecology, land size is viewed as an endowment factor that determines production capacity, the level of diversification, and opportunities for improving household welfare (Ogutu et al., 2023). Therefore, understanding yard size as a production resource is fundamental to analyzing household productivity.

Theoretically, land is a primary production factor that serves as the physical space for crop cultivation activities and the integration of other production components. At the yard scale, land size determines the number and types of commodities that can be cultivated, the cropping patterns that can be implemented, and the intensity of space utilization (Hansen et al., 2023). The larger the yard size a household has, the greater the potential to increase production output, both in terms of yield quantity and the diversity of commodities produced.

From an agroecological perspective, yard size is closely related to the ecological capacity of the system. Larger yards allow for the formation of more complex, multi-layered vegetation structures, resembling natural ecosystems, resulting in more efficient utilization of light, water, and nutrients (Shrestha et al., 2025). This structure not only

supports increased production but also enhances system stability by reducing the risk of pest and disease attacks and increasing resilience to environmental disturbances.

Yard size also determines opportunities for production diversification, an important strategy in household agriculture. Ogutu et al. (2023) showed that households with relatively larger yards tend to grow more types of food crops, vegetables, and fruits, thus providing a more diverse and stable food source throughout the year. This diversification serves as a risk mitigation mechanism, particularly in conditions of climate uncertainty and fluctuating food prices.

However, the relationship between land area and productivity is not always linear. Several studies emphasize that increasing land area does not automatically lead to increased productivity per unit area, especially if it is not accompanied by adequate labor, capital, and technical knowledge (Hansen et al., 2023). In the context of home gardens, limited household labor is often a major obstacle to optimally managing larger plots of land.

From a household economic perspective, home garden size influences production scale and opportunities for commercialization. Sufficiently large home gardens allow households to generate surplus production beyond their own consumption needs, thus opening up opportunities for selling produce and increasing cash income (Msengana et al., 2025). Conversely, very small home gardens tend to be focused on meeting daily consumption needs and have limited opportunities to generate economic surplus.

Home garden size is also related to the efficiency of input use. Larger home gardens provide flexibility in arranging planting areas, such as separating production zones, nursery areas, and processing organic matter. This allows for more planned and efficient cultivation practices, including crop rotation and sustainable soil fertility management (Baliki et al., 2022). In the long term, this efficiency contributes to increased overall system productivity.

In developing countries, home gardens are often the only relatively secure land resource that can be directly controlled by households. Shrestha et al. (2025) emphasize that in areas with high land ownership pressure, yards serve as the "last straw" available for household use for food production. Therefore, yard size has strategic implications for household food security and crisis adaptation.

In Indonesia, yard size varies greatly across regions and is influenced by cultural factors, population density, and land use dynamics. Adityo & Shibata (2025) show that changes in yard structure and size due to modernization and changes in rural spatial planning can reduce the production capacity and ecological function of yards. This situation emphasizes the importance of considering yard size as a key variable in analyzing household farm productivity.

In addition to absolute area, the proportion of yard utilization is also an important aspect in assessing its role as a production resource. Large yards that are not optimally utilized can result in lower productivity than smaller yards that are intensively managed. Hansen et al. (2023) emphasized that management intensity, access to water, and technical knowledge are often determining factors in the success of yard utilization.

Within the framework of production theory, yard size can be positioned as a quasi-fixed input in the short term, but it can influence household decisions in allocating other inputs such as labor and capital. Households with large yards tend to allocate more time and resources to cultivation activities, especially when they perceive the potential economic and food benefits that can be obtained (Ogutu et al., 2023).

Thus, yard size as a production resource not only serves as a physical space for cultivation activities but also as a factor shaping the production, diversification, and livelihood strategies of farming households. Yard size influences production capacity, opportunities for income generation, and contributes to food security and household welfare. A comprehensive understanding of the role of yard size is an important basis for analyzing its influence

on the productivity of farming households, especially in the context of agroecological-based household farming systems.

The Relationship Between Yard Size and Farmer Household Productivity

The relationship between yard size and farm household productivity is a crucial issue in the study of small-scale agriculture and agroecology, particularly in the context of farm households facing limited access to large agricultural land. In agricultural economic theory, land is positioned as the primary production factor determining output capacity and opportunities for farm diversification, including in yard-based household farming systems (Ogutu et al., 2023). Therefore, yard size plays a strategic role in shaping farm household productivity levels, from biophysical, economic, and food consumption perspectives.

Conceptually, yard size influences household productivity through mechanisms that increase production capacity. Larger yards provide more space for growing various crops, adjusting cropping patterns, and integrating other production components such as small livestock and organic material processing. Hansen et al. (2023) emphasize that the availability of physical space is a crucial prerequisite for implementing more complex and productive agroecological systems at the household scale. By increasing the size of their home gardens, households have a greater opportunity to increase production volume and ensure a sustainable food supply.

The relationship between land area and productivity can also be explained through the scale effect. Within the framework of production theory, increasing land area allows households to achieve a larger scale of production, thus increasing total output, although productivity per unit area may not necessarily increase proportionally (Ogutu et al., 2023). In home gardens, this scale effect is evident in the increased number of plants and the area of cultivated land, which ultimately increases total household production.

In addition to the scale effect, home gardens are also associated with production diversification, a key factor in increasing household productivity. Diversification allows households to grow a variety of food crops, vegetables, and fruits with different harvest cycles, resulting in a more stable food supply throughout the year. Ogutu et al. (2023) showed that households with larger home gardens tend to have higher levels of diversification, which positively impacts household income and food security. This diversification also serves as a risk mitigation strategy against crop failure and commodity price fluctuations.

From an agroecological perspective, yard size influences the structure and complexity of production systems. Larger yards allow for the formation of a more complete, multi-strata vegetation structure, resembling a natural ecosystem. This structure increases the efficiency of light, water, and nutrient utilization, and supports beneficial ecological interactions such as natural pest control and increased soil fertility (Shrestha et al., 2025). Thus, yard size influences not only production quantity but also the quality and sustainability of household production systems.

However, the relationship between yard size and household productivity is not always linear and positive. Several studies have shown diminishing returns to increasing land area if not accompanied by increases in other inputs such as labor, capital, and technical knowledge (Hansen et al., 2023). Under these conditions, larger yards have the potential to be managed suboptimally, resulting in decreased productivity per unit area and limited contribution to household welfare.

Limited household labor is a key factor moderating the relationship between yard size and productivity. Small-scale farming households generally rely on family labor, so their ability to manage their home gardens is heavily influenced by the number of household members and the allocation of work time. Hansen et al. (2023) emphasized that increasing land area without adequate labor support can reduce management intensity and negatively impact productivity.

In addition to labor, access to water and production inputs also influences the strength of the relationship between home garden area and productivity. Larger home gardens require a larger water supply and more intensive input management for optimal production. Baliki et al. (2022) demonstrated that training and mentoring-based interventions that improve household input management capacity can strengthen the positive impact of land area on household productivity and food security. These findings indicate that home garden area only provides maximum benefits when supported by adequate supporting factors.

Factors Influencing Yard Productivity

Yard productivity as part of a household agricultural system is not determined by a single factor, but rather the result of a complex interaction between biophysical, socioeconomic, and institutional factors. In agroecological and household economic studies, yards are viewed as micro-scale production systems that are highly sensitive to variations in resources and household management capacity (Hansen et al., 2023). Therefore, understanding the factors influencing yard productivity is crucial to explaining variations in production outcomes across farming households.

Biophysical Factors of Yard Land

Biophysical factors are the fundamental determinants of yard productivity. Soil conditions, water availability, microclimate, and land area influence the yard's ability to support optimal plant growth. Shrestha et al. (2025) showed that soil fertility and water availability are the most dominant factors determining yard productivity in rural areas, particularly in vegetable and seasonal food crop cultivation systems. Water availability plays a strategic role because most yards rely on rainfall or limited water sources such as shallow wells and rainwater. Hansen et al. (2023) emphasized that limited water access is a major obstacle to sustainable yard production, especially during the dry season. This condition often leads to decreased planting intensity and yields, despite the available land area. The yard microclimate, which is influenced by vegetation cover, building structure, and land orientation, also plays a significant role in determining productivity. The multi-strata vegetation structure in agroecologically managed yards can create more stable microclimate conditions, thus supporting plant growth and reducing environmental stress (Ogutu et al., 2023).

Yard Size and Land Use Intensity

Yard size is a key production factor, but its impact on productivity is largely determined by land use intensity. Large yards managed extensively can yield lower productivity than narrow yards managed intensively (Hansen et al., 2023). Land use intensity reflects how optimally households utilize available space for food production. Research conducted by Ibrahim et al. (2026) explains that Subak agricultural intensification activities in Bali produce numerous ecological benefits, capable of controlling pest attacks on rice plants and maintaining a sustainable environment. Ogutu et al. (2023) show that households with high levels of yard intensification—characterized by planting density, commodity diversification, and input management—have greater productivity and economic contribution than households with low intensity, regardless of differences in land area. These findings emphasize the need to analyze land area along with management patterns and intensity. In addition to food crops planted in yards, some farming households grow medicinal plants that are beneficial to the household, such as in Nubamado Village, Lembata District (Odjan and Subiantoro, 2024).

Household Labor and Time Allocation

Household labor is a determining factor in yard management because most cultivation activities are carried out manually by family members. Yard productivity is greatly influenced by the number of household members involved and the time allocated to cultivation activities (Baliki et al., 2022). Hansen et al. (2023) stated that limited labor is often a major obstacle in managing large yards, leading households to reduce the intensity of maintenance or the types of crops cultivated. Conversely, households with adequate labor availability can manage yards more intensively and productively.

Knowledge, Skills, and Access to Extension

Technical knowledge and cultivation skills significantly influence yard productivity. Households with good knowledge of cultivation techniques, soil management, and pest control tend to be able to increase production yields despite limited land (Baliki et al., 2022). Training and mentoring-based interventions have been shown to improve household capacity in managing yards sustainably. Baliki et al. (2022) showed that the positive impact of yard training on production and food security can persist for up to six years after the intervention. This indicates that knowledge is a crucial asset in increasing yard productivity.

Access to Production Inputs

Access to production inputs such as quality seeds, organic fertilizer, and other supporting facilities also determines yard productivity. Households with limited access to inputs often face obstacles in increasing production yields, even when land and labor are available (Ogutu et al., 2023). The use of organic inputs from household waste, such as compost, is an important strategy for sustainably improving soil fertility and yard productivity. Hansen et al. (2023) noted that utilizing household organic waste not only increases yields but also reduces production costs and environmental impacts.

Crop Diversification and System Complexity

Crop diversification is a key strategy in increasing the productivity and stability of yard systems. Yards planted with various types of crops with different harvest cycles can produce more stable output and reduce the risk of production failure (Adeosun et al., 2025). Adeosun et al. (2025) showed that crop diversity is positively related to household productivity and food security, as it provides multiple food sources and income. Diversification also increases resource utilization efficiency and supports agroecological principles. Islam et al. (2025) explained in their research that the high demand from the community for local food consumption presents a major opportunity to develop these commodities in home gardens.

Household Socioeconomic Factors

Household socioeconomic characteristics, such as education level, income, and asset ownership, influence a household's ability to manage their yard productively. Households with higher levels of education tend to be more open to innovation and new cultivation practices, thereby increasing yard productivity (Msengana et al., 2025). Household income also plays a role in determining the ability to purchase inputs and allocate time to yard activities. Households with high economic pressure often face a trade-off between yard production activities and other economic activities that generate cash income (Ogutu et al., 2023). This can be explained by research conducted by Ratnasari et al. (2025) in Bicak village, Mojokerto district, which found that the effectiveness of lowland rice production is largely determined by the amount of capital owned by farmers.

Gender Factors and the Role of Household Members

In many contexts, yard management is dominated by women, making gender factors important in analyzing yard productivity. Hansen et al. (2023) emphasized that women's involvement in yard management contributes to increased food availability and household nutritional quality. Women's empowerment through access to resources and knowledge has been shown to increase yard productivity and its social impacts. Therefore, yard productivity analysis needs to consider gender dynamics within farming households.

Institutional Factors and the External Environment

Institutional factors, such as policy support, government programs, and market access, also influence yard productivity. Yard development programs integrated with food security policies have been shown to increase household production capacity and welfare (Shrestha et al., 2025). External factors, such as climate change and land use dynamics, also influence the sustainability of yard productivity. Adityo & Shibata (2025) demonstrated that changes in yard structure due to modernization can reduce its productive and ecological functions, necessitating policy-based adaptation strategies and spatial planning.

Based on the above description, it can be concluded that yard productivity is the result of a complex interaction between biophysical, technical, socioeconomic, and institutional factors. While yard size is an important factor, its impact on productivity is strongly influenced by management intensity, labor availability, knowledge, and external support. A comprehensive understanding of these factors provides an essential basis for designing research and interventions aimed at improving yard productivity and the well-being of farming households.

CONCLUSION

Local food production, as related to yard size, is determined by several key factors, including: biophysical land factors, yard size and intensity of yard use, household labor and work time allocation, knowledge and skills, access to production inputs, crop diversification and system complexity, socioeconomic factors within farming households, gender and the roles of household members, and institutional and external environmental factors.

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