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PERSPECTIVES OF RURAL FARMING HOUSEHOLDS ON HOME GARDENS AS AN AGROFORESTRY FOR FOOD SECURITY: A QUALITATIVE STUDY IN INDONESIA

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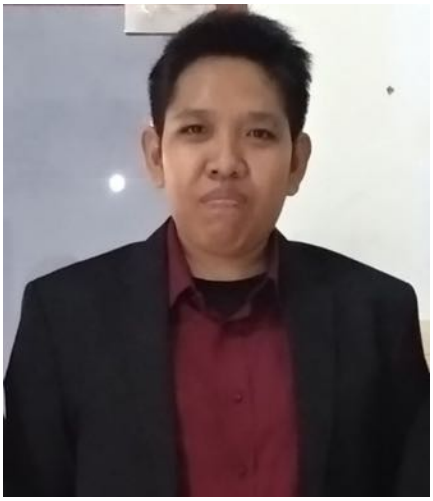

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ABSTRACT

In developing countries, rural farmers contribute significantly to food production, but their households are still vulnerable to poverty, food insecurity, and malnutrition. Food security is a concept that refers to the ability of a country or region to ensure the availability, accessibility, and utilization of sufficient and nutritious food for its entire population, both in normal situations and under crisis conditions such as natural disasters or political instability. Food security is critical as it is directly related to national security, public health, and sustainable development. To improve food security, governments and international agencies often focus on policies such as increased food production, diversification of food sources, sustainable management of natural resources, and food assistance programs for vulnerable populations. The practice of agroforestry in home gardens offers a variety of readily available, cost-effective, and nutritious food options, which plays a significant role in enhancing the food security of agricultural families. Agroforestry, an integrated land management system combining food crops, trees, and sometimes livestock, offers a potential solution to improve food security. By growing various crops, farmers are not solely dependent on a single source of food, which reduces the risk of crop failure. Agroforestry systems increase resilience to climate change by reducing the impact of natural disasters, such as floods and droughts. Trees can act as wind barriers, reduce soil erosion, and aid in water conservation. This qualitative research with a systematic exploratory approach and grounded analysis examines how agroforestry contributes to farmers' food security by conducting in-depth interviews with farmers in North Luwu, Indonesia. The study identified home garden categories of agroforestry and then evaluated the role of agroforestry food production in terms of securing the food needs of households. The study discovered that restructure food bolsters across various income brackets by promoting healthier eating habits. Additionally, food production enhances the sustainability of food supplies for households and the health and prosperity of agriculturalists. The primary obstacles to producing food at the household level were identified as secure access to appropriate land and the possession of adequate farming expertise.

Key words: agroforestry, farmer, rural, food security, household, home garden, Indonesia

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INTRODUCTION

Rural farmers produce 40-70% of the food consumed in developing countries [1, 2]. Despite their crucial role, they are the most susceptible to hunger, poverty, food insecurity, and challenges compounded by low productivity and limited knowledge and skills. External issues like climate change and the COVID-19 pandemic further hinder farming households' ability to address these problems [3]. In developing and underdeveloped regions, notably Africa and Southeast Asia, malnutrition and food insecurity are particularly prevalent [1,4,5]. Interestingly, in these areas, increased employment often correlates with increased stunting and malnutrition and increased physical activity [4].

Our dietary choices and the sources of our nourishment are crucial factors that influence our existence. However, the consequences of climate change, including erratic weather, flooding, drought, and soil degradation, have a direct bearing on the yield of agriculture, the cornerstone of food security in rural areas [6]. As global environmental conditions shift and food prices fluctuate, there is heightened concern regarding the potential health and safety impacts associated with worldwide food commodity networks [7, 8, 9]. Household food security offers a framework for examining these interrelated concerns by encapsulating the challenges of hunger, health, sustainability, and the pivotal role that food plays in the social fabric of daily existence [10, 11, 12].

This study examines the role of agroforestry systems in home gardens in improving food security at the household level. Home garden refers to cultivating food crops on privately owned land near the residence, which is then utilized for consumption or marketed for sale. Despite the importance of agroforestry systems in home gardens, more research is needed. To bridge this research gap, the research presented in this paper investigates the role of agroforestry in supporting farm household food security, focusing on the North Luwu region of Indonesia. The initial approach to answering this question was to create a detailed qualitative picture of households with yards in the North Luwu region. A series of in-depth interviews were conducted to explore the role of homegrown crops for those who cultivate, consume, and share their harvest with others. Armed with a qualitative understanding of food production methods, we can look at agroforestry practices from the perspective of farm household food security and evaluate the contribution of consumable agroforestry to household nutrition in North Luwu, Indonesia.

LITERATURE REVIEW

More scientific literature is needed to investigate the role of home-based agroforestry systems in developing countries, especially regarding their impact on food security. In this research, within the broader narrative of rural food security, it

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is imperative to consider previous examples and contemporary research from developed countries and rural environments in Southeast Asia. Next, we will offer a brief review of the literature related to food security, clarify the terminology used in this paper, and provide an overview of various aspects of food security, including food accessibility, sustainability of food production, and the degree of influence of farm households on the food system.

Rural agriculture and agroforestry

Worldwide, an estimated 800 million people are informally engaged in rural agriculture, which takes place in small areas such as fallow land, village outskirts, and forests [13]. Rural agriculture makes a significant contribution to meeting the needs of rural populations around the world. An estimated 90% of fresh produce consumed in North Luwu, Indonesia, is grown in and around villages [14]. Similar figures were also found in several villages in Indonesia, including Sumatra, Kalimantan, Java, and Sulawesi [15, 16].

Food shortages due to climate fluctuations have highlighted the potential of rural food production. For example, post-COVID-19, farmland produces 70% of fresh produce in Indonesia [17]. In the North Luwu region, over 90 community gardens alongside 11 allotment gardens administered by the village authorities underscore the local commitment to agricultural initiatives. Additionally, many households partake in food production within the village precincts. However, quantifying this participation is challenging due to the private nature of the land used for agroforestry practices. A study highlights the prevalence of domestic food farming in rural settings, indicating that approximately 60% of the inhabitants within and surrounding North Luwu produce a portion of their food, a testament to the region's agrarian involvement [14].

Academic discourse on the role of agroforestry in farmers' livelihoods needs to be explored more. While there exists a substantial corpus of literature delving into the historical narrative of land use and design, as well as investigations into the cultural implications of agricultural practices, the emphasis seldom rests on the produce itself [18, 19]. The extant studies about agroforestry imply that for many households, including those confronting unstable food security, the crops cultivated are often esteemed more for their economic contribution to household livelihoods rather than for their sociocultural significance [20, 21, 22]. Nonetheless, agroforestry is increasingly recognized as a critical alternative to conventional nutrition sources, offering a resilient strategy to bridge deficits in the food supply during periods of shortage and amidst the challenges posed by climate change, whether through direct consumption or the distribution of produce [22, 23].

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Home gardens serve not only as a bastion of sustenance but also as a conduit for personal expression and a wellspring of pride and autonomy among agrarian households [24]. Furthermore, disseminating home garden produce fosters communal bonds, fortifying the social fabric within communities [25, 26, 27]. Research conducted on Indonesian agroforestry has illuminated that a prevalent practice among farmers is sharing harvests with neighbors and kin, a tradition upheld at each harvest cycle. Additionally, the study noted that more than half of these agriculturists engage in more structured forms of crop sharing, contributing to community entities or religious establishments such as mosques [12].

Household food security

Agroforestry, by endowing rural inhabitants with the capacity to cultivate a plethora of agricultural produce, plays a pivotal role in bolstering household food security. Food security at the household echelon is predicated on the availability of and access to safe, nutritionally adequate, and sufficient food to sustain optimal health and well-being [28]. The conceptualization of food security has evolved to encompass a multifaceted understanding that transcends mere economic accessibility, acknowledging that various constraints may intrude on access and nutritional requirements. The term "household food security" is thus employed to articulate a more nuanced and systemic comprehension of food security and the imperative of fulfilling food necessities in an environmentally prudent and socially sustainable manner, guaranteeing enduring food security [27]. Hence, household food security may be defined as all family members having unfettered access to safe and nutritious food procured sustainably [22, 28].

By 2021, projections indicated that 4.79% of Indonesian households would grapple with food insecurity [28]. For numerous Indonesian families, particularly those subsisting on limited incomes, consuming high-quality food represents a significant challenge. Dietary patterns within these households are often characterized by a paucity of fruits and vegetables, an increased intake of fats, and a fiber deficiency, diverging from the nutritional guidelines promulgated by Health Indonesia [10, 27]. In Indonesia's urban centers, marked by their cultural diversity, many city residents may need more familiarity with the spectrum of fresh produce available in local stores. Furthermore, specific neighborhoods may lack physical access to healthy food options, a barrier that could exacerbate the challenges of achieving nutritional adequacy [25].

This examination elucidates the potential for further research into rural agroforestry and its role in bolstering community-level food security. The capability of homegardens food production to underpin the physical, social, and environmental well-being of rural communities presents a promising avenue. A more profound comprehension of rural food production methodologies and the interplay of

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reciprocal networks is imperative to efficaciously reinforce agroforestry practices within homegardens and to fortify the food security of farming households.

METHODOLOGY

Study site and sample

This study presents a systematic exploratory assessment aimed at elucidating the role of household-level food production in bolstering food security within North Luwu, Indonesia. It constructs a qualitative narrative concerning agroforestry farmers, delving into the nuances of their land use, food production, and community interactions. The research focused on an area deemed representative of neighborhoods with low to middle-income levels, characterized by a comparatively sparse population density. The selection of interviewees was conducted employing a purposive sampling methodology.

Initially, selected informants (n = 40) were asked short questions regarding their farming practices for screening food crops and subsequently recruited for further interviews. A total of 20 informants participated in the in-depth interviews, including participants who grow fruits or vegetables on their land. The interview process began with the exploration and documentation of participants' agroforestry. Farm spaces were mapped and photographed to document the various uses of open space and the proportion of space devoted to food crops. In-depth semi-structured interviews [29] were conducted after exploring why interviewees chose to grow food, who they shared it with, and the impact of agroforestry on household income and nutrition.

Credibility and dependability

In this research, measuring credibility and dependability is achieved through triangulation. This involves using various methods, data sources, theories, or researchers to verify the consistency of the findings. Such an approach ensures that the results do not depend exclusively on a single method or source, enhancing their credibility. Furthermore, the research incorporates member checks, a process involving participants actively. This is done by sharing the findings with them and soliciting their feedback to confirm that the interpretations made by the researcher align with their actual experiences.

Data analysis

The interview transcripts and field notes were analyzed using a grounded theory methodology, as outlined [30]. Analytical categories and themes were inductively derived from the field notes after each interview session and throughout the examination of the interview transcripts. Initiating the analytical process concurrent with the onset of data gathering is crucial to safeguard against the oversight of significant indicators within the research. The preliminary analysis can serve as a

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guiding mechanism for the direction of subsequent interviews and observations, thereby enhancing the robustness and comprehensiveness of the research findings [30].

The transcription of interviews, alongside the field notes, was methodically coded into emergent themes identified during the data collection phase. This process included the application of 'codes' directly derived from the text of the interviews. Subsequently, these themes were aggregated into categories to facilitate a coherent thematic analysis. Key themes and interrelationships were identified by meticulously examining characteristics such as frequency of emergence and differentiation among participants' narratives. The distinctive attributes of each case were scrutinized, and comparative analyses were conducted to discern patterns, with variables such as gender, age, and neighborhood-serving as focal points for differentiation.

Preliminary conclusions were rigorously evaluated to address any contradictory or incongruent instances, affirming that all data procured from the interviews were integrated into the analysis following the analytical strategies described [31]. The multifaceted data collection methodologies employed in this study—including interviews and field notes—facilitated the triangulation of research data, thereby providing a more robust corroboration of the emergent theory [31]. For illustrative purposes, the comparative and characterizational analysis of farming households was not confined to interpretations derived from coded interview transcripts; it also examined the diversity and volume of food produced in their home gardens. It is to be noted that the analysis was inclusive yet selective, with only certain cases being considered. Thus, it was adjudicated that the study had attained a theoretical saturation deemed adequate for fulfilling its exploratory objectives.

RESULTS AND DISCUSSION

This section begins by developing a typology to describe the practice of home gardens, aiming better to understand farmers' motivations and perceptions about their farms. It then examines home gardens through the lens of community food security, focusing on access to healthy food, the associated social cohesion, the development of community relationships through food, community control over the food system, and the sustainability of food production.

Characterizing Agroforestry

Out of forty farming households that responded to the initial screening interview, more than half grew food crops, defined as vegetables and fruits. Half of these households also reported cultivating pulses as food. The food crops were predominantly planted in backyards, while the vegetables and fruits were typically grown adjacent to the house. The research sites were selected based on their

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structural similarity, while ensuring similarity in other aspects like household income. The 20 farmer households interviewed were evenly split in terms of gender, and most were under 50 years old.

Interviewees engaged in agroforestry practices were cultivating a diverse range of crops. Additionally, nearly half of them grew food crops they deemed readily accessible. These included common varieties like spinach, cabbage, cucumber and fruits such as papaya, banana, rambutan, cocoa, and palm oil. Often, these crops are fresh, organic, and locally produced, making them readily available. Cacao farms are the most prevalent type among the surveyed agroforestry practices. These farms are designed and maintained for easy access to the produce necessary for chocolate production. The farmers often focus on cultivating commonly available horticultural products, including a broad range of fruits and vegetables. Additionally, the respondents highlighted the significance of accessing organic food free from pesticides and preservatives. While generally small-scale, these agroforestry operations can expand, given sufficient space or economic incentives, to produce larger quantities of horticultural products.

Respondents with children at home, who primarily view food cultivation as an educational opportunity, tend to cultivate small plots of land. This group does not encompass all respondents with children; specifically, it includes those farmers interviewed for whom growing food is chiefly motivated by teaching their children. While the yield from this type of agroforestry is generally modest, these farmers believe it is an effective method to engage children in agriculture.

Even though the primary focus of these farmers lies in the cultivation process rather than producing large quantities of crops, they are among the most significant crop producers, particularly of cocoa, as observed in this study. These farmers also frequently share their harvest with others. Like other respondents, they intentionally restrict their cultivation to meet household consumption needs and enhance their economic situation. All interviewed farmers expressed a desire to manage their agroforestry practices, a deep appreciation for the surrounding ecosystem, and a sense of satisfaction in cultivating crops for harvest. Early experiences in agroforestry play a significant role in their later decisions to grow crops. Notably, all respondents were raised in families engaged in farming.

Agroforestry and community food security

Accessibility

The interviewed farmers generally cultivated crops sufficient to sustain their own households. Additionally, approximately half of these farmers produced large quantities of fresh horticultural products. Respondents typically expressed reluctance to purchase crops similar to those they cultivated. They reported feeling

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food secure consistently having ample quantities of their desired produce. In North Luwu, a bustling farmers' market, abundant with vegetable and fruit vendors, contributes to this sentiment. Thus, these responses mirror a context where fresh produce is readily available.

Although the respondents mentioned they do not usually purchase the same types of food they grow, they also acknowledged that owning a farm has altered their eating habits. This change, as emphasized by the participants, is attributed to the fact that the available food cannot match the freshness, taste, and accessibility of the food they cultivate. Agroforestry practices, particularly the use of organic fertilizers and interaction with the environment, not only enhance the freshness of food but also shift farming households' perspectives on ecological importance. Participants reported that engaging in agroforestry has increased their likelihood of selecting seasonally appropriate and, in some instances, organically grown produce. Moreover, agroforestry fosters a heightened awareness of the seasonality of local foods and the effects of pesticides and chemical fertilizers.

Social capital

Agroforestry practices serve as a means to connect with others, both through the reciprocal exchange of produce and through shared labor, fostering a sense of community among neighbors. Despite this, the interviewees predominantly viewed agroforestry as an activity aimed at benefiting their own families rather than the community at large. While the farmers did share food, distributing this small surplus was not typically seen as a primary goal of their agroforestry efforts. Nevertheless, they exchange food with neighbors and form relationships with other farmers, from whom they learn various food-growing techniques and exchange their produce.

In North Luwu, farmers strengthen their bonds with various neighbors through food exchanges and conversations about agriculture. For instance, one neighbor might cultivate spinach but not papaya, offering an opportunity for exchanging local knowledge. Another neighbor might benefit from cucumbers grown in a productive agroforestry setting. Similarly, in cocoa agroforests with large fruit trees, several neighbors inquire annually about the fruit's readiness, offering their assistance with the harvest.

Ecology and Sustainable Practices

Environmental ethics emerged as the primary motivation for crop cultivation among many interviewed farmers. They strongly believe in the significance of local consumption and feel responsible for utilizing their land for farming. Additionally, they view agroforestry as a means to harmonize with nature and heighten their awareness of broader environmental concerns. Most of these farmers adhere to

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organic practices, with nearly half using at least some form of homemade compost. A few even dedicate significant space and effort to develop productive composting systems, eliminating the need for additional purchased tools.

Despite the environmental advantages of consuming locally sourced produce and minimizing pesticide use, some aspects of agroforestry in villages can negatively affect its sustainability. A primary concern is water usage. Although the interviewed farmers may limit their use of chemical fertilizers and pesticides, their frequency of watering crops is notably high. It was observed that these farmers typically irrigate their crops at least twice a week, including those who consciously conserve water. Home agroforestry influences community food security in various ways. However, the interviewees say the most significant impact is not on community food security. Instead, the effect on the health and well-being of the farmers themselves stands out as most important.

Enablers and obstacles

Numerous factors can either promote or impede agroforestry in rural regions. A crucial element is possessing the necessary skills to manage a productive farm. Setting up and maintaining a farm demands considerable effort and expertise. All interviewees have familial experience in agroforestry, which they often leverage to establish and maintain healthy, productive farms.

Sunlight and rainfall are vital components for successful home agroforestry, yet the importance of space for plant growth appears to be less critical. Although having space is beneficial, a larger farm sometimes yields a higher crop yield. The farms observed during the interviews varied in size, with some larger farms yielding an abundance of crops. The actual size of the land, combined with the farmer's priorities and those of other household members regarding land use, play significant roles in determining farm productivity. For instance, in some households, having space for children to play is crucial. But if alternative areas, like a garden near the house, can serve this purpose, more land can be allocated for agroforestry activities.

Agroforestry in North Luwu

This research had two main goals: the first was to create a detailed analysis of the home agroforestry systems in North Luwu, and the second was to evaluate the detailed observations from this analysis to understand the role of home agroforestry in enhancing local food security. In the process, 40 households were randomly selected for screening, leading to the identification of several households engaged in cultivating food crops. Over half of these households were found to be growing various food crops, from which 20 were chosen for comprehensive semi-structured interviews.

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The study reveals a diverse profile of home agroforestry farmers, who primarily engage in crop cultivation driven by nutritional needs and economic factors. These farmers have varied motivations for adopting agroforestry methods. During the interviews, three distinct categories of farmers were identified: those who farm for educational purposes, environmental conservation, and occupational reasons. These categories reflect their varying motivations for cultivation, influencing their farm management and the significance of their land in their lives. Although each category differs in its approach, all contribute significantly to the community's food security. Home agroforestry plays a multifaceted role in food security, enhancing access to food, nutritional value, self-sufficiency, and environmental health at both household and community levels [32-37].

This research found that the most notable contribution of home agroforestry to food security is its enhancement of dietary accessibility and nutritional quality for the interviewed farming households. Although food affordability was not a primary concern, owning a farm enabled these households to access a wider range of fresh and nutritious food items than they might typically purchase. This aspect of home agroforestry is beneficial for households at all income levels. Additionally, the routine involvement in home agroforestry alters the farmers' perspectives towards crop cultivation, enabling them to produce organic food for their consumption. The farmers place high value on having direct oversight and knowledge about the cultivation practices of their crops.

Each farmer interviewed comes from a background deeply rooted in agriculture, cultivating crops on their farms that are integral to their identity and their community's heritage. Moreover, most of the crops these farmers grow are also commonly found in other areas. Although home agroforestry is a significant contributor to community food security [18, 38, 39, 40]. Many farmers are driven by the goal of producing agricultural goods in an eco-friendly manner. These individuals prioritize organic farming techniques and composting on their land. Additionally, other farmers interviewed also endeavor to adopt sustainable practices. Notably, none of them apply pesticides in their home agroforestry operations. Yet, only about half of them practice composting, and they frequently utilize the local village water system for irrigation. While there is potential for further enhancement in sustainable practices [14,28,32,40], all farmers have positively influenced the sustainability and environmental aspects of their diets, and thus community food security, by cultivating a portion of their food domestically.

While the concept of community food security offers valuable insights into the advantages of home agroforestry, it needs to provide a holistic view. The farmers interviewed revealed a perspective that extends beyond the conventional scope of community food security, highlighting the influence of cultivating food crops on their

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overall health and well-being. Farming, specifically the act of nurturing the farm, plays a significant role in enhancing farmers' physical and mental health [23,41]. The benefits of being outdoors, engaging in physical labor, and breathing fresh air are highly valued in their daily lives [21,35]. Furthermore, these farmers underscored the deep satisfaction and belonging they derive from tending to their farms through the harvest season. For many, the farm is seen as a tranquil retreat from the rigors of everyday life, serving as a vital source of relaxation [41].

CONCLUSION, AND RECOMMENDATIONS FOR DEVELOPMENT

When considering the obstacles and enablers of home agroforestry, factors such as land ownership and agricultural expertise emerge as crucial for its success. Additionally, there are other considerations, notably apprehensions regarding the safety of practicing agroforestry in residential gardens. Despite these concerns, the farmers interviewed expressed that such risks did not overshadow the advantages of the crops they cultivated [35]. Access to home agroforestry is not universal. There is a significant need for support among farmers, particularly in enhancing their skills in ecological farming practices. It is essential to allocate more resources towards creating communal farmland areas and educational opportunities for farmers. Such initiatives would aid in enhancing the sustainability and reach of rural agroforestry practices.

Home agroforestry promises to transform our understanding and interactions with plants and rural environments. This approach is intimate and hands-on, compelling individuals to consider not just their dietary choices and quantities but also the origins and significance of their food. Beyond addressing nutritional needs and accessibility, home agroforestry enhances communities' and families' sustainability, health, and well-being. The heightened self-sufficiency and food system expertise observed among participants in this study underscores its valuable contribution to community food security. The personalized approach prevalent in the home agroforestry practices observed in this study indicates that home agroforestry may not directly contribute to broader community development. Additional research is necessary to explore how the cultivation of communal relationships through crop sharing might be enhanced and utilized to bolster food security at a level beyond individual households. This study serves as a foundation for academic inquiry and community advancement, fostering a deeper comprehension of the ties between rural home agroforestry and food security and identifying potential obstacles. Armed with this understanding, formulating and refining programs and policies aimed at aiding household-level food producers can be more effectively undertaken.

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