

The Contribution of Home Food Gardening Program to Household Food Security in Indonesia: A Review

HAJI SAEDIMAN^{1*}, ABDUL GAFARUDDIN¹, HIDRAWATI HIDRAWATI¹, IDRUS SALAM¹,
ALMIRA ULIMAZ², ILMA SARIMUSTAQIYMA RIANSE¹, SARINAH SARINAH³,
SITTI AIDA ADHA TARIDALA¹

¹Department of Agribusiness, Faculty of Agriculture, Halu Oleo University, Kendari
INDONESIA

²Department of Agricultural Industry Technology, Politeknik Negeri Tanah Laut, Kalimantan Selatan
INDONESIA

³Department of Food Science and Technology, Faculty of Agriculture, Halu Oleo University, Kendari
INDONESIA

Abstract: - Home gardens are an essential component of the local food system and family farming worldwide. In Indonesia, a home food gardening program was initiated in the early 2010s to optimally utilize home yards for improving the adequacy of food consumption and nutrition intake of households. In the present challenging situation of Covid-19 pandemic, there has been a growing interest in home gardens to help mitigate food insecurity caused by food supply chain disruptions and the emergence of physical and economic barriers that limit access to food. This paper is a review of pertinent literature to find out the characteristics of home gardens and home gardening program in Indonesia and then examine their contribution to each pillar of food security: availability, access, utilization, and stability. The experiences of home gardens worldwide are reviewed to understand the global context of home gardens and food security. Literature reviews found a positive impact of home gardening program on food availability, access, and utilization. However, improving food stability through a home food gardening program is still a challenging task. This finding implies that the positive contribution of the home food gardening program to household food security is largely limited to the program period. Nevertheless, the program is still an important strategy to address food insecurity and nutrition deficiency of low-income households. Future research should assess factors affecting the sustainability of the program to derive viable models applicable in diverse circumstances. There is a need for research to assess the value and importance of home gardens as a coping strategy to reduce vulnerability and food insecurity in the present global Covid-19 pandemic.

Key-Words: Contribution, food, food insecurity, food security, home garden, household, Indonesia, program

Received: January 2, 2021. Revised: June 30, 2021. Accepted: July 9, 2021. Published: July 26, 2021.

1 Introduction

World Food Summit 1996 [1] defines food security as a situation that “exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.” To promote household food security, the Indonesian government has adopted various strategies and programs, such as increasing rice production, subsidized rice for the poor, cash transfer, diversification of staple foods [2–4], and home gardening [5,6]. As a result, food security has improved and the undernourishment prevalence has been reduced from 19.7% in 1990–1992 to 7.6% in 2014–2016 [7]. In 2015, however, 16% of rural

districts were still highly vulnerable to food insecurity [7,8]. According to the Global Food Security Index 2018, Indonesia had a food security score of 47.1 and ranked 68 from 113 countries surveyed [9].

The issues in food security include not only the number of households with food-insecure status, but also the quality of diets they have. In general, low-income households do not focus yet on the nutritional content and quality [8,10]. Dietary Diversity Score (DDS) revealed that Indonesians consumed fewer tubers and roots, meat, vegetables, and fruits and more cereals [11]. Anwar and Hardinsyah [12] noted three characteristics of food consumption in Indonesia, namely, (i) less

diversified, low level of quality, and the dominance of carbohydrate-source food, (ii) less consumption of vegetables, fruits, and beans, and (iii) inadequate nutrient intake.

Home gardening is the cultivation of a small plot of land near homes or homesteads with various plants and animals that can provide an additional source of food and income [13,14]. Home gardening has been widely accepted and practiced in various settings by subsistence families in developing countries. Many studies have shown that home gardening has been an essential part of the local food system and family farming in urban and rural areas to improve food security, nutrition, and livelihood [14–18]. In tropical countries, home gardens have diverse varieties of crops and are suitable to local microclimates. Resources-poor households can establish and maintain them in a small plot of lands using a few inputs [14].

Home gardens have existed for centuries among the rural and urban households in Indonesia. Therefore, the government has adopted some initiatives to promote home gardening throughout the country. Nevertheless, the development of home gardening received special attention since 1991 with the adoption of Diversification of Food and Nutrition Program [6]. In 2010, the Ministry of Agriculture launched a program called Acceleration of Diversification of Food Consumption with the following objectives: (i) Increase participation of women groups in the provision of food and nutrition resources through home garden utilization to produce carbohydrates, vitamin, and mineral, (ii) Increase the utilization of local foods and their processed products as carbohydrate sources beyond rice and wheat flour, and (iii) Increase motivation and participation and encourage changes in the mindset of people to consume diversified, nutritious, balanced, and safe diets. The program's target was to improve DDS through increased consumption of animal-based protein, beans, vegetables and fruit, and the reduction of per capita rice consumption [6]. The Ministry then designed M-KRPL (*Model Kawasan Rumah Pangan Lestari*, or Model for Sustainable Home Food Garden Area), which was replicated nationwide as the KRPL (*Kawasan Rumah Pangan Lestari*, or Sustainable Home Food Garden Area) program.

The KRPL program started in 2011 and aimed to increase household-level food self-sufficiency through home yard utilization, local resource based food diversification, conservation of food crops, and improved household welfare. The concept "area" emphasizes a group of households in a neighborhood to facilitate the management,

extension and guidance, and marketing. The concept "sustainable" means the continued functioning of the gardens even after the program's termination. The sustainability is enhanced through the establishment of a nursery at the village, which will supply seeds and seedlings to the community and individual home gardens. The beneficiaries of the KRPL program are women groups.

Numerous studies have investigated several aspects of the KRPL program [19–28]. However, little researches have been done to examine its contribution to food security. This paper reviews the Indonesian experiences with the KRPL program with particular emphasis on its contribution to each component of food security: availability, access, utilization, and stability. The review also presents the experiences of home gardens in other countries in relation to their contribution to food security and other relevant aspects. The findings identify areas that the government and other parties should focus on to promote food security through the home food gardening program.

2 Home Gardening

The Indonesian term for home gardens is *pekarangan*. Home gardens might be called in the literature as kitchen, mixed, farmyard, backyard, compound, or homestead garden [14,29,30]. Soemarwoto *et al.* [31] use "home garden" to emphasize the close connection between the home and the garden. For the villagers, a home garden is a production unit and a dwelling place [32]. Indeed, it is an ecological system where interaction occurs among human beings, plants, animals, soil, and water [31,33].

Home gardens have been used throughout the world as an important additional source of food to improve household food security and nutritional diversity. According to Niñez [34], home gardening is the oldest agricultural production system and the most sustainable form of agricultural cultivation. Home gardening has been an essential part of the local food system and family farming for centuries. The subsistence production system that marked the beginning of modern agriculture started in small plots adjacent to the households [14]. The practice of home gardening might be in the form of a community garden, collective garden, or individual garden.

In some countries, home gardens, both the community and individually-managed ones, have emerged in response to a time of food scarcity. For example, in the United States, community gardens were popularized following World War II to provide households with fresh fruits and vegetables [35,36].

Urban agriculture was used to mitigate the effect of economic hardship and structural adjustment [37,38], and prevented a sharp decrease in the nutrition security of the urban residents. In Cuba, people used home gardens to cope with food insecurity during the economic crisis and political isolation [38]. However, as Birky and Storm [39] have argued, the current community and home gardening has been responding to a variety of drivers, such as (i) environmental movement and urban sustainability, (ii) more focus on the provisions of healthy, local foods, and (iii) more focus on community development. During the Covid-19 pandemic, home and community gardening is considered an important strategy to improve food security since it can also promote physical activity, peacefulness, and social connection [40,41].

Home gardens have some characteristics and provide multiple benefits to individual, households, and communities. In addition to being located close to dwellings, they have several characteristics, such as (i) containing high plant diversity [42], (ii) production being supplemental to family consumption and income [43], (iii) occupying small plots [34,44,45], and (iv) having low barriers to entry even for low income households [14,29]. Marsh [29] stated that a home garden is a production system that low-income households may easily practice since it uses locally accessible resources and applies traditional pest and disease control and indigenous farming practices. Galhena *et al.* [14] elaborated social, economic, and environmental benefits of home gardens. According to Landon-Lane, as cited by Galhena *et al.* [14], home gardening has several significant benefits, namely, (i) increased food security, (ii) improved nutrition, (iii) supplementary income and better rural employment, (iv) reduced risk of failure, and (v) environmental benefits.

Despite similar characteristics among the home gardens, each garden may have different structure, functionality, composition, and appearance [46,47], depending on the location, available household resources, and family members' preferences, skills, and commitment. Soemarwoto *et al.* [31] argued that the structure of home garden depends on ecological and cultural factors. The decisions related to the home gardening activities from upstream to downstream subsystems are primarily made by women [37] and are mainly driven by domestic consumption, household income generation, daily necessities, and market forces [14,48]. The proximity of home gardens to dwellings and their subsistence nature are two key reasons for the high

involvement of women, who are also involved in reproductive and social activities [49]. The household's socioeconomic status determined the garden composition, structure, cultivation intensity, and plant diversity [17].

Home gardens improve access to food sources from fresh plants and animals, which regularly provide households with energy and nutritional requirements. Home gardens also provide spices, medicines, herbs, fodder, and firewood [29,31,50,51]. A pioneering research in Indonesia conducted at the beginning of 1930s by Ochse and Terra as cited by Galhena *et al.* [14] showed that households obtained 14% of protein and 18% of the caloric intake from home gardens. Maxwell [52] observed that 81% of households practicing urban farming did so to improve their food security. Urban farming significantly improves food security and nutrition of poor households in Sub-Saharan Africa [52]. Moreover, urban agriculture improves the nutritional status of children [37].

Several factors can support and hinder home food gardening. They include gardening skills, availability of space and sunshine, security of tenure, availability of time, and pest and disease occurrence [23,53]. Lack of planting materials [23,50], inadequate supply of quality seeds [30,54], and lack of finance [50] have also been reported as barriers in home gardening. Galhena *et al.* [14] identified other constraints after reviewing a wide range of publications, including limited access to agricultural inputs, lack of access to water, poor soil fertility, limited marketing opportunities, and lack of information and advisory services.

3 About KRPL Program

In Indonesia, the government introduced home-yard utilization in 1951 under the so-called Karang Kitri movement, a national campaign for communities to plant their home-yards and other unused lands to address land degradation [55]. In 1996, the government program focused on home yards utilization as alternative plots to produce foods needed by the households [23]. The KRPL program was then initiated in the early 2010s to optimally utilize home yards for improving the adequacy of food consumption and nutrition intake of the participating households [56]. As can be seen in Fig 1, the program involved 13,209 women groups throughout the country during the 2015–2019 period [57]. Since 2000, the government has modified the program in terms of target beneficiaries, location, goal, and activities. The beneficiaries are no longer restricted to women groups and the target locations are areas facing issues of stunting or food insecurity.

The program has now stipulated income generation as one of its important objectives and included post-harvest and marketing in its core activities.

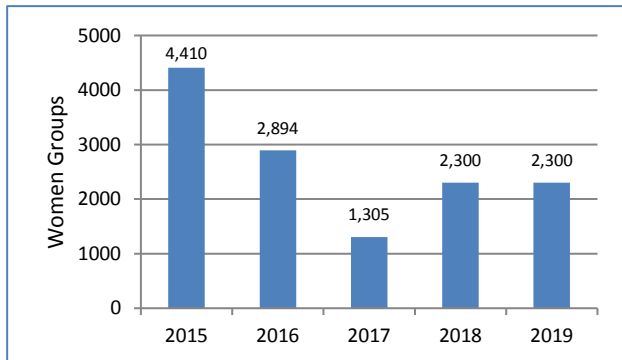


Fig. 1. Trend in the number of beneficiary women groups of KRPL program during the period of 2015-2019

KRPL is an area where each household utilizes its home garden intensively through wise management of local resources to improve the sustainability of food supply by maintaining and increasing food quality, value, and diversity. Participating households are expected to develop their capacity socially and economically in meeting food and nutrition needs in sustainable ways, leading to an improved welfare of communities and families, attainment of food diversification, and local plant conservation [11]. To improve knowledge and skills of members of the women groups, the government through the program undertakes capacity-building activities regarding the basics of home gardening, technologies for KRPL development, nutritious and safe foods, and sanitation and health. Sample KRPL technologies include nursery management, planting media preparation, farming practices of vegetable crops, fertilizing and crop maintenance, household waste composting, and making pesticides from herbs.

Optimum utilization of the yards of urban and rural houses was done with the assistance of extension officers. In addition to optimum utilization of the yards, the KRPL program was also aimed at empowering women groups to consume diversified, nutritious, balanced, and safe foods and encourage food processing to have more diversified meals. A community-based nursery is established in every village to provide crop seedlings grown in KRPL-supported home gardens [23]. The nursery establishment addresses the difficulty of getting crop seedlings, thus promoting sustainability of the activities.

The target groups of home yard optimum utilization activities are women groups with more than 15 members living close to each other in a

neighborhood or village. Each member should utilize her home yard by growing food crops (vegetables, fruits, and tubers) or raising animal, including fish. The decision on which crops to cultivate and animals to raise depends also on the yard size. For example, households with the yard size being less than 100 m² are usually directed to grow vegetable crops. In this regard, the objective is to supplement food and nutrition availability at the household level. The food produced from home garden is mainly used for home consumption, and if there is a surplus, it can be provided to other members of the group or sold to the market.

The KRPL program was implemented in three stages, namely, establishment (year 1), development (year 2), and self-reliance (year 3) [58]. The government provides financial support mainly at the establishment stage. At the development stage, the amount of such financial assistance is significantly reduced and is no longer provided at the self-reliance stage. Activities done in the establishment stage included (i) socialization and training on home-gardening, (ii) establishment of demonstration plot as the field laboratory for the group, (iii) establishment of community-based nursery, (iv) development of members' home gardens, and (v) extension and guidance on diversified, nutritious, balanced, and safe foods. Activities done in the development stage included (i) development of demonstration plot, (ii) development of community-based nursery, (iii) development of home-gardens of members, (iv) training and demonstration on menu with diversified, nutritious, balanced, and safe foods, and (v) food processing. Overall, steps done included (i) establishment of groups, (ii) needs assessment, (iii) formulation of activity schedule, (iv) training and guidance, (v) establishment and management of nursery, (vi) establishment of demonstration plot, and (vii) development of the community area [58]. At the self-reliance stage, the government mainly does monitoring and control and provides limited assistance when necessary.

Food diversification is vital in food security promotion, because the quality of food consumption seen from DDS is still low. In 2010, the DDS was 75.7 percent from the ideal level of 100 percent (Badan Litbang Pertanian as cited in Purwantini *et al.* [11]). Here, the KRPL program is one way to improve household food security [11]. The government aimed to achieve availability DDS of 96.32% in 2019, which was only 86.69% in 2015 [59].

4 Food Security

Food security is a widely used concept, and hence there has been a search for its accurate and consistent measure. Proposed indicators and indexes include food consumption and anthropometric indicators [60], calory intake, dietary diversity, poverty, and subjective indicators [61]. Coates [62] recommended food sufficiency, nutrient adequacy, cultural acceptability, safety, certainty, and stability, whereas Wineman [63] advocated quantity, quality, and stability. Other popular food security indicators are the Coping Strategy Index (CSI), the Dietary Diversity Score (DDS), the Food Insecurity Experience Scale (FIES), the Household Food Insecurity Access Scale (HFIAS), and the Household Food Security Survey Module (HFSSM) [64–66]. This plethora of indicators is mainly due to the multi-dimensional nature of food security that cannot be easily captured by a single measure [65,67–69]. Also, food security has multiple levels (households, district, provincial, national, and global) and time dimensions that add to the more complexity in its measurement [70,71].

In line with the definition that World Food Summit in 1996 has adopted, food security encompasses four components: availability, access, utilization, and stability [72,73]. These four components should exist to attain food security. Food availability is measured by the production and supply of food, food access by the income level, and food utilization by nutrition or food diversity [74]. Stability deals with the constancy of the other three pillars over time [66].

Food availability refers to physical availability and focuses on the supply side [75]. Availability means the sufficiency in food supply, obtained from domestic production, imports, food reserves, donation, or wild foods [73]. Food access means access to physically available food, indicating that households need adequate resources to get food for a healthy diet [73,76]. Better food access might depend on socio-economic development, employment, income, safety nets, and market access [75,77]. Challenging situations and shocks due to unemployment, poverty, price spikes, reduced income, and economic and political instability could affect food access [75,78].

Food utilization is the maximizing of households' consumption of adequate energy and nutrient. A number of factors are responsible for the adequacy of individuals' energy and nutrient intake, such as the nutrient content of the food, dietary diversity, food preparation, intra-household food distribution, and actual uptake of nutrients and energy [73]. Sufficient energy and nutrient intake

and its good biological utilization determine individuals' nutritional status [73,76].

Stability considers the susceptibility of the three pillars and deals with the temporal dimension of food security. Stability issues constitute short-term and long-term instability. Short-term instability might be due to temporary and seasonal disruptions and may lead to acute food insecurity. Medium-to-long term instability might be due to inadequate long-term access to food and may lead to chronic food insecurity [73,78]. Stability might be the most challenging aspect to measure, as it is also a part of each other elements over time [65].

5 The KRPL Program and Food Security

5.1 Food Availability

Food availability refers to the food supply obtained from domestic production, food reserves, imports, food aid, etc. [14]. It relates to the physical availability of food. According to Masuku and Sithole [79], food availability is measured by food production and food supply. Availability implies uninterrupted supplies of food [16]. Challenges for food availability include growing population, land conversion [80], crops or livelihood shift [81,82], and climate change [83,84].

The KRPL program has proven to provide many benefits to participating households. For participating households, the program contributed to the provision of foods for household consumption, reduced food expenditure, and diversified food consumption [23,25,58,85,86]. A study by Saptana *et al.* [87] in Pacitan District showed that home gardens contributed to 53% of household consumption in a KRPL village, whereas in a non-KRPL village, the contribution is 43%. In the participating village, the detailed contribution to home food consumption was as follows: vegetables (50%), tuber and roots (30%), livestock products, including eggs (20%), fruits (15%), and meat (10%) [11]. Likewise, the KRPL program in Surakarta increased food availability and reduced household food expenditure [25]. However, as home gardens only supplement food consumption, they cannot entirely meet the food needs of households.

Home gardening is often associated with vegetable and fruit production base, so the above contribution of root and tuber of 30% of home consumption is worth noting. The types of tuber and root commonly cultivated and consumed either as the main or co-staples are cassava, taro, and sweet potato. They can be consumed as boiled fresh tuber and fried slices, or be processed into flour and

different diets and snacks. Cassava can be processed into *gaplek* (dried cassava), *kasoami* (steamed food from dewatered cassava mash), *oyek* (mixed with rice), *tiwul* (cassava rice), fermented products, snacks or other products [2,8,10]. Taro can be processed into noodle, *pangsit*, and steak ([88]).

The positive contribution of the KRPL program to household food availability agrees to study results in other countries. According to Marsh [29], home gardens provide more than half of the vegetable supply for households with gardens. Kortright and Wakefield [53] reported that households in Toronto, Canada, grow a wide diversity of vegetables and fruits, and have different priorities and motivations with gardening. In Bangladesh, households participating in a home gardening project had more food than non-participating households [16]. In the United States, gardening has been promoted to increase vegetable and fruit intake in poor neighborhoods with limited access to nutritious foods [89]. The proportion of households experiencing food insecurity dropped from 31.2% before gardening to 3.1% after gardening [90]. In Lima, the capital of Peru, home gardening increased the availability of carbohydrates and nutrient-rich fruits and vegetables that poor residents usually cannot afford economically to access them [91]. Holben *et al.* [92] found that households who did not have a garden will experience food insecurity with hunger four times greater than those with a garden. In food-insecure families, home gardening has a positive correlation with increased produce intake and lower food spending [93].

The results of the literature review suggested that home gardens increase food availability with few exceptions. In the Maphephetheni uplands in KwaZulu-Natal, South Africa, a study by Shisanya and Hendriks [94] found that community gardens did not contribute significantly to household food security. Brun *et al.* [95] found in a study conducted in Senegal that home gardens did not significantly add to the family food security and nutrition of participating households. Likewise, KRPL-supported home gardens in Sragen District of Central Java did not provide optimal yield to the home-gardeners due to low rainfall and water shortages [96]. In Mempawah District of West Kalimantan, the proportion of food expenditures between households participating and not participating in the KRPL program did not show any statistical difference [26].

5.2 Food Access

Food access means the ability to access food physically and economically. Home gardening

enables constant physical access to food because of its proximity to home [97]. Due to its close proximity, the women of the house can always pick, pull, or cut the produce at the garden anytime she needs, whether for family consumption or sale [97,98]. Home gardens meet the second feature of food security as they yield produce that can be consumed or sold to obtain an income [97]. Some horticultural crops that can be grown in home-yard or small-scale gardens provide good returns [99]. The additional income can then be used to purchase other foods, farm inputs, and other household needs [100].

Numerous studies on the KRPL program showed that home gardening improves accessibility to food for participating households [5,20,23,25–27,85,87,101,102] through increased access to a variety of fresh foods, lower food expenditure, and additional income. KRPL households grow various kinds of food crops, especially vegetables. Amrullah *et al.* [23] reported that RPL households in Banten grew tomatoes, cauliflower, lettuce, bok choy, cabbage, long beans, spinach, chilies, celery, mustard, Chinese broccoli, and eggplants. In Bengkulu, RPL households grow 13 kinds of vegetables [85]. KRPL home gardens in West Kalimantan focuses on the five most consumed vegetables, namely, brown mustard (*Brassica juncea* L), amaranthus, tomato, water spinach, and chilies [102]. In addition to vegetables, women groups also grow fruits, tuber crops, medicinal plants, livestock, and fish [11,20,25,87]. These crops and animals are available in the home gardens, which are close to home, thus enhancing access to food.

Home gardens improve households' access to food by reducing household food expenditure and providing additional income. The amount of household consumption and extra income depends on the kinds and price of crops grown, the size of gardens, and household size. Amrullah *et al.* [23] reported that the value of home consumption and sales turnover from home gardens is Rp374,534 on average in a growing season, compared to Rp2,919,152 of total household income. In Kediri, the average income from home gardens under the KRPL program is Rp644,753 per year, compared to Rp158,290 per year from non-KRPL households [20]. In Bengkulu, home gardens under the KRPL program provide net returns of Rp14,051,000 per year and reduce the household food expenditure to Rp3,565,632 per year. In Mempawah West Kalimantan, optimal land utilization through KRPL contributes 3% to the total household income, and home gardens significantly increase household

income [26]. The KRPL program in Surakarta increased access to food and reduced household food expenditure [25].

Enhancing food access and the nutritional quality of household diets is the most essential benefit of home gardens to food security. Home gardening improves economic access to food because it allows many urban and rural poor families to have diverse fresh and nutritious produce [103]. Especially for low-income households where food affordability is a crucial issue, having home gardens ensures that the food is accessible. This is especially true for some conditions that lead to rising prices of foods, such as food price shock, conflict, and currency depreciation. Other factors include poor farm productivity, the inappropriate land tenure system, and pandemic, leading to food insecurity in rural areas [94]. In this regard, home gardening increases resilience through the provision of short-term relief [9].

The proximity of home gardening to home enables residents to access the food without barriers in terms of lack of transportation and time spent obtaining food. It has been shown that distance and transportation factors are sometimes limiting the ability of residents to get the types of foods they want [35]. Therefore, most residents will purchase foods at the nearest stores or market. Thus home gardening can be considered the most cost-efficient food source in terms of the absence of distance, transportation, and time barriers. In this regard, home gardening is particularly relevant to residents with physical disabilities and illness. Studies by Akrofi *et al.* [104] and Baiyegunhi and Makwangudze [74] show that home gardening is more important in HIV-positive households than in negative-HIV households. Home gardens provide a significant contribution to DDS in HIV-positive households [104].

In recent challenging situations due to Covid-19 pandemic, home gardening is proposed as a versatile option to address food insecurity. The pandemic could aggravate food insecurity in urban areas due to the food supply chain disruptions and the emergence of physical and economic barriers that limit access to food [41], [105]. Given its many demonstrated benefits, home gardening could be an effective strategy to enhance household food security during and after the Covid-19 pandemic [41]. A current surge in home food gardening is, to some extent, associated with the Covid-19 pandemic [106], and there is some correlation between home gardening and food security [105].

5.3 Food Utilization

As explained previously, food availability alone may not guarantee a household's food security. There should also be a food utilization dimension that deals with food quality and nutrient intake. In this regard, the KRPL program enhances household ability to access a higher diversity of fresh and nutritious produce than they might purchase otherwise. Annisahaq *et al.* [20] found that DDS of households participating in the KRPL program is higher than that of non-participating households. The average score for KRPL participants is 80.53, and that for non-participants is 62.32. From the eight food groups that participants had consumed, the group of tuber and root crops successfully reached the ideal score of 100, whereas rice, fruit and vegetables almost reached the ideal score. In non-participating households, only rice group that meets the ideal score. It can be concluded that the KRPL program improves dietary diversity [20,87].

An increase of DDS in KRPL areas was also reported by Purwantini *et al.* [5] based on their study in Pacitan East Java. The KRPL program had increased the score from 65.6% to 77.5%. Again, the score in participating households was better than that of non-participating households. Nevertheless, the score is still less than the ideal score of 100, indicating the need to improve the quality and diversity of foods to be consumed.

Purwantini *et al.* [5] investigated food consumption in KRPL and non-KRPL areas. Their study showed that the KRPL program provides positive impact on the increased energy and protein intake of the communities [11]. However, a further detailed analysis of the types of foods based on the nutrition adequacy score revealed that some foods are not yet balanced. Consumption of animal-based protein and tuber and root crops was still less than the recommended level. Likewise, consumption of vegetable and fruit was still a bit less than the ideal level. Therefore, the KRPL program should consider the inadequacy of these specific foods to select crops to be planted and animals to be raised. The KRPL groups may encourage cultivation of popular fruits and vegetables such as banana, papaya, lemon, and moringa. Types of animals that can be raised include goat, free-range chicken, and some kinds of fishes. In Southeast Sulawesi, cattle raising through traditional rearing method using either tethering or extensive system is common among smallholder farmers with relatively large house-yard and dry-lands [84,107].

Amrullah *et al.* [23] observed that KRPL participants grow a higher number of varieties of fresh vegetables, which then contribute to their more

dietary diversification. In Surakarta, the KRPL program helps meet nutritional needs for households [25]. The KRPL program increased food utilization through the processing of non-rice staples and the consumption of more nutritious and balanced diets [25]. Food diversity also contributes significantly to the diet quality by providing essential vitamins and minerals [31]. The positive impact of the KRPL program on households' nutritional status confirmed the findings of earlier studies in Indonesia. Ochse, as quoted by Galhena *et al.* [14], found a positive correlation between home gardens and households' nutritional status.

The positive impact of the home gardening program on nutrient intakes has been reported in several countries. Participating households under a gardening and nutrition project in Bangladesh grew many vegetable and fruit crops and improved their nutritional quality from those garden produce [16]. In Burkina Faso, an integrated agriculture and nutrition program improved mothers' dietary diversity and meat and fruit intake [108]. In Los Angeles USA, participants of the LA Sprouts program reported a reduction in their BMI and increase in dietary fiber intake [109]. A study by Webb [110] in the Eastern Cape, South Africa, showed that home gardens are associated with nutrition [94]. Home gardening enables households to have better access to a wider variety of foods, which improves total dietary consumption and enhances the supply and absorption of vital nutrients [29,54].

Home gardens produce a wide variety of fresh foods that increase the quantity and quality of nutrients available to households. To have an enriched and balanced diet, the families should aim to have a sufficient quantity and variety of their food supplies [100,103,104], and the addition of fruits and vegetables in a meal often makes other foods more palatable and can lead to overall increased food intake [100]. Various studies found that home gardens add the caloric intake and supplement staple-based diet with a substantial amount of proteins [47], vitamins [17,111], and minerals (International Institute for Rural Reconstruction, 1993 [111,112]). Therefore, households should take efforts to increase diversification of fruit and vegetable crops in their home gardens. Such diversification will improve the nutritional quality of garden produce in protein, vitamin, mineral, and fiber contents [111], which will boost the family's food security and nutritional status [113].

5.4 Food Stability

Home gardens are expected to improve food stability since their production occurs almost continuously all year round and their proximity to home ensures access to food at all times. However, stability is the least frequently investigated component of food security, so that the actual association between home gardens and food stability is not much understood, including with the KRPL program. For many researchers, stability is only like an additional, not an essential, component of food security [65]. Maxwell argued that stability is a critical component of each dimension (availability, access, and utilization) over time, rather than a stand-alone [65]. For this reason, stability might be the most challenging element of food insecurity to capture.

Soemarwoto [15] distinguishes two components of stability, namely, the constancy of production from one season to another and constancy from year to year. While constancy from year to year is less clear due to fluctuations in yield and market demand, constancy of production from season to season is stable. Soemarwoto argues that home gardens can be called *lumbung hidup* (living granary) because they can provide constant supply of produce throughout the year [15]. A similar condition is observed in Nhema communal area where households grow tubers, vegetables, and fruit trees to protect their food security and income from their agriculture's risk and uncertainty [113].

Some studies linked the stabilization aspect of food security with the ecological role of plants to influence the living and physical environment. For example, Huges and Philippe (as cited by Ajah *et al.* [97]) stated that plants, especially perennials, produce humus, help control erosion, and create shade. As such, trees can modify the garden condition and conserve the environment of other plants. It is argued that this ecological sustainability helps guarantee food availability over time from the garden [97]. However, this ecological sustainability role does not apply in the KRPL program in urban areas with garden size of less than 300 m² since the crops grown do not include trees and perennial crops. KRPL supported crops mainly consist of vegetables and sometimes secondary food crops that do not function to modify the climatic conditions of the garden [97].

Concerning the KRPL program, the constancy of production from year to year may apply only to selected home gardens. Residents of semi-urban and rural localities might have large home gardens where they can grow vegetables, fruits, and subsistence plants which can be harvested according

to need all the year. However, the KRPL program in urban areas is mostly implemented in small-sized gardens [114] and hence promoted mostly vegetables. In this regard, Kurniawan *et al.* [25] investigated the stability of food availability on the basis of the ability of KRPL garden crops to provide food continuously. The study found that the nature of KRPL was to help meet food needs of the households, so that it did not contribute much to the stability of food availability [25]. The main factor was the relatively small plots of KRPL gardens. Other factors included the types of crops grown, planting pattern, productivity, and the technical efficiency of inputs use [11].

To maximize the utilization of the small-sized plots, many gardeners use hydroponic systems [24,114,115] or planting media such as pots and polybags [23,56,116,117]. The hydroponic system uses large tubes of plastic filled with lava with holes along the sides for seedlings to be placed in and effectively addresses land constraints in urban settings [24]. While collective gardening using a hydroponic system can address land constraints and enable the harvest of produce all the year, there are institutional and technical issues [24,114] that often lead to difficulty to sustain its operation. Therefore, the constancy of production in KRPL supported home gardens is also related much to the sustainability of the home garden program.

As a government program, the KRPL program should provide continued benefits to participating households after its completion. Therefore, after the withdrawal of financial support from the government in year 3, member households are expected to continue implementing home gardening activities either collectively or individually. Factors that affect sustainability include functioning of seed garden, household participation, the role of local champion, KRPL infrastructure, market institution, crop selection and rotation, gardening skills, local government support, and gardening technology [118,119]. However, most KRPL-initiated home gardens cannot sustain their activities once the support from the government ends [118,119]. Non-continuation of home garden activities partly or entirely will disturb the constancy of production and hence the food stability.

6 Conclusion

This study aimed to determine the KRPL program's contribution to household food security in Indonesia. Household food security was assessed from food availability, access, utilization, and stability. Literature shows that home gardens under

the program improve food availability, access, and utilization. However, the program does not contribute to the improvement of food stability. Nevertheless, overall, the KRPL program enhances food security status of households participating in the program, though such status improvement is limited mainly to the period during the life of the program.

The KRPL program has been shown to strengthen the availability of food to households, notably vegetables, since most households in urban areas grow vegetable crops due to the small size of their yards. The types of vegetables grown are short-duration and popularly consumed varieties, which enable households to garden them year-round. A constant supply of vegetables throughout the year demonstrates that the program has boosted food availability to households. At the same time, the proximity of home gardens to dwellings means that increased production will strengthen access to food, as families can harvest them anytime without any physical and economic barriers. In addition, many households use income generated from garden produce to purchase other foods, indicating further strengthening of the ability to access food.

The KRPL program enhances the utilization of food by households. Literature shows that participation in the program improves DDS of households. This means that the KRPL program improves dietary diversity and hence the nutritional quality of consumed food. This is enabled by diversification of vegetable crops in home gardens, leading to the increased nutritional value of garden produce accessible to households. Many households also use income from garden produce and savings on food bills to purchase other nutritious foods, indicating that the quality of food accessible to family members has improved.

Food stability is the least topic being investigated, and the existing literature suggests that the KRPL program does not improve the food stability of households participating in the program. Home gardens in urban areas under the KRPL program cannot perform the ecological role of plants since they do not grow trees and perennial crops that are often linked to the stabilization aspect of food security. Moreover, in most cases, constancy of production from year to year is primarily hindered by the inability of women groups to sustain program activities after the withdrawal of government support. In other words, there is a need to improve the sustainability of home gardens to improve the stability of food availability, access, and utilization over time.

Given the many benefits of home gardens, the KRPL program is still an important strategy to address food insecurity and nutrition deficiency of low-income households. Future research should assess the sustainability of KRPL-supported home gardens and factors affecting it to derive viable models applicable in diverse circumstances. There is also a need for researches to assess the importance of home gardens for food production and livelihood enhancement in the present global Covid-19 pandemic. Other aspects such as the use of new technologies, access to extension services, and women empowerment need further research.

References:

- [1] FAO, Rome Declaration on World Food Security and World Food Summit Plan of Action, World Food Summit, 1996. <http://www.fao.org/3/W3613E/W3613E00.htm> (accessed March 5, 2021).
- [2] H. Saediman, A. Amini, R. Basiru, L.O. Nafiu, Profitability and Value Addition in Cassava Processing in Buton District of Southeast Sulawesi Province, Indonesia, *J. Sustain. Dev.* Vol. 8, No. 1, 2015, pp. 226–234.
- [3] H. Saediman, M.A. Limi, Rosmawaty, P. Arimbawa, Y. Indarsyih, Cassava consumption and food security status among cassava growing households in southeast sulawesi, *Pakistan J. Nutr.* Vol. 15, No. 12, 2016, pp. 1008–1016.
- [4] H. Saediman, H. Helviani, L. Refiana Said, S. Sarinah, S.A. Adha Taridala, L.O. Alwi, I. Sarimustaqiyma Rianse, Market Structure of Sago Starch in Southeast Sulawesi, Indonesia, *WSEAS Trans. Bus. Econ.* Vol. 18, 2021, pp. 628–635.
- [5] T.B. Purwantini, S. Saptana, S. Suharyono, Program Kawasan Rumah Pangan Lestari (KRPL) di Kabupaten Pacitan: Analisis Dampak dan Antisipasi ke Depan, *Anal. Kebijak. Pertan.* Vol. 10, No. 3, 2012, pp. 239–256
- [6] Saptana, Sunarsih, S. Friyatno, Prospek Model-Kawasan Rumah Pangan Lestari (M-KRPL) Dan Replikasi Pengembangan KRPL, *Forum Penelit. Agro Ekon.* Vol. 31, No. 1, 2013, pp. 67–87
- [7] World Food Programme, *WFP Indonesia Country Brief July 2018*, 2018. <https://docs.wfp.org/api/documents/WFP-0000073777/download> (accessed October 1, 2018).
- [8] H. Saediman, S. Aisa, M. Zani, M.A. Limi, W.O. Yusria, Food Security Status of Households in a Cassava-Growing Village in Southeast Sulawesi, Indonesia, *J. Agric. Ext.* Vol. 23, No. 1, 2019, pp. 199–209.
- [9] The Economist Intelligence Unit, *Global Food Security Index 2018: Building Resilience in the Face of Rising Food-Security Risks*, The Economist Intelligence Unit Limited, London, 2018.
- [10] M. Zani, H. Saediman, S. Abdullah, L. Daud, L. Yunus, Determinants of household food expenditure in a cassava growing village in southeast Sulawesi, *Acad. J. Interdiscip. Stud.* Vol. 8, No. 3, 2019, pp. 302–310.
- [11] T.B. Purwantini, Saptana, S. Suharyono, Program Kawasan Rumah Pangan Lestari (KRPL) di Kabupaten Pacitan: Analisis Dampak dan Antisipasi ke Depan, *Anal. Kebijak. Pertan.* Vol. 10, No. 3, 2012, pp. 239–256.
- [12] K. Anwar, Hardinsyah, Konsumsi Pangan dan Gizi Serta Skor Pola Pangan Harapan pada Dewasa Usia 19-49 Tahun di Indonesia, *J. Gizi Dan Pangan.* Vol. 9, No. 1, 2014, pp. 51–58.
- [13] S.O. Odebode, Assessment of home gardening as a potential source of household income in Adinyele local government are of Oyo state, Niger. *J. Hortic. Sci.* Vol. 11, No. 1, 2006, pp. 47–55.
- [14] D.H. Galhena, R. Freed, K.M. Maredia, Home gardens: a promising approach to enhance household food security and wellbeing, *Agric. Food Secur.* Vol. 2, No. 1, 2013, pp. 1–13.
- [15] O. Soemarwoto, G.R. Conway, The Javanese Homegarden, *J. Farming Syst. Res.* Vol. 2, No. 3, 1991, pp. 95–117.
- [16] V.N. Bushamuka, S. de Pee, A. Talukder, L. Kiess, D. Panagides, A. Taher, M. Bloem, Impact of a homestead gardening program on household food security and empowerment of women in Bangladesh, *Food Nutr. Bull.* Vol. 26, No. 1, 2005, pp. 17–25.
- [17] K.F. Wiersum, *Diversity and change in homegarden cultivation in Indonesia*, in: B.M. Kumar, P.K.R. Nair (Eds.), Springer, Dordrecht, 2006: pp. 13–24.
- [18] A.B. Cabalda, P. Rayco-Solon, J.A.A. Solon, F.S. Solon, Home Gardening Is Associated with Filipino Preschool Children's Dietary Diversity, *J. Am. Diet. Assoc.* Vol. 111, No. 5, 2011, pp. 711–715. .
- [19] H.P. Saliem, Kawasan Rumah Pangan Lestari (KRPL): Sebagai Solusi Pemantapan

- Ketahanan Pangan, in: *Prosiding Kongr. Ilmu Pengetah. Nas.* di Jakarta Tanggal 8-10 Novemb. 2011, 2011: pp. 1–10.
- [20] A. Annisahaq, N. Hanani, Syafrial, Pengaruh Program Kawasan Rumah Pangan Lestari (KRPL) dalam Mendukung Kemandirian Pangan dan Kesejahteraan Rumah Tangga (Kasus di Kelurahan Rejomulyo, Kecamatan Kota, Kota Kediri), *Habitat*. Vol. 25, No. 1, 2014, pp. 32–39.
- [21] L. Asnamawati, M. Berlian, Alni, Dampak pemberdayaan masyarakat melalui program kawasan rumah pangan lestari di Provinsi Bengkulu, in: *Prosiding Semin. Nas. Tah. Mat. Sains dan Teknol.* 2016, Jakarta, 2016, pp. 153–172.
- [22] G.N.Y. Suputra, I.G.S.A. Putra, I.D.P.O.S. Suardi, Evaluasi Dampak Program Kawasan Rumah Pangan Lestari (KRPL) pada Kelompok Wanita Tani (KWT) Tunas Sejahtera di Kecamatan Blahbatuh, Kabupaten Gianyar, *E-Journal Agribisnis Dan Agrowisata*. Vol. 5, No. 1. 2016, pp. 1-10.
- [23] E. Rastiyanto Amrullah, A. Pullaila, A. Ishida, H. Yamashita, Effects of Sustainable Home-Yard Food Garden (KRPL) Program: A Case of Banten in Indonesia, *Asian Soc. Sci.* Vol. 13, No. 7, 2017, pp. 1–9.
- [24] A. Febriyanti, V. Juwono, The Acceleration of Food Consumption Diversity Policy Implementation through Sustainable Food-Reserved Gardening: The Case of Jakarta, *Adv. Soc. Sci. Educ. Humanit. Res.* Vol. 167, 2017, pp. 94–100.
- [25] Y.Y. Kurniawan, A. Daerobi, B. Sarosa, Y.P. Pratama, Analisis Program Kawasan Rumah Pangan Lestari dan Hubungannya Dengan Ketahanan Pangan Serta Kesejahteraan Rumah Tanga (Studi Kasus di Kota Surakarta), *J. Ilmu Ekon. Terap.* Vol. 3, 2018, pp. 1–22.
- [26] A.K. Akbar, A.H.A. Yusra, Y.S.K. Dewi, Dampak Program Kawasan Rumah Pangan Lestari Terhadap Pendapatan dan Pengeluaran Pangan di Kabupaten Mempawah, *J. Soc. Econ. Agric.* Vol. 7, No. 1, 2018, pp. 9–17.
- [27] A.F. Lestari, R. Setyaningsih, Perbedaan Tingkat Keragaman Pangan Balita dan Tingkat Pendidikan Orang Tua di Rumah Tangga Kawasan Rumah Pangan Lestari (KRPL) Dan Non KRPL, *Amerta Nutr.* Vol. 2. No. 4, 2018, pp. 364–372.
- [28] S.N. Isnian, Narti, Y. Taufik, S.N. Isnian, Persepsi Wanita Tani dalam Program Kawasan Rumah Pangan Lestari (KRPL) di Kecamatan Kulisusu Kabupaten Buton Utara, *Bpsosek*. Vol. 21, No. 1. 2019, pp. 9–16.
- [29] R. Marsh, Building on traditional gardening to improve household food security, *Food Nutr. Agric.* Vol. 22, 1998, pp. 4–14.
- [30] M. Mohsin, M.M. Anwar, F. Jamal, F. Ajmal, J. Breuste, Assessing the role and effectiveness of kitchen gardening toward food security in Punjab, Pakistan: a case of district Bahawalpur, *Int. J. Urban Sustain. Dev.* Vol. 9, No. 1, 2017, pp. 64–78.
- [31] O. Soemarwoto, I. Soemarwoto, Karyono, E.M. Soekartadiredja, A. Ramlan, The Javanese home garden as an integrated agro-system., *Food Nutr. Bull.* Vol. 7, No. 3, 1985, pp. 44–47.
- [32] S.R. Mondal, Role of Traditional Home Gardens in Natural Resource Management, *Orient. Anthropol. A Bi-Annual Int. J. Sci. Man.* Vol. 9, No. 2, 2009, pp. 209–218..
- [33] P. Ghosh, Outlook on Baranaaja: The traditional mixed cropping system of the central Himalaya, *Outlook Agric.* Vol. 38, No. 1, 2009, pp. 101–104.
- [34] V. Niñez, Household Gardens : Theoretical and Policy Considerations, *Agric. Syst.* Vol. 23, 1987, pp. 167–186.
- [35] W.W. Furness, C.M. Gallaher, Food access, food security and community gardens in Rockford, IL, *Local Environ.* Vol. 23, No. 4, 2018, pp. 414–430.
- [36] L. Lawson, *City Bountiful A Century of Community Gardening in America*, First Edition, University of California Press, Berkeley, 2005.
- [37] D. Maxwell, C. Levin, J. Csete, Does urban agriculture help prevent malnutrition? Evidence from Kampala, *Food Policy.* Vol. 23, No. 5, 1998, pp. 411–424.
- [38] C. Buchmann, Cuban Home Gardens and Their Role in Social–Ecological Resilience, *Hum. Ecol.* Vol. 37, No. 6, 2009, pp. 705–721.
- [39] J. Birky, E. Strom, Urban Perennials: How Diversification has Created a Sustainable Community Garden Movement in The United States, *Urban Geogr.* Vol. 34, No. 8, 2013, pp. 1193–1216.
- [40] S.R.A. Aziz, N.H.M. Zain, N.H.N. Zulkipli, N.A.A. Azam, Factors influencing people’s participation in home garden project during covid-19 pandemic: A review, *Int. J. Adv.*

- Trends Comput. Sci. Eng.* Vol. 9, No 1.4 (Special Issue), 2020, pp. 184-191
- [41] R. Lal, Home gardening and urban agriculture for advancing food and nutritional security in response to the COVID-19 pandemic, *Food Secur.* Vol. 12, No. 4, No. 1, 2020, pp. 871-876
- [42] H. Tynsong, B.K. Tiwari, Plant Diversity in the Homegardens and their Significance in the Livelihoods of War Khasi Community of Meghalaya, North-east India, *J. Biodivers.* Vol. 1, No. 1, 2010, pp. 1-11.
- [43] E. Mattsson, M. Ostwald, S.P. Nissanka, What is good about Sri Lankan homegardens with regards to food security? A synthesis of the current scientific knowledge of a multifunctional land-use system, *Agrofor. Syst.* Vol. 92, No. 6, 2018, pp. 1469-1484.
- [44] K. Vijayaraghavan, M.U. Nayak, M.S. Bamji, G.N.V. Ramana, V. Reddy, Home gardening for combating vitamin A deficiency in rural India, *Food Nutr. Bull.* Vol. 18, No. 4, 1997, pp. 337-343.
- [45] B. Pritchard, M. Vicol, A. Rammohan, E. Welch, Studying home gardens as if people mattered: Why don't food-insecure households in rural Myanmar cultivate home gardens?, *J. Peasant Stud.* Vol. 46, Vol. 5, 2019, pp. 1047-1067.
- [46] E.C.M. Fernandes, P.K.R. Nair, An evaluation of the structure and function of tropical homegardens, *Agric. Syst.* Vol. 21, No. 4, 1986, pp. 279-310.
- [47] E. Torquebiau, Are tropical agroforestry home gardens sustainable?, *Agric. Ecosyst. Environ.* Vol. 41, No. 2, 1992, pp. 189-207.
- [48] S.R. Mondal, Role of Traditional Home Gardens in Natural Resource Management Some Observations on Ethnic Communities of Sub Himalayan North Bengal, *Orient. Anthropol.* Vol. 9, No. 2, 2009, pp. 209-218.
- [49] S. Surni, H. Saediman, Gender participation in palm sugar processing in Kolaka district of Southeast Sulawesi, *WSEAS Trans. Environ. Dev.* Vol. 16, 2020, pp. 34-39.
- [50] M.E. Kabir, E.L. Webb, T.K. Dhar, Are Home-gardens Managed Properly in Rural Bangladesh?, *Asia. Pac. J. Rural Dev.* Vol. 20, No. 2, 2010, pp. 47-68..
- [51] V. Ninez, Introduction: household gardens and small-scale food production., *Food Nutr. Bull.* Vol. 7, No. 3, 1985, pp. 1-5.
- [52] D.G. Maxwell, Alternative food security strategy: A household analysis of urban agriculture in Kampala, *World Dev.* Vol. 23, No. 10, 1995, pp. 1669-1681.
- [53] R. Kortright, S. Wakefield, Edible backyards: a qualitative study of household food growing and its contributions to food security, *Agric. Human Values.* Vol. 28, No. 1, 2011, pp. 39-53.
- [54] A. Talukder, L. Kiess, N. Huq, S. De Pee, I. Darnton-Hill, M.W. Bloem, Increasing the production and consumption of vitamin A-rich fruits and vegetables: Lessons learned in taking the Bangladesh homestead gardening programme to a national scale, *Food Nutr. Bull.* Vol. 21, No. 2, 2000, pp. 165-172.
- [55] Murniati, A.A. Nawir, L. Rumboko, T. Gumartini, *The Historical National Overview and Characteristics of Rehabilitation Initiatives*, in: A.A. Nawir, Murniati, L. Rumboko (Eds.), CIFOR, Bogor, 2007.
- [56] S.H. Widayanti, *Evaluasi kinerja model kawasan rumah pangan lestari pada balai besar pengkajian dan pengembangan teknologi pertanian melalui pendekatan*, Institut Pertanian Bogor, 2015.
- [57] Badan Ketahanan Pangan, *Pekarangan Pangan Lestari (P2L)*, Badan Ketahanan Pangan. (Online), 2021. <http://bkp.pertanian.go.id/kawasan-rumah-pangan-lestari> (accessed May 10, 2021).
- [58] Badan Ketahanan Pangan, *Petunjuk Teknis Bantuan Pemerintah Kegiatan Kawasan Rumah Pangan Lestari (KRPL) Tahun 2019*, Badan Ketahanan Pangan Kementerian Pertanian RI, Jakarta, 2019.
- [59] Kementerian Pertanian Republik Indonesia, *Laporan Tahunan Badan Ketahanan Pangan Tahun 2015*, Badan Ketahanan Pangan Kementerian Pertanian RI, Jakarta, 2016.
- [60] H. de Haen, S. Klasen, M. Qaim, What do we really know? Metrics for food insecurity and undernutrition, *Food Policy.* Vol. 36, No. 6, 2011, pp. 760-769
- [61] D. Headey, O. Ecker, Rethinking the measurement of food security: From first principles to best practice, *Food Secur.* Vol. 5, No. 3. 2013, pp. 327-343
- [62] J. Coates, Build it back better: Deconstructing food security for improved measurement and action, *Glob. Food Sec.* Vol. 2, No. 3, 2013, pp. 188-194
- [63] A. Wineman, Multidimensional Household Food Security Measurement in Rural Zambia, *Agrekon.* Vol. 55, No. 3, 2016, pp. 278-301
- [64] C.U. Ike, P.T. Jacobs, C. Kelly, A

- multidimensional approach to measuring household food security in Taraba State, Nigeria: comparing key indicators, *Dev. Pract.* Vol. 27, No. 2, 2017, pp. 234-246
- [65] D. Maxwell, J. Coates, B. Vaitla, *How do different indicators of household food security compare? Empirical evidence from Tigray*, Feinstein International Center, Medford, USA, 2013.
- [66] M. Izraelov, J. Silber, An assessment of the global food security index, *Food Secur.* Vol. 11, No. 5, 2019, pp. 1135–1152.
- [67] D. Maxwell, C. Levin, M. Armar-Klemesu, M. Ruel, S. Morris, C. Ahiadeke, *Urban livelihoods and food and nutrition security in Greater Accra, Ghana*, International Food Policy Research Institute (IFPRI), 2000.
- [68] N.H. Broussard, S. Tandon, *Food Insecurity Measures: Experience-Based Versus Nutrition-Based Evidence From India, Bangladesh, and Ethiopia*, Economic Research Service USDA, 2016.
- [69] A. Mabiso, B. Cunguara, R. Benfica, Food (In)security and its drivers: insights from trends and opportunities in rural Mozambique, *Food Secur.* Vol. 6, No. 5, 2014, pp. 649–670.
- [70] O. Ecker, C. Breisinger, *The food security system: A new conceptual framework*, IFPRI Discussion Paper 1166. Washington, D.C.: International Food Policy Research Institute (IFPRI), 2012
- [71] Abdullah, D. Zhou, T. Shah, S. Ali, W. Ahmad, I.U. Din, A. Ilyas, Factors Affecting Household Food Security in Rural Northern Hinterland of Pakistan, *J. Saudi Soc. Agric. Sci.* Vol. 18, No. 2, 2019, pp. 201-210.
- [72] K. Brüssow, A. Faße, U. Grote, Implications of climate-smart strategy adoption by farm households for food security in Tanzania, *Food Secur.* Vol. 9, No. 6, 2017, pp. 1203–1218.
- [73] FAO, IFAD WFP, *The State of Food Insecurity in the World 2015: Meeting the 2015 International Hunger Targets*, FAO, Rome, 2015.
- [74] L.J.S. Baiyegunhi, K.E. Makwangudze, Home Gardening and Food Security Status of HIV/AIDS Affected Households in Mpophomeni, KwaZulu-Natal Province, South Africa, *J. Hum. Ecol.* Vol. 44, No. 1, 2013, pp. 1–8.
- [75] K. Reincke, E. Vilvert, A. Fasse, F. Graef, S. Sieber, M.A. Lana, Key factors influencing food security of smallholder farmers in Tanzania and the role of cassava as a strategic crop, *Food Secur.* Vol. 10, No. 4, 2018, pp. 911–924.
- [76] R. Gross, H. Schoeneberger, H. Pfeifer, H. Preuss, *The four dimensions of food and nutrition security: definitions and concepts*, Inwent and FAO, 2000.
- [77] P.A. Lorenzana, C. Mercado, Measuring household food security in poor Venezuelan households, *Public Health Nutr.* Vol. 5, No. 6a. 2002, pp. 851–857.
- [78] C.B. Barrett, Measuring Food Insecurity, *Science (80-.)*. Vol. 327, No. 5967, 2010, pp. 825–828.
- [79] M.B. Masuku, M.M. Sithole, The impact of HIV/AIDS on food security and household vulnerability in Swaziland, *Agrekon*. Vol. 48, No. 2, 2009, pp. 200-222
- [80] H. Saediman, Mustika, L. Nalefo, M. Tufaila, M. Zani, Cost and Return Analysis of Rice Farming and Brick Making in South Konawe District of Southeast Sulawesi, *Int. J. Sci. Technol. Res.* Vol. 8, No. 10, 2019, pp. 835–838.
- [81] S. Surni, H. Saediman, F. Wulandari, M. Zani, L. Yunus, S.A.A. Taridala, Profitability and constraints of small-scale tomato production in Baubau municipality of Southeast Sulawesi, *WSEAS Trans. Environ. Dev.* Vol. 16, 2020, pp. 219–225.
- [82] H. Saediman, Y. Indarsyih, S. Abdullah, S.A. Fyka, I.S. Mboe, Assessing major drivers of crop shifting from rice to horticultural production: a case of Landono sub-regency in Southeast Sulawesi, *IOP Conf. Ser. Earth Environ. Sci.* Vol. 724, 2021, 012006.
- [83] H. Saediman, L.O. Lasmin, M.A. Limi, U. Rianse, L. Geo, Rice Farmers' Perception of Climate Variability in South Konawe District of Southeast Sulawesi, *Int. J. Sci. Technol. Res.* Vol. 9, No. 2, 2020, pp. 3128–3132.
- [84] H. Saediman, M.A. Limi, Y. Indarsyih, S. Abdullah, W.O. Yusria, Rice farmers' adaptation practices to climate change: a case of Konda subdistrict in Southeast Sulawesi, *IOP Conf. Ser. Earth Environ. Sci.* Vol. 724, 2021, 012102.
- [85] U.P. Astuti, B. Honorita, *Studi Ekonomi Pemanfaatan Lahan Pekarangan Melalui Penerapan Model Kawasan Rumah Pangan Lestari di Kota Bengkulu*, in: Pros. Semin. Inov. Teknol. Pertan. Spesifik Lokasi Mendukung Empat Sukses Kementerian. Pertan. Di Provinsi Bengkulu, 2012, pp.

- 233–237.
- [86] N.H. Kario, Impelementasi Mendukung Ketahanan Pangan Melalui Kegiatan M-KRPL di Kota Kupang Nusa Tenggara Timur, *Agritech*. Vol. 17, No. 1, 2015, pp. 1–10.
- [87] Saptana, T.B. Purwantini, Y. Supriyatna, Ashari, A.M. Ar-Rozi, T. Nurasa, S. Haryono, I.W. Rusastra, J. Situmorang, *Dampak Pengembangan Model Kawasan Rumah Pangan Lestari Terhadap Kesejahteraan Rumah Tangga dan Ekonomi di Perdesaan*, Pusat Penelitian Sosial Ekonomi dan Kebijakan Pertanian, Bogor, 2011.
- [88] S. Lesmayati, R. Qomariah, Teknologi Pengolahan Komoditas Ubi-Ubian Mendukung Pengembangan Agroindustri di Kawasan Rumah Pangan Lestari (KRPL), in: *Pros. Semin. Nas. Inov. Teknol. Pertan. Spesifik Lokasi*, Banjar Baru 6-7 Agustus 2014, Banjar Baru, 2014, pp. 619–627.
- [89] N.I. Larson, M.T. Story, M.C. Nelson, Neighborhood Environments: Disparities in Access to Healthy Foods in the US, *Am. J. Prev. Med.* Vol. 36, No. 1, 2009, pp. 74–81.
- [90] P.A. Carney, J.L. Hamada, R. Rdesinski, L. Sprager, K.R. Nichols, B.Y. Liu, J. Pelayo, M.A. Sanchez, J. Shannon, Impact of a Community Gardening Project on Vegetable Intake, Food Security and Family Relationships: A Community-based Participatory Research Study, *J. Community Health*. Vol. 37, No. 4, 2012, pp. 874–881.
- [91] V. Niñez, Working at half-potential: Constructive analysis of home garden programmes in the Lima slums with suggestions for an alternative approach, *Food Nutr. Bull.* Vol. 7, No.3, 1985, pp. 1–9.
- [92] D.H. Holben, M.C. McClincy, J.P. Holcomb, K.L. Dean, C.E. Walker, Food security status of households in Appalachian Ohio with children in Head Start, *J. Am. Diet. Assoc.* Vol. 104, No. 2, 2004, pp. 238–241.
- [93] L.C. Hopkins, D.H. Holben, Food insecure community gardeners in rural Appalachian Ohio more strongly agree that their produce intake improved and food spending decreased as a result of community gardening compared to food secure community gardeners, *J. Hunger Environ. Nutr.* Vol. 13, No. 4, 2018, pp. 540–552.
- [94] S.O. Shisanya, S.L. Hendriks, The contribution of community gardens to food security in the Maphephetheni uplands, *Dev. South. Afr.* Vol. 28, No.4, 2011, pp. 509–526.
- [95] T. Brun, J. Reynaud, S. Chevassus-Agnes, Food and Nutritional Impact of One Home Garden Project in Senegal, *Ecol. Food Nutr.* Vol. 23, 1989, pp. 91–108.
- [96] R. Oelviani, A. Hermawan, Zul Irfan, A. Choliq, Potensi dan Prospek Pemanfaatan Lahan Pekarangan untuk Mendukung Ketahanan Pangan Rumah Tangga Petani di Kabupaten Sragen, Provinsi Jawa Tengah, in: *Pros. Semin. Nas. Optim. Lahan Pekar. Untuk Peningkatan Perekon. Masy. Dan Pengemb. Agribisnis*, 2012, pp. 197–208.
- [97] A.I. Ajah, S.I.N. Agera, S.E. Ejembi, Prospects of the Contribution of Home Gardens to Food Security in Our Households, *J. Res. For. Wildl. Environ.* Vol. 5, No. 1, 2013, pp. 23–27.
- [98] B.M. Kumar, P.K.R. Nair, The enigma of tropical homegardens, *Agrofor. Syst.* Vol. 61–62, No.1-3, 2004, pp. 135–152..
- [99] H. Saediman, L.O. Alwi, I.S. Rianse, S.A.A. Taridala, S. Salahuddin, Comparative Profitability of Melon and Watermelon Production in South Konawe District of Southeast Sulawesi, *WSEAS Trans. Bus. Econ.* Vol. 17, 2020, pp. 933–939.
- [100] B.M. Jacobs, M. Aliber, A.A. Oyelana, Investigating the Contribution of Home Gardening to Household Food Security with regard to Dietary Diversity, *J. Hum. Ecol.* Vol. 55, No. 1-2, 2016, pp. 80–91.
- [101] S.F. Zahro, *Kontribusi Pengembangan Kawasan Rumah Pangan Lestari Dalam Mendukung Kesejahteraan Masyarakat: Studi Kasus Desa Banjarsari, Kecamatan Pacitan, Kabupaten Pacitan, Jawa Timur*, Institut Pertanian Bogor, 2012.
- [102] N.P. Rini, E. Dolorosa, D. Kurniari, Evaluasi Program Kawasan Rumah Pangan Lestari (KRPL) di Desa Mekar Sari Kecamatan Serawai Kabupaten Sintang, *J. Soc. Econ. Agric.* Vol. 8, No. 1, 2019, pp. 51–61.
- [103] M.L. Chadha, M.O. Oluoch, Home-based vegetable gardens and other strategies to overcome micronutrient malnutrition in developing countries, *Food Nutr. Agric.*, Vol. 32, 2003, pp. 17–23.
- [104] S. Akrofi, I.D. Brouwer, L.L. Price, P.C. Struik, Home Gardens Contribute Significantly to Dietary Diversity in HIV/AIDS Afflicted Households in Rural Ghana, *J. Hum. Ecol.* Vol. 31, No. 2, 2010, 125–134.

- [105] L. Mullins, S. Charlebois, E. Finch, J. Music, Home food gardening in Canada in response to the covid-19 pandemic, *Sustain.* Vol. 13, No. 6, 2021, 3056
- [106] M.J.F. Montefrio, Interrogating the “productive” home gardener in a time of pandemic lockdown in the Philippines, *Food and Foodways.* Vol. 28, No. 3, 2020, pp. 216-225
- [107] H. Saediman, S. Tanggapili, Bahari, L. Yunus, S. Abdullah, S.A.A. Taridala, Management Characteristics of Small-Scale Beef Cattle Production in Konawe District of Southeast Sulawesi, *Biosci. Res.* Vol. 16, No. 4, 2019, pp. 3854-3860.
- [108] D.K. Olney, L. Bliznashka, A. Pedehombga, A. Dillon, M.T. Ruel, J. Heckert, A 2-year integrated agriculture and nutrition program targeted to mothers of young children in Burkina Faso reduces underweight among mothers and increases their empowerment: A cluster-randomized controlled trial, *J. Nutr.* Vol. 146, No. 5, 2016, pp. 1109-1117
- [109] L.E. van Lier, J. Utter, S. Denny, M. Lucassen, B. Dyson, T. Clark, Home Gardening and the Health and Well-Being of Adolescents, *Health Promot. Pract.* Vol. 18, No. 1, 2017, pp. 34–43.
- [110] N. Webb, Food-gardens and nutrition: Three Southern African case studies, *J. Fam. Ecol. Consum. Sci. /Tydskrif Vir Gesinsekologie En Verbruikerswetenskappe.* Vol. 28, No. 1, 2010, pp. 62-67
- [111] International Institute for Rural Reconstruction, *The bio-intensive approach to small-scale household food production*, International Institute of Rural Reconstruction, Silang, Cavite, Philippines, 1993.
- [112] Z. Asfaw, Z. Woldu, Crop associations of home gardens in Welayta and Gurage in Southern Ethiopia., *SINET: Ethiop. J. Sci.* Vol. 20, No. 1, 1997, pp. 73-90
- [113] A. Maroyi, Traditional homegardens and rural livelihoods in Nhema, Zimbabwe: a sustainable agroforestry system, *Int. J. Sustain. Dev. World Ecol.* Vol. 16, No. 1, 2009, pp. 1–8.
- [114] Mahrannisa, Agussabti, S. Kasimin, Analysis of the Effectiveness of Sustainable Food House Area Program (Krppl) in Utilization of Yard Land in Banda Aceh, *Russ. J. Agric. Socio-Economic Sci.* Vol. 85, No. 1, 2019, pp. 153–162.
- [115] P. Tutuko, T. Widiyaningtyas, E. Sonalitha, B. Nurdewanto, Pemberdayaan Kelompok Rumah Pangan Lestari dalam Budidaya Tanaman Hidroponik, *J. Akses Pengabd. Indones.* Vol. 3, No. 1, 2018, pp. 7–16.
- [116] Eliza, S. Tarumun, N. Dewi, M. Syaifullah, Contribution of Farming Sustainable Food House Area (KRPL) on Household Economics in Pekanbaru City, in: *Proc. Int. Semin. Role Funct. Women a Just Prosperous Soc.*, Centre for European Studies, University of Indonesia, Depok, 2017, pp. 363-374.
- [117] H.H. Sibyan, *Upaya Peningkatan Ketahanan Pangan Rumah Tangga Melalui Kawasan Rumah Pangan Lestari (KRPL) di Dusun Bulurejo Desa Kepuhrejo Kecamatan Kudu Kabupaten Jombang*, Universitas Islam Negeri Sunan Ampel Surabaya, 2018.
- [118] R.M. Fitrilia, *Keberlanjutan Kawasan Rumah Pangan Lestari (KRPL) di Kota Malang (Studi Kasus pada 11 Kelurahan)*, Universitas Brawijaya, 2018.
- [119] T. Pujiana, K.K. Rangga, Y.A. Syarief, A. Mutolib, Strategi Pengembangan Program Kawasan Rumah Pangan Lestari Kabupaten Tulang Bawang Barat, *J. Ilm. Membangun Desa Dan Pertan.* Vol. 5, No. 3, 2020, pp. 79-86

**Creative Commons Attribution
License 4.0(Attribution 4.0
International ,CC BY 4.0)**

This article is published under the terms of the Creative Commons Attribution License 4.0
https://creativecommons.org/licenses/by/4.0/deed.en_US