

# Influence of Home Gardening on Household Food Security in Rarieda Sub-County of Siaya County in Kenya

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## ABSTRACT

The number of people lacking food security globally is on the rise despite the numerous global interventions put in place to address it. About 2.3 billion people lack food security, with 828 million of them being undernourished. In Kenya, approximately 17 million people are food insecure with two million relying on food relief. Almost 80% and 68% of Siaya and Rarieda households are not food secure. This study employed cross-sectional research design to examine the influence of home gardening on household food security in Rarieda sub-County. Analytical results indicated that about 73.53% of the respondents practiced home gardening to boost household food security. Grains, horticultural crops, aquaculture and livestock farming were characteristic features of home gardening. The results indicated a strong positive and significant correlation between home gardening and household food security ( $r=0.633$ ;  $p<0.000$ ) with a composite mean and standard deviation of 3.23 and 1.315, respectively. The study concluded that home gardening strongly, positively and significantly influenced household food security in Rarieda sub-County. The study recommended that home gardening be embraced and promoted not only in Rarieda but also in Kenya at large so as enhance food security.

**Keywords:** Home gardening, Household food security, Rarieda sub-County

## BACKGROUND OF THE STUDY

The World Food Summit defined food security as a situation where all people have adequate economic and physical access to enough, nutritious and safe food to meet their needs for a healthy and active life at all times (FAO et al., 1996). This definition outlines four dimensions of food availability, accessibility, utilization, and stability. Availability is determined by supply and production of food, accessibility by financial capability levels, utilization by variety and nutrition while stability implies the constancy of the first three dimensions over time (FAO et al., 2020). These dimensions should exist for a household to be considered as being food secure. However, the world over has on no occasion been able to declare the globe food secure. As a result, food insecurity has remained a global challenge despite the numerous interventions that have been put in place to address it (FAO et al., 2022).

Estimates by Food and Agriculture Organization (FAO) showed that approximately 278 million people (19.1%) in Africa lacked food security (FAO et al., 2021). These statistics were greater than world's average of 8.9%, with Africa leading across all regions (FAO et al., 2020). In 2022, global hunger index ranked Kenya 94<sup>th</sup> out of 121 countries with a score of 23.5, implying that the country had a serious level of hunger (GFSI, 2022). About 17 million Kenyans lack food security with 2 million of them living on food relief (KNBS, 2018, FAO et al., 2019). Siaya County suffers high food insecurity with GoK (2014) reporting that

80.7% of households in the County lacked food security. In Rarieda sub-County, 68% of households lacked food security (KNBS, 2019). This was higher than other sub-Counties in the County, for instance, Gem sub-County which had 37% of households lacking food security, Ugunja had 46.6% and Bondo was at 56% (Obonyo et al., 2016; Otieno, 2014; Oloo, 2021). Previous researches on food security in the sub-County focused on other variables such as socio-cultural determinants of household food security (Musyoka, 2021). Guided by the theories of food availability decline and food endowment and entitlement (Sen, 1981, 1984), this study sought to examine the influence of home gardening on household food security in Rarieda sub-County. The findings of this study can help review local and national food security policies particularly the implementation of food security initiatives into the rural development projects. They further create awareness on the influence of home gardening on household food security and add to the existing body of knowledge.

## LITERATURE REVIEW

Home gardening is agricultural production on lands adjacent to homesteads (Odebode, 2016). Studies by Galhena (2013) in Sri-Lanka, Boone and Taylor (2016) in Nicaragua, and Wright (2014) in Philippines resolved that home gardening system had the ability to enhance food security by enhancing access to high quality calories food in the form of vegetables and fruits. Further, these studies revealed how and why home gardening system should be expanded and supported to address the present issues of undernourishment. Senerathna and Ginigaddara (2019) undertook a study in northern Sri-Lanka on the influence of home gardening system on food security and livelihoods of households headed by women. The results of their study revealed that home gardening had a greater impact in promoting food security and livelihoods among women-headed households. However, the study focused on households headed by women. Women headed households are normally characterized by low income and most of them have no access or ownership to land. This created a gap for this study which focused on households headed by both women and men in Rarieda Sub-County so as to bridge the gap.

A study in Ghana by Akrofi (2012) focused on contributions of home gardening to food security amongst HIV and AIDS households. The study found out that home gardening provided households with improved nutrition through the provision of nutritious food making such households food secure. Another study by Baiyegunhi and Makwangudze (2013) in South Africa found out that home gardening provided significant contribution to dietary diversity score to HIV-positive households. However, the two studies focused on households living with HIV and AIDS which encounters challenges of poor economic conditions and labor shortage. This provided a gap for this study which looked at all households irrespective of their HIV and AIDS status.

Musotsi et al. (2008) undertook a study in Bungoma on the influence of home gardening on household food security. The findings of this study revealed that home gardening remained the most important agricultural system. The daily nutritional demands and household needs could be accessed in the established home gardens. However, the study focused on crops and livestock aspect of home gardening. It did not focus on fruit trees and fish farming which are also part of home gardening systems. Therefore, a study focusing on all aspects of home gardening is likely to yield different results. Hence, the need for this study which sought to examine the influence of home gardening systems on household food security in Rarieda sub-County.

A study by Huho and Muriuki (2021) found out that home gardening played a major role in achieving food security among households in Machakos. The study revealed that home gardening produced fresh vegetables and fruits. Farmers sold some of their produce to the nearest markets to get income which they used to purchase other food items. However, the study by Huho and Muriuki (2021) was qualitative in approach thus creating a gap for this study which used both qualitative and quantitative approaches.

Households with home gardens enhanced the quality of their diets by consuming vegetables rich in Vitamins A and C, and are able to access dietary diversity (Boedecker et al., 2019). Chepkirui (2019) related the quality of women diet directly to the composition of home gardens. The researcher found a positive correlation between garden size and number of crops with nutrient diversity and micronutrient adequacy. Further, this study revealed that home gardens provided a buffer to nutritional deficiencies due to their rich diversity which encourages dietary diversity and nutritional benefits. However, the study focused on the influence home garden on dietary diversity and micronutrient adequacy among women of reproductive age thereby addressing the utilization tenet of food security. This created a gap for this study which focused on all the four dimensions of food security and on both male and female household heads.

Hansen et al. (2023) carried out a study in Siaya County. The study aimed to identify perceptions and experiences among rural caregivers of children less than five years and local stakeholders working in the fields of agriculture and nutrition with regard to home gardening in Siaya County. The findings of the study revealed that home gardening was beneficial for household nutrition, finances and women empowerment. For instance, home gardening boosted finances through increased home production and thus saving on food purchases. However, the study was based on perception and experiences rather than quantitative assessment, a gap filled by this study which employed both qualitative and quantitative approach. The study also brought forth the concept of women empowerment through home gardening system which is not the concern of this study.

## **METHODOLOGY**

### **Research design**

This study was anchored on a cross-sectional research design which allowed for one-time data collection, was affordable and incorporated both quantitative and qualitative analyses. The study data was collected from farm households and key informants. The unit of analysis was the households while the heads of household were the respondents.

### **Study locale**

The study was undertaken in Rarieda sub-County of Siaya County, Kenya. The sub-County, whose area is approximately 405 square kilometers, has a population of 152,570 persons representing 25,428 households according to 2019 census report (KNBS, 2019). It has five wards namely: North Uyoma, East Asembo, West Uyoma, West Asembo, and South Uyoma constitutes Rarieda sub- County. The wards are further subdivided into 23 Sub-locations (GoK, 2018). The sub-County lies between latitudes  $0^{\circ}15'$  North to  $0^{\circ}26'$  South of the equator, and longitudes  $34^{\circ}15'$  East to  $34^{\circ}29'$  East of the Prime Meridian.

The sub-County experiences equatorial climate throughout the year. However, nearness to Lake Victoria has modified the climate such that it does not display the characteristics of a typical equatorial climate. The sub-County experiences long rains that start in March to June and short rains that start in August to November. However, the area's rainfall is unreliable and this has impacted subsistence agriculture resulting to escalated cases of food insecurity in the sub-County (Siaya County Integrated Development Plan, 2018)

The land use activities in the sub-County consist of residential, gold mining, charcoal burning, brick making and agriculture (Siaya County Integrated Development Plan, 2018). Approximately 60% households practice subsistence production of maize, sorghum, millet, sweet potatoes, beans, cassava, cotton, pawpaw, mango, watermelon and vegetables, and small-scale livestock keeping of upgrade and pure dairy cattle, zebu, local goat, sheep and poultry (Siaya County Integrated Development Plan, 2018; Clinton et al., 2018; Thumbi et al., 2015). The average farm size in sub-County is 1.5ha and soil types ranges from black cotton

soil in Madiany to sandy, loamy, and red volcanic soils in Rarieda Division (Siaya County Integrated Development Plan, 2018). The soils are generally poor due to over-cultivation resulting to low productivity hence lack of food security.

### Sample size determination and sampling

The study employed the Fishers et al. formula to come up with the sample size of 384 respondents was used. The questionnaires were administered to the 384 household heads selected from the five wards in Rarieda sub-County. The sample size per ward used in the study was achieved by dividing the total number of households from each ward by the total households of the whole sub-County and the multiplied by the total sample size as shown in Table 1.

Table 1: Sample size determination from each ward in Rarieda sub-County

No.	Name of ward	Total population	Number of households	Sample Size
1	East Asembo	47,497	$\frac{47497}{6} = 7916$	$\frac{7916}{25428} \times 384 = 120$
2	West Asembo	29,441	$\frac{29441}{6} = 4906$	$\frac{4906}{25428} \times 384 = 74$
3	North Uyoma	32,322	$\frac{32322}{6} = 5387$	$\frac{32322}{25428} \times 384 = 81$
4	West Uyoma	22,759	$\frac{22759}{6} = 3793$	$\frac{22759}{25428} \times 384 = 57$
5	South Uyoma	20,551	$\frac{20551}{6} = 3425$	$\frac{3425}{25428} \times 384 = 52$
<b>Total</b>	<b>5 Wards</b>	<b>152,570</b>	<b>25,428</b>	<b>384</b>

Source: Modified from KNBS (2019)

Stratified random sampling was used to get the individual household heads from the sample size for each ward. Questionnaires were administered to the 384 household heads who provided relevant information to the study. Purposive sampling was applied to get the key informants who gave holistic and representative information on the sub-County's food security status.

### Data analysis and results presentation

Quantitative data was processed in Microsoft Excel and analysis was done using Statistical Package for Social Science (SPSS version 22). Descriptive statistics were used to portray the demographic characteristics of the respondents and the proportional relationship between aspects of home gardening and household food security. Pearson product moment correlation was used to assess how food security was predicted by home gardening. Results were tabulated and presented in percentages, standard deviations (SD), and means, followed by an interpretation and discussion of the same. Qualitative data was analyzed by

creating relevant themes and patterns.

### Ethical considerations

A research permission was given by Maseno University through approval of the proposal by School of Graduates Studies and Ethics Review Committee of the university. Furthermore, approval of ward administrators to undertake the study in their area of jurisdiction was sought. Informed consent was adhered to by the respondents signing the consent forms. Participation in the study was on voluntary basis. Respect for anonymity and confidentiality was guaranteed through coded identifiers in questionnaires administered without applying real respondent names. The purpose of the study was clearly stated to clear any ambiguity and misunderstanding from the respondents on information collection and use.

## RESULTS AND DISCUSSION

### Demographic characteristics of the respondents

This section looked at gender, age, household heads, educational qualifications, household land sizes, level of household monthly incomes and main occupation as the main demographic characteristics of the respondents in the study area. The aspect of gender was important as it revealed the gender roles in food security while age also indicated the age group majorly involved in food production. The outcome is highlighted in Table 2.

Table 2: Demographics characteristics of the respondents

Characteristics	Frequency	Percent
<b>Respondents' Gender</b>		
Male	149	48.69%
Female	157	51.31%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Respondents' Age (Years)</b>	<b>Frequency</b>	<b>Percent</b>
18-35	79	25.82%
36-50	94	30.72%
51-65	69	22.55%
66-70	51	16.66%
>70	13	4.25%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Respondents' Education Qualification</b>	<b>Frequency</b>	<b>Percent</b>
None	00.00	0.00%
Primary	63	20.59%
Secondary	111	36.27%
Certificate /Diploma	76	24.84%
Degree and above	56	18.30%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Head of the Household</b>	<b>Frequency</b>	<b>Percent</b>
Male Headed	205	65.25%
Female Headed	131	34.75%

<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Approximate Household Size</b>	<b>Frequency</b>	<b>Percent</b>
1	7	2.29%
2-5	116	37.91%
6-8	137	44.77%
Above 8	46	15.03%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Main Occupation</b>	<b>Frequency</b>	<b>Percent</b>
Formal Employment	38	12.42%
Business	78	25.49%
Farming	144	47.06%
Fishing	41	13.40%
Other (Specify)	5	1.63%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Monthly Income</b>	<b>Frequency</b>	<b>Percent</b>
0-4,000	86	28.10%
4001-10,000	154	50.33%
Above 10,000	66	21.57%
<b>Total</b>	<b>306</b>	<b>100%</b>
<b>Approximate Land Size</b>	<b>Frequency</b>	<b>Percent</b>
1-3Ha	185	60.46%
4-6Ha	94	30.72%
Above 7Ha	14	4.5%
Others (Specify)	13	4.25%
<b>Total</b>	<b>306</b>	<b>100%</b>

The results as presented in Table 2 revealed that 51.31% of the respondents were female whereas 48.69% were male. This implied that females took the major role in producing food for their households. This result conformed to the findings of Asha (2009) which found out that women in Africa actively participated in activities that aimed at providing food for the family than men.

Majority of the farmers (31%) were within 36-50 years' age bracket. This revealed that agriculture was majorly done by the middle age population. The younger population normally migrates from rural to urban areas in search of employment in other sectors of the economy different from agriculture which is attributed to the uneducated and older generation. Additionally, agriculture is labor intensive, which make it difficult for the older, lesser energetic population to practice it. The elderly (>65years) were not actively involved in farming because they were less energetic, opting to stay at home to be taken care of by the energetic respondents.

On level of education, the study sought to determine how literate the respondents were as that would determine their ability to apply scientific knowledge and skills in agricultural productivity. Results in Table 2 revealed that 20.59% of the household heads had primary education level, 36.27% had secondary education level, 24.84% had certificate and diploma education level while 18.30% had degree and above level of education. According to UNESCO (2015), basic education was important as it enabled one to read and understand the world around them. Educational attainment by the household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs which

enables them to read instructions on fertilizer packs and diversification of household incomes which in turn enhances households' food supply.

This study aimed to establish where decision making and control over agricultural production resources were vested. The findings in Table 2 revealed that majority (65.25%) of households were headed by male while female headed households were at 34.75%. The result on gender representation for household respondents and household heads was very significant as it brought in the aspect of gender participation which was seen to be very important in terms of food security and resource management (Adam et al., 2019)

In establishing the household sizes, the study sought to ascertain the burden of feeding the families and this was important as it helped to estimate the household food ration requirement. The result in Table 2 revealed that majority of the households had 6 to 8 members, at 44.77%. This implied that the family sizes were big and needed high agricultural productivity to meet their food requirement needs.

On determining the respondents' occupation, the study sought to assess the respondents' major sources of livelihoods. The results in Table 2 revealed that 12.42% of the respondents had formal employment, 25.49% engaged in business, 13.40% were fishermen, and majority (47.06%) practiced agriculture. This implied that most of the households' respondents in Rarieda were farmers who grew crops such as maize, sorghum, beans, millet and small-scale livestock keeping. This finding conformed to the report by Siaya County Integrated Development Plan (2018) which revealed that about 60% of households in Rarieda practiced agriculture.

On determining the income brackets of the respondents, the study sought to ascertain the respondents' ability to meet their financial obligations as far as their basic needs were concerned. The results in Table 2 indicated that majority of the respondents were low-income earners with over half of them earning Ksh. 4,001 to 10,000. This revealed that the households had low purchasing power and could barely meet the financial thresh-hold to buy food stuff for their households in case they did not produce enough in their farms. Further, this determined their ability to afford the agricultural inputs for food productivity. These findings corroborated the findings obtained by MoALF (2016) that revealed that Siaya County recorded a high poverty level of approximately 47.6%, hence persistent food insecurity.

Land size is the total area of land cultivated for food and cash crops by households and is measured in hectares. Households with larger farm sizes are expected to be more food secure than households with smaller farms. The results in Table 2 indicated that majority (60.46%) of the respondents had land sizes of 3ha and below. This implied that their small land-holdings could not sufficiently support meaningful agricultural productivity leading to scarcity and underproduction of agricultural produce, hence food insecurity. These findings supported the results of Obonyo et al. (2016) in Ugunja which revealed that most rural population depended on small ancestral land for production hence persistent food insecurity.

### Descriptive statistics on household food security

Descriptive statistics were done to establish the level of household food security in Rarieda sub-County. The results were as presented in Table 3.

Table 3: Descriptive statistics on household food security

Household Food Security Statements	Strongly agree 5	Agree 4	Neutral 3	Disagree 2	Strongly disagree 1	Mean	S.D
We produce enough food in my household to last to the next season	39(12.75%)	52(16.99%)	24(7.84%)	113(36.93%)	78(25.49%)	2.55	1.367

The farm produce can sustain the foods needs of my household	35(11.44%)	40(13.07%)	20(6.54%)	112(36.60%)	99(32.35%)	2.35	1.352
We buy most of our household food requirement from the market	81(26.47%)	107(34.97%)	19(6.21%)	59(19.28%)	40(13.07%)	3.42	1.396
We depend on food donation from relatives for our household needs	38(12.42%)	58(18.95%)	21(6.86%)	110(35.95%)	79(25.82%)	2.56	1.376
We can afford to have all the three means a day	39(12.75%)	56(18.30%)	26(8.50%)	88(28.76%)	97(31.70%)	2.52	1.422
Our meals are made of balanced diet and are in enough proportions	27(8.82%)	37(12.09%)	31(10.13%)	101(33.01%)	110(35.95%)	2.25	1.297
We sell our surplus to the market to supplement our income for other household expenditure like school fees	33(10.78%)	60(19.61%)	26(8.50%)	114(37.25%)	73(23.86%)	2.56	1.330
The food we consume is highly nutritious and is available throughout the year	27(8.82%)	36(11.76%)	34(11.11%)	102(33.33%)	107(34.97%)	2.26	1.289
There is enough food supply in the local market and is easily affordable without having to travel far	41(13.40%)	80(26.14%)	26(8.50%)	82(26.80%)	77(25.16%)	2.76	1.421
We sometimes go hungry without food for up to 2 days or even more	74(24.18%)	71(23.20%)	23(7.52%)	79(25.82%)	59(19.28%)	3.07	1.494
<b>Composite Mean and Standard Deviation</b>						<b>2.63</b>	<b>1.374</b>

The results indicated that a majority of the respondents (36.93%) disagreed that they produced enough food



in their household to last them to the next season while 25.49% of them strongly disagreed with the statement. On the other hand, only 12.75% and 16.99% strongly agreed and agreed, respectively, that they produced enough food to last them to the next season. This implied that majority of the households produced food that was hardly enough to last them to the next season. This could be explained by the fact that 45% of the respondents in the sub-County had household size of 6 to 8 members. The large family size depending on the farm produce without any additional source of income to supplement escalated food insecurity in the sub-County. The findings of this study agreed with the results that revealed that Siaya County produced food that could only last six months in a year with the deficit going up to 8 months in poor climatic seasons (Siaya County Integrated Development Plan, 2018). In support of this finding, an interview with a key informant revealed the following:

We use a lot of money to buy fertilizers and hybrid seeds during the planting season. But during harvesting season we get nothing much from our farms. Sometimes the rain is unreliable and at times the rains are too much and end up destroying the crops before they are harvested. Additionally, extension officers who are expected to educate farmers on the best farming practices are rarely seen in the sub-County. As a result, farmers get low produce that can hardly sustain them until the next season thereby leading to food insecurity. For instance, farmers produce approximately 3 bags of maize, 0.6 bags of beans and 0.3 bags of millet. This produce is hardly enough to last the farmer to the next season because of large family sizes. Therefore, food insecurity has persisted in the sub-County.

(In-depth interview with a key informant in West Asembo)

This sentiment implied that the problem of food insecurity was widespread in the sub-County as the household farmers experienced a lot of challenges such as drought, famine and pests which led to low production. Therefore, the food produced was not enough to last the households to the next season.

The results in Table 3 showed that 36.60% of the respondents disagreed that their farm produce could sustain food needs of their households while 32.35% strongly disagreed on the same. On the other hand, 11.44% strongly agreed while 13.07% agreed, respectively, that their farm produce could sustain food needs of their household. This implied that most of the households in Rarieda sub-County did not produce much food crops from their farms to sustain their food needs. They either went hungry or had to buy their foodstuffs from the local food markets which also depended on availability of foodstuffs and income. As a result, majority of household farmers in the sub-County continued to be food-poor. These findings agreed with Ndolo's (2019) findings that 98% of the respondents in Mwala sub-County were food insecure because of low produce from their farms which failed to sustain their food needs. However, the study by Ndolo (2019) adopted Neoliberalism and Dependency Theory in explaining factors such as natural, socio-economic and physical factors on food security. This created a gap for this study which focused on home gardening and its influence on household food security and adopted Food Availability Decline and Endowment and Entitlement Theories.

Results in Table 3 showed that a majority of households' respondents (26.47%) strongly agreed while 34.97% agreed that they bought most of their household's food requirement from the market. On the other hand, 13.07% strongly disagreed while 19.28% disagreed that they bought most of their household food requirement from the market. This implied that the cropping regime of most household farmers in Rarieda sub-County could not meet their household's food requirement and the supplement was sourced from the market which depended on affordability and availability of the financial resources to meet the cost. This finding agreed with the result that was obtained by Huho and Muriuku (2021) that revealed that 70% of households in Kangundo purchased food from the market because they had small land sizes to support meaningful agricultural activities. Rainfall was also unreliable to support rain-fed crop farming. However, the study was constraint by small parcels of land since the peri-urban area of Kangundo is one of the fastest growing peri-urban zones due to its proximity to Nairobi thereby creating a gap for this study which was

conducted in rural Rarieda sub-County.

This study further aimed at investigating on whether the household heads depended on food donations from relatives for household food needs. The results in Table 3 revealed that about 12.42% of the respondents strongly agreed while 18.95% agreed that they depended on food donations from relatives for their household food needs. On the other hand, majority of the respondents (35.95%) disagreed while 25.82% strongly disagreed with the statement which in deep reflection meant that even the relatives did not have any surplus farm produce to give to their starving kinsmen. Further probing of household heads revealed that they occasionally obtained food donations from local politicians and the government that occasionally distributed 1kg of maize and 1kg of rice grains to households. The implication of this was that most households in the sub-County lacked food security and depended on donors and well-wishers for food donations. This finding conformed to the findings of Kabui (2008) that revealed that 55% of the households in Tharaka Division received food aid from Plan International and World Food Program through Catholic Diocese of Meru.

On whether the household could afford to have all the three meals a day, 12.75% of the respondents were in strong agreement while 18.30% of the household respondents also agreed with the above statement. On the other hand, 31.70% of the respondents strongly disagreed while 28.76% disagreed, respectively, that they could afford to have all the three meals a day. This implied that majority of the households in Rarieda sub-County could not afford to have all the three meals a day. These households planned their meals such that they could only have two meals a day comprising of less nutritious foods and in small quantities. Further, the study findings were implicative that small-scale farmers in Rarieda sub-County relied on a variety of coping strategies such as eating less-preferred foods and reducing portions of food to counter their household food insecurity. This was in agreement that increased reliance on coping strategies was associated with lower food availability (Mjonono et al., 2009) thereby dispelling doubts on food insecurity in Rarieda sub-County. These findings agreed with the findings of Sabila (2014) which revealed that 67% of residents in Mount Elgon sub-County could only afford two meals a day. However, the study by Sabila (2014) was conducted in Mount Elgon which experiences frequent inter-ethnic attacks leading to increased cases of food insecurity.

An in-depth interview with a key informant revealed that:

Most of the people in this area are farmers. At times we get good harvest but food insecurity has persisted in the area because most farmers sell almost all their produce at a cheaper price during harvesting period to cater for other needs such as paying school fees. That has led to persistent food insecurity in the region and as a result, most households are forced to reduce the number of meals per day.

(In-depth interview with a key informant in Rarieda sub-County)

These sentiments implied that occasionally farmers in Rarieda sub-County got good harvest. However, since agriculture was the main source of livelihood, households were forced to sell part of their farm produce at cheaper prices to meet other family obligations, an observation that limited the frequency of meal-taking in such households.

Further, the results in Table 3 revealed that approximately 8.82% of respondents strongly agreed while 12.09% agreed, respectively, that their household diets were made of balanced diet and were in enough proportions. On the other hand, 35.95% of the respondents strongly disagreed while 33.01% disagreed with the statement. This implied that majority of households in Rarieda sub-County could not access balanced diet and depended majorly on sole consumption of maize that did not provide recommended nutrients to households leading to nutritional insecurity. These findings agreed with the results obtained by Sabila (2014) which observed that 65% of the residents in Mount Elgon sub-County could not afford to maintain

balanced diet on their daily menu. However, the study aimed at identifying factors influencing food security in rural households in Mount Elgon while the present study focused on the influence of home gardening on household food security.

In seeking to establish if households sold their food surplus to the market to supplement their income for other household expenditures like school fees, only 10.78% of the respondents strongly agreed while 19.61% agreed, respectively. A majority (23.86%) of the respondents strongly disagreed while 37.25% disagreed with the statement. This implied that majority of the respondents did not produce any surplus food to sell in the market. They consumed all the food crops they produced and were forced to employ various coping strategies such as skipping meals and limiting food-portion sizes. This clearly showed that food security was a challenge in the sub-County. These findings disagreed with the results of Huho and Muriuki (2021) which revealed that 50% of households in Kangundo sold their food surplus such as vegetables and eggs from chicken to nearby market and obtained income. However, the study by Huho and Muriuki (2021) had its results based on perception thereby creating a gap for this study.

The study further established that 8.82% of the respondents were in strong agreement while 11.76% agreed, respectively, that the food they consumed was highly nutritious and available throughout the year. On the other hand, 34.97% of the respondents strongly disagreed while 33.33% disagreed, respectively, with the statement. This implied that majority of the household respondents in the sub-County ate less-nutritious food which was also unavailable throughout the year. These households depended on maize and any other accompaniments which were the most popular dietary provisions. These households further revealed that as long as they had something to hold their stomachs, they were “okay”. This clearly showed that households in Rarieda sub-County were food insecure. These findings agreed with the findings of Odunga (2016) whose results showed that 68% of the respondents relied majorly on maize to make *Githeri* (beans and maize cooked as a mixture). However, the study focused on one dimension of food security which is availability while this one focused on all the four dimensions of food security so as to adequately address food security.

On whether there was enough food supply in the local market and was easily affordable without having to travel far to purchase the food, results in Table 3 indicated that 13.40% of the respondents strongly agreed and 26.14% agreed, respectively, with the statement. On the other hand, 26.80% of the respondents were in disagreement while 25.16% of them were in strong disagreement that there was enough food supply in the market. This implied that majority of the respondents in Rarieda had to travel far to purchase what they did not have and was unavailable in the local market. This clearly showed that food access was a challenge in Rarieda sub-County.

The results in Table 3 revealed that 24.18% of the respondents strongly agreed that they sometimes went hungry without food for some 2 days while 23.20% of the respondents agreed with the statement. This pointed towards a situation where by food-aid might be required in Rarieda sub-County for a significant part of the year by majority of the residents. The findings validated the results of the Ministry of Agriculture and Livestock (2016) on Siaya County’s poverty level reported to be at 47.5%. With the high levels of poverty, households had no financial ability to access other foodstuffs from the market and were forced to go without food for two days or so. This clearly showed that this study was timely since a sizeable population of the sub-County were still struggling with food insecurity.

Findings of this study were very consistent with Food Availability and Decline Theory which defined food availability as when all people have sufficient quantities of food available on a consistent basis as dictated by production. It therefore meant that the food produced in Rarieda sub-County was not sufficient to meet the demands for food by various households. Hence, most households lacked food security and would go without food for up to two days.

### Influence of home gardening on household food security

Results in Table 4 displays a summary of the findings on the influence of home gardening system on household food security in Rarieda Sub-County, Siaya County.

Table 4: Descriptive statistics on home gardening and household food security

Home Gardening Statements	Strongly agree 5	Agree 4	Neutral 3	Disagree 2	Strongly disagree 1	Mean	S.D
I do practice home gardening to boost household food security	112(36.60%)	113(36.93%)	19(6.21%)	40(13.07%)	22(7.19%)	3.83	1.254
Vegetables and other horticultural crops are the most preferred crops grown under home gardening	109(35.62%)	98(32.03%)	32(10.46%)	51(16.67%)	16(5.23%)	3.76	1.243
Tubers are common crops grown under home gardening	52(16.99%)	49(16.01%)	30(9.80%)	100(32.68%)	75(24.51%)	2.68	1.433
Grains and cereal crops are major crops grown under home gardening	101(33.01%)	93(30.39%)	36(11.76%)	53(17.32%)	23(7.52%)	3.64	1.301
Fish farming and aquaculture is practiced under home gardening	81(26.47%)	89(29.08%)	34(11.11%)	72(23.53%)	30(9.80%)	3.39	1.353
Domestic animals in home gardening are majorly kept for food and dietary supplements	82(26.80%)	99(32.35%)	37(12.09%)	65(21.24%)	23(7.52%)	3.50	1.291
Domestic animals in home gardening are reared majorly for their by-products like manure, skin and biogas; and services like transport and animal power	27(8.82%)	33(10.78%)	35(11.44%)	82(26.80%)	129(42.16%)	2.17	1.318
Domestic animals in home gardening are reared mainly for sale to provide income	78(23.49%)	95(31.05%)	39(12.75%)	61(19.93%)	33(10.78%)	3.41	1.343

Domestic animals in home gardening are reared for socio-cultural purposes like to pay dowry and maintain high social status	28(9.15%)	41(13.40%)	50(16.34%)	81(26.47%)	106(34.64%)	2.36	1.321
There are fruit orchards in home gardening that provide fruits and income to the households	83(27.12%)	103(33.66%)	33(10.78%)	63(20.59%)	24(7.84%)	3.52	1.296
<b>Composite Mean and Standard Deviation</b>						<b>3.23</b>	<b>1.315</b>

Results from Table 4 revealed that 36.60% of the respondents were in strong agreement while 36.93% were in agreement that indeed they practiced home gardening to boost their household food security. This was done by cultivating crops, fruit trees, rearing animals and fish farming. This means that about 73% of the households in Rarieda sub-County practiced home gardening upon realization of the food benefits that accrued from this system. For instance, households that adopted this system could obtain fresh fruits, livestock products, fish, vegetables, cereals and root crops. They consumed the foods accrued from this system thus enhancing their household food security. These findings conformed to findings of studies by Bahta (2018) and Musotsi (2008). The two studies revealed that home gardening system was responsible for about 45% food insecurity decline. An interview with a key informant supported the above facts by revealing that:

In this area people have home gardens where they plant fruit trees, vegetables, cereals, and rear livestock such as cows, goats, sheep and chicken. Home gardening system therefore has led to improved dietary diversity. Home gardening has enabled households to obtain food continuously throughout the year. Additionally, this system provides supplemental food which has enabled households to be food secure.

(In-depth interview with a key informant in North Uyoma)

The results in Table 4 revealed that 35.62% of the respondents strongly agreed while 32.03% agreed, respectively, that vegetables and other horticultural crops were the most preferred crops grown under home gardening systems. Approximately 64% of households in Rarieda sub-County grew vegetables such as black nightshade, scarlet runner, cabbages, amaranth, pumpkin, tomatoes, spider plant, and Jews-mallow. Therefore, home gardening enabled instant continuous physical access to green groceries due to its close proximity to households. In the home gardening system, there was always some produce waiting to be picked, pulled or cut no matter the time of the year. Therefore, home gardening system improved accessibility and availability of food. These findings were in consistence with findings of Abdoellah (2020) which revealed that home gardening improved household food security. However, the study by Abdoellah (2020) focused on degradation and absence of home gardens due to their commercialization. This study took a different turn as it examined the influence of home gardening system on household food security in Rarieda sub-County.

Approximately 16.99% of the respondents strongly agreed while 16.01% agreed, respectively, that tubers such as sweet potatoes, cassava, groundnuts were commonly grown under home gardening systems. The respondents revealed that some of the tubers such as cassava were boiled and used as accompaniments for tea while some portions could be processed into flour and used for making ugali and porridge. Households

that grew various tubers such as sweet potatoes, cassava and groundnuts on their garden could access food all year round thereby ensuring availability and accessibility of food. These findings conform to the findings of a study by Saptana, (2011) which found out that roots and tubers grown under home gardening systems contributed to household food security by 30% in the USA. However, the study by Saptana (2011) was done in a highly developed nation (USA). This created a gap for this study which was done in an African rural set up that is characterized by high poverty levels and high population growth rate.

The results in Table 4 indicated that approximately 33.01% of the respondents strongly agreed while 30.39% agreed, respectively, that the most popular crops grown under home gardening systems were legumes and cereal crops like maize, finger millet, beans, and sorghum. However, due to scarcity of land, inadequate finances to purchase fertilizers and hybrid seeds and repair damage of the farms by livestock, production of cereals and legumes from the home gardening system was low. This implied that home gardening crops did not significantly improve household food security. These findings agreed with the findings of a study by Musotsi (2008) which revealed that home gardening crops failed to play a significant role in the food security of Bungoma households due to small farm sizes and lack of capital to purchase fertilizers and certified seeds.

Out of the total number of respondents interviewed, 26.47% strongly agreed while 29.08% agreed, respectively, that they practiced fish farming (aquaculture) under home gardening system. They had fish cages in their lake-backyard. The major fish species from the fisheries were Nile perch, Tilapia, Dagaa and the African Catfish. However, the inclusion of fish farming in the home-gardening system deviated from other studies such as Matson (2017) and Tesfamariam (2018). The two studies focused majorly on crops, vegetables, fruits and livestock found in home gardening systems and their impact on food security. This study bridged the identified gap by observing that households living in close proximity to the lake practiced fish farming under home gardening systems. A key informant in an interview revealed that:

People who live closer to the lake have fish ponds where they rear variety of fish species such as Tilapia, Mud fish and African Cat fish. However, they encountered challenges such as lack of education and training, outbreak of fish disease, high feed cost, and lower productivity and profitability, attack by predators and poor management of ponds.

(In-depth interview with a key informant in Rarieda sub-County)

These sentiments revealed that fish farming under home gardening systems did not significantly enhance household food security because of the many challenges that were faced. Those who practice fish farming under home gardening systems incurred losses discouraging majority of the respondents in the area from engaging in the practice. Another key informant revealed that:

Majority of residents here are poor. Therefore, they cannot afford to purchase fish which is sold at very high prices by owners of the pond. Therefore, the households practicing fish farming under home gardening were forced to target tourists and local hotels. Additionally, majority of them lack refrigeration facilities leading to losses.

(In-depth interview with a key informant in East Asembo)

These sentiments implied that majority of the respondents were poor. This was supported by earlier results which revealed that majority of the respondents were low-income earners with Ksh. 4001 to 10,000 accounting for over 50% of the respondents while those above Ksh. 10,000 formed only 21.57% of the respondents. The low income limited financial ability of the respondents to purchase fish resources which were sold at very high price. As a result, they depended on other sources of protein. This indicated that even though households in Rarieda sub-County had access to fish resources, it had no guaranteed sustainability.

Therefore, fish farming under home gardening system did not significantly enhance household food security.

Rearing domestic animals in home-gardening systems was popular. About 26.80% of the respondents strongly agreed while 32.35% agreed, respectively, that most of the domestic animals in home gardening systems were reared for food such as milk, meat and eggs. The animals reared by households in the sub-County included cows, goats, sheep, chickens, ducks and pigs. However, this was majorly done on small-scale and with either local or improved livestock breeds through cross-breeding.

The results in Table 4 further revealed that 8.82% of the respondents strongly agreed while 10.78% agreed, respectively, that domestic animals in home gardening systems were majorly reared for their by-products like manure, skin and biogas, and services like transport and animal power. These findings agreed with findings of a study by Musotsi (2008) which revealed that about 60% of household farmers in Bungoma had a pit for preparing farm yard manure which they used on their farms so as to improve productivity.

Approximately 23.49% of the respondents strongly agreed while 31.05% agreed that domestic animals in home gardening systems were reared mainly for sale to provide income. Household farmers in Rarieda sub-County could occasionally sell some of the reared domestic animals such as chicken and gain income which they could use to buy other food items. It was generally rare for the Rarieda sub-County households to slaughter livestock for food but would rather sell and earn income from such sales. Ignorance and cultural beliefs also hindered some households from locally consuming products like eggs and thus preferred selling them for cash. These findings agreed with findings by Huho and Muriuki (2021) which revealed Kangundo residents sold chickens and eggs to obtain income which they spent for school fees besides other services. The income could also be put to savings.

The results in Table 4 further established that 9.15% of the respondents strongly agreed while another 13.40% agreed that domestic animals under home gardening systems were reared for socio-cultural purposes like to pay dowry and maintain high social status in the community. This could be attributed to the fact that most of the respondents in the sub-County were poor where 50.33% had a monthly income of Ksh. 4000-10000. Therefore, they did not rear domestic animals for prestige rather for food benefits such as milk and meat.

The results in Table 4 further revealed that about 27.12% of the respondents strongly agreed while another 33.66% agreed, respectively, that there were fruit orchards in home gardening systems that provided fruits and income to the households. The respondents in the sub-County confirmed that they had fruits like, Oranges, Avocados, Passions, Pawpaw, Mangos, Jambolan, Melons and Tamarinds. Due to the wealth of the study area that is favorable to production of fruits, it would be profitable for the households to practice cultivation of fruit trees. This would enable them to feed on their harvest thereby improving quality and quantity of their diet. They could also sell surpluses to get income that they would use to purchase other foodstuffs not produced on their farms. This finding agreed with the findings of studies such as Wright (2014) and Oladele et al. (2020). These studies revealed that fruit orchards in home gardening provided fruits which supplemented the households' diets and also provided income when fruits were sold in the market which could be used to buy other foodstuffs.

Further analysis was done to determine the direction, degree and strength of the linear association between the predictor (home gardening) and the criterion (household food security) variables. The results were as indicated in Table 5.

Table 5: Analysis of correlation between home gardening and household food security

Variable		Home Gardening	Household Food Security
Home Gardening	Pearson' Correlation	1	0.633**

	Sig. (2-tailed)		0.000
	'n'	306	306
<b>Household Food Security</b>	Pearson' Correlation	0.633**	1
	Sig. (2-tailed)	0.000	
	'n'	306	306
<b>** Correlation, at 0.05 level of significance for a two-tailed test</b>			

In Table 5, the results revealed a linear association between home gardening and food security at household levels where there was a significant strong positive correlation ( $r=0.633$ ;  $P<0.000$ ) between the predictor and the criterion variables with the priori common alpha set at  $\alpha = 0.05$ . The implication here was that as households intensified home gardening, food security was significantly enhanced. For instance, home gardening system met the first dimension of food security, that is availability, by enabling instant continuous physical access of food due to close proximity to the kitchen. The womenfolk could always pull, pick, cut or harvest the produce from their backyards as appropriate food or even for the markets. The additional income from the surplus sale was used to buy other food items to meet other households needs.

Home gardening system also met the other food security dimension of utilization for uptake of nutritious and quality supplements. This system enhanced households' capacity to access fresh, nutritious and variety produce. Therefore, home gardening system made households to have more dietary diversification hence meeting the nutritional needs of households. This finding agreed with the findings of a study by Chepkirui et al. (2019) which revealed that dietary diversity score for households with home gardens increased as they were able to access fresh vegetables, meat, milk, fish and tubers. Counter-intuitively, the findings differed from those of Depenbusch et al. (2021) who reported statistically insignificant influence of home gardens on household diets in Uganda and Kenya.

## CONCLUSION

This study aimed at examining the influence of home gardening on household food security in Siaya's Rarieda sub-County. From the analytical results, the study concluded that home gardening system enabled households in Rarieda sub-County to achieve food availability, accessibility and utilization except stability. The study further established that grains, horticultural crops, aquaculture and livestock farming were characteristic features of home gardening in the region. The study therefore concluded that there existed a strong positive and significant correlation between household food security and home gardening.

For policy and practices, the study recommends that home gardening be promoted such that in the households' backyards are food production systems that should be undertaken to enhance food security. The study further suggests that factors that influence food security in Rarieda sub-County other than the home gardening be studied. Such factors include mixed cropping, single food crop farming, environmental and socioeconomic factors.

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