

**Assessing the Effect of Home Gardening on Smallholder Farming Households' Food Availability and Income Supplementation: A Case in Careysberg District, Montserrado County, Republic of Liberia.**



**A research thesis submitted to Van Hall Larenstein University of Applied Sciences in partial fulfillment of the requirement for the Degree of Masters in Management of Development, with a specialization in Food and Nutrition Security.**

BY

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**Dedication**

This work is dedicated to my loving and caring wife Jumamah Kesselee, my supervisor Dr. Beatriz Hummel, the faculty and staff of Van Hall Larenstein University of Applied Sciences, to my mom Yassah Kesselee and my dad Henry Kesselee. The above-mentioned personalities gave me all the required support during my study at VHL and my thesis research. To my wife, you have been very inspirational and supportive in making sure that I achieve my goals. You always told me to be focused and believed in myself.

## **Acknowledgment**

I want to extend my deepest gratitude to the following individuals, group and organization for their immense support in making sure that I fulfill my dreams.

I want to bless God for his protection upon my life, the overwhelming love and care that he has shown me throughout my educational sojourn at VHL. Had it not been his love and care I wouldn't have been where I am today. I am grateful to the government and people of the Kingdom of Netherlands for the financial services rendered during my stay in the Netherlands. My deepest gratitude to my supervisor, Dr. Beatriz Hummell for her critical and constructive feedback, critical insight, proper guidance, patience, and moral support given me throughout my thesis research. This work wouldn't have been a success without you Doc. To my mentor, Dr. Pleun Van Arensbergen, I want to wholeheartedly thank you for giving me courage, moral support, critical feedback and critical insight from the beginning of my study at VHL to the end. You were always willing to attend to me during my thesis even when you were not my supervisor. I also want to be grateful to my assessor, Mrs. Leonoor Akkermans for her constructive and critical feedback during my research proposal defense. The feedback given me was very instrumental in making sure that I conduct proper research.

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## **Abstract**

In 2016, a non-governmental organization called AgroTech Liberia implemented a home gardening program titled Make Use of Your Backyard for smallholder farming households who were identified during needs assessment study conducted by the organization. The home gardening program was introduced because the identified households were experiencing low production, thus resulting in food and income insecurity. This program amongst others was introduced with the objective of improving households' food availability and as well as supplement households' income from the sales of excesses derived from home gardening. The selection of project beneficiaries was carried out based on a household owning plot sizes between 20 by 20m, 30 by 30m and 40 by 40m. The home gardening program which was implemented in the Careysberg District targeted 120 beneficiaries from three communities (Kort's Town, Fendell, and Mount Barclay). The purpose of this study was therefore to assess the effect of the Make Use of Your Backyard home gardening program implemented by AgroTech Liberia on smallholder farming household's food availability and income supplementation. This study was undertaken because there has been no research conducted to establish the effect of the home gardening program implemented and besides, the community in which the program was implemented is still faced with food insecurity.

To assess this knowledge gap, several methods were employed by the researcher such as semi-structured interviews, focused group discussions, a systematic observation by the researcher and key informants' interviews. In addition to the tools, two categories of respondents were used to determine the effectiveness of AgroTech Liberia Make Use of Your Backyard home gardening program. The 2 categories of respondents include beneficiaries of AgroTech Liberia' home gardening program and non-program beneficiaries who were also practicing home gardening. The total of 30 respondents comprising of 15 program beneficiaries and 15 non-program beneficiaries who were practicing home gardening were selected using a simple random sampling.

Generally, the key findings from the study established that the Make Use of Your Backyard home gardening program implemented by AgroTech Liberia achieved its objectives by making food available and supplemented income as anticipated by the organization. The findings showed that the program made food available for beneficiaries by increasing their households' food stock, both in the field and in the house due to the diversity of crops grown, as compared to non-program participants who had only a few crops in their fields and in their houses. The findings also established that the program implemented by AgroTech Liberia had increased the daily food consumption frequency from 1time daily to 3-4 times daily as compared to non-program participants of 1-2 times daily. In addition to food availability, the Make Use of Your Backyard program also increase the dietary diversity scores of program participants to 7.0 as compared to non-program participants who had 5.0.

The findings from the field showed that the program implemented also supplemented income for all the 15 (100%) beneficiaries of the program which was also anticipated by AgroTech Liberia, as compared to non-program beneficiaries whom only 9 constituting (60%) of the 15 respondents agreed that they earned some extra income from their home gardens. The findings also indicated that the income supplemented were used to pay for education-related matters, health services, clothes, and other food and non-food items not produced in home gardens. The key findings finally established that women have access and control over the income supplemented from home gardens.

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## Acronyms

NGO-----	Non-Governmental Organization
FAO-----	Food and Agriculture Organization
USAID-----	United States Agency for International Development
FSNS-----	Food Security and Nutrition Survey
HG-----	Home Gardening
ATL-----	AgroTech Liberia
LISGIS-----	Liberia Institute for Geo-Information services
FBPA-----	Farmers' Based Participatory Approach
FNS-----	Food and Nutrition Security
HHDS-----	Household Dietary Diversification Score
SSI-----	Semi-Structured Interview
FGD-----	Focused Group Discussion
KI-----	Key Informant

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## **CHAPTER 1: INTRODUCTION**

### **Introduction**

This chapter gives a general overview of the food and nutrition security status of the World and Liberia. It also provides information on the status of home gardening in Liberia and the problem needed to be addressed by this study. Additionally, it explains the research problem, its objectives, main research questions, and sub-questions.

### **1.1 Background of the Study**

Most hungry and malnourished people in the World live in developing countries under sub-standard living conditions and over half a billion of the world population suffer from chronic food insecurity. With the global population anticipated to reach over 9 billion by 2050, there is a continuous need to increase food production, (Galhena et al, 2013). In this situation, countries around the world, especially developing countries where the prevalence of hunger, malnutrition and food scarcity is more severe, are leading to various strategies to meet the growing demand and to avert food insecurity. Liberia, a developing Country faces food insecurity, validated its food security status along with several partners including the United States Agency for International Development (USAID) and Food and Agriculture Organization (FAO). According to Liberia's Comprehensive Food Security and Nutrition Survey report (MOA, 2018), 30% of the population of 4.6 million is classified as moderately or severely food insecure. Moreover, 32% of children under 5 years suffer from chronic malnutrition (low height for age or stunting) as the result of chronic hunger, 15% underweight and almost half a million (69%) are anemic (USAID, 2008).

### **1.2 Problem Description**

The Careysberg District, which is in the northwestern part of the country was one of the hardest-hit Districts in Liberia during the fourteen years of civil conflict and the Ebola crisis of 2014. The district continues to have increased vulnerable households, especially smallholder farming households because of persistent low production. This results in low food availability, low income and contributes to 30% of the households to be food insecure, (IPC, 2017). The selection of the Careysberg District for the research is therefore based on a previous program implemented by AgroTech Liberia in the district and the challenges faced by households in the district. Additionally, the doubt of whether the project beneficiaries are among the currently vulnerable households give the researcher enough reason to focus on these communities.

According to the Ministry of Agriculture (2015), the persistent low production in the district was attributed to poor extension services, lack of farming inputs, limited knowledge on contemporary farming methods, and the use of traditional low yielding varieties. As a result of the low production, farmers continue to face, poor households are unable to make adequate food available for their families and generate income since they rely solely on agriculture as their main livelihood. Moreover, most smallholder farming households cannot afford to send their children to school or eat a quality diet as well as maintain wellbeing because of the many challenges facing their livelihood.

On that note, the AgroTech Liberia (ATL) a local non- governmental entity working with urban and rural communities in promoting Food and Nutrition Security in Liberia through agriculture saw the need for an immediate intervention in Careysberg District. In March 2016, ATL adopted multiple strategies like the provision of extension advisory services, labor-saving technologies, building farmers' technical capacity and linking farmers to the market. In addition to the many programs introduced, home gardening program was implemented for smallholder farming households who were identified during the baseline study conducted by ATL. The selection of project beneficiaries was based on a household owning plot sizes between 20 by 20m, 30 by 30m and 40 by 40m. The home gardening program which was

implemented in the district targeted 120 beneficiaries from three communities (Kort's Town, Fendell, and Mount Barclay). The program which came into action in January 2016 was titled Make Use of Your Backyard, and was designed with the objective of empowering smallholder farming households to adopt multiple strategies that will provide them with additional income (Food accessibility) from excesses derived from home gardening and increase household food availability through the cultivation of various crops like vegetables, legumes, root and tubers and cereal crops. ATL used a Farmers Based Participatory Approach (FBPA) to enable participants to build their knowledge of contemporary farming practices by involving both extension agents and participants in field demonstration activities. Following the training, smallholder farmers were given inputs like fertilizers, pesticides, improved varieties, irrigation materials, and extension services to enhance their production.

Home gardens are an integral part of subsistence food production systems and the agricultural landscape of most developing countries all over the world which has endured the test of time (Galhena et al, 2013). The practice of home gardening is common in Liberia both in urban and rural communities. Vegetables, fruits, root and tuber crops and cereal crops such as maize are often grown in places situated near homes for easy access and protection from thieves. The practice of home gardening in Liberia is mainly intended to provide households with food and generate extra income derived from excesses (BRAC, 2018). With the belief that home gardening provides direct access to highly nutritious food for the family (Marsh, 1998), initiating a home gardens program in Liberia for smallholder households is crucial to improving the country's food security status.

### **1.3 Research Problem/ Statement**

The Make Use of Your Backyard program implemented by ATL which targeted smallholder farmers came to a closure in July 2017. Even though there have been approximately two years since the program ended, information on the effect of the program is still unknown to ATL. Moreover, the district in which the program was implemented is currently facing low food availability and income insecurity, (MOA, 2018) and ATL have no information as to whether the project beneficiaries are among the vulnerable households. It is also not clear as to whether the program which was meant to enable vulnerable smallholder farming households to improve their food availability and supplements their income achieved its objectives. Consequently, the Commissioner (ATL) has seen the need to assess the Make Use of Your Backyard program's effect on small-holder farming households' food availability and income supplementation (Economic accessibility) as well as the constraints participants' households are faced with when practicing home gardening.

### **1.4 Research Objectives**

The purpose of this research is to assess the effect of the Make Use of Your backyard home gardening program implemented by AgroTech Liberia on smallholder household's food availability and income supplementations. Also, it aims to assess the constraints Smallholder households are faced with when practicing home gardening. The assessments are essential in order to make recommendations to ATL on the outcomes of the Make Use of Your Backyard program for enabling program evaluation and improvement, identification of necessary modifications for future replicating, redesigning previous implementation strategies and possibly scaling up the program within the same or other communities.

### **1.5 Main research questions**

1. What are the effects of the Make Use of Your Backyard home program implemented by AgroTech Liberia on smallholder farming household's program participants' food availability?

2. What are the effects of the Make Use of Your Backyard program implemented by AgroTech Liberia on smallholder farming household's program participants' income supplementation?

**1.6 Sub-questions for main question 1**

1. How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiaries' food availability?
2. How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiary's dietary diversity?
3. What constraints or challenges smallholder farming households who benefited from the Make Use of Your Backyard program implemented by AgroTech Liberia are faced with when practicing home gardening?

**1.7 Sub question for main question 2**

1. To what extent AgroTech Liberia Make Use of Your Backyard program have supplemented the income of smallholder farming households who benefited from the program?
2. How is the income supplemented from AgroTech Liberia Make Use of Your Backyard program spent or utilized by smallholder farming households who benefited from the program?
3. How is the income supplemented from home AgroTech Liberia Make Use of Your Backyard being controlled by program beneficiaries' households?

## CHAPTER 2: LITERATURE REVIEW

### Introduction

This chapter provides a comprehensive review and analysis of literature related to the practice of home gardening. It also addresses the effect of home gardening on household food availability and income supplementation. It presents definitions of main concepts, conceptual framework, and operationalization of key concepts such as home gardening and food availability and home gardening and income supplementation. Additionally, it discusses a brief analysis of the farming systems of Liberia.

### 2.1 Definition of key concepts

**Household-** For the purpose of this research, the household is considered as the social unit that is more appropriate for investigating the effect of home gardening on small-holder farmer's households. Therefore, a household is considered as the social unit which lives in the same place, share the same meal and make a coordinated decision over the allocation of resources, (Burgoyne, 2008).

**Small-Holder Farming Household-** According to Burgoyne (2008), smallholder farming households are rural cultivators practicing intensive, subsistence, and diversified agriculture with the use of limited resources. He went further to say that a household is the major corporate social unit for mobilizing labor, managing productive resources and organizing consumption.

**Food Security-** Food security' exists when all people, at all times, have physical, social and economic access to sufficient, quality and nutritious food to meet their dietary needs and food preferences for an active and healthy life, (FAO, 2011).

**Food Availability-** can be defined as the obtainability of enough quality food by means of production, food aid, and gift, food stock and direct purchase (FAO, 2011).

**Income Supplementation-** This is the extra income generated from other sources to enhance the household's main source of income (Aguila et al., 2015).

### 2.2 Conceptualization of Home Gardening

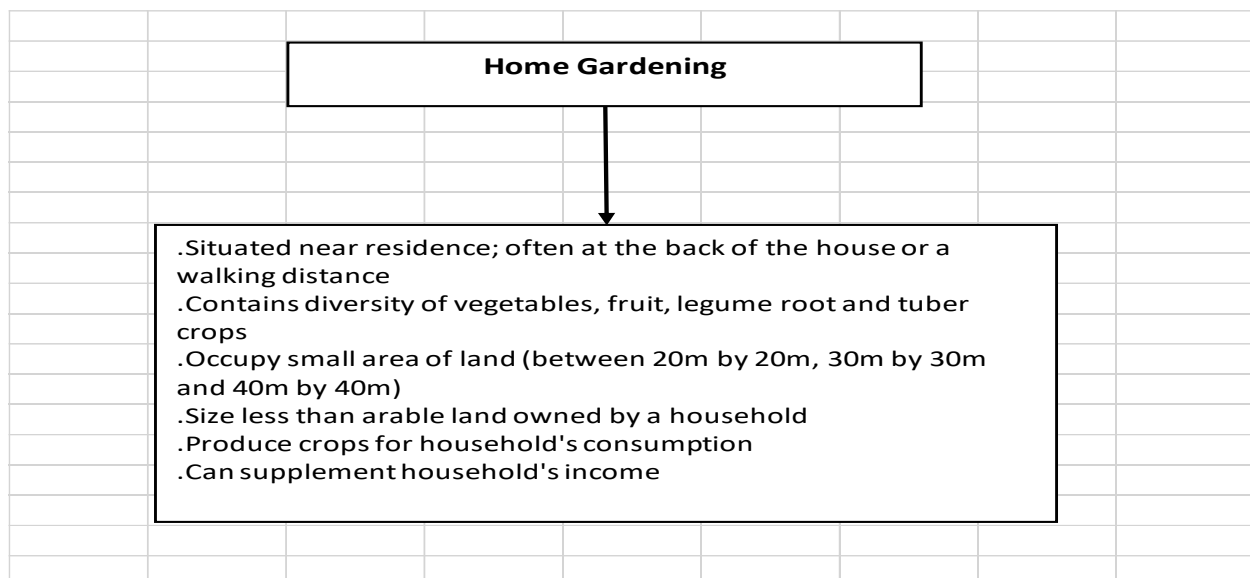
Generally, home gardening can be defined as the cultivation of crops and rearing of animals on a small piece of land which may be situated around the household or within walking distance from the family (Olajide-Taiwo, 2010). The Home Garden is a small-scale system of production supplying animals and plants utilitarian items not obtainable, affordable or readily available through markets, large field production, hunting, gathering, and fishing (Olajide-Taiwo, 2010). Home gardens are often located close to homes for security, convenience, and care. Home Gardens occupy land marginal to field production and labor marginal to major household income-generating activities. However, such a garden features ecologically adapted and complementary species and are marked by low capital input and simple technology. Home gardens as a cropping system composed of soil, crops, weeds, pathogens, and insects that convert resource inputs into food, feed, fuel, fiber, and pharmaceutical (Weimer, 2008). Additionally, home gardening can be described as a well-defined multi-storied and multi-use area near the family home that serves as a small scale supplementary food production systems maintained by the household members and one that comprises a diverse array of plant species that mimics the natural ecosystem (Akfori, 2013). Home gardens with diverse cross provide households access to the quantity and quality foods that improve the nutritional status of households (Weimer, 2008).

The beginning of modern agriculture can be dated back to small scale production systems that started in small garden plots near the homes (Galhena, 2013). These gardens have tirelessly borne the test of time and continue to play an important role in providing food and income for the households (Galhena, 2013).

Home gardens appear to have developed independently in the Indian subcontinent, Indonesia and other parts of Southeast Asia, the tropical Pacific islands, the Caribbean, and various parts of tropical Latin America and Africa (Brownrigg, 2008). Since the early Studies of home gardens by Dutch scholars Osche and Terra, (1934) on mixed gardens in Java, Indonesia there have been comprehensive contributions to the subject definitions, species, functions, structural characteristics, composition, socio-economic, and cultural importance. Home Gardens are found both in rural and urban areas in primarily small-scale subsistence agricultural systems (Akfori, 2013). Additionally, home gardens are normally established on a piece of land that is small or not ideal for tree crops or forage cultivation because of their size, topography, or location (Akfori, 2013). The size of a home garden varies amongst households, and normally their average size is less than that of the arable land size owned by the household. However, this may not always be the same for those households that do not own farming land and for the landless. New innovations have made home gardening possible even for the households that have little land or no land at all to cultivate crops (Ranasinghe, 2009).

For the context of this research, the conceptual definition of a Home Garden will be used to assess the effect of home gardening on small-holder farming households' food availability and income supplementation. Therefore, home gardening is a cropping system often situated near homes that contain diverse crops like vegetables, fruits, legumes, and root and tuber crops, for household food consumption and for supplementing households' income. Although home gardening is the integration of crops and animal husbandry, the conceptual definition used in this study does not incorporate animal production or husbandry because the program implemented by ATL did not include animal products.

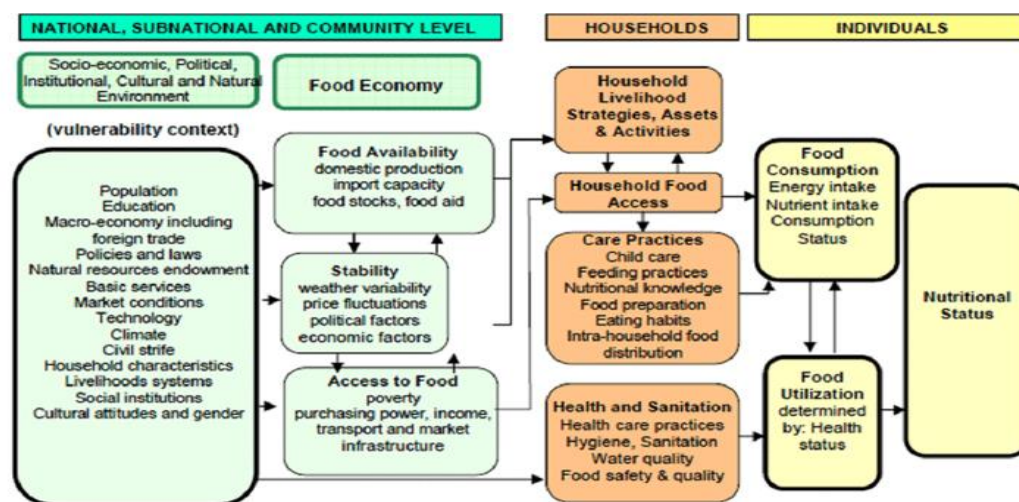
**Figure 1: Conceptual definition of home gardening**



**Source:** author (2019)

## 2.3 Conceptualization and Operationalization of Home Gardening and Food Security Framework

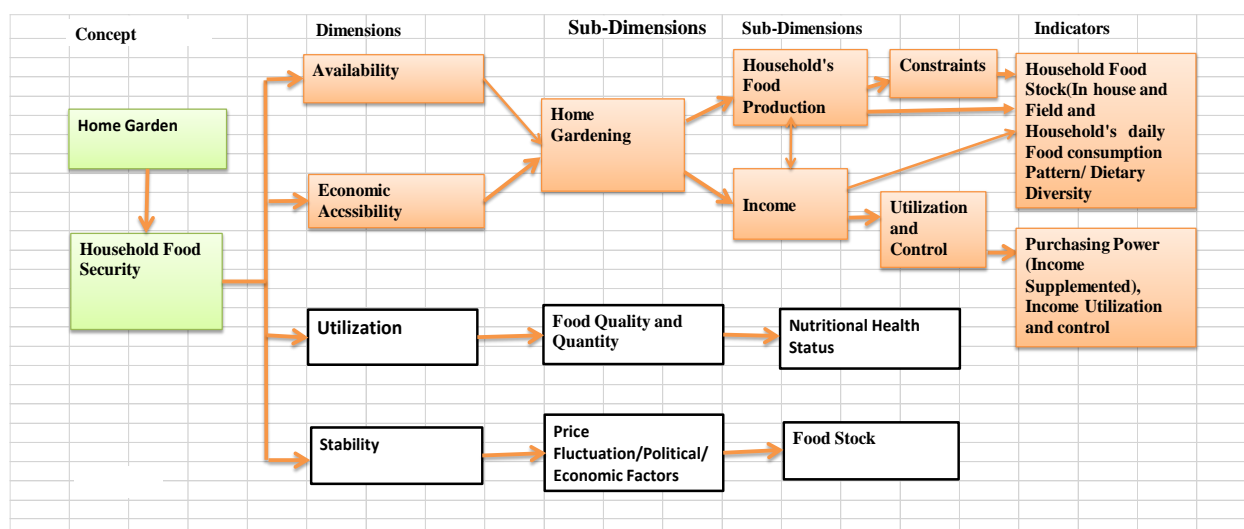
Figure 2: FAO FIVSM Food Security Framework



Source: (FAO, 1999)

Since food availability is a dimension of food security, the FIVSM Food Security Framework of FAO 1999, (Figure 2) is contextualized to depict the effect of home gardening on small-holder farming households' food availability. It illustrates home gardening as a sustainable livelihood strategy for small-holder farming household's food availability and income supplementation. According to the below-contextualized framework of Food Security (Figure 3), there are two main ways in which smallholder households can improve food availability and supplement income, household's production (home garden), direct purchase from income generated from excesses (economic accessibility) and donation/gift (external). This research is, therefore, going to focus on home gardening and its effect on smallholder farmer's food availability and income supplementation. It is important to note that addressing two dimensions of food security does not necessarily mean that food security can be completely achieved. However, this research considers that home garden contains diverse edible plants and animal species that contribute to household food quality and diversity (Utilization), supplement income generation for the purchase of other food and non-food items (Accessibility), and is cultivated near homes all year round, thus making providing households with have for consumption (Availability).

Figure 3: Conceptualization and Operationalization of Home gardening into Food Security Framework



Source: author (2019)

The concept of home gardening in smallholder household's food availability and income supplementation is operationalized by measuring the key concepts of this research (Food Availability and Income Supplementation). It does so by assisting a set of indicators, as depicted in Figure 2.

For measuring food availability, it utilizes the following indicators: availability of household's food stock (in the house and field), household's daily consumption pattern or frequency and dietary diversity. Additionally, previous experiences before the Make Use of Your Backyard program were introduced and after in terms of food, availability will be compared. Measuring income supplementation, it utilizes the following: income generated from excesses and income utilization and control.

The beginning of modern agriculture can be dated back to small scale production systems that started in small garden plots near the homes (Galhena, 2013). These gardens have tirelessly borne the test of time and continue to play an important role in providing food and income for the households (Galhena, 2013).

Home gardens appear to have developed independently in the Indian subcontinent, Indonesia and other parts of Southeast Asia, the tropical Pacific islands, the Caribbean, and various parts of tropical Latin America and Africa (Brownrigg, 2008). Since the early Studies of home gardens by Dutch scholars Osche and Terra, (1934) on mixed gardens in Java, Indonesia there have been comprehensive contributions to the subject definitions, species, functions, structural characteristics, composition, socio-economic, and cultural importance. Home Gardens are found both in rural and urban areas in primarily small-scale subsistence agricultural systems (Akfori, 2013). Additionally, home gardens are normally established on a piece of land that is small or not ideal for tree crops or forage cultivation because of their size, topography, or location (Akfori, 2013). The size of a home garden varies amongst households, and normally their average size is less than that of the arable land size owned by the household. However, this may not always be the same for those households that do not own farming land and for the landless. New innovations have made home gardening possible even for the households that have little land or no land at all to cultivate crops (Ranasinghe, 2009).

#### **2.4 Home Garden and Smallholder Households' Income (Economic Accessibility)**

The practice of home gardening is widely encouraged in many countries as a mechanism to prevent food insecurity and as a source of income supplementation for rural and urban households in developing countries (Ranasinghe, 2009). Although home gardens are viewed as subsistence crop production systems, they can be designed to be more effective commercial businesses by growing high-value crops and animal husbandry (Galhena, 2013). Several studies have concentrated on evaluating the potential or real economic contribution of home gardens to households and the local economy as well as development. For example, a study conducted in eastern Nigeria reported that tree crops and livestock produced in home gardens accounted for more than sixty percent of household income (Okigbo, 2013). The practice of home gardening requires fewer resources such as inputs, it is extremely important for poor households that have limited access to production inputs, (Igwe, Aguiyi, & Nwazuruoke, 2014). It has been discovered that moderately rigorous crops produced in home gardens can supplement as much income for households, (Calvet-mir *et al.*, 2012). Home gardening benefits go beyond food and nutritional security and subsistence to income generation, especially for resource-poor households. Home gardens contribute to income supplementation and increase the household's purchasing power, which improves households' living standards (Calvet-mir *et al.*, 2012). A study conducted in Abia State, Nigeria by (Igwe, Aguiyi, & Nwazuruoke, 2014), established that households involved in the practice of home gardening earned extra income from the harvest gathered from their home gardens.

Food items collected or harvested from home gardens can also be sold to supplement household income expenditure. Additionally, home gardening practices can be developed into a small cottage industry, and income supplemented from the sale of excesses from home garden products and the savings from consuming homegrown food products can lead to more increase in disposable supplemented income that can be used for other domestic processes (Ezyguire, 2010).



## **2.5 Home garden and smallholder households' food availability**

The practice of home gardening provides households direct access to diversified food crops, thereby increasing the quantity and quality of food that a household can access for consumption to improve food and nutrition security (Clarke et al., 2014). Investing in home gardening as a pro-poor or pro-food and nutrition security intervention through input support boosts the farmers' productivity, thereby increasing households' food availability and promoting food and nutrition insecurity (Keating et al, 2012). Rendering support to home gardening practices will increase the household's production level, thus providing households with diverse food crops, thereby improving the nutritional status of household members, (Ranasinghe, 2009). The increase in household's food stock through production contributes significantly to rural household's daily food consumption frequency (Ezygguire, 2010). For instance, a study conducted on rural households in Kampala, Uganda who benefited from home gardening experienced a dramatic change in food consumption patterns from 2 meals a day to 4 meals a day (FAO, 2011). Similarly, in Baghdad, Sarajevo, Bosnia, and Herzegovina, in the 1990s, household's food stock and daily food consumption increased significantly, thus meeting households' nutrition needs (FAO, 2011).

Home gardening may be accomplished with virtually no financial resources, using local planting materials, such as manures, live fencing and traditional methods of pest control. Home gardening is a production system that the poor can easily enter and make a living (Galhena, 2013).

## **2.6 Home Gardening and Household's Dietary Diversity**

Home gardening provides households with diverse fresh foods that can increase the quantity and improve the quality of nutrients available for smallholder farming household's members (Wüstefeld, 2013). Households with home gardens usually gain more than 50 % of their supply of vegetables and fruits (such as plantains, cassava, carrot, sweet potato, cucumber, and pumpkin), and medicinal plants; those households having garden systems that include animal-raising also attain their primary and often the only source of animal protein (Wüstefeld, 2013). Very small vegetable gardens with diverse crops can provide a significant percentage of the recommended dietary allowance for protein (10 to 20 %), iron (20 percent), calcium (20 %), vitamin A (80 %) and vitamin C (100 %) (Wüstefeld, 2013).

The home garden may become the major source of household food and income during periods of shocks such as the pre-harvest spare season, low harvest, unemployed period, health or medical issues suffered by a member of the family or agricultural and economic disruption caused by civil war or other disasters (Wüstefeld, 2013).

## **2.9 Intra- Household Dynamic on household's Resources**

When assessing gender roles in economic resources, it is important to understanding the intra-household dynamics in the decision-making process (Ibnouf, 2009). How a household's resources are allocated among the individuals within a household will determine the food security status of the household's members (Ibnouf, 2009). Decision making in households varies depending on the nature of the society or cultural consideration and its organization, which differs from region to region. In some contexts, women have control over resources like income within households and make key decisions; while in others, men dominate the household's decision-making process over finances; and in some other contexts, the decision is made jointly by both man and woman through dialogue, negotiation, and bargaining (Babu, Gajanan & Hallman, 2017).

In Liberia, access and control over a household's resources vary from region to region. According to Liberia's National gender profile of agriculture and rural livelihood assessment by FAO (2018), it was established that in North-Western Liberia, women are more in control of economic resources, while major decision related to other household's resources are made jointly. It is believed in this region of Liberia that the control over the household's income by women leads to good decision making. In other regions such as South-Eastern Liberia, major decisions on household resources are made predominantly made by men. Intra-household resource allocation largely depends on two main processes: the resource generation process and the resource distribution process (Babu, Gajanan & Hallman, 2017). The resource generation process depends on how various members of the household allocate their labor to production activities within and outside the home. The resource distribution process, on the other hand, depends on the pattern of consumption such as food and nonfood commodities and other investments in human capital development (Babu, Gajanan & Hallman, 2017).

## **2.7 Constraints/ Factors affecting the practice of Home Garden**

While there are multiple benefits behind the practice of home gardening in developing countries, it is important to discuss the key challenges affecting the sustainability of home garden practices to enable making recommendations for improving home garden practices as well as making the home garden a viable and sustainable food security strategy. Among several constraints, access and control over suitable and enough land to establish a home garden, lack of ownership and usage rights of some form and lack of inputs are the most important limiting factors of home gardening practice (Ezygguire, 2010). Other constraints limiting the practice of home gardening include access to financial capital or credit facility, access to water, limited extension and advisory services, limited access to labor supply, and poor access to markets.

## **2.8 The concept of Food and Nutrition Security (FS)**

Food is defined as any substance that people eat and drink to maintain life and growth. Therefore, Food Security can be achieved, if adequate food (quantity, quality, safety, socio-cultural acceptability) is always available and accessible for and satisfactorily utilized by all individuals to live a healthy and happy life, (FAO, 2009). Based on this definition, food must meet the physiological requirement with regard to quality and quantity. The nutritional status of an individual is determined not only to be the quantity of food consumed but by quality as well. Dietary diversification also contributes immensely to individual food consumption quality. Home gardening which comprises diverse plants and species contributes to households' food consumption quality.

There are four dimensions of food security; availability, accessibility, utilization, and stability (FAO, 2011) which are discussed below.

**Food Availability-** is the amount of food that is physically present in a household or country through all forms of production, commercial imports, food aid, and food stocks, (Weingartner, 2012). At the national level, food availability is defined as the combination of domestic food production, commercial food imports, food aid and domestic food stocks (FAO, 2011).

For the context of this study, food availability is achieved from the domestic production (home gardening) and direct purchase from income derived from home gardening excesses; household food stock and consumption pattern.

**Accessibility-** It is the physical and economic access to available food to ensure that all households and all individuals within those households have enough resources to obtain food for a healthy life (KO et al, 2018). It depends on the level of household resources, like financial capital, labor, and knowledge on prices. Food access cannot be achieved without households being self-sufficient in food production

(Weingartner, 2012). According to this definition, the most important is the ability of the households to generate enough income which, together with their own products, can be used to meet food needs. Food accessibility in the context can, therefore, be defined as the ability of households to derive income from the production of home gardening for the purchase of food and non-food items to meet households' needs.

**Utilization-** Adequate utilization of food refers to the ability of the human body to metabolize food (Omotayo, et al., 2016). To make adequate and nutritious food reachable, the households must make decisions about what food is to be prepared, purchased and consumed and how the food is allocated within the household (Omotayo, et al., 2016). It is important to note that in households where food distribution is unequal, even if the measured combined food access is enough, some individuals within the households may suffer from food shortage (Weingartner, 2012). Additionally, the biological utilization of food should also be taken into thought. Biological utilization refers to the ability of the human body to take food and convert it into energy utilization by the body.

**Stability-** describes the time frame over which food and nutrition security is being considered in a given period. Stability is derived when the supply of household-level remains constant during the year and in the long term. This includes food, income and economic resources (Weingartner, 2012).

## **CHAPTER 3: RESEARCH METHODOLOGY**

### **Introduction**

This chapter focuses on the methods that will be employed by the researcher in collecting data. It addresses the role of the researcher, study area, sampling procedure, data analysis and research limitations, and research timetable and data collection schedule.

### **4.1 Methodology**

This research employed a qualitative data collection approach based on the collection of primary and secondary data related to home gardening and its effect on smallholder farming household's food availability and income supplementation. Primary data was gathered from a total of 30 respondents from 3 villages in the Careysberg District (Korto's Town, Fendell, and Mount Barclay) in which AgroTech Liberia implemented Make Use of Your Backyard program from 2016 to 2017. Fifteen (15) smallholder farming households who benefited from the Make Use of Your Backyard program and 15 smallholder farming households who did not benefit from the program and are practicing home gardening participated in assessing the effect of the program. The reason for selecting these two categories of people was to effectively establish any variations in terms of household food availability and income supplemented. The 15 participants from each category were heads of households or next in command. In order to establish the effect of the home gardening program implemented by AgroTech Liberia on smallholder household's food availability and income supplementation, the current food availability status and income supplementation between project participants and non-project participants in terms of household's food stock (production and stocks in storage hut, bin or shed), daily food consumption frequency, income supplemented and current household's production were compared. As commonly witnessed in Liberia, the frequency of the household's daily food consumption is often determined by the household's level of food availability (FSNS, 2018). Additionally, the Household Dietary Diversity Score (HDDS) was used as a proxy indicator to compare the food quantity and quality of food consumed in participants and non-participants households. Moreover, the constraints limiting home gardening practices were established during the data collection process.

### **4.2 Sampling procedure**

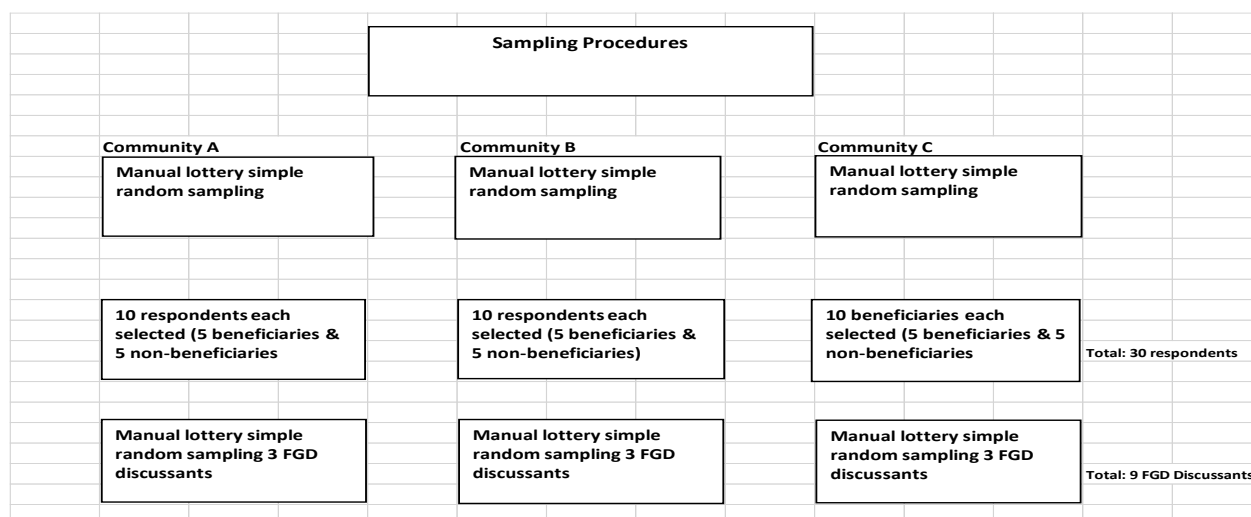
The selection of the target population was done using a manual lottery random sampling to eliminate systematic bias. Prior to conducting the sampling procedure, a brief meeting was held between all the program participants from each community whose names were given to the researcher by AgroTech Liberia executive director and the 25 non-program participants who were selected by the local chiefs in each community to be randomly selected. The target population from each category was identified and separated in their respective categories. Both males and females were given the opportunity to participate in the manual lottery random sampling in each category, to afford equal opportunity to every gender in the selection process. After the simple random sampling, a total of 18 females and 12 males (5 males and 10 females program participants and 7 males and 8 females non-program participants) from the two categories of respondents were selected to participate in the study. The involvement of both genders in the research population was not for the purpose of comparing the effect of the program between them but rather based on providing them equal opportunity to participate.

In order to select an equal number of participants in each of the participating villages (Korto's Town, Wendell, and Mount Barclay), five respondents were randomly selected from each category in each community (Project & Non-Project Participants). A manual lottery random sampling was designed using a piece of paper with two indicative numbers of zero and one prepared and rapped by the researcher. The zero-number represented 'NO' and was as many as the total number of project beneficiaries in each

community who participated in the home gardening program, while the one representing 'YES' was limited to only 5. This method was also used in selecting non-project beneficiaries who are practicing home gardening. Finally, individuals who selected YES were automatically considered respondents while those who selected NO did not participate.

The focused group discussion participants were selected among the 10 participants (5 Project and 5 Non-project participants) from each community using simple lottery random sampling with the same procedure. In the separate focused group discussions, both males and females in each category of respondents attended the same discussion to have cross ideas of the topics introduced by the researcher. This has proven to be workable in Liberia as females do not find it intimidating to discuss issues in a group with their male counterparts. According to the Ministry of Gender and Development report (MOGD, 2016), the voices of women tend to more recognized and respected by their male counterparts due to the level of awareness and protection of women's rights in Liberia. In order to have an interactive focused group discussion, discussants agreed to set rules and regulations to govern the discussion. This was done to allow everyone to respect the views of others.

**Figure 4:Sample selection procedure**



Source: author (2019)

### 4.3 Data collection

In the collection of data, a combination of tools was used to understand the effect of the home gardening program on smallholder farming household's food availability and income supplementation. These methods or tools included a desk study using secondary data from secondary sources, Focused Group Discussion, Key informants, Observation, Dietary Diversity Score and Semi-structured interview.

#### 4.3.1 Semi-Structured Interview (SSI)

As mentioned in the previous section under-sampling procedure, all the 30 respondents randomly selected participated in the semi-structured interviews. The Semi-Structured Interview (SSI) was used to assess the following questions:

- Sub-question 1(How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiaries' food availability?) of main question 1.

- Sub-question 3 (What constraints or challenges smallholder farming households who benefited from the Make Use of Your Backyard program implemented by AgroTech Liberia are faced with when practicing home gardening?) of main question 1,
- Sub-question 2 (How is the income supplemented from AgroTech Liberia Make Use of Your Backyard program spent or utilized by smallholder farming households who benefited from the program? of main question 2.
- Sub-question 3 (How is the income supplemented from home AgroTech Liberia Make Use of Your Backyard being controlled by program beneficiaries' households? of main question 2.
- Sub-question 1 (To what extent AgroTech Liberia Make Use of Your Backyard program has supplemented the income of smallholder farming households who benefited from the program? of main question 2.

The SSI contained objective (Closed) questions that helped the researcher in collecting information from the respondents. The SSI was conducted after the two separate focused group discussions were carried out. This was done to allow interviewees who found it difficult to respond to the questions related to income and food availability amid others can have the opportunity to do so since these questions directly interfered with their individual privacy. Interviews were conducted in the respondent's house and lasted 1 hour each with a follow up in the field. Respondents during the semi-structured interviews provided how home gardening has contributed to their households food availability, their monthly income generated from home gardening, the challenges affecting the practice of home gardening, the role of men and women in promoting home gardening and their food availability condition before and after the program was introduced. The reason for using the Semi-Structured Interview was to allow the respondent and interviewer to engage in a formal interview. The SSI gave the respondents the chance or freedom to express themselves in their own terms. Additionally, the SSI provided the research in-depth, reliable and comparable quality data because respondents who were not able to contribute with personal information in the focused group discussion were able to do so.

An interview guide (Appendix 1) with a list of topics to be covered was prepared and pre-tested before taking into the field to conduct the interviews. After pre-testing the interview guide, it was observed that the answers given were in line with the research questions. Open-ended questions were included in the interview guide to allow the respondent to provide more answers. The researcher pleaded with the respondents to extend the interview time from 45 minutes to 1 hour since voice recording could not be carried out throughout the data collection process due to the lack of electricity.

**Figure 5: Researcher conducting a semi-structured interview**



Source: author (2019)

#### 4.3.2 Focused Group Discussion (FGD)

The discussion with the respondents in the focused group was the first data collection method employed by the researcher. Two separate focused group discussions of nine participants each consisting of the program and non-program participants were conducted. The FGDs were conducted within an open atmosphere to allow focused, conversational and two-way communications between the discussants and the researcher. Before the discussions, discussants were in consensus as to where the focused group discussions should be held. The two focused group discussions were held at the local chiefs' houses and lasted for 2 hours each. The focused group discussions were facilitated by only the researcher. Note-taking was done by the researcher, while the first 4 days recording was done by a discussant. The focused group discussions were used to assess the following questions.

- Sub-questions 1 (How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiaries' food availability?) of the main question 1 in order to get a deeper insight on the status of food availability of smallholder farming households prior to the practice of home gardening and after the introduction of the home gardening program from a group perspective. Since these questions could be easily discussed in the joint section, discussants were free to elaborate based on their own experiences on food availability.
  - Sub-question 3 of main question 1 (What constraints or challenges smallholder farming households who benefited from the Make Use of Your Backyard program implemented by AgroTech Liberia are faced with when practicing home gardening?).
  - Sub-question 3 of main question 2 (How is the income supplemented from home AgroTech Liberia Make Use of Your Backyard being controlled by program beneficiaries' households?)
- The information generated was summarized using a predesigned sheet for further analysis. The data from the FGD was collected using a semi-structured group interview question guide (Appendix 2) with open questions covering various topics of interest. The reason for using this method was to get diverse views from group perspectives based on experiences with regards to food availability before and after the program was introduced.

**Figure 6: Focused group discussion**



Source: author (2019)

#### 4.3.3 Observation

The systematic observatory approach was used to ascertain and verify information gathered on some of the observable factors mentioned during the semi-structured interviews and focused group discussions.



The observation method was employed after every semi-structured interview had come to an end. During the data collection, food stock claimed by respondents to be in the field and in the house were observed. Moreover, home gardens sizes were measured by the researcher to verify the figures received from respondents. The researcher used notetaking on observable features. For example, those physical challenges affecting the practice of home gardening like erosion, pest and disease infestation, water availability and land size can be observed. Additionally, the land size and the types of crops and grown were verified by the researcher during observation.

**Figure 7: Researcher observing food stock in the field and in the house**



**Source:** author (2019)

#### **4.3.4 Key Informants (KI)**

In order to get a diverse insight and validate the responses during the interview process, 3 key informants comprising of two local chefs and one AgroTech Liberia program officer were selected to participate in providing additional information. The selection of the two local chiefs was based on their knowledge and experience on home gardening and the Make Use of Your Backyard program itself. The selection of the



program officer based on the recommendation of AgroTech Liberia executive director. The interviews with the AgroTech Liberia program officer were carried out at the organization's office in Careysberb District, while the ones with the local chiefs were held at their residence. Each key informant interview lasted for 45 minutes. Questionnaires containing open questions were used to conduct the key informant's interviews (Appendix 3).

**Figure 8: Key informant visit with program officer of AgroTech Liberia**



Source: author (2019)

#### **4.3.5 Household Dietary Diversity Score (HDDS)**

The HDDs was used to address sub-question 2 (How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiary's dietary diversity?) of main question 1(What is effect does home gardening has on small-holders farming food availability?) in order to measure the dietary intake of individual household. This enabled the researcher to determine the effect of home gardening on smallholder farming households' food availability. The Dietary Diversity Score is a qualitative measure of household food consumption that reflects household access to adequate and quality of foods and is also a proxy indicator for nutrient adequacy of individual diet (FAO, 2011). The HDDs were used to collect and calculate the household's food access. It was also used to measure the different types of food groups consumed over a 24 hours period. The accumulation of more diversified food crops increases the dietary diversity score of households as a result of an increase in consumption (Deborah, Ekesa & Kennedy, 2018). This implies that a more diversified diet is often associated with improved outcomes in areas such as birth weight, child anthropometric, and nutrition security of the family (Musotsi, 2008). Questions about the consumption of different types of food groups were asked to the person who was directly involved in the preparation of food. A questionnaire containing 12 food groups was designed and used to measure the dietary diversity scores (Appendix 5). The interview was conducted with the person in charge of preparing a meal in the house.

**Table 1: Research questions and data collection methodology**

Research Questions	Answering Methods	# of Respondents	Indicators
<b>Main question 1:</b> What are the effects of the Make Use of Your Backyard home program implemented by AgroTech Liberia on small-holder farming household's program participants' food availability?			
<b>Sub-question 1:</b> How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiaries' food availability?	Two Focused Group Discussions	9 Project participants FGD & 9 Non-Project Participants each FDG	Household Production Household's
	Semi-Structured interview	15 Project participants & 15 Non-Project Participants	Food stock (Food stock in the field and in the house)
	Key informants	1 project officer and 3 people who have knowledge on HG	
<b>Sub-question 2:</b> How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households' beneficiary's dietary diversity?	Dietary Diversity Score	15 Project Participants & 15 Non-Project Participants	Dietary Diversity Score
<b>Sub-question 3:</b> What constraints or challenges smallholder farming households who benefited from the Make Use of Your Backyard program implemented by AgroTech Liberia are faced with when practicing home gardening?	Two Focused Group Discussions	9 Project participants FGD & 9 Non-Project Participants each FDG	Constraints identified by respondents
	Semi Structured interview	15 project participants	
	Observation	Researcher	
	Key informant interview	1 project officer and 3 people who have knowledge on HG	
<b>Main question 2:</b> What are the effects of the Make Use of Your Backyard program implemented by AgroTech Liberia on smallholder farming household's program participants' income supplementation?			
<b>Sub-question 1:</b> To what extent AgroTech Liberia Make Use of Your Backyard program have supplemented the income of	Semi Structured interview	15 Project Participants & 15 Non-Project Participants	Income generated

smallholder farming households who benefited from the program?

<b>Sub-question 2:</b> How is the income supplemented from AgroTech Liberia Make Use of Your Backyard program spent or utilized by smallholder farming households who benefited from the program?	Semi Structured interview	15 project participants	Items income used on or ways income is used
<b>Sub-question 3:</b> How is the income supplemented from home AgroTech Liberia Make Use of Your Backyard being controlled by program beneficiaries' households?	Semi Structured interview	15 Project Participants & 15 Non-Project Participants	Number of men, women, and couples controlling income
	Two Focused Group Discussions	9 Project participants FGD & 9 Non-Project Participants each FDG	

**Source:** author (2019)

### 5.1 Secondary Data

In order to conduct this study, a desk study was carried out using secondary data sources like journals, articles, reports, books and online videos. Information on the effect of home gardening on food availability and income supplementation was collected and compiled to set the basis for the qualitative data collection.

### 5.2 Data Analysis

The data analysis process begun immediately after the researcher reported home each day from the field. Relevant information relating to sub-questions was cross-checked, organized and displayed for further analysis. Key issues like income, food stock, food consumption pattern, dietary diversity, and current domestic production, constraints affecting home gardening practices and the access and control over income generated from home gardening were identified, transcribed and organized based on their relationship with the sub-questions, and recorded using a pre-designed categorized form. Quotes and statements from participants were recorded during every discussion. To avoid the wrong representation of data and ensure quality in data collection, information from the field was thoroughly and carefully analyzed. This enabled the researcher to meaningfully interpret the data. Finally, Excel was used to display field data in a presentable way.

### 5.3 Research Limitations

There were several factors that limited or hindered the data collection process. The most notable ones were the rainy season, poor accessibility of target community due to bad roads, the willingness of respondents to participate in the process since there is no compensation for ethical reasons and the limited number of respondents. The research which begun at the latter part of June through August posed a serious challenge. The rainy season at this period in Liberia was at its peak where people barely leave their houses. The extent to which the rain falls ranges from 975mm to 995mm monthly. In some instances, the rain falls for 2-3 days without ceasing. This had the propensity to impede the movement of the researcher in some ways. In addition to the challenges, the data was collected in one of the hinterlands where access to the road is a serious challenge. There are no paved roads leading to the communities where the target group is situated. To practically address these challenges, the researcher moved in target communities for 4 weeks to enable the researcher to have easy access to the respondents. Finally, with the lack of compensation, the possibility of getting respondents or discovering enough information was also a serious challenge. Communities in Liberia have been engulfed with the

belief that every research an individual participates in must-have benefits attached after all. Therefore, any research that does not create the impression of increased expectations might not achieve its objective. However, as a researcher who had the passion and believed in research quality, the researcher addressed this by doing a good community entry and by clearly defining his role and position before starting the data collection process. Finally, the study conducted did not include more respondents as a result of limited resources, which means that the results might not be a true representation of the total research areas.

## CHAPTER 4: RESEARCH CONTENT

### Introduction

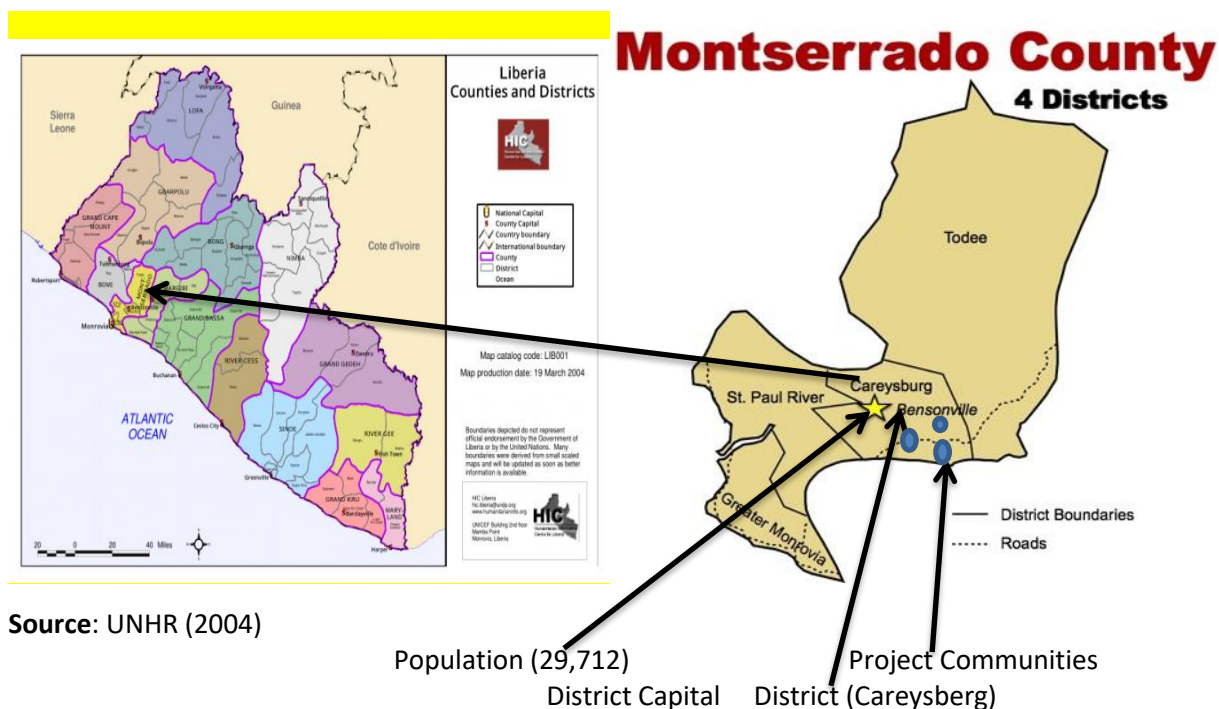
This chapter provides brief information on the research area, its selection, specifically, its location, population, climate, and its population. It also provides background information on AgroTech Liberia, its inception, mission, core value, objectives and Make Use of Your Backyard home gardening program.

### 6.1 Study Area and its Selection

The selection of the Careysberg District, Montserrado County, as the study area was based on the fact that AgroTech Liberia Make Use of Your Backyard program was implemented in communities within the district. Additionally, the lack of knowledge as to whether the project beneficiaries are among the currently vulnerable households give the researcher enough reason to focus on these communities.

Montserrado County is located in the northwestern portion of Liberia. It is one of Liberia's 15 counties that constitute the division in the nation and it has five Districts. Bensenville serves as the capital with the area of the county measuring 1,912.7 square kilometers (738.5 sq. mi). Montserrat county has a population of 1,118,241 (LISGIS, 2008), making it the most populated county in Liberia. The county shares bordered with Bomi County to the West, Bong County to the north, and Margibi County to the East. Carlsberg District is one of the six Districts located in Montserrado County with 324 towns and villages. The population of the Careysberg district is 29,712 and it's a capital city is Bensenville.

**Figure 9: Map of Liberia indicating Careysberg District, Montserrado County**



Source: UNHR (2004)

### 6.2 Organization Description

AgroTech Liberia (ATL) is a local non- governmental entity working with urban and rural communities in promoting Food and Nutrition security through a capacity building program, livelihood development and natural resource management. The organization was founded in 2014 by a group of university graduates who realized how the Ebola outbreak had affected the livelihoods of the people of Liberia. To give back to society, the organization was the relevance of promoting agriculture-related programs.

- ❖ **Objective:** To build the resilience of farmers in rural and urban communities through multiple livelihood options for sustainable peace and development.
- ❖ **AgroTech Liberia mission:** Empowering urban and rural communities to use available resources to improve food and nutrition security through agricultural production and processing using Farmers' Based Participatory Research (FBPR), as well as health education for sustainable peace and development, (AgroTech, 2015)
- ❖ **Vision:** Empowered urban and rural communities for self-sufficiency, resilience and good health.

#### **Organization's outputs**

- ❖ **Special capacity building:** Build capacity of farmers by providing technical scientific farming knowledge such as planting methodology, and fertilizer application. Design and implement livelihood programs in rural and urban communities. Provides consultancy services for NGOs and engages with the Private sector in the area of advocacy.
- ❖ **Labor-saving service:** Liberia agriculture sector is been underdeveloped for several reasons including lack of agriculture machinery to carry out farming activities. As many farmers are still using hoes and cutlasses which results in low productivity, AgroTech Liberia introduced the labor-saving device and machine service since 2014 to reduce drudgery in the farming sector as most of those currently farming is from 40 years and above.
- ❖ **Extension services:** AgroTech Liberia provides extension services to farmers through training, visual aid, Farmers Field School (FBPA) among others.

**Organization effect /Users:** AgroTech Liberia activities rural and urban rice farmers (women and men) and other organizations.

**Organization impacts:** Improve food security, increase household income, improve well-being and build farmers' capacity.

**Organization inputs:** In achieving its mission in Liberia, AgroTech Liberia utilizes all the livelihood assets in all aspects of its operation.

**Human Assets** - The organization has a total of 30 employees and 20 contractors who have some form of ideas on agriculture, finance, management, and economics.

**Financial Assets** - The organization is been financially supported by organizations like the World Bank through the Japanese livelihood grant project, USAID and FAO through project awards. It is also been partly funded by the government of Liberia through the Ministry of Agriculture. Besides the donor's funding, the organization engages in other production activities to be more sustainable.

**Natural Asset-** The organization owns 20 hectares of arable land with trees.

**Physical Assets** – AgroTech Liberia has 4 office buildings, 8 cars, 15 bikes, 6 power tillers, 7 combine harvesters, 18 computers, 13 printers, and have access to information devices.

**Social Assets-** The organization is partnering with several governmental and non- governmental organizations like the Ministry of Agriculture.

#### **6.3 Make Use of Your Backyard home gardening program background and plan**

In its effort to contribute to revamping the agriculture sector devastated by the Ebola crisis of 2014, after proper needs assessment in 2016 AgroTech Liberia introduced the Make Use of Your Backyard home gardening program in Careysberg District in three communities (Kort's Town, Fendell, and Mount Barclay), having realized that smallholder farmers in the district faced low food availability and low income as the result of low production. This program amongst others was introduced as a strategy to improve households' food availability and as well as supplement households' income from the sales of excesses derived from home gardening. The selection of project beneficiaries was carried out based on a

household owning plot sizes between 20 by 20m, 30 by 30m and 40 by 40m. The home gardening program which was implemented in Kort's Town, Fendell community and Mount Barclay) targeted 120 beneficiaries from three communities. AgroTech Liberia used a Farmers Based Participatory Approach (FBPA) to enable participants to build their knowledge on contemporary farming practices by involving both extension agents and participants in field demonstration activities. Five weeks of intensive training was provided to build farmers' capacities in areas like planting, chemical application, and nursery development. Following the training, participants were given inputs like fertilizers, pesticides, irrigation materials, improved varieties of seeds such as maize, cabbage, pepper, tomatoes, okra, cassava stalk, etc. Additionally, extension delivery services to enhance their production was provided during the first 6 months of the program.

## CHAPTER 5: RESULTS

### Introduction

This chapter provides information on respondents and presents field data. The results are displayed according to the indicators of the research framework. Graphs and tables are used to clearly illustrate results concisely.

### 6.1 Sex of the respondents

In the simple random sampling carried out by the researcher, which gives equal opportunity to both males and females to be randomly selected, 18 out of 30 (60%) respondents selected were females while 12 out of 30 (40%) respondents were males as displayed in the table below.

**Table 2: Respondent by Sex**

Sex	Number of Respondents	Percentage
Males	12	40%
Females	18	60%
<b>Total</b>	<b>30</b>	<b>100%</b>

**Source:** author (2019)

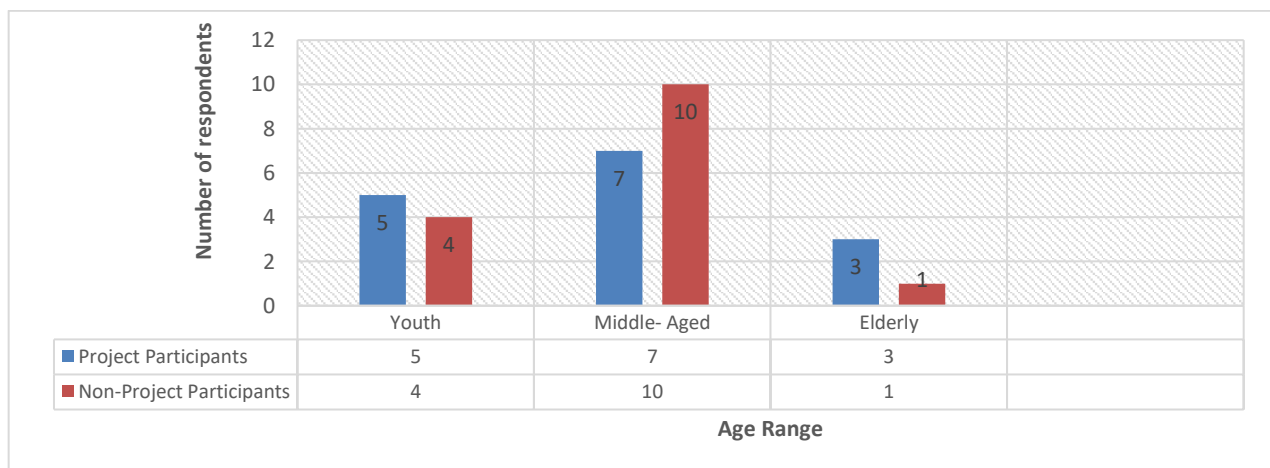
The result in Table 2 shows that women respondents were more than male respondents

### 6.2 Age of Respondents

The result of the demographic information collected shows that 5 out of the 15 (33.3%) respondents who participated in the program were youth between (18 and 35 years) as defined in the context of Liberia (LISGIS,2008), while respondents between 36-48 were 7 (46.6), thus giving the highest number in terms of participants. Finally, 3 (20%) respondents were between the age of (49- 60).

Among the non-program participants, 4 (26.6%) out of the 15 respondents were youth between (18 and 35 years old), 10 (66.6%) out of 15 non-program participants were middle-aged between (36 and 48 years old), while 1 (6.6%) out of the 15 non-program participants was elderly (49 and 60 years old). Figure 10 below illustrates the age range of respondents.

**Figure 10: Ages of respondents**



**Source:** author (2019)

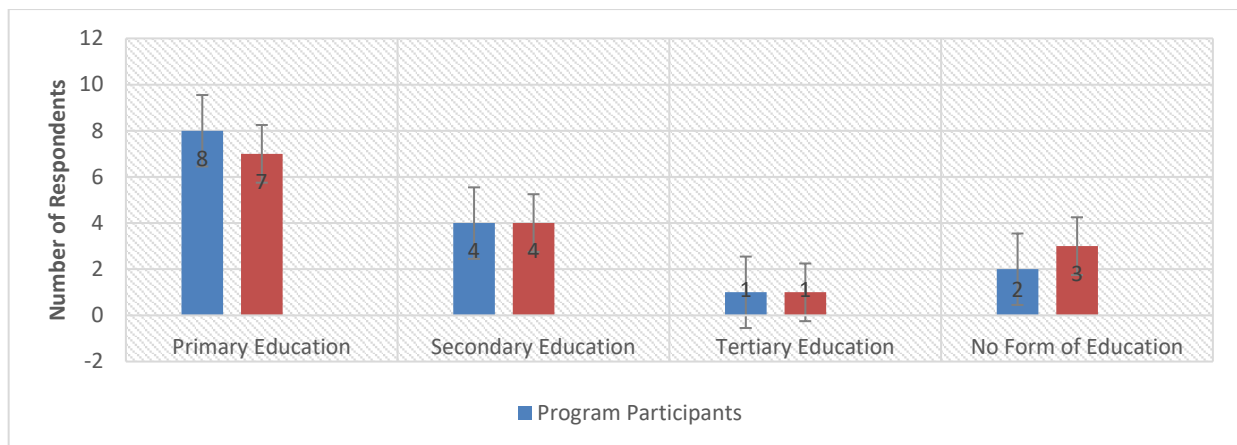


Figure 10 above indicates that the distribution of age among program participants in the three categories of age range is more proportional as compared to non-program participants who had 66.6% of their respondents as middle-aged.

### 6.3 Respondents' level of education

The result of the semi-structured interviews conducted established that 13 program participants (86.6%) had some primary, secondary and tertiary educations, while 2 (13.3) did not have any form of education. It was revealed that 12 out of 15 non-program participants (80%) had attended primary, secondary, and tertiary education, while 3 (20%) out of 30 did not have any form of education. Figure 11 displays the categorical level of respondents' education.

**Figure 11: Level of education of respondents**



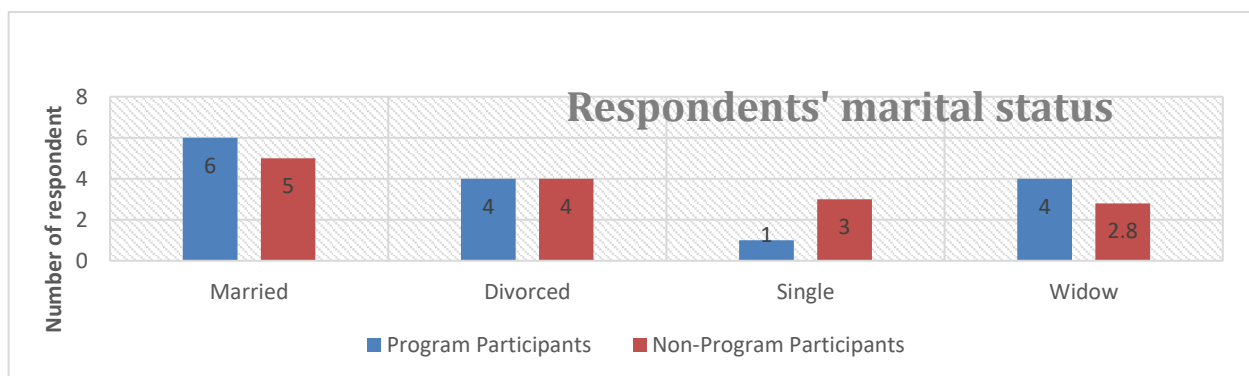
Source: author (2019)

The result in Figure 11 above shows that program participant (86.6%) and non-program participant (80%) had some form of education (86.6), while only 5 respondents from both categories of respondents did not have any education

### 6.4 Marital status of respondents

The result of the interview conducted showed that 6 (40%) out of the 15 program participants were married, 4 (26.6%) divorced, 1 (6.6%) was single and 4 (26.6%) widowed, while 5 (33.3%) non-program participants were married, 4 (26.6%) divorced, 3 (20%) were single and 3 (20%) were widow as illustrated in Figure12.

**Figure 12: Marital status of respondents**



Source: author (2019)

The result indicated in Figure 12 shows that both categories of respondents had almost the same number of respondents in each marital status.

### 6.5 Land areas cultivated by both categories of respondents

**Table 3: Land areas cultivated by both categories of respondents**

Land area in meter square	No. of respondents
<b>Program Participants</b>	
20m by 20m (400m)	7 Respondents (46.6%)
30m by 30m (900m)	4 Respondents (26.6%)
40m by 40m (1600m)	4 Respondents (26.6%)
Total:	15
<b>Non-Program Participants</b>	
20m by 20m (400m)	10 Respondents (66.6%)
40m by 40m (1600m)	5 Respondents (33.3%)
Total:	15

**Source:** author (2019)

From the observatory method employed by the researcher to authentic the information gathered from the semi-structured interviews regarding land size occupied by home gardens, the result established that participants of the Make Used of Your Backyard program had 3 categories of land sizes as a guideline for eligibility by AgroTech Liberia. Non-program participants had 2 categories of land sizes as indicated during the semi-structured interviews and authenticated by the researcher through measurement. The result showed that 7 program participants (46.6%) had the land size 20m by 20m, while 10 non-program beneficiaries (66.6%) had a similar size. The data in Table 3 shows that both program participants and non-program participants had virtually the same land sizes in 2 of the 3 land categories. The result also shows that only 4 program participants had a land size of 30m by 30m which was not seen with non-program participants. What was also established was the fact that non-program participants had the highest number of respondents occupying the largest land size of 40m by 40m as compared to program participants. It can be concluded that program participants and non-program participants had virtually the same land sizes for home gardening.

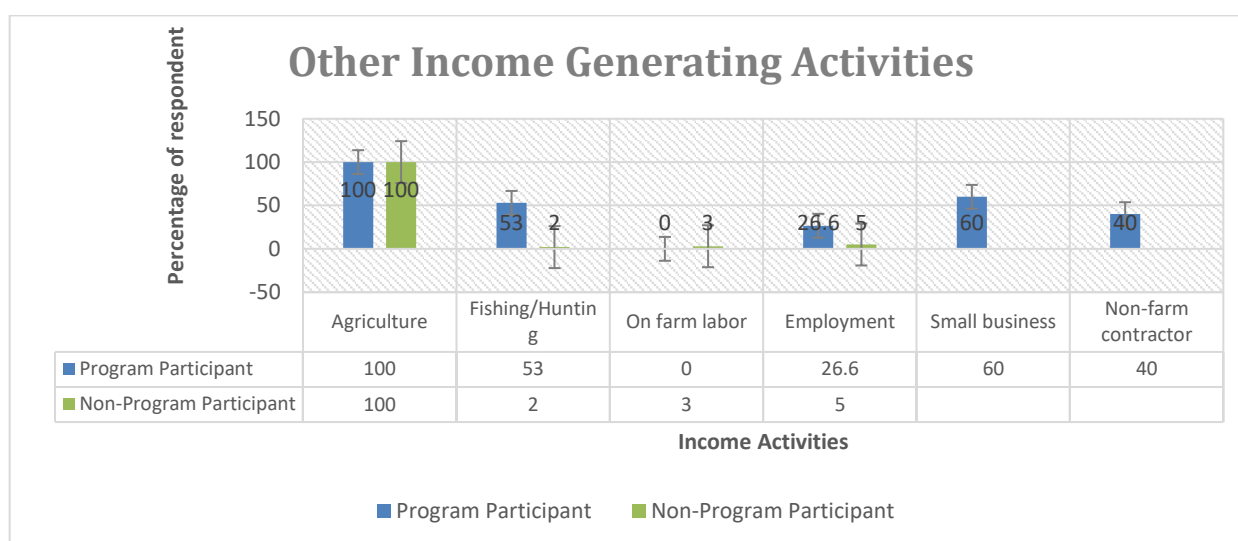
### 6.6 Other income-generating activities identified

**Table 4: Other income-generating activities**

Activity	No. of Program Participants	No. of Non-Program Participants
Agriculture	15 (100%)	15 (100%)
Fishing/hunting	8 (53.3%)	9 (60%)
On farm labor	0	6 (40%)
Formal employment	4 (26.6%)	2 (13.3%)
Small business	9 (60%)	5 (33.3%)
Non-farm contractor	6 (40%)	6 (40%)

**Source:** author (2019)

**Figure 13: Other income-generating activities**



**Source:** author (2019)

The result shown in Table 4 and Figure 13 indicates that agriculture is the main source of income for all Make Use of Your Backyard program beneficiaries and non-program beneficiaries. In addition to agriculture, 53.3% of program participants and 60% of non-program participants have income generated by fishing and hunting, 60% of program participants and 33.3% of non-program participants are doing small businesses, 40% of program participants and 40% of non-program participants worked as non-farm contractor, 60% of non-program participants do on-farm labor, while no program participants work as a farm laborer. Finally, 26.6% of program participants and 13.3% of non-program participants are employed.

The result revealed that program participants and non-program participants were involved in the same income-generating activities. It can be concluded the agriculture is the main income-generating activity for both categories of respondents.

## 6.7 Key findings

### 6.7.4 Dietary Diversity

The Household Dietary Diversity Score (HDDS), a proxy indicator that measures the number of unique food groups consumed by household members over a given period. The HDDS was used to determine the household's ability to acquire enough quality and quantity of food to meet the members of a household nutritional requirement for productive lives. The HDDS was assessed in order to investigate whether having a home garden had an impact on a household's dietary diversity. Twelve food groups were used to determine the dietary diversity scores of both categories of respondents.

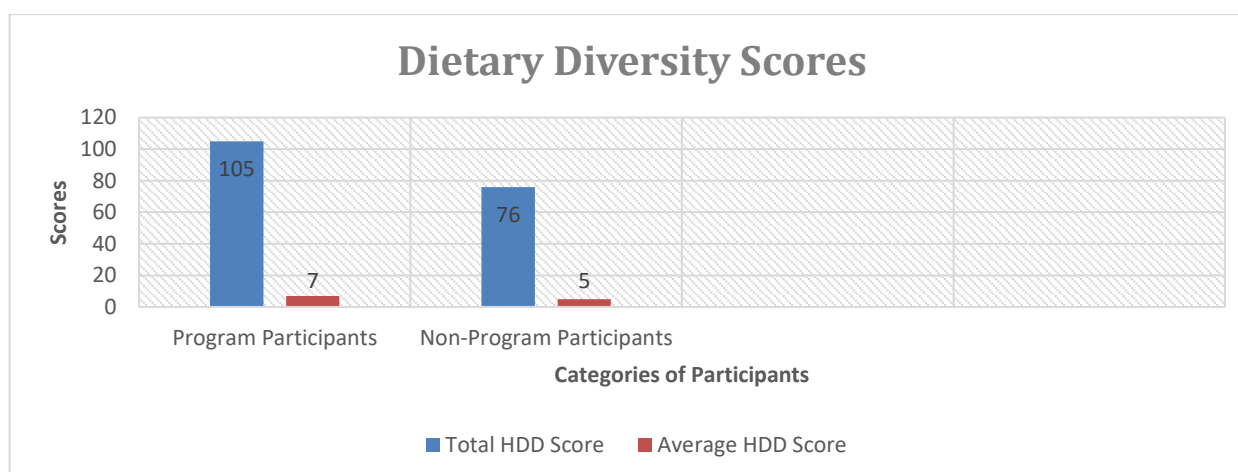
The period of 24 hours was taken in order to calculate the HDDS of households. Also, any food item consumed outside the home was not recorded. As a rule, any average HDDS less than or equal to 3 represents poor or low Dietary Diversity. Any average score ranging from 4 to 5 is considered medium or acceptable though not enough (requires improvement). Any average score above from 6 indicates a high dietary diversity score and a clear indicator of the households' ability to acquire enough quality and quantity of food to meet the dietary requirements of all household members.

**Table 5: Summary of the HDD Sores**

Category of Respondents	Total HDD Scores	Average HDD scores
Beneficiaries of the Make Use of Your Backyard program	105	7.0
Non-program beneficiaries who are practicing home gardening	75	5.0

**Source:** author (2019)

From Table 8 above, beneficiaries of the Make Use of Your Backyard program earned the highest dietary diversity score of 7.0 compared to non-program participants who are also practicing home gardening, scored 5.0. Also, from the HDDS coding sheet analyzed by the researcher, it was observed that participants of the Make Use of Your Backyard program had eaten most crops grown in their home gardens within the 24 hours given period as compared to non-program participants. Figure 21 below illustrates clearly the dietary diversity scores of both categories.

**Figure 14: Dietary diversity scores of respondents**

**Source:** author (2019)

The data in Figure 21 shows that program participants scored the highest dietary diversity scores compared to non-program participants. This could mean that the increased in diversified food crops contributed to the increase in program participants' dietary diversity scores.

#### 6.7.1 Household's Food Stock in the field (production) and crop variety

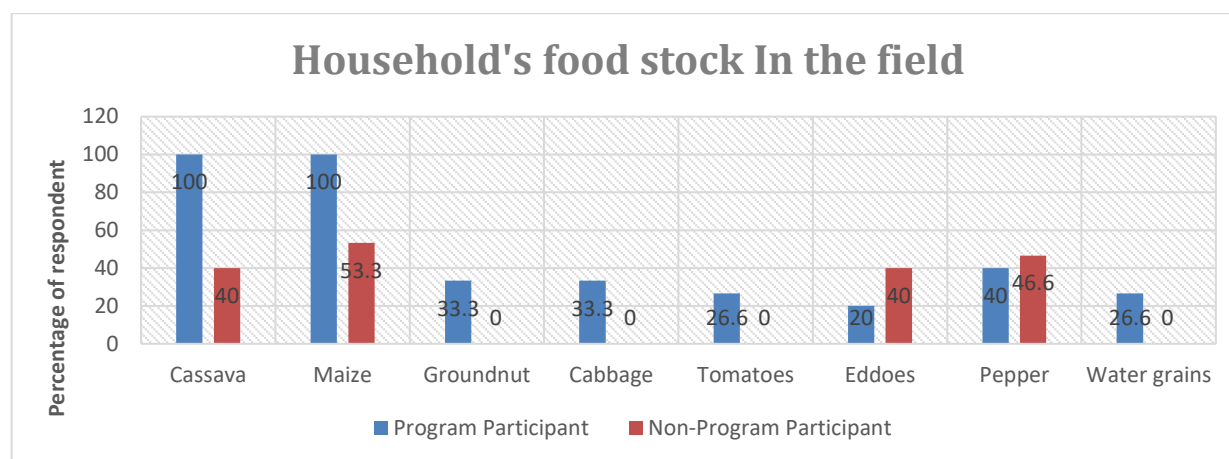
The result of the semi-structured interviews, focused group discussions and systematic observation employed by the researcher showed that all program participants and non-program participants agreed that they have crops cultivated in their home gardens.

The results established the following crops being cultivated in home gardens by both categories of respondents as indicated in Table 5 and Figure 11 below.

**Table 6: Food stock in the field**

Crops' common names/Local names	Type	No. of Program Participants	No. of Non-Program Participants
Cassava	Root and Tuber	15 (100%)	6 (40%)
Maize/Corn	Cereal	15 (100%)	8 (53.3%)
Groundnut	Leguminous	4 (33.3%)	None
Cabbage	Vegetable	5 (33.33%)	None
Tomatoes	Fruit	4 (26.6%)	None
Eddoes	Root and Tuber	3 (20%)	6 (40%)
Pepper	Spice	6 (40%)	7 (46.6%)
Water Grains	Vegetables	4 (26.6%)	None

Source: author (2019)

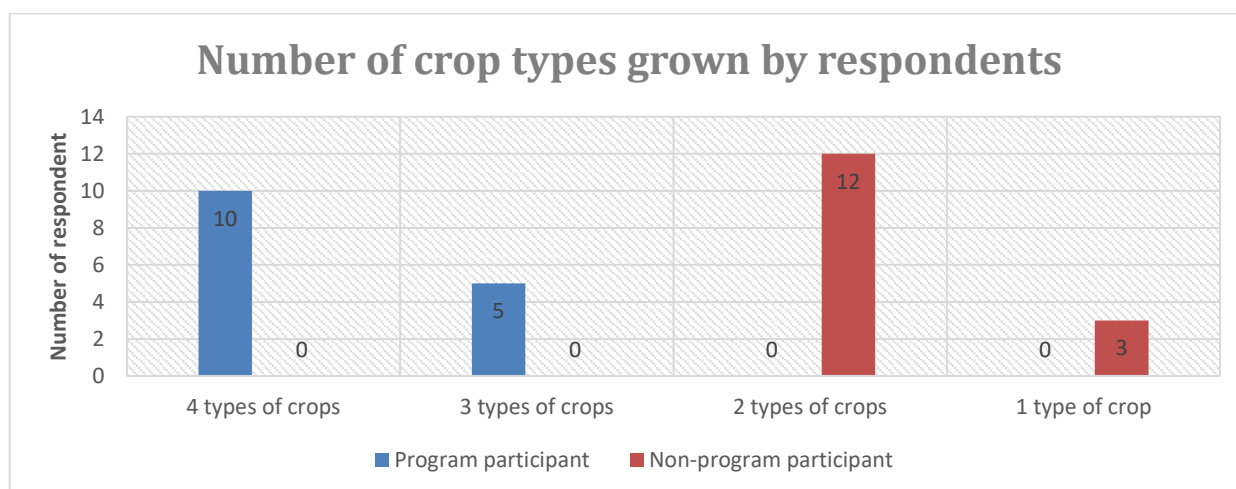
**Figure 15: Household's food stock in the field**

Source: author (2019)

Table 5 and Figure 14 above indicate 8 different types of crops being cultivated by program beneficiaries, while only 4 different types of crops were being cultivated by non-program participants. The result also showed that all program participants of the Make Use of Your Backyard program implemented by AgroTech Liberia had 3-4 different types of crops currently in the field, non-program participants had 1-2 different types of crops in the field. It can, therefore, be concluded that program participants had more food stock in the field as compared to non-program participants. This result indicates that households' food available through home gardening as illustrated in the research framework is achieved.

The result further indicated that 10 program participants constituting 66.6% had 4 types of crops in their fields, while 5 constituting 33.3% had 3 different types of crops in their fields. Additionally, 12 non-program participants constituting 80% had 2 types of crops grown in their fields, 3 constituting 20% had only 1 type of crops being cultivated in their fields. Figure 15 below clearly and concisely illustrates the number of crops grown by respondents from the two categories.

**Figure 16: Number of crop types grown by respondents**



**Source:** author (2019)

During field observation, some of the crops in the field such as cassava, pepper, maize, cabbage, and groundnuts were seen matured in the field and ready for consumption, while others were going through growth stages. The result also revealed that the second and third staple crops grown in Liberia (cassava and maize) were only cultivated by 6 (40%) and 8 (53.3%) non-program participants households respectively as indicated in Table 5 above. The result also showed that the second and third stable food (cassava and maize) after rice in Liberia were identified in all the respondent home gardens who benefited from the Make Use of Your Backyard program. During the semi-structured interviews, all program participants (100%) attributed the diversity of crops in their home gardens to the support rendered by AgroTech Liberia in providing a variety of improved seeds that were previously not available to them. As explained by all the program participants during the interviews, the production of diverse crops has contributed greatly to the availability of diverse food in their households, thus improving the quality and quantity of food. Respondent AA explained comparing the present to the previous years before the program was introduced.

**Figure 17: Respondent AA Testimony on food availability status before and after the program**



**Respondent AA:** “When I started home gardening before, things were still difficult for me and my family. My family and I were only growing few crops in our garden and that most of the crops we are growing could not give us high yield due to low quality of seeds. It was also very difficult to find quality seeds. Even if we saw quality seeds, we could not afford to buy them. As a result, my family and I could not rely on the garden for households’ source of food. We could barely eat regularly. The health status of my children was terrible. But things changed to good after AgroTech Liberia introduced its program. Now my family and I can boast of more food with quality coming from our garden. My children can now eat regularly”.

**Source:** author (2019)

As confirmed in the focused group discussion, all the 9 program beneficiaries' discussants agreed that they are growing many crops because of the inputs provided by AgroTech Liberia. They further agreed that before, they were only engaged in cultivating one type of crop due to the difficulty in acquiring good seeds, but now, they can boast of having 3-4 types of crops in their gardens. According to the discussants, the diversity of improved crops has provided adequate and quality food for their households. With access to diverse crops, discussants explained that others have become envious of them in their communities.

Moreover, during the focused group discussion with the program participants, the issue of animal production was raised in which all the 9 discussants agreed that animal production should be considered in any future program. According to them, they spent more of their income supplemented from home gardening on animal products. The income spent on animal products according to them could be used to address other competing priorities if they were involved in animal rearing. They further agreed that including animal rearing in future programs will enable them to earn some extra income that will enable them to meet other household's needs.

Also, according to the information gathered in the focused group discussions, non-program participants lamented that they are only growing crops from hand to mouth. They further explained that they are growing a small variety of crops because they do not have any external support. They further explained that they cannot afford either to get quality seeds because they are difficult to find on the market. According to them, even if they find the good seeds on the market, they do not have the money to buy them. They lamented that the home gardens they are cultivating are not reliable for the household's food source but further explained that they are only involved in home gardening because anything that has to do with agriculture is what they love doing. Also, from the focused group discussion, 6 out of 9 of the non-program participants expressed fear that their love for home gardening is dying slowly and they might at some point in time be forced to quit if nothing is done, while the 3 respondents that it is because of the love they have for home gardening that is keeping them in the practice. They also added that had it not for other livelihood activities, their houses would have been food insecure completely.

According to the information collected from the key informant's interview, the AgroTech Liberia program officer assigned in the district also confirmed that prior to the introduction of the Make Use of Your Backyard program, not many seeds were accessible to the beneficiaries. According to the extension officer, only a few seeds were seen with beneficiaries prior to the program. The extension officer further explained that even the few seeds that were identified were not of good quality.

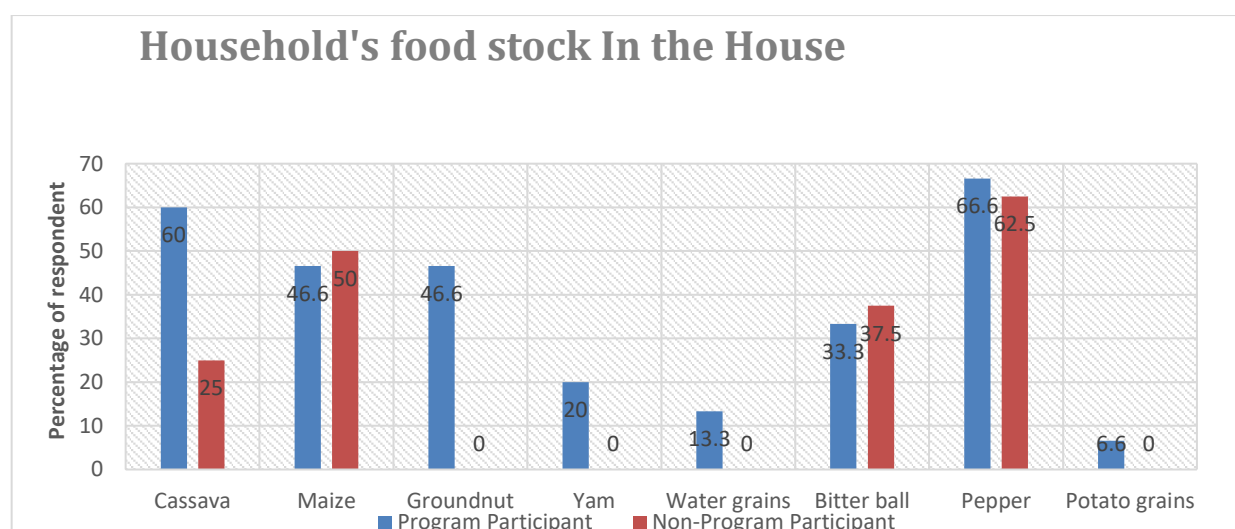
#### **6.7.2 Food Stock in the House (storage hut, bin, or shed)**

The result of the semi-structured interviews showed that all the 15 (100%) program beneficiaries agreed that they have food stock from home gardening among their households' food stock in storage hut, bin, or shed, while only 8 (53.3%) non-program participants agreed that they have food stock from home gardening amongst households' food stock in storage hut, bin, or shed. below. Table 6 and Figure 13 display the different types of food stock identified in both categories of respondent's households.

**Table 7: Food stock in the house**

Crops	Edible Type	Program Participants	Non-Program Participants
Cassava	Dry/Fresh	9 (60%)	2 (25%)
Maize	Dry/Fresh	7 (46.6%)	4 (50%)
Pepper	Dry/Fresh	10 (66.6%)	5 (62.5%)
Groundnut	Dry/Fresh	7 (46.6%)	None
Bitter ball	Dry/Fresh	5 (33.3%)	3 (37.5%)
Yam	Fresh	3 (20%)	None
Water Grains	Fresh	2 (13.3%)	None
Potato Grains	Fresh	1 (6.6%)	None

Source: author (2019)

**Figure 18: Household's food stock in the house (storage hut, bin, or shed)**

Source: author (2019)

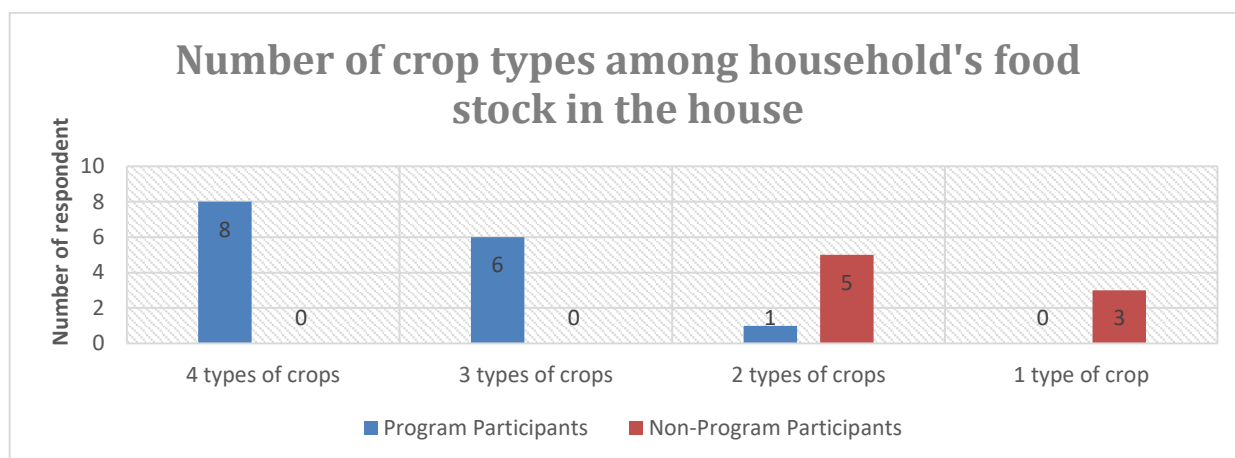
The result of the semi-structured interviews and systematic observation as indicated in Table 6 and Figure 17, shows that 8 fresh/dry crops produced in home gardens were identified among program beneficiary's household's food stock in the house, while only 4 types of crops were identified among non-program participants food stocks in the house. Dry food cultivated from home gardens during previous growing seasons and fresh foods from current production were seen in both categories of respondents' households as indicated in Table 6 and Figure 17. The result further reveals that the second and third staple food (maize and cassava) in Liberia were seen among 60% and 46.6% program participants food stock respectively as compared to non-program participants. The 9 program participants during the focused group discussion agreed that it is because of AgroTech Liberia home gardening program they have increased in diversified food stock in their households.

It was also revealed that 2-4 different types of crops produce from home gardening were found amongst all the 15 program participants household's food stock in the house, while the 8 non-program participants who agreed that they have food stocks from home gardening had only 1-2 types of food stocks each among household's food stock in the house. Among the food stock in the house, 8 program participants out of 15 had 4 types of food stocks from their home gardens, 6 out of 15 had 3 types of food stock from their home gardens, while only one 1 had 2 types of food stocks in houses from their home gardens. Meanwhile, 5 out of the 8 non-program participants who had food stocks derived from home gardening had 2 types of food stocks in their houses, while 3 out of the 8 non-program participants had



only 1 type of food stock from home gardening in the house. Figure 18 below illustrates the variation in the number of food stocks in the house between the two categories of respondents.

**Figure 19: Number of crop types among household's food stock in the house**



**Source:** author (2019)

Based on the field results as shown in Table 6 and Figure 18, it can be concluded that program participants (100%) had more food stock in their households as compared to non-program participants who had 53.3% of their respondents having food stock derived from home gardening in their households. The result also showed that 100% of program participants had more diversified types of food stock (2 to 4 types of crops) from home gardening in their households as compared to the non-program participant (1 to 2 types). This result indicates that households' food available through home gardening as illustrated in the research framework is achieved.

### 6.7.3 Household Daily Food Consumption Frequency

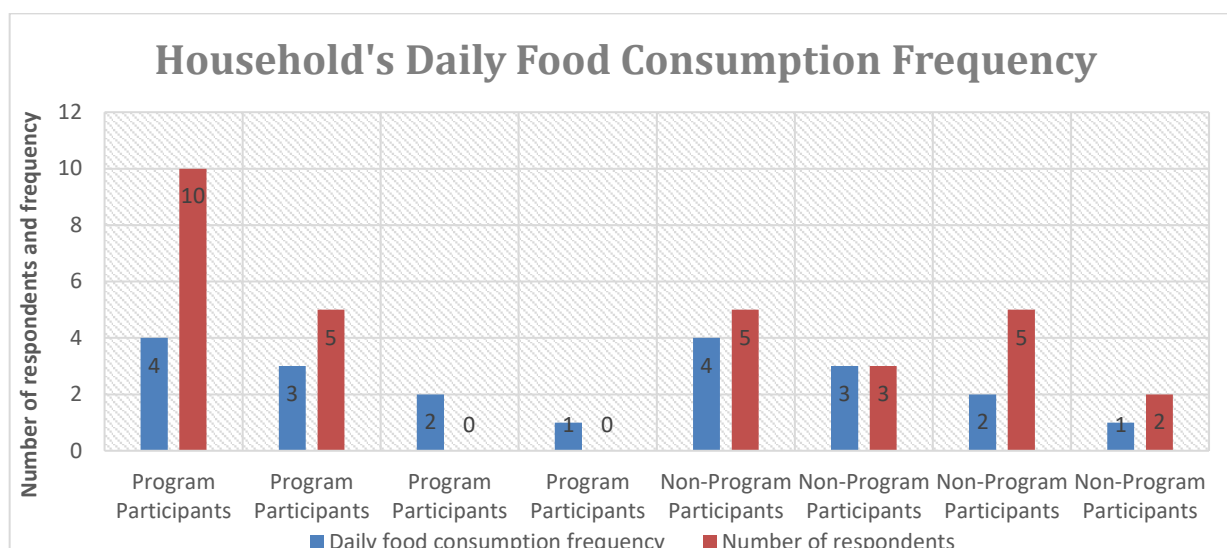
During the semi-structured interviews conducted by the researcher, daily food consumption frequency between participants of Make Use of Your Backyard Program and non-program participants were assessed. Respondents were asked how many times they prepare food and eat daily in their houses. As in Liberia, the frequency in daily food consumption is determined by the quantity of food availability in the house, (FSNS, 2018). Table 7 and Figure 19 below illustrate the variation between the two categories of respondents.

**Table 8: Households' daily food consumption frequency**

Daily Consumption Frequency	No. of Program Participants	No. of Non-Program Participants
4 Times daily	10 (66.6%)	5 (33.3%)
3 Times daily	5 (33.3%)	3 (20%)
2 Times daily	None	5 (33.3%)
1 Time daily	None	2 (13.3%)
<b>Total:</b>	<b>15/100%</b>	<b>15/100%</b>

**Source:** author (2019)

**Figure 20: Household's daily food consumption frequency**



**Source:** author (2019)

The Table 7 and Figure 19 above show that 10 (66.6%) Make Use of Your Backyard Program participants prepared and eat food 4 times daily (breakfast, lunch, dinner, and supper), while 5 (33.3%) non-program participants prepared and eat the same number of times daily. The result shows that no program participant prepares and eats food 1 or 2 times daily in their households.

During the semi-structured interviews, 13 (86.6%) program participants attributed the increase in daily food consumption to the program introduced by AgroTech Liberia, while 2 program participants attributed to home gardens and other sources of livelihood. According to the 13 program beneficiaries, home gardening has increased the number of times they eat daily. When asked to compare the daily food consumption frequency before and after the program was introduced, all 13 respondents said prior to the introduction of the program, they barely used to cook nor eat 1 to 2 times a day. Respondent BB for example explained.

**Figure 21: Respondent 2 testimony about daily food consumption frequency**



**Respondent BB:** “Before we used to eat only one time a day in our house. At that time, we were only cultivating rice, the rice farm was not big enough to give us enough yield due to small land size and lack of inputs. We used to be managing the limited yield harvested for it could last for few months. And besides we were depending on the farm to generate income. Since the program was introduced, we started having more food in our house. Our children can cook whenever they want to. We have dry food and fresh food in our house”.

**Source:** author (2019)

When raised the issue of daily food consumption frequency in the focused group discussion, all the 9 discussants who benefited from the Make Use of Your Backyard Program agreed that the current food consumption frequency is by far better than previous years before the program was introduced. They also added that before then, they were only eating by chance, but agreed that they can now eat 3-4 times daily. According to them, they were only focusing on rice. When the rice farm failed, the houses went out food. As a result, they had to reduce the daily food consumption.

During the focused group discussion involving non-program participants, 7 out of the 9 discussants agreed that the home gardens they are making are not making much impact on their household's food availability nor contributing significantly to their households' daily food consumption frequencies, while 2 respondents explained that although they are not producing much from their gardens, the limited food gathered from their gardens is helping to increase their daily food consumption frequency. The 7 discussants further agreed that they are involved in home gardening because of the interest they have in agriculture. They also added that the lack of external support has contributed negatively to the poor performance of their home gardens.

Based on the results, the food consumption frequency in all the 15 program participants (100%) households had increased tremendously from 1 to 2 times daily to 3 to 4 times daily as the result of the Make Use of Your Backyard Home gardening program, while there is no significant impact of home gardening on non-program participants food consumption frequency.

### 6.7.5 Constraints or Challenges affecting the practice of home gardening

The result presented below a synthesis from the data collected through the semi-structured interviews, key informants' interviews and focused group discussions conducted involving both program and non-program participants. Seven (6) constraints were identified by Make Use of Your Backyard program participants and non-program participants. The constraints mentioned are listed in order of ranks:

**Table 9: Constraints faced during the practice of home gardening**

Constraints	No. of Program participants	Rank
Access and control over land	14	1
Lack of Inputs	13	2
Limited Knowledge/Skill	12	3
Lack of credit opportunity	11	4
Limited extension services	10	5
Labor	8	6
<b>Non-Program Participants</b>		
Lack of Inputs	15	1
Access and control over land	13	2
Limited Knowledge/Skills	12	3
Labor	8	4
Limited extension services	6	5
Limited credit facility	5	6

**Source:** author (2019)

The result from the semi-structured interview focused group discussion, and key informant interviews show that 6 constraints were highlighted by Make Use of Your Backyard participants and non-program participants. Among the constraints, access and control over land and lack of inputs were the top-ranked constraints highlighted by both categories of respondents.

**Access and control over land-** During the separate focused group discussions involving Make Use of Your Backyard program participants and non-program participants, 7 out of the 9 discussants of program participants and 8 out 9 non-program participants agreed that access and control over land is a serious challenge to home gardening practices. The discussants explained that most of the land they are cultivating on belongs to someone else. According to them, the land can sometimes be taken away from them and they will have to seek assistance from others which often affects their production activities. This point was also emphasized by the key informants that access and control over land is the major challenge faced by home gardeners.

**Lack of Inputs-** During the semi-structured interviews involving both categories of respondents, 12 (80%) out 15 program participants agreed that the lack of inputs has become a hindrance to home gardening practices. The program participants explained that since the closure of the home gardening program, no organization, for example, has provided them new seeds. According to them, the seeds they are using have been used over and over, thus reducing the viability and productivity. On the other hand, all 15 (100%) non-program participants pointed out that the lack of inputs is a major challenge in practicing home gardening. According to them, they have been using poor quality seeds which is one of the reasons they are not earning much from their home gardens.

**Limited Knowledge/Skills-** The semi-structured interviews showed that the lack of contemporary knowledge on crop production (home gardening) was emphasized by 11 (73.3%) and 12 (80%) program and non-program participants respectively. Also as agreed during the two separate focused group discussions, discussants explained that when there is an outbreak of disease or pest infestation, they do

not have the knowledge required to control the outbreak. Program participants agreed that though the training was conducted, it was not intensive to allow them to acquire more knowledge. The training lasted for only two weeks according to the discussants). They further explained that because of the limited training, they find it difficult to even apply fertilizers and other chemicals, since they do not know how to do it.

**Limited extension delivery services-** During the separate focused group discussions, 6 out of 9 program participants and 6 out of 9 non-program participants agreed that limited extension services pose a threat to home gardening practices. According to them, whenever they encounter problem in the field that requires the intervention of extension agent, they don't have an extension agent to relate to. As a result, they sometimes go-ahead to take the risk.

**Access to credit opportunity/facility-** Lack of credit facilities was one of the many constraints mentioned by both categories of respondents. For example, during the focused group discussion involving program participants, 7 out of the 9 discussants agreed that they do not have any credit facility that gives loans to farmers. According to them, the only financial institution that gives loans to farmers is very far from them. They further explained that even when they go to the financial institution, they do not have the requirement to be given credits.

**Labor-** The result of the field data established that both program and non-program participants complained of home gardening labor being intensive and require more attention. During the semi-structured interviews, 10 program participants complained that they do not have the labor force to cultivate their home gardens. They added that during production, they must hire a laborer to work on their farm, which according to them always cost them a significant amount of their income from home gardening and other sources. They also added that the labor-saving services delivered by AgroTech Liberia have not reached them since their involvement in the program. This result was also confirmed by one of the key informants that the household's labor supply is one of the challenges facing gardeners and farmers in totality. Most of the labor force is school going youths who are not always available during the labor period.

## **6.8 Income supplementation**

Beneficiaries of the Make Use of Your Backyard program participants and non-program participants were asked during the semi-structured interviews if they keep a record of any excesses sold from home gardening. The result showed that 10 (66.6%) of the Make Use of Your Backyard program participant agreed that they keep records of sales from home garden excesses, while 5 (33.3%) explained that they do not keep a record on paper, know during harvest how much they earned monthly. The result also indicated that 9 (60%) non-program participants agreed that they keep records of sales from excesses from home gardening, while 6 (40%) explained that they do not earn any income from home gardening and therefore, they do not have a record.

During the focused group discussion with program participants, participants were asked during the focused group discussion whether home gardening has supplemented their households' income.

All 9 discussants agreed that they earned extra income from home gardening. The result of the semi-structured interviews also confirmed that all the 15 (100%) program participants asserted that home gardening has supplemented their households' income, while 9 non-program participants (60%) out of 15 accepted that they earned extra income from home gardening. The non-program participants who did not earn any income attributed the failure to low yield as a result of the lack of input support. The program participants further agreed that the income they are earning is because of the increased yield due to the support given to them by AgroTech Liberia.

To measure the extent to which home gardening has supplemented smallholder farming households' income, the income supplemented from home gardening was compared between the 15 program participants and 9 non-program participants. The monetary figures are given in Liberian Dollars (LRD) by respondents were categorized according to the regional agriculture income statistical report of Liberia

(MOA,2013) as shown in Table 10 below. It is important to note that, the data assessed could not indicate the income supplemented from home gardens in terms of percentage against total household income. Only 5 (20.8%) respondents out of 24 respondents from both categories had a record or could remember their total household income monthly. It was however expected that not all participants would disclose exact income and income supplementation values in order to maintain household privacy.

**Table 10: Monthly income from home gardening in relation to land size in Liberian Dollars (LRD) through home gardening in relation to land size.**

Income Range in LRD	#. of PP	Average Income-PP	#. of NPP	Average Income NPP	Land size 20m by 20m	land size 30m by 30m	land size 40m by 40m
(\$2000-\$3000)	0	0	6 (66.6%)	\$2,700	4 NPP	-	2 NPP
(\$3100-\$4100)	2 (13.3%)	\$3,400	2 (22.2%)	\$3,100	2 PP	-	2 NPP
(\$4200-\$5200)	5 (33.3%)	\$4,960	1 (11.1%)	\$4,500	5 PP	-	1 NPP
(\$5300- \$6300)	2 (13.3%)	\$5,750	None	0	-	2 PP	-
(\$6400-\$7400)	1 (6.6%)	\$6,700	None	0	-	1 PP	-
(\$7500-\$8500)	5 (33.3%)	\$8,040	None	0	-	1 PP	4 PP
<b>Total:</b>	<b>15</b>	<b>\$28,850LRD</b>	<b>9</b>	<b>\$10,300LRD</b>	<b>11</b>	<b>5</b>	<b>8</b>

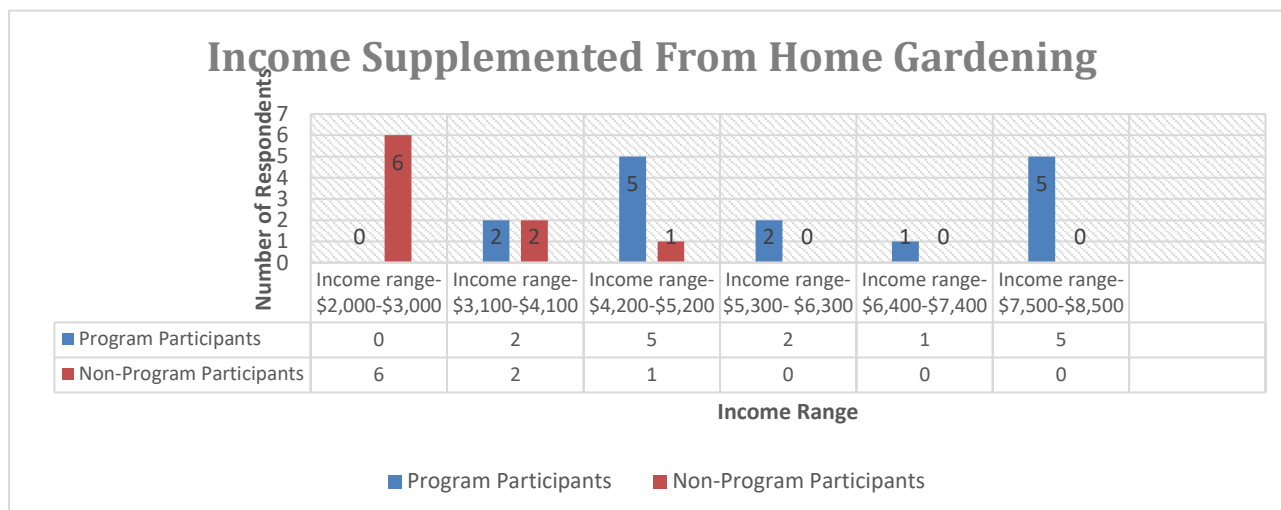
**Source:** author (2019)

**Note:** PP=Programam participants, NPP= Non-program Participants

The data displayed in Table 10 above indicates that all 15 program participants (100%) had generated extra income from home gardening as anticipated by AgroTech Liberia, while 9 non-program participants (60%) out of 15 extra income from home gardening. The result shows that beneficiaries of Make Use of Your Backyard program earned more income than non-program participants in every average income. The result indicates that the total income supplemented from home gardening by program participants (**\$28,850LRD**) is by far more than the total income earned by non-program participants (**\$10,300LRD**). The result in Table 10 shows that over half of non-program participants (66.6%) income fall within the lowest income range (**\$2000 LRD to \$3000LRD**), while no program participant was found in this income range. The data also show that none of the 5 non-program participants who had the biggest land size of 40m by 40m (see Table 3) earned income from the three higher income range, while all 4 program participants who had the same land size earned an income within the highest income range of **\$7,500-\$8,500**. It can be concluded that the home gardening program supplemented the household's income. Moreover, program participants earned more income as compared to non-program participants. This result relates to income supplementation through home gardening as illustrated in the research framework.

The result also indicates that all program participants who had the largest land sizes earned more income than those with smaller land sizes. On the contrary, all the non-program participants who had the largest land size earned the same amount as compared to non-program participants with smaller land sizes. Figure 22 below displays the income supplemented in categories.

**Figure 22: Income supplemented from home gardening**



**Source:** author (2019)

### 6.9 How income supplemented from home gardening is spent by both categories of respondents

During the semi-structured interviews involving program and non-program participants, all the 15 (100%) Make Use of Your Backyard Program beneficiaries who agreed that home gardening has supplemented their households' income along with the 9 non-program participants who agreed that they earned extra income from excesses sold from home gardening were asked how the income supplemented from home gardening were spent. Four (4) ways in which they spent their supplemented income are shown in Table 11.

**Table 11: Ways in which income supplemented from home gardening is spent**

Ways income is spent	# of program participants	# of Non-program participants
Education	15	6
Other food and non-food product not from home gardens	12	9
Health care	7	7
Clothes	3	4

**Source:** author (2019)

The result is shown in Table 11 above the semi-structured interviews, all the respondents from both categories who earned extra income from home gardening spent the income generated on the same 4 identified ways, education, other food products that were not grown in their home gardens, health care delivery services, and clothes. This result relates to income utilization as indicated in the research framework. Program participants during the interviews explained that the income supplemented from home gardening has relieved them from lots of financial obligations, as respondents CC for example explained.



**Figure 23: Respondent Testimony 1: How income supplemented from home gardening is spent**



**Respondent CC:** “Before my husband and I had to do on farm labor before we get money to pay our children’s school fees. Sometimes we used to work and could not get our money in time. As a result, our children were always put of school because of the lack of school fees. Even to send our children to hospital was always a challenge for my husband and me. Since the home gardening program was introduced, my husband and I immediately stopped working for people. We put all our efforts in making home gardens. Fortunately for us, everything has changed in our house. The money we get from the garden along with what my husband gets from fishing and hunting has been able to pay our children’s school fees, buy other food items, clothes and send our children to hospital”.

**Source:** author (2019)

In addition to the respondent’s testimony, the meeting with the local chief confirmed that the income supplemented from home gardening has been of great help in paying their children’s school fees regularly and affording medical care. Finally, during the key informant interview, the local chief explained that he had witnessed the living conditions of the program beneficiaries before and after the program was introduced. He assured that the current financial status of beneficiary households is far better than before the program.

### 7.1 Access and Control over income supplemented from home gardening

During the semi-structured interviews, involving both program and non-program participants, all the 15 program participants (100%) and the 9 non-program participants (60%) were asked as to who has access and control over the income supplemented from home gardening. Table 12 below illustrates how both categories of respondents position themselves.

**Table 12: Access and control over income supplemented from home gardening**

Category of Respondents	No. of program Participants	No. of non-Program Participants
Women	13 (86.6)	8 (88.8)
Men	0	0
Couples	2 (13.3%)	1 (11.1%)
<b>Total:</b>	<b>15</b>	<b>9</b>

**Source:** author (2019)



The result illustrated in the Table 12 showed that 13 out of the 15 program participants (86.6%) and 8 out of the 9 non-program participants (88.8%) who earned extra income from home gardening practices agreed that women have access and control over the income supplemented from home gardening, while only 2 out of 15 program participants (13.3%) and 1 out of 9 non-program participants (11.1%) agreed that both husband and wife controlled the income supplemented from home gardening. The 3 respondents explained that the reason both husband and wife control the income is because of the believe that 2 heads are better than 1 head. The 6 respondents who did not agree that they earned extra income from home gardening were not asked.

The result also revealed that women's access and control over income has taken place for a long time in the region. The respondents explained that women in the region are trusted for making rational decisions over households' income. Respondent DD testimonial supports this result.

**Figure 24: Respondent testimony about access and control over income supplemented income**



**Source:** author (2019)

**Respondent DD:** “We rely on our women to control our income. For example, my wife oversees all the money coming from the garden. I trust all her decisions regarding the utilization of the money. If not for her wise decision, we would have been suffering in this house. She always makes sure to buy everything we need in our house especially clothes, other food, keep money for medical expenses and school fees. The welfare of our children is always her priority. For me I do not like to keep any income meant for our house”.

The issue of access and control over supplemented income from home gardening was raised in the separate focused discussions, 7 out of the 9 discussants of program participants agreed that women have access and control over the income supplemented from home gardening, while 8 out of the 9 discussants of non-program participants agreed that women have access and control over income supplemented from home gardening. From the field data displayed above, it can be concluded that women have dominance over income supplemented from home gardening. This result, therefore, relates to income control as illustrated in the research framework.

## **7.2 Extra Benefits from Home Gardening**

During the focused group discussion, all the 9 Make Use of Your Backyard program beneficiaries did not only mention the effect of the home gardening program on their households' food availability and income but also agreed that home gardening has integrated and strengthened their social network. They explained that sometimes they share food stock from the gardens with family members, friends, and neighbors which have helped them build strong relationships in their communities. Discussants furthered agreed that prior to the introduction of the program, they were regarded as less privileged people and their opinions were never regarded by friends and even family members. According to them, their involvement in the Make Use of Your Backyard program has made them problem solvers. This result also corresponded with the result of the semi-structured interviews in which 12 out of the 15 respondents

mentioned that the Make Use of Your backyard program has not only provided them food and income but integrated them by adding values to their existences, improving their social network and made them problem solvers. Respondent EE for example explained:

**Figure 25: Respondent Testimony on extra benefits from home gardening**



**Respondent EE:** “My family and friends see us as important people now. We were never regarded as important people before. We were always called names like debtors or beggars. We could not put our hands up when men and women were talking. Everything suddenly changed when we were afforded the opportunity to participate in the home gardening program. Those who used to call us names are now running to us for assistance. We sometimes give free fresh and dry food from our garden to friends, community members and family. We have strong relationship with virtually everyone in the community”.

**Source:** author (2019)

## CHAPTER 6: DATA ANALYSIS AND DISCUSSION

### Introduction

This chapter presents the discussion of the results using findings from primary data. The discussion provides a thorough analysis of how key findings are related or different from the literature presented in Chapter 2 of this study. The discussion also reflects upon the researcher's role in the field.

Home gardening as it is commonly called in Liberia has shown to be an evidence-based lively diversification strategy to improving household food and nutrition security. Based on the research findings, it was established that the program implemented by AgroTech Liberia contributed significantly to smallholder farming households' food availability by increasing and diversifying households' food stock, thus providing households direct access to safe and nutritious food for household's consumption. The findings also indicated that the diversity of improved crops provided adequate and quality food for participants' households. These findings agree with a study done across the Beijing Municipality of China in peri-urban, suburban, and exurban communities by Clarke et al. (2014, p. 8), who stated that the practice of home gardening provides households direct access to diversified food crops, thereby increasing households' food and nutrition security. The findings also go in line with Wüstefeld's assumption (2013, p. 9) that home gardening provides households with direct access to food that can increase the quantity and improve the quality of nutrients available to household members.

The different types of food groups made available to participants through home gardening changed households' food and nutrition security status. From the analysis of the results, program participants succeeded in diversifying their households' food stocks by cultivating the various types of improved crop varieties distributed to them by AgroTech Liberia. It is possible to conclude that the step taken by the organization to provide input such as improve seeds was a good strategy to enable households to produce more diversified food and to also build households' resilience towards livelihood vulnerability such as climate change. Investing in home gardening as a pro-poor or pro-food and nutrition security intervention through input support, boosts farmers' productivity, thus reducing food and nutrition insecurity. Although home gardening is a livelihood strategy for resource-poor households, it is important to note that home gardening requires support in every form, especially amidst climate change and global economic crises that affect livelihood activities. Based on the findings, program participants' edge over non-program participants is as a result of the lack of input on the part of non-program participants. If the same support given to program participants were given to non-program participants, both categories of respondents would have obtained similar results.

The findings established that home gardening improved participants' dietary diversity scores. According to the Household Dietary Diversity Scores coding sheet analyzed in this research (Chapter 5, p.50), it was observed that participants of the Make Use of Your Backyard program had eaten most crops grown in their home gardens within the 24 hours given period as compared to non-program participants. The results also showed that the dietary diversity score for program participants was higher than non-program participants. This result agrees with the study conducted on smallholder households in Bukoba District in Tanzania and Kiboga district in Uganda by Deborah, Ekesa & Kennedy (2018, p. 18). They explained that households that accumulated more diversified food crops had increase dietary diversity scores as compared to households that accumulated less. It is, then, possible to state that the diverse food gathered and consumed from home gardens by rural households plays an important role in improving households' diet, thereby reflecting on the household's dietary diversity score. From the analysis, this result implies that the more diversified a household's food becomes, the better the nutritional status of its members. It is possible to conclude based on findings that the main reason behind non-program participants not having more diversified food stocks in their home gardens and houses is as a result of the lack of input support. This limits them from producing more diversified food which results in low yields, thereby reducing households' dietary quality.

The research findings (Chapter 5, p.51) showed that access and control over land, lack of inputs, labor, lack of credit opportunities/facilities, limited extension services, and limited knowledge/skills on home gardening are the constraints affecting home gardening practices for both categories of respondents. Access and control over land and lack of inputs were the top-ranked constraints affecting the program and non-program participants. These findings agree with Ezygguire (2010, p. 9), who stated that among several constraints, access and control over suitable and enough land to establish a home garden, lack of ownership and usage rights of some form and lack of inputs are the most important limiting factors of home gardening practice. Ezygguire further added that other constraints limiting the practice of home gardening include access to financial capital or credit facility, access to water, limited extension and advisory services, limited access to labor supply, and poor access to markets. Based on the findings, the constraints mentioned by program participants were the same constraints affecting non-program participants. This means that the program design and implementation did not effectively address some of the constraints that were feasible to the organization. According to the project information (Chapter 4, p. 24), participants before the start of the program were provided intensive field training for 5 weeks, but according to the findings, program participants were only trained for 2 weeks. It is, then, possible to conclude based on findings that for a program like home gardening to be sustainable, considerations need to be given to its notable constraints. The use of non-viable seeds, for example, could result in low yield, thereby exposing households to food insecurity.

Based on the research findings, it is possible to conclude that the Make Use of Your Backyard program implemented by AgroTech Liberia supplemented smallholder farming households' income through excesses derived from home gardening as anticipated by the organization. The results of this study showed that home gardening has supplemented households' incomes agrees with a study conducted in Abia State, Nigeria on farmers who were practicing home gardening by Igwe, Aguiyi, & Nwazuruoke (2014, p. 8), they stated that households involved in the practice of home gardening earned extra income from the excess harvest and sold. The findings indicated that income supplemented from home gardening was accessed and controlled by women. This result is similar to FAO (2018, p.10) gender assessment report. According to Liberia's National gender profile of agriculture and rural livelihood assessment by FAO, it was revealed that in North-Western Liberia, women are more in control of economic resources, while major decisions related to other household resources are made jointly. It can be concluded that women's involvement in accessing and controlling a household's income is a way of improving the household's food and nutrition security. The improvement in program participants' nutritional status is the result of the diverse food consumed directly from home gardening and the food purchased by women from income generated from home gardening. It is, then, concluded that the two ways in which home gardening contributes to households' food and nutrition security (availability) are through direct consumption of food stocks(fresh/dry) from home gardening and through the consumption of food stocks purchased from income supplemented from home gardening.

## **General Discussion**

The research findings have indicated that home gardening has contributed significantly to program participants' households by providing them quality and quantity food for household consumption. The increase in household food availability and income supplementation according to the findings improved households' nutritional status. The findings established that the different types of crops cultivated by program participants enable them to obtain more food stock both in the field and in the house, thus giving households the opportunity to sell some of their excesses derived from home gardens in order to supplement income. It is also established in the findings that the excesses sold from home gardening contributed to households' food availability because the income generated was used to purchase other food items that were not produced in the home gardens. The findings indicated that program participants improved in every area of comparison as compared to non-program participants, because of the support given to them by AgroTech Liberia. The result also showed that women's access and control over households' income contributed to the effective and efficient use of supplemented income, as men referred to them as being rational in managing income.

The variation between program participants and non-program participants signifies the importance of supporting rural livelihoods. Although home gardening did not provide more food stocks and more income for non-program participants, it is important to note that, to some extent, it contributed to household food availability and income supplementation. This means that if a little support is rendered to home gardening practices, the practice of home gardening can become an effective strategy for addressing the household's food and income insecurity.

Based on the findings, program participants who had larger land sizes earned more income than those with smaller land sizes, while non-program participants who had larger land sizes earned the same amount as those with smaller land sizes. It is possible to conclude that in some cases, especially the case of supported home gardeners, the higher the land size, the higher the income.

### **Reflection on the researcher's role**

The lack of knowledge of research was one of my greatest challenges as a student and a mid-career professional. As a matter of fact, prior to the researcher's study at VHL, the researcher had never done research both in the academic world or in the field as a professional. The researcher was threatened by this fear to the point of turning the scholarship opportunity down. It was difficult for the researcher to believe in himself that he could conduct a research for the first time at a higher educational level. The researcher needed to achieve his goal as a researcher in his professional life. In order to achieve his goal as a good researcher, the researcher decided to accept the challenge and take some practical steps as explained in the paragraphs below.

In an effort to build the researcher's capacity, the researcher regarded the mini-research, research proposal and thesis as processes that could build my knowledge in research. As part of the role of a researcher, the researcher knew the task ahead was never going to be easy. The researcher realized that to conduct valid qualitative research, it is expected that the researcher understands the usage of research techniques and tools to the best of the researcher's ability. To understand the practical applications of qualitative research techniques, methods, and tools, the researcher devoted his time to the mini-research. The researcher saw the mini-research as an activity that could prepare him for the fieldwork. To maximize the opportunity, the researcher involved himself completely in the mini-research, always willing to take up the challenge and take lead in every activity. The mini-research offered the researcher the opportunity to learn and apply some qualitative data techniques that could be used in the field.

While in the field, the researcher felt confident that he could accomplish the task no matter what. Although it was insightful applying the techniques in the field, it was however challenging. During the fieldwork, the researcher was able to learn how to facilitate a group discussion with people from different backgrounds, make adjustments in research tools to get more information (introduced income question in focused group discussion), adapt situations that came up. Conducting interviews, compiling results, analyzing and discussing it was an opportunity that enables the researcher to learn more about qualitative research. The successful completion of the field research has built the researcher's confidence to demonstrate the knowledge and experience from the field as a professional in the development world. The knowledge acquired from the field will be used by the researcher to undertake research initiatives in the professional world.

### **Reflection on the researcher's role in applying the tools**

Prior to getting into the field, the researcher thought about how effective planning could be necessary before beginning the data collection process. The researcher communicated with his commissioner to seek logistical support and to communicate with the target group ahead of time. The researcher also prepared all the tools ahead of time in order to effectively work within the time frame provided.

The researcher sought to conduct the research, explore and transfer knowledge to the benefit of the commissioner. Ethical principles such as the issuance of consent forms, professional responsibility, and attitude were highly considered while conducting this research. The researcher sought to build

knowledge using observation, analytical skills, and theories from a wide range of sources. The researcher tried to develop fluency with methods and try to identify what counts as evidence and what are acceptable practices for creating new knowledge.

Before beginning the data collection, the researcher thought how his role as an international scholarship award student could influence his process by increasing respondents' financial expectations. There is this notion that every research conducted by international students is either sponsored by the scholarship program, government or organization. To reduce such expectation, a brief meeting in each participating community with selected respondents was held, the researcher's mission and position as a student were made clear to the audience. Surprisingly, the researcher was given overwhelming support by the participating communities. The inhabitants of the participating communities were very cooperative, supportive and more eager to participate in the study. According to the respondents, their son has traveled to the western world to gain an education, and as such, the needed support should be provided. The overwhelming support given to the researcher awakened the spirit of self-confidence to engage respondents without the fear of being intimidated or confronted with financial issues.

As previously stated in the research limitation that the peak of the rainfall in Liberia coincides with the data collection period and that it could affect the data collection process. To prevent the rain from becoming a hindrance to the process, the researcher moved into the research communities in order to have easy access to the respondents. As initially planned by the researcher to stay in the field for 4 weeks to have easy access to the target population, the researcher spent 3 weeks instead of 4 weeks. As previously anticipated that the rain would have obstructed the data collection process, this was indeed not the case. The excess rainfall enables the researcher to have easy access to the respondents because it was very difficult for the respondents to leave their huts. They could not leave their huts to the farms or other places which were used as an opportunity to speak with them.

Before conducting the focused group discussions with a combination of both genders, the researcher was filled with fear and thought the result could be influenced by men dominating the discussion, as this is the case in many areas in Africa. To be honest, the researcher never thought he could single-handedly conduct a focused group discussion since it was the first time. What really gave the researcher the confidence was the voice of his wife that kept saying you can do it, just believe in yourself. To have an interactive discussion with both genders, the researcher asked the discussants to suggest a way the discussion could be held in a peaceful atmosphere. The discussants agreed that rules and regulations be made to guide the process. Together, they all made the governing rules for the discussion. Allowing respondents to decide on where the focused group should be held proves how the knowledge acquired as a facilitator of change was applied. What was very interesting to see as a researcher was the fact the researcher was able to conduct an interactive focused group discussion with a combination of both males and females. Although literature and experience had indicated that in Liberia both males and females can peacefully engage in group discussion without one group being intimidated, the researcher was still not very convinced that this could work since this was the researcher's first time conducting a focused group discussion. Surprisingly, the two focused group discussions were more interactive, interesting and insightful than expected.

Another interesting experience during the field data collection process was that, during the planning stage of data collection, several tools were designed by the researcher to address each of the research questions. Surprisingly, the researcher discovered that most of the tools initially thought not workable in answering some questions due to cultural norms and individual principles tend to be more effective in finding answers to those questions. For instance, the question of access and control over households' income was thought to only be discussed with individual respondents rather than in plenary, but when raised in the focused group discussions by the researcher, it was interesting to know that discussants were more elaborate than expected. Also, the issue of income supplementation which was thought to only be discussed at the household's level during the semi-structured interviews became more effective in giving more elaborate answers after being raised in the focused group discussions. This experience

shows that as a researcher, it is always important to counter-check what others have said. It is also important to know that as a researcher, you must be willing to adopt or give a try to whatever methods possible, you never can tell which one works effectively in providing answers to your questions.

As part of the roles of a researcher, you must always try to know a brief history of your research area. This was one of the avoidable circumstances the researcher did not take into consideration before getting into the field. During the researcher's first day in the field, he realized that all three communities did not have access to electricity. The researcher did not do proper inquiry as to whether electricity was available in the target communities. This situation which could have been avoided became a threat that had the propensity to affect the data collection process by limiting the information required to answer the research questions. The researcher began worried after realizing that all the devices needed to be used for recording had gone off in the first 4 days of data collection. The only option left was note-taking. The researcher could not find a way to charge the devices but rather thought of a way to remedy the situation. The researcher explained the situation to the respondent and pleaded with them to extend the interview time to 1 hour rather than the 45 minutes planned initially. This was done to allow the researcher to get all the information needed since taking notes was the only option left and besides, the process was only facilitated by the researcher alone. The researcher spent a lot of time with the respondents in order to get all the details written down. This method worked very well because respondents were asked to provide clarity since there was ample time allotted for the interviews. This also enables the researcher to ask more probing questions in order to obtain detail information from respondents.

## **Chapter 7: Conclusion and Recommendation**

### **Introduction**

This section provides answers to all the sub-questions of the study conducted by the researcher. The questions are therefore addressed according to indicators in the research framework.

In conclusion to the sub-question, “How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households’ beneficiaries’ food availability?” home gardening from all indications in the findings is an effective livelihood strategy to addressing household’s food security in terms of food availability in vulnerable farming households. Although program participants practicing home gardening encountered many challenges, they were able to produce more diversified food crops, thereby increasing the level of food stock in their households. Participants of the program confirmed that there has been a tremendous improvement in households’ food availability as compared to previous years. The findings established that the number of crops found in each program beneficiary home garden had increased compared to previous years before the program was introduced. It is possible to conclude that their involvement in home gardening practices lead to the improvement of their household’s food availability. The findings further established that all the program beneficiaries had more food stock in their households derived from home gardening as compared to non-program beneficiaries who had lower food stocks in their houses. According to the findings, program participants' benefits from home gardening were not limited only to the provision of food stock, but also providing them access to different types of food stocks. In addition to the increase in diversified households’ food stock, home gardening played an important role in improving households’ daily food consumption frequency for program participants, as compared to non-program participants. It is, then, possible to conclude that home gardening has multiple effects on households’ food availability ranging from an increase in food stocks, food consumption frequency, and food and nutrition security status of households.

Regarding the sub-question “How has the Make Use of Your Backyard program implemented by AgroTech Liberia affected smallholder farming households’ beneficiary’s dietary diversity?”, it can be concluded that the number of different food groups consumed by a household has a positive impact on household’s nutritional and health status. The increase in the consumption of diversified food groups also has a positive reflection on the household’s dietary diversity score. Based on the number of unique foods produced and consumed by program participants' households, the dietary diversity score increased. From the findings, analyzed between program beneficiaries and non-program beneficiaries, program participants earned the highest dietary diversity score as compared to non-program participants who are also practicing home gardening. It is possible to conclude that the higher the HDDS earned by a household, the higher the indication of household’s ability to acquire enough quality and quantity of diverse food to meet the dietary requirements of all household members. Also, from the researcher's findings, it was observed that program participants had consumed most crops grown in their home gardens within the 24 hours given period as compared to non-program participants. It is also possible to conclude that diversified food gathered from home gardens have contributed significantly to improving households’ diet.

Regarding the sub-question “What constraints or challenges smallholder farming households who benefited from the Make Use of Your Backyard program implemented by AgroTech Liberia are faced with when practicing home gardening?”, home gardening like other livelihood activities has constraints associated to its practices. These constraints can be addressed if organizations begin to see them as threats to home gardening and considered how to address some of them in program design and implementation. Although program participants received support from AgroTech Liberia, the research finding established that program participants and non-program participants faced the same constraints limiting the practice of home gardening. It is possible to conclude according to the research findings and



other literature (Ezyguire, 2010, p. 9) that, the most common constraints limiting home gardening practices are access and control over land, lack of inputs, limited extension services, lack of credit opportunity, labor and limited knowledge on home gardening. It is possible to also conclude that the lack of contemporary knowledge on crop production as claimed by program participants is a result of the poor design and implementation of the program. The organizations claimed it had intensively trained the participants, but on the contrary, participants lack the knowledge claimed to be taught. Participants, for example, explained that, when there is an outbreak of disease or pest infestation, they do not have the knowledge required to control the outbreak. It was also made clear in the result that limited extension services prevented participants from relating to extension agents with problems encountered in the fields. Based on these findings, it is then possible to conclude that the training and extension services provided by AgroTech Liberia were limited as claimed in the program plan (Chapter 4, p. 24). It is also possible to conclude that, though program participants received input from AgroTech Liberia, the input supply was not a continual process, this affected program participants' households by making them use one input over and over at their detriment.

With regards to the sub-question "To what extent AgroTech Liberia Make Use of Your Backyard program has supplemented the income of smallholder farming households who benefited from the program?", it is possible to conclude that the benefit of home gardening is not just about providing households quality and quantity food for healthy life, but also an effective approach to supplementing income for resource-poor households. One of the ways in which households make food available is through direct purchase. From the findings also observed in other literature, all program participants earned extra income from home gardening as compared to non-program participants. It was also established that program participants earned the highest supplemented average income in all the income categories, as compared to non-program participants. The total average income earned by program participants was by far higher than the total average income for non-program participants. The income earned from home gardening also aided in improving households' food availability through direct purchase of other food products that were not produced in home gardens. Based on these findings, it is possible to conclude that income supplemented from home gardening improved participants' household's food availability.

Regarding the sub-question "How is the income supplemented from AgroTech Liberia Make Use of Your Backyard program spent or utilized by smallholder farming households who benefited from the program?", the practice of home gardening by program beneficiaries contributed to addressing some household's basic needs and services. It can be concluded based on the findings that the income generated increased households' purchasing power which was used to address other households' needs. The increase in purchasing power through home gardening relieved households from lots of financial obligations. The finding established four ways in which income supplemented from home gardening is spent by all program participants and the non-program participants who earned extra income. All income earners from home gardening identified the same ways the income supplemented is utilized. The 4 ways include education-related payment (such as school fees), health care, other food, and non-food product not from home gardening and clothes.

With regards to the sub-question "How is the income supplemented from home AgroTech Liberia Make Use of Your Backyard being controlled by program beneficiaries' households?", it is possible to conclude that women's access and control over households' income is important to improving households' food availability. If women are given equal access to households' resources as their male counterparts, food and nutrition insecurity will be eradicated. The findings indicated that women dominated the control of supplemented income from home gardening. Women's dominance over supplemented income according to the findings, is based on their ability to manage, control and make rational decisions regarding income utilization. Men in the study areas believed that women make rational decisions on income utilization and as such, they are always allowed to have control of household income.

Home gardening as the name depicts is a livelihood strategy that integrates both crop production and animal rearing. The finding established that the home gardening program did not include animal rearing.

Households earning income from home gardening spent some of their incomes on animal products that could have been reared in their home gardens. It is possible to conclude that the production of both crops and animals in home gardens will not only provide households with diversified food but supplement more income for households and prevent households from spending income on some products that can be produced in home gardens.

Finally, what was also established in the study which was not noticed to be mentioned in existing literature was the fact that the Make Use of Your Backyard program did not only make food available for smallholder farming households or supplement their households' income but also integrated them in society by giving them status and values. The findings showed that before the program was introduced, participants were regarded as less fortunate people. As indicated in the findings, program beneficiaries were regarded as decision-makers and people whom others could relate to for assistance. It can, therefore, be concluded that home gardening is not just about food and nutrition security, but a means of strengthening social network or social integration.

The researcher would like to acknowledge that the limited sample size of the research was one of its limitations. The findings from this study might not be a true representation of the total target population because of the limited respondent due to inadequate resources.

## **General Conclusion**

Generally, it is possible to conclude based on all the evidence presented in this study, that home gardening is an effective livelihood strategy for addressing food and nutrition security issues, especially households' food availability and income supplementation. It is also possible to conclude based on the research findings that home gardening contribution towards participants households' food availability and income supplementation was by enabling households that participated in the home gardening program improve their dietary quality through crop diversification, increase households' food stocks through production and direct purchase from excesses derived from home gardening and by contributing to household's purchasing power (income). According to the findings, the improvement in participants' food availability and income was the result of the support given by AgroTech Liberia. The findings established that all program participants households that participated in the home gardening experienced a significant change in their household's food and nutrition security status. The changes in their food and nutrition security status were as a result of the cultivation of diverse food groups, thereby resulting in quality food consumption. It is also possible to conclude as per all the findings that, the practice of home gardening is an evident-based food and nutrition security approach for resource-poor households. If households have limited or no resources are given the needed support to engage in home gardening, the risk of facing food insecurity will be reduced.

From the findings, the practice of home gardening did not only provide households quality and quantity food for households' consumption but played an important income supplementary role for households. Amid household' competing priorities as mentioned by participants, the income supplemented from home gardening excesses helped them to meet households' basic needs and services. Based on the findings, the women controlled and accessed income for effective utilization. With women involvement in controlling supplemented income from home gardening, households earning income from home gardening were able to utilize the income in addressing some of the issues that made them vulnerable before the program was implemented.

The research findings also showed that the benefit of home gardening exceeded the making of food available and supplementing income to increasing households' food consumption frequency, integrating households that were thought to be vulnerable and by building the social network of vulnerable households. The increase in food stock as indicated in the findings, enable participants' households to eat regularly, thus increasing their daily food consumption frequency. It is, then possible to conclude that the practice of home gardening is associated with multiple benefits, other than food and nutrition security.

Although program participants received the support as shown in the program implementation plan (Chapter 4, p. 24) and confirmed in the findings, both program participants and non-program participants complained of the same constraints affecting home gardening. It is possible to conclude that, the AgroTech Liberia implementation strategy did not; to some extent take some of those constraints into serious consideration during the program design and implementation, as there was no difference between those supported and those who were not supported in terms of constraints. It is possible to conclude that constraints such as building farmers' knowledge that was thought to have been considered in the program design and implementation strategy were not addressed sufficiently.

## **Recommendations**

As the result of the Make Use of Your Backyard program implemented by AgroTech Liberia for smallholder farming households has shown that home gardening is a strategy for supplementing households' income and making adequate and quality food available, the following recommendations in addressing the limiting factors or constraints established in the findings be taken into consideration by AgroTech Liberia and other relevant agencies as outlined below.

- ❖ As the research result has indicated that home gardening is an effective strategy to improve household's food availability and supplement household's income, it is important that such strategy is initiated to target vulnerable population, in order to have a diversified livelihood that will curb the prevalence of food insecurity in Liberia. The practice of home gardening is essential for building the resilience of households that do not have the resource base to withstand shocks. It is recommended that AgroTech Liberia reintroduced the Make Use of Your Backyard home gardening program in the previous communities and other vulnerable communities that will target households that are practicing home gardening and those households that want to but do not have the means of doing so.
- ❖ To achieve food and nutrition security, livelihood diversification plays a crucial role. The research findings have indicated that the exclusion of animal rearing affected household's income utilization and household's food consumption. It is important to note that the more diversified a household livelihood becomes, the more resilience it becomes. Including animal rearing in home gardening practiced is a way of reducing households' food and income insecurity. The researcher recommends that AgroTech Liberia sees the need to include animal rearing in future programs in order to enable participants to diversify their livelihood activities, thereby enabling them to increase their households' income and promote dietary diversity. The inclusion of animals is not only for the purpose of diversifying livelihood activities but as a way of improving households' dietary quality. Additionally, including animal rearing will contribute to the provision of animal manure for farmers, thereby reducing the demand for inorganic fertilizers.
- ❖ Knowledge acquisition in contemporary agriculture is important in livelihood development. According to the findings, all categories of respondents lack the required knowledge to properly engage in home gardening practices. It is important that in order to promote home gardening, capacity development through knowledge building is crucial to the achievement of any livelihood program. If farmers acquire the needed knowledge, they can be able to cope with the many challenges facing their livelihood. Although AgroTech Liberia conducted training for its participants, the results showed that the knowledge gained was limited to cope with the many challenges. The researcher would like to recommend that in future programs, intensive training be conducted for beneficiaries on contemporary home gardening and animal rearing practices, such as chemical application, planting methodologies and animal feeding practices.
- ❖ Extension service which is the link between farmers and research institutions cannot be underestimated. Extension service delivery strengthens farmers' capacity to innovate, by providing them access to knowledge and information. Providing extension services to households practicing home gardening is a way of empowering them to innovate and cope with challenges that affect their livelihood. Limited extension service was identified by respondents as one of the

many constraints affecting the practice of home gardening. Program participants practicing home gardening do not have access to extension services which has denied them the opportunity to relate to extension agents with situations beyond their control. The researcher recommends that long-term extension services delivery be considered in any future program undertaken by AgroTech Liberia. This will enable participants to relate to extension agents with problems that are beyond their control and to also innovate ideas that will benefit them.

- ❖ The research findings pointed out that the lack of input was one of the top-ranked constraints affecting the practice of home gardening. The lack of input as emphasized by participants if not addressed will affect the sustainability of the home gardening program implemented. According to the participants, no input has been supplied since the program came to a closure, thus resulting in the use of non-viable seeds. The likelihood of program participants returning to their previous state is high if they continue facing this input challenge and nothing is done. It is important that such constraint is addressed in order to increase the productivity of home gardeners. The researcher recommends that regular inputs needed to enhance farmers' productivity be made available. If households practicing home gardening are given the necessary support such as seeds, the overuse of seeds will be curtailed.

### **Area for further research**

The respondents who participated in the study represented both genders, but the research was unable to assess the difference in terms of food availability and income supplementation. The researcher would like to suggest that further research be carried out to assess the effect of the 'Make Use of Your Backyard' home gardening program between households headed by males and households headed by females in order to determine any variations in terms of food availability and income supplementation between both categories.

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## Appendix 1

Questionnaires used during data collection

Master's in management of Development Food Security and Rural Development  
Semi-structured interview Questionnaire for Research Data Collection in Clay District,  
Montserrado County, Liberia



Greetings, I am Flomo Kesselee a Liberia currently studying Master in Management of Development with a specialty in Food Security and Rural Development at Van Hall Larenstein University of Applied Sciences in the Kingdom of Netherlands. As a prerequisite to complete my study, I am required to conduct research in the area of Food Security. I have therefore decided to assess the effect of Make Use of Your Backyard home gardening to Smallholder household's food availability and income supplementation. Since you are one of those that participated in the Program implemented by AgroTech Liberia, I would like to discuss with you in 1 hour the following topics; home gardening and food availability, home gardening and income and the challenges facing the practice of home gardening. I therefore kindly request your permission to proceed. You are free to quite the interview any time you wish.

### Section 1: Respondent personal details

1. Name \_\_\_\_\_ sex \_\_\_\_\_ Age \_\_\_\_\_
2. Marital status: (Single), (Married), (Divorced), (Widowed)
3. Educational: (Primary), (Secondary), (University), (None), others specify \_\_\_\_\_
4. Number of members in the household \_\_\_\_\_
5. Number of children \_\_\_\_\_
6. Number of children in School \_\_\_\_\_

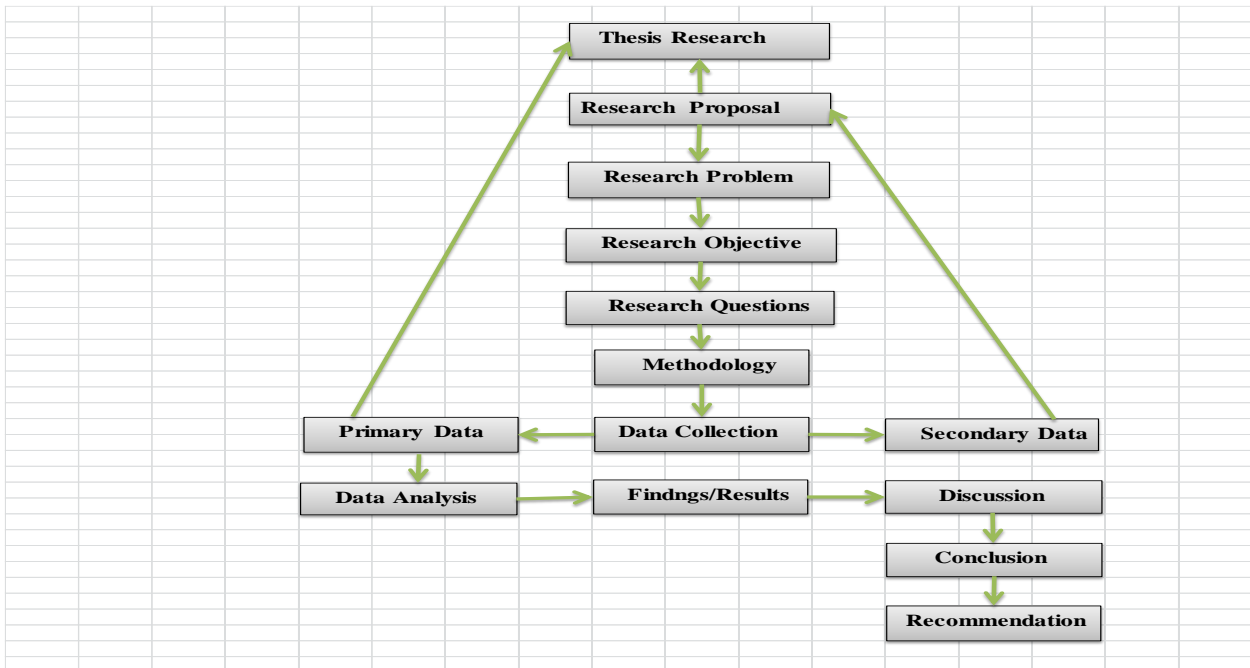
### Section 2: HG and effects on Food Availability and Income

7. Are you currently practicing Home gardening? Yes/No, if not, have you practiced in the past?
8. Can you tell me how long you have been practicing home gardening?
9. What is the size of your home gardening plot? (20m by 20m), (30m by 30m), (40m by 40m), (others)
10. What types of crops do you cultivate at home?
11. How many times do you cultivate crops in your garden annually?
13. Can you share with me what the food availability status was like in your household before and now after the introduction of home gardening?
14. Is there any food stock in your households? (Yes), (No); if yes, can you share with me the sources of the food stock?
15. Can you share with me based on your experience any changes in food consumption patterns or frequency in your household before and after the introduction of the home gardening Program?
16. Can you tell me what the income status was like before the implementation of the home gardening program and after the implementation of the program?
17. What are your main sources of income?
18. Does home gardening offer your family with extra income? Yes/No, if yes, do you keep a record of monthly income? Yes/No
19. During harvest, how much do you realize in Liberian Dollars Monthly from the sales of produce from the garden? (\$2,000-\$3,000), (\$3,100-\$4,100), (\$4,200-5,200), (\$5,300- \$6,300), (\$6,400-\$7,400), (\$7,500-\$8,500)
20. How do you spend the income supplemented from home gardening?
21. Who has control over the income supplemented from home gardening?
22. Are there any challenges facing the practice of home gardening? Yes/ No, if yes what are those challenges?
23. Is there any organization or individual helping you to overcome these challenges?
24. What specific benefits have you enjoyed by practicing benefit gardening?

25. Do you have any other comment or question would love to ask?

Thank You Very Much!

### Data collection flow chart





## Appendix 2

Master's in management of Development Food Security and Rural Development

Focused Group Discussion Interview Questionnaire for Research Data Collection in Careysberg District, Montserrado County, Liberia

Date : \_\_\_\_\_

Discussants : \_\_\_\_\_

Duration : 2 hours

Venue : \_\_\_\_\_

Facilitated by \_\_\_\_\_



Greetings, I am Flomo Kesselee a Liberia currently studying Master in Management of Development with a specialty in Food Security and Rural Development at Van Hall Larenstein University of Applied Sciences in the Kingdom of Netherlands. As a prerequisite to complete my study, I am required to conduct research in the area of Food Security. I have therefore decided to assess the effect of the Make Use of Your Backyard home gardening program on Smallholder farming household's food availability and income supplementation. Since you all participated in Make Use of Your Backyard program implemented AgroTech Liberia, I would like to discuss with you in 2 hours the following topics; Home Gardening and Food availability, Home gardening, and Income supplementation and the challenges facing the practice of home gardening. I therefore kindly request your permission to proceed. You are free to quite the interview any time you wish.

### Question

1. Can you share with me what the food availability status was like before the introduction of home gardening?
2. What can say about the status of food availability in your households after the introduction of home gardening?
3. If you were to compare before and now, what do you think has changed in terms of food availability and income?
4. Can you tell me what the income status was like before the implementation of the home gardening program and after the implementation of the program?
5. Can you discuss with me the challenges hindering the practice of home gardening?
6. What specific benefits can you share with me that you have got from practicing home gardening?

Thank You Very Much!

### Appendices 3



Master's in management of Development Food Security and Rural Development

Key Informants Interview Questionnaire for Research Data Collection in Careysberg District, Montserrado County, Liberia

Greetings, I am Flomo Kesselee a Liberia currently studying Master in Management of Development with a specialty in Food Security and Rural Development at Van Hall Larenstein University of Applied Sciences in the Kingdom of Netherlands. As a prerequisite to complete my study, I am required to conduct research in the area of Food Security and Rural Development. I have therefore decided to assess the effect of Home gardening on Smallholder farming household's food availability and income supplementation. You have therefore been selected as one of the key informants based on your knowledge of the Make Use of Your Backyard program implemented by ATL, your experience, and the length of time you have lived in the community. I would like to discuss with you in 45 minutes the following topics; Home Gardening and Food availability, Home gardening, and Income Supplementation and the challenges facing the practice of home gardening. I therefore kindly request your permission to proceed. You are free to quite the interview any time you wish.

#### Questions

1. Can you tell me what the food availability status was like in project participant's households before and now after the program was introduced?
2. What do you know about the income status of project participant households before and after the introduction of the home gardening program?
3. Are there any changes you have observed since the introduction of the home gardening program? Yes/No, if yes, what do you think is responsible for the changes?
4. In your opinion, are there challenges project participants households are faced with in practicing home gardening? Yes/No, if yes, do you know of any organization or individual aiding participants' households to address these challenges?
5. Do you have any questions, concerns or suggestions?

Thank you very much for your time

#### Appendices 4

Master's in Management of Development Food Security and Rural Development  
Respondent Consent Form for Research Data Collection in Clay District,  
Montserrado County, Liberia



Greetings, I am Flomo Kesselee a Liberia currently studying Master in Management of Development with a specialty in Food Security and Rural Development at Van Hall Larenstein University of Applied Sciences in the Kingdom of Netherlands. As a prerequisite to complete my study, I am required to conduct research in the area of Food Security and Rural Development. I have therefore decided to assess the effect of Home gardening on Smallholder household's food availability and income supplementation. Since you are one of those that participated in the Make Use of Your Backyard program implemented by AgroTech Liberia, you have been invited to participate as a respondent in this study. Taking part in the study is voluntary and you may, therefore, withdraw anytime without penalty. You are assured that your refusal to participate will not in any way affect you or any member of your family. Participating in the study might not benefit you, but the information gained might benefit others.

As mentioned above, the purpose of the study is to assess the effect of home gardening on smallholder farming household's food availability and income supplementation. Therefore, this study requires asking questions, voice recording, video recording of participants, and note-taking.

All information obtained in the study will be kept strictly confidential by the researcher. The result of this study will later be presented with no individual participant being identified.

If you have any questions please feel free to contact me at +231775570381/  
[+231880610054/+31687711240/flomokesselee@gmail.com](mailto:+231880610054/+31687711240/flomokesselee@gmail.com)

By signing this consent form, you are indicating that you clearly understand the aforementioned information and agree to participate in this study.

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Appendices 5

### Dietary Diversity Score

Now I would like to ask you about the types of foods that you or anyone else in your household ate yesterday during the day and at night

QUESTIONS and FILTERS	CODING CATEGORIES
A. Did any member of your households in the past 24 hours eat bread, rice noodles, biscuits, or any other foods made from millet, sorghum, maize, rice, wheat?	A. _____[     ]
B. Did any member of your households in the past 24 hours eat potatoes, yams, eddoes, manioc, cassava or any other foods made from roots or tubers?	B. _____[     ]
C. Did any member of your households in the past 24 hours eat vegetables?	C. _____[     ]
D. Did any member of your households in the past 24 hours eat fruits?	D. _____[     ]
E. Did any member of your households in the past 24 hours eat beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meat?	E. _____[     ]
F. Did any member of your households in the past 24 hours eat eggs?	F. _____[     ]
G. Did any member of your households in the past 24 hours eat Did any member of your households in the past 24 hours eat fresh or dried fish or shellfish?	G. _____[     ]
H. Did any member of your households in the past 24 hours eat foods made from beans, peas, lentils, or nuts?	H. _____[     ]
I. Did any member of your households in the past 24 hours eat cheese, yogurt, milk or other milk products?	I. _____ (     )
J. Did any member of your households in the past 24 hours eat foods made with oil, fat, or butter?	J. _____[     ]
K. Did any member of your households in the past 24 hours eat sugar or honey?	K. _____[     ]
L. Any other foods, such as condiments, coffee, tea?	L. _____[     ]

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**Coding sheet for program participants dietary diversity scores**

Respondents	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total score
Type of food group																
Cereal	1	1	1	1	0	1	1	0	1	0	1	0	1	1	1	11
Root and Tuber	1	1	0	1	1	1	1	1	0	1	1	0	1	1	1	12
Vegetables	1	1	1	1	1	0	1	1	1	0	1	1	1	1	1	13
Fruits	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	9
Meat, poultry	1	1	1	0	0	1	1	1	0	1	0	1	1	0	1	10
Eggs	0	0	1	0	1	0	0	0	1	0	1	0	0	1	0	5
Fish & Sea food	1	1	1	0	0	1	0	1	0	1	0	1	1	0	0	8
Pulses/legumes/nuts	0	0	0	0	1	0	0	1	0	0	1	1	1	1	0	6
Milk & milk products	0	0	0	1	0	0	0	0	1	1	1	1	1	1	0	7
Oil/ fats	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
Sugar / honey	0	1	1	1	0	1	0	0	1	1	0	0	0	0	0	6
Miscellaneous (coffee & tea)	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3
<b>Scores:</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>6</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>5</b>	<b>105</b>
<b>HDDS</b>	<b>7.0</b>															

