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Assessment of Socio-economic Impacts of the Climate Smart Gardens Project in Low Income Residential Areas in Mbabane City, Eswatini

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Abstract

The study focused on assessing the socio-economic impacts of the climate smart gardens project in low income residential areas in the Kingdom of Eswatini, using Mbabane city as a case study. Issues raised in the study include impacts of the project on the socio-economic lives (household income and food security) of the community members as well as the challenges faced by the project. A survey research approach was adopted to collect information from a sample of 57 households selected through snowball sampling where an interview-guided questionnaire was administered to heads of households. Data was analyzed using the Statistical Package for Social Sciences (SPSS) version 20 and Microsoft excel. The findings indicate that a majority of the interviewed household heads, were employed and some were street vendors. It was also gathered that purchasing still remains the most common means of sourcing cereals (grains) and fruits, while vegetables were mostly domestically produced as far as food acquisition is concerned. The climate smart gardens project only significantly improved means of accessing vegetables. Moreover, the project improved households' income through saving money that would have been used to purchase vegetables. Water was the most common challenge and was mainly caused by the recent drought that hit the country. It was concluded that the impacts of the project were mainly seen in household income than household food security.

Keywords

Climate Smart Gardens, Low Income Residential Areas, Household Income, Mbabane, Vegetables, Household Food Security

1. Introduction

Africa is the fastest urbanising continent in the world, as such it has the highest urbanisation rate of 3.5% per year [1]. The number of Africans living in urban areas is projected to increase from the 36% in 2010 to 50% by 2030 [2]. Rapid urbanisation is linked to rapid increase in urban poverty and food insecurity. For instance, it is expected that by 2020, 40-45% of the poor in Africa and Asia will be concentrated in towns and cities [3].

Noteworthy is that, African cities are often not able to provide sufficient employment opportunities to the increasing population in the developing world something which has led to the increase in the urban poor. The urban poor often lack money to purchase food or land to grow it [4]. Sub-Saharan Africa faces more development challenges than any other region in the world. In the year 2002, 746 million people in urban areas were living below the poverty line (U$ 1.90 a day) [5]. The urban poor have adopted many survival strategies which include growing of crops in backyard gardens and vacant spaces such as unused plots. This is known as urban farming or urban agriculture. By way of definition, urban agriculture is the carrying out of farming

activities in built up urban areas where open space is available which can also include keeping livestock [6]. Urban agriculture addresses three global goals, namely sustainable increase in food production and availability, economic and social progress, and sustainable management and use of natural resources [3].

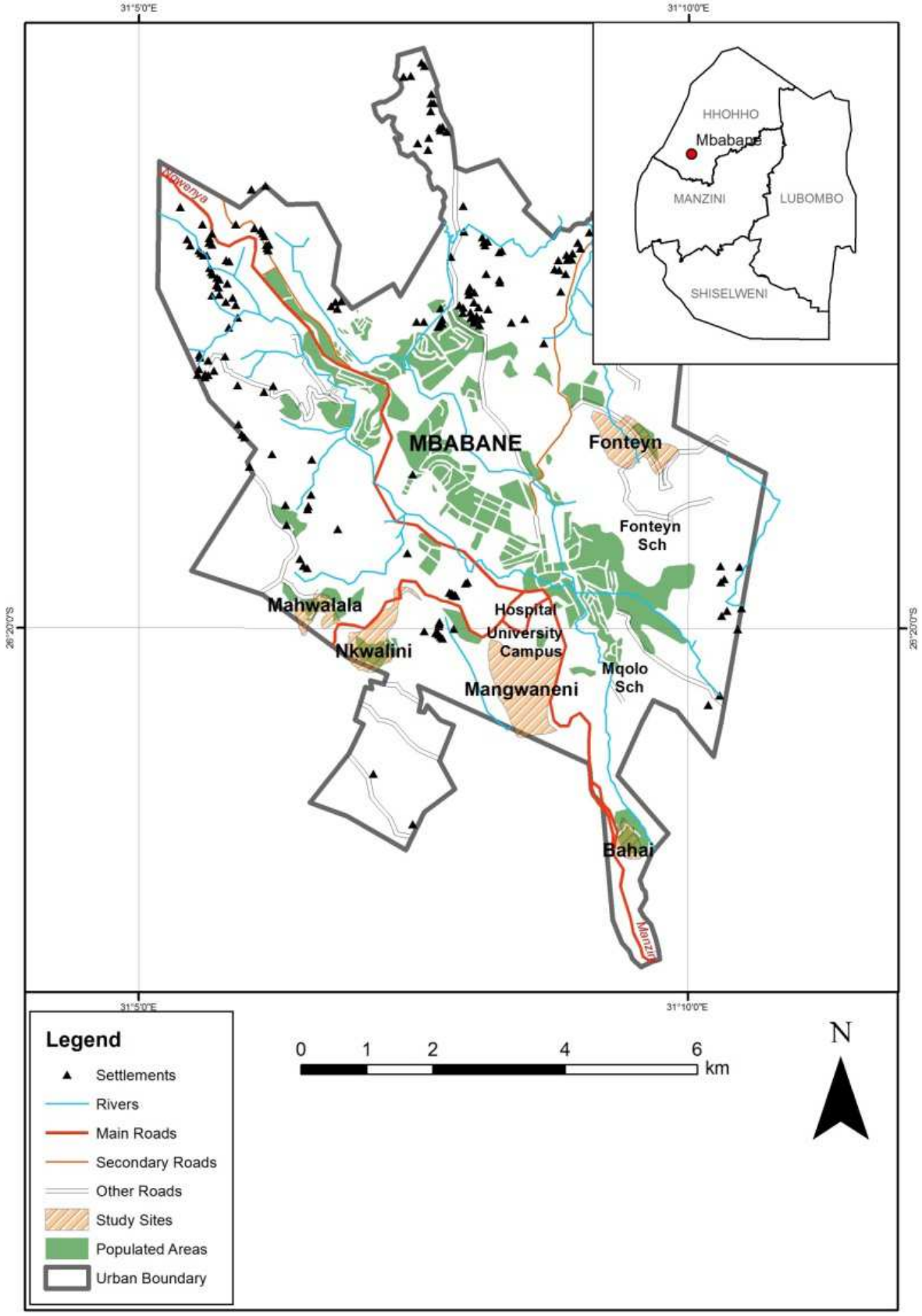

Figure 1. *Mbabane urban area showing Nkwalini, Mahwalala, Bahai and Fonteyn.*

In West Africa, in particular, 20 million people practice urban agriculture [7]. Urban agriculture has experienced a massive transition over the years and has gained popularity across the globe mostly in developing countries. It came as a response to climate change concerns, increasing prevalence of urban poverty and increasing costs of food. In most developing countries there are low wages yet food prices are high. Notwithstanding its importance, urban agriculture is handicapped by a number of factors. The phenomenon of rapid urbanisation itself brings challenges as it is characterised by high unemployment and overcrowding. Other challenges faced by urban agriculture are increased competition for land, water, energy and labour. Climate smart agriculture is aimed at addressing some of these challenges. This is mainly because, climate smart agriculture is farming that helps build resilience and reduces agriculture's effect on global warming. It does not degrade the environment and at the same time it produces organic agricultural products. Through the use of organic fertiliser, the soil retains water for a longer period and absorbs more nutrients. The organic fertiliser is generated through compositing food and yard waste, which also helps in waste minimization through reduction, re-use and recycling. In turn, more agricultural products are produced in a small area compared to traditional agriculture.

In an effort to mitigate and respond to impacts of climate change, the Municipal Council of Mbabane City adopted sustainable environmental practices often called greening practices. The major focus of the practices is environmental sustainability. As part of the sustainable green practices, organic climate smart project was implemented in low income residential areas namely; Bahai, Mangwaneni, Nkwalini Zone 4, Mahwalala zone 5 and Fonteyn (Figure 1). It aims at addressing issues of food insecurity, environmental degradation and poverty. As already indicated the project goes hand in hand with waste minimization through reduction, re-use and recycling through compositing. All in all, 736 climate smart gardens were established in these communities in the year 2015. Noteworthy is that, the involved communities were able to produce 2 438 kg of compost.

The purpose of the project is to address social, economic and as well as environmental challenges faced by the city. Socially the project takes into consideration the high levels of poverty in the Kingdom of Eswatini, therefore climate smart gardens/ permaculture provide people with nutritional agricultural products that they can eat. Economically, the country has a high rate of unemployed people. The people within these communities can practice this type of gardening in their backyards, and then sell surplus produce which will bring income within households hence improving their livelihoods. Environmentally, this is the most important purpose of climate smart gardens/ permaculture. Traditional agriculture is a large contributor to land degradation whereas a climate smart garden/ permaculture does not degrade the environment in anyway, instead it makes it environmentally friendly.

1.1. Problem Statement

The country is experiencing high poverty levels with 73% of the rural population living below the poverty line ($1.90 a day) and 31.1% of the urban population being poor [8]. The urban poor are normally food insecure. Food insecure households are certainly the most poor. In a study conducted Manzini it was found that the majority of the urban poor were severely food insecure [9].

Moreover, the urban poor's access to food was mainly through food purchase yet their purchasing power was shrinking. Regardless of the challenges faced by the urban poor, poverty is still being considered as a rural problem. Food aid programs are focused on rural areas yet empirical evidence shows that food insecurity is also an urban problem. Furthermore, urban agriculture still remains an informal sector activity in most urban areas. Agriculture has also been associated with rural areas, for instance only 20% of urban households had a home garden of which 82% cultivated less than 0.5 acres on average [10].

In response to the problem of urban poverty and food insecurity, the Municipal council of Mbabane in the Kingdom of Eswatini, adopted an initiative referred to as climate smart garden's project which focuses on addressing the challenges faced by the urban poor in the city's low income residential areas. The project was implemented in low income residential areas namely; Bahai, Mangwaneni, Nkwalini Zone 4, Mahwalala zone 5 and Fonteyn (Figure 1). However, the impacts of the project on socio-economic lives of residents in the involved communities are not known. Noteworthy is that, the climate smart garden's project has a potential to address problems of the urban poor with regard to poverty and food insecurity.

1.2. Objectives

The main objective of the study is to assess the role of climate smart gardens' project on socio-economic development in low income residential areas in Eswatini using Mbabane City as a case study from 2013 to 2017.

The specific objectives are:

i. To determine whether there are impacts of the project on the socio-economic lives of the community members.
ii. To determine whether there are challenges faced by the project.

2. Materials and Methods

2.1. Sampling

The study targeted heads of households and community facilitators of the climate smart garden projects at Bahai, Mahwalala Zone 5, Nkwalini Zone 4, and Fonteyn. Mangwaneni was excluded due to ongoing conflicts with the Council. The justification for choosing these communities as study sites was mainly due to the fact that this is where the

project started. The study had a sampling frame of 529 households in the aforementioned low income communities. The 529 households were grouped into their respective communities. The distribution of participants was as follows; Bahai (92), Mahwalala Zone 5 (173), Nkwalini Zone 4 (127) and Fonteyn (137). Snowballing sampling technique was used to select households in each community. For instance, eight (8) households were from Bahai, 19 were from Mahwalala Zone 5, 11 were from Nkwalini Zone 4 and 19 households were from Fonteyn. All in all, 57 households were involved in the study. Noteworthy is that, initially, the study targeted to sample more than 10% of the 529 participants. This was meant to ensure that the sample is proportional in all the areas; however this could not be achieved due to unwillingness to participate in the study and unavailability of beneficiaries during the time of the study. Thus, only the 57 participants who were present and willing to participate were interviewed.

2.2. Data Collection

In depth face to face interviews were conducted with heads of households and where they were not available adults who were available were interviewed. Another interview was also conducted with a public health inspector from the municipal council of Mbabane. An interview guide and a questionnaire were utilised, one for the Health inspector and the other for the heads of households. Moreover, observation was used to make estimates of the size of garden, the type of garden and types of vegetables grown.

3. Findings

The study targeted households from Mbabane city's low income residential areas. The respondents of the study were heads of household or project participants. Also, in cases where the head of household was not present, the eldest adult was interviewed. From the 57 respondents, 47.4% were males and 52.6% were females. Furthermore, a majority of the respondents were still in the economically active age range (15-64), 80.7% of the respondents were aged between 20 and 59 and only 19.3% were between the age ranges of 60 to 79 which are often referred to as the dependent population.

In terms of occupation, 36.8% were unemployed, 24.6% were self-employed and 38.6% were employed. Regarding family size, 33.3% of the households had between five to nine occupants followed by those with less than five (31.6%) occupants (Table 1).

Table 1. *Number of household occupants.*

Number of occupants	Frequency	Percentage (%)
Less than 5	18	31.6
5 to 9	19	33.3
10 to 14	15	26.3
15 +	5	8.8
Total	57	100

To assess the level of dependency on the head of household in relation to employment status, cross tabulation was done between occupation of head of household and the total number of occupants. Among households whose heads are unemployed the most frequent number of household occupants was 10 to 14 (15.79%), among households whose heads were employed the dominant household size was less than five (17.54%) and lastly for households where household heads were self-employed the dominant household size was less than five (10.53%) (Table 2).

Table 2. *Occupation and size of household.*

Occupation	Size of household							
	Less than 5		5 to 9		10 to 14		Over 15	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Unemployed	2	3.5	6	10.5	9	15.8	4	7
Self-employed	6	10.5	5	8.8	3	5.3	0	0
Employed	10	17.5	8	14	3	5.3	1	1.8

3.1. Climate Smart Gardens

Respondents were asked questions concerning when they started participating in the project, types of vegetables grown, sources of inputs, other sources of income, reason for participating in the project and average monthly income from selling produce. The results pertaining to when the respondents started practicing organic gardens were as follows; 10.5% started in 2013, 19.3% started in 2014, 28.1% started in 2015, and 10.5% started in 2016. Notably, 91.2% of the respondents still have gardens and 8.8% no longer have gardens. However, from those that have gardens 17.3% have reverted to conventional gardens while a majority (74.1%) still maintain organic gardens.

Different crops are grown at different quantities depending on priorities and resources at the disposal of participants. Spinach (23%) is the most grown vegetable followed by cabbages (18%) and lettuce (14%). The least grown crops are beans (1%) and pumpkins (1%) (Figure 2).

There are two main reasons given by respondents for participating in the project, these are to feed their families (78.9%) and to sell the produce (21.1%). It is also worth noting that the reason for participating varied with size of garden. For instance, those whose gardens are less than five meter square in size produced to feed their families whereas as the size of garden increases the desire to sell also increases (Table 3).

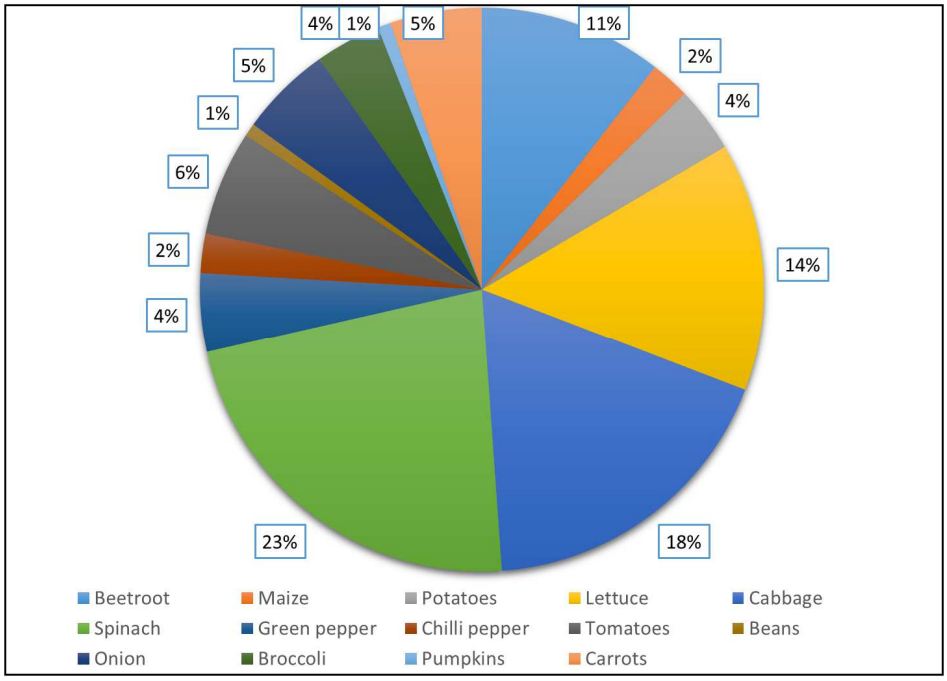

Figure 2. *Crops grown in the garden.*

Table 3. *Size of garden and reason for participating.*

Size of garden	Reason for participating				Total	
	To feed family		To sell produce			
	Freq.	%	Freq.	%	Freq.	%
Less than 5 sq. meter	14	24.6	0	0	14	24.6
5 to 9 sq. meter	22	38.6	2	3.5	24	42.1
10 to 14 sq. meter	6	10.5	5	8.8	11	19.3
15+ sq. meter	3	5.3	5	8.8	8	14.0

Respondents were also asked questions pertaining to sources of inputs for their gardens namely; water for irrigation, compost, seedlings and labour. Streams were the most common source of water for respondents. For instance, 43.9% of the respondents relied on nearby streams as source of water for irrigation, 35.1% used tap water while 17.5% used grey or recycled water and 3.5% used was harvested rain water. In addition, a relationship was observed between the source of water and occupation whereby 55% of those who used tap water were employed, 10% were self-employed and 35% were unemployed (Table 4).

Table 4. *Occupation and source of water for irrigation.*

Occupation	Source of water for irrigation							
	Tap water		Grey water		Stream		Harvested	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Unemployed	7	35	4	40	9	36	1	50
Self-employed	2	10	3	30	8	32	1	50
Employed	11	55	3	30	8	32	0	0
Total	20	100	10	100	25	100	2	100

The findings on the other farming inputs were as follows; 64.9% of the respondents reported that the gardens were maintained by a gardener while 35.1% indicated that household members were the main source of labour. Seedlings were mostly accessed through purchase (82.5%) while 12.2% of the respondents indicated that they have home nurseries, with 5.3% receiving seedlings from the Municipal Council. The 5.3% who received seedlings from the Council were the community facilitators who worked closely with the Municipal Council. The major source of compost for the respondents was homemade compost (56.1%), while 10.5% received compost from the Municipal Council, with 5.3% purchasing the compost. On the other hand, 28.1% of the respondents pointed out that they have since replaced compost with fertilizers in their gardens.

Respondents were also asked if the produce was sold and the average monthly income derived from selling the produce. For instance, 50.9% were selling their produce while 49.1% were not. Noteworthy is that, those who were selling their produce had a surplus. Therefore, not selling the produce was due to lack of surplus with the produce was only sufficient for household consumption. Average monthly

income derived from selling produce from the gardens by the respondents ranged from less than E200 to more than E500. Among the 50.9% of the respondents who indicated that they sell their produce, only 3.4% had an income of over E500. The majority (24.1%) had an average monthly income which ranged from E200 to E300, and these were participants whose gardens are between five to nine square meters (Table 5). One would expect that the bigger the garden the more money made, however in this case there were few respondents with bigger gardens hence they were not fairly represented.

Questions relating to other sources of income were asked, such that 78.9% of the respondents had other sources of income while 21.1% only relied on the gardens for income. The other sources of income include salary (53.5%) and elderly grants (18.6%) (Figure 3).

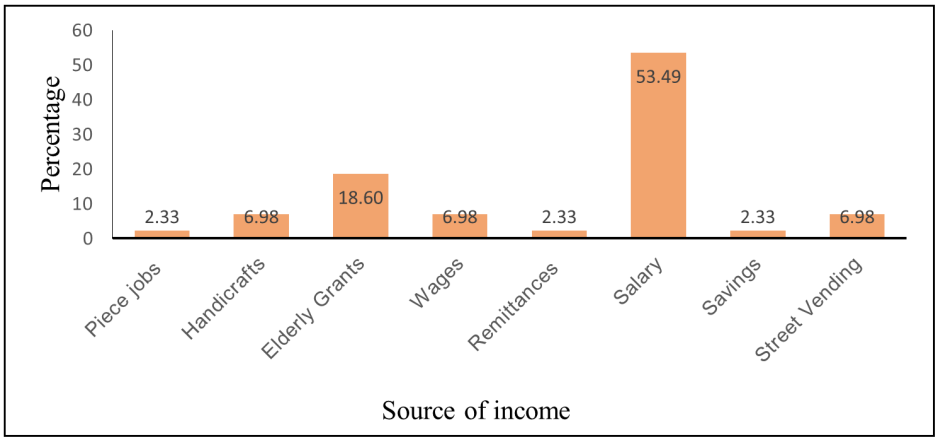

Figure 3. *Source of income in the communities.*

Table 5. *Average monthly income from selling produce and garden size.*

Size of garden	Frequency and percentage of respondents	Average monthly income				
		Less than E200	E200-E300	E300-E400	E400-E500	More than E500
Less than $5m^2$	Frequency	1	0	0	0	0
	%	100	0.0	0.0	0.0	0.0
5 to $9m^2$	Frequency	7	4	0	0	0
	%	63.6	36.4	0.0	0.0	0.0
10 to $14m^2$	Frequency	1	4	1	3	1
	%	10.0	40.0	10.0	30.0	10.0
$15m^2$+	Frequency	1	5	1	1	0
	%	12.5	62.5	12.5	12.5	0.0

The relationship between the size of garden and income generated from selling garden produce was further explored using Spearman correlation and Pearson R. The calculated value for Pearson R was 0.403. The Pearson R correlation is a measure used to assess relationships between variables. The calculated value (0.403) indicates a positive relationship between size of garden and income generated from selling the garden produce. In essence, this means that the bigger the garden, the more income will be generated from selling its produce.

3.2. Food Security

In assessing the socio-economic impacts of the project pertaining to food security the questions asked related to household's means to accessing food, duration of food after purchasing, type and frequency of meals consumed (in a week), and food sufficiency. Respondents were asked if participating in the household gardens project has improved household income and how has the project improved household income. For instance, 86% of the respondents reported to the affirmative while 14% stated that it has not improved household income. Among the 86% respondents who indicated that household income has improved, 52.8% stated that this was through saving money that would have been used to purchase vegetables, while 47.2% reported that it was through selling produce.

The response on whether household income was improved by participating in the project was affected by other factors which include the size of garden. A cross tabulation was done between the two variables in order to determine if there was indeed a relationship between them (size of garden and household income). The findings as shown in Table 6 indicate that indeed there is a relationship between the two variables. Out of the respondents who indicated that the project has not impacted on household income, 75% had the smallest garden sizes of less than five square meters. Furthermore, 25% of those who responded 'no' to the question had garden size between 5 to 9 square meters. The results prove that the project impacted on those with gardens sizes from 5 to 9 square meters with regard to household income.

Table 6. *Size of garden and whether participating in the project has improved household income.*

Size of garden	Yes		No	
	Frequency	%	Frequency	%
Less than $5m^2$	8	16.7	6	75
5 to $9m^2$	22	45.8	2	25
10 to $14m^2$	11	25.6	0	0
$15m^2$+	8	16.7	0	0

Household's means of accessing food was measured for both before and after participating in the project. The types of food were grouped into three subgroups; grains, fruits and vegetables. The means for accessing food were as follows; rural relatives, purchase, domestic production and other. Each type of food was assigned the four means of accessing food and a comparison was made for both before and after the project in order to identify any changes. The findings indicate that participating in the project had minimal impact (if any) on respondents' means of assessing both grains and fruits. Purchasing was the major means of accessing grains before the project with 70.2% per cent, on the other hand 29.8% indicated that they obtain grains from rural relatives, namely maize and mealie-meal. Regarding how grains were accessed after the project, the findings reveal that the project had an impact on sourcing grain even though it was very minimal. For instance, there was a decline in the proportion of respondents who relied on purchasing grains from 70.2% before the project to 67% after the project. Moreover, before the project only two means of sourcing grains were present which were purchase and sourcing from rural relatives, while after the project a proportion of two per cent (2%) of the respondents accessed grains through domestic production. There was also an increase observed in the proportion of those who accessed grains from rural relatives from 29.8% to 31% after the project.

In assessing the impact of the project on the acquisition of vegetables the same procedure as that used for grains was employed. Due to the sizes of the gardens vegetables were the mostly grown crops; hence a major shift from purchasing to domestic production was observed (Figure 4). For instance, Figure 4 shows that before respondents participated in the project 80.7% purchased vegetables while after participating in the project only a proportion of 14% purchased vegetables. Also, before the project a proportion of only 8.8% of the respondents grew vegetables, while after the project the proportion increased to 80.7% (Figure 4).

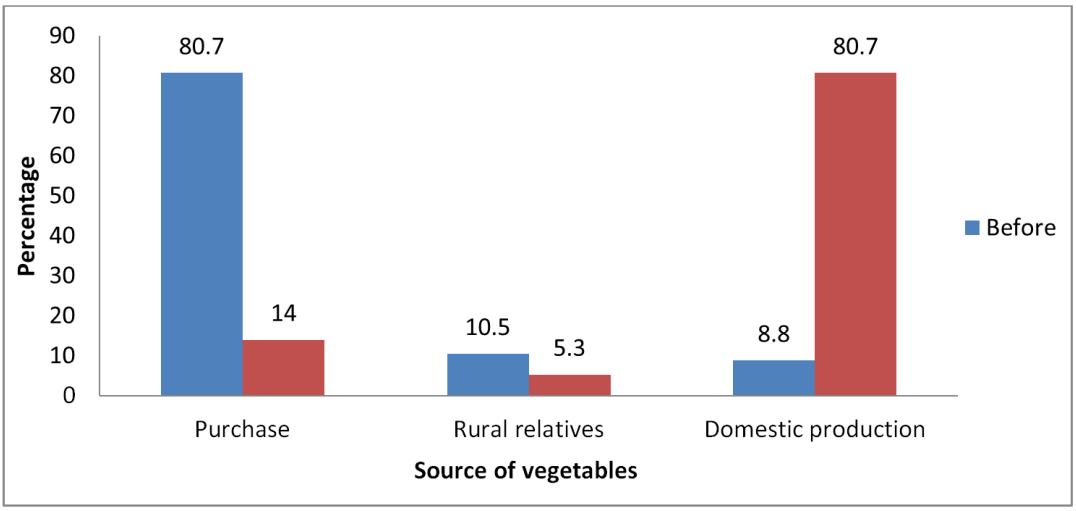

Figure 4. *Means of accessing vegetables before and after the project.*

The project's impacts on fruits were very minimal. Table 7 shows that the proportion of respondents who purchased fruits before (87.7%) and after (87.7%) the project was not changed. A slight increase was observed with regard to domestic production of fruits as an increase from 3.5% before the project to 5.3% after the project (Table 7).

Table 7. *Means of accessing fruits before and after the project.*

Means of accessing fruits	Before the project		After the project	
	Frequency	%	Frequency	%
Purchased	50	87.7	50	87.7
From rural relatives	5	8.8	4	7.8
From Domestic production	2	3.5	3	5.3

Respondents were asked questions pertaining to the duration of food after a purchase and how sufficient is food

in their households. As far as duration of food after a purchase is concerned, 47% of the households' food last for a week, with 22.8% having food lasting for either less than a week or a month and only 7% had food that lasted over a month (Figure 5).

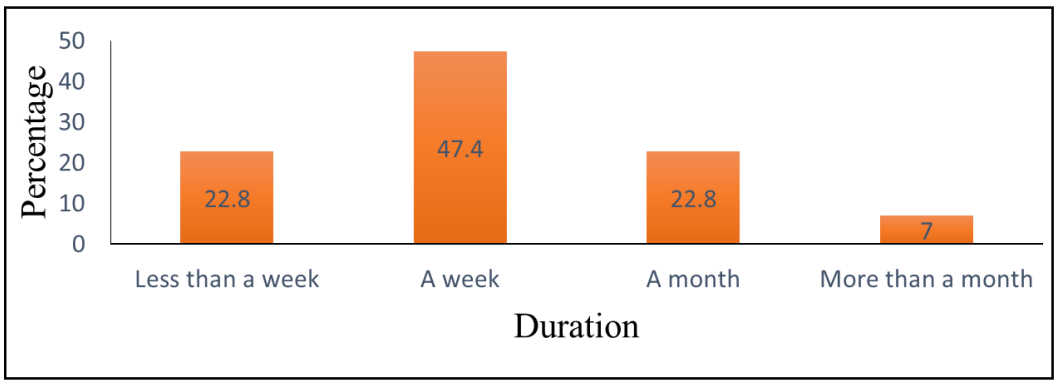

Figure 5. *Duration of food after purchasing.*

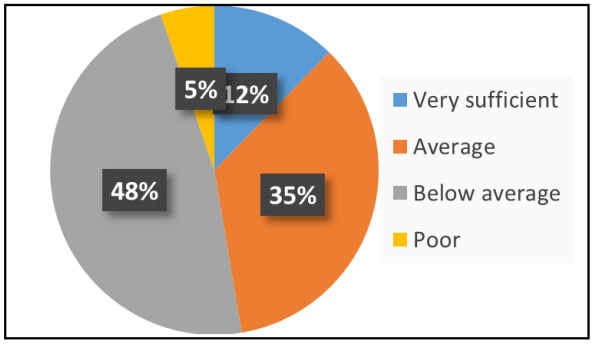

Figure 6. *Household's food efficiency.*

Figure 6 shows how sufficient was the food in the different households. For instance, most of the households (48%) indicated that the food they got was below average, while 35% pointed out that their food efficiency was average and 12% stated that they had very sufficient food, while 5% had poor food efficiency (Figure 6).

Household size and food sufficiency were observed to be related. A majority of households with many occupants had poor food sufficiency. Food sufficiency was observed in households whose size was less than 5 occupants (71.4%) whereas households with poor food sufficiency were those with over 15 occupants (66.7%) (Figure 7). Household's level of food sufficiency is also related to head of household's occupation. Households who had very sufficient food were those whose heads were employed. Contrariwise, households who had poor food sufficiency were those whose heads were unemployed followed by those whose heads were self-employed. Another factor that contributed to food sufficiency in the households was selling the garden's produce. Households who indicated that they had very sufficient food were those who were selling the produce from their gardens, while households who had poor levels of food sufficiency did not sell their produce (66.7%) (Figure 7).

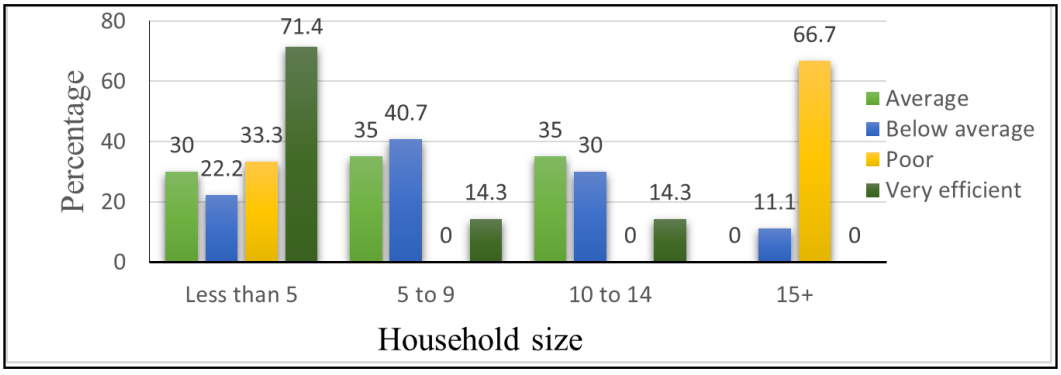

Figure 7. *Level of food sufficiency.*

Food diversity was one of the indicators that were used to measure food security. To measure food diversity, questions were asked on the type of meals consumed and their frequency per week. The types of meals were grouped into various combinations namely; carbohydrates only, carbohydrates and proteins, balanced meal and lastly proteins and vitamins. Carbohydrates and proteins (42.1%) was the most common meal served three times a week (Figure 8). Balanced meals were mostly consumed two times a week (38.6%), while 31.6% of the respondents indicated that they had carbohydrates only as a meal (Figure 8).

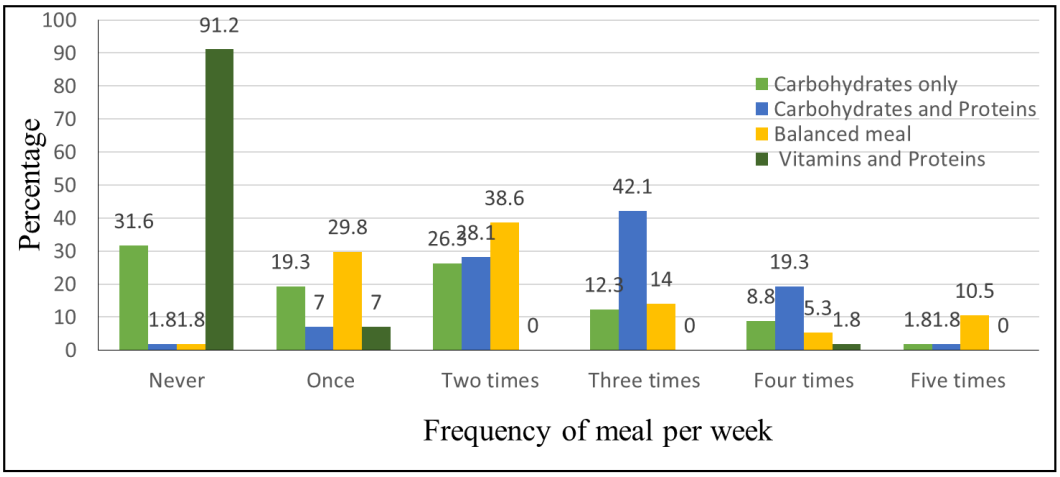

Figure 8. *Type of meal and consumption frequency.*

3.3. Challenges and Coping Strategies

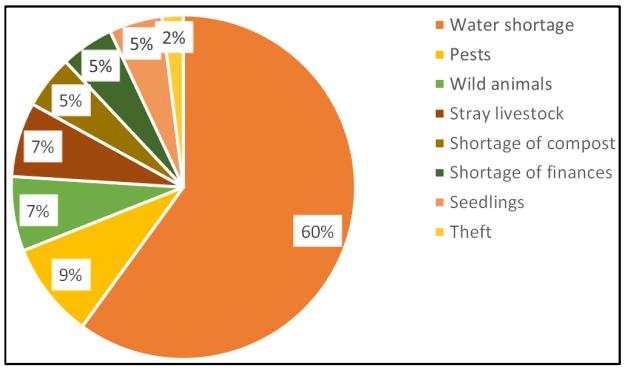

Figure 9. *Challenges encountered in the garden project.*

The study also assessed the challenges encountered by participants in the climate smart gardens project as well as measures taken to address those challenges. A majority of respondents (84.2%) pointed out that they had encountered challenges in participating in the project, while 15.8% had never encountered any challenge. The challenges include water shortage (60%), pests (9%), wild animals (7%), stray livestock (7%), shortage of compost (5%), and shortage of finances (5%), seedlings (5%) and theft (2%) (Figure 9).

Regarding measures taken to address the challenges, a majority of respondents (64.8%) stated that nothing was done to address the challenges (Figure 10). Among the respondents who had water shortages 5.3% reported that the situation normalized after good rains were received. Moreover, respondents who had a challenge of pests indicated that they used pesticides (3.6%) and 1.8% of the respondents reverted to conventional gardening as a coping strategy (Figure 10).

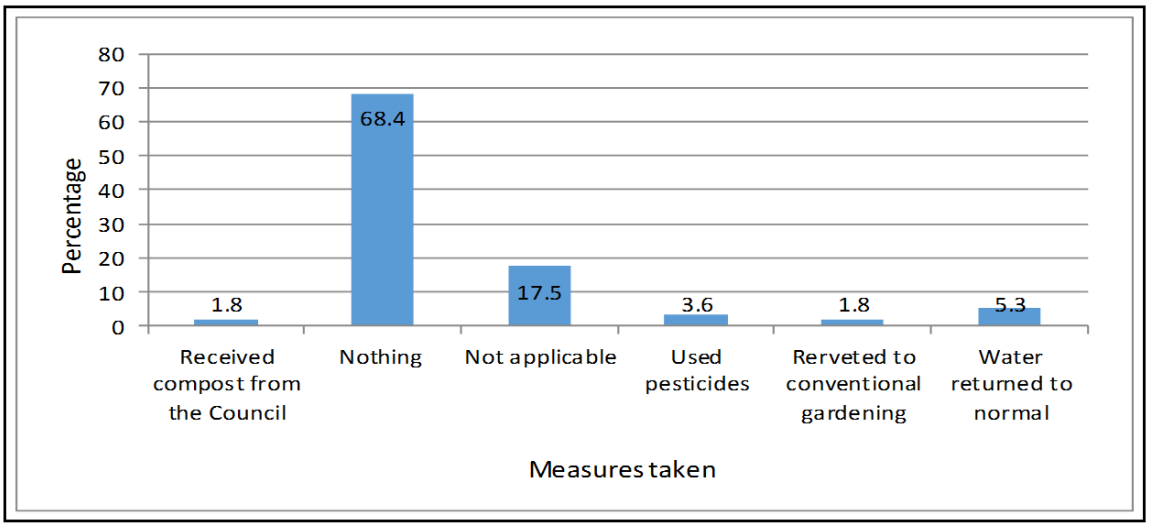

Figure 10. *Measures taken to address challenges faced in the garden project.*

3.4. The Municipal Council's Report

According to the Municipal council of Mbabane city, the performance of the climate smart gardens project was inconsistent yet the overall reception was positive. Pilot garden sites were randomly chosen, without any discernable criteria for selecting them. Moreover, the project has been rolled out to other wards or communities within the city and

even outside the city boundary. The Municipal council also indicated that it was in the process of introducing organic smart gardens in middle and high income residential areas.

Noteworthy is that, the municipal council has encountered challenges as project implementers which include land scarcity, funding, people's attitudes towards some greening practices especially the concept of dry sanitation, vandalism of public pilot gardens. The major challenge highlighted was dependency of participants on the Municipal Council. Participants continue to expect to be provided with farming inputs such as seedlings and compost.

There were two main anticipated environmental impacts of the climate smart gardens project namely sustainability and cleaner environment and these were duly achieved. The socio-economic impacts were food, jobs through formation of associations, wellness through eating balanced meals and balance diets. The initial plan of the implementers was that residents would form associations and be allocated vacant land to establish gardens, however, this never materialized. Finances and land scarcity were identified as the main cause of the failure. The future plan for the project is to replicate for the next 3 years.

4. Discussion

The overall performance of the project is inconsistent as observed by the Municipal council of Mbabane city. The findings show that most of the gardens were no longer organic as respondents often reverted to the use fertilizers and pesticides, which are against organic gardening. The concept of organic smart gardens is all about recycling waste that would have been thrown into landfills and also water that would have been thrown down the sewages. However, the findings show that a majority of the respondents still prefer tap water over grey water.

The gardens are generally small in size and they are constrained by shortages of vacant land. Most of the gardens are not cultivated into full capacity. In cases where they are cultivated to full capacity only a small portion is organic, while the rest is conventional. These findings are in-line with those of the Swazi Vulnerability Assessment Committee and United Nations World Food Programme, which observed that in Eswatini there were only 20% of households with home gardens and 82% of them cultivated less than 0.5 acres which is equivalent to 2023.428 square meters [10].

The findings of the study revealed that the most grown vegetables in the gardens were spinach, cabbages, lettuce, carrots, potatoes, tomatoes, hot pepper and onions. These vegetables have the advantages of being easy to grow, growing quickly, and are relatively convenient to harvest as observed by the Urban Gardner Republic [11]. These advantages are further echoed by the Urban Organic Gardner which listed carrots and lettuce among others as the best vegetables to grow in urban small gardens [12].

Regarding the source of water for irrigation, streams play a pivotal role more especially because Mbabane city is a well-drained area. The use of streams is both attributed to the cost factor and the availability of water. Often times, urban farmers are in conflict with Municipal councils over the use of water for agricultural purposes. Streams are considered unsafe sources of water since they are highly contaminated, and this is often worse in informal urban communities. Cofie, Nikiema, Imprain, Adamtey, Paul and Koné argue that even though there are many benefits derived from urban agriculture, the production is associated with health risks since vegetables are contaminated with pesticides and pathogens through the use of polluted stream water [13].

The findings also indicate that waste water was used but at a limited scale. The use of waste water is generally complicated and the attitude towards recycled water among urban households is still negative. The World Health Organization published guidelines for using waste water in agriculture, but evidence suggests that their application seems to be difficult in many field situations [14].

With respect to household income, the findings indicate that low income settlements are mostly poor with low incomes but high expenditure on food. The findings are in agreement with those of the Population Crisis Committee which observed that 50-80% of the income in low income households is spent on food [15]. Noteworthy is that, the findings reveal that the climate smart gardens project has improved household income among low income residential areas in Mbabane city through reduced expenditure on purchasing vegetables. Also, the project improved households' income through revenues received from selling the produce. Notably, considering that some participants in the projects did not have any other source of income except for the climate smart garden project, it is therefore a viable source of income.

Nonetheless, participating in the project for most households has not been a survival strategy but a means of supplementing household income and nutrition. This is largely because most of the participants have other sources of income; hence they solely joined the project to feed their families rather than selling the produce from the gardens. Worth noting is that, today backyard gardening is regarded as a means for supplementing household nutrition and income. One of the benefits of backyard gardens is supplementing family budget on food. This is corroborated by AgriHome which observed that households that actively grow home gardens are able to cut down expenditure on food to about 40% [16].

Regarding food access, purchase is the most common means of acquiring food for the urban poor. The findings depicts that grains and fruits are still being accessed the same way as they were accessed before the climate smart gardens project. These findings are in-line with those of Gwebu who stated that supermarkets in Manzini have become an important source of food for the urban poor [17]. Also, rural-urban linkages exist in Mbabane's low income residential areas. Thus, urban households continue to source grains from rural areas even after the climate smart gardens project. In the Kingdom of Eswatini, it is common for urban dwellers to have a place in the rural areas where agriculture is practiced

on a larger scale. It is also worth noting that even before the climate smart gardens project came into place there were households who had home gardens albeit not organic, hence not promoted and supported by the municipal authorities. In Eswatini, over 70% of the population is found in rural areas, and this population thrives on agricultural activities, hence the prevalence of rural-urban food remitting. According to the Food and Agriculture Organization, rural- urban food remitting is mostly common among poor urban households compared to middle and upper-income areas and thus contributes to bolstering their food security [18].

Notably, the climate smart gardens project had a major impact on the means of accessing vegetables. It was discovered that before the project most households were purchasing vegetables, with only a few relying on vegetables produced in their backyard gardens. Therefore, a major shift from purchasing to domestic production of vegetables was observed after the climate smart gardens project. For instance, after the project over 80% of these respondents produced their own vegetables, and therefore the proportion that still purchases vegetables dropped drastically. It is worth noting that some of the households who still purchase vegetables do have gardens, however the vegetables produced are not enough. This is due to small garden sizes.

With respect to food sufficiency, the findings indicate that a majority of households had below average food, hence they were food insecure. Noteworthy is that, households whose heads were employed were more food secure than those with unemployed heads of households. Moreover households with many occupants were food insecure whereas those with fewer occupants were food secure. These findings are supported by Olayeni in a study conducted in Osun State Nigeria who observed that a large family size has a negative influence on household food security [19].

The findings also reveal that balanced meals were not frequently consumed in most households. As such, balanced meals were mostly consumed two times a week. Most importantly, balanced meals were common in households whose heads were employed, as well as those with bigger gardens. The most frequently served meals comprised carbohydrates and proteins, and there were instances where carbohydrates were consumed alone, particularly bread. It was also discovered that after a purchase, food lasts for a week in most households. This was common in households with larger numbers of occupants. Notably, this is an indication that most households are food insecure in Mbabane's low income residential areas.

Therefore, the idea behind the climate smart gardens project was that the urban poor should not buy everything from the supermarkets; rather they should grow vegetables in their own gardens. This is meant to improve their food diversity, and positively contribute to healthy diets, hence improved food security. For the Municipal council this would mean cleaner environments and a reduced amount of waste in landfills since the project is centered on the culture of nutrient recycling and reusing. In the final analysis, it emerged that the overall impacts of the project on food security were very minimal. In particular, the project mostly impacted on household income rather than food security. This is because most of the gardens are generally small and thus produced small quantities of vegetables. Consequently, this limits the participants from selling a surplus produce in order to buy other foods essential for their households in order to improve household's food security.

The findings reveal that a large proportion of participants have encountered challenges since they started participating in the climate smart gardens project. For instance, water shortages were highlighted as the most common challenge for households; even though Mbabane is a well-drained area. It is worth noting that the country in the years 2015 and 2016 was hit by a drought, which brought water crisis in the whole country. In particular, Mbabane was hit hard by the drought which resulted to gardening being prohibited in Mbabane for those who used water services from the Municipal Council. Moreover, not only did the drought caused water shortages for those using water from Eswatini Water Services Corporation, most of the streams traversing the city were at their lowest levels and some completely dried up.

Another challenge was a shortage of other faming inputs such as compost and seedlings. Noteworthy is that, when the project was implemented these inputs were provided by the Municipal Council, therefore participants still expect the council to provide them. The Municipal Council reported that the major challenge they faced as implementers was that of dependency on the council. These findings are echoed by Ilorah, who asserts that Africa is experiencing an endemic of dependency on foreign aid which seems to support the popular view that the continent is incapable of existing free from aid [20]. Moreover, the challenges encountered by the participants in the climate smart gardens project were similar to those observed by Olawepo in Nigeria [21]. For instance, Olawepo observed that urban agriculture's main challenge in Nigeria was disturbance on farms by intruders and animals [21]. Furthermore, Olawepo indicate that other challenges were unreliable supply of inputs such as fertilizers, insecurity of tenure on farmlands especially for farmers within developed areas, lack of financial support from government, water shortage, and insufficient time to work on the garden [21].

It is worth noting that, participants made an effort to cope with the challenges although most of them were futile. For instance, nothing much could be done to alleviate the challenge of water shortage. Thus, the only salvation was that the drought stopped and rains began to fall. It must be noted that participants who complained about pests used pesticides which according to the principles of organic gardening is wrong.

5. Conclusion

Based on the findings of the study, it can be concluded that a majority of households in Mbabane are food insecure. Households' access to food is dependent on its occupation status since a large proportion of the food consumed is

purchased. The climate smart gardens project has improved food security but to a small extent. The initiative of smart gardens project is one good move in addressing issues of poverty and food insecurity in low income residential areas in the Kingdom of Eswatini. However, in order to curb challenges of food insecurity more has to be done. This is mainly because grains generally require vast land in order to have a sufficient produce. Urban areas do have vacant land but it is not allocated for agriculture rather for other land uses such as construction of shopping malls. These areas can be used to grow crops as they await development. Land in urban areas is very scarce, however, that does not mean nothing can be done to find ways to mitigate these challenges. Rural urban migration is causing a decline in food production since rural areas are prime producers of food. This being said, urban areas have to find ways to feed themselves through production of their own food especially for the urban poor.

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