ECONOMIC ASSESSMENT OF URBAN AND PERI-URBAN VEGETABLE PRODUCTION IN MBEYA MUNICIPALITY, TANZANIA

BY

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ABSTRACT

A study on economic assessment of urban and peri-urban vegetable production was conducted in Mbeya Region. Urban Agriculture (UA) is defined as the growing of plants and the raising of animals for food and other uses within (intra) and fringing (peri) urban built up areas. The general objective of this study was to investigate the economics of growing vegetable in urban and peri-urban areas. Specifically, the study aimed at determining the quantity and monetary value of four selected vegetables produced in (MM); identifying the vegetables grown, assessing the area used; analyzing the gross margins (GM) of the selected four major vegetables and examining the contribution of vegetable production to household incomes in (MM). The data were collected using a structured questionnaire. Purposive and simple random samplings were used to select 160 respondents engaged in urban and peri-urban vegetable production. Data were analyzed using SPSS computer programme. Chi-square test showed statistical significant differences at ($p< 0.035$) in GM between urban and peri-urban vegetable growers and revenue analysis showed a statistical significant difference at ($p<0.053$) between urban and peri-urban vegetable growers. Plot sizes analysis showed statistical significant differences between urban and peri-urban vegetable growers at ($p < 0.008$) for *Amaranthus*, at ($p < 0.001$) for Chinese cabbage, at ($p< 0.031$) for *Brassica carinata* and at ($p < 0.008$) for Swiss chard. The contribution of vegetable analysis showed high statistical significant differences between urban and peri-urban vegetable growers at ($p\leq 0.01$) for Amaranths and Chinese cabbage. Statistical significant differences also showed at ($p< 0.001$) for *Brassica carinata* and at ($p< 0.015$) for Swiss chard. This study recommended that extension agents should provide education on vegetables with high (GM) per square meter and provision of credits to urban and peri-urban vegetable growers by the Government. Longitudinal studies were suggested to be carried out to ascertain the most profitable species of vegetables countrywide.

DECLARATION

I, Stanton Mwafungo Lumililo do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and neither has never been submitted nor concurrently being submitted for any degree award in any other institution.

.... 21/11/2011

Stanton Mwafungo Lumililo **Date**

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The above declaration is confirmed

.... 21/11/2011

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(Supervisor)

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DEDICATION

I dedicate this work to my parents father the late Lumililo Mwandapile and late mother Keta Isengela who both passed away seven months after I started my studies. Though they are not alive, may God rest their souls in eternal peace as they were the ones who laid the foundation and inspiration of my education attainment.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
DALDO	District Agricultural Livestock Development Officer
GM	Gross Margin
Ha	Hectare
Ho	Hypothesis
Kg	Kilogram
MAFS	Ministry Of Agriculture Food security and Co-Operatives
M^2	Meter square
MM	Mbeya Municipality
MALDO	Municipal Agricultural Livestock Development Officer
SPSS	Statistical Package of Social Science
TR	Total Revenue
Tshs	Tanzania shillings
TVC	Total Variable Cost
UA	Urban Agriculture
UNDP	United Nation Development Programme
US $	United States Dollar
ZPHS	Zonal Plant Health Services

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Worldwide, urban agriculture (UA) is defined as the growing of plants and the raising of animals for food and other uses within and around cities and towns and related activities such as the production and delivery of inputs and the processing and marketing of product (René van, 2006). It is also defined as an activity that produces, processes, and markets food and other products, on land and water in urban and peri-urban areas, applying intensive production methods, using natural resources and urban wastes, to yield a diversity of crops and livestock (UNDP, 1996). UA is located within or on the fringe of a city and comprises of a variety of production and processing at household level to full commercialized agriculture. The number of activities to promote UA at international and local level has grown but urban farmers in many cities in the world still struggle to get their main survival strategy recognized by city authorities (René van, 2006).

The pressing need for food security is drawing more people into agriculture activity in the urban and urban periphery, sometimes as a last resort to survival (Basler, 1995). For that matter, UA is acknowledged for its potential role in increasing food security, employment and income generation, poverty alleviation, waste management, and environment sustainability (Elias, 2003; Sawio, 1994). UA contributes to a wide variety of urban issues and is being increasingly accepted and used as a tool for sustainable city development. Currently, the challenge is to integrate UA into city planning and facilitate its multiple benefits for urban inhabitants. Several countries are involved in agriculture, for example, in Kathmandu, Nepal, almost one third of the fruit and vegetable needs of the city are met by the household production (Wade, 1980). In China, 80 percent of the vegetables eaten by the urbanites are produced within the six large municipalities (Skinner, 1974). In South America, UA is becoming a solution to the problems of urban poor. In Brazil, several cities have started UA projects and other shanty towns of Santiago (Chile) and elsewhere in Latin America (Sachs, 1985). In Poland, Kleer (1987) reported that about 46 percent of vegetables and potatoes consumed in cities were produced in urban areas. In the United States, UA was encouraged through the "green belt towns of 1935-38 (Christensen, 1986) based on Ebenezer Howard's garden city" idea of 1896 (Osborn, 1965 cited in Mlozi, 1994).In Africa; UA in towns and cities is done for a combination of reasons, which are inherent in the socio-economic, political and cultural backdrop of the African countries.

UA in most countries has a big impact among poor urban residents who constitute the majority in many Africans towns and cities. For example, Gbadegesin's (1991), study in Ibadan, Nigeria, revealed that farming in the urban environment was guided by the logic of survival. Similarly, Freeman (1991) in Nairobi, Kenya reported that, the most important motives for UA was first to use their entire amount harvested to feed the farmers' own families or dependants, second to grow vegetables as a diet supplement, third to use urban produce for cash sale, fourth to free up scarce cash that would otherwise be spent on purchases of food and devoted to other pressing family needs (Mlozi, 1994).

In Tanzania, UA is defined as the raising of animals and the growing of crops in areas designated urban by the United Republic of Tanzania Local government (Urban authorities) Act Number 8 of 1982, section 80 (Mlozi, 1996). Animal reared include dairy cattle, poultry, pigs and goats. Vegetables grown include African spinach (*mchicha*) cabbages, tomatoes, eggplants and carrots. Currently, UA in Mbeya municipality comprises of vegetable production activities that have increasingly become the major economic contributing factors to urban and peri-urban household survival. Vegetable production supplements daily food needs, gives money to buy other basic items and provides income to vegetable growers. However, no study has looked at the economic importance of vegetable production in a municipality. This study will thus attempt to do this.

1.2 Problem Statement

The contribution of vegetable production in Mbeya municipality is important owing to its salient features. Nevertheless, data regarding its contribution is lacking. This study, therefore, will be undertaken to come up with data to be used by other stakeholders in urban development.

1.3 Problem Justification

Currently, the informal sector has emerged as a strategy of survival for unemployed people, especially low wage earners and women. UA has expanded markets. This calls for increased governmental assistance in terms of financial resources, extension services to enhance the sustainability of the private sector, especially vegetable production.

1.4 Study Objectives

1.4.1 General objectives

The general objective of this study was to investigate the economics of growing vegetables in urban and peri-urban areas of Mbeya municipality (MM)

1.4.2 The specific objectives

i To determine the monetary value of the selected varieties of vegetables produced in MM.

ii To identify the vegetables grown in urban/peri-urban areas in MM.

iii To assess the plot size used for vegetable production in MM.

iv To analyze the gross margins of the common varieties of vegetables in MM.

v To examine the contribution of vegetable production to household incomes in MM.

1.4.3 Hypotheses testing

To compare the gross margin (GM) of selected major varieties of vegetables between urban and peri-urban areas in (MM), the following hypothesis was used:

Ho_1: The gross margin (GM) of selected major varieties of vegetables produced; there is no significant statistical difference between urban and peri-urban areas in (MM). This hypothesis was tested using Chi-square statistical analysis.

Ho_2: The revenue of the selected major varieties of vegetables produced does not differ significantly between urban and peri-urban areas in (MM), and this was tested by Chi-square statistical analysis.

H_{o3}: The plot sizes on which vegetables are grown do not significantly differ between urban and peri-urban areas in (MM) and this hypothesis was tested using Chi-square statistical analysis.

H_{o4}: The contribution of vegetable production to household incomes doesn't differ significantly between urban and peri-urban areas in (MM). This was tested using Chi-square statistical analysis.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

UA refers to a griculture practiced in small areas such as vacant plots, gardens, balconies and containers within the city for growing crops and rising livestock for own consumption or sale in neighborhood markets (Nugent, 2000). By supplying perishable products, such as vegetables, fresh milk, and poultry products, urban agriculture to a large extent compliments rural agriculture and increases the efficiency of national food system (Brook and Davila, 2000). Peri-urban agriculture refers to as farm units close to town that separate intensive semi-or fully commercial farms to grow vegetables and other horticultural crops (Nugent, 2000). The outer boundaries of peri-urban areas of 30 km are considered as peri-urban and the maximum distance within which a given percentage of producers can sell crops at a farm-gate price (Mougeot; 2000, Stevenson *et al.,* 1994). Beyond 50km from city centre no longer present peri-urban features. This peri-urban interface is characterized by rapid land use changes and changing livelihood (Brook and Davila, 2000).

2.2 Urban and Peri-Urban Vegetable Production

2.2.1 Types of urban vegetable production

First, home and farm gardening: Vegetable production in western countries is carried out for home table and thus reduces living expenses. However, the quality of the products is usually more desirable (John, 1953). Second, home gardens in high density areas: Gardens in high density is for mainly subsistence kind of farming based on a survival for the poorer households (Jacobi and Amend, 1997). Third, home gardens in low-and medium-density areas: These gardens have favorable conditions for gardening. Mlozi (1998) found that garden sizes on house plots, varied between 500-800m^2 and that the bulk of production was for home consumption. Fourth, open space production: This land which is on open space is public, hazardous land not suitable for construction, road services, and available land for the community. The area can vary considerably in size and ownership (Jacobi and Amend, 1997; Jacobi *et al.*, 2000). In 1996, in the urban areas of Dar-es-Salaam, nearly 650m^2 of open space were cultivated with an average plot size of 700 -980m^2 (Dongus, 2001; Stevenson *et al,* 1996).

2.2.2 Peri-urban vegetable production

In peri-urban areas, agriculture is the primary economic activity. The average farm size of peri-urban areas is 204ha of which on average 0.6 ha is under vegetable and fruit production (Stevenson et al., 1996). Stevenson *et al.*, (1996) estimated that, about 35000 farming households depend on peri-urban fruit and vegetable production for their incomes. Stevenson *et al.,* (1996) found that 90% of the 204 interviewed, peri-urban farmers indicated that in peri-urban areas, agriculture is their primary economic activity.

The usual cost of marketing functions in addition to buying and selling, includes transportation, storage, grading, price determination, financing, and consumption of risks (Iglasia and Samuel, 1974). Vegetables can be sold in fresh and processed forms, each varying in supply and demand and method of marketing necessary

(Iglasia and Samuel, 1974). Being close to the market, the urban farmer can tailor produce to market demand, supplying high-value and perishable items. The nearness ensures better contact and control over supply and quality (Richter *et al.,* 1994). Various studies show that the contribution of urban vegetable production to household income is enormous. For example, Mlozi, (2004) in Dar-es-Salaam showed that *Amaranthus* growers earned annual minimum, maximum and mean of Tshs.193 396 (US $ 277.50), 1 389 750 (US$ 1,635) and 700 272 (US$ 823.80), respectively from vegetable sales. According to Kourous (2005), even small gardens can bring in 3 US$ a day for poor families. In Mexico, household income for many people working in urban agriculture was actually higher than the national average salary (Lima *et al.*, 2000). Production of vegetables requires primarily the availability of land and water. The fulfillments of transport functions between the places of supply and demand are simpler for urban and peri-urban production locations than for outside locations as they can use bicycles or handcarts and public means of transport. Taxes and buses are also used.

Limited education of farmers is a problem to adoption process, but farmers who are knowledgeable are expected to be frontline in doing any progressive activity compared to others (Senkondo *et al.,* 1998); age of the farmer is equated to older farmers having a positive effect on adoption (Lapar and Pandey, 1999). Household size members working in the farm are likely to be non adopters, because farming activities is labour intensive so it has an influence on productivity or failure of the innovation (Batz *et al.,* 1 999).

2.3 Conceptual Framework

2.3.1 Operational definition of key variables and indicators

The dependent variable of economic importance of dry-season u/peri-urban vegetable production was vegetable income which was defined as money earned per month. This was measured as the net household vegetable product that is total value of vegetable produced minus the total cost incurred to produce the vegetables. The independent variables included household characteristics, educational level (the highest level of formal education), sex (female or male) of respondents, and age of respondents. Others included household size (the number of people living in a household), plot size high, medium and low density sizes in square meters and marital status (if the respondents were married or single, divorced or widowed). Production characteristics, included, types of vegetable grown, purpose of growing vegetables, period of growing vegetables, selling prices, extension services and capital which was the amount of cash invested in vegetable production. Others were cost of production/unit area, use of manure, organic/inorganic fertilizers and pesticides per litre/kg in Tshs. Vegetable productivity was defined as the quantity of vegetables produced per area kg/m^2 (Fig 1).

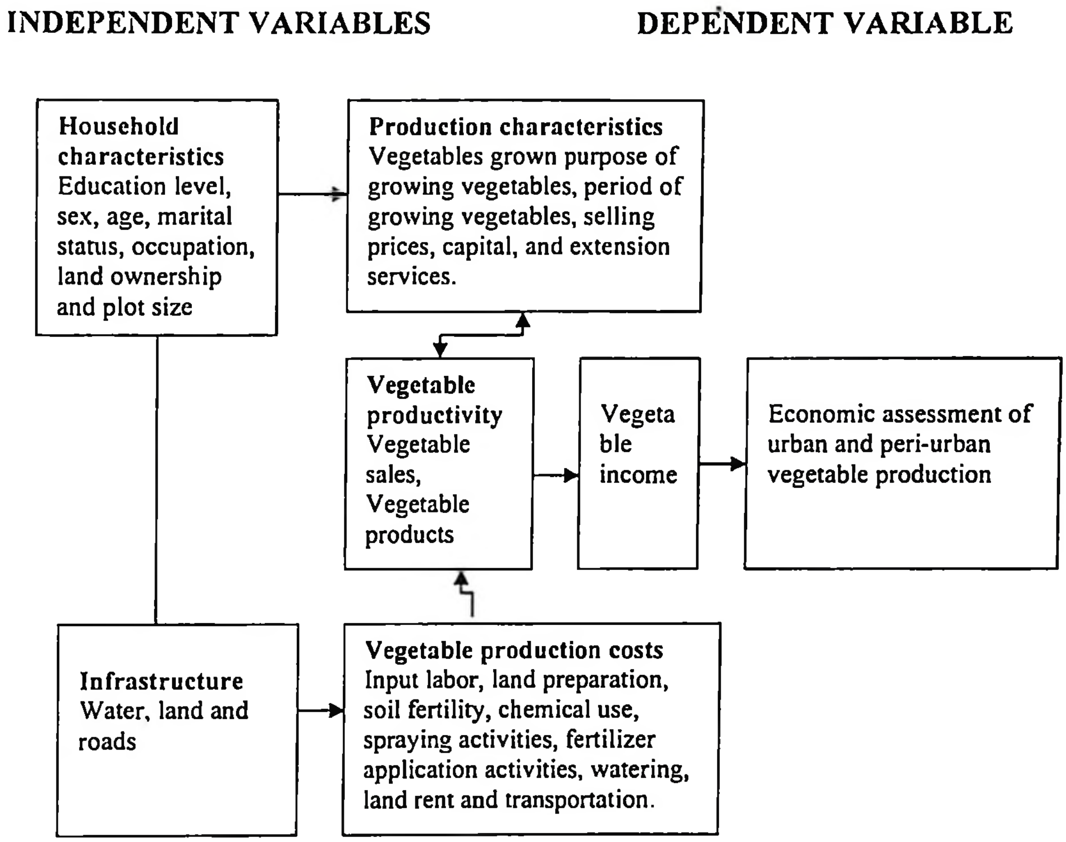

Figure 1: Conceptual framework for economic assessment of urban and peri-urban vegetable production in Mbeya urban and peri-urban areas.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

The methodology comprises of the description of the study area, while the second section deals with the sampling techniques and procedures of data collection.

3.2 Description of Study Area

The study was conducted in Mbeya region in the Mbeya Urban District which comprised of the Mbeya town. It is bordered to the north by the Mbeya Rural District, to the East by the Rungwe District, to the South by the Ileje District and to the West by the Mbozi District. The Mbeya Urban District is situated at the latitude of 80^0, 50'- 57's and longitudes of 33^0 30'- 35^0, E. The altitude is 1600-2400 a.s.l. (Mbeya City Profile, 2010). The general range of temperature is between 6^0 c in the highlands and 29^0 c on the low lands. Average rainfall per year is around 900mm. According to the 2005 Tanzania National census, the population of the Mbeya Urban District was 280 000. Mbeya town is the major administrative and business centre of Mbeya Urban and the region as whole. The area was selected because of the increasing engagement in both urban and peri-urban vegetable production. The main ethnic groups are Safwa and Malila. There are also a combination of other tribes from neighboring districts and regions such as Nyakyusa, Ndali, Nyiha, Nyamwanga and Hehe, Bena, and Kinga respectively. Their main economic activities included agriculture and livestock production, which were practiced at subsistence level. This study was conducted in three divisions namely, Utengule Usongwe, Iyunga and Tembela. Four production areas were selected in the three divisions; high-, medium-, low-density and peri-urban areas which had characteristic features of about 60-20m^2, 55-15m^2, 50-10m^2, and 100-70m^2, respectively. High-and medium-density vegetable growers were sampled in Ruanda ward in the South for Sinde-Ilolo and Block-T respectively, low-density vegetable growers were sampled from Sisimba ward in the North for Uzunguni and while peri-urban vegetable growers were sampled from wards of Uyole in the East and Utengule Usongwe in the West for Uyole and Mbalizi respectively.

3.3 Research Design

Research design was a cross-sectional as it allowed collecting data from a single point at a time thus using minimum time and other resources (Kumar; Casley and Bailey, 1987).

3.4 Sampling Procedures

Sampling procedures were simple random sampling and Purposive sampling. Purposive sampling was used to obtain low-, medium-, high- and peri-urban vegetable growing areas while Simple random sampling technique was to obtain vegetable growers in each of the mentioned areas (Mwakaje, 2007). Sample size was 160 respondents who were drawn from a sampling frame of 240 people. Sample size determination was done by using:

Formula 1: [$n = N/1+N\ (e^2)$] where N=population size, n = sample size, e = the level of precision (o.o5) assuming 95% is confidence level. Therefore, $n = 240/1+240(0.05^2) = 240/1+0.6 = 160$ (Yamane, 1967). Representative samples from different areas were indicated as shown in the table 1 here below:

Table 1: Distribution of respondents by production area (n=160)

Plot classification	Population N	Number of respondents n	Percentage %
Low-density	50	40	20.83
High-density	60	40	25.0
Medium-density	55	40	22.92
Peri-urban	75	40	31..25
Total	240	160	100

3.5 Data Collection Procedures

3.5.1 Primary data collection

Primary data were collected using structured questionnaires with both close and open ended questions (Mosses, 2009).

3.5.2 Pre-testing of instruments

Validity and reliability of the instrument was checked prior to the main survey by computing alpha cronbach coefficient as indicated in appendix 3 (J.Gliem and R.Gliem), (2003).

Pretesting was computed by using:

Formula 2: [$\sum\sigma y^2/\sigma x^2$ (Ratio of variance)] = m, then, 1-m. σy^2 = computed variance of all questions to all selected respondents, σx^2 = computed variance of each question to individual respondents. The product of m-1 was multiplied to the ratio of k/k-1, where k = total No. of questions (11). Thus, k/k-1x (1-m) was the alpha-cronbach value.

$\sum\sigma y^2/\sigma x^2$ = 1.89/18.8, 1-m = 1-(1.89/18.8) = 1-0.10053 = 0.10 = 0.899

Thus, k/k-1 x (1- m) = 11/10 – 1 x (0.899) = 0.9838. This is the alpha-Cronbach value.

The items to be homogeneous the alpha coefficient must be above 0.6. According to the pre-testing exercise carried out; the alpha-cronbach coefficient was computed and found to be:

0.98384 > 0.6 which was a desirable one demonstrating that items were homogeneous.

3.5.3 Secondary data collection

Secondary data was collected from journals, agricultural offices and other resource persons.

3.6 Data Processing and Analysis

Objectives of the study were reviewed; data collected and then sorted out according to the variables and objectives of the study. Data were coded and entered into the computer for purposes of analysis. The data were analyzed using Statistical Package for Social Sciences (SPSS).

The raw score were subjected to descriptive statistics namely, frequencies, means and percentages. These statistics were used to analyze data related to all objectives. Chi-square and ANOVAs statistical test were used to test the hypotheses formulated for the study. The chi-square computed was used to compare the influence of individual factors on quantities of vegetables and determine the differences between gross-margins, revenues, yield, plot sizes and monetary value of the four selected types of vegetables in the four production areas namely, low-, high-, medium- and peri-urban areas.. Economic analysis in small-scale agricultural production (Phiri, 1991), was determined by using:

Formula 3: ($GM = \sum TR - TVC$) Where, GM = Gross margin (gross profit) of vegetables in Tshs/ha $\sum TR$ = Total revenue from sales of vegetables in Tsh/ha. $\sum TVC$ = Total variable cost spent on production of vegetables in Tshs/ha.

CHAPTER FOUR

4.0 STUDY RESULTS AND DISCUSSIONS

4.1 Overview

This chapter presents results and discussions of the study. Section one examines the socio-economic profile of respondents in the four study sites that included age, sex, marital status, education level and occupations. This study examined these variables in order to understand their background. It was apparent that characteristics of vegetable growers had an influence on decision making such as what and how to produce, which affected vegetable productivity. This section also looks at the production characteristics and supporting services such as vegetable crops grown, period of growing vegetables, plot size, land ownership, land rent, and sources of labour, inputs, water and vegetable information. Another issue looked at was agriculture extension visits and their frequency, which appeared to influence vegetable productivity.

Section two, examined quantity and monetary value of selected four major vegetables using gross margin (GM) of selected major varieties of vegetables. Revenue of selected major varieties of vegetables produced in urban and peri-urban areas did not statistically differ as well as plot sizes on which vegetables were grown. Lastly, this section compares the contribution of vegetable household incomes and found that it did not statistically differ between urban and peri-urban areas. Section three of this chapter assessed marketing of vegetables, while section four compared the gross margin (GM) of four selected major vegetables. Contribution of the four selected vegetables in urban and peri-urban, and section six dwelt on production constraints in both areas.

4.2 Characteristics of respondent

4.2.1 Age

Of the 160 respondents, less than a half, 73 (45%) indicated that they were between ages of 32-45 years old. And of these, 27 (16.4%) lived in peri-urban areas, and 17 (11.4%) in medium density areas. Yet, 16 (10.2%) lived in high-density areas, while 13 (8.1) lived in low-density areas. Data indicated that, number of respondents in peri-urban areas was relatively more compared to other density areas. The reasons could be that respondents in peri-urban areas depended mostly on agriculture for survival. Moreover, respondents between ages of 46-59 years old were 40 and these, 15 (9.5%) lived in low-density areas, while 11(6.9%) lived in high-density areas. Yet, eight (5%) lived in peri-urban areas, and six (3.9%) in medium-density areas. The reasons for a small number of participants in the vegetable production could be lack of resources including land and water.

This study found that, most people in medium-density and peri-urban areas did activities such as petty businesses. Table 2 shows that, of the 160 respondents, few, 29 (18.1%) mentioned to had ages ranging from 18-31 years and of these, 13 (8.1%) lived in medium- density areas, and seven (6.8%) in peri-urban areas, while six (3.7%) lived in low-density areas, and few, three (1.9%) lived in high-density areas. Respondents with ages of 60 years and above, were 17 (10.6%) and of these, ten (3.1%) lived in high-density areas, and six (3.1%) in low-density areas. The reasons for aged respondents cultivating vegetables in high-density areas, was probably due to lack of other options. In peri-urban and medium-density areas, there was one (0.6%) respondents. The reasons for a small number of respondents in these areas, was because most were retirees who relied on pensions and sometimes kept poultry, dairy cattle and pigs. However, there were no statistical significant differences at P≤ 0.05, implying that; respondents' age did not influence vegetable production (Table 2).

Table 2: Distribution of respondents by age (n=160).

Age of respondents in years	L-density n	L-density %	M-density n	M-density %	H-density n	H-density %	P-urban n	P-urban %	Total n	Total %	X^2-value	P-value
18-31	6	3.7	3	8.1	3	1.9	7	6.8	29	18.1	159.549	0.05
32-45	13	8.7	7	11.4	16	10.2	27	16.4	73	45		
46-59	15	9.5		5	11	6.9	6	3.6	40	26.3		
60 ≥	5	3.1	1	0.6	10	5.7	1	0.6	17	10.6		
Total	40	25	0	25	40	25	40	25	160	100		

4.2.2 Sex of respondent

The results for the sex of respondents presented on Table 3 shows that of the 160 respondents, two thirds 97 (60.6%) were males and of these, 33 (20.6%) lived in peri-urban areas, and few, 22 (13.3%) lived in low-density areas. Yet, 22 (13.8) lived in high-density areas, while 20 (12.5%) lived in medium-density areas. Of the 160 respondents, females involved in vegetable production, were above one third, 63 (39.4%) and of these, 20 (12.5%) lived in medium-density areas, while 18 (11.3%) lived in low areas, while seven (4.4%) lived in peri-urban areas. The reasons for a small number of females participating in vegetable production could be due to their being busy with other household-based chores. The p-value of the two variables was statistically significant at p< 0.012 implying that, participating in vegetable production was mainly done by males.

Table 3: Distribution of respondents by sex, marital status and Occupation (n=160)

	Sex of respondents											
	L-density		M-density		H-density		P-urban		Total		X^2-value	P-value
	n	%	n	%	n	%	n	%	n	%		
Male	22	13.8	20	12.5	22	3.8	33	20.6	97	60.6	10.97	0.012
Female	18	11.3	20	12.5	18	1.3	7	4.4	63	39.4		
Total	40	25	40	25	40	25	40	25	160	100		
Marital status												
Married	31	19.4	32	20	31	9.4	35	21.9	129	80.7	0.257	0.8
Single	6	3.8	6	3.8	5	3.1	4	2.5	21	13.2		
Widowed	2	1.3	-	-	2	1.3	1	0.6	5	3.2		
Divorced	1	0.6	2	1.3	2	..3	-	-	5	3.2		
Total	40	25	40	25	40	25	40	25	160	100		
Main occupation												
Self employed	2	1.3	4	2.5	1	.6	-	-	7	4.4	76.622	0.0
Farming	11	6.9	30	18.8	38	23.8	39	24.4	118	72.9		
unemployed	-	-	-	-	8	5.0	17	10.6	25	15.6		
Total	17	10.7	36	45.1	50	31.3	57	35.6	160	100		

Table 4: Demographic characteristics on influence of vegetable growing by Regress ional model coefficients[a]

Variables	Unstandardized coefficients		Standardized coefficients	Sum of squares	Mean squares	R	T-test	F-test	Df	Sig.
	B	Std. Error	Beta							
Constant	3.799	0.624		200.000	7.745	0.482	6.057	7.745	6	0.000
Age	-7.83E-03	0.007	-0.087				1.167			0.245
Sex	-0.287	0.169	-0.125				-1.69			0.093
Marital status	-5.30E-02	0.120	-0.032				-0.44			0.66
Education	0.154	0.071	0.160				2.168			0.032
Occupation	-0.452	-0.091	0.366				-4.97			0.000
Land ownership	7.748E-02	0.171	00.033				0.453			0.651

Results:

Age, sex, marital status and occupation did not influence vegetable growing as they showed negative regression coefficients (bearing negative signs) implying that these variables decrease the probability of outcome. Age when tested at $p < 0.245$ showed no statistical significant difference implying there was no influence on vegetable growing, sex when tested at $p < 0.093$ showed statistical significant difference implying that it had some influence on vegetable growing, marital status when tested, at $p < 0.66$ showed no statistical significant difference implying it had no influence on the vegetable growing and occupation when tested at $p < 0.01$ showed highly statistical significant difference implying that it had an influence on the vegetable growing. Further, education and land ownership showed to influence vegetable growing as they are positive regression coefficients (bearing positive signs) meaning that, these variables increased the probability of the outcome. These values (education and land ownership) when tested at their p-values $p < 0.032$ and $p < 0.01$ respectively, education showed statistical significant difference implying that it had an influence on vegetable growing activities while land ownership showed highly statistical significant difference implying having strong influence on vegetable growing activities. As a summary, the p-value of all variables tested at $p < 0.01$ indicated that there was a high statistical significant difference implying that there was a strong influence on vegetable growing activities.

4.2.3 Marital status

Data on Table 3 indicates that, of the 160 respondents, most 123 (80.6%) indicated that they were married and of these few, 35 (21.9%) lived in peri-urban areas, and less than a quarter 32 (20.0%), lived in medium-density areas. Further, data shows that, still few, 31 (19.4%) mentioned that they lived in high- and low-density areas, respectively. Of the 160 respondents, few, 21 (13.1%) were single and of these six 6

(3.8%) lived in low-density areas, while the other six (3.8%), lived in medium-density areas. Yet, five (3.1%) and four (2.5%) reported that they lived in high-density, and peri-urban areas respectively. The reasons for few singles could be that, they had few responsibilities as most had no family obligations. Yet, there were five (3.1%) widows, and of these two (1.3%) lived in low-density areas, while two (1.3%), and one (0.6%) lived in high-density and peri-urban areas, respectively. Further, of the 160 respondents, divorced respondents were five (3.1%). Of these, two (1.3%) reported that they lived in high-, and peri-urban areas respectively, while one, (0.6%) lived in low-density areas. Marital status did not influence vegetable production as there was no statistical significance at $p < 0.811$ (Table 3).

4.2.4 Main occupation

Table 3 shows that, of the 160 respondents, few, seven (4.4%) mentioned that they were self employed, and of these, four (2.5%) lived in medium-density areas, while two (1.3%), lived in low-density areas, and one (0.6), lived in high-density areas. Of the 160 respondents, three quarters 118 (73.8%) reported that they did farming (including vegetable) as their main incomes earning activitiy, and of these, a quarter, 39 (24.4%), lived in peri-urban areas, while less than a quarter, 38 (23.8%), lived in high-density areas. In medium-density areas, there was less than a quarter, 30 (18.8%) of the respondents, while few, 11 (6.9%) lived in low-density areas.

Of the 160 respondents, ten (6.3%) reported that, they were employed and of these four, (2.5%) lived in low-density areas, and three (1.9%) lived in high-density areas, while two (1.3%) and one (1.2%) lived in peri-urban and medium-density areas, respectively. The reasons for participation of employed respondents in vegetable growing, could be to supplement their incomes. And the p-value was highly statistically significant at $p < 0.01$ implying that, most respondents did farming (vegetable growing) as their main occupation (Table 3).

4.2.5 Education level

Table 5 indicates that, of the 160 respondents, about two third 79 (59.4%) reported to had attained primary education, and of these, few, 29 (18.1%) lived in high-density areas, and 24 (15.0%) in peri-urban areas. Yet, 23 (14.4%) lived in medium-density areas, while three (1.9%) lived in low density areas. Of the 160 respondents, above a quarter, 59 (26.2%) indicated to had attended secondary schools. Of these, less than a quarter, 33 (20.6%) lived in low-density areas, and few 11 (6.9%) lived in medium-density areas. Nine, (5.7%) lived in peri-urban areas, while few, five (3.1%) mentioned to living in high-density areas. Of the 160 respondents, nine (5.7%) reported to had attained university education and of these, four (2.5%) lived in medium-density areas, while three (1.9%) and two (1.3%) lived in low-density and peri-urban areas, respectively. Of the 160 respondents, nine (5.6%) indicated to had attended adult education, of these, five (3.1%), three (1.9%), and one (0.6%) lived in high-, peri-urban and low-density areas, respectively. Further, of the 160 respondents, five (3.2%) had non formal education, and of these, two (1.3%) lived in medium-density and peri-urban areas respectively, while one (0.6%), lived in high-density areas. The p-value of the four variables tested, had statistical significant differences at $p \leq 0.01$ implying that, education level had an influence on vegetable growing.

Table 5: Distribution of respondents by education level (n=160)

Education level	L-densit n	%	M-density n	%	H-density n	%	P-urban n	%	Tot n	%	X^2-value	p-value
Non formal education	-	-	2	1.3	1	0.6	2	1.3	5	3.2	65.39	0.0
Attended adult education	1	0.6	-	-	5	3.1	3	1.9	9	5.6		
University education	3	1.9	4	2.5	-	-	2	1.3	9	5.7		
Primary education	3	1.9	23	14.4	29	18.1	24	15.0	79	49.4		
Secondary education	33	20.6	11	6.9	5	3.1	9	5.6	59	26.2		
Total count	40	25	40	25	40	25	40	25	40	25.0		

4.3 Purpose of Growing Various Vegetables

When data was combined, of the 160 respondents, most 101 (84.9), indicated that they grew *Amaranthus* for both cash and food, and of these, one third 36 (29.9%) lived in high-density areas, and a quarter 32 (26%) lived in medium-density areas. Yet, less than a quarter 22 (18.5%) reported to live in low-density areas, while few, 11 (9.2%) lived in peri-urban areas. Growing *Amaranthus* for food and cash reflected the reality of urban life, which was supported by Stevenson at al. (1996) study who found that, vegetable crops improved food security and offered employment opportunities and income to urban dwellers. The p-value of the three valuables tested, showed that, there was a high statistical significance differences at $p \leq 0.01$ implying that, respondents grew *Amaranthus* for food and to earn money (Table 6).

Table 6: Distribution of respondents by purpose of growing types of vegetables (n=160)

Amaranthus production	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
Cash	1	0.8			1	0.8			2	0.16	29.110	0.0
Food	14	11.8	2	1.7	1	0.8			16	13.4		
Both	22	18.5	32	26.9		30.3	11	9.2	101	84.9		
					36							
									160	100		
Chinese cabbage production											36.358	0.0
Cash	2	1.7			1	0.8			3	2.5		
Food	16	10.0			1	0.8			17	10.8		
Both	19	16.0	32	26.9	32	26.9	19	16.0	140	85.8		
***Brassica carinata* production**									160	100		
Cash			2	1.3	4	2.5	1	0.6	7	4.4		0.0
Food	16	10.0	5	3.1					21	13.1		
Both	24	15.0	33	20.6	36	22.5	39	24.4	132	82.5		
Swiss chard production									160	100		
Cash					1	0.6			1	0.6		0.45
Food	10	6.3	1	0.6					11	6..9		
Both	10	6.3	3	1.9	3	1.9	4	2..5	20	12.6		
									32	21.6		

Further of the 160 respondents, most, 140 (85.8%) mentioned that, they grew Chinese cabbage to get both cash and food, and of these, 140 (85.8%) respondents, 32 (26.9%) and 19 (16%), reported that they lived in high-, medium- and low-density and peri-urban areas, respectively. Of the 160 respondents, few, 17 (10.8%) reported that, they grew Chinese cabbage to get food only, and of these, few 16 (10.0%), lived in low-density areas, and one (0.8%) in peri-urban areas. Of the 160 respondents, few, three (2.5%) respondents, reported that they grew Chinese cabbage to earn cash, and of these, two (1.7%), lived in low-density areas, and one (0.8%) lived in high-density areas. Data showed how variables reflected the real life situation to both urban and peri-urban dwellers in sustaining their livelihoods through growing of vegetables. The p-value of the three variables tested, indicated that, statistically it was highly significant at $p \leq 0.01$ implying that, growing Chinese cabbage for food and to earn money was important (Table 6).

Data on Table 5 indicates that, most, 132 (82.5%) of respondents mentioned that, they grew *Brassica carinata* for both food and to earn money. Of these respondents, less than a quarter, 39 (24.4%) lived in peri-urban areas, few, 36 (22.5%), lived in high-density areas, 33 (20.6%) lived in medium-density areas, and 24 (15.0%), lived in low-density areas. Of the 160 respondents, few 21 (13.1%) reported that, they grew *Brassica carinata* to get food, and of these, 16 (10.0%) lived in low-density areas, and five (3.1%) in medium-density areas. Data on Table 5 indicates that, of the 160 respondents, few, seven (4.4) of the respondents, mentioned that they grew *Brassica carinata* to earn money, and of these four (2.5%) lived in high-density areas, two (1.3%) lived in medium-density areas, and one (0.6%) in peri-urban areas. The p-value of the three items namely cash, food and both tested, were highly statistically significant at $p \leq 0.01$ implying their importance.

Of the 160 respondents, few, 20 (12.6%) indicated that, they grew Swiss chard for both food and to earn money, and of these, ten (6.3%) lived in low-density areas, and three (1.9%) in medium-density areas. While, three (1.9%) lived in high-density areas. Similarly, of all respondents, few 11 (6.9%) reported that, they grew Swiss chard, and of these, ten (6.3%) lived in low-density areas, and one (0.6%) in medium-density areas. Only one (0.6%) respondent, who lived in high-density areas, reported to growing Swiss chard for earning money. Generally, it was found that, Swiss chards were not grown commonly because seed was expensive. The p-value of three variables tested, indicated that, it was not statistically significant at $p \leq 0.450$ implying that it was not worth growing them.

4.4 Vegetable Plot Sizes

Plot sizes on which respondents grew vegetables, were divided into four major areas: low-, medium-, high-density and peri-urban areas. Of the 160 respondents, a quarter, 40 (25%) reported to growing *Amaranthus* in medium-density areas, covering 5,325m^2 which was the highest. The reasons could be that, respondents had other options of growing other different types of vegetables. Similarly, in low-density areas, a quarter, 40 (25%) of the respondents, reported to growing *A maranthus* covering a total area of 3,896m^2 being the biggest area cultivated for a single vegetable. In peri-urban areas, also a quarter, 40 (25%) of the respondents, reported growing *Amaranthus* in an area of 3,300 m^2 while, a quarter, 40 (25%) of the respondents in high-density areas, reported growing *Amaranthus* in an area measuring 1137.5m.^{2} The p-value of the four variables indicates that, there was a statistical significant differences of plot sizes at $p<0.001$ implying that, among the four locations, plot sizes differed (Table 7).

Table 7: Vegetables plot sizes (n=160)

Area classification	Number of respondent (n)	Percentage (%)	Acreage m²	X^2-value	P-value
Amaranthus					
Low-density	40	25	3,896	155.435	0.001
Medium-density	40	25	5,325		
High-density	40	25	11,375		
Peri-urban	40	25	3,300		
Chinese cabbage					
Low-density	40	25	3,218	150.188	0.001
Medium density	40	25	6,050		
High-density	40	25	8,055		
Peri-urban	40	25	5,633		
Brassica carinata					
Low-density	40	25	900	99.372	0.031
Medium-density	40	25	1,900.5		
High-density	40	25	1,249.5		
Peri-urban	40	25	7,500		
Swiss chard					
Low-density	8	5	1,332	67.234	0.008
Medium-density	1	0.6	120		
High-density	10	6.3	2,150		
Peri-urban	13	8.1	4,600		

Table 7 indicates that, of the 160 respondents, who grew Chinese cabbage, a quarter 40 (25%) indicated to living in peri-urban areas, and they reported to growing them on an area measuring 8,055m.^{2} Similarly, a quarter 40 (25%) respondents reported growing Chinese cabbage in an area measuring 6,050m^2 and lived in medium-density areas, while in high-density areas a quarter 40 (25%) of respondents grew Chinese cabbage of an area measuring 5,633m^2 and those in low-density areas, a quarter 40 (25%) indicated that they grew Chinese cabbage in an area measuring 3,218m.^{2} The p-value of the four variables were highly statistically significant at $p \leq 0.001$ implying that, areas under Chinese cabbage differed in four areas (Table 7).

As for *Brassica carinata,* of the 160 respondents, there was a quarter 40 (25%) mentioned that they lived in peri-urban areas, and reported to growing them in an area covering 7,500m^2. Similarly, a quarter 40 (25%) of the respondents who lived in medium-density areas, they mentioned to growing *Brassica carinata* in areas covering 1,900m^2. Also respondents who lived in high-density areas, a quarter, 40 (25%) of them reported to growing *Brassica carinata* in areas covering 1,249m^2, while those in low-density areas, a quarter, 40 (25%) indicated to growing them on an area covering 900m^2 which was small compared to other vegetables. The reasons could be due to their low preferences compared to other vegetables. Also the p-value of the four locations tested, indicated that, there was statistically significant differences at $p < 0.031$ among plot sizes. This implied that, in the four locations, there were variations of plot sizes on which vegetables were grown under (Table 6). Table 6 indicates that, of the 160 respondents, 32 (20%) grew Swiss chard, and of these, 13 (8.2%), ten (6.3%), and eight (5%) lived in peri-urban, high-density and low-density areas, respectively. The plot sizes on which they grew Swiss chard were 4600m^2; 2150m^2; 1332m^2, respectively. However, one (0.6%) respondent who lived in medium-density areas, reported to growing Swiss chard on an area measuring 120m^2. The p-values of the variables tested indicated that, there was a high statistical significant difference at $p \leq 0.008$. This implied that, Swiss chard plot sizes differed in the four locations.

4.5 Periods of Growing Vegetables

4.5.1 Growing vegetables during rainy Season

Table 8 indicates that, there were two vegetable growing seasons: rainy and dry season. Data indicated that, of the 160 respondents, 106 (66.3%) mentioned that they grew *Amaranthus* in April, and of these, a quarter 40 (25%), 29 (18.1%), 28 (17.5%), and few, ten (6.3%) who indicated that they grew *Amaranthus* in April lived in high-density, peri-urban, medium-, and low-density areas, respectively. Of the 160 respondents, one third, 53 (33%), reported that they grew *Amaranthus* in December and January, and of these few 29 (18.1%), lived in low-density areas, and 12 (7.5%) in medium-density areas. Also it was found that 11 (6.9%) of the respondents who lived in peri-urban areas, reported that grew *Amaranthus* in December and January. Only one, (0.6%) respondent who lived in high-density areas mentioned to growing *Amaranthus* in December and January. Similarly, another one (0.6%), who lived in low-density areas, reported to growing *Amaranthus* in March. The reasons for growing *Amaranthus* during the rainy season could be to use the available rains. The p-value of the variables tested, indicated that, there was a high statistical significant difference in the months that respondents grew vegetables at $p \leq 0.01$.This implied that, respondents grew *Amaranthus* in different months during the rainy season (Table 8).

Of the 160 respondents, above one third, 52 (32.5%) reported that, they grew Chinese cabbage in December and January, and of these, few, 24 (15%), 14 (8.8%) lived in low-density and peri-urban areas, respectively. Also, data indicated that, 13 (8.1%) respondents who lived in medium-density areas also mentioned that, they grew Chinese cabbage in December and January. But, one (0.6%) respondent who lived in low-density areas, reported to growing Chinese cabbage in February. The p-value of the tested variables indicated there was, no statistical significant differences at $p < 0.767$ which implied that, all months were ideal for growing Chinese cabbage (Table 8).

Of the 160 respondents, less than a quarter, 39 (24.4%) mentioned that, they grew *Brassica carinata* in the rainy season of December and January. Of these, few, 25 (15.6%), lived in low-density areas, and seven, (4.4%) in medium-density areas. Also, it was found that, of those who grew *Brassica.carinata,* in December and January, six (3.8%) lived in peri-urban areas, and only one (0.6%) indicated to living in high-density areas. The reasons could be, to utilize the available rains for optimum yield and thus maximize profits. However, the p-value of the tested variables indicates that, there were no statistical significant differences at $p < 0.656$. This implies that, the months were not ideal for *Brassica carinata* growing. Of the 160 respondents, 32 (20%) reported that, they grew Swiss chard in December. And of these, 17 (10.6%), 14 (8.8%) and one (0.6%) grew Swiss chard in December in low-density, peri-urban, and medium-density areas, respectively. The reasons could be to utilize rains for optimum Swiss chard growing. The p-value of the variables tested, indicated that there were no statistical differences at $p<0.211$ implying that December and January were ideal period for vegetable growing.

4.5.2 Growing vegetables during dry season

Data on Table 7 indicates that, most, 154 (96.2%) of the respondents, reported to growing *Amaranthus* during the dry season of June, and of these, a quarter 40 (25%) lived in medium- high-density areas, and peri-urban areas. But of the 34 (21.3%) respondents who lived in low-density areas, they indicated to growing *Amaranthus* in July and August. The reasons for growing *Amaranthus* during the dry season could be the lack of insect pests and diseases. The p-value of variables tested, indicates that, there were no statistical significant differences at $p< 0.354$ implying that, the period of growing *Amaranthus* did not differ in the four locations.

Table 8: Periods of growing vegetables (n=160)

Vegetable type	Period in months	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
Amaranthus	December & January	29	18.1	12	7.5	1	0.6	11	6.9	53	33	50.038	0.0
	March	1	0.6							1	0.6		
	April	10	6.3	28	17.5	40	25	29	18.1	106	66.3		
Total		40	25	40	25	40	25	40	25	160	100		
Chinese cabbage	December & January	24	15	13	8.1	1	0.6	14	8.8	52	32.5	1.142	0.767
	February	1	0.6							1	0.6		
Total		**25**	**15.6**	**13**	**8.1**	**1**	**0.6**	**14**	**8.8**	**53**	**33.1**		
Brassica carinata	December	25	15.6	7	4.4	1	0.6	6	3.8	39	24.4	1.615	0.656
	January	3	1.9							3	1.9		
Total		**28**	**17.5**	**7**	**4.4**	**1**	**0.6**	**6**	**3.8**	**42**	**26.3**		
Swiss chard	December	17	10.6	1	0.6	-	-	14	8.8	32	20	0.987	0.12
	January	3	1.9							3	1.9		
Total		**17**	**10.6**	**1**	**0.6**	-	-	**14**	**8.8**	**32**	**20**		
Dry-season Amaranths	June	34	21.3	40	25	40	2.5	40	25	154	96.2	6.657	0.354
	July	3	1..9							3	1..9		
	August	3	1.9							3	1..9		
Total		**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Chinese cabbage	June	29	18.1	40	25	40	25	40	25	149	93.1	7.801	0.253
	July	8	5.0							8	5.0		
	August	3	1.9							3	1.9		
Total		**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Brassica carinata	June July	40	25	40	25	40	25	40	25	160	100.	6.657	0.357
Total		**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100.**		
Swiss chard	June July	19	11.9	7	4.4	3	1.9	3	1.9	32	20	5.432	0.211
	August	3	1.9							3	1.9		
Total		**19**	**11.9**	**7**	**4.4**	**3**	**1.9**	**3**	**1.9**	**32**	**20**		

Further, Table 7 shows that, of the 160 respondents, most, 149 (93.1%) mentioned that they grew Chinese cabbage in June, and of these, a quarter, 40 (25%) lived in high-and medium-density areas, and peri-urban areas. Also, of those who indicated to growing Chinese cabbage in June, few, 29 (18.1%) lived in low-density areas. Few, eight (5.0%) and three (1.9%) respondents, indicated that they grew Chinese cabbage in July and August and they lived in low-density areas. The reasons for growing Chinese cabbage in dry-season could be to escape serious insect pests and disease attack. The p-value of the variables tested, indicates that, there was no statistical significant differences at $p \leq 0.253$, implying that, all dry months were ideal for growing Chinese cabbage in the study areas.

Data on Table 8 indicates that, of the 160 respondents, a quarter, 40 (25%) indicated that they grew *Brassica carinata* in June and July, and they all lived in low-, medium-, and high-density, and peri-urban areas, respectively. Reasons for growing *Brassica carinata* during these dry months could be to take advantage of presence of markets. The p-value of the variables tested, indicates that, there was no statistical significant differences at $p\leq 0.254$ implying that, June and July months were ideal for growing *Brassica carinata.* Further, Data on table 7 indicates that, of the 160 respondents, less than one quarter, 32 (20%) indicated that they grew Swiss chard in June and July. And of these few, 19 (11.9%) lived in low-density areas, and seven, (4.4%) lived in medium-density areas. Also, three (1.9%) respondents, mentioned to living in high-density areas, and peri-urban areas respectively. The reasons could be to utilize the markets as many people failed to raise Swiss chard during this period due to water shortages. Another reason could be to escape incidents of insect pests and disease attacks, which were a threat during the rainy season. The p-value of the variables tested, indicated that there were no statistical differences at $p< 0.211$ implying that June July and August were ideal period for vegetable growing. *4.6*

4.6 Factors Contributing to Vegetable Growing

4.6.1 Labour

Table 9 indicates that, of the 160 respondents, 89 (55.6%) mentioned that the source of labour in growing vegetables were females, and of these, 32 (20%), 20 (12.5%), 20 (12.5%) and 17 (10.6%) reported to living in peri-urban, medium-, high-, and low-density areas, respectively. Further, of the 160 respondents, one third 53 (33.3%) indicated that, the source of labour were males. And of these, 19 (11.3%), 18 (11.9%), ten (6.3%) and six (3.8%) reported to living in medium-density, high-density, low-density and peri-urban areas, respectively. Using hired labour was mentioned by few, 12 (7.5%)respondents as a source of labuor and of these, eight (5.0%), one (0.6%) mentioned as living in low-density, and high-density areas, respectively, while two (1.3%) lived in peri-urban areas. Few respondents, six (3.7%) indicated to using other sources of labour and of these, few, five (3.1%), and one (0.6%) reported to living in low-density and high-density areas, respectively (Table 7). The p-value of the tested variables indicates that there was a high statistical significant difference at $p \leq 0.01$ implying that, the sources of labour differed in vegetable growing activities (Table 9).

Table 9: Sources of labor, income, and land ownership (n=160)

Variable	L-density		M-density		H-density		P-urban		Total		X-value	P-value
	n	%	n	%	n	%	n	%	n	%		
Source of labor												
Females	17	10.6	20	12.5	20	12.5	32	20.0	89	55.6	37.395	0.000
Males	10	6..3	19	11.9	18	11.3	6	3. 8	5.3	33.3		
Hired labor	8	5.0	1	0.6	1	0.6	2	1..3	12	7..5		
Other sources	5	3.1	-	-	1	0.6	-	-	6	3.7		
Total	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Source of income											87.224	0.008
Field crops	2	1..3	6	3..2	1	0.6	1	0.6	9	5.7		
Livestock keeping	4	2..5							4	2..5		
Vegetable growing	8	5.1	27	17.1	38	23.8	38	24.7	111	69.9		
Formerly imployed	26	15.8	7	4.4	1	0.6	1	0.6	36	21.5		
Total	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Land ownership												
Purchased	25	15.6	14	8.8	19	11.9	16	10	74	46.5	8.436	0.380
Rented	10	6..3	20	12.5	13	8.1	12	7..5	55	34.4		
Inherited	5	3.1	6	3.8	8	5.0	12	7..5	31	19.4		
Total count	40	25	40	25	40	25	40	25	160	100		

4.6.2 Incomes

Data on Table 10 indicates that, of the 160 respondents, over two thirds, 111 (69.9%) indicated that their incomes from growing vegetable. And of these, 38 (24.7%), 27 (17.1%) and eight (5.1%) mentioned that, they lived in peri-urban, high-density, medium-density, and in low-density areas, respectively. Further, data on Table 8 indicates that, of the 160 respondents, few nine (5.7%) who reported that their incomes depended on vegetable growing. Of these, five (3.2%), two (1.3%), and one (0.6%) reported that, they lived in medium-, low- and high-density and peri-urban areas, respectively. Of the 160 respondents, few four (2.5%), mentioned to earn incomes from livestock keeping and these lived in low-density areas. The reasons for having no respondents in high-density areas, was lack of space to keep livestock, and lack of money to buy animals.

A study in Dar-es-Salaam by Jacob and Amond (1997) confirmed that, home gardens usually used backyards covered to 40-80m^2 to keep both livestock and grow vegetables. The last item to be examined was respondents' employment. Of 160 respondents, less than a quarter 36 (21.5%), reported that they were formally employed, and of these, 25 (15.8%) lived in the low-density areas, seven (4.4%) in medium-density areas, and one (0.6%), in high-density and peri-urban areas, respectively. The p-value of the four variables tested indicated that, there was a high statistical significant difference at $p \leq 0.008$. This implied that there were differences in sources of incomes that respondents got, and vegetable growing contributed the most (70%).

Data on Table 10 shows that, of the 160 respondents, a quarter, 40 (25%) indicated that, they earned monthly incomes of Tshs. 2 560 000 (US $ 1600), 1 481 160 (US $ 925 725), 1 474 600 (US $ 921 625) and 450 522 (US $ 281.576) from growing *Amaranthus* in peri-urban, high-, medium-, and low-density areas, respectively. The earning per respondent per month was Tshs. 64 000(US $ 40), 37 029(US $ 23.14), 36 865(US $ 23 041) and 13 263(US $ 8.29) respectively. In low-density areas, respondents got little income per month compared to other locations perhaps due to having small plots (50-10m^2). The p-value of the variables tested, indicates that, there was a high significant differences at $p \leq 0.000$ implying that, the amount earned per month per respondent differed in the four areas.

4.6.3 Land ownership

Table: 10 shows how respondents got the land onto which they grew vegetables. Of the 160 respondents, less than half, 74 (46.3%) indicated that they purchased the land on which they grew vegetables. And of these, 25 (15.6%), 19 (11.9%), 16 (10.0%) and 14 (8.8%) lived in low-density, high-density, peri-urban, and in medium-density areas, respectively. Further, of all the respondents, one third, 55 (34.4%) mentioned that, they inherited land and of these, 20 (12.5%), 13 (8.1%), 12 (7.5%) and ten (6.3%) mentioned that, they lived in medium-density, high-density, peri-urban, and low-density areas, respectively. Yet, of the 160 respondents, few 31 (19.4%) indicated to inheriting land on which they grew vegetables, and of these, 12 (7.5%), eight (5.0%), six (3.8%), and five (3.1%) reported that, they lived in peri-urban, high-density, medium-density, and low-density areas, respectively. The p-value for the three variables was not statistically significant at p≤ 0.380, implying that; means of ownership had no influence on vegetable growing.

Table 10: Vegetable Incomes per month (n=160)

Vegetable	Income in Tshs	L-density		M-density		H-density		P-urban		Total		X^2-value	P-value
		n	%	n	%	n	%	n	%	n	%		
Amaranthus	450522	40	25							40	25	143.062	0.0
	1474600			40	25					40	25		
	1481160					40	25			40	25		
	2560000							40	25	40	25		
Total	**5966282**	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**160**		
Chinese cabbage	400,000	40	25							40	25	148.24	0.0
	1,338,750			40	25					40	25		
	2,511,520					40	25			40	25		
	2,720,000							40	25	40	25		
Total	**6,970,270**	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Brassica carinata	128,360	40	25							14	31.7	117.171	0.001
	1,792,000			40	25					40	25		
	1,760,000					40	25			40	25		
	3,146,640							40	25	40	25		
Total	**6,827,000**	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		
Swiss chard	504,112	10	6.3							10	6.3	44.000	0.015
	220,000			4	2.5					4	2.5		
	420,000					13	8.1			13	8.1		
	1,176,000							4	2.5	4	2.5		
Total	**2,320,112**	**10**	**6.3**	**4**	**2.5**	**13**	**8.1**	**4**	**2.5**	**32**	**19.4**		

Similarly, of the 160 respondents, a quarter, 40 (25%) indicated that, they earned monthly incomes of Tshs. 2 720 000, 2 511 520, 1 338 750 and 400 000 growing Chinese cabbage in peri-urban, high-, medium-, and low-density areas, respectively. Respondents in low-density areas earned low incomes from Chinese cabbage and the reasons could be they had other options. In peri-urban and high-density areas, respondents earned high incomes per month because there was a good market for Chinese cabbage. However, the p-value of the variable tested, indicates that, there was a high significant differences at $p \leq 0.000$ implying that, the amount earned per month per respondent differed in the four study areas.

Further, of the 160 respondents, a quarter 40 (25%) indicated that, they earned monthly incomes of Tshs. 3 146 640, 1 792 000 1 760 000 and 128 360 from growing *Brassica carinata* in peri-urban, medium-, high-, and low-density areas, respectively. The earning per respondent per month was Tshs.78 666, 44 800, 44 000 and 128 000, respectively. Incomes from *Brassica carinata* in peri-urban areas, was high compared to other locations, and the reasons could be of few respondents producing *Brassica carinata* and thus individuals maximized profits. The p-value of the variables tested, indicates that, there was statistical significant differences at $p < 0.056$ implying that, incomes in these four areas differed.

Data on Table 10 shows that, of the 160 respondents, few, 13 (8.1%) ten (6.3%), four (2.5%), and four (2.5%) indicated that they earned a monthly incomes of Tshs. 1 176 000, 504 112, 420 000 and 220 000 from growing Swiss chard in peri-urban, low-, high-, and medium-density areas, respectively. The earnings per respondent per month was Tshs. 294 000, 50 411, 32 308, and 55 000, respectively. The lowest incomes were obtained in medium-density areas and the reasons could be due to lack of customers. The p-value of the variables tested, indicates that there was a statistical significant difference at $p < 0.015$ implying that, incomes earned from Swiss chard in the four study locations differed.

4.6.4 Cost of Lenting Land for Vegetables

Data on Table 11 indicates costs involved in renting land for vegetable growing. Of the 160 respondents, few, 52 (32.5%) indicated that, they rented land for Tshs.10, 000.00, and of these, over a half, 27 (51.9%) reported that, they rented land for growing vegetables. And of these, ten (19.2%), seven (13.5%), and three reported that they lived in medium-, and high-density areas, peri-urban, and low-density areas, respectively. The other important group of respondents were 12 (23.1%) who indicated that they incurred Tshs. 20 000.00 for renting land for growing vegetables. Of the 52, respondents, five (9.6%), four (7.7%), two (3.8%) and one (1.9%) mentioned that they lived in medium-density, high-density, peri-urban, and low-density areas, respectively. Also, there were five (9.6%) respondents who indicated that they incurred Tshs. 15 000.00 for renting land and of these, four (7.7%), and one (1.9%) indicated to living in medium-and high-density areas, respectively. The p-value of the variables tested, indicates that, there was no statistical significant differences at $p < 0.111$ implying that, land rent in the four study locations did not differ.

Table 11 Costs incurred on renting land for vegetables (n = 160)

Cost of rent in Tshs.	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
4,000-6,000.00	1	1.9							1	1.9	39.677	0.111
8,000					1	1.9			1	1.9		
10,000	3	5.8	10	19.2	7	13.5	7	13.5	27	51.9		
15,000			4	7.7	1	1.9			5	9.6		
20,000	1	1.9	5	9.6	4	7.7	2	3.8	12	23.1		
25,000	1	1.9							1	1.9		
30,000							1	1.9	1	1.9		
40,000			1	1.9					1	1.9		
50,000	1	1.9							1	1.9		
80,000	1	1.9							1	1.9		
100,000							1	1.9	1	1.9		
Total	8	15.3	20	38.4	13	25	11	21.1	52	32.5		

4.7 Input Use in vegetable Growing

4.7.1 Input use and sources

Study findings show that a number of respondents reported using inputs in growing vegetables, and of the 160 respondents, most, 153 (95.6) reported that they used inputs in the growing vegetables. Of these over a quarter, 40 (26.1%), 39 (25.5%), and 34 (22.2%) who mentioned to using inputs lived in high-density, peri-urban, and low-density areas, respectively. Further, most 128 (80%) respondents, indicated that they got inputs from stockiest, and of these, one third, 40 (31.2%), 39 (30.7%), 28 (21.9%) and few, 20 (15.8%) indicated to living in medium-, high- and low-density areas, and peri-urban areas, respectively. Also, one (0.6%) respondent, who lived in low-density areas, acquired inputs from other sources. The p-value of the variables tested, was not statistical significant at p< 0.329 implying that, the inputs acquired for growing vegetables in the four study areas did not differ.

Study findings indicate that, there were three types of water sources used for vegetable growing. Tap water in low- and medium-density areas, wells, and tap water in low- and medium-density areas, stream water and water wells in medium-, and high-density areas. However, in peri-urban areas, stream water, was the only source for vegetable growing.

Data on Table 12 indicates that, of the 160 respondents, a quarter 40 (25%), 35 (71.3%), 22 (13.5%) were indicated to walking distances covering 500m, 181m, and 180m to water stream to fetch water to irrigate vegetables in peri-urban, high-density and medium-density areas, respectively. Distances to water sources in peri-urban areas, were relatively longer compared to other study areas, The p-value of variables tested, indicated that, there was high statistical significant differences at $p \leq 0.01$ implying that, distances that respondents walked to water stream differed. Further, of the 160 respondents, three quarters, 35 (21.9%), 14 (8.75%) reported that, they walked distances covering 50m and 45m to fetch water from taps to irrigate vegetables in medium- and low-density areas, respectively. The p-value of the variables tested, indicates that, there was no statistical significant differences at $p < 0.599$ implying that, distances to tap water did not differ in the study areas.

four (2.5%) respondents lived in high-density areas, indicated that they walked a distance of 110m to fetch water wells to irrigate vegetables while five (3.13%) respondents lived in low- and high-density areas respectively, reported to walking distances of 50m, and 15m respectively to fetch water wells to irrigate vegetables. The p-value of the tested variables indicated that, there were statistical significant differences at $p \leq 0.003$ implying that, distances to fetch water from water wells for vegetable production differed in the four study locations.

Table 12: Respondents' sources of water (n=160)

Distance from water source	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	X-value	P-valu
Water wells 15m	5	3.13							19.500	0.003
110m			4	30.2						
50m					5	3.13				
Total count	**5**	**3.13**	**4**	**2.5**	**5**	**3.13**				
Tap water 45m	35	21.9							7.476	0.599
50m			14	8.75						
Total count	**35**	**21.9**	**14**	**8.75**						
Stream-water 181m			22	13.5					44.518	0
180m					35	21.9				
500m							40	100.4		
Total count			**22**	**13.5**	**35**	**21.9**	**40**	**100.4**		
Grand total	40	100	40	100	40	100	40	100.		

4.7.2 Extension services

Data on table 13 indicates extension agents that visited respondents who grew vegetables. Of the 160 respondents, few, 28 (17.2%) agreed that, extension agents visited them and gave advice for improving vegetable growing. Of these respondents, 20 (12.7%), six (3.8) and two (1.3%) lived in peri-urban, low-density and high-density areas, respectively. The p-value of the variables tested, indicates that, it was statistically significant at $p < 0.01$ implying that, extension agents did not adequately visit respondents growing vegetables.

Table 13: Respondents' sources of information about growing vegetables (n=160)

Ext visit / Agents	L-density n	L-density %	M-density n	M-density %	H-density n	H-density %	P-urban n	P-urban %	Total n	Total %	X² value	P-value
Yes	6	3.8			2	1.3	20	12.7	28	17.2	43.3	0.0
No	34	21.7	40	25	38	24.2	20	12.7	132	84.1		
Total count	**40**	**25**	**40**	**25**	**40**	**25.**	**40**	**25**	**160**	**100**		
Source of vegetable information												
Radio	3	1..9					1	0.6	4	3..5	893	0.0
Neighbors	7	4..5	3	1.9	9	5.7	10	6.4	29	18.5		
Relatives			1	0.6		·	2	1.2	3	1.8		
Friends	4	2..5	3	1.9			4	2.5	11	7.0		
Leaflets	8	5.1	2	1.3			1	0.6	11	7.0		
Personal experi	14	8.9	31	197	29	185	3	1.9	77	49.0		
Agric.Ext. agents	4	2.5			2	1.3	19	12.1	25	15.9		
Total count	**40**	**25**	**40**	**25.**	**40**	**25**	**40**	**25**	**160**	**100**		
Frequency of contact with extension agents?											15.3	0.004
Once/ week	10	6.3			40	25	20	12.5	70	43.8		
2-3times/wk	10	6.3				·	10	6.3	20	12.6		
4-5times/wk	10	6.3					10	6.3	20	12.6		
Total count	30	18.9			40	25	40	25	110	69		

Data on Table 13 shows that, respondents used different sources to get information about vegetables. Of the 160 respondents, less than a half, 77 (49%) reported that, they used personal experiences as source of information in growing vegetables. Of these, 31 (19.7%), 29 (18.5%), 14 (8.4%) and three (1.3%) reported that, they lived in medium-, high-, and low-density and peri-urban areas, respectively (Table 12). In addition, of the 160 respondents, 29 (18.5%) and 25 (15.9%) indicated that, they got information about growing vegetables from neighbours, and agricultural extension agents, respectively. For the 29 (18.5%) respondents, ten (6.4%), nine (5.7%), seven (4.5%), and three (1.9%) indicated that, lived in peri-urban, high-, low-, and in medium-density areas, respectively. For the other 25 (15.9%) respondents who indicated that they got information from agricultural extension agents. Further, 11 (6.9%), four (2.5%), and three (1.9%) respondents, indicated that they got information from friends, radio and relatives respectively, and of these lived in low-density and peri-urban areas, and in medium-density areas, respectively. For the four (2.5%) respondents, three (1.9%) and one (0.6%) indicated they got information from radio in low-density and in peri-urban areas, respectively. Further, data on Table 12 shows that, of the 160 respondents, few 11 (7%) mentioned that, they got information about vegetables from leaflets. Of these, eight (5.1%), two (1.3%), and one (0.6%) lived in low-, medium-density and peri-urban areas, respectively. None of the respondents in high- and low-density areas who indicated getting information from neighbours, relatives and friends, perhaps due to having other sources of information. And also, there was no one in medium-density areas, who got information from agricultural extension agents. The reasons could be that the agricultural extension agents did not visit them. The p-value of the variables tested, indicates that, there was a high statistical significant difference at $p \leq 0.01$ implying that, respondents got information about vegetable growing from various sources.

Data on Table 13 indicates that, of the 160 respondents, 70 (43.8%) and 20 (12.6%) indicated they were visited by agricultural extension agents for vegetable growing once per week, 2-3 times per week, and 4-5 times per week, respectively. For the 70 (43.8%) respondents, a quarter, 40 (25%), few, 20 (12.6%) and ten, (6.3%) lived in high-density, peri-urban, and low-density areas, respectively. For the 20 (12.6%), few, ten (6.3%), lived in peri-urban and low-density areas, respectively. There were no respondents visited in the medium and high-density areas. The reasons could be that there were no extension agents in those areas. The p-value tested, indicates that, there was statistical significant differences at $p < 0.004$ implying that, frequency of visits by extension agents differed in four study areas.

4.8 Vegetable Yields and Marketing

4.8.1 Vegetable Yields

Data on table 14 shows that, of the 160 respondents, a quarter 40 (25%) indicated that, they produced a total of 7750, 5325, 2875 and 1489 kilograms of vegetables of *Amaranthus* in peri-urban, high-, medium-, and low-density areas, respectively. The p-value of the variables tested, indicates that, there was a statistical significant differences at $p < 0.030$ implying that, vegetable yield in the four study areas differed (Table 13). Of the 160 respondents, a quarter, 40 (25%) indicated that they produced 6433, 4225, 4235, and 1914 kilograms of Chinese cabbage per month in peri-urban, medium-, high-, and low-density areas, respectively. The p-value of the variables tested, indicates that, there was a high statistical significant differences at $p \leq 0.01$ implying that, Chinese cabbage yields varied in four study areas. Further, of the 160 respondents, a quarter 40 (25%) reported that they produced 6050, 3740, 2800, and 664 kilograms of *Brassica carinata* per month in high-, medium-density, peri-urban and low-density areas, respectively. The p-value of the variables tested, indicates that, there was a statistical significant differences at $p < 0.01$ implying that, there was variations in vegetable yields in four study areas. (Table13). Data on Table 14 indicate that, of 120 respondents, 40 (25%), 32 (20%) 26 (16.7%), and 22 (13.3%), indicated that they produced 4600, 1650, 911, and 195 kilograms of Swiss chard per month in peri-urban, high-, low-, and medium-density areas, respectively. The number of respondents growing Swiss chard was relatively lower compared to other vegetables vegetable types, due perhaps to high price of Swiss chard seed. The p-value of variables tested, indicated that, there was significant differences at $p < 0.282$ implying that, vegetable yields for Swiss did not vary in the four study areas.

Table 14: Yields of vegetables/month (n=160)

Plot location *Amaranthus*	Yield in kg Per m^2	Number of Respondents (N)	Percentage of Respondents (%)	X^2-value	P-value
Low- density	1489	40	28.1	143.008	0.03
Medium-density	2875	40	7.6		
High-density	5325	40	33.3		
Peri-urban	7750	40	28.9		
Total	**17439**	**160**	**100**		
Chinese cabbage yield in kg					
Low-density	1914	40	23.8	148.820	0.0
Medium-density	4235	40	30.5		
High-density	4225	40	32.4		
Peri-urban	6433	40	3.3		
Total	**16807**	**160**	**100**		
Brassica carinata **yield in kg**					
Low-density	**664**	**40**	**23.5**	**117.171**	**0.001**
Medium-density	2800	40	13.7		
High-density	6050	40	37.3		
Peri-urban	3740	40	29.4		
Total	**13254**	**160**	**100**		
Swiss chard yield in kg					
Low-density	**911**	**40**	**25**	**56.350**	**0.082**
Medium-densit	**195**	**26**	**16.7**		
High-density	1650	22	13.3		
Peri-urban	4600	32	20		
Total	**7356**	**120**	**75**		

4.8.2 Vegetable marketing

Of the 160 respondents, less than a half, 77 (48.1%), one third 51 (31.9%), and few 32 (20%) reported that, they sold vegetables at farm gates, market places, and hawking, respectively. Of the 77 (48.1%) respondents, less than one quarter 38 (24%), few, 35 (22.5%) and four (2.5%) reported that they lived in medium-, low-, and high-density areas, respectively and sold vegetables at farm gates. For the one third, 51 (31.9%) respondents, that they grew vegetables, a quarter, 40 (25%) six (3.8%) and five (3.1%), reported that they lived in peri-urban, high- and low-density areas, respectively sold vegetables at market places. For the few, 32 (20%) respondents, 30 (18.7%) and two (1.2%), mentioned that they lived in high- and medium-density areas, respectively and hawked vegetables that they grew. There was no one in peri-urban, medium-, and low-density areas who sold vegetables at farm gates, market places, and hawking. The reasons could be that here respondents produced vegetable that customers bought directly from gardens. The p-value of the variables tested, indicates that, there was a high statistical significant differences at p≤ 0.01 implying that, selling vegetables in the four study areas differed.

Table 15: marketing of vegetables (n=160)

Where do you sell Vegetables?	L-density		M-density		H-density		P-urban			Total	X^2-value	P-value
	n	%	n	%	n	%	n	%	n	%		
Farm gates	35	22.0	38	24.0	4	2.5			77	48.5	198.031	0
Market place	5	3.1			6	3.8	40	25.0	51	31.9		
Hawking			2	1.2	30	18.7			32	19.9		
Total count	40	25	40	25	40	25.0	40	25.0	160	100		
To whom do you Sell vegetables?												
Middlemen	3	2.2	36	22.5	38	24.0	38	24.0	115	72.0	94.335	0
Local consumers	37	23.1	4	2.5	2	1.2	2	1.2	45	28.0		
Total count	40	25	40	25	40	25	40	25	160	100		
Who mainly sells vegetable In the garden												
Mother	21	13.1	19	11.9	4	2.5			44	27.5	79.666	0
Father	19	11.9	21	13.1	36	22.5	40	25	116	72.5		
Total count	40	25	40	25	40	25	40	25	160	100		
Market constraints												
Low price	1	0.6							1	0.6	11.307	0.179
Low demand	1	0.6							1	0.6		
Customers' preferences	38	24	40	25	40	25	40	25	158	99		
Total count	40	25	40	25	40	25	40	25	160	100		
What kind of transport do You use to carry vegetables												
Own car	1	0.6							1	0.6	2.046	0.036
Own bicycle	39	24.4	16	10.0	20	12.3	30	18.8	105	65.5		
Head carry			24	15.0	20	12.3	10	6.3	54	33.6		
Total count	40	25	40	25	40	25	40	25	160	100		
Why difficult vegetable selling?												
Few customers	8	5.0							8	5.0	142.27	0
Low farm-gate price	32	20.0	40	25	40	25	40	25	152	95		

Of the 160 respondents, three quarters, 115 (71.9%) and over a quarter, 45 (28%), data indicated that, they sold their vegetables to middlemen and one to one respectively. For the three quarters, 115 (71.99%) respondents, less than a quarter, 38 (24%), few, 36 (22.5%) and three (2.2%), indicated that they lived in peri-urban, high-, medium- and low-density areas, and sold vegetables to middlemen respectively. For the 45 (28%) respondents, less than a quarter, 37 (23.1%) four

(2.5%) and two (1.2%) mentioned that they lived in low-, medium-, and high-density, and peri-urban areas, respectively sold vegetables to one to one. The p-value of the variables tested, indicates that, there was a high statistical significant differences at $p \leq 0.01$ implying that, selling vegetables in the four study areas differed.

Of the 160 respondents, three quarters, 116 (72.5%) and obove a quarter, 44 (28%), indicates that, a father and a mother sold vegetables respectively. For the three quarters 116 (72.5%) respondents, a quarter, 40 (25%), 36 (22.5%), 21 (13.1%) and few, 19 (11.9%) who indicated to living in peri-urban, high-, medium- and low-density areas, respectively, said that a father sold vegetables. For the 44 (28%) respondents, less than a quarter, 21 (13.1%), 19 (11.9%) and few, four (2.5%), who indicated living in low-, medium- and high-density areas, respectively, reported that a mother sold vegetables. Selling of vegetables in peri-urban areas the reasons could be vegetables were too bulky for mothers to handle the business as they could not ride bicycles with a bulk of vegetables to a market place. The p-value of the variables tested, indicates that, there was a high statistical significant differences at $p \leq 0.01$ implying that, fathers and mothers differed in selling vegetables.

4.8.3 Means of transporting vegetables to markets

On Table 16 indicates that, of the 160 respondents, over a half, 105 (65.5%), 54 (33.6%), and one (0.6%), mentioned that, they used bicycles, head carry, and own cars to transport vegetables to markets respectively. Of the 105 (65.5%) respondents, who used bicycles, 39 (24.5%), 30 (18.8%), few, 20 (12.3%) and 16 (10.0%) lived in low-density, peri-urban, high-, and medium-density areas, respectively. For the 54 (33.6%) respondents, who head carried vegetables to markets, less than a quarter, 24 (15%), few, 20 (12.3%) and ten (6.3%) in medium- and high-density areas, respectively. One (0.6%) who used a car to carry vegetables to markets lived in low-density areas. The p-value of the tested variables indicates that there was a statistical significant difference at p< 0.036 implying that, means of transport for vegetables to market varied.

Further on table 16 indicates that, of the 160 respondents, most, 158 (99%), indicated that, vegetable preferences, low demand, and low prices limited vegetable growing, and of these, 40 (25%), 38 (24%) mentioned to living in medium-, high-density and, peri-urban and low-density areas, respectively. The p-value of the tested variables indicates that, there was no a statistical significant difference at p< 0.179 implying that, market constraints were similar in all four study areas.

4.9 Monetary Value of Produced Vegetable

4.9.1 Money earned per week

Data on Table 17, shows that, of the 160 respondents, a quarter, 40 (25%) indicated that they earned Tshs. 2 064 686.00, 1 403 500.00, 422 000.00, and 193 600 from selling growing *Amaranthus* per week in peri-urban, high-, medium-, and low-density areas, respectively. The p-value of the variables tested, indicates that, there was a statistical significant differences at p< 0.002 implying that, amount of money earned from selling *Amaranthus* per week varied. On average, a respondent in a high-density area earned Tshs. 1 403 500 (US $ 9,357) per month or Tshs. 36 934.2

(US $ 24.7) per respondent per week or 5276.3 (US $3.5%) per respondent per day. This supports Kourous (2005) findings that even small gardens could bring in up to US $3 a day for poor families.

Table 16: Money earned and spent/wk by respondents (n=160)

Plot location	Amount of money saved/wk Tshs	No. of respondents	Percentage (%) of (n)	X^2-value	P-value
Low-density	193 600.00	40	25	323.273	0.002
Medium-density	422 000.00	40	25		
High-density	1 403 500.00	40	25		
Peri-urban	2 064 686.00	40	25		
Total	4 083 786.00	160	100		
Amount spent per week					
Low-density	255 000.00	40	25	87.816	0.063
Medium-density	296 000.00	40	25		
High-density	246 500.00	40	25		
Peri-urban	180 300.00	40	25		
Total	977 800	40	25		

4.9.2 Amount of money spent on buying food per week

Data on Table 17 indicates that, of the 160 respondents, a quarter, 40 (25%) mentioned that spent Tshs. 296 000, 255 000, 246 500, and 180 300 per week and Tshs. 7423, 6375, 6163, 4508 per day, in medium-, low-, and high-density and peri-urban areas, respectively on buying food items for their households. In medium-density areas, respondents spent more money than those in peri-urban. The reasons could be that people in peri-urban had other food sources. The p-value of the variables tested, indicates that, there was a statistical significant differences at p< 0.063 implying that, the money spent on food differed in the study areas.

4.9.3 Average production costs of vegetables

Data on Table 18 shows that of the 160 respondents, a quarter, 40 (25%) respondents, they incurred Tshs. 40.00 in low-density areas. For the 10 (6.3%)

respondents, indicated that they incurred Tshs. 838.00, 337.00, 306.00, and 274.00, (600.00, 280.00, 234.00, 174.00), in peri-urban, medium-, and high-density areas, respectively to produce vegetables. There was cost of growing vegetables in low-density areas, because they had small plots 10-50m^2 and used kraal and farm yard manure to fertilize plots. In peri-urban areas, cost of production was high as they had bigger plots 70-100m^2. The p-value of the variables tested, indicates that, there was no statistical significant differences at p< 0.352 implying that, cost of growing vegetables did not vary in the four study areas (Table 18).

Table 17: Average costs of growing vegetables (n=160)

Cost inTsh/m^2	L-density		M-density		H-density		P-urban		Total		X^2-value	P-value
	n	%	n	%	n	%	n	%	N	%		
32-600.00			10	6.3					10	6.3	48.000	0.153
40.00	40	25.0							40	25.0		
235.00					10	6.3			10	6.3		
74.00			10	6.3					10	6.3		
109..00					10	6.3			10	6.3		
234..00			10	6.3					10	6.3		
121.00					10	6.3			10	6.3		
280.00			10	6.3					10	6.3		
337.00							10	6.3	10	6.3		
306.00							10	6.3	10	6.3		
214.00					10	6.3			10	6.3		
838.00							10	6.3	10	6.3		
274.00							10	6.3	10	6.3		
Total count	40	25	40	25	40	25	40	25	160	100		

4.9.4 Gross margin of the four selected types of vegetables

Gross margin is the total amount of money (gross profit) obtained after subtracting total variable costs (amount of money spent on production in Tshs/ha) (Phiri, 1991). Data on table 19 shows gross margins of the four selected vegetables in the four study areas. Of the 160 respondents, one quarter, 40 (25%) indicated that they earned gross margins of Tshs. 6480.00 (*Amaranthus*), 4863.00 (Chinese cabbage), 3099.00

(*Brassica carinata*), and 1556.00 (Swiss chard) per growing season in peri-urban, high-, medium-, and low-density areas, respectively. Gross margin for Amaranths was high (6480.00) perhaps because *Amaranthus* were cheap to grow and they matured faster. Also, *Amaranthus* was grown twice in a single dry season. Gross margin for *Brassica carinata* was low (Tshs.1556.00) the reasons being that it was less preferred. Also, price of *Brassica carinata* was relatively lower e.g. Tshs. 126.00/kg or Tshs 200.00/m^2, while that of *Amaranthus* was Tshs 276.00/kg or Tshs. 467.00/m^2 (Table 18, 19). The p-value of the variables tested, indicates that, there was a statistical significant differences at p< 0.035 implying that, gross margins of the four selected vegetables varied in the four study areas (Table 19)

Table 18: Gross margin per square meter of the four selected vegetables

Type of vegetable	Gross margin	L-density n	L-density %	M-density n	M-density %	H-density n	H-density %	P-urban n	P-urban %	X^2-value	P-value
Amaranthus	410.00	40	25							48.00	0.035
	2461.00			40	25						
	509.00					40	25				
	3100.00							40	25		
Total	**6480.00**	40	25	40	25	40	25	40	25		
Chinese cab.	168.00	40	25								
	696.00			40	25						
	944.00					40	25				
	3055.00							40	25		
Total	**4863.00**	40	25	40	25	40	25	40	25		
B.carinata	346.00	40	25								
	362.00			40	25						
	72.00					40	25				
	776.00							40	25		
Total	**3099.00**	40	25	40	25	40	25	40	25		
Swiss chard	773.00	40	25								
	600.00			40	25						
	814.00					40	25				
	912.00							40	25		
Total	**1556.00**	40	25	40	25	40	25	40	25		

Data on Table 20 indicated positive coefficients implying having relationship between the plot classification (urban and peri-urban) and types of vegetables grown. This implied that, they had an influence on vegetable growing thus influencing the gross margin. The p-values are statistically significant confirming the results obtained by using Chi-square analysis model.

Table 19: Regression modal coefficients in relation to types of vegetables tested

Variables	Coefficient	Std. Error	Sum of square	Mean square	F	t	Sig.
Amaranthus	1.614	1.094	1.876	1.876	1.006	0.911	0.459
Chinese cabbage	2.556	1.178	0.014	0.014	0.006	2.179	0.06
Brassica carinata	2.671	0.900	0.308	0.308	0.131	2.968	0.097
Swiss chard	2.672	0.890	0.33	0.33	0.142	3.001	0.095

4.9.5 Sales of vegetables Tshs/m^2

During vegetable selling, there were two types of customers. Type one customers were middlemen who bought vegetables in Tshs per unit area while type two customers were ordinary consumers who bought vegetables in Tshs per kg for home uses hence, in so doing there were two types of prices i.e Tshs./kg and Tshs./m^2. Data on Table 21 shows that, of 160 respondents, over one third, 31 (19.2%), 30 (18.8%), and few, ten (6.3%), respondents indicated that they sold *Amaranthus* per week in Tshs. at Tshs/kg. of 3012.00, 1255.00, 650.00, and 360.00 in peri-urban, high-, medium-, and low-density areas, respectively. And less than a half, 30 (18.8%), 21 (13.1%), 21 (13.1%), and few, 11 (6.9%)of the respondents indicated that they sold Tshs./m^2 at 2935.00, 1117.00, 370.00, and 348.00 from growing Amaranths in peri-urban, high-, medium-, and low-density areas, respectively. Vegetable price in peri-urban areas was relatively higher compared to other areas because vegetable produced were of high quality due to good management.

Vegetable prices in low-density areas were low because due to respondents having other options. The p-value of the variables tested, indicated that, there was no statistical significant differences at $p < 0.074$ and 0.035 for price implying that, price varied.

Further, Table 21 indicated that, of the 160 respondents, less than a half, 33 (20.6%), 20 (12.5%), 14 (8.8%), and few, 13 (8.13%) respondents who sold Chinese cabbage per day indicated that earned Tshs. of 1,123.00, 957.00, 467.00, and 276.00 in peri-urban, high-, medium-,and low-density areas, respectively. Of all, above one third, 33(20.6%), 28 (17.5%), less than a quarter, 15(9.4%), and few, 14 (8.8%) indicated that they sold Chinese cabbage per m^2 for 673.00, 400.00, 282.00, and 128.00 in peri-urban, low-, medium-, and high-density areas, respectively. In peri-urban areas, price of Chinese cabbage/m^2 was high due to good management. In low-density areas, the price of Chinese cabbage was low because vegetables were produced by gardeners mainly for home use. The p-value of the variables tested, indicated that, there was no statistical significant differences at $p < 0.152$ and $p < 0.130$ for Tshs./kg and Tshs./m^2 respectively, implying that prices did not differ.

Table 20: Vegetable prices in terms of Tshs/kg and Tshs/m^2 (n=160)

Name of vegetable *Amaranthus* price/kg in Tshs	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
651.00	10	6.3							10	6.3	191.970	0.074
3 012.00			31	19.4					31	19.4		
369.00					30	18.8			30	18.8		
1 255.00							10	6.3	10	6.3		
Total count	10	18.4	31	32.4	30	37.3	10	11.2	80	50		
Amaranthus price/m^2												
348.00	20	12.5							20	12.5	83.625	0.035
370.00			20	12.5					20	12.5		
1 117.00					30	18.8			30	18.8		
2 935.00							11	6.9	11	6.9		
Total	20	12.5	20	12.5	30	18.8	11	6.9	80	50		
Grand total									160	100		
Chinesecabbage/kg												
276.00	13	8.1							13	8.1	118.833	0.152
467.00			20	12.5					20	12.5		
957.00					33	20.6			33	20.6		
1 123.00							14	8.8	14	8.8		
Total count	13	8.1	20	12.5	33	20.6	14	8.8	80	50		
Chinese cab./m^2												
400.00	15	9.4							15	9.4	133.856	0.030
282.00			18	11.3					18	11.3		
128.00					33	36.1			33	20.6		
673.00							14	8.8	14	8.8		
Total count	15	9.4	18	11.3	33	36.1	14	8.8	80	50		
Grand total									160	100		

Data on Table 22 indicates that, of the 160 respondents, 30 (18.8%), above 20 (12.5%), and ten (6.3%), indicated that they sold at Tshs/kg for 228.00, 200.00, 147.00, and 126.00 from growing vegetables in peri-urban, medium-,high-,and low-density areas, respectively. For the price of Tshs/m^2, less than one half, 33 (20.6%) 32 (20%), few, 17 (10.6%), and 12 (7.5%) of the respondents reported to selling *Brassica carinata* at Tshs/m^2 for 2199.00, 974.00, 791.00, and 235.00 in peri-urban, high-, low-, and medium-density areas, respectively. In peri-urban areas vegetables prices were high perhaps due to good management hence producing quality vegetables. The p-value of the variables tested, indicates that there was no statistical significant differences at $p<0.101$ implying that, Tshs. /kg and Tshs. /m^2 prices did not vary.

Data on Table 22 shows that, of the 160 respondents, six (3.8%). few. four (2.5%), seven (4.4%), indicated that they sold Swiss chard at Tshs./kg for 767.00, 413.00,341.00, and 187.00 in peri-urban, high-, medium-, and low-density areas, respectively. For Tshs./m^2 six (43%), five (36%), four (2.5%), and three (1.9%) respondents indicated to selling Swiss chard at Tshs./m^2 for 3833.00, 2,119.00, 900.00, and 365.00 in peri-urban, high-, low-, and medium-density areas, respectively. In peri-urban and high-density areas, prices of Swiss chard were high due to high demand as Swiss chard seed were expensive. The p-value of the variables tested, indicated that, there was a statistical significant differences at $p< 0.087$ implying that, prices of Swiss chard per kg and price per m^2 varied in the four study areas.

Table 21: Vegetable prices in terms of Tshs/kg and Tshs/m² (n=160)

Name of vegetable	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
Brassica carinata/m² in Tshs												
791.00	2	1.3							2	1.3	102.482	0.001
235.00			32	20					32	20		
974.00					30	18.8			30	18.8		
2199.00							16	10	16	10		
Total count	2	1.3	32	20	30	18.8	16	10	80	100		
Brassica carinata/kg in Tshs												
126.00	20	12.5							20	12.5	105.395	0.001
200.00			20	12.5					20	12.5		
147.00					30	18.8			30	18.8		
228.00							10	6.3	10	6.3		
Total count	20	12.5	20	12.5	30	18.8	10	6.3	80	50		
Grand total									160	100		
Swiss chard/kg in Tshs												
187.00	7	4.4							7	4.4	55.375	0.138
341.00			4	2.5					4	2.5		
413.00					4	2.5			4	2.5		
767.00							6	3.8	6	3.8		
Total count	7	4.4	4	2.5	4	2.5	6	3.8	21	13.2		
Swiss chard/m² in Tshs												
900.00	4	2.5							4	2.5	15.206	0.087
365.00			5	3.1					5		3.1	
2 119.00					3	1.9			3	1.9		
3 833.00							6	3.8	6	3.8		
Total coun	4	00	5	36	3	21	6	43	11	11.3		

4.9.6 Revenues earned in each of the four study area

Data on Table 23 indicates that, of the 160 respondents, a quarter, 40 (25%) indicated that they got Tshs. 19 892.00, 4 308.00, 3 781.00, and 2 000.00 from growing vegetables in peri-urban, high-, medium-, and low-density areas, respectively. There was high revenue per plot in peri-urban because they had bigger plots 70-100m^2 and agricultural extension agents visited them. In low-density areas, revenue was low because they had smaller plot sizes (50-10m^2), and other options for their incomes. The p-value of the variables tested, indicates that, there was a statistical significant differences at $p< 0.053$ implying that, revenues varied in four study areas.

Table 22: Distribution of revenues per unit area (m^2) (n=160)

Revenue inTshs/m^2 Per square meter	L-density		M-density		H-density		P-urban		Total		X^2-value	P-value
	n	%	n	%	n	%	n	%	n	%		
200-2 000.00	40	25							40	25	48.000	0.053
181.00					20	12.5			20	12.5		
1 250.00			10	6.3					10	6.3		
724.00			10	6.3					10	6.3		
837.00			10	6.3	10	6.3			20	12.5		
970.00			10	6.3					10	6.3		
3 793.00							10	6.3	20	12.5		
3 938.00					10	6.3	10	6.3	10	6.3		
2 741.00							10	6.3	10	6.3		
19 892.00							10	6.3	10	6.3		
Total count 364730	**40**	**25**	**40**	**25**	**40**	**25**	**40**	**25**	**160**	**100**		

Data on Table 24 regarding revenue the coefficients t, Beta and F were indicated to be positive implying having relationship between the plot classification (Urban and peri-urban areas) and types of vegetables grown, thus showing an impact on the revenue. Negative coefficients on the other hand, indicate negative increase of probability to outcome of variables. This confirms the results obtained by the Chi-square on Table 23.

Table 23: Regression model showing relationship between revenue and plot classification

Variables	Coefficient	Standard error	Sum of of squares	Mean sq	T-test	F-Test	Sig.
Amaranthus	1.212	1.331	1.876	1.876	0.911	1.201	0.459
Chinese cabbage	1.792	1381	0.768	0.768	0.603	0.363	0.324
Brassica carinata	2.671	0.900	0.308	0.308	2.968	0.296	0.097
Swiss chard	2.303	1.277	0.094	0.094	1.8.4	0.038	0.213

4.9.7 Vegetables consumed in household and given free

Table 25 shows that, of the 160 respondents, indicated that, most 107 (77.3%) indicated that they consumed 1.0 kg of *Amaranthus* per day in their homes while five (4.5%) said that gave 2.0 kg of *Amaranthus* to friends and relatives. Of the 107 (77.3%) respondents, 36 (22.5%), 32 (20%), 27 (24.1%) and few, 12 (10.7%) reported that they lived in high-, medium-, low-density, and peri-urban areas respectively. For the five (4.5%) respondents, of these, few, four (3.6%) and one (0.9%) indicated that they lived in peri-urban and low-density respectively. The p-value of the variables tested, indicated that, there was a high statistical significant differences at $p \leq 0.01$ implying that, the amount of *Amaranthus* that respondents consumed at homes and gave away differed in the four study areas.

Further, data on Table 25 shows that of the 160 respondents, 100 (62.5%) and 37 (23.1) respondents indicated that they consumed 3.0 kg of Chinese cabbage in their homes and gave away 3.0 kg of Chinese cabbage to friends and relatives. Of the 100 (62.5%) respondents, it was indicated they were above one third, 32 (20%), 31 (19.4%), 21 (13.1%) and few, 16 (10%) indicated that they lived in high-, medium-, and low-density areas and peri-urban areas respectively. For the 37 (23.1%)

respondents, who indicated that they gave 3.0 kg of Chinese cabbage to friends and relatives. 21 (13.1) and 16 (10%) lived in peri-urban, and low-density areas, respectively. The p-values of the variables tested, indicate that, there was no statistical significant differences at $p< 0.384$ for Chinese cabbage consumed in the households. But there was a high statistical significant difference at $p\leq 0.01$ for Chinese cabbage given away implying that, amount of Chinese cabbage given away varied in the study areas.

Data on Table 25 indicates that, of the 160 respondents, 74 (46.3%) indicated that they consumed 1.5 kg of *Brassica carinata* in their homes while five (3.1%) who lived in low-density areas gave 2.5 kg of *Brassica carinata* to friends and relatives. For the 74 (46.3%) respondents, who indicated that consumed 1.5 kg 33 (20.6%), 25 (15.6%), 12 (7.5%), and four (2.5%) lived in high-, medium-, peri-urban and low-density areas, respectively. The p-values of the variables tested, indicated that, there was a high statistical significant differences at $p\leq 0.01$ for *Brassica carinata*, $p< 0.004$ for *Brassica carinata* given away. This implied that *Brassica carinata* consumed in homes and that one was given away varied in the four study areas.

Further, data on Table 25 shows that, of the 160 respondents, 40 (25%) and 23 (14.4%) indicated to consuming 1.0 kg of Swiss chard in their homes, and gave away to friends and relatives respectively. Of the 40 (25%) respondents, nine (5.6%), six (3.8%), five (3.1%), three (1.9%) who consumed 1.0 kg of Swiss chard lived in low-peri-urban, medium-, and low-density areas respectively. For the 23 (14.4%) respondents, who gave away 1kg of *Brassica carinata* nine (5.6%), six (3.8%), five

(3.1%), and three (1.9%) indicated that they lived in in low-, peri-urban, medium-and high-density areas, respectively. The p-value of the variables tested, indicates that, there were no statistical significant differences at p< 0.398 for Swiss chard consumed in the homes and that given away respectively (Table 25).

Table 24: Amount of vegetables consumed at home and given free (n=160)

Name of vegetable	Amount of vegetable In kg	L-density		M-density		H-density		Peri-urban		Total		X^2-Value	P-value
		n	%	n	%	n	%	n	%	n	%		
Amaranthus consumed	1	27	16.9	32	20	36	22.5	12	7.5	107	66.9	27.8	...
Amaranthus given free	3	1	0.6					4	2.5	5	4.5	27.9	0.0
Chinese cabbage consumed	3	28	17.5	32	20	32	20	16	10	108	67.5	3.8	0.3
Chinese cabbage given free	3	21	13.1					16	10	47	23.1	3.2	0.4
Brassica carinata consumed	1.5	4	2.5	25	15.6	33	20.6	12	7.5	74	46.2	17.7	0.0
Brassica carinata given free	3.5	5	3.1							5	6.8	19.2	0.0
Swiss chard consumed	1	9	5.6	5	3.1	3	1.06	6	3.8	23	13.56	.....	...
Swiss chard given free	1	9	5.6	5	3.1	3	1.06	6	3.8	23	13.56	4.0	0.4

4.9.8 Vegetable constraints

Data on table 26 shows that, of the 160 respondents, most 149 (94.8%) reported that the main problem of growing vegetables in their areas were insect pests, diseases, and lack of extension agents, 10 (5.4%) said it was accessing loans. Of the 149 (94.8%) respondents 40 (25%), 36 (23%), 34 (22.1%), and 32(20%) reported to living in high-, low-, medium-density areas and peri-urban areas, respectively. Of the

10 (5.4%) respondents, who had a problem of accessing loans six (3.2%), and four (2.4%) reported to living in the medium- and low-density areas, respectively. The p-value of the variables tested, indicates that, there was a statistical significant differences at p< 0.028 (Table 26). This implied that, problems of growing vegetables in four study areas differed significantly.

Table 25: Constraints of vegetable growing (n=160)

What are the problems	L-density n	%	M-density n	%	H-density n	%	P-urban n	%	Total n	%	X^2-value	P-value
Poor access to loan	4	2.4	6	3.2					11	5.4	9.096	0.028
Diseases, pests and lack of extension agents	36	23	34	22.1	40	25	32	20	152	95		
Total count	40	25	40	25	40	25	32	20	152	95		

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This chapter presents the conclusion and recommendations based on the findings of the study. The chapter is divided into two sections, conclusion and recommendations.

The study dealt with economic assessment of urban and peri-urban vegetable production in Mbeya Municipality (MM) Tanzania. It found out that, urban (low-, medium- high) and peri-urban vegetable growers differed in terms of their socio-economical characteristics, production characteristics, access to resources for production marketing channels. Generally, the study showed that, the peri-urban and high-density vegetable production areas were an important source of vegetables in Mbeya Municipality. Many high-density and peri-urban vegetable growers were dependant on vegetable production as a source of income by 22% and 24% of the respondents respectively. More over, the peri-urban vegetable growers indicated that, vegetable production had a significant contribution of 94.7% (*Amaranthus* 34.1%, Chinese cabbage 33.4%, *Brassica carinata* 27.2% and Swiss chard 27.2%) to their monthly household income than those in the urban areas.

On the other hand, low and medium-density vegetable growers, produced vegetables on small plot sizes mainly on the backyard more for house hold consumption. In both production areas, major source of vegetables, was from the markets, with the gardens being secondary sources. However, own grown vegetables provided some food to households and increased food security of families as well as permitting use of each income on other items other than purchase of vegetables. The study findings showed that, the most commonly grown and profitable vegetables were *Amaranthus*, Chinese cabbage, and Brassca carinata. In 2009 growing season, all respondents 160 (100%), grew *Amaranthus* and reported to had produced 17.4 metric tones of *Amaranthus* on an area of 2.4 ha with a monetary value of Tshs 3 629 266.00 (US $ 2419.5). All respondents 160 (100%) grew Chinese cabbage and produced 16.8 metric tones on an area of 2.1 ha with monetary value of Tshs 4 246 260 (US $2830.8). More over, the study findings showed that, all respondents, 160 (100%) grew *Brassica carinata* and produced 13.3 metric tones worth Tshs 2 308 930 (US $ 153.3) on an area of 2.4 ha. Further, respondents 32 (89%) grew Swiss chard and produced 7.4 metric tones worth Tshs 2 320 112 (US 1546.7) on an area of 0.8 ha. In general, the study findings indicated that, the total quantity of the four main vegetables produced, was 54.9 metric tones worth Tshs 12.5 million (US 8,333) on an area of 7.7 ha.

5.2 Recommendations

The following are recommendations based on the study results and conclusion from this study.

(i) Technically, extension agents should play a role to provide education to vegetable growers, particularly to vegetables with high gross margins per square meter such as *Amaranthus*, Chinese cabbage and *Brassica carinata*. This will help farmers to increase their production and ultimately diversify their incomes as vegetable production contributes significantly to household income and food security.

(ii) At the policy level, the government should provide credit to urban and peri-urban vegetable growers and also work out on an important strategy that can provide opportunities to those living in the high-density and peri-urban areas to access loans from different sources of finance institutions so as to enable them excel more than what they are doing now.

(iii) More research should be done in other areas so as to ascertain these findings and obtain reliable data on levels of production and total value of production.

5.3 Suggestions for Further Studies

It has been observed that, most of the urban and peri-urban vegetable growers did not keep records and therefore nothing was known in details about vegetable production. This led to a big problem of not finding recorded data during this study. For that matter, further longitudinal studies should be done right from the early stage of land preparation to marketing throughout the growing season to obtain the most profitable species of vegetables in urban and peri-urban areas in Tanzania towns.

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APPENDICES

Appendix 1: Questionnaire

Subject: Economic assessment of urban and peri-urban vegetable production in Mbeya Municipality.

General information

Interviewer's name ………………………………, Date of interview………………

Name of respondent……………………………

Questionnaire Number…………………………..

Location/village…………………………………

Ward……………………………………………..

Division…………………………………………..

1 Individual characteristics

1.1 What is your age?......................Years

1.2 Gender (Tick) 1=Female 2 =Male

1.3 Educational level of respondents.

1= Non formal education……………………

2= Attended adult education ………………

3= Secondary education……………………

4 = University…………………………………

1.4 Marital status

1= Married 2 = Single 3 = Widowed 4 = Divorced.

2.0 Household/production characteristics

2.1 How many people live in your household?

Household composition

Age group	Male	Female
Children < 5 years		
Children 5 – 18 years		
Adult 18-31 years		
Adult 32-45 years		
Adult 46-59 years		
60 and above		

2.3 School-going children-.........girls,-................ boys................

2.4 Plot area classification

1 = High density 2 = Medium density 3 = Low density 4 = Peri-urban

2.5 Area size of plot........................ (......x........) m^2

2.6 Main occupation

1 = Self employed 2 = Farming 3 = Unemployed 4 = Employed, 5=Do business, 6= keep house

2.7 What are your main source of income and means of livelihood?

1 = Food production 2 = Livestock production 3 = Vegetable cultivation

4 = Others (Specify)..................................

2.8 Type of livestock kept ....

2.9 Who in the household is primarily responsible for vegetable cultivation?

1 = Male 2 = Female 3 = Labor 4 = People staying with (mother, farther)

2.30 Do you own any land (tick) 1 = Yes 2 = No

2.31 If yes, what is the way of ownership? 1 = Purchased 2 = Rented 3 = Inherited

2.32 How big is the land you own?

2.33 If rented, how much do you pay per month during the production season?

2.34 How big is the land you lent.....................................

2.3 5.What percentage of your land is used for vegetable cultivation?

1 = 25 percent 2 = 50 percent 3 = 75 percent 4 = 100 percent

2.36 What is the contribution of food crops that are found on the area in terms of percentage?

Crop	%
....	....
....	....
....	....

2. 37 How long have you been gardening?

2.38 Mention the 4 main vegetable crops in order of importance that you commonly grow and for what purpose

Vegetable	Purpose of growing			How much do you get/day From selling vegetables
	Food	Cash	Both	

2.39 How many months do you grow vegetables in the year?

2.40 Name the vegetable crops that you grow in the rain season when do you plant?

....

....

....

....

....

....

....

....

....

2.41 Name the vegetable crops that you grow in the dry season when do you plant

....

....

....

....

....

2.42 Give reasons for growing them in the rain season

Crop reason

....

....

....

....

2.43 Give reasons for growing them in the dry season

Crop reason

....

....

....

....

2.44 Mention the space that vegetables cover in your garden

Type of vegetable Area covered (m^2)

....

....

....

....

2.45 Please estimate how much money you get per month from each of the 4 main vegetables you grow

Vegetables grown	Area Cultivated (m^2)	Yield Kg/m2	Amount Sold (kg)	Price/kg (Tshs)	Income (Tshs)

2.46 Mention the type of vegetables consumed at home and given free in the past two weeks

Vegetable	Amount consumed (kg)	Amount given Free (kg)	Cost (Tshs)

2.47 How many kg of vegetables/week that you grew yourself did you consume? = 1-3kg 2 = 4-6kg 3 = 7-9kg 4 = 10-12kg

2.48 What is the total amount of money spent on buying food/week?

2.49 What is the total amount of money spent on buying vegetables/week?

2.50 How much do you save per week by growing own vegetables?

2.51 Do you have any other activities besides vegetables that contribute to your incomes?

1 = Yes 2 = No

2.52 If yes, what are they... ....,

...................................., ...

2.53 What is the income of such activities?

Activities	Income
....	............................in Tshs
....	..............................in Tshs
....	...............................in Tshs

2.54 What other vegetables that you grow in the urban besides the 4 main vegetables

1.............................. . 2................................

3.................................4................................

2.55 What other vegetables do you grow in the peri-urban besides the 4 main vegetables?

1.............................. . 2.......................................

3 .... .4 ....

2.56 Please estimate the weekly income that you earn from growing vegetables versus other income generating

1. Activity	Tshs/week	Total annual income	Percentage of total household income
Vegetable production			
2. Other activities (specify)			

3.0 Money

3.1 Where did you get the first money to start growing vegetables garden?

1 = Crop sales 2 = Loan 3 = given by relatives 4 = Own sources 5 = Sold livestock 6 = Did business 7 = Others, specify

3.2 What is your main source of labor?

Source/ relationship	**Number**	**Type of work done**	**Cost/plot (Tshs)**
Family			
Relatives			
Neighbors			
Hired labor			
Other (specify)			

3.3 Did you get any loan for growing vegetable 1 = Yes 2 = No

3.4 If answered yes what was the source of loan you received...............from where.............

4.0 Do you use any input in your garden? (Such as inorganic or organic manure, fertilizers, seeds, insecticides/fungicides/herbicides).

1 = Yes 2 = No

4.1 If yes, mention input used, amount applied, cost of input and their sources

Type of input	Amount applied (kg/ltr) per plot	Value/cost (Tshs)	Source of inputs 1 = input from stockiest 2 = Government agency 3 = Others (specify)

4.2 What is the source of water for vegetable gardening?

Source (tick)	Distance (m)	When scarce & When abundant (month)	Amount applied (ltrs)	Cost of water Per ha (Tshs)
Tape water				
River				
Well				
Stream				

4.3 What is the status of soil fertility in your vegetable garden?

1 = Very fertile 2 = fertile 3 = moderately fertile 4 = not fertile

5. Supporting services

5.1 Where do you get information about vegetable gardening?

1 = Radio 2 = Newspaper 3 = Neighbors 4 = Relatives 5 = Friends

6 = leaflets 7 = Personal experience 8 = agriculture extension agents

5.2 Do agricultural extension agents visit you to give advice on growing vegetables production?

1 = Yes 2 = No

5.3 If, yes what is the frequency of contact with extension agents?

1 = Once per week 2 = 2-3 times per week

2 = 4-5 times per week 4 = More than 5 times per week

5.4 Have you attended any training in growing vegetables 1 = Yes 2 = No

5.5 What problems do you face in growing vegetables? Please rank them on the scale of 1 to 5, where 1 is the most serious and 5 is the least.

1.................................... 2....................................

3................................. 4......................................

5 ....

6.0 Marketing of vegetables

6.1 Where do you sell your vegetables?

1 = Production site 2 = Market place 3 = Hawking

2 = Work place 5 = Tender 6 = others (specify).........

6.2 In which form do you sell vegetables? 1 = dried vegetables 2 = fresh vegetables

6.3 How do you measure quantity of vegetables for sale? 1 = in kgs 2 = in bundles 3 = per square unit area

4 = in special local baskets

6.4 To whom do you sell your vegetables?

1 = Middlemen 2 = Local consumers 3 = Traders 4 = Neighbors

5 = at local market 6 = others, specify..............................

6.5 Do you have other places for marketing your vegetables outside MM 1 = Yes 2 = No

6.6 If yes, what are those places? Name...

6.7 Do you find difficulties in selling your vegetables? 1 = Yes 2 = No

6.8 If yes, Why?

1 = Market place is very far from home 2 = Lack of transport facilities

3 = Few customers 4 = Low demand

5= Low farm gate price 6 = others (specify),

6.9 What factors do you consider when deciding to sell your vegetables?

1 = Price offered 2 = Household cash needs 3 = Personal ties with middlemen

4 = Honesty of middlemen 5 = others (specify)........................

6.10 How do you determine the price?

1 = Quality 2 = Preferences 3 = Income of buyers 4 = Demand 5 = Season

6.11 Who mainly sells vegetables from the garden?

1 = Mother 2 = Father 3 = Children, 4 = Laborer, 5 = others (specify)..............

6.12 Do you organize marketing of vegetables with other producers? 1 = Yes 2 = No

6.13 What kind of transport do you use to carry vegetables to the markets?

1 = Own car 2 = Hired bicycle 3 = Own bicycle

4 = Public transport 5 = Head carry vegetables to the markets

6 = Hired laborers

6.14 What marketing costs do you incur when marketing vegetables?

1 = Storage cost 2 = Packaging cost 3 = Transportation cost

6.15 What problems do you face in marketing vegetable? Please rank them in the scale of

1 to 5, where 1 is the most serious and 5 is the least.

1 .... 2 .... 3 .... 4 .... 5 ....

6.16 Do you sell some of the vegetables/ as the processed products?

1 = Yes, 2 = No

6.17 If yes, what kind of a process that the vegetables undergo? 1 = Sun-drying 2 = Canning

6.18 What are the costs of vegetable production versus income (all costs are per m^2)

Table 1: Costs of vegetable production. Vegetable type 1(all costs are per m^2)

Amaranthus	Urban			Peri-urban
	Low-density	Medium-density	High-density	
1 The cost of land prepa				
2 Renting				
3 Use of organic fertiliz				
4 Use of FYM				
5 Seeds				
6 Spraying activities				
7 Fertilizer application				
8 Use of fungicides				
9 Weeding				
10 Watering				
11 Harvesting				
Transportation				

Table: 2 cost of vegetable production, vegetable type II (all costs are in terms of Tshs per square meter)

Variable	Urban			Peri-urban
	Low-density	Medium-density	High-density	
1 Cost of land preparatn				
2 Renting				
3 Use of organic fertiliz				
4 Use of FYM				
5 Use of fungicides				
6 Seeds				
7 Spraying activities				
8 Fertilizer application				
9 Weeding				
10 Watering				
11 Harvesting				
12 Transportation				

Table: 3 cost of vegetable production, vegetable type III (all costs are in terms of Tshs per square meter)

Variable	Urban			Peri-uban
	Low-density	Medium-density	High-density	
1 Cost of land prepar.				
2 Renting				
3 Use of organic fertiliz.				
4 Use of FYM				
5 Use of fungicides				
6 Seeds				
7 Spraying activities				
8 Fertilizer application				
9 Weeding				
10 Watering				
11 Harvesting				
12 Transportation				

Table: 4 costs of vegetable production, vegetable type IV (all costs are in terms of Tshs per square meter)

Variable	Urban			Peri-urban
	Low-density	Medium-density	High-density	
1 Costs of land prepar.				
2 Renting				
3 Use of organic fertiliz.				
4 Use of FYM				
5 Use of fungicides				
6 Seeds				
7 Spraying activities				
8 Fertilizer application				
9 Weeding				
10 Watering				
11.Harvesting				
12 Transportation				

6.19 What are incomes obtained from different vegetables that respondents grow in urban and peri-urban areas either seasonally or on weekly basis

INCOMES OF DIFFERENT VEGETABLES FROM URBAN AND PERI-URBAN AREAS				
AREAS ON WHICH VEGETABLES ARE GROWN	VEGETABLE TYPE 1 (Tshs)	VEGETABLE TYPE 2 (Tshs)	VEGETABLE TYPE 3 (Tshs)	VEGETABLE TYPE 4 (Tshs)
1.Low density	……………	……………….	…………	…………….
2.Medium density	……………	……………….	…………….	…………….
3.High density	……………	……………….	…………….	………………
4.Peri-urb	……………	……………….	…………….	……………

Appendix 2: Distribution of revenues, gross margins, locations, acreages and costs

Total area, cost of production, Revenue and Gross-margin are computed per unit area	Low density	Medium density	High density	Peri urban	Total	
Amaranths						
Area covered (m^2)	3896	5325	11375	3300	23896	2.4 ha
Cost of production/m^2 inTsh	40.00	280.00	214.00	838.00	1372.00	
Revenue in Tsh per sq.m	450.00	2741.00	724.00	3938.2	7853.20	
Gross margin inTsh	410.00	2461.00	509.00	3100.5	6480.00	
Chinese cabbage						
Area covered	3,218	6,050	12,250	11,333	32851	2.1 ha
Gross marginTsh	168.00	696.00	944.00	3055.00	4863.00	
Cost of production in Tsh	32.00	274.00	121.00	234.00	661.00	
Revenue Tsh	200.00	970.00	1066.00	3290.00	5526.00	
Brasca carinata						
Area covered	900	2,981.00	12,495	7,500	23876	2.4 ha
Cost of production in Tsh	104.00	174.00	109.00	306.00	693.00	
RevenueTsh	450.00	1080.00	181.00	3,793.00	5506.00	
Gross marginTsh	346.00	362.00	72.00	776.00	1556.00	
Swiss chard						
Area covered	1,332	120.00	2,150	4,600	8202	0.8 ha
Cost of production in Tsh	64.00	337.00	235.00	337.00	1237.00	
Revenue Tsh	837.00	1250.00	1049.00	9420.00	4078.00	
Gross margin	773.00	600.00	814.00	912.00	3099.00	

Appendix 3: Showing Alpha cronbach values with computed standard deviation and variance $1 - (\sum \sigma y^2/\sigma x^2)$ = Alpha cronbach coefficient

QUESTIONS/RESPONDENTS	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	TOTAL	STD. DV	VAR.
Q3	5	5	5	5	5	5	5	5	5	3	48	1.99	1.89
Q4	1	1	1	1	1	1	1	1	1	2	11		
Q8	1	1	1	1	1	1	1	1	1	1	10		
Q11	3	3	1	3	3	3	3	3	3	3	28		
Q13	2	1	1	2	2	2	1	4	1	1	17		
Q14	2	1	2	1	1	1	1	1	1	1	13		
Q29	1	1	1	1	1	1	1	1	1	1	10		
Q33	2	2	1	2	2	2	1	1	1	1	15		
Q39	4	2	4	3	3	4	4	5	4	2	35		
Q46	2	2	2	2	2	2	2	2	2	2	20		
Q47	7	7	7	7	7	7	7	7	7	7	70		
TOTAL	30	26	26	28	28	29	27	31	27	25	277		
STANDARD DEVIATION	1.9	1.92	2.1	1.92	1.92	1.96	2.07	2.14	2.07	1.74	=	1.9 Y^2	
VARIANCE	1.8	1.8	19	1.8	1.8	1.8	1.8	1.9	2.0	1.9	=	18.8 X^2	