

**SOCIO-ECONOMIC ASSESSMENT OF AGRICULTURAL
COMMERCIALISATION OF INDIGENEOUS AFRICAN VEGETABLES:
A CASE STUDY OF AFRICAN EGGPLANT IN ARUMERU DISTRICT**

BY

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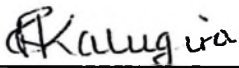
ABSTRACT

A study aimed at assessing the socio-economic impact of household's participation in commercialization African eggplant (*solanum aethiopicum*) was carried out in four villages in Arumeru district in Tanzania. The study determined the existing extent of commercialization of African eggplant by households, determined and compared at different levels of commercialization the household members' time allocation, income levels and ownership by gender, as well as land resource allocation for different crops. Data were collected by structured questionnaire for individual farmers supplemented by interview checklists for focus group. SPSS computer programme was used for data analysis. The results showed that: African eggplant growers had significantly higher extents commercialization than non-growers. Time spent by household's members, income levels and women's control of income was also higher in African eggplant growers. The average land allocation for food crops was 0.76 hectares and 0.70 hectares for African eggplant growers and non-growers respectively which is insignificantly different between the two farmers' categories. Time in hours per day spent by family members for African eggplant growers was 7.64 while for non-growers was 5.2. Moreover, total annual income in Tanzanian shillings (TShs) of African eggplant growers was 2 449 617 compared to 2 030 767 for non-growers. In case of women's control of income, there was a slight difference between the two categories in which for African eggplant growers decision making by both husband and wife was higher. The following policy implications have been raised: Commercialization of African eggplant should be enhanced notably through improving technologies. Participation of women should be safeguarded by increased access of women to credit for the short term financing of

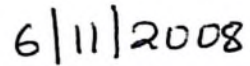
cash crop productive inputs. Acquiring land for production of African eggplant through renting instead of using land which has been used for production of food crops should be maintained.

DECLARATION

I, Editha Kalugira, do hereby declare to the senate of Sokoine University of Agriculture that, this dissertation is my own original work and it has not been submitted or concurrently being submitted for a higher degree award in any other University.

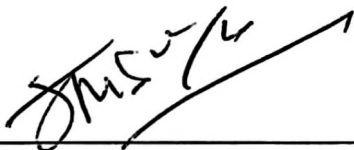


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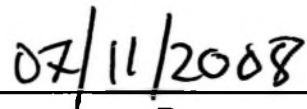


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The above declaration is confirmed



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I am grateful to my father Mr.Gerald Kalugira and my late mother Mrs Eva Kalugira who invested the little they had in my education. I know a good number of friends who were academically excellent but were never sent to school. What can I give in turn that equals to your investment? Absolutely none! Just with a lot of your love, accept my thanks that come from the bottom of my heart.

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DEDICATION

This work is dedicated to: The almighty God for his faithful guidance throughout my life, my family of Mr. G. Rugabera, my parents, my brothers and sisters and friends for their material and moral support. I pray and trust that our almighty God shall bless them.

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LIST OF ABBREVIATIONS AND SYMBOLS

ASDS	Agricultural Sector Development Strategy
AVRDC-RCA	Asian Vegetables Research Development Center-Regional Center for Africa
CIA	Central Intelligence Agency
GTZ	Germany Technical Cooperation
Kg	Amounts in kilograms
NBS	National Bureau of Statistics
NPES	National Poverty Eradication Strategy
PRSP	Poverty Reduction Strategy Paper
SPSS	Statistical Package for Social Sciences
Sq. kms	Square kilometers
TAS	Tanzanian Assistance Strategy
TDV	Tanzanian Development Vision
TShs	Tanzanian Shillings
URT	United Republic of Tanzania
USCAPP	Uganda Soil Conservation and Afforestation Pilot Project

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Agriculture continues to be the backbone of the Tanzanian economy, presently accounting for about half of the national income, three quarters of merchandise export, and is a source of livelihood for about 80% of Tanzanians. The relatively large size of the sector makes the overall growth performance in the economy and improvement in the living standard of the people highly dependent on what happens in it. The progress in poverty reduction likewise is highly dependent on the growth of this sector due to the fact that the incidence and severity of poverty is twice as high in rural areas as in urban areas (Kashuliza *et al.*, 2002).

According to the World Bank (1994), the urban incomes are 2 to 3 times greater than rural incomes, and rural households lag behind urban households in the indicators of the standard of living. The lives of the majority could be expected to improve significantly with substantial investment in agriculture since this sector's size and its prominence for poverty reduction in the country makes it a focal point for development.

According to Debello (2007), horticultural products may stabilize export income at macro economic level and therefore it is worthwhile to explore the possibilities for growth of this sector. Vegetable farming has had a rapid expansion over the last few years since the country started its transition into a market economy. This has been accompanied by a remarkable change in agriculture from traditional and largely

subsistence vegetable cultivation towards commercial production for urban sale and export. One of the most important emerging commercial vegetable growing areas in Tanzania is Arumeru district (Nyange, 1993), which is the focus of this study.

In order to stimulate the process of commercialized sustained vegetable production in Arumeru district, the Tanzania government and non-governmental organizations such as the Asian Vegetable Research and Development Center-Regional Center for Africa (AVRDC-RCA) among other initiatives are supporting production of African egg plant (*Solanum aethiopicum*) in order to promote it as an alternative cash crop. This initiative is in line with the Tanzania policy framework for poverty reduction strategies as defined in the Tanzanian Development Vision (TDV) to 2025, the National Poverty Eradication Strategy (NPES), the Poverty Reduction Strategy Paper (PRSP), the Agricultural Sector Development Strategy (ASDS) and the Tanzania Assistance Strategy (TAS).

1.2 Problem statement and justification

Vegetable crops, unlike traditional cash crops such as coffee, tea or cotton, give immediate returns mainly two or three months from the time of planting. Farmers therefore prefer these to traditional cash crops, which take too long to mature (Verheij, 1982). On the other hand, vegetables grow virtually in any ecological environment in Tanzania. Therefore, there are lots of potentials for Tanzanian small holder farmers to enter into this industry.

In 2002, the AVRDC-RCA started promoting neglected indigenous vegetables in Tanzania (AVRDC-RCA, 2005). Under this programme, production of African egg

plant has been promoted aiming at improving productivity, household income and reducing poverty. Arumeru district is among the districts that have taken up this crop intensively.

A lot of research has been done in many aspects of vegetable production like economics of vegetable marketing in Arumeru by Nyange (1993) and AVRDC's experiences with marketing of indigenous vegetables by Chadha (2003). However, not much has been documented on the socio-economic impact of agricultural commercialization of indigenous vegetables at household level (Marshall *et al.*, 1996). This study is therefore an attempt to assess the socio economic impact of household's participation in growing African eggplant. The study has determined the existing extents of commercialization of the crop and related it with time allocation by household members, distribution of the resulting income by gender and land resource allocation for various crops. The study has also attempted to establish income levels resulting from growing African egg plant. The assessment is likely to be useful in identifying the challenges, opportunities, lessons and achievements of agricultural commercialization of African indigenous vegetables. Such an understanding is likely to result into better policy making for alleviating poverty in the area, and for the rural poor in general.

1.3 Objectives

1.3.1 General objective

The general objective of the study is to assess the socio-economic impact of commercializing African eggplant. The study has also sought to understand the policy implications of agricultural commercialization of indigenous African

vegetables in areas where people are increasingly shifting away from traditional cash crops such as coffee into non-traditional cash crops.

1.3.2 Specific objectives

The specific objectives of the study are:

1. To determine and characterize the existing extents of commercialization of African eggplant by households in Arumeru district.
2. To determine and compare the household members' time allocation at different levels of commercialization of African eggplant.
3. To determine and compare the income levels and their control by gender at different levels of commercialization of African eggplant.
4. To determine and compare land resource allocation for different crops at different levels of commercialization of African eggplant.
5. To make comparisons in household members time allocation, income levels & their control, and land resource allocation between the African eggplant growers and non-growers.

1.3.3 Research questions

The following research questions were used to guide the present study:

- What is the extent to which African eggplant has been commercialized in the households in Arumeru District?
- What is the proportion of time spent by men, women and children on the African eggplant activities?
- Who owns and controls the household income resulting from selling of African eggplant?

- What is the proportion of land that is allocated for African eggplant? And what are the implications to production of other key crops such as staple food crops?
- Is there any difference between the African eggplant growers and non-growers in terms of household members' time allocation, income levels & control and land resources allocation?

1.4 Conceptual framework and definitions of key concepts

1.4.1 Extent of commercialization

Commercialization of subsistence agriculture can take many different forms (Fig. 1). It can occur on the output side of production with increased market surplus and increased productivity and production levels. This is normally accompanied with changing technology such as the use of machinery, irrigation and improved seeds. It can also occur on the input side with increased use of purchased inputs such as fertilizers, chemicals, other agricultural inputs and hired labour. Most often these forms of commercialization occur simultaneously. Commercialization is not restricted to just cash crops. The so called traditional food crops are frequently marketed to a considerable extent and therefore qualify for commercialization (von Braun and Kennedy, 1994).

1.4.2 Social economic impact

So far the major concern of government and donor institutions has been economic growth in terms of physical output and earnings of this new crop. There has been very little attempt in the area to assess the short and long term comparative

advantage of commercialization of African eggplant vis a vis households welfare and resource management. So this study attempts to fill the gap by focusing on how commercialization of African egg plant has impacted the lives of people in Arumeru district in terms of household land resource allocation, income control by gender and time allocation.

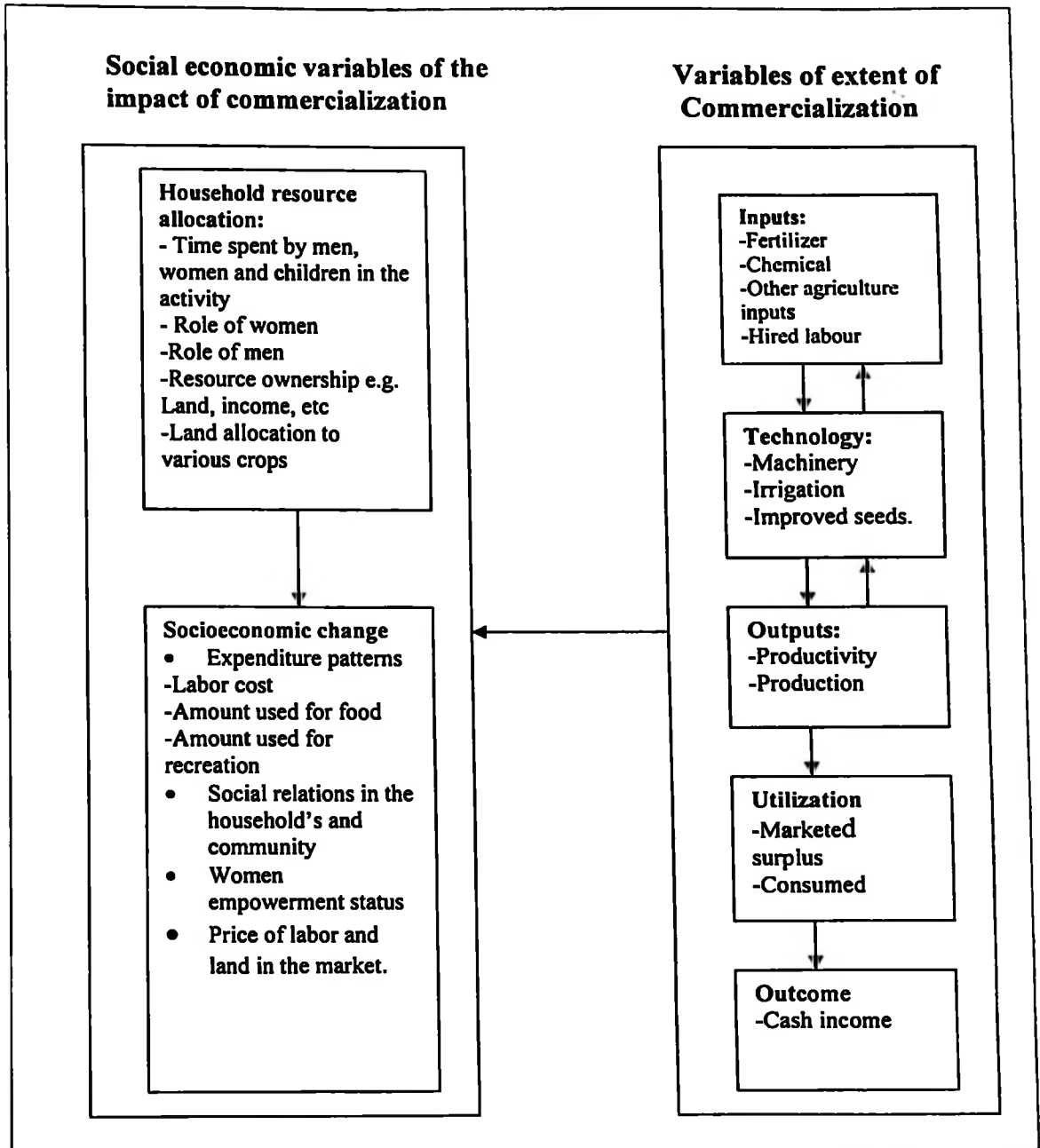


Figure 1: Conceptual frame-work on assessing socio-economic impact of agricultural commercialization

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 General view of agricultural commercialization

According to Pingali (1997), the commercialisation of agriculture is characterised by greater market orientation of agricultural production, including a greater reliance on purchased food products. There is also a progressive substitution out of non-tradable inputs in favour of purchased inputs (including fodder, power traction and chemical fertilisers) and the gradual decline of integrated (e.g. crop-livestock) production systems and their replacement by specialised enterprises for crop, livestock and aquaculture products.

To continue getting yield increase in crop production requires sustained technical expertise to identify appropriate technologies and adapt them to local environmental conditions (Pingali, 1997). However, for many households, sustaining a rising level of income will require diversification into new enterprises, the requisite skills for which have to be learnt. On the other hand, given the requirements of a particular technology, household labour is also required to manage and supervise the input of non-farm members. However, the importance of knowledge acquisition and of “learning by doing” is not just on the production side. As commercialisation proceeds, it follows that more time is spent in market transactions, identifying and procuring inputs and keeping up with changing trends, tastes and opportunities in output markets (Pingali, 1997).

The optimistic view is that agriculture commercialization creates employment, increases productivity, reduces rural poverty, generates household income and causes

rapid agricultural growth. Therefore, it increases food availability and affordability, and thereby leading to an improvement in the health and nutritional status of the population (von Broun and Kennedy, 1994). However, as noted by von Braun and Kennedy (1994), technological change or commercialization of subsistence agriculture can reduce food security at the household or community level. They also argued that commercialization may also limit women's access to resources and control over household income, and may increase their workload. The impact of commercialization on food availability also depends on whether the crop is a food or a non-food crop e.g. market oriented food production like vegetables, fruits, potatoes and improved cereals can directly improve household level food availability (Sharma, 1999). The cash income obtained from selling these products can also increase the farmer's ability to acquire additional food for the family.

According to Goulven *et al.* (1999), intensification and commercialization of non-traditional cash crops may increase the crop but at the expense of food crops self sufficiency. Given these trends, benefits from commercialization of non-traditional cash crops may be offset by reduced production of food crops. It is interesting to note that new technology in agriculture brings in more male labor and thus makes it more a men's crop at the same time. The share of men in total family labor is lower for the smallest farm sizes (von Braun *et al.*, 1991). This pattern of a decreasing women's share in agricultural family labor with rising farm size is found in many developing countries, however, the relative decrease goes along with an absolute increase in women's agricultural work in many cases (von Braun *et al.*, 1991).

But, commercialization of non-traditional cash crops may not be successful due to a number of constraints within production, collection, processing, storage, transport, marketing and sale (Marshall *et al.*, 1996). The authors suggest a need to analyze the ecological, socio-economic and cultural factors that determine the success of commercialization of non-traditional cash crops. Such analysis could enable those at high risk of failure to be identified before major investment decisions are made. For this study, parameters of commercialization will be in terms of changing in inputs and technology use, total production, production per unit area, utilization of products and cash obtained from the crop. This approach was also used by von Braun and Kennedy (1994).

2.2 Review of factors influencing agricultural commercialization

Commercialisation of a crop can be influenced by the increased demand. For example, commercialisation of wild edible fungi in developing countries such as Zimbabwe, Malawi and Turkey was influenced by the strong local demand and increased demand in Eastern Europe, Turkey and Mexico (Boa, 2004). In the case of African eggplant in Arumeru, the commercialisation has been influenced by urbanisation which had drawn communities from rural areas to urban areas where urban farming is not practiced to any significant extent (Chadha, 2003). People from the rural areas have therefore made use of the opportunity to sell their African eggplant in the cities (Chadha, 2003).

2.3 Effects of agricultural commercialization on the community and household

2.3.1 Effects on household members' time allocation

According to von Braun *et al.* (1991) preferences in the allocation of household's income for health care and nutrition depend on gender and age. It is quite conceivable that commercialization may affect the situation of various family members differently, depending on how it changes the allocation of time, responsibilities and control over income within a household. Increasing the productivity of farm work causes an upward shift of the overall production function.

It motivates extended on-farm work and reduced off-farm work. According to the above mentioned authors, time allocated to home production is not affected unless the improved technology can also be applied on home gardens explicitly reserved for home production.

In Rwanda, the share of women's labour was higher than for men in all activities (von Braun *et al.*, 1991). Men's participation was important for soil preparation and harvest activities, while planting and weeding were predominantly tasks of women. The only exception to this was in potatoes after commercialization of the crop and, to a lesser extent, sorghum, where men contributed considerably to the family labor input for planting and weeding activities. Application of fungicides to control late blight in potatoes was exclusively done by men, but women transported water to the field (von Braun *et al.*, 1991).

With commercialization of rice in West Africa, seasonal work pattern by men and women showed strikingly different tendencies. Men's total work in agriculture

decreased from 77% to 55% of available time while women's total work increased slightly (Weil, 1973). This may imply more leisure for men or increased non-farm work, which apparently was not shared with women (Weil, 1973). Reassignment of rice as a commercial crop in the Gambia led to an increase in the burden of communal agricultural work for both women and men but relatively more for women (von Braun *et al.*, 1989). According to Akinnifesi *et al.* (2006), family labour demands have increased two to three times in Zambia after commercialization of wild fruits.

2.3.2 Effects on household income distribution by gender

According to Folbre (1986), considerable attention has been focused on the issue of intrahousehold resources distribution in recent years following a growing recognition that neither poverty nor development interventions affect all members of household uniformly. There is a practical concern that project and policy initiatives that raise overall household incomes may at the same time be the cause of shifts of patterns of intra-household resource allocation that results in a negative effect on certain individuals (Haaga and Mason, 1987). This concern relates primarily to the differential effect of changes on women versus men, and on different age groups within the household (Due, 1987).

Before the introduction of new rice technology in the Gambia, rice production was the activity of women but now the activity is controlled by men (von Braun *et al.*, 1989). That is, men are the ones who are controlling activities in the field, assessing how much rice to sell or store, deciding in whose store to keep the rice and

determining the quantity of rice to be used for cooking each day. Because the new rice production is commercial, women automatically have a reduced say in its production and disposal. Thus for those families where men do not pay women for their work in the field, women have suffered an absolute increase in work and a decline in independent income. Also women's control over rice fields in the Gambia declined as the yield (technology) levels increased in the rice production (von Braun *et al.*, 1989).

Kennedy and Cogill (1987) argued that incomes of the farmers participating in the sugarcane production in Kenya were significantly higher than those of non sugar growers and most of the difference in income came from marketed agricultural surplus. Given that total household income was higher for sugar producers, women from sugar growing households controlled a higher absolute amount of income than women from non-sugar producing households.

Studies in Ethiopia indicate that women in households with commercialized cross-bred cows maintained control over income (Shapiro *et al.*, 1998), although other studies in the area have reported that as cash crops are introduced in small holder production systems, with integration into the market, women may lose control over cash income to men (Shapiro *et al.*, 1998). According to Gumbo *et al.* (1990), commercialization of wild fruits helped women to control income in Zimbabwe. Women are often responsible for the sale of exotic fruits but they do not control the money this activity generates. They do, however, control money they receive from selling wild fruits.

Studies of commercialization of *Marula* fruit in South Africa show that there is an increase in the active involvement of local women in the collection and processing of the fruit and in the sale of its by-products (Nwonwu, 2006). This is a major achievement in the empowerment of women and gender equality struggle in a traditional society that is overly patriarchal. It is however feared that the rising scale of commercialization might, in future, limit the access that women currently enjoy in the *Marula* based industry (Nwonwu, 2006). In Uganda, according to Kimaru and Jama (2005), USCAPP banana farms had previously been managed by women who provided most of the labor. Men only came in for heavy duty works such as uprooting old banana stools. Women also did most of the marketing and decided how to use money earned from sale of surplus bananas. The dramatic change in the banana yields and a corresponding increase in income led men to be attracted to work on the farms and started to take part in managing production and sales (Kimaru and Jama, 2005).

2.3.3 Effects on the land resource allocation

Much of the sugarcane grown in Kenya is grown on plots of land that have historically been planted with maize (Kennedy and Cogill, 1987). The proportion of land under food crops is substantially less for sugarcane farmers than for non-sugarcane farmers, but the decline in the proportion of land allocated to food crops by sugarcane farmers has not affected household food security. Food production has been maintained because of the larger amount of farmland held by sugarcane farmers. Furthermore, non-sugarcane farmers grow significantly more sorghum, millet and cassava. These crops are associated with more traditional diets in the

region (Kennedy and Cogill, 1987). Total land area cultivated for new rice fields in the Gambia after commercialization of the crop expanded by 6% between 1983 and 1985 while the area under all other crops dropped by 8% (von Braun *et al.*, 1989). In Philippine, Bouis and Haddad (1990) reported that a substantial number of households converted land from maize to sugarcane production after commercialization of sugar cane. The main effect of the introduction of export cropping in this area was a significant deterioration in access to land by small holder maize tenants. This is because small holder farmers were consolidated into large sugarcane farms whereby hired labour was primarily used.

In Rwanda the commercialization of tea in Rubaya area took place mainly by clearing and planting of formerly uncultivated parts of the Gishwait forests and was not detrimental to food crop production, also there seems to be a tendency towards increasing acreages and yields of potatoes in the area (von Braun *et al.*, 1991). Also potato demand encouraged farmers from distant regions in the surrounding communes to cultivate potato plots in the forest. Some of the plots were acquired through temporary leases from the reforestation project while others were occupied informally (von Braun *et al.*, 1991).

Bhaskaran (2002) noted that commercialization of Asian traditional food created substantial demand for Asian food in Australia. As a result, there was increased conversion of farm land from other uses into production of the commercialized crops. In Ghana, the main effect of the introduction of export crops such as pineapples, pawpaw, banana and mangoes was the significant deterioration in access

to land as small holder food crop farms were consolidated into larger scale export crop farms (Afari, 2003). Coupled with this dilemma was the increased pressure on arable land for human settlement resulting from population growth (Afari, 2003). For some cash crops, there is interdependence between the share of land allocated to a given crop and the share of the specific crop harvest sold at a farm gate implying that institutional arrangements influence household crop choices and the level of commercialization (Debello, 2007).

In Nigeria, after commercialization of vegetables there was no great change in crops planted because the land for vegetables was acquired mainly by hiring, purchasing and inheritance (Pasquini *et al.*, 2004). According to High and Shackleton (2005), commercialization of wild plants in South Africa created competition of land with the main crops planted in arable land and home gardens.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

This chapter shows the methodology that was used in the study. It includes the description of the study area, which encompasses the geographic characteristics, population and the economic situation. Otherwise the chapter addresses the research design, data collection techniques, measurement of variables, data processing and analysis.

3.1 Description of the study area, justification for its selection and description of African eggplant

3.1.1 Arumeru District

The study was conducted in Arumeru district. Arumeru is one of the five districts in the Arusha region located to the east of Arusha town at 03^o 24'S latitude and 36^o 47' E longitude. The region and district maps (Figures 2 and 3) show the location of the study area. The total area of the district is approximately 2 966 sq. kms which is only 3% of the total area of the region. Arumeru district has a population of 514 651 (URT, 2005) accounting for 39.97% of the regional total.

The district has six administrative divisions which are divided into 37 wards and 137 villages. Arumeru district consists of four agro-ecological zones. Firstly, the highland area that is 2000 to 3000m above sea level characterized by coffee/banana inter-cropping. This zone is located on the southern and south eastern part of the district. Secondly, the medium land area (1500 to 2000m) found on the western and south-western side of the district. Thirdly, Arumeru also includes some areas situated at

high altitudes on the northern and north eastern parts of the Meru Mountain which have a more erratic rainfall pattern. This area is characterized by banana/coffee inter-cropping, maize/bean inter-cropping and semi intensive livestock keeping. Fourthly, the low land area (800 to 1500m) where African eggplants are commercially grown. The area stretches towards the south and western parts of the district and is characterized by flat and to some extent undulating plains (URT, 2000).

Over 90% of the people are involved in crop and livestock production. The mean annual rainfall of Arumeru district is 500 to 1400mm depending on the elevation. The district was chosen for the study because is among the areas where commercialization of African egg plant has been promoted and people are shifting from the traditional cash crop (coffee) to this non non-traditional cash crop (African egg plant). This has provided opportunity to investigate the socio-economic impact of commercializing this new crop.

3.1.2 African eggplant

The African eggplant (*solanum aethiopicum*) is a vegetable widely produced in Africa. The production of this crop is expanding because of its economic and nutritional importance (Chadha and Oluoch, 2003). The crop is also known as garden eggs, *ngogwe* or *nyanya-chungu*. The crop grows well in the warm and humid conditions found throughout the savannah belt of West and East Africa. The optimal temperature for the crop is 23 to 25⁰C during day and 18 to 25⁰C during nights. It can grow on a wide range of well drained soils. The optimum pH of the soil is between 5.5 and 6.8 (Chadha and Oluoch, 2003). The crop is fast maturing and yet can be

harvested over a period of time, so it yields both quick results and extended ones. In many parts of Africa there is considerable scope for producing much better quantity. It also has notable market potential and could become the cornerstone of localized rural economic development. There is even potential for exporting African eggplant to Europe and North America to earn some foreign currency (National Research Council, 2006).

3.2 Research design

This study was a cross sectional survey, which enabled the researcher to collect data at a single point in time. This design was the most appropriate because it is cost effective and less time consuming (Babbie, 1990). The design was adopted in order to get quantitative information and according to Babbie (1990) and Bailey (1998), this method is suitable for a descriptive study as well as for the determination of relationship between and among variables at a particular point in time.

TANZANIA ADMINISTRATIVE MAP

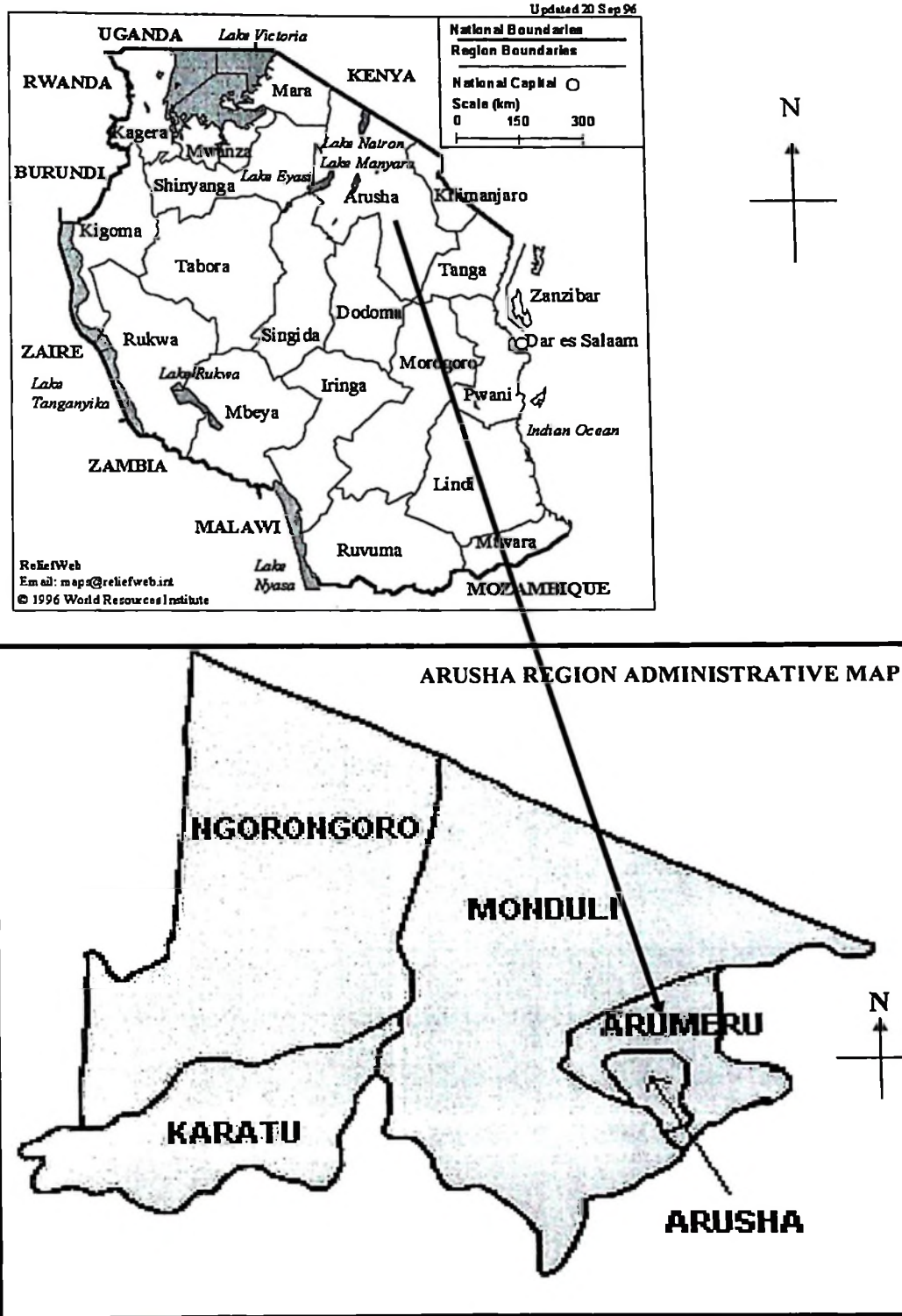


Figure 2: Map of Tanzania showing the study area (Arumeru district)

Source: Adopted and modified from CIA (2007).

3.3 Data collection

3.3.1 Data sources

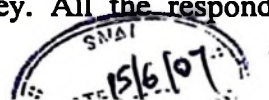
Both primary and secondary data were used in this study. However, the study mainly used primary data, which were collected by interviews and focus group discussions from farmers in the sampled villages. Secondary data were only used to supplement primary data. Secondary data sources included both published and unpublished relevant documents from the Internet, AVRDC-RCA and Agricultural Department of Arumeru district.

3.3.2 Reconnaissance survey

Reconnaissance survey was conducted so as to assess the general structure of the research area. The aim was to get the preliminary picture of the study area. This involved meeting with local influential people, village leaders, village agricultural field officers and to estimate the number of households to be sampled in each location of the selected villages.

3.3.3 Household survey

A structured questionnaire was used to collect data from individual households whereby both open-ended and closed-ended questions were designed to solicit information from respondents (Appendix 1). The questionnaire was pre-tested on ten respondents in one of the villages so that the validity and reliability of the questionnaire items were checked and necessary modifications were made to suit the prevailing local circumstances. The pre-test respondents had similar characteristics as the respondents included in the main survey. All the respondents who were



involved in the pre-testing were excluded from the sample. Face to face interview was used in administering the questionnaire.

3.3.4 Sampling procedure and sample size for interview

The sampling frame of the study was the list of individual households from the villages in which the AVRDC-RCA Programme has been promoting production of African egg plant in Arumeru District. In order to obtain the desired population sample, simple random sampling was used to obtain four villages out of eight which have been working closely with the AVRDC-RCA Programme. Through the list of households obtained from the village executive office in each village, 30 households were randomly selected. A sample size of not less than 100 respondents is recommended by researchers for small case studies involving household surveys by allowing thorough data collection and statistical analysis of the results (Bailey,1998).

Therefore a total of 120 households were sampled out of 1 316 households for the analysis which was about 9% of the total households in the sampled four villages. Manyika (2000) suggested that for a sample to be a representative of the population, a random sample should not be less than 5% of the total population under study. Based on this criterion, a sampling intensity of 9% gave a good representation. The sampled villages and the total number of households in each in brackets included Nambala (379 households), Maweni (160 households), Karangai (327 households) and Manyire (450 households).

3.3.5 Stratification

The study used a 'with and without' impact assessment procedure. Stratification was done for the purpose of obtaining two distinguished categories of farmers, namely (i) African egg plant growers, and (ii) Non-growers of African egg plant. Stratification into two categories were based on the number one ranked cash crop that a household mentioned as the main cash crop. Those which mentioned growing African egg plant to be the number one cash crop were categorized as African egg plant growers and farmers who ranked other crops like maize, beans and tomato as their number one cash crop were categorized as non-growers of African egg plant.

3.3.6 Focus group discussion

This technique was useful for supplementing information obtained from the questionnaire survey. Through use of checklists (Appendix 2) the researcher had a chance to obtain general information from villagers which revealed more on the project's impact in relation to their social and economic life. In each of the four villages sampled, eight to ten individuals were included in each category of farmers' i.e. African eggplant growers and non-growers. Members of the focus group discussions were carefully selected to include both men and women, community leaders and from varying socio-economic and age groups.

3.4 Measuring the extent of commercialisation

Various parameters of measuring the extents of commercialisation were employed in this study. They included income obtained from African eggplant per year, proportion of the total household income obtained from African eggplant per year,

total households income per year, productivity (production per unit area), amount in kilograms harvested, proportion of the amount sold, amounts of inputs used, number of technologies as well as number of inputs plus technologies used by farmers. The categorization of technologies distinguished tractor, plough, spraying machines, improved seeds, composite manure and irrigation. On the other hand, hired labour, pesticide (chemical), fertilizer (chemical) were the inputs. Input and technology were combined to create a new parameter of extent of commercialization which was named inputs plus technologies.

In each parameter, extent of commercialisation was categorised into three levels i.e. low, moderate and high extents according to specified criteria which were set for the purpose of this study. Categories of extent of commercialization in this study are shown in Table 1.

3.5 Data processing, analysis and presentation

Data from the questionnaires was analyzed statistically using Statistical Packages for Social Sciences (SPSS) computer programme. The collected data was first coded into meaningful computer numbers/codes to assist in the analysis. The analysis included determining descriptive statistics such as percentages, means and frequencies. Chi-square stastic through cross tabulation was used to determine the relationship between categorical variables. Correlation analysis was used to test for relationships in socio-economic variables and different parameters of extent of commercialization of African eggplant. T-test was used to test for mean differences between African eggplant growers and non-growers with regard to time spent by household's members, land resource allocation and income levels and ownership by gender.

Table 1: Categories of extents of commercialization of African eggplant

Parameter of extent of commercialization	Extents	Categorization
1. Income/Year		
(a) Income from African eggplant (TShs)	Low	Less than 1,400,000
	Moderate	1 400 001-2 500 000
	High	Above 2 500 000
(b) Proportion (%) of total income from African eggplant	Low	30-60
	Moderate	60.1-75.0
	High	75.1-100.0
(c) Total household income(TShs)	Low	Less than 1 900 000
	Moderate	1 900 000-3 100 000
	High	Above 3 100 000
2. Amount of African eggplant in kg harvested		
	Low	Less than 18 500
	Moderate	18 500-30 000
	High	Above 30 000
3. Proportion (%) of total amount of African eggplant sold		
	Low	Less than 93.0
	Moderate	93.1-94.0
	High	Above 94.0
4. Production per hectare(kg)		
	Low	Less than 17 000
	Moderate	17 001-31 000
	High	Above 31 000
5. Number of inputs used		
	Low	0-1.0
	Moderate	1.1-2.0
	High	2.1-3.0
6. Number of types of technologies used		
	Low	1-2
	Moderate	3-4
	High	5 and above
7. Number of inputs plus technologies used by farmers		
	Low	3-4
	Moderate	5-6
	High	7-8

3.6 Limitations of the study

The study had the limitations which might have affected the result in one way or another. Since most data were collected from farmers, data availability was the problem because farmers hardly kept any written farm records, thus their responses depended on their memories of the respective issues. The collected data could somehow be affected by this weakness. In overcoming the mentioned limitation, the researcher tried to involve other members of the households like older children and

spouses during the interviews in order to help the respondents to re-call some of the information. Thus, the researcher is confident that the information that has been collected is reliable.

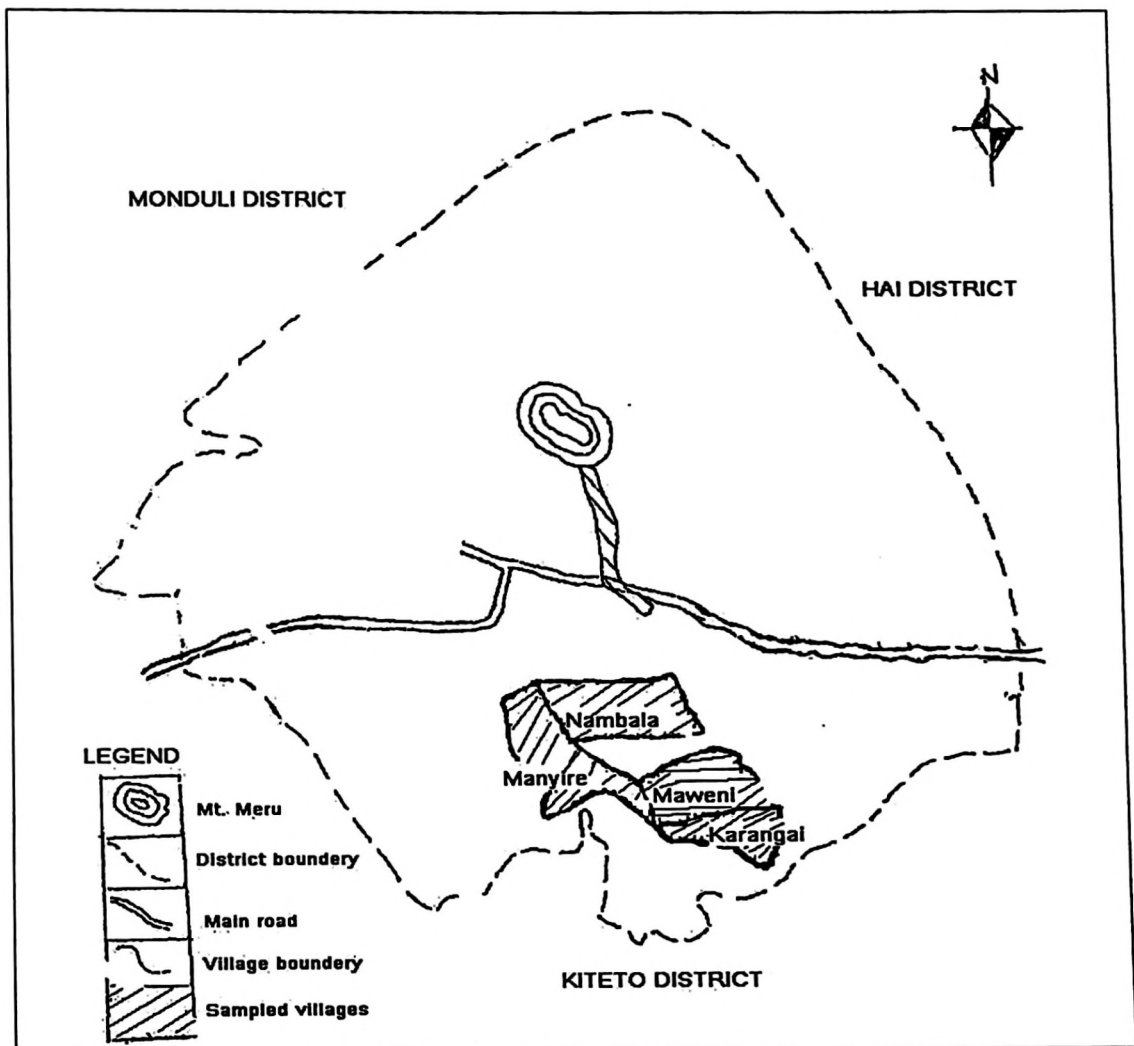


Figure 3: A sketch map of Arumeru district showing sampled villages

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the findings and discussion of the study. The chapter is divided into five sections. Section one highlights the relevant socio-demographic characteristics of the surveyed households. Section two focuses on the determination and characterization of the existing extent of commercialization of African eggplant by households in Arumeru district. Sections three to five present and discuss the household members' time allocation, income levels and ownership by gender, and land resource allocation for different crops at different levels of commercialization.

4.1 Socio-demographic characteristics of the respondents

Five aspects of socio-economic characteristics namely age, sex, ethnic origin, marital status and level of education of the respondents are considered here.

4.1.1 Age

Table 2 provides a summary of the results. In total, 45.8% of the interviewed respondents were aged between 30 to 45 years, 28.3% were less than 30 years while 15.8% were above 55 years and 10% were aged between 46 to 55 years. The results imply that most of the respondents in the households surveyed were mature people and therefore able to take household responsibilities. Most of them were between 30 and 55 years old.

4.1.2 Sex

The sample of the respondents surveyed comprised of 66.7% men and 33.3% women (Table 2). Fewer females were included in the survey largely because the study area is characterized by male dominance.

4.1.3 Marital status

The results in Table 2 show that 64.2% of the respondents were monogamously married while only 15% were single. Others were 10%, 8.3% and 2.5% widowed, divorced/separated and polygamous married, respectively. These results are typical characteristics of many areas in Tanzania whereby 60% women and 50% men are married (NBS, 2005).

4.1.4 Ethnic origin

Main ethnic origins in the area were Meru, Chagga and Arusha (Table 2). About 61 percent were Meru, 15.8% were Chagga, 9.2% were Arusha and 14.2% were others which comprised of Pare, Haya, Kurya, Gogo, Sukuma, Sandawe, Nyaturu and Nyiramba. The results indicate that while the Meru were the majority and originate in the area, there were other tribes who have probably moved into the surveyed area.

4.1.5 Level of education

Educational levels of bread earners mostly heads of households are expected to play a role in ensuring household's access to basic needs such as food, shelter and clothing (Person and Swanson, 1966). Skills and education increase working efficiency and productivity making the household able to use and adopt new

agricultural technologies resulting into more income (Yonghong and Katrina, 2007). The results in Table 2 indicate a high level of literacy in the study area with a large number of primary school leavers (68.3%) followed by those with no formal education or did not complete primary school (16.7%) and 15% having secondary school education. The small number in secondary school education may be due to the fact that after attending primary education, which is compulsory for all children of 7 to 14 years (NBS, 2003), majority could not afford or pass for higher education. The results reveal further that the study area has high literacy level of adults (83.3%) i.e. primary education and secondary school, compared to the average for Mainland Tanzania which is reported to be 56% (NBS, 2003). This literacy level is useful for a small scale farmer to learn, use and adopt new and appropriate agricultural technologies introduced, since most of the technologies can be offered using Swahili language (NBS, 2003).

Table 2: Socio-demographic characteristics of the respondents

Variable	Farmer category		Total N=120
	African egg plant growers n=60	Non growers of African egg plant n=60	
Age in years			
<30	18(30%)	16(26.7%)	34(28.3%)
30-45	32(53.3%)	23(38.3%)	55(45.8%)
46-55	6(10.0%)	6(10.0%)	12(10.0%)
>55	4(6.7%)	15(25.0%)	19(15.8%)
Sex			
Female	18(30%)	22(36.7%)	40(33.3%)
Male	42(70%)	38(63.3%)	80(66.7%)
Marital status:			
Monogamous married	36(60%)	41(63.3%)	77(64.2%)
Polygamous married	2(3.3%)	1(1.7%)	3(2.5%)
Single	10(16.7%)	8(13.3%)	18(15.0%)
Divorced/separated	7(11.7%)	3(5.0%)	10(8.3%)
Widowed	5(8.3%)	7(11.7%)	12(10.0%)
Ethnic origin:			
Meru	32(53.3%)	41(68.3%)	73(60.8%)
Chagga	6(10.0%)	13(21.7%)	19(15.8%)
Arusha	10(16.7%)	1(1.7%)	11(9.2%)
Others	12(20.0%)	5(8.3%)	17(14.2%)
Level of education:			
Less than primary school	9(15.0%)	11(18.3%)	20(16.7%)
Completed primary school	44(73.3%)	38(63.3%)	82(68.3%)
Secondary school	7(11.7%)	11(18.3%)	18(15.0%)

4.2 Extent of commercialization

Extents of commercialization in this study were measured through various parameters which included:

- Income obtained from African eggplant per year
- Proportion of total household income from African eggplant
- Total household income per year in TShs
- Amount of African eggplant in kilograms harvested
- Proportion of the amount sold against the total production

- Number of inputs used
- Number of technologies used
- Number of inputs plus technologies used by farmers.

The range and mean for each parameter are shown in Table 3.

4.2.1 Categorization of commercialization of African eggplant by using different parameters

This section attempts to categorize the existing extent of commercialization of African eggplant in the surveyed area in each parameter of commercialization into three levels i.e. low, moderate and high using criteria which were set for the purpose of analysis in this study. Table 4 summarizes the results. Low levels of commercialization of the crop were exhibited by the majorities in terms of the amount of income obtained from African eggplant (41.66%) as well as in the amount of the crop harvested per year (40%).

Moderate levels of commercialization did dominate with regards to total household income (45%), proportion of the crop that was sold (61.66%), production per hectare (50%) and number of types of technologies used (95%). High levels of commercialization did dominate on three aspects, namely proportion of total income from African eggplant and proportion of total amount of eggplant sold (36.66%), number of inputs used (63.33%) and number of inputs plus technologies used (63.33%).

Table 3: General characteristics of extent of commercialization among African eggplant growers in Arumeru District

Parameter of extent of commercialization	Mean Value	Range		Standard Deviation
		Minimum	Maximum	
1. Income(per year)				
(a) Income obtained from African eggplant in the households (TShs)	1 730 533	340 000	3 380 000	834 305
(b) Proportion (%) of total income from African eggplant	67.47	30.63	86.56	13.61
(c) Total income in (TShs)	2 449 617	790 000	4 104 000	885 368
2. Amount in kg of African eggplant harvested	23 019	4 500	44 950	11 080
3. Proportion (%) of total amount of African eggplant sold	93.89	91.40	94.44	0.40
4. Production per hectare(kg)	18 644	3 100	45 000	7 087
5. Number of inputs used	2.28	0	3	1.03
6. Number of types of technology used	3.93	2	5	0.41
7. Number of Inputs plus technologies used by farmers	6.22	3	8	1.25

Table 4: Characteristics at different extent of commercialization

Parameter of extent of commercialization	Extents	Criteria for categorization	(n)	%
1. Income/Year				
(a) Income from African eggplant in household (TShs)	Low	Less than 1 400 000	25	41.66
	Moderate	1 400 001-2500000	22	36.66
	High	Above 2 500 000	13	21.66
(b) Proportion (%) of total income from African eggplant	Low	30-60	18	30.00
	Moderate	60.1-75	20	33.33
	High	75.1-100	22	36.66
(c) Total household income (TShs)	Low	Less than 1 900 000	19	31.66
	Moderate	1 900 000-3100 000	27	45.00
	High	Above 3 100 000	14	23.33
2. Amount of African eggplant in kg harvested	Low	Less than 18500	24	40.00
	Moderate	18 500-30 000	23	38.33
	High	Above 30 000	13	21.66
3. Proportion (%) of total amount of African eggplant sold	Low	Less than 93	1	1.66
	Moderate	93.1-94.0	37	61.66
	High	Above 94	22	36.66
4. Production per hectare(kg)	Low	Less than 17 000	26	43.3
	Moderate	17 001-31 000	30	50.0
	High	Above 31 000	4	6.66
5. Number of inputs used	Low	0-1	17	28.33
	Moderate	1.1-2.0	5	8.33
	High	2.1-3.0	38	63.33
6. Number of types of technologies used	Low	1-2	1	1.66
	Moderate	3-4	57	95.00
	High	5 and above	2	3.33
7. Number of inputs plus technologies used	Low	3-4	6	10.00
	Moderate	5-6	16	26.66
	High	7-8	38	63.33

4.2.2 Comparison of commercialization between African eggplant growers and non-growers

Essentially, this section attempts to investigate the differences in the extent of commercialization between African eggplant growers and non-growers. T-test was

used to test for differences of means of the two groups. Table 5 summarizes the results. All the parameters of commercialization were significantly higher at $P < 0.001$ for the African eggplant growers except for the total household income per year. The probable reason for that may be due to the fact that, African eggplant is a new cash crop in the area. In order to get high yields of the crop more technologies and inputs are needed compared to other crops which can grow in the natural condition, so farmers who have adopted the crop are employing more technologies and inputs than the non-growers. The proportion of total income from the number one ranked cash crop was higher for the African eggplant growers probably due to the fact that these farmers tend to spend much of their time on the crop so much that they don't have time to do other alternative income generating activities such as petty trade. Therefore they tend to depend mostly on African eggplant production. Therefore on the basis of the sample of this research, it can be concluded that there is significant difference in parameters of extent of commercialization between African eggplant growers and non growers. The African eggplant growers showed a significantly higher extent of commercialization.

On the case of difference in income levels between African eggplant growers and non-growers of the crop, the results show that the mean income from selling ranked number one cash crop for African egg plant growers category was 1 730 533 TShs which is significantly higher than the mean income from selling ranked number one cash crop for non-growers of African eggplant which was 999 267 TShs ($P < 0.001$). However, total household mean income per year in TShs was 2 449 617 for African eggplant growers and 2 030 767 for non-growers of the African eggplant which are not significantly different (statistically). This shows that there is no difference in

household's total annual income between African eggplant growers and non-growers of the crop. The explanation for that may be that, non-growers of African eggplant do not spend much time in the production of their number one ranked cash crop as indicated in Table 7. The mean hours spent by household members of African eggplant growers was 7.64 compared to 5.2 hours per day which was spent by the non-growers of African eggplant. This situation is likely to have provided more time for non-growers of African eggplant to engage themselves in other income generating activities compared to African eggplant growers. This was confirmed during focus group discussions. The results reveal further that on average the study area has higher incomes compared to the average income for the rural mainland Tanzania which is reported to be 435 648 TShs (Intergrated labour force survey, 2000/01).

The result is different from the observation by Kennedy and Cogill (1987), who noted that incomes of the farmers participating in the sugarcane production in Kenya were significantly higher than those of non-sugarcane growers and most of the difference in income came from marketed agricultural surplus.

Table 5: Results of t-test for comparison of mean values of extents of commercialization between African eggplant growers and non growers

Parameter of extent of commercialization	Mean Value		t-value	Significance
	African eggplant growers n=60	Non growers of African eggplant n=60		
1. Income(TShs)				
(a) Income per year obtained from African eggplant or number one ranked cash crop(per year)	1 730 533	999. 267	3.72	0.000***
(b) Proportion (%) of total income from African eggplant or number one ranked cash crop	67.47	38.69	8.25	0.000***
(c) Total household income per year	2 449 617	2 030 767	1.95	0.054 ^{ns}
2. Number of inputs used	2.28	1.17	5.09	0.000***
3. Number of technology used	3.93	2.78	6.47	0.000***
4. Number of inputs plus technologies used	6.22	3.95	6.07	0.000***

***Significance at P<0.001

^{ns} no significance

4.3 Relationship between time spent by household's members and extent of commercialization of African eggplant

Correlation analysis was done in order to investigate the relationship between parameters of extent of commercialization of African eggplant and time in hours per day spent by the women, men and children in the activities related with the crop. Results are summarized in Table 6. The results indicate that time spent by women and children in the activities of production of African eggplant were not significantly correlated with the parameters of commercialization of the crop.

On the other hand, the results for the men were different. The results in Table 6 show that there is strong positive correlation for men between parameters of extent of

commercialization namely number of inputs, amount of African eggplant harvested, total households income per year, income obtained from African eggplant per year, proportion of total income from African eggplant as well as number of inputs plus technologies at $P < 0.01$ level (2-tailed) and time spent in the production of African eggplant. This indicates that as the mentioned parameters of extent of commercialization of African eggplant goes up, time spent by men (husbands) in production of African eggplant increases. The probable reason may be that as production levels of African eggplant increases, intensive supervision is needed which makes husbands more responsible as indicated in Table 8. This was also confirmed during focus group discussion.

In case of proportion of amount sold, production per hectare and number of technologies, the results depict no significant correlation between these parameters of extent of commercialization and time spent by men. This may be due to the fact that the mentioned parameters have less to do with production and therefore may not increase time spent.

Table 6: Correlation results test of parameters of commercialization of African eggplant and time spent by household members

Parameter of extent of commercialization	Time spent by women in hours per day (51)	Time spent by men in hours (51)	Time spent by children in hours per day (22)
1. Income(TShs)			
(a) Income obtained from African eggplant per year	0.051 ^{ns}	0.688**	0.278 ^{ns}
(b) Proportion (%) of total income from African eggplant	0.077 ^{ns}	0.564**	0.330 ^{ns}
(c) Total households income per year	-0.003 ^{ns}	0.636**	0.220 ^{ns}
2.Amount in kg of African eggplant harvested	0.050 ^{ns}	0.688**	0.277 ^{ns}
3.% amount sold	0.090 ^{ns}	0.256 ^{ns}	0.147 ^{ns}
4.Production per hectare in kg	-0.184 ^{ns}	-0.025 ^{ns}	0.169 ^{ns}
5.Number of inputs used	-0.033 ^{ns}	0.473**	0.100 ^{ns}
6.Number of technologies	0.108 ^{ns}	0.117 ^{ns}	0.279 ^{ns}
7.Number of inputs plus technologies	0.009 ^{ns}	0.405**	0.166 ^{ns}

**Correlation is significant at the P<0.01 (2-tailed)

^{ns} Correlation not significant at the P<0.01 (2-tailed)

4.4 Comparison of time spent by households members between African eggplant growers and non-growers

This section attempts to investigate the differences in household's member's time allocation between African eggplant growers and non-growers of the crop. Number one ranked cash crop was considered for the non-growers of African eggplant. T-test was used to test for differences in mean time. Table 7 summarizes the results. Mean time in hours per day allocated for African egg plant growers was higher than that of number one ranked cash crop by non-growers of African eggplant by all members of household (i.e. wife, husband and children). The differences were stastically significant at P<0.001 or P<0.05.

Therefore on the basis of the sample of this study, it can be concluded that African eggplant growing households generally spent more time in the production of the crop than the time spent by the non-growing households on their high ranked cash crops. This is supported by von Braun *et al.* (1991) who noted that increasing the productivity motivated extended on-farm work time and reduced off-farm work time. Also, von Braun *et al.* (1989) noted that reassignment of rice as a commercial crop in Gambia led to an increase in the burden of communal agricultural work for both women and men but relatively more for women. In this case the burden is more for men, this is due to the fact that men are the ones who are responsible for agricultural activities in Meru culture as shown in Table 8.

Slight burden of agricultural activities for women in African eggplant growers is due to the fact that women in African eggplant growing households are mostly responsible for marketing the crop (i.e. 25% were doing marketing alone and 40% were doing marketing together with their husbands as shown in Table 8. This is because African eggplants are sold in markets like Tengeru and Mererani which require long walking. The same findings were found in Mzimba region in the north of Malawi where women walk long distances in order to meet traders of wild edible fungi (Boa, 2004). According to Meru culture, women are responsible for taking products to the market. This is different from non-growers of African eggplant where husbands are mostly responsible for selling their number one ranked cash crops. Eighty five percents of marketing of number one ranked cash crop in non-growers of African eggplant is done by men only. This was also observed and confirmed during focus group discussions.

This supports the argument by von Braun *et al.* (1991) that after commercialization of crop, activities are increasingly done by men. For example, in the case of commercialization of potatoes in Rwanda, weeding and application of fungicides to control late blight were exclusively done by men, but women joined to transport water to the field. Similarly, commercialization of rice in Gambia caused women to automatically have a reduced say in its production and disposal (von Braun *et al.*, 1989), and that women's control over rice fields in Gambia declined according to yield (technology) levels in the rice production.

Table 7: Results of t-tests comparison of mean time spent per day in African eggplant by the growers and in number one ranked crop by the non growers

Household member	Farmer Category				T-value	Significance
	African egg plant growers (n=60)		Non growers of African egg plant (n=60)			
		Mean(hours/day)		Mean(hours/day)		
Wife	51	2.17	47	1.70	2.57	0.012*
Husband	51	4.78	52	3.27	7.49	0.000***
Children	22	2.37	20	1.58	2.60	0.013*
All family members	60	7.64	60	5.20	5.87	0.000***

*=Significance at P<0.05

***=Significance at P<0.001

Table 8: Labour distribution between African egg plant growers and non growers

Variable	Farmer Category									
	African eggplant growers				Non growers of African eggplant					
	n	1	2	3	4	n	1	2	3	4
Land clearing	60	4(6.7)	24(40)	17(28.3)	15(25)	60	2(3.3)	34(56.7)	9(15)	15(25)
Land ploughing	60	4(6.7)	39(65)	3(5)	14(23.3)	60	2(3.3)	35(58.3)	8(13.3)	15(25)
Land harrowing	60	4(6.7)	40(66.7)	2(3.3)	15(25)	60	2(3.3)	37(61.7)	6(10)	15(25)
Planting	60	4(6.7)	10(16.7)	28(46.7)	19(31.7)	60	2(3.3)	14(23.3)	27(45)	17(28.3)
Weeding	60	4(6.7)	10(16.7)	27(45)	18(30)	60	5(8.3)	12(20)	28(46.7)	14(23.3)
Pesticide spraying	60	4(6.7)	39(65)	0(0)	17(28.3)	25	1(4)	20(80)	1(4)	3(12)
Irrigation	60	4(6.7)	38(63.3)	1(1.7)	17(28.3)	28	4(4)	21(84)	0(0)	3(10.7)
Harvesting	60	4(6.7)	11(18.3)	25(41.7)	20(33.3)	60	4(6.7)	14(23.3)	26(43.3)	16(26.7)
Ferrying of produce	60	9(15)	28(46.7)	8(13.3)	15(25)	60	2(3.6)	30(53.6)	9(16.1)	15(25)
Marketing of produce	60	15(25)	10(16.7)	24(40)	10(16.7)	60	6(10)	51(85)	0(0)	3(5)
Decision making of household income	60	11(18.3)	41(68.3)	8(13.3)	0(0)	60	9(15)	47(78.3)	4(6.7)	0(0)

NB: Numbers in brackets denote percentages

Key to family members codes

1=Wife only 3=Husband and wife
 2=Husband only 4=Husband, wife and children

4.5 Extent of commercialization, income levels and income control by women in the study area

This section attempts to determine the relationship between income levels, control of income by women and extent of commercialization of African eggplant. Correlation analysis was used to test for the relationships between income levels and extent of commercialization. Table 9 summarizes the results. Decision making by women at different extent of commercialization was also done by descriptive statistics (percentages). Table 10 summarizes the results. Income levels between African eggplant growers and non-growers of African eggplant were compared by using t-test (Table 11). Also income ownership by gender between African eggplant growers and non-growers was assessed by descriptive statistics (percentages). Table 8 summarizes the results.

Table 9: Correlation results test of parameter of commercialization of African eggplant and income levels

Parameter of extent of commercialization	Income per year obtained from African eggplant (TShs)	Households Total income per year in (TShs)
1. Proportion(%) of total income from African eggplant	0.81**	0.66**
2. Amount in kg of African eggplant Harvested	1.00**	0.96**
3. % amount sold	0.40**	0.40**
4. Production per Hectare in kg	0.35**	0.37**
5. Number of Inputs used	0.75**	0.73**
6. Number of Technologies	0.30 *	0.30**
7. Number of Inputs plus technologies	0.71**	0.70**

**Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

4.5.1 Relationship between income levels, control of income by women and extents of commercialization of African eggplant

The results in Table 9 show that there was a strong positive correlation between parameters of extents of commercialization and income obtained from African eggplant and total households income. In decision making by women, the results in Table 10 show that women's decision making was low in all the parameters of extent of commercialization implying that at all levels the decision making are still mainly done by men. The probable reason may be the fact that all activities in the production processes of African eggplant (the main source of households income) are done mainly by men which make them the decision makers of the households income. Also, male dominance is still existing in the area. This supports the argument by Shapiro *et al.* (1998) that as cash crops are introduced in small holder production systems, with integration into the market, women may lose control over cash income to men.

Table 10: Decision making by women at different extents of commercialization

Parameter of commercialization	Categories of commercialization	Decision maker of households income		
		Men	Women	Men & women
1.Total number of technology	Low	3(50)	2(33.3)	1(16.7)
	Moderate	8(50)	5(31.3)	3(18.8)
	High	30(78.9)	4(10.5)	4(10.5)
2.Household total income (TShs)	Low	10(52.6)	6(31.6)	3(15.8)
	Moderate	20(74.1)	4(14.8)	3(11.1)
	High	11(78.6)	1(7.1)	2(14.3)
3.Income from African eggplant in households(TShs)	Low	14(56)	7(28)	4(16)
	Moderate	17(77.3)	3(13.6)	2(9.1)
	High	10(76.9)	1(7.7)	2(15.4)
4.Production per hectare(kg)	Low	16(61.5)	6(23.1)	4(15.4)
	Moderate	22(73.3)	4(13.3)	4(13.3)
	High	3(75.0)	1(25.0)	0(0)

Figures in parenthesis are percentages

Table 11: Results of t-test for comparison of mean Incomes per year between African egg plant growers and non growers

Variable	Farmer Category		t-value	Significance
	African eggplant growers n=60	Non-growers of African eggplant n=60		
	Mean	Mean		
Income in TShs obtained from ranked number one cash crop	1 730 533	999 266.67	3.72	0.000***
Total households income in TShs per year	2 449 617	2 030 767	1.95	0.054 ^{ns}

*** Significance at (P<0.001)

^{ns} Not significance at (P>0.05)

4.5.2 Comparison of income control by women between African eggplant growers and non growers

Table 8 makes comparison between African eggplant growers and non-growers. In both categories, the decision making of the household's income was mainly done by men i.e. 68.3% and 78.3% for African eggplant growers and non-growers respectively. Generally the results imply that men maintained control over the income. This may be due to the fact that male dominance still exists in the surveyed area, which was also confirmed during focus group discussions.

However, there was a slight difference between the two categories in which for African eggplant growers decision making by both husband and wife was 13.3% compared to only 6.7% for non-growers of African eggplant. The probable reason for that may be the fact that in African egg plant growers' women participate in marketing of the crop. This was observed and confirmed during focus group discussions. This conforms with the observation by Kennedy and Cogill (1987) that

women from sugarcane growing households controlled a higher absolute amount of income than women from non-sugarcane producing households in Kenya.

4.6 Land resource allocation in relation to food production

This section aims at pointing out the impact of commercialization of African egg plant on food crops production in the study area. Correlation analysis was done to test for relationship between land resource allocation for production of food crops and parameters of extent of commercialization of African eggplant. Results are summarized in Table 12. It appears that there is a general negative correlation between the extent of commercialization and the land allocated for production of food crops. Four of the parameters of the extent of commercialization have a significant correlation at $P < 0.01$, namely:

- Production per hectare
- Number of inputs
- Number of technologies and
- Number of inputs plus technologies

This suggests generally that as commercialization increases land allocated for food crops decreases which may be detrimental to food situation, especially if the resulting income is not used to support food supply.

Table 12: Correlation results test of parameters of extent of commercialization and land resources allocation

Parameter of extent of commercialization	Total land for agriculture (hectare)	Land allocated for food crops (hectare)	Land allocated for African eggplant (hectare)
1.Income			
(a) Income obtained from African eggplant per year	0.86**	-0.23 ^{NS}	0.78**
(b)Proportion (%) of total Income from African eggplant	0.68**	-0.24 ^{NS}	0.64**
(c) Total households			
Income per year in TShs	0.82**	-0.21 ^{NS}	0.78**
2.Amount in kg of African eggplant harvested			
	0.86**	-0.23 ^{NS}	0.78**
3.% of the amount sold	0.86**	-0.23 ^{NS}	0.78**
4.Production per hectare	-0.02 ^{NS}	-0.59**	-0.22 ^{NS}
5.Number of inputs used	0.62**	-0.51**	0.44**
6.Number of technologies	0.20 ^{NS}	-0.41**	0.09 ^{NS}
7.Number of inputs plus technologies	0.57**	-0.55**	0.39**

**Correlation is significant at the $p < 0.01$ level (2-tailed)

^{NS} Correlation not significant at the $p < 0.01$ level (2-tailed)

4.6.1 Comparison of agricultural land allocation between African egg plant growers and non-growers

This section investigates the differences in land resource allocation between African eggplant growers and non-growers. Table 13 shows the results. There is a significant differences ($P < 0.001$) in land area used in agricultural activities (i.e. farmland) between African eggplant growers and non-growers with the means of 1.62 and 0.93 hectares respectively.

Land allocated for production of number one ranked cash crop among African eggplant growers and non-growers are also significantly different at $P < 0.001$ with the means of 1.28 and 0.62 hectares respectively. However the difference between the two categories of farmers in terms of land allocation for food crops is not significantly different. This probably is due to the fact that much of the land that is used for growing cash crops, including African eggplant, is obtained by renting (Table 15). That means, the part of their land which they owned through inheritance (63.3% and 66.7% for African eggplant growers and non-growers of African eggplant, respectively) was maintained for food crops. This was also confirmed during focus group discussions. This supports the argument by Pasquini *et al.* (2004) that after commercialization of vegetables in Nigeria, land for other crops was maintained because land for vegetables were mainly acquired through hiring.

Also, despite the generally smaller farmland size by the non-growers of the African eggplant (Table 13), greater proportion of farmers in this category (60%) employed mixed cropping system of farming compared to the growers of African eggplants (36.7%). Table 14 summarizes the results. This helped the non-growers of African eggplant to utilize the available land for production of food crops as well as their cash crops. This is supported by Kennedy and Cogill (1987), who reported that commercial sugarcane farmers in Kenya maintained food production because of the larger amounts of farmland which they held. Also von Braun *et al.* (1991) reported the same in Rwanda where commercialization of tea in Rubaya area took place mainly by clearing and planting of formerly uncultivated areas, and therefore did not reduce food crop production.

Table 13: Land resources allocation between African eggplant growers and non growers

variable	Farmer category		t-value	Significance
	African eggplant growers n = 60	Non growers of African eggplant n = 60		
	Mean	Mean		
Land (ha) used in agriculture	1.62	0.93	5.54	0.000***
Land (ha) used in production of food crops	0.69	0.76	-0.899	0.370 ^{NS}
Land(ha) used in production of commercial crop number 1	1.28	0.62	7.836	0.000***

***Significance at (P<0.001)

^{NS} Not significance at (P>0.05)**Table 14: Distribution of respondent farmers according to various farming systems, they practiced among African egg plant growers and non growers**

Type of farming System ,	Farmer Category	
	African egg plant growers n=60	Non-growers of African egg plant n=60
Mixed cropping	22(36.7)	36(60)
Monocropping	38(63.3)	24(40)
Crop rotation	38(63.3)	15(25)

Figures in parenthesis are percentages

Table 15: Distribution of respondent farmers according to ways they acquired land among African eggplant growers and Non-growers of the crop

Method of acquiring land	Farmer Category	
	African eggplant growers	Non-growers of African eggplant
Inherited	38(63.3)	40(66.7)
Given by village government	10(16.7)	9(15.0)
Bought	13(21.7)	17(28.3)
Open space	0(0)	2(1.7)
Renting	39(65.0)	24(40.0)

Figures in parenthesis are percentages

CHAPTER FIVE

5.0 CONCLUSIONS AND POLICY IMPLICATIONS

5.1 Conclusions

The main aim of this study was to assess the socio economic impact of commercialization of African eggplant in Arumeru district. Extents of commercialization of African eggplant was determined by using different parameters of commercialization namely income obtained from African eggplant per year, proportion of total households income from African eggplant, total household income per year in TShs, amount of African eggplant in kilograms harvested, proportion of the amount sold, production per hectare, number of inputs used, number of technologies used as well as number of inputs plus technologies used by farmers.

Three aspects of socio-economic were considered. These were time spent by household members in production of number one ranked cash crop, land resource allocation and income levels and control by women. Attempt was done to compare between African eggplant growers and non-growers. Also relationship between household members' time allocation in the production of African eggplant, income levels and control by women, land resources allocation and extents of commercialization of African eggplant were considered. A cross sectional survey was used to collect information from villagers in the surveyed area. The collection of data from villagers was done on the basis of individual personal interviews or focus group discussions.

Main focuses of analysis were on determination of existing extents of commercialization of African eggplant by using various parameters of agricultural commercialization, relationship between parameters of commercialization and time spent by household members in the production of African eggplant, land resources allocation and income levels and control by women. Also the mean difference between African eggplant growers and non growers on parameters of agricultural commercialization, time spent by household members on the production of number one ranked cash crop, land resources allocation and income levels and control by women were considered.

5.1.1 Extent of commercialization

Extents of commercialization of African eggplant in Arumeru district were determined by using various parameters of commercialization namely income obtained from African eggplant per year, proportion of total annual household income from African eggplant, total household income per year in TShs, amount of African eggplant in kilograms harvested, proportion of the amount sold, production per hectare, number of inputs used, number of technologies used as well as number of inputs plus technologies used by farmers. The study found that total household income was not significantly different between African eggplant growers and non growers. All other parameters of commercialization showed significant difference between the two types of farmer's categories. Moreover, in all parameters of commercialization, means for African eggplant growers were higher than those of non-growers of the crop.

From this study it is generally concluded that African eggplant growers have higher extent of commercialization than that of non-growers. Thus the notion that traditional cash crops possess a number of commercialization characteristics which give them a comparative advantage over non traditional cash crops can be questioned based on this study.

5.1.2 Time spent by household members

- i. The study has shown that there is a strong positive relationship between parameters of commercialization of African egg plant and time spent by husbands. Time spent was also higher in the growing of African eggplant as compared to time spent by husbands in production of number one ranked cash crop among the non-growers of African eggplant.
- ii. Time spent by women on number one ranked cash crop in both farmer categories (African eggplant growers and non-growers) is low compared to men. However, women among African eggplant growers, spent more time than their counterparts of non-growers of African eggplant.
- iii. The overall time spent by household members has pointed out that African egg plant growers spend more time on their number one ranked cash crop compared to non-growers.
- iv. The relatively more time spent by African eggplant growers in production of number one ranked cash crop may be caused by the demand for irrigation and spraying, which makes farmers spend more time in the field in order to accomplish the jobs. This is different from non-growers of African eggplant

where in most of the production cycle of the crops like maize there are no activities of spraying and irrigation-therefore less labour demanding.

5.1.3 Income levels and control by women

The study has shown that, there is positive relationship between income levels and extent of commercialization. But, there is no difference in income control by women at different extents of commercialization of African eggplant. This may be caused by the male dominance in the surveyed area. Income control by women between African eggplant growers and non-growers showed that there was a slight difference between the two categories in which African eggplant growers were better. The probable reason may be the fact that in African eggplant growers women participated in marketing of the crop.

5.1.4 Land resources allocation

The study has shown that, there is a negative relationship between income related parameters of commercialization and land resources allocation for food crops. That is, as income level raises the land allocated for food crops decreases. The difference in land allocated for food production between African eggplant growers and non growers was insignificant.

5.2 Policy implications

On the basis of this study, the following policy implications can be raised:

- i. Despite the fact that African eggplant growers have shown higher levels of commercialization than non-growers, it is advised that commercialization of

African eggplant growers should be enhanced notably through improving technologies.

- ii. Since commercialization of non traditional cash crops, in particular African eggplant is one of the measures of poverty alleviation in the rural households, improving participation of both women and men is vital for a better output. Despite considerable efforts by AVRDC-RCA programme to promote women access to the new cash crops, women participation is still low. Women's interest would be safeguarded and enhanced by increased access of women to credit for the short term financing of cash crop productive inputs. Village specific women's groups that exist traditionally in the surveyed area could form the basis for cooperative organs through which loan guarantee might be provided.
- iii. On the issue of time spent by household members, commercialization of African eggplant seemed to increase men's time for on-farm activities. The technologies for the activities which consume a lot of time like planting, irrigation and spraying should be improved which may reduce the time spent by husbands in the field. This can be achieved through African eggplant growers to consider networking with various farmers within and outside the country by information exchange and dissemination, workshops as well as study tours. This can provide a means to update farmers on new technologies.
- iv. The system of acquiring land for production of African eggplant through renting instead of using land which has been used for production of food crops should be maintained. Thus, the potentially harmful effect on the production of food crops due to the commercialization of non-traditional cash

crops in particular African eggplant will be controlled. Training farmers on systems of farming which may help efficient utilization of land for production of food crops and non-traditional cash crops should also be emphasized.

- v. Promoting commercialization of non-traditional cash crops is beyond the responsibility of a single programme in isolation. There is therefore a need for AVRDC-RCA programme to form a prime move group that will disseminate information about commercialization of non-traditional cash crops in the district and the country at large.
- vi. AVRDC-RCA is a programme and most programmes operate on short term bases, thus before reaching good number of farmers the programme will have terminated. There is therefore a need for AVRDC-RCA to collaborate closely with the government in terms of expertise and type of AVRDC-RCA activities in the promotion of non-traditional cash crops in particular African eggplant so as to ensure sustainability even when the programme phases out.

5.3 Areas of further research

- i. African eggplant production requires irrigation by pumping up water from the rivers. However, using river water may put the sustainability of the river under pressure. Unsustainable water use could also limit the production of African eggplant. Future research along this line is important and urgent.
- ii. Further socio-economic research on other reasons apart from the ones stipulated in this study for differences between African eggplant growers and non-growers needs to be undertaken.

- iii. The factors to consider in ensuring that policy makers are aware and incorporate commercialization of non-traditional cash crops in national priority programmes to alleviate poverty in the rural areas need to be researched on.

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B3. How was the land obtained?

How land obtained	1=Yes	2=No
1=Inherited		
2=Bought		
3=Given by village government		
4=Accessed a free land		
5=Rented		

B4 .How much land is used for production of African egg plant production/first cash crop?.....acres

B5. What about for other crops?.....acres

B6. For how long have you been in African egg plant/first cash crop production?.....Years

B7. Did you use the following farm inputs in the last production season of African eggplant/first cash crop?

Farm inputs	1=Yes	2=No
1=Fertilizer(chemical)		
2=Pesticide(chemical)		
3=Hired labour		
4=Other Agriculture inputs		

B8. Did you use the following farm technology in the last production season of African egg plant/first cash crop?

Type of technology	1=Yes	2=No
1=Machinery e.g. (tractor)		
2=Irrigation		
3=Improved seed		
4=Implements e.g.(Sprayers)		
5=Others(specify)		

B9 .What is the amount of African egg plant/first cash crop you harvested in bags per acre? (refer the last harvesting season).....

10. How is the utilization of African egg plant/first cash crop produced in your family distributed?

Utility	Quantity(bags)
1=Marketed	
2=Consumption	
3=Others(specify)	

B11. Where do you sell your produce?.....

B12. If you do sell your product, What is your annual household income from production of African egg plant/first cash crop production?.....Tshs

B13. What is your annual household income from other businesses?.....Tshs.

1=Crops production..... TShs.

2=Livestock..... TShs.

3=Petty trade.....TShs.

4=Remittance.....TShs.

5=Others (specify).....TShs.

C.DETERMINATION OF THE HOUSEHOLD'S MEMBERS TIME ALLOCATION

Who in your household is the most responsible for African egg plant/first cash crop production in different stages and the time they spent/day?

No	Responsible	1=wife	2=husband	4=Children		Time hours/day
				1=girls	2=boys	
C1	Land clearing					
C2	Land ploughing					
C3	Harrowing					
C4	Planting					
C5	Weeding					
C6	Pesticide spraying					
C7	Harvesting					
C8	Ferrying of produce from the farm to market/home					
C9	Pruning					
C10	Markets of produce					
C11	Custodian of earned cash					

1=Wife 2=Husband 3=Husband and wife 4=Children(girls)
5=Children(boys) 6=Wife, husband and children

System	1=Yes	2=No
1.Mixed cropping		
2.Monocropping		
3.Intercropping		
4.crop rotation		
5.Others(specify)		

D.DETERMINATION OF THE HOUSEHOLD'S MEMBERS INCOME OWNERSHIP BY GENDER

D1. Who mainly sells African egg plant/first cash crop produced in your family?

1=Wife 2=Husband 3= Husband and wife 4=children 5= others (specify)

D2. Who has the final say in spending the money from African egg plant production?

1=Wife 2=Husband 3=Husband and wife 4=Children 5=others (specify)

E.DETERMINATION OF LAND RESOURCE ALLOCATION

E1. What system do you use to grow African egg plant/first cash crop in your farm?

E2 .Did you stop producing any crop in favour of African egg plant/first cash crop?

1=Yes 2=No

E3.If Yes, which crop(s) did you switch from:.....

E4.Did you reduce plot size of any crop in order to increase the African egg Plant/first cash crop area size?

1=Yes 2= No

E5.If yes, which crop(s) has reduced?.....

E6.How much land has reducedacres

E7.Who controls the land? 1=Husband 2=Wife 3=others (specify)

E8.Have you increased the farm field for African egg plant/first cash crop since you have started engaging yourself in the production of the crop? 1=Yes 2=No

E9.If yes, how much? (Acres).

THANK YOU FOR YOUR COOPERATION!

Appendix 2: Checklist for focus group discussion

1. What are the main cash crops grown in your farms.
2. Rank your cash crops according to importance in your households?
1.....2.....3.....
3. What type of inputs is used in African egg plant/first cash crop production?
4. What type of farm technology is employed in Production of African egg plant/first cash crop?
5. What is the amount (bags) of African egg plant/first cash crop produced per acre?
6. What is the general annual household income obtained from production of African egg plant /first cash crop?
7. What is the roles of household's members in African egg plant/first cash crop production i.e. Husbands, Wives and children and the time they take/day.

No	Responsible	1=wife	2=husband	4=Children		Time hours/day
				1=girls	2=boys	
C1	Land clearing					
C2	Land ploughing					
C3	Harrowing					
C4	Planting					
C5	Weeding					
C6	Pesticide spraying					
C7	Harvesting					
C8	Ferrying of produce from the farm to market/home					
C9	Pruning					
C10	Markets of produce					
C11	Custodian of earned cash					

1=Wife 2=Husband 3=Husband and wife 4=Children (girls) 5=Children (boys) 6=Wife, husband and children

8. Who mainly sells the African egg plant/first cash crop produced in the family?
Husbands, Wives, or Children.
9. Who mainly owns what is obtained from African egg plant/first cash crop production?
10. Who has the final say in earnings from African egg plant/first cash crop?
11. Did you stop producing any crop in favor of African eggplant/first cash crop? If yes, then.....
12. Which crops have been stopped in favor of African egg plant/first cash crop?
13. Did you reduce a plot size of any crop to increase the African egg plant/first cash crop size? If yes, then
14. Which crops have been reduced?
15. How much land is used for production African egg plant/first cash crop?
16. How about for other crops?
17. Have you increased the farm field since you have started engaging yourself in the production of African egg plant/first cash crop?
18. Establishment of Production calendar of African egg plant/first cash crop

No	Activity	J	F	M	A	M	J	J	A	S	O	N	D
1	Land clearing												
2	Ploughing												
3	Harrowing												
4	Planting												
5	Weeding												
6	Harvesting												
7	Pesticide spraying												
8	Ferrying of [produce from farm to market/home												
9	Market of produce												
10	Supplying of inputs												
11	Pruning												

THANK YOU FOR YOUR COOPERATION!

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