DISSEMINATED CASHEW-NUT PRODUCTION TECHNOLOGIES AND THEIR EFFECT TO CASHEW-NUT PRODUCTIVITY IN MKINGA DISTRICT, TANZANIA

IBRAHIM, GEORGE

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ABSTRACT

Disseminated agricultural production technologies in cashew-nut crop are essential to help farmers ensure cashew-nuts productivity. To ascertain this, a study to establish the extent to which disseminated cashew-nut technologies improved cashew productivity in Mkinga. Specific objectives of the study were:- To examine the input providers and type of extension services that was provided to cashew-nut growers, to identify and analyses challenges faced by farmers in integrating the disseminated cashew-nut production technologies and practices into cashew nut production and to establish the current levels of productivity as result of the adopted cashew-nut production technologies and practices.

District was conducted. Eighty cashew-nut producing farmers at Mahandakini and Mavovo villages were interviewed. Descriptive statistics and Mann Whitney test were used to analyze data especially comparing cashew productivity and technologies/practiced used. Results indicated that few farmers (below 50%) accessed improved cashew-nut technologies and extension services from production stages to marketing. Most extension workers were public employees. The main reason for poor accessibility and utilization of production technologies was lack of extension services. The big challenge to farmers among others was lack of training. The mean average of cashew-nut productivity in Mkinga District was found to be 0.38 Tons/hectare which according to CBT report (2013) is very small compared to national cashew-nut productivity which was at 0.8Tons/hectare. It was thus recommended to strengthened cashew nut improvement programme through trainings. The study concluded that there were few extension officers to meet the village needs and recommended employing more extension agents to teach farmers.

DECLARATION

I, George Ibrahim, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work done within the period of registration and that it has neither been submitted nor is concurrently being submitted to any other institution.

_____ _____

George Ibrahim Date
(MSc. AEE - Candidate)

The above declaration is confirmed by

_____ _____

Dr. Emmanuel Rwambali Date
(Supervisor)

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DEDICATION

I devote this work to my parents Ibrahim Kingumbi and the late Tasiana Pembe who laid the foundation of my education which made me what I am today.

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LIST OF ABREVIATIONS AND ACRONYMS

ASDP	Agriculture sector development programmes
CATA	Cashew-nut authority of Tanzania
CBT	Cashew-nut board of Tanzania
CRIN	Cocoa research institute of Nigeria
FFS	Farmer field school
MAFC	Ministry of agriculture food security and cooperative
MTSP	Medium term strategy plan
NAP	National agriculture policy
NAPB	National agricultural products board
NBS	National bureau of statistics
NGOs	Non-governmental organization
NRI	National research institute
NSGRP	National strategy for growth and reduction of poverty
PMD	Powdery mildew diseases
SACAs	Savings and credit associations
SACCOs	Savings and credit cooperative societies
SEP	Single factor productivity
SSA	Sub-Saharan Africa
T&V	Training and visiting system
TFP	Total factor productivity
URT	United republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Agricultural extension services and advisory systems are essential in moving toward the broader goal of increasing farm income and improving rural livelihoods through disseminating improved technologies and practices. Technology transfer is extension model which was prevalent during colonial times and re-emerged with intensity during the 1970s and 1980s during the training and visit (T&V) system. The stimulus for these investments was to speed up the dissemination of green revolution technologies to farmers, mainly in Asian and African countries (Benor and Harrison, 1977). Recently, facilitation extension approach has evolved over time from participatory extension methods and now extension focuses on getting farmers with common interests to work more closely together to achieve both individual and common objectives.

Agricultural extension, or agricultural advisory services, comprises the entire set of organizations that support people engaged in agricultural production and facilitate their efforts to solve problems; link to markets and other players in the agricultural value chain; and obtain information, skills, and technologies to improve their livelihoods (Birner *et al.,* 2009). The agricultural extension approach in Tanzania is currently demand driven, involving farmers' groups in the planning and implementation process. The system is also integrating different extension providers. "The extension services use a combination of dissemination pathways such as demonstration plots/Farmer Field Schools (FFS), farmer field days and exchange visits/study tours" (Mvuna, 2013).

Delivery of quality agricultural extension services and improved technologies in Tanzania has been a centre of attention for a long time. Given the fact that the majority of

Tanzanians (more than two thirds) live in rural areas and depend on small-scale agriculture for their livelihood and employment (URT, 2006), the Government's efforts have been geared towards improving production and productivity so as to attain food security and sufficiency at household and national levels. These efforts are in line with the targets of the National Development Vision 2025 which envisages achieving a high quality livelihood through, among other things, food self-sufficiency and food security. (MAFC, 1996)

Tanzania is suffering from low agricultural productivity due to a number of factors including inadequate extension services leading to ineffective dissemination of technologies, poor market linkages, weak links between research and extension and inadequate government support (Ministry of Agriculture Food Security and Cooperatives, 2007; Wambura *et al.*, 2012; Churi *et al.,* 2012). Helping farmers to improve their productivity and products standards would raise the contribution of agriculture to the national GDP and household livelihoods. However, this can be achieved through improved disseminated agricultural technologies.

Research and extension systems in Tanzania, have already worked out the necessary practices to successfully produce and market the new crops and/or products including cashew-nut which would increase profits for the farming communities by expanding their supply of high value products to larger urban markets.

Cashew-nuts represent a small proportion of agricultural production in the United Republic of Tanzania (URT), with about 300 000 hectare cultivated (2 percent of total area) producing approximately 100 000 tonnes per year (Nkonya and Hurle, 2013). The main producing regions in the country include Mtwara, Lindi, Coast, Ruvuma and Tanga.

According to the Government of the United Republic of Tanzania (URT) (2012), the production volume of cashew nuts in Mkinga District was about 887 Metric Tons for the season 2007/08 and ranked first among the districts in Tanga Region. Productivity and quality in cashew-nut production depends on disseminated technologies and farm management like ploughing, intercropping, pruning, the application of pesticides and use of improved planting materials as well as the knowledge with which these are applied (URT, 2012).

1.2 Problem Statement and Justification

In Mkinga District, the cashew subsector provides an employment to about 90% of Mkinga population of about 118 065 people according to national census of 2012 (URT, 2013). Cashew was the priority cash crop chosen by the District agricultural stakeholder meeting in 2007. Although there is more than 20 100 hectares suitable for the cashew-nut production in the District, currently it is only 11 764 hectares that are under cashew cultivation (Mkinga District Council, 2013). Apart from that, productivity levels of cashew-nut by Mkinga farmers in 2012 was just about 0.4tons/hectare which was relatively low compared to 0.8tons/hectare in other parts of Tanzania and 1.2 tons/hectare worldwide (URT, 2013).

To change such a situation the District thought, you needed proven disseminated cashew-nut production technologies and recommended agricultural practices that could alleviate the situation and thus they went ahead to implement that. That being the case, it is therefore important to determine the effect of those disseminated cashew-nut production technologies and practices and check whether they were extended in first place and whether they are actually being utilized by farmers. Similarly, there is need to check whether their application ultimately translated into improved productivity. Information

obtained from this study will inform stakeholders in the agriculture sector on what need to be done in order to improve cashew-nut productivity.

1.3 Objectives

1.3.1 General objective

To determine effects of disseminated cashew-nut production technologies on cashew-nut productivity in Mkinga District

1.3.2 The specific objectives were

i. To examine the input providers and type of extension services that was provided to cashew-nut growers.

ii. To identify and analyse challenges faced by farmers in integrating the disseminated cashew-nut production technologies and practices into cashew nut production.

iii. To establish the current levels of productivity as result of the adopted cashew-nut production technologies and practices.

1.4 Research Questions

The major questions of this study were:

i. Who are the input providers and kind of extension services was provided to cashew-nut producers in Mkinga District?

ii. What kind of challenges did farmers in Mkinga District face in the process of integrating recommended cashew-nut production technologies and practices?

iii. What are the current levels of cashew-nut productivity in Mkinga District as a result of the adopted technologies and practices and how do they compare with the national average?

1.5 Conceptual Framework

It is the role of agricultural extension to make sure that farmers are familiar and use disseminated cashew-nut production technologies and recommended cashew-nut practices like raising appropriate seedling, weeding, pruning, grafting, fertilizer application, proper spacing, top working, mulching, application of fungicides and pesticides. Similarly, extension has the obligation of linking farmers with agricultural services such as input suppliers as well as credit facilities since these may have direct and indirect influence on whether farmers can apply certain technologies or not and which can ultimately affect cashew-nut productivity. Socio-economic characteristics such as age, marital status, level of education, farm size and sex might determine the extent of adoption of technologies and good agricultural practices.

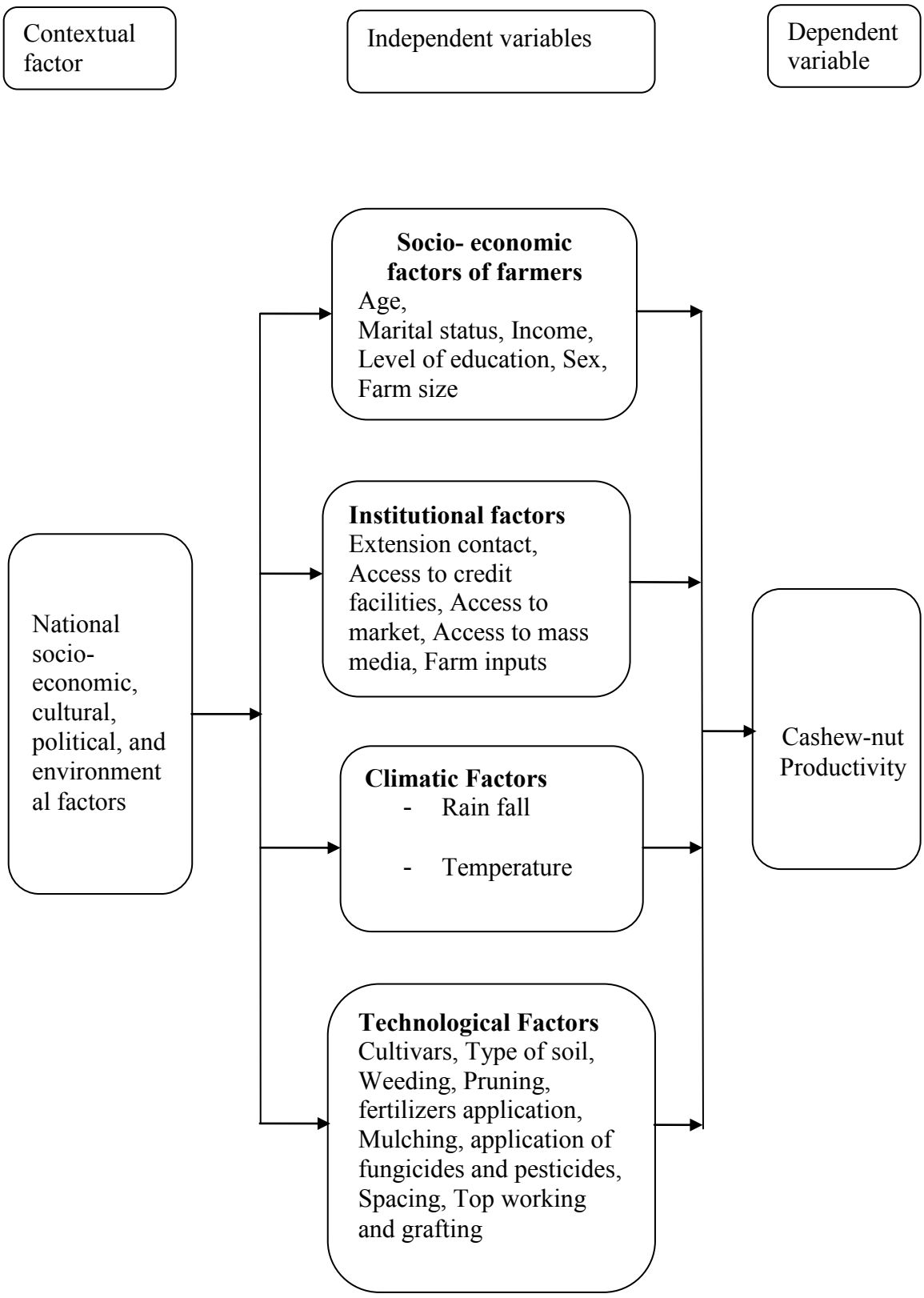

Figure 1: Conceptual Framework: Disseminated cashew-nut production technologies and their effect to cashew-nut productivity in Mkinga District

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1Conceptualization of Key Terms/Concepts

2.1.1 Productivity

Productivity is generally defined as a ratio of a volume measure of output to a volume measure of input use (OECD, 2001). The measure of output and input is usually in a standard unit such as money value. In the case of agricultural productivity, it is the quantity (value) of agricultural output per unit quantity (value) of input(s) used in production such as fertilizer application, pesticides, herbicides and improved seeds (OECD, 2001). Measures of agricultural productivity can be classified broadly, either as single factor productivity (SFP) or total factor (multifactor) productivity (TFP) measures (Wiebe *et al.*, 2001; OECD, 2001).

According to Wiebe *et al.* (2001), SFP relates a measure of output to a single measure of input while TFP relates a measure of output(s) to a bundle of inputs. Within these two broad categories (SFP and TFP), there are many different measures; for example, at farm level, SFP measures may include yield, labour productivity and capital productivity while TFP measures may include an index of a ratio of the value of output(s) to the value of a combination of two or more factors such as land and labour or labour and capital, or the value of all factors of production utilized in the production process (Wiebe *et al.,* 2001). Yield, which is commonly expressed in tonnes per hectare (t/ha) is the most frequent measure of agricultural productivity and is defined as amount of agricultural output per unit of land used in production (Wiebe *et al.,* 2001).

2.1.2 Agricultural technologies versus productivity

Measures should be taken to improve technology transfer to farmers by employing and training of more extension staff, establishment of village demonstration plots and provide incentives to extension staff including transport. There is a great need of improving farmer knowledge on technical issues related to cashew growing and processing together with farm business management. It is recommended that Special training for farmers should be conducted in accordance to their requirements. There are many possibilities for the potential applications of the technology in agricultural extension (FAO, 1993; Zijp, 1994).

The cashew plants are appraised over three consecutive crop years for growth and vegetative habit, *Heliopolis* tolerance, powdery mildew resistance, with and without chemical control, yield in terms of nut weight, number and quality as percent kernel out-turn (Harries *et al.*, 1998). Yet, many cashew-growing areas in Tanzania still depend on seedling material and polyclonal seed gardens have been established for that reason. Harries *et al.* (1998), presented a stepwise Breeding Programme Cycle, of which all steps in the Programme are repeated annually. It is essential that farmers should be able to choose from a range of tested materials, those clones/genotypes that are most suited to their growing conditions and preferences for high cashew productivity.

Providing the farmers with extension services only does not always lead to increasing land productivity since many farmers still do not have sufficient technical knowledge (CUTS, 2011). For example, due to shortage of labour and lack of sufficient knowledge on rice farming, farmers at the initial stages of rice production prefer broadcast method of sowing rice; however, such a method imposes difficulties in carrying out other farm management operations like weeding, thinning and gap filling, pest and disease control

and even fertilizer application. As a consequence, sub-optimal yields are obtained per unit area. For example in Tanzania only 10% of rice farmers use improved varieties, while the rest rely mainly on traditional ones which have low yield potential, are susceptible to lodging and late maturing (URT, 2009). Similarly, for cashew nut production because of trying to avoid some labour demanding operations like weeding it has made farmers achieve low productivity of only about 0.4tons/hectare in Mkinga District and even high producing regions to achieve a relatively low average of about 0.8tons/hectare as compared to world average of 1.2tons/hectare (URT, 2012).

2.1.3 Factors affecting utilization of agricultural technologies

Tanzania is suffering from low agricultural productivity due to a number of factors including an inadequate extension system leading to ineffective dissemination of technologies, poor market linkages, weak links between research and extension and inadequate government support (Ministry of Agriculture Food Security and Cooperatives, 2007; Wambura *et al.*, 2012; Mvuna, 2013; Churi *et al.,* 2012).

According to Doss and Morris (2001) factors influencing adoption of technologies include; farm size, risk exposure and capacity to bear risks, human capital, labour availability, land tenure, access to financial institutions, and access to information. Others are social capital, household characteristics, type and price of inputs, extension services, infrastructure ecological and environmental factors. For example presence of extension service can influence easy access to information on existence of agricultural inputs to farmers, the more contact the farmer has with the extension services, the more likely will be the information/knowledge s/he has and the better will be the use of agricultural inputs (Haji, 2003).

2.1.4 Agricultural inputs

Agricultural inputs refer to a range of materials, which may be used to enhance agricultural productivity. The most important agricultural inputs include fertilizers, herbicides, pesticides and improved seeds. The use of agricultural inputs is fundamental in modern agriculture. In 2002-2003 SSA farmers used on average 9 kg of fertilizers per hectare of arable land compared to 100 kg per hectare in South Asia, 135kg per hectare in Southeast Asia and 73kg per hectare in Latin America (Crawford *et al.,* 2006). While agricultural production and productivity soared in Asia and Latin America during the last four decades (1960 – 2000), they have largely stagnated in Africa and therefore new subsidy programs began to emerge in several African countries (Crawford *et al*., 2006).

2.1.5 Extension agents and disseminated agricultural technologies

Extension agents are some of the most important sources of agricultural information in any country. Farmer access to information on agricultural technologies through increased government investment in extension services is crucial in revealing the opportunities of using such technologies, thereby reducing the subjective uncertainty on one hand and fostering increased adoption on the other (Strauss *et al.,* 1991; Langyintuo and Mekuria, 2005). Studies in this area including that of Igodan *et al.* (1988); Strauss *et al.* (1991); and Akromov (2009) report a positive relationship between extension services access and use of improved technologies.

2.2 Agricultural extension policy in Tanzania

Agricultural extension includes the provision of farmers with knowledge, information, experiences and technologies needed to increase and sustain productivity and for improved wellbeing and livelihoods (NRI, 2011). Delivery of quality agricultural extension services in Tanzania has been a centre of attention for a long time given the

fact that the majority of Tanzanians (more than two thirds) live in rural areas and depend on small-scale agriculture for their livelihood and employment (URT, 2006),

The National Agriculture Policy of 2013 was advanced after the review of the Agriculture and Livestock Policy of 2006, targeting at developing and transforming the agricultural sector in Tanzania, to make it more efficient, competitive and profitable. Some areas of attention that hinder development of the agricultural industry include low productivity, inadequate support services, low quality produce, poor participation of private sector and dependence on rain-fed agriculture (NAP, 2012). Both National Agriculture Policy of 2007 and the old Agriculture and Livestock Policy of 1997 emphasized the need to deploy agricultural extension officers to work at village level. The target of the government is to employ about 15 082 extension officers by the end of 2015 (MAFC, 2009).

According to the draft of agriculture extension policy (MAFC, 2006) the vision of agricultural extension services in Tanzania should by the year 2028, be participatory, demand-driven, market-oriented, cost-effective, gender sensitive and provided in a collaborative and coordinated way involving various stakeholders. The policy emphasizes on collaboration, coordination and supervision of extension services amongst all the actors in order to create synergy and improve effectiveness and efficiency.

Under the Regional Administration Act, 1997 and the Local Government Act No. 6 of 1999, the responsibility for implementing extension services lies with the local government authorities. During this process of decentralization of extension services a number of issues had to be addressed and the struggle continues until to-date. Some of those issues that had to be addressed included low level of professional skills and poor

understanding of many Councillors, inadequate skills of extension staff in mobilization, leadership development, group formation, participatory problem solving strategies and general lack of a strategic framework for extension (Rutatora and Mattee, 2001). In Tanzania, there are still no substantial improvements of agricultural and livestock production among small-scale farmers despite the extension decentralization efforts made to ensure that extension services are available to many farmers (Kyaruzi *et al.,* 2010).

2.2.1 Farmers' information needs from extension

Agricultural extension services have been defined as the communication of improved skills, practices, innovations, technologies and knowledge to farmers (Ani and Baba, 2009). This implies that extension services help people, particularly farmers, by educating them about and promoting farming practices and techniques that will increase their production and make it more efficient. According to Pangani (2007), agricultural extension officers help farmers increase productivity of their farms and improve their living standards. These officers have many roles as advisers, technicians and middlemen operating between agricultural research institutions and farm families.

Agricultural extension, or agricultural advisory services, comprises the entire set of organizations that support people engaged in agricultural production and facilitate their efforts to solve problems; link to markets and other players in the agricultural value chain; and obtain information, skills, and technologies to improve their livelihoods (Birner *et al.,* 2009).

The focus of this definition of extension was transfer of technology to improve productivity, especially for staple food crops. Agricultural extension service can be an engine for enhancement of social and economic development and it involves transfer of

technology, facilitation roles, provision of advisory and information services (Rivera and Zijp, 2003). Most studies analyzing access to extension service in the context of agricultural technology show its strong positive influence on adoption. In fact Yaron *et al*. (1992) show that its influence can counter balance the negative effect of lack of years of formal education in the overall decision to adopt some technologies.

While transfer of technology still has relevance, agricultural extension is now seen as playing a wider role by developing human and social capital, enhancing skills and knowledge for production and processing, facilitating access to markets and trade, organizing farmers and producer groups, and working with farmers toward sustainable natural resource management practices (Swanson, 2008). Within this expanded role, the breadth of information that agricultural extension can support through provision and facilitating access and sharing is much larger. In addition, as the agriculture scenario has become more complex, farmers' access to sources of reliable and relevant information has become increasingly important.

People involved in agriculture need improved skills, information, and ideas in order to develop an agriculture that will meet complex demand patterns, reduce poverty, and preserve or enhance ecological resources (Zijp, 1997).

A study by Zutter *et al.* (2006), noted that in order to successfully help poor farmers over the long term, a "cognitive approach to learning" will be required to increase the capabilities of small-scale farmers and their producer groups to find or create replicable solutions to their problems. Another study by Daudu (2009) revealed that in Nigeria extension services are still the most preferred sources of agricultural information available. In Tanzania, extension services are the primary means by which the

government channels information to farmers in an effort to increase agricultural production (Wambura, 2004).

A study by Aina (2006) revealed that the ratio of extension workers to farmers in Africa is low. Thus, in Africa many farmers are not supplied with information by extension workers. Studies also conducted in Tanzania by Mattee (1989) revealed that farmers' involvement in extension activities at that time was low to the extent that, 60.3% had not attended extension meetings, 58.7% had not participated in field days, 46.45% had not been visited by an extension worker and 69% had not read extension pamphlets or bulletins. A study conducted in Zambia by Kalusopa (2005) revealed that the most important sources of information for small scale farmers are NGOs, information centres and to so a lesser extent government extension services. This implies that farmer's seldom use government extension services as a source of agricultural information in solving their day to day agricultural problems. Training is important aspect in agricultural development while information on improved technologies is important to farmers and is mainly made possible through agricultural extension (Makhura, 2008).

2.2.2 Roles of private sector in provision of extension

About 80 percent of the world's extension services are publicly funded and delivered by civil servants (World Bank, 1997). Universities, parastatals and nongovernment organizations deliver about 12 percent of services, and the private sector another 5 percent. About 95 percent of extension staff works in public agricultural extension systems (Umali and Schwartz, 1994). Private sector can hardly carry out extension activities effectively without cooperating with the government (the public sector). Showing on how the government play significance role in facilitating deliverance of extension service, commenting on the significance of public in provision of extension services Kibwika (2011), has reported that, though challenged by its ineffectiveness, the

District public extension remained central to the delivery of agricultural advisory services.

The desire for an expanded private sector in extension provision requires a rethinking of the place and role of the state and of private and public advisory services. Some authors (Anderson and Feder, 2004; Kidd *et al.*, 2000), consider that the state has a role to play above all in the most disadvantaged areas and for the poorest farmers. As emphasized by Rivera and Zijp (2002), evolution towards a privatized advisory system is not straight forward and requires a precise clarification of the role of institutions, economic opportunities to be able to finance advisory services, advisory service providers with adequate capacities, and farmers able to formulate clear demands.

Finally, the privatisation of advisory services implies that the state should develop new functions to regulate relationships between actors and should ensure that public interests are considered (Labarthe, 2005; Klerkx *et al.*, 2006; Rivera and Alex, 2004). The private sector is attracted to participate as input suppliers, services providers and producers (Kimaro *et al*., 2010). With the current restructuring, more and more of the public services, including agricultural extension, will be provided by private organizations including NGOs, and civil society. According to Ameur (1994), diversity is the only way to address ever-changing conditions and various categories of users.

2.3 Cashew-nut Production Technologies and Their Effect on Cashew-nut Productivity

Cashew-nut is very modest in its soil requirements and can adopt itself to varying soil conditions without impairing productivity. It can grow on poor or stony soils likely due to its extensive root development. The best soils for cashew-nut are deep, friable, well-

drained, sandy loam soils without a hardpan (Ohler, 1979). Cashew-nut seedlings present great variation in growth habit, quality of crop and yield. Generally a distinction is made only between those with yellow or red cashew apples. Tests have indicated that very large nuts usually have inferior kernels, low density and slow germination (Caribbean Technological Consultancy Services Network, 1993).

The importance of improved technologies in cashew-nut was realized only with the introduction of "Model Clonal Cashew Garden" (MCCG) scheme, under which improved varieties are supplied to the farmers (Johnson and Manoharan, 2009). But in recent developments, farmers used polyclonal seeds or seeds from selected clones (AC4, AC10, AZA2, AZA17 and AC28) and grafting is the most recent propagation technique used.

Cashew-nut might require as long as eight weeks to germinate. Using seeds of high density, from selected trees, the weakest seedlings should be removed from the site, leaving only the strongest one to grow and by planting more than one seed; the occurrence of gaps in a plantation is reduced. A cashew-nut seedling would grow and develop much faster if weeding is practiced at the initial stages (Ohler, 1979). It is thus recommended that the seedlings are transplanted within a week of emerging, to ensure that the transplantation is successful.

Nigerian produces a limited variety of cashew-nut consisting mainly of yellow and red varieties, however high yielding cashew varieties with low gestation period and bigger nuts have been introduced. The Cocoa Research institute of Nigeria (CRIN) with mandate to research into cashew has developed an improved variety of cashew-nut called Brazilian Jumbo with nuts maturing within 1 year in contrast to the local wild varieties which mature after 5 years (CRIN, 2001).

According to the CRIN factors influencing production and harvest include old trees, deforestation, low yield varieties, dominance of small holdings and wild varieties, land acquisition, high cost of input, climatic conditions, diseases, pest and fire outbreaks, post-harvest loses, infrastructural constraints, quality, market price of the products and competition amongst the local buying agents (CRIN, 2001).

Productivity and quality in cashew-nut production depends on the application of inputs and use of improved planting materials as well as the knowledge with which these are applied. In fact, various studies have shown that the main costs in cashew production relate to inputs, particularly fungicides and hired labour (Ashimogo *et al*., 2008). Without controlling powdery mildew disease there will be a crop loss of more than 70% and the remaining production will be of poor quality (Sijaona and Shomari 1987, Waller *et al.,* 1992). To control diseases Sulphur Bayfidan, Topas, Anvil and Bayleton are recommended (Sijaona, 1984; Jalgaonkar *et al*., 2009). However, to make cashew-nut more environmentally friendly there is a need to look into aspects of reducing usage of industrial pesticides by developing appropriate organic pesticides or developing varieties resistant to pests and diseases by using both conventional and biotechnology approaches. Similarly, canopy management like trimming and pruning affects the quantity of sunlight intercepted by the trees, as tree shape determines the presentation of leaf area to in coming radiation which affects productivity (Singh, 2010).

Observations show that in developing countries, there is a gap between agricultural performance and available research information. This has been attributed to poor agricultural extension services as well as limited interaction between technology developers (researchers) and extension workers. Poor communication between actors in extension services delivery particularly the Government, NGOs, private sector

(agribusiness) and farmers has also been shown to hinder flow of developed technologies to farming communities (Kimaro *et al.,* 2010).

2.3.1 Dissemination of Agricultural Technology under Farmer Field School (FFS)

According to Van den Berg (2007), experience has shown that FFS graduates often require follow up to develop their acquired knowledge and skill in order to disseminate technical package according to their local circumstances. Farmer studies are a key follow up activity community-level planning is another important follow up activity. Specific training on field study skills helps farmers to conduct studies in an independent and sound manner.

2.4 Challenges of Cashew-nut Production Technologies and Practices

Less application of inputs particularly pesticides, is affecting cashew-nut productivity substantially. Devastating effects of Powdery Mildew Disease (PMD) is a major constraint in cashew nut production in the country (Sijaona and Shomari, 1987). Tanzania's agriculture like that of other SSA countries is still characterized by low input use. For instance, The Poverty and Human Development Report of 2007 (R&AWG, 2007 cited by Msuya *et al.,* 2008) showed that; 87% of Tanzanian farmers interviewed by the research and analysis group under Tanzanian's National Strategy for Growth and Reduction of Poverty (NSGRP, 2011/2012) were not using chemical fertilizer; 77% were not using improved seeds; 72% were not using pesticides, herbicides or insecticides (agrochemicals).

According to the National Sample Census of Agriculture 2007/08 the reasons for low input use by the smallholder farmers are high prices, lack of purchasing power, in sufficient knowledge of the effects of inputs and how to use them (NBS *et al.,* 2009).

Due to this constrain/scenario of low input access smallholder farmers productivity is low (Gadzirayi *et al*., 2006).

Farmers also were not able to calibrate the recommended application rates of pesticides on cashew. The major challenges faced by farmers were on how to identify destructive insect pests and also application rates to be used for different insecticides, thus most of spraying activities were done by hired motorized blowers' operators. The diseases may cause a yield loss ranging between 70 to 100% depending upon phytosanitary measures taken (Sijaona and Shomari, 1987). Other diseases, which appears to be a great threat to the industry, includes Anthracnose (Colletrotrichum spp), Dieback (Phomopsis spp) and wilt problem.

On the other hand, damage from sucking pests such as Helopeltis spp, Coconut bugs (Pseudotheraptus wayi), Stem borers (Mecocorynus spp) and Mealy bug (Pseudococcus spp) is equally important. These main pests affect both yield and quality and they are likely to increase in importance when mildew is controlled. Preventative and control measures of both biological and chemical nature are known to majority of farmers, actual application is challenged by a number of factors including economical (Sijaona and Shomari, 1987).

In fact, various studies have shown that the main costs in cashew production relate to inputs, particularly fungicides and hired labour (Ashimogo *et al*., 2008). Mole (2000) shows that employing technology is related to the price of nuts, but with prevailing input and cashew prices the different technology packages, including chemical control, was not profitable under sole cashew cropping conditions. He argued that price incentives must be combined with improved technology and marketing infrastructure for production to

increase (Mole, 2000). There is an additional point here. Unprotected market integration also exposes farmers to price fluctuations. The collapse of raw nut prices in the 2000–2001 seasons (World Bank, 2001) had a negative impact on the incentive to invest.

The existing credit institutions as well as the cooperative societies do not provide sufficient funds to farmers to purchase the required inputs (United Nations Industrial Development Organization, 2011). Credit markets in Tanzania are underdeveloped and formal lending and credit are available primarily for the public sector. Access to financial services, such as savings or cash deposits, is especially uncommon in rural Tanzania (Dercon and Krishnan, 1996).

Financial resources that are available in rural areas include: Savings and Credit Co-operative Societies (SACCOS), Savings and Credit Associations (SACAs), and informal sources of credit (family, friends, and moneylenders) (Rweyemamu, 2003). In other words there are no capital and production loans from financial institutions like banks and Savings and Credit Co-operatives Societies (SACCOs) for cashew-nut farmers (Shoo, 1998). Sometimes farmers that are willing to take loans face an insurmountable problem to present collaterals to financial institutions in order to secure loans (Masawe *et al.,* 2011a). Similarly, the capacity of farmers to lodge loans requests and manage financial transactions is very low (Ashimogo *et al.,* 2006).

Market liberalization of the cashew industry, whereby inputs, crop and processing business were privatized with minimum interference from the government future development of cashew industry in Tanzania will depend upon proper management of the Regional input funds widespread adoption of integrated cashew management package (Martin *et al*., 2011).

Traditionally, the extension effort in developing countries had focused primarily on increasing production and productivity by farmers. However, currently attention has shifted more towards increasing farmers' incomes and improving their livelihood (Christoplos, 2010). As a result extension is now expected to direct attention to ensuring economic returns to whatever activity the farmers may be involved in, and to advise farmers on how to maximize income. An important element of this strategy is to link famers to markets for whatever they are producing so that they may realize maximum returns.

Thus, in the drive to link farmers to markets, an important aspect is therefore the organization of farmers into co-operative groups designed to help with marketing and technology, or through facilitation of farmer-market linkages (Swanson, 2006). Coordination and links with complementary agricultural services are key problems for extension organizations, especially the links with research, input supply systems, credit, and marketing organizations (Axinn, 1988).

The Cashew-nut Authority of Tanzania (CATA) took over the role of National Agricultural Products Board (NAPB). CATA was given a wide ranging of responsibility for developing the industry by promoting the activities of growers, stimulating processing, regulating and controlling marketing and exporting. An effective marketing system needs to remain in operation and the farm-gate price of raw nuts must continue to be attractive. It is also imperative that taxation be restrained and kept to a reasonable level (Topper *et al.*, 1998).

The challenges that faced cashew-nuts industry was processing facilities, processed kernels for export to United Kingdom, South Africa, South Korea, Pakistan and Kenya

(Cashew Board of Tanzania, 2001). Only a small part of national production is actually consumed locally after processing by traditional methods. Wider local use is made, however, of cashew apples, which are eaten fresh or used to produce a local beer (ulaka) or a spirit (nipa). Nevertheless, most apples are unused but measures are underway to make cashew juice and other secondary products such as jams, chutney, pickles, vinegar and candy (Chijinga, 2001).

2.5 Cashew-nut Productivity and Disseminated Technologies

Information on improved inputs and the best ways of using them can improve farmers production and productivity (Meitei and Devi, 2009; Momodu, 2010). Information on improved technologies is important to farmers and is mainly made possible through agricultural extension (Makhura, 2008). Hence majority of cashew-nuts gardens were of seedling origin (Jeeva *et al.,* 2006) and even now many of the new cashew-nut gardens are being established with seedlings only.

However, most research is focused on the analysis of changes in agricultural practices induced by the intervention, and mainly highlights a reduction in the use of pesticides (e.g. Nisha and Rakhesh, 2006, in India; Orozco *et al.,* 2008, in Mexico). In Asia, Van den Berg and Jiggins (2007) show, however, that farmer schools have impacts that go beyond the simple acquisition of technical knowledge. These include immediate impact of training through aggregated data like knowledge about ecology, experimentation skills, pesticides reduction, group building, communication skills, education skills and negotiation skills. Another impact is developmental impacts of training often using qualitative methods which include sustainable production, improved livelihoods, improved biodiversity, poverty reduction, farmers association, farmer study groups, farmer to farmer extension, farmer networks, policy change and awareness campaigns.

Cashew-nuts yield vary between trees, areas and age depending on technologies and management practices, environment and incidence of insect pests and diseases. In Tanzania, a productivity level of cashew-nut farmers is about 11 kg/tree while worldwide is about 22kg/tree (URT, 2013). Productivity and quality in cashew production depends on farm management like ploughing, intercropping, pruning, the application of pesticides and use of improved planting materials as well as the knowledge with which these are applied (URT, 2012).

New initiatives in the last few years have been undertaken to revive the sector in Mozambique , including subsidies, implementation and coordination of treatment of trees against powdery mildew disease by spraying trees, new plantations nurseries with new varieties, training, extension work including cultivation techniques and pruning as well as research (INCAJU, 1998).

2.6 Overview on Global Cashew-nuts Production

The cashew-nuts tree is strictly tropical and its cultivation is largely restricted to latitudes 15 degrees north and south. The best climatic conditions for cashew-nuts are found in the tropical coastal lowlands where there is a well-defined dry season of at least four months. Cashew is widely grown across the tropics where in most countries it remains a smallholder crop and only Brazil has a significant production of cashew from plantations. The main country producers of cashew nuts are India, Vietnam, Brazil and Tanzania, with further significant harvests in Mozambique, Indonesia and West Africa (Jaeger, 1999).

2.6.1 Cashew-nut production policy management environment in Tanzania

The Cashew nut Board of Tanzania (CBT) is a corporate body established by the Act No. 21 of 1984 (As amended in 1993) to replace Tanzania Cashew nut Marketing Board. It is entrusted with the responsibility of regulating the development of the Cashew Industry in Tanzania. In undertaking its mandated roles the Cashew nut Board puts more emphasis in improving efficiency and effectiveness in the cashew nut sub sector in order to meet requirements of different stakeholders thereby enabling them to contribute to the national development (URT, 2013).

The Medium Term Strategic Plan (MTSP) provides a framework for improved services delivery in the Board by introducing performance based management systems. The plan is guided by the aspirations of the Tanzania Development vision 2025 which aims for high quality livelihood, peace, stability and unity, good governance, well educated society and a strong and competitive economy. It is committed to the *MKUKUTA* framework and the Agriculture Sector Development Programmes (ASDP). It is therefore an expectation that the Strategic Plan will enable the Cashew nut Board to organize itself to improve quality efficiency, effectiveness and performance of services on a continuous basis and sustain this gain in the longer term (URT, 2013). Cashew nut Board of Tanzania (CBT) report shows that Tanzania in 2012 produced about 158 000 metric tonnes of cashew nuts, standing at 90% of all that is harvested in the country, but less than 10% was processed internally (URT Report, 2013).

According to the CBT report cashew nuts provide an important source of income for 250 000 smallholder farmers in Tanzania. Main production areas are the districts of Mtwara, Lindi, and Ruvuma. They account for 80-90% of Tanzania's marketed cashew

nut crop. Cashew-nuts are the source of three-quarters of total cash incomes of farmers in these districts (URT Report, 2013).

The cashew-nut sub-sector contributes 18% of Tanzania's merchandise export earnings. The average smallholder cashew farmer occupies about one to two hectares of farm under cashew nut trees, sometimes intercropped with food crops, mainly cassava, grain staples and legumes. Large-scale private plantations occupy about 2 000 hectares in Lindi and Mtwara regions (URT Report, 2013).

According to cashew-nuts board report in 2001 the majority of harvested cashew nuts are purchased raw, exported and processed abroad, mainly in India. This is then re-exported to different countries around the world at a higher price than the original one. Failure to utilize full capacity of cashew-nut crop is due to insufficient fund for purchasing the raw cashew-nuts and meeting production cost. Currently there are only three working plants located in Mtwara, Dar es Salaam and Newala which can process not more than 20 000 tons per year.(URT Report, 2012).

Cashew nut is the main cash crop of Southern Tanzania regions and is also grown, to a lesser extent, in other regions, particularly along the coast including Tanga region. Smallholders, estimated at 280 000 households, on some 400 000 hectares in mono or mixed-crop production systems predominantly grow cashew nut (Shomari, 1990; Topper *et al*., 1998).

The average smallholder cashew farmer occupies about one to two hectares of cashew trees, sometimes intercropped with food crops, mainly cassava, grain staples and legumes. Large-scale private plantations occupy about 2 000 hectares in Lindi and Mtwara regions. Most of the cashew was planted in the 1950s and 1960s, with a marked

decline in planting since mid-1970s. However, new plantings started again in early nineties and by late nineties (Topper *et al.,* 1998).

2.6.2 Credit and cashew-nut production in Tanzania

Ashimogo *et al*. (2008) noted that some credit institutions were in place but farmers refrain from taking loans because of the fear of crop failure or low farm gate price that would make them not to be able to repay the credits and their huge interests. Sometimes farmers that are willing to take loans face an insurmountable problem to present collaterals to financial institutions in order to secure loans (Masawe *et al.,* 2011). Similarly, the capacity of farmers to lodge loans requests and manage financial transactions is very low (Ashimogo *et al.,* 2006).

Organization of farmers into co-operative groups designed to help with marketing and technology utilization or through facilitation of farmer-market linkages could help alleviate the above mentioned problems (Swanson, 2006). However, while farmer organizations have many benefits, the success of such groups is quite unpredictable, and greatly depends on many factors which among others include the mission statement of their union, the organizational structure, human resources and communication mechanisms (Wennink and Heemskerk, 2006).

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

Mkinga is one of the eleven districts in Tanga Region located in north-eastern of Tanzania. The district is constituted of about 2948 square kilometres. The variations in the topography contribute to a diversity of climates that range from hot and humid in the coastal plains to temperate in the mountains. High temperatures and high humidity characterize the coastal lowlands. The coast generally receives between 1100mm and 1 400mm of rain fall in a year including Mahandakini Village. The areas further inland to the northwest receive 400-500 mm especially in the lee side of the mountains including Mavovo Village.

3.2 Research Design

A cross-sectional study design was used whereby data were collected at a single point in time (Babbie, 1990). The design was chosen because it was appropriate and could effectively meet the intended objectives.

3.3 Sampling Procedure and Sample Size

Two villages of Mahandakini and Mavovo were purposively selected because these were the highest producers of cashew-nut in the District (Mkinga District Report, 2013). The Sampling frame was all cashew-nut farmers both male and female in the two villages. Village lists were prepared then simple random sampling was used to select 40 farmers from each of the two villages to make a sample of 80 respondents. According to Matata *et al.* (2001) having 80-120 respondents was adequate for social-economic studies in sub Saharan Africa. Two village leaders, four ward/village agricultural extension officers, two District extension officers purposively served as key informants.

Table 1: Percentage distribution of respondents by village and sex in Mkinga District (n=80)

Name of Village	Sex of Respondents		Total
	Female	Male	
Mavovo	16	24	40
Mahandakini	20	20	40
Total	**36**	**44**	**80**

3.4 Data Collection Methods

3.4.1 Primary data

Both quantitative and qualitative data were collected. For quantitative data a questionnaire was used and administered to farmers while qualitative data was collected using a checklist with key informants. Instrument pre-test was done to farmers outside the study area with the same characteristics to test the instrument validity and reliability and changes were accommodated accordingly.

3.4.2 Secondary data

Secondary data included information on type of technologies and practices disseminated to farmers, the number and type of extension service providers in the district and availability of input supplied. This information was collected from documents available at the village, district offices, cashew- nut board, and Agriculture research station at Naliendele.

3.5 Data Analysis

Primary quantitative data were collected, coded, entered, cleaned and analyzed using computer software SPSS (Statistical Package for Social Science) version 16.0. Descriptive statistics such as frequencies, means, and percentages on socio-economic

characteristic was calculated to determine the distribution of the study variables, while Mann-Whitney was used to determine differences in cashew nut productivity as a result of cashew-nut disseminated technologies. Qualitative data were analysed and summarised along key questions.

3.6 Limitations of the Study

One of the major limitations with this study is based on the fact that some farmers could not easily recall production figures or data hence to solve this problem the secondary data and local measurement were used.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

Findings have been presented in line with the specific objectives of the study. The chapter is organized into section which include; socio-economic characteristics of respondents, input providers and types of extension services to cashew-nut growers, challenges in integrating disseminated cashew-nut production technologies and current cashew-nut productivity in Mkinga District as a result of disseminated cashew-nut technologies.

4.1 Socio-Economic Characteristics of Respondents

The socio-economic characteristics of respondents play an important role especially in the field of agriculture. Most studies have associated farmers' age, farmers' education, land holding size, famers' family size, gender and marital status with crop production. Many studies have shown those characteristics as having a positive effect on technical efficiency. (Liviga and Mekacha, 2008; Msuya *et al.*, 2008; Oluwasola, 2010; Boehnke, 2003) For example, these studies found out that age, marital status, level of education, incomes and size of family labour of respondents had positive effect on technical efficiency. Some of these issues will be checked against the results of this study.

4.1.1 Age of respondents

Out of 80 respondents involved in this study about 2.5 percent had their ages between 18-27 years, 13.7 percent had 28-37 years of age, 31.2 percent had the ages between 38-47, 28.8 percent had their ages between 48-57 and 23.8 percent had their ages equal to or greater than 58 years (Table 2). As reported by the key informants, the majority of people in the ages between 18 and 37 years do not engage in cashew-nut production activities

because either they are doing petty business in Tanga city or are engaged in fishing activities. On the other hand the results indicated that middle aged people above 38 years were the ones busy with cashew-nut production activities. Similarly, Liviga and Mekacha, (2008) in their study about youth migration and poverty alleviation a case study they did on petty traders in Tanzania, reported that most youth who get chance to go to school their main aim is to migrate to urban areas and look for opportunities in non-agricultural employment. If these tasks are left to aged people then definitely their technical efficiency will be low due to reduced labour efficacy.

4.1.2 Sex of respondent

Although the majority of respondents (55%) engaged in cashew-nut production activities were males as compared to 45 percent of females. (Table 2) the numbers are not significantly different. These findings did not concur with FAO report (2010) which found out that cash and export crops are frequently regarded as “men’s” crops and subsistence crops as “women’s crops since a good number of males according to key informants were not interested in cashew-nut activities instead they were more inclined into fishing activities.

4.1.3 Marital status of respondents

On marital status of respondents, the results show that 70 percent of respondents were married and about 11.3 percent were single (Table 2). This shows that majority of married people are less mobile compared to singles and hence due to family obligations they remain in the villages doing agriculture. This result agrees with Khan (2010) in study of rural development and rural out migration in Uttar Pradesh that married people have more family burdens and obligations; hence they are less mobile as compared to singles.

4.1.4 Education levels of respondents

Education is usually valued as a means for acquiring knowledge and skills about farming technology. Education enhances the ability to derive, decode and evaluate useful information for agricultural production. The rate at which one can access, assimilate and idealize new knowledge could depend on the educational level of the individual. Thus, low level of education tends to foster unfavourable attitudes towards the acceptance of improved farm practices (Ani, 1998; Oluwasola, 2010; Waller *et al.,* 1998; Caswell *et al.,* 2001).

The study found a high level of illiteracy with a significant number of respondents who had no formal education. The majority of the interviewed respondents (60%) had no formal school education, while 36.2 percent had obtained primary school education and only 3.8 percent had secondary school education (Table 2). These results do not correspond with what Shenduli (1998) found in the study on the role of farmer's groups network in the adoption and diffusion of selected technologies in the upper Mgeta Morogoro, that there was a reasonable high literacy rate which had a lot of implications in terms of agricultural development since extension officers could easily communicate innovation to farmers by using written extension materials like booklets, leaflets, newsletters and posters. These results indicate that more people with no formal education and primary school education are the ones residing in the village dealing with cashew-nut production. However, Msuya *et al.* (2008) like in this study, reported very low levels of education among small scale farmers in the study area.

Table 2: Percentage distribution of respondents by age, sex, marital status and educational levels (n=80)

Variables	Frequency	Percentage
Age categories		
18-27	2	2.5
28-37	11	13.7
38-47	25	31.2
48-57	23	28.8
Equal or greater than 58	19	23.8
Total	**80**	**100.0**
Sex		
Male	44	55
Female	36	45
Total	**80**	**100.0**
Marital Status		
Single	9	11.25
Married	56	70.0
Widowed	6	7.5
Divorced	9	11.25
Total	**80**	**100.0**
Level of Education		
No formal education	48	60
Primary school education	29	36.2
Secondary school education	3	3.8
Total	**80**	**100.0**

4.1.5 Land tenure and the size of cashew-nut farm owned

Concerning the land tenure, results from Table 3 showed that 70 percent of respondents owned land by inheritance while 30 percent bought their land. The reasons for a large

proportion of the respondents to own land by inheritance had to do with the fact that most of the cashew-nut producers were traditional residents of those villages in the district. The results are similar with what Blarel *et al.* (1992) found in the studies done in Ghana and Rwanda on the economics of farm fragmentation who concluded that in most African societies land acquisition is through inheritance with few through rental arrangements or purchase.

According to this study, among 80 respondents involved in this study 53.8 percent had greater than two acres of cashew-nut farm, 23.7 percent had between one acre and two acres and 22.5 percent had less than one acre. These findings are in line with those of the Tanzania agricultural sample census 2007/08 which revealed that more than 50 percent of farming households that grow crops had farm sizes ranging from 0.025 to 3.75 acres (NBS, 2010). However, farmers in this study indicated that land was not limiting instead it was the traditional tools like hand hoes which limit them to expand on cashew-nut production. Similarly, in the study of agro-food chains and networks for development, Ruben *et al.* (2006) indicated that the majority of African smallholders cultivate less than two hectares (5 acres) of farm lands because of the use of rudimentary tools and lack of access to processing machines.

4.1.6 Monthly Income and Source of Labour

Income of respondents was measured on a monthly basis and 86.2 percent of respondents had income below Tsh 120 000 per month, 10 percent ranged from Tsh 120 000-200 000 per month and only 3.8 percent had above Tsh 200 000 per month (Table 3). Low income as indicate in Table 3 is a manifestation of low crop yield since farmers had no cash to purchase inputs required for crop production. It was also reported as being difficult to get credit since they could not meet minimum collateral and other loan security requirements.

With regard to labour, about 62.5 percent of respondents depended on family labour, 13.75 percent on hired labour while 23.75 percent used both sources of labour (Table 3). This is clear indication that the majority of farmers depended on family labour and therefore the size of the family in a way determined the production levels. The results are in line with Starkey's (1996) findings in the study on networking for sustainable agriculture who argued that household labour availability had an influence on utilization of technologies.

Table 3: Percentage distribution of respondents by land tenure, size of cashew-nut farm, monthly income, and source of labour (n=80)

Variables	Frequency	Percentage
Land tenure		
Inherited	56	70
Bought	24	30
Total	**80**	**100.0**
Size of Cashew-nut farm		
Less than one acre	18	22.5
Between one acre and two acres	19	23.7
Greater than two acres	43	53.8
Total	**80**	**100.0**
Monthly income		
Below 120 000Tsh	69	86.2
Between 120 000 and 200 000Tsh	8	10
Above 200 000Tsh	3	3.8
Total	**80**	**100.0**
Source of labour		
Family	50	62.5
Hired	11	13.75
Both	19	23.75
Total	**80**	**100.0**

4.1.7 Family labour

Family size is used to determine the available labour for farm work basing on the extent of contribution of each member in farm work (Boehnke, 2003). Out of 50 respondents

who use family labour, 26 percent of those had 1-3 able bodied people, 40 percent with 4-6 able bodied people, 30 percent with 7-9 able bodied people and 4 percent more than 9 bodied able people (Table 4). With an average of about 4.6 members of able bodied people excluding children, supply of labour shouldn't have been a problem. It is therefore a puzzle as to why many cashew-farms in Mkinga District are still under bush. Although farmers can increase their labour through traditional labour exchange arrangements, these are usually only short-term. The fact that farmers cultivate a number of crops this might have contributed to cashew production shortage of labour. This outcome could be explained or comparable to the results of a study on constraints and progress through integrated crop management cashew nut production (Martin *et al.,* 1997), who observed that shortage of labour, has probably been one of the most important factors limiting the rehabilitation of abandoned cashew farms, particularly those that were abandoned for many years.

Table 4: Percentage distribution of respondents by size of family labour (n=50)

Size of family labour	Frequency	Percentage
1-3	13	26
4-6	20	40
7-9	15	30
Equal or Greater than ten	2	4
Total	**50**	**100.0**

4.1.8 Experience of respondents on cashew-nut production

In a study of the socio-economic determinants of technology adoption by farmers it was expressed that farmers with long years of experiences had better managerial ability and tended to be more practical especially with regards to utilization of information (Daneji *et al.,* 2006). Out of 80 cashew-nut farmer respondents of this study, 27.5 percent had experience of more than 13 years, while 25 percent had about 10-13 years of experience,

20 percent had 7-9 years of experience, 20 percent had 4-6 years of experience and 7.5 percent had about 1-3 years of experience (Table 5).

Hence these results indicated the fact that cashew-nut farmers in Mkinga District had sufficient experiences in cashew-nut farming and therefore lack of experience cannot count on their behavior of irresponsive towards the implementation of the recommended practices. In this case other factors have to explain why they were not adopting the recommended practices and probably insufficient labour as a result of attending to many different crops could be the reason behind it. It is however, interesting to note that a study done in India cashew-nut farmers had an average experience of about 23.5 years (*Shivaramu et al.,* 2004*, Veerkar et al.,* 2006).

Table 5: Percentage distribution of respondents by experiences in cashew-nut production (n=80)

Experiences (years)	Frequency	Percentage
0-3	6	7.5
4-6	16	20
7-9	16	20
10-13	20	25
More than 13 years	22	27.5
Total	**80**	**100.0**

4.2 Input Providers and Types of Extension Services to Cashew-nut Growers

The variables of interest in this study were:- presence of extension agent/contact, access to credit facilities to cashew-nut growers, access to market, access to mass media, and access to farm inputs including fertilizer, insecticides, fungicides, manure, and improved

seedling. Input providers include District, NGOs, private sector, Cashew-nut Board of Tanzania and research institutions.

4.2.1 Agricultural extension contact

Out of 80 respondents involved in this study about 43.8 percent indicated that they had an agricultural officer in their village and 56.2 percent had no agricultural extension officer (Table 6). All village agricultural extension officer identified were government employees. Similarly, 91.2 percent of the respondents (80) indicated the importance of having a village agricultural extension and 8.8 percent thought agricultural extension officers were not that important. From the results it is very clear that the District public extension officers remain central to the delivery of agricultural extension and advisory services. The results are still a reflection of what was already reported in the past by Umali and Schwarz (1994) that about 95 percent of extension staff in Africa, work in public agricultural extension systems.

Out of 73 respondents who saw the importance of having village agricultural extension officer, about 38.4 percent of those cited the need to be nearby to agricultural extension services in order to get advices, while 32.8 percent they said because they just needed to be close with agricultural officer for close supervision of their activities and 28.8 percent wanted to be close to agricultural services including extension (Table 6).

On the other hand out of 48 respondents who had contact with agricultural extension officers, about 45.8 percent indicated to have contact with agricultural extension officer after more than a month, 25 percent twice a month and 16.7 percent only once per month (Table 6). Generally the results indicated that cashew-nut farmers in Mkinga had less contact with their agricultural extension officer. These results resemble those of the study

of adoption of cashew technologies done in India which found that contact with extension agencies was low among majority of the cashew farmers while participation in extension programmes was found to be medium for almost two-third of the farmers (Lakshmisha, 2000); Shivaramu *et al.,* 2004).

Furthermore, the results indicated that out of 48 respondents who had contact with agricultural extension officer 52 percent had contact through village meetings, 27.1 percent through farm visits, 18.2 percent through office visits and only 2.1 percent were visited by the extension officer at their homes. It is clear that the majority of cashew farmers were mainly met by the agricultural officers during the village meetings where the opportunity to discuss individual concerns and in details could not exist. Rutatora and Mattee (2001) in the study of agriculture extension providers reported on the inability of many Districts in Tanzania to fund extension services from their own sources without external assistance while the cost of cashew-nut production is relatively high. This is because revenues collected are very low, hardly sufficient to cover many development priorities in the Districts. The poor financial situation makes it difficult for the District to allocate sufficient funds to hire more extension workers as well as facilitate the existing ones. Because of those circumstances the available extension workers are unable to reach many farmers.

Out of 48 respondents who contacts with agricultural extension officers about 81.2 percent indicated that the information received from those extension officers were advices on new technologies and motivation to try them. Only 14.6 percent got comments based on what was observed on the farm (Table 6). The results indicated that many farmers had no moment to discuss and analyze their production problems with extension workers. Since there was insufficient interaction with extension workers,

sometimes it was difficult for them to even identify their problems. According to Zutter *et al.* (2006) in the study on poverty and how to accelerate change in Latin America indicated that, to successfully help poor farmers over the long term, a "cognitive approach to learning" will be required to increase the capabilities of small-scale farmers and their producer groups to find or create replicable solutions to their problems.

Table 6: Percentage distribution of respondents by presence and importance of Agricultural Extension Agent (n=80, 73, 48)

Aspects	Frequency	Percentage
Presence of Village Agricultural Extension Officer		
Yes	35	43.8
No	45	56.2
Total	**80**	**100.0**
Importance of Agricultural Extension officer		
Yes is important	73	91.2
No is not important	7	8.8
Total	**80**	**100.0**
		(n=73)
Reason for importance of Village Agricultural Extension Officer		
To be close with agricultural extension	21	28.8
To be close for supervision	24	32.85
To have nearby agricultural services	28	38.35
Total	**73**	**100.0**
		(n=48)
Rate of Contact with Agricultural Extension Officer		
One time per month	8	16.7
Two time per month	12	25
Three times per month	4	8.3
Many times per month	2	4.2
Meet after a month	22	45.8
Total	**48**	**100.0**
Location of contact by Agricultural Extension Officer		
When he/she visit my farm	13	27.1
I drop by his/her house to ask for advices	1	2.1
In village meeting	25	52
I drop by his/her office when I need help	9	18.8
Total	**48**	**100.0**
Type of Information by Agricultural Extension Officer		
Comments based on what she/he observed on farm	7	14.6
Advices on new technologies and motivation	39	81.2
Information generally on agriculture	2	4.2
Total	**48**	**100.0**

4.2.2 Training received from village agricultural extension officer

Training is an important aspect in agricultural development while information on improved technologies is important to farmers and is mainly made possible through agricultural extension (Makhura, 2008). Out of 80 respondents involved in this study 43.8 percent received training on seedling and spacing, 23.8 percent received training on mulching, and 22.5 percent got training on use of fertilizers, 43.8 percent got training on both weeding and pruning and 18.8 percent received training on top working (top working is grafting of mature crops) (Table 7). Similarly, 21.2 percent of respondents received training on both grafting and manure application, 48.8 percent received training on diseases and only 15 percent received training on cashew nut processing (Table 7).

In general given the nature of the training provided to farmers and the proportion of those who received training, it is clear that most farmers have limited knowledge not only on technical issues related to cashew growing and processing but also in farm business management. A study by Aina (2006) in Botswana revealed that the ratio of extension workers to farmers in Africa is low, thus, many farmers are not supplied with information by extension workers. Similarly, farmers who had higher levels of education and received training had higher abilities to perceive, interpret and respond to new information about improved technologies than their peers with little or no education (Langyintuo and Mekuria, 2005; Tabi *et al.,* 2010).

Table 7: Percentage distribution of respondents by various trainings received from Extension Officer (n=80)

Training on practices	Frequency	Percentage
Training on seedling		
Yes	35	43.8
No	45	56.2
Total	**80**	**100.0**
Training on spacing		
Yes	35	43.8
No	45	56.2
Total	**80**	**100.0**
Training on mulching		
Yes	19	23.8
No	61	76.2
Total	**80**	**100.0**
Training on fertilizer application		
Yes	18	22.5
No	62	77.5
Total	**80**	**100.0**
Training on weeding		
Yes	35	43.8
No	45	56.2
Total	**80**	**100.0**
Training on pruning		
Yes	35	43.8
No	45	56.2
Total	**80**	**100.0**
Training on top working		
Yes	15	18.8
No	65	81.2
Total	**80**	**100.0**
Training on grafting and manure applications		
Yes	17	21.2
No	63	78.8
Total	**80**	**100.0**
Training on diseases		
Yes	39	48.2
No	41	51.8
Total	**80**	**100.0**
Training on shedding		
Yes	12	15
No	68	85
Total	**80**	**100.0**

4.2.3 Perception of farmers on information provided on cashew-nut technologies/ practices

Using Likert scale measurements, out of 35 respondents who received training on seedling only 11.4 percent strongly felt that seedling training from extension officer was very useful, 82.9 percent as useful and only 5.7 percent thought it was not useful. Similarly, on spacing training 11.4 percent strongly felt that the training was very useful, 82.9 percent as useful and 5.7 percent as not useful (Table 8). Furthermore, out of 35 respondents who received training on weeding, 20 percent considered the training to be very useful, 77 percent as useful and 2.9 percent as being not useful. A similar picture was pointed out when it came to the 35 respondents who received training on pruning since 17.1 percent thought it was very useful 80 percent as useful and 2.9 percent as not being useful in cashew-nut production activities (Table 8).

Likewise when Likert scale was used to solicit opinion on those who received training on manure use (17), 5.9 percent considered it to be very useful, 82.4 percent considered the training to be useful and the remaining 11.7 percent thought it was not useful. Similarly, for those who were trained in grafting, 5.9 percent thought it was very useful, 70.6 percent as useful and 23.5 percent thought it was not useful (Table 8). For those who received training on diseases (69), 38.5 percent had the opinion on the training as being very useful and the remaining 61.5 percent as useful (Table 8).

Generally the findings of this study indicate that the respondents who received training on various cashew production practices had positive attitudes towards information or training received from extension officers. Similar observations were made following a study on perceptions of cashew demonstration farmers towards recommended soil and water conservation and plant protection measures in India where it was found that the

respondents of the study area had medium to highly favorable opinion towards important recommended practices of cashew, which could have motivated the adoption level and that most of farmers who had contact with extension officers generally showed positive attitude to the support they received and also perceived extension officer as being very helpful. (Venkattakumar *et al.,* 2005).

Table 8: Percentage distribution of respondents by their perception on information/ training received on seedling, spacing, weeding and pruning (n=35, 17, 39)

Training type	Frequency	Percentage
Training on seedling		
Strongly agree	4	11.4
Agree	29	82.9
Disagree	2	5.7
Total	**35**	**100.0**
Training on spacing		
Strongly agree	4	11.4
Agree	29	82.9
Disagree	2	5.7
Total	**35**	**100.0**
Training on weeding		
Strongly agree	7	20
Agree	27	77.1
Disagree	1	2.9
Total	**35**	**100.0**
Training on pruning		
Strongly agree	6	17.1
Agree	28	80
Disagree	1	2.9
Total	**35**	**100.0**
		(n=17)
Training on grafting		
Strongly agree	1	5.9
Agree	12	70.6
Disagree	4	23.5
Total	**17**	**100.0**
Training on Manuring		
Strongly agree	1	5.85
Agree	14	82.4
Disagree	2	11.75
Total	**17**	**100.0**
		(n=39)
Training on diseases		
Strongly agree	15	38.5
Agree	24	61.5
Total	**39**	**100.0**

4.2.4 Other source of information

Apart from agricultural extension officers, respondents also received information from other sources including 31.3 percent who received agricultural information from radios while 1.2 percent received similar information from newspapers and about 67.5 percent received information from fellow farmers (Table 9). It was found that farmers could learn a lot from their fellow farmers as they visited each other's fields. Similarly, it was reported that they also shared agricultural knowledge, experiences and how to handle the challenges they met during informal and formal social gatherings. Previous studies on analysis of the role of females' farmers in household energy management in Nigeria indicated that interpersonal communication among farmers is the most frequent medium of dissemination of agricultural information (Nabinta 2003).

Table 9: Percentage distribution of respondents by other source of information (n=80)

Source of Information	Frequency	Percentage
Radio	25	31.3
News papers	1	1.2
Fellow farmers	54	67.5
Total	**80**	**100.0**

4.2.5 Access to market and credit facilities

Out of 79 respondents who sold cashew-nut in the study area (one of the respondents the plants had not started bearing fruits) about 69.6 percent sold their cashew-nuts immediately after harvesting, 6.3 percent sold before harvest while only 24.1 percent stored their cashew for better prices during off-season. The reason for selling immediately is due to lack of storage facilities and no well defined cashew-nut marketing channels (Table 10). When it comes to marketing only 1.3 percent sold their cashew

through warehouse system while 98.7 percent sold their cashew-nut to brokers (Table 10). The results also indicated that only 2.5 percent had regular customers for raw cashew-nut while 97.5 percent had not regular cashew-nut customers the reasons being that the warehouse system was not well established in Mkinga District and farmers had very little knowledge about the system.

The results continued to indicate that out of 79 respondents who sold cashew-nut, 97.5 percent sold all of their cashew-nut while 2.5 percent did not. Similarly, about 81 percent said that the price of cashew-nut was bad while 19 percent considered it to be fair (Table 10). Despite the price being poor, 93.7 percent said that it was easy to get buyers (Table 10). Lack of credible marketing system and having many unregulated brokers, conspire to create low prices in order to earn huge profits. Experiences in Mozambique have also indicated that the system has allowed continued control of farm gate prices, and therefore the greater share of additional profit from higher cashew prices in that country has been retained by the trading sector (Hanlon, 2000; INCAJU, 2002).

Out of 80 respondents 82.5 percent did not get any credit for cashew-nut production activities while only 17.5 percent acquired credit (Table 10). Results also indicated that out of 14 respondents who acquired credit about 42.9 percent got their credits from family members and friends while 28.6 percent got from informal savings or credit groups. The results suggested that there were no reliable financial institutions which supported cashew-nut farmers in Mkinga District. The formal credit system demands one to have trustworthy collateral assets to be able to take a loan of which most farmers cannot meet.

Table 10: Percentage distribution of respondents by cashew-nut marketing and credit facilities (n=79, 80, 14)

Aspect	Frequency	Percentage
Time of selling cashew-nut		
Sold before harvest	5	6.3
Sold immediately after harvest	55	69.6
Store and wait for better price	19	24.1
Total	**79**	**100.0**
Marketing channel		
Ware house system	1	1.3
Brokers	78	98.7
Total	**79**	**100.0**
Regular customer of cashew-nut		
Yes	2	2.5
No	77	97.5
Total	**79**	**100.0**
Whole sale of cashew-nut		
Yes	77	97.5
No	2	2.5
Total	**79**	**100.0**
Performance of cashew-nut marketing		
Fair	15	19
Bad	64	81
Total	**79**	**100.0**
Access to buyers		
Easy	74	93.7
Fair	5	6.3
Total	**79**	**100.0**
		(n=80)
Credit to respondent		
Yes	14	17.5
No	66	82.5
Total	**80**	**100.0**
		(n=14)
Financial organization		
Family and friends	6	42.9
Informal savings or credit group	4	28.6
NMB	1	7.1
Cooperative society	3	21.4
Total	**14**	**100.0**

4.2.6 Source of capital for cashew-nut activities

Most farmers depended mainly on personal savings and family labour to undertake cashew-nut activities. For example, out of 80 respondents when it came to weeding activities, 40 percent used personal savings to cover the operation, 21.2 percent used revenue from cashew-nut sales and only 10 percent borrowed from credits institution (Table 11). In pruning out of 46 respondents who pruned cashew trees 65.2 percent used personal savings, while 23.9 percent used cashew-nut sales and only 4.3 percent used funds from credit institutions (Table 11). Similarly, out 32 respondents who mulched cashew trees about 75 percent used personal savings from other activities and 25 percent used cash from cashew-nut sales. The results continued to show that out of 52 respondents who treated diseases with chemicals, 48.1 percent used personal savings from other activities, 25 percent from cashew sales, and 3.8 percent from credit institutions (Table 11). In general the results showed that a good number of farmers in Mkinga District used personal savings from other activities like wages from manual labor to operate cashew-nut farms because they had no loans and they had very little income from cashew-nut sales.

Table 11: Percentage distribution of respondents by source of capital for preparing cashew-nut activities (n=80, 46, 32, 52)

Activity	Frequency	Percentage
		(n=80)
Source of capital for preparing holes		
Personal savings	39	48.8
Cashew-nut sales	6	7.5
Not use money	35	43.8
Total	**80**	**100.0**
Source of capital for weeding		
Personal savings	32	40
Cashew-nut sales	17	21.2
Credit	8	10
Not use money	23	28.8
Total	**80**	**100.0**
		(n=46)
Source of capital for pruning		
Personal savings	30	65.2
Cashew-nut sales	11	23.9
Credit	2	4.3
Not use money	3	6.5
Total	**46**	**100**
		(n=32)
Source of capital for mulching		
Personal saving from other activities	24	75
Cashew-nut sales	8	25
Total	**32**	**100.0**
		(n=52)
Source of capital for diseases		
Personal saving from other activities	25	48.1
Cashew-sales	13	25
Credit	2	3.8
Not use money	12	23.1
Total	**52**	**100.0**

4.3 Challenges in Integrating Disseminated Cashew-Nut Production Technologies

The variables of interest in this study were cashew-nut training, access of input supply like fertilizers, fungicides, insecticides and improved seedling; technical knowhow, access to market as well as capital for investment.

4.3.1 Challenges Faced on Cashew-nut Training

Training of farmers in cashew production activities is very important since it can change farmer's mind to pursue practices that will increase crop productivity. The results indicated that out of 80 respondents only 35 percent got training on spacing and this is reflected of the fact that 52 percent of the respondents planted their cashew without recommended spacing and had a spacing that was less than 12 metres by12 metres. Only about 18.8 percent planted their cashew on a recommended spacing of 12 metres by12 metres (Table 12). The 52 respondents who did not get training on spacing, 57.7 percent of them didn't get a chance to attend training, 13.5 percent thought it was not important and 25 percent due to lack of time (Table 13).

Similarly, out of 80 respondents more than 50 percent did not get training seedling handling, weeding, pruning, top working, grafting, and diseases control, shedding and marketing (Table 12). The main reasons given were the fact that some did not get a chance to attend, some did not have time, some thought it was not important and others had family problems (Table 13). With regard to marketing, Christoplos (2010) noted the fact that traditionally extension efforts in developing countries had focused primarily on increasing production and productivity to the detrimental effect of marketing.

In general results showed that over half of respondents did not get chance to attend any of cashew-nut production and marketing trainings because there are few extension

officers. If cashew-nut production has to be transformed there is need to equip farmers with the necessary knowledge and skills for them to be able to handle various operations. However, the challenge is how to involve more cashew-nut farmers into the cashew training programs, get more extension staff to facilitate the training and involve cashew-nut board of Tanzania.

Table 12: Percentage distribution of respondents by type of cashew-nut training (n=80)

Training	Frequency	Percentage
Spacing training		
Yes	28	35
No	52	65
Total	**80**	**100.0**
Spacing of cashew trees in farm		
Less 12M x 12M	52	65
12M x 12M	15	18.8
More than 12M x 12M	13	16.2
Total	**80**	**100.0**
Training on seedling		
Yes	29	36.2
No	51	63.8
Total	**80**	**100.0**
Training on weeding/Pruning		
Yes	30	37.5
No	50	62.5
Total	**80**	**100.0**
Training on top working/grafting		
Yes	28	35
No	52	65
Total	**80**	**100.0**
Training on cashew-diseases		
Yes	39	48.8
No	41	51.2
Total	**80**	**100.0**
Training on shedding		
Yes	10	12.5
No	70	87.5
Total	**80**	**100.0**
Training on Marketing		
Yes	11	13.8
No	69	86.2
Total	**80**	**100.0**

Table 13: Percentage distribution of respondents on reason for not attending various trainings

Reasons for not attending training	Frequency	Percentage
		(n=52)
Reason of farmers not attending spacing training		
Far from village	2	3.8
Lack of time	13	25
Not get chance	30	57.7
Not important	7	13.5
Total	**52**	**100.0**
Reason of not attending top working/grafting training		
Family problem	2	3.8
Far from village	1	1.95
Lack of time	7	13.5
Not get chance	41	78.8
Not important	1	1.95
Total	**52**	**100.0**
		(n=50)
Reason of farmers not attending weeding training		
Far from village	2	4
Lack of time	13	26
Not get chance	29	58
Not important	6	12
Total	**50**	**100.0**
Reason of not attending training on pruning		
Lack of time	12	24
Not get chance	35	70
Not important	3	6
Total	**50**	**100.0**
		(n=41)
Reason of not attending diseases training		
Family problem	2	4.9
Lack of time	11	26.8
Not get chance	27	65.9
Not important	1	2.4
Total	**41**	**100.0**
		(n=70)
Reason of not attending shedding training		
Family problem	2	2.9
Lack of time	6	8.55
Not get chance	56	80
Not important	6	8.55
Total		**100.0**
	70	
		(n=69)
Reason of not attending marketing training		
Family problem	2	2.9
Lack of time	5	7.25
Not get chance	59	85.5
Not important	3	4.35
Total	**69**	**100.0**

4.3.2 Input supply and cashew-nut agricultural practices

Inputs supply and improved agricultural practices in the cashew-nut production is very important in increasing productivity. Productivity and quality in cashew production depends on farm management like weeding, intercropping, spacing, seedling pruning, the application of pesticides and use of improved planting materials as well as the knowledge with which these are applied.

4.3.2.1 Agricultural inputs

The results indicated that for the last two seasons, out of 80 respondents only 3.8 percent were able to buy inorganic fertilizer (Table 14). Out of 77 respondents who were not able to buy inorganic fertilizer about 74 percent said fertilizers were not important in cashew production, 14.3 percent said fertilizers were expensive while 10.4 percent said fertilizer was not available (Table 14). This is a clear indication that most farmers did not give priority to the application of fertilizer and did not understand the importance of fertilizers in improving productivity. The challenge is how to create awareness of the importance of fertilizer to the farmers in this area given the nature in which extension is operating and the coverage they have.

Similarly, out of 80 respondents only 33.8 percent were able to buy improved seedlings. Out of 53 respondents who were not able to buy improved seed/seedling about 54.7 percent said improved seedlings were not available and 24.5 percent said such seedlings were not important in cashew production while 18.9 percent considered the seedling to be expensive (Table 14). It is clear that improved seedlings were inaccessible to most farmers for the reasons they provided and the challenge here is how to make these farmers aware of the importance of improved seedlings in increasing productivity, making the seedlings be available and affordable to farmers.

The results also indicated that out of 80 respondents only 22.5 percent were able to buy and use insecticides/fungicides. Out of 62 respondents who were not able to buy insecticides/fungicides about 58.1 percent expressed the reason of insecticides/fungicides as being expensive, 21 percent as not being available, 17.7 percent as not being important in cashew production and 3.2 percent as input supplier shops being far from the village. Based on farmers' expressions it looks like insecticides/fungicide were unaffordable to farmers. The challenge here is how to minimize the cost of the insecticides and fungicides to allow farmers afford the cost of purchasing the fungicides/insecticides. The results echo various studies done in Tanzania and elsewhere which indicated the fact that the main costs in cashew production relate to inputs, particularly fungicides and hired labour (Ashimogo *et al.,* 2008; Alemayehu (2008).

Out of 80 respondents only 17.5 percent were able to use fertilizers. Among the 14 respondents who use fertilizer 92.9 percent use organic and only 7.1 percent use inorganic fertilizers (Table 15). Out of 66 respondents who did not use fertilizers 72.7 percent thought their soils were still fertile, 9.1 percent considered fertilizers to be expensive, 7.6 percent expressed fertilizers as not being available in the study area, 3 percent was just lack of awareness and 1.5 percent they said supplier shops were far from the village (Table 15).

The use of fertilizers among farmers is still very minimal and the challenge here is for extension agents to create awareness on the importance of application of fertilizer. The results resemble those of the study on adoption of manures and fertilizers in cashew-production in Mozambique which was found the use of fertilizers being poor among farmers (Nirban and Sawant, 2000).

The results indicated that out of 80 respondents of this study 78.8 percent were able to use fresh seeds/seedling and 21.2 percent continued with old trees. The results continue to show that out of 63 respondents who plant fresh seed/seedling 55.5 percent used local varieties, 41.3 percent used both local and improved varieties while only 3.2 percent use improved varieties. The results moreover show that out of 17 respondents who did not plant fresh stands of cashew 58.8 percent indicated that fresh seed/seedlings were not available, 23.5 percent said it was expensive and 11.8 percent due to lack of awareness. This shows that there is willingness to plant fresh new cashew-nut seedlings though the challenge is access and availability of improved varieties. This mirrors well the information obtained from the District that the district planted only 15 000 new improved cashew plants by the year 2014.

Out of 80 respondents only 22.5 percent were able to use insecticides/fungicides. Out of 18 respondents who use insecticides/fungicides, 11.1 percent used inorganic insecticides/fungicides and 88.9 percent used both organic and inorganic. Out of 62 respondents who did not use insecticides/fungicides 75.8 percent said they did not use insecticides/fungicides because it was expensive while 12.9 percent they said because it was not available and 11.3 percent they said because it was not important (Table 15). These results show that there were very minimal use of insecticides and fungicides because the input was very expensive hence the big challenge here is how facilitate farmers to afford the price of insecticides/fungicide and treat cashew-nut diseases effectively. However, Venkattakumar (2009) noted that 90 percent of demonstration farmers who received subsidies in India finally ended up adopting plant protection measures.

In general the results reflect what had been reported by other studies that Tanzania's agriculture like that of other Sub-Saharan Africa is still characterized by low input use. For instance, The Poverty and Human Development Report of 2007, cited by Msuya *et al.* (2008) showed that 87 percent of Tanzanian farmers interviewed by the research and analysis group under Tanzanian's National Strategy for Growth and Reduction of Poverty (NSGRP,2011/2012) were not using chemical fertilizer; 77 percent were not using improved seeds and 72 percent were not using pesticides, herbicides or insecticides (agrochemicals). According to the National Sample Census of Agriculture 2007/08 the reasons for low input use by the smallholder farmers are high prices, lack of purchasing power, in sufficient knowledge of the effects of inputs and how to use them hence the input should be reduced and voucher system should be used (NBS *et al.,* 2009).

Table 14: Percentage distribution of respondents by ability to buy inputs and reasons for not affording to buy input

Inputs	Frequency	Percentage
		(n=80)
Ability to buy fertilizer		
Yes	3	3.8
No	77	96.2
Total	**80**	**100.0**
Ability to buy Improved seed/seedling		
Yes	27	33.8
No	53	66.2
Total	**80**	**100.0**
Ability to buy insecticides/fungicides		
Yes	18	22.5
No	62	77.5
Total	**80**	**100.0**
		(n=77)
Reason of not affording to buy fertilizer		
Expensive	11	14.3
Input supplier shops are far	1	1.3
Not available	8	10.4
Not important	57	74
Total	**77**	**100.0**
		(n=53)
Reason of not affording to buy seed/seedling		
Expensive	10	18.9
Input supplier shops are far	1	1.9
Not available	29	54.7
Not important	13	24.5
Total	**53**	**100.0**
		(n=62)
Reason of not affording to buy insecticides/fungicides		
Expensive	36	58.1
Input supplier shops are far	2	3.2
Not available	13	21.0
Not important	11	17.7
Total	**62**	**100.0**

Table 15: Percentage distribution of respondents by use of input in cashew-nut production activities, Type and reason of not using the input

Variables	Frequency	Percentage
		(n=80)
The use of fertilizer		
Use	14	17.5
Not use	66	82.5
Total	**80**	**100.0**
Use of Seed/seedling		
Use	63	78.8
Not use	17	21.2
Total	**80**	**100.0**
Use of Insecticides/fungicides		
Use	18	22.5
Not use	62	77.5
Total	**80**	**100.0**
		(n=14)
Type of fertilizer		
Organic	13	92.9
Inorganic	1	7.1
Total	**14**	**100.0**
		(n=63)
Type of seedling/seeds		
Improved	2	3.2
Local	35	55.5
All of Above	26	41.3
Total	**63**	**100.0**
		(n=18)
Type of insecticides/fungicides		
Organic	0	0
Inorganic	2	11.1
All of Above	16	88.9
Total	**18**	**100.0**
		(n=66)
Reason of not using fertilizer		
Not readily available	5	7.6
They are expensive	6	9.1
Soil is still fertile	48	72.7
Lack of awareness	2	3
Not important	4	6.1
Input supply shops are far	1	1.5
Total	**66**	**100.0**
		(17)
Reason of not using seed/seedling		
Not readily available	10	58.8
Expensive	4	23.5
Lack of awareness	2	11.8
Not important	1	5.9
Total	**17**	**100.0**
		(n=62)
Reason of not using insecticides/fungicides		
Not readily available	8	12.9
Expensive	47	75.8
Lack of awareness	7	11.3
Total	**62**	**100.0**

4.3.2.2 Use of recommended agricultural practices

Recommended agricultural practices like spacing, seedling, mulching, pruning, top working and grafting are very important in the production of many crops like cashew-nut, fruits and many other commercial crops. Productivity and quality in cashew production depends on farm management like ploughing, intercropping, pruning, the application of pesticides and use of improved planting materials as well as the knowledge with which these are applied.

Out of 80 respondents only 21.2 percent used recommended spacing when planting new crop. Out of 63 respondents who did not follow recommended spacing, 41.3 percent thought it was not important and 20.6 percent due to lack of time while 20.6 percent said they were not aware (Table 16). The challenge here is how to create awareness among farmers of the importance of spacing.

Out of 80 respondents 38.8 percent planted new cashew-nut crop (Table 16). Out of 49 of respondents who did not plant new cashew crop 45 percent thought it was not important while 16.3 percent lack of training and 16.3 percent did not have time. Furthermore the out of 31 respondents who planted new cashew crops 54.8 percent planted new cashew-nut because it was convenient and 16.2 percent considered it to be easy to use and produce high yield (Table 17). Although some farmers planted new cashew crops but still they did not understand the importance of planting new cashew crop in relation to productivity. The challenge is how make farmers recognize the importance of planting new cashew crop in order to improve productivity.

Out of 80 respondents only 35 percent used mulching under cashew-nut trees (Table 16). Out of 52 respondents who did not mulch the cashew trees, 57.7 percent were not aware

of the importance, while 25 percent lacked training. Out of 28 respondents who mulched their cashew trees 50 percent used it because it was convenient, while only 17.9 percent used with a consideration of producing high yield, about 17.9 percent used it as an effective mechanism against pests, whereas 7.1 percent used it because it had low costs (Table 17). The results imply that mulching practice in cashew-nut production is not familiar to many farmers and the challenge is how to create awareness.

About 57.5 percent of respondents pruned their cashew-nuts (Table 16). Out of 34 respondents who did not prune, 47 percent did not prune their cashew-nut due to lack of training while 26.5 percent did not prune because it was expensive (Table 17). Out of 46 respondents who pruned cashew trees 50 percent pruned to produce high yield while 34.8 percent used it because it was convenient (Table 17). The results show that a good number of cashew farmers in Mkinga District probably have identified pruning to be an important cultural practice in cashew production. Findings from India indicated that about 31 percent of farmers have never adopted pruning despite long tradition of cashew production (Shivaramu *et al.,* 2004).

Out of 80 respondents only 7.5 percent used grafting of the cashew seedling (Table 16). Out of 74 respondents who did not graft cashew about 48.6 percent did not because of lack of training and 44.6 percent because they were not aware of the technology. Among 6 respondents who grafted cashew said it was convenient, high yield and as well as because of low costs involved (Table 18). The great challenge is how to create awareness and provide skills to farmers so that they can utilize the technology.

Similarly out of 80 respondents only 5 percent used top-working practice (Table 16). Out of 76 respondents who did not use top working about 48.7 percent did not use because

they were not aware, while 44.7 percent of respondent said was due to lack of training. Among 4 respondents who applied top working is because the plant produces high yield and it is convenient (Table 18). These results show that farmers lack awareness of the practices and that why many farmers cut down mature cashew trees for charcoal instead of top working.

Out of 80 respondents only 13.8 percent used manure (Table 16). Out of 69 respondents who did not use manure 56.5 percent thought it was not important, 14.5 percent were not aware and 13 percent they considered it to be time consuming. Among 11 respondents who applied manure thought it was low cost (54.5%), Convenient (54.5%) and easy to use 18.2 percent (Table 18). Similarly out of 80 respondents only 45 percent weeded their cashew-nut farms once per season while 32.5 percent weeded their farms twice which is recommended. About 20 percent weeded more than the recommended and about 2.5 percent did not weed with a reason that weeding was not important (Table 16).

In general low to medium uses of technologies and practices with respect to cashew production could be attributed to the fact that farmers are yet to realize the importance of these technologies and practices on the yield levels and the potential economic benefits that could be accrued out of it. Similar findings in cashew-nut technologies and practices were found by Bhairamkar *et al.* (2004), Shivaramu *et al.* (2004) and Venkattakumar (2005, 2006, 2009). However, Gupter (2000) in his study of grassroots innovations for survival noted that farmers are not necessarily more conservative but they are certainly more cautious because they know what they will get if they follow traditional practices. The moment they change to new practice, they are moving from a state of security to a state of insecurity and therefore they need to be supported by training and other means to implement change.

Table 16: Percentage distribution of respondents by recommended practices (n=80)

Practice	Frequency	Percentage
The use recommended spacing		
Use	17	21.2
Not use	63	78.8
Total	**80**	**100.0**
Plant of new crops		
Use	31	38.8
Not use	49	61.2
Total	**80**	**100.0**
The use of mulching		
Use	28	35
Not use	52	65
Total	**80**	**100.0**
The use of pruning		
Use	46	57.5
Not use	34	42.5
Total	**80**	**100.0**
The use of top working		
Use	4	5
Not use	76	95
Total	**80**	**100.0**
The use of grafting		
Use	6	7.5
Not use	74	92.5
Total	**80**	**100.0**
Use of manure practices		
Use	11	13.8
Not use	69	86.2
Total	**80**	**100.0**
Frequency of weeding cashew-nut farm		
Once	36	45
Twice	26	32.5
Thrice	7	8.8
More than three times	9	11.2
Weeding is not important	2	2.5
Total	**80**	**100.0**

Table 17: Percentage distribution of respondents by reasons of using and not using recommended practices (Spacing, Planting new crops, Mulching and Pruning)

Reason of using/ not using spacing	Frequency	Percentage
		(n=63)
Reasons of not using recommended spacing		
Not known	13	20.6
Lack of training	11	17.5
Not important	26	41.3
Lack of time	13	20.6
Total	**63**	**100.0**
		(n=17)
Reason of using recommended spacing		
Low cost	2	11.8
Convenient	10	58.8
High yield	5	29.4
Total	**17**	**100.0**
		(n=49)
Reason of not planting new/seed/seedling		
Not known	4	8.2
Lack of training	8	16.3
Expensive	1	2.0
Not important	22	45.0
Lack of time	8	16.3
Not available	6	12.2
Total	**49**	**100.0**
		(n=31)
Reason of planting new seed/seedling		
Low cost	1	
3.2		
Convenient	17	
54.8		
Effective against pest and diseases	3	
9.7		
Easy to use	5	
16.15		
High yield	5	
16.15		
Total	**31**	
100.0		
		(n=52)
Reason of not using mulching		
Not known	30	57.7
Lack of training	13	
Expensive	1	25.0
Not important	4	
Lack of time	4	1.9
Total	**52**	
		7.7
		7.7
		100.0
		(n=28)
Reason of using mulching		
Low cost	2	7.1
Convenient	14	
Effective against pest and diseases	5	50.0
Easy to use	2	17.9
High yield	5	7.1
Total	**28**	17.9
		100.0
		(n=34)
Reason of not pruning		
Lack of training	16	47.0
Expensive	9	26.5
Not important	4	11.8
Lack of time	5	14.7
Total	**34**	**100.0**
		(n=46)
Reason of pruning		
Low cost	3	6.5
Convenient	16	34.8
Effective against pest and diseases	2	4.35
Easy to use	2	4.35
High yield	23	50.0
Total	**46**	**100.0**

Table 18: Percentage distribution of respondents by reasons of using or not using recommended practices (Grafting, Top working, Manuring)

Reason of using/ not using recommended spacing	Frequency	Percentage
		(n=74)
Reason of not graft cashew-nut		
Not known	33	44.6
Lack of training	36	48.6
Expensive	2	2.7
Not important	2	2.7
Lack of time	1	1.4
Total	**74**	**100.0**
		(n=6)
Reason of grafting cashew-nut		
Low cost	1	16.65
Convenient	4	66.7
High yield	1	16.65
Total	**6**	**100.0**
		(n=4)
Reason of top working cashew-nut		
Convenient	1	25
High yield	3	75
Total	**4**	**100.0**
		(n=76)
Reason of not top working cashew-nut		
Not known	37	48.7
Lack of training	34	44.7
Expensive	2	2.6
Not important	1	1.3
Lack of time	2	2.6
Total	**76**	**100.0**
		(n=11)
Reason of apply manure in cashew-nut		
Low cost	2	18.2
Convenient	6	54.5
Easy to use	3	27.3
Total	**11**	**100.0**
		(69)
Reason of not applying manure		
Not known	10	14.5
Lack of training	5	7.3
Not important	39	56.5
Lack of time	9	13.0
Not available	6	8.7
Total	**69**	**100.0**

4.4 Current Cashew-Nut Productivity in Mkinga District as a Result of Disseminated Cashew-Nut Technologies

Based on Mkinga District report, the productivity of raw cashew-nut was about 0.4 tons/hectare in the season 2011/12. According to this report the production has been decreasing due to many reasons including change in climatic factors such as temperature, humidity and rainfall. On the technical side it has been affected by lack of application of insecticides/fungicides, fertilizer, improved seedling, mulching, and grafting. Furthermore lack of reliable market and lack of capital contributed to the decreases of cashew-nut productivity because the required operations could not be undertaken (Mkinga District Report, 2013). It was therefore worth looking at the cashew production trend in the District and also trying to establish the reasons behind it such as lack of training, lack of awareness to farmers, unavailability of input.

4.4.1 District cashew-nut productivity trend for the last two seasons

Among 80 respondents interviewed in this study who were cashew-nut producers about 46.25 percent produced about 0.25-0.5 tons of cashew-nut per hectare, 21.25 percent produced greater than 0.5 to 0.75 tons/hectare and only 12.5 percent harvest more than 0.75 tons per hectare (Table 19). Under normal recommended practices the expected outcome worldwide is about 1.2 tons per hectare. It is clear that many farmers' farms had low cashew-productivity and these results tally well with secondary data collected from the District and key informants that cashew productivity was low to an average of about 0.4Tons/hectare as reported by Mkinga District. However, when farmers were asked of their opinion with regard to the productivity trend, 72.5 percent of 80 respondents thought the trend of cashew-nut productivity in Mkinga is decreasing, while about 13.8 percent interestingly thought it was increasing or remained the same (Table 19).

Out of 80 respondents only 42.5 percent of respondents belonged to cashew-nut Farmer Field School (FFS) groups. Out 36 of respondents who were members of FFS groups,

70.6 percent indicated that FFS groups as being helpful, while 29.4 percent thought they were very helpful (Table 19). These results indicated that there were very few members of cashew FFS in the District something that was also expressed by key informants. Based on an impact evaluation of 25 different case studies of integrated pest management and FFS report by FAO (van den Berg, 2004) concluded that FFSs had a significant impact on reducing the use of pesticides and increasing crops yields. It was also noted that this approach stimulated continued learning and strengthened the social and political skills of farmers. Various researchers also observed that if a nation is concerned about strengthening its extension programs in the area of sustainable natural resource management, then the FFS may be an important approach to consider as one extension methodology among other approaches (Godtland *et al.,* 2004; Rajalahti *et al.,* 2005; Amudavi, 2007).

Table 19: Percentage distribution of respondents on their opinion about Cashew-nut productivity trend and FFS membership (n=80, 34)

Aspect	Frequency	Percentage
		(n=80)
Cashew-nut productivity in Tons/hectare		
From 0-0.25Tons	16	20
Greater than 0.25 to 0.5Tons	37	46.25
Greater than 0.5 to 0.75Tons	17	21.25
More than 0.75Tons	10	12.5
Total	**80**	**100.0**
Trend of cashew-nut yield in Tons/Hectare		
Increasing	11	13.75
Decreasing	58	72.5
Remaining the same	11	13.75
Total	**80**	**100.0**
Member of FFS group		
Yes	34	42.5
No	46	57.5
Total	**80**	**100.0**
		(n= 34)
Knowledge and skill of FFS		
Very helpful	10	29.4
Helpful	24	70.6
Total	**34**	
		100.0

About 72.7 percent of the 11 respondents who said there was an increasing trend of cashew-nut productivity thought it was due to improved cashew-nut technologies/practices provided to them, while 9.1 percent thought it was just a coincidence with good weather, good soils and good market facilities (Table 20). The results also show that out of 11 respondents who said there was an increasing trend of

cashew-nut productivity about 90.9 percent thought cashew technologies had a big role to play in the development of the crop, while 9.1 percent said technologies had insignificant role to play.

Among 58 respondents who said there was decreasing trend of cashew-nut productivity, 70.7 percent said cashew-nut productivity decreased due to poor farm management and technologies, 24.1 percent said because of poor weather especially rainfall and 5.2 percent thought it had to do with lack of capital (Table 20).

Out of 80 respondents only about 13.8 percent of the respondents got assistance from government to meet cashew-nut production cost and of those 72.7 percent got seedling assistance and 18.2 percent got seedlings, training and other inputs assistance (Table 20). The results echo what Rutatora and Mattee (2001) noted of the fact that many Districts in Tanzania are unable to fund such services from their own sources without external assistance. This is because the revenues collected are very low and can hardly cover many development priorities in the Districts. Similarly, the poor financial situation makes it difficult for the District to allocate sufficient funds to extension as a result the extension workers are not able to reach many farmers.

Table 20: Percentage distribution of respondents on measures to increasing cashew-nut yield and Government assistance (n=11, 80, 58)

Aspect	Frequency	Percentage
		(n=11)
Reason for increasing production		
Coincidence of good climate	1	9.1
Improved cashew technologies/practices	8	72.7
Good soil	1	9.1
Good market facilities	1	9.1
Total	**11**	**100.0**
Roles of improved cashew technologies		
Has a big role to play	10	90.9
Has small role to play	1	9.1
Total	**11**	**100.0**
Kind of assistance obtained from government		
Training	1	9.1
Seedling	8	72.7
All of above	2	18.2
Total	**11**	**100.0**
		(n=80)
Government assistance in meeting production cost		
Yes	11	13.8
No	69	86.2
Total	**80**	**100.0**
		(n=58)
Reason for decreasing cashew-nut yield		
Poor weather (rainfall/ temperature)	14	24.1
Poor farm management/technologies	41	70.7
Lack of capital	3	5.2
Total	**58**	**100.0**

4.4.2 Cashew-nut Technologies and its Effect on Productivity for the Last Two Seasons

4.4.2.1 Cashew productivity for the last two seasons

The results in a Figure 2 shows that the mean average of cashew-nut productivity by farmers in Mkinga District is 0.38 tons/hectare, which according to URT report (2013) is very small compared to the national average cashew-nut productivity which was at 0.8 tons/hectare.

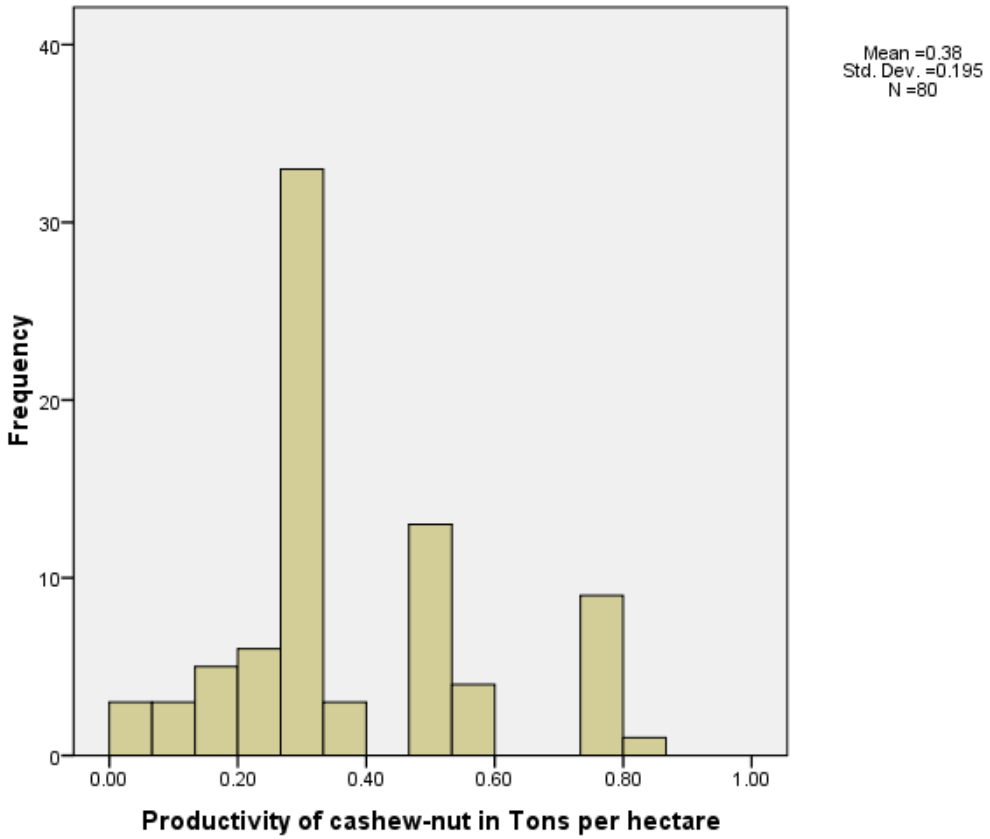

Figure 2: Cashew-nut productity for the last two seasons in Mkinga District

4.4.2.2 Current cashew-nut productivity as a result of improved cashew-nut technologies/practices

The technologies in interest was fertilizers, improved seedling/seeds, spacing, use of insecticides/fungicides, planting of new cashew crop, top-working, grafting, mulching and pruning. The test was made to compare farmers who used and those who did not use

cashew-nut technologies/practices and their respective cashew-nut productivity in tons/hectare. The test used was Mann-Whitney because the data obtained was not normal (non-parametric).

Out of 80 respondents interviewed 14 used fertilizers while 66 did not use fertilizer when their productivity medians were subjected to Mann-Whitney test there were no significant differences (439, $p > 0.05$) at 5% significant levels (Table 21).

Similarly, out of 80 respondents 63 used improved seed/seedling and 17 did not use improved seed/seedling. When their productivity medians were subjected to Mann-Whitney test there were no significant differences (Mann-Whitney= 478, $p > 0.05$) at 5% significant levels. This might be because of many farmers planted seed/seedling in recent years while in order to see the impact of productivity of cashew-nut it takes up to at least five years.

Out of 80 respondents in this study 18 used fungicides/insecticides with very high cashew-nut median productivity of 0.520 Tons/hectare and 62 did not apply fungicides/insecticides with low cashew-nut median productivity of 0.300Tons/hectare. When their productivity medians were subjected to Mann-Whitney test there were significant differences (Mann-Whitney= 357, $p < 0.05$) at 5% significant levels Thus, as farmers use pesticides as productivity increases. The results are informed with what Sijaona and Shomari (1987) reported that, with regard to diseases powdery mildew if not treated by pesticides is a major constraint in cashew nut productivity in Tanzania.

Out of 80 respondents 17 used recommended spacing and 63 respondents did not use spacing practices. When their productivity medians were subjected to Mann-Whitney test there were significant differences (Mann-Whitney= 348.5, $p < 0.05$) at 5% significant levels

Similarly out of 80 respondents in this study 28 used mulching practice with cashew median productivity of 0.325Tons/hectare and 52 did not use mulching practice with cashew-nut median productivity of 0.300Tons/hectare. When their productivity medians were subjected to Mann-Whitney test there were slightly significant differences (Mann-Whitney= 542, $p < 0.05$) at 5% significant levels.

Out of 80 respondents 31 planted new cashew-nut crops with cashew-nut median productivity of 0.325Tons/hectare and 49 did not planted new cashew-nut crops with cashew-nut median productivity of 0.310Tons/hectare. When their productivity medians were subjected to Mann-Whitney test there were significant differences (Mann-Whitney= 559.5, $p < 0.05$) at 5% significant levels. The results are in line with the key informants analysis that many cashew-nut plants in Mkinga District are inherited from previous generations and thus they produce very low compared to those who planted new cashew-seedlings.

Likewise out of 80 respondents in this study 46 pruned cashew-nut trees with median cashew-nut productivity of 0.325Tons/hectare while 34 did not pruned cashew trees with median productivity of 0.300Tons/hectare When their productivity medians were subjected to Mann-Whitney test there were significant differences (Mann-Whitney= 562.5, $p < 0.05$) at 5% significant levels. This results show that pruning was an important aspect in cashew-nut productivity. The results confirmed by Singh in the study of canopy management in the fruits crops in India that canopy management like trimming and pruning affects the quantity of sunlight intercepted by the trees, as tree shape determines the presentation of leaf area to in coming radiation which affects productivity (Singh, 2010).

Finally out of 80 respondents of this study 6 grafted cashew seedlings and majority 74 of respondents did not grafted cashew-nut seedling. When their productivity medians were subjected to Mann-Whitney test there were not significant differences (Mann-Whitney= 163.5, $p > 0.05$) at 5% significant levels. This was because many farmers grafted cashew-trees in recent years hence many plants are still young for comparison.

Table 21: Current cashew-nut productivity as a result of use/not use of cashew-nut technologies/practices (n=80)

Technology/practice	Median cashew-productivity level	Use the technology/practice	Cashew productivity in Tons/hectare when use	Not use the technology/practice	Cashew productivity in Tons/hectare when not use	Sign.
Fertilizer	0.3	14	O.310	66	0.300	0.770
Seedling/seeds	0.3	63	0.300	17	0.300	0.500
Insecticide/pesticides	0.3	18	0.520	62	0.300	0.020
Spacing	0.3	17	0.325	63	0.310	0.027
Mulching	0.3	28	0.325	52	0.300	0.059
Planting of new crops	0.3	31	0.325	49	0.310	0.047
Pruning of cashew trees	0.3	46	0.325	34	0.300	0.032
Grafting	0.3	6	0.323	74	0.300	0.283

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Based on the findings it can be concluded that in all villages the agricultural extension officers identified were basically government employees and their numbers were not sufficient to meet the village needs. Similarly, farmers' participation in cashew-nut technologies and practices trainings was found to be low.

There were no enough private or other institutions input providers for cashew-nut production hence the District Government Authorities had to shoulder the provision of insecticides/fungicides and improved seedlings. Farmers had no storage facilities and no well defined cashew-nut marketing channel and there were no reliable financial institutions which would support cashew-nut farmers with credit for them to be able to utilize fully cashew-nut technologies/practices.

The main challenge was found to be lack of access to credit that would make them apply the production technologies and inputs. This was compounded by lack of training with regard to cashew production and marketing. As a result of that cashew-nut productivity in Mkinga District decreases from 0.4Tons/hectare in season 2011/12 to 0.38Tons/hectare in the last two seasons.

5.2 Recommendations

In view of the above conclusions the following recommendations are made:

i. Strengthen cashew nut improvement trainings to help farmers articulate the use of proposed disseminated technologies/practices. This should be accompanied with employing more extension agents to teach farmers.

ii. Facilitate supply of cost-effective inputs with the support of financial institutions which will provide credit to farmers to utilise them.

iii. Strengthen Cashew nut marketing in order to increase farmer's income in order to invest back into production.

REFERENCES

Aina, L.O. (2006). Information provision to farmers in Africa. The Lib. Ext. Service, Univ. of Botswana P/Bag 0022, Gaborone, Botswana World Lib. and Inf. Cong. : 72nd Ifla General Conf. and Council 20-24 Aug. 2006, Seoul, Korea.

Akramov, T.K. (2009). Decentralization, Agricultural Services and Determinants of Input Use in Nigeria. IFPRI Discussion Paper 0094. [at:www.ifpri.org/ sites/default/files/publications/ifpridp00941.pdf] site visited on 12 /7/2013.

Alemayahu, S.M. (2008). Farmer's perceptions on the effectiveness of Cooperatives in Disseminating Agricultural Technologies in Ethiopia: A case of Adea District. A Dissertation for Award of MSc. Degree at Sokoine University of Agriculture, Morogoro, Tanzania.110pp.

Ameur, C. (1994). Agricultural Extension: A Step beyond the Next Step. World Bank Technical Paper 247. Washington, D.C.: World Bank.

Amudavi, D.M. (2007). The effects of farmer community group participation on rural livelihoods in Kenya. In Barrett, C.B. Mude, A.G. and Omiti, J.M. (Eds.), Decentralization and the Social Economics of Development Lessons from Kenya. Oxfordshire: CABI.

Anderson, J.R. and Feder, G. (2004) Agricultural Extension: Good Intentions and Hard realities. *World Bank Research Observer* vol 19 No 1 (19: 41-60).

Ani, A.O. (1998). Assessment of farmers' extension education needs in Yobe State, Nigeria. *Nigerian J. Agric. Educ*., 1: 152–8.

Ani, A.O. and Baba, S.A. (2009). Utilization of selected electron mass media as sources of agricultural information by farmers in northern Taraba state Nigeria. *Journal of Tropical Agricultural Research and Extension*, Vol.12 (1) [http:www.agri. ruh.ac.lk/tare/View files/V 12%281%29/AEC 7 7.htm] site visited on 10/01/ 2015.

Ashimogo, G., Mlozi, M. and Silayo, V. (2006). Market analysis and survey of small scale cashew processing firms. Vol I. BACAS Consultancy Final Report presented to PEA, Common Fund for Commodities, Regional Cashew Improvement Network of Eastern and Southern Africa-Mtwara Tanzania.

Ashimogo, G., Mlozi, M. and Silayo, V. (2008). Cashew profitability analysis and projection of the sector's future performance in Kenya, Malawi, Mozambique and Tanzania. BACAS Consultancy Final Report presented to PEA, Common Fund for Commodities, Regional Cashew Improvement Network of Eastern and Southern Africa-Mtwara Tanzania.

Axinn, G. (1988). Guide on Alternative Extension Approaches. Rome: FAO.

Babbie, E. (1990). Survey Research Methods. Wadworth Publishing Co., California. 395pp.

Benor, D. and Harrison, J.Q. (1977). Agricultural Extension: The Training and Visit.

Bhairamkar, M.S., Mehta, P.G., Sawant, P.A. and Tawade, N.D. (2004). Adoption of recommended cashew cultivation technologies by the cashew growers. *The Cashew*, 18 (2): 7-12.

Birner, R., Davis, K.E., Pender, J., Nkonya, E., Anandajayasekeram, P., Ekboir, J., Mbabu, A., Spielman, D.J., Horna, D., Benin, S. and Cohen, M. (2009). From Best Practice to Best Fit: A Framework for Designing and Analyzing Pluralistic Agricultural Advisory Services Worldwide. *Journal of Agricultural Education and Extension* 15(4): 341 – 355.

Blarel, B.P., Hazzell, F. and Quiggin, J. (1992). Economics of farm fragmentation: evidence from Ghana and Rwanda. *Journal of World Bank Economic Review,* 6(1):233-254.

Boehnke, R.W. (2003). The challenges of Introducing a Warehouse Receipts System in Caribbean Technological Consultancy Services (CTCS) Network. (1993). Information package on cultivation, processing and marketing of cashews. St. Michael, Barbados, Caribbean Technological Consultancy Services Network.

Caswell, M., Fuglie, K., Ingram, C., Jans, S. and Kascak, C. (2001). "Adoption of Agricultural production practices: Lessons learned from the US. Department of Agriculture area studies project." Washington DC. US Department of Agriculture. Resource Economics Division, Economic Research service, Agriculture Economic Report No. 792.

Chijinga, J. (2001). Evaluation of various uses of cashew apple. Cashew Research.

Christoplos, I. (2010). Mobilizing the potential of Rural and Agricultural Extension. *Extension Reform for Rural Development* (edited by Rivera, W. and Alex G.) Neuchatel group, Washington. pp 2.

Churi, A.J., Mlozi, M.R.S., Tumbo, S.D. and Casmir, R. (2012). Understanding Farmers Information Communication strategies for managing Climate Risks I Rural Semi-Arid Areas, Tanzania. *Internationals Journal of Information and Communication Technology Research* 2(11): 838 – 845..

Crawford, E., Jayne, W., Valerie, T. and Kelly, A. (2006). Alternative Approaches for Promoting Fertilizer Use in Africa. Agriculture and Rural Development Discussion Paper 22, Washington D.C., The World Bank.

CRIN (2001). Cashew Research Programme and Achievement (1970-1990) Cocoa Research Institute of Nigeria (CRIN, 2001), Ibadan Nigeria.

CUTS International, (2011). Boosting Development in Kenya: Better Participation of Smallholders in Agri-Business, Geneva. pp 2-4.

Daneji, M.I., Tafida, I. and Ali, B.U. (2006). Socio-economic Determinants of Technology . Adoption by farmers of Maigana area of the Kaduna State Agricultural Development Programme in Muhammed, I.R., Muhammed, B.F., Bibi Faruk, F. and Shehu, Y. (eds), 2006. Nigeria.

Daudu, S., Chando, S.S. and Igbashal, A.A. (2009). Agricultural Information Utilized by farmers in Benue State, Nigeria. *Publication Agriculture and Technology,* Vol.5 (1)39 – 48.

Davis, K. E. (2008). *Extension in Sub-Saharan Africa*: Overview and Assessment of Past and Current Models, and Future Prospects. International Food Policy Research Institute. Addis Ababa, Ethiopia. pp16.

Dercon, S. and Krishnan, P. (1996). Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints. *Journal of Development Studies,* 32(6): 850-875.

Doss, C.R. and Morris, M.L. (2001). How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. *Agricultural Economics,* 25: 27 - 39.

FAO (1993). *The potentials of microcomputers in support of agricultural extension, education and training.* Rome: FAO.

FAO (2010). Strengthening Micro-Enterprises in Tanzania: The Case of Small Scale Vegetable Farmers in Arusha Tanzania, Final Report, Economic and Social Research Foundation.

FAO (2009). Seed security for food security in the light of climate change and soaring food prices: challenges and opportunities, Rome, Italy. pp1.

Feder, G. and Slade, R.H. (1986). Methodological Issues in the Evaluation of Extension. In Investing in Rural Extension: Strategies and Goals (Gwyn E. Jones, ed.).London and New York: Elsevier.

Gadizirayi, C.T., Mutandwa, E. and Chikuvire, T.J. (2006). Effectiveness of Maize Cob Powder in controlling Weevils in Stored Maize Grain. In: *African Quarterly*. 8(4). [http://www.african.ufl.edu/asq/v8/v8i4al.htm]site visited on 25/04/2014.

Godtland, E.E., Sadoulet, A., de Janvry, R., Murgai, O. and Ortiz, O. (2004). The impact of farmer-field-schools on knowledge and productivity: a study of potato farmers in the Peruvian Andes. *Economic Development and Cultural Change* 53(1): 63–92.

Gupter, A.K. (2000). Grassroots innovations for survival. *ILEIA Newsletter for low External Input and Sustainable Agriculture.* 16(2): 5-6.

Haji, B. (2003). Adoption of cross bred Dairy Cows in Arsi Zone. The case of Tiyo and Lemu Bilbilo woredas. MSc. Thesis (Unpublished) Presented to School of Graduate Studies of Alemaya University, Ethiopia.

Hanlon, J. (2000). Power without responsibility: the World Bank and Mozambican cashew nuts, *Review of African Political Economy* 83.

Harries, H.C., Kusolwa, P.M., Milanzi, K.J. and Massawe, P.A.L. (1998). A cashew breeding programme for Tanzania Proc.Int. Cashew and coconut conference: Tree for life- The key for development, Dar-es-Salaam Tanzania.17-21February I997, pp. 123-128.

Igodan, C.O., Ohaji, P.E. and Ekpere, J.A. (1988). Factors Associated with theAdoption of Recommended Practice for Maize Production in the Kainji Lake Basin of Nigeria. *Agricultural Administration and Extension*, 29, pp.149-156.

INCAJU (1998). *Componente produção, Plano director do caju*, Instituto de foment.

INCAJU (2002). *Boletim e estatisticas da campanha 2000/2001*, Maputo, Mozambique, March. Innovation," University of Greenwich, England. Innovation: Case Studies from Benin, Rwanda and Tanzania. Bulletin No. 374. Royal Tropical Institute. Amsterdam.

Jaegar, P. (1999). The Market for cashew-nut and its Relevance for Production in African Production.

Jalgaonkar, V.N., Gawankar, M.S. and Patil, P.D. (2009). Efficacy of some insecticides against cashew tea mosquito bug Helopeltis antonii Sign, *J. Plant Prot. Res*., 1(1): 96-97.

Jeeva, S., Aneesa Rani, M.S., Ambedkar, V., Sachidanadam, K., Balusamy, M., Raja, K. and Manjula, K. (2006). Cashew Production Technologies. Regional Agricultural Research Station, Vridhachalam and Department of Horticulture, Tamil Nadu Agricultural University, Coimbatore. pp 36.

Johnson, B. and Manoharan, M. (2009). Marketing Behaviour of Cashew Farmers. Indian Res. J. Ext. Edu., 9 (1).

Kalusopa,T .(2005).”The challenges of utilizing of Information Communication Technologies (ICTs) For The Small Scale Farmers in Zambia’’. *Journal of Hi Tech* Vol.23, 414 – 424.

Khan, M. A. (2010). - Rural Development and Rural Outmigration in Uttar Pradesh: A Case of Agriculture, Food Security and Co-operatives, November, Dar es Salaam.

Kibwika, P. (2011). The state of Agricultural Extension in the Bread Basket area of Tanzania. A report of the Alliance for a Green Revolution in Africa (AGRA) pp 62.

Kidd, A.D., Lamers, J.P.A., Ficarelli, P.P. and Hoffmann, V. (2000). Privatising agricultural extension: caveat emptor. *Journal of Rural Studies* 16(1), pp. 95_102.

Kimaro, W.H., Mukandiwa, L. and Mario, E.Z.J. (Eds), (2010). Towards Improving Agricultural Extension Service Delivery in the SADC Region. Proceedings of the Workshop on Information Sharing among Extension Players *in the SADC Region*, Dar es Salaam, Tanzania. pp. 26 – 28.

Klerkx, L., De Grip, K. and Leeuwis, C. (2006) Hands off but Strings Attached: The Contradictions of Policy-induced Demand-driven Agricultural Extension. *Agriculture and Human Values*, 23(2), pp. 189_204.

Kyaruzi, A.A., Mlozi, M.R.S. and Busindi, I.M. (2010). *Gender Based Effectiveness of Agricultural Extension Agents’ Contacts with Smallholder Farmers in Extension Services Delivery*: A Case of Kilosa District, Tanzania.

Labarthe, P. (2005). Trajectoire d'innovation des services et inertie institutionnelle: dynamique du conseil dans trois agricultures europuˆ `

Lakshmisha, R. (2000). Impact of cashew demonstrations on knowledge, adoption and yield levels of farmers in Dakshina Kannada district. MSc. (Ag.) thesis (Unpub), University of Agricultural Sciences, Bangalore. pp 85-88.

Langyintuo, A. and Mekuria, M. (2005). Modeling Agricultural Technology Adoption Using the Software STATA. CIMMYT-ALP Training Manual No. 1/2005 (Part Two). International Maize and Wheat Improvement Center, Harare, Zimbabwe.

Liviga, A.J and Mekacha, R.D.K. (2008). Youth Migration and Poverty Alleviation: A Case Study of Petty Traders (Wamachinga) in Dar es Salaam, Research Report No. 98.5.

Majule, A.E., Masawe, P.A., Millanzi, K.J., athaniels, N.Q., Shomari, S.H., Sijaona, M.E.R. and Stathers, T. (1997). Cashew nut production in Tanzania: constraints and progress through Integrated Crop Management. *Crop Protection* 15: 5-14.

Makhura, M.T. (2008). Overcoming Transaction Costs Barriers to Market Participation of Smallholder Farmers in the Northern Province of South Africa. Thesis for Award of PHD Degree at University of Pretoria, South Africa, 193pp.

Martin, P. J., Topper, C.P., Bashiru, R.A., Boma, F., de Waal,.D., Harries, H.C., Masawe, P.A.L. and Kapinga, F.A. (2011). Towards a sustainable cashew industry in Tanzania. Proceedings of the Second International Cashew

Conference held at Hotel Africana Kampala, Uganda, 26th -29th April 2009. CABI UK (In press) Cavalcant J.J. V., M.D. Vilela de Resende. J. R. Crisostome, R. de Paiva 2007. Genetic control of quantitative breeding strategies for cashew improvement. *Crop breeding and Applied Biotechnology* 7:186-195.

Matata, T., Sekarani, A., Wandara, E., Dixon, J. (2001). Farming Systems Approach to Technology- Development and Transfer in Zimbabwe GCP/RAF/334/SWE, Harare.

Matee, A.Z. (1989). Organization and Management of Agriculture Service for small scale farmers in Tanzania, research report submitted to FAO, ROME. [www.africa.kyoto – uac.jp/ kiroku] site visited on 30 May 2014.

Meitei, L.S. and Davi, T.P. (2009). Farmers Information needs in rural Manipur. *An Assessment of Library Information Studies* 56: 35 – 40.

Ministry of Agriculture and Cooperatives, (1996). Cashew and coconut Tree crops.

Ministry of Agriculture Food and Cooperative, (2007). Improved Agricultural Technologies Recommended in Tanzania. The Department of Research and Training. Ministry of Agriculture Food Security and Cooperatives, Dar es Salaam, Tanzania. 144pp.

Ministry of Agriculture food and Cooperatives, (2006). Draft Agricultural Extension Policy Dar es Salaam, Tanzania.

Mkinga District Council (2013). Cashewnuts Production in Mkinga District Annual Report. Mkinga, Tanga. 10pp.

Mole, P.N. (2000). An Economic Analysis of Smallholder Cashew Development Opportunities and Linkages to Food Security in Mozambique's Northern Province of Nampula, PhD thesis, Michigan State University, Ministry of Agriculture and Rural Development, Directorate of Economics, Mozambique. Oxfam (2000). *Agricultural Trade and the Livelihoods of Small Farmers*, 1–11, Oxfam, Oxford.

Momodu, M.O. (2010). Information needs and information seeking behaviour of rural dwellers in Nigeria: A case study of ekpoma in Esau west local government area of Edo state, Nigeria. *Journal of Library Reviews* 51(8): 406 – 410.

Msuya, E.E., Hisano, S. and Nairu, T. (2008). *Explaining Productivity Variation among Smallholder Maize Farmers in Tanzania*. In: World Congress of Rural Sociology Association. Goyang, Korea.31pp.

Mvuna, J.K. (2013). Agricultural Extension System In Relation To Ripat Effort. Ministry of Agriculture Food Security and Cooperatives, Dar es Salaam, Tanzania.

Nabinta, R.T. (2003). Analysis of the role of Females farmers in household energy Management in Kaltungo Local Area of Gombe State in Nigeria.

NAP (2012). "The National Agricultural Policy (Final draft)," United Republic of Tanzania; Dar es Salaam.

National Bureau of Statistics (NBS), Ministry of Agriculture and Food Security (MAEC), Ministry of Water and Livestock Department (MWLD), Ministry of Cooperative and Marketing (MCM) and Presidents Office, (2009). National Sample Census of Agriculture 2007/08 Small Holder Agriculture Volume II: Crop Sector. National Report. Dar es Salaam.

Nirban, A.J. and Sawant, P.A. (2000). Constraint analysis of cashewnut growers. *The Cashew*, 14 (1): 45-49.

Nisha, A. and Rakhesh, D. (2006). Study on Effectiveness of Farmer Field School (FFS) Approach in Rice Ecosystem for Integrated Pest Management. *International Journal of Agricultural Sciences,* 2(2), pp. 621_625.

Nkonya, N. and Hurle, B.J. (2013). Analysis of incentives and disincentives for cashewnuts in the United Republic of Tanzania. Technical notes series, MAFAP, FAO, Rome. 31pp.

NRI (2011). "Natural Resources Institute: Agricultural Extension, Advisory Services and Innovation," University of Greenwich, England.

OECD (2001). Measuring Productivity: Measurement of Aggregate and Industry-Level. OECD Manual. [www.SourceOECD.org] site visited 14/06/2014.

Ohler, J.G. (1979). *Cashew.* Koninklijk Instituut voor de Tropen, Amsterdam. 260pp.

Orozco, C.S., Jimenez, S.L., Estrella, C.N., Ramirez, V.B., Pena, O.B.V., Ramos, S.A. and Morales, G.M. (2008). Escuelas de campo y adopcion de ecotecnia agricola. *Ecosistemas* 17(2), pp. 94_102.

Pangani, M.D. (2007). Perceptions of small holder on the effectiveness of female and male agriculture and Livestock extension field officers based on the Akap sequence. A case study of Mvomero District. Dissertation for award of MSc in Agriculture Economics of Sokoine University of Agriculture. Programme; Proposals for 2001/02, ARI naliendele, Mtwara, Tanzania. Project Completion R*eport,* Dar es Salaam.

Rajalahti, R., Woelcke, J. and Pehu, E. (2005). Monitoring and Evaluation for World Bank Agricultural Research and Extension Projects: A Good Practice Note. Agriculture and Rural Development Discussion Paper No. 20. Wash-ington, DC: The World Bank.

Rivera, W. and Alex, G. (2004) Introduction to Revitalization within Public Sector Services: *In Agriculture and Rural Development Discussion Paper 11 Vol.4 Extension Reform for RD pp1-2.*

Rivera, W.M. and Zijp, W. (2002). Contracting for Agricultural Extension: International Case Studies and Emerging Practices. Wallingford, UK: CABI Publishing.

Ruben, R., Slingerland, M. and Nijhoff, H. (2006). *Agro-food Chains and Networks for Development*. Aad Van Tilburg, Wageningen University. 115pp.

Rutatora, D.F. and Mattee, A.Z. (2001). Major Agricultural Extension Providers in Tanzania. *African Monograph* 22(4): 155 – 173.

Rweyemamu, D. (2003). Reforms in the Agricultural Sector: The Tanzanian Experience. Global Development Network.

Shenduli, A.A. (1998). The role of farmers' groups network in the adoption and diffusion of selected agricultural technology in the Upper Mgeta, Morogoro Rural District.

Shivaramu, K., Manjunatha, D., Mohan, E. and Guruprasad, T.R. (2004). Impact of cashew demonstration on adoption of recommended cultivation practices by farmers. *The Cashew*, 18 (2): 16-21.

Shoo, J.A.E. (1998). The cashew nut Industry in Tanzania Status Report. In:Proceedings of the international Cashew and Coconut Conference; Trees for life –the key to Development.(Topper, C.P.; Caligari, P.D.S., Kullaya, A.K., Shomari S.H., Kasuga L.J., Masawe, P.A.L. and Mpunami, A.A., eds) pp.76-83. Biohybrids International Ltd, Reading UK.

Sijaona, M.E.R. (1984). Investigations into effectiveness of sulphur w.p. against Oidium anacardii Noack on five cashew tree types at Naliendele. *Rivista di Agricultura Subtropicale Tropicale*, 78: 199-209.

Sijaona, M.E.R. and Shomari, S.H. (1987). Powedry mildew disease of cashew in Tanzania. TARO Newsletter 2, 4-5.

Sijaona, M.E.R. and Shomari, S.H. (1987). The powdery mildew disease of cashew in Tanzania. *TARO Newsletter,* 11(3): 4-5.

Singh, G. (2010). Practical manual on canopy management in fruit crops. Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, Krishi Bhanvan, New Delhi.

Starkey, P. (1996). Networking for sustainable agriculture: Lessons from animal traction development. Getekeeper series 58, London, 24pp.

Strauss, J.J., Barbosa, M., Teixeira, S., Thomas, D. and Gomes, R.J. (1991). Role of Education and Extension in the Adoption of Technology: A study of Upland Rice and Soybean Farmers in Central-West Brazil. *Agricultural Economics* 5(4), pp.341- 359.

Swanson, B.E. (2006). The changing role of agricultural extension in a global economy. *Journal of International Agricultural Education and Extension* 13(3): *5 – 17.*

Swanson, B.E. (2008). *Global Review of Good Agricultural Extension and Advisory Service Practices.* FAO, Rome. pp ix. System. The World Bank. Washington, DC.

Tabi, A.J., Vabi, M.B. and Malaa, D.K. (2010). Adoption of Maize and Cassava Technologies in the Forest-Savannah Zone of Cameroon: Implications for Poverty Reduction. *World Applied Sciences Journal,* 11(2), pp.196-209.

Topper, C.P., Martin, P.J., Katinila, N., Kikoka, L.P., Lamboll, R., Massawe, P.A.L. and Shomari, S.H. (1998). The historical and the institutional background of Tanzanian cashew-nut industry in proceedings of the International cashew-nut and coconut conference; Trees for life- the key to Development (Topper, C.P., Caliagri PDS., Kulaya, A.K., Shomari, S.H., Kasuga, LJ., Massawe, P.A.L., Mpunami, AA., eds.) Bio hybrids international Ltd. Leading UK. pp 76-83.

Umali, D.L. and Schwartz, L. (1994). Public and Private Agricultural Extension: Beyond Traditional Frontiers. World Bank Discussion Paper 236. Washington, D.C.: World Bank.

United Nations Industrial Development Organization, (2011). *Cashew Value Chain*: A diagnostic. Vienna, Austria. pp66.

United Republic of Tanzani, (URT). National sample census of agriculture; *Smallholder Agricultura. Volume* II: 2012. Crop sector-National Report.

United Republic of Tanzania, (2009). National rice development strategy. Dar es Salaam: United Republic of Tanzania, Ministry of Agriculture Food Security and Cooperatives.

URT (2006). *Agriculture Sector Development Programme.* Support Through Basket Fund. Government Programme Document, Dar es Salaam, Tanzania. 103pp.

URT (2012). National sample census of agriculture; smallholder agricultura. Volume II:2012. Crop sector-National Report.

URT (2013). 2012 Population and Housing Census. Population Distributed by Areas. National Bureau of Statistics Ministry of Finance Dar es Salaam Office of Chief Government Statistician, President's Office. Finance, Economy and Development Planning, Zanzibar.

URT (2013). Cashew nut Industry Strategy For internal consultations in CBT/CIDTF.

Van den Berg, H. and Janice, J. (2007). Investing in Farmers. The Impacts of Farmer Field School in Relation to IPM. *World Development,* 35(4):663-686.

Van den Berg, H. (2004). IPM Farmer Field Schools: A synthesis of 25 impact evaluations, Wageningen University, Report prepared for the FAO Global IPM Facility, Rome.

Veerkar, P.D., Wadkar, S.S., Bhosale, S.S. and Bagade, S.R. (2006). Constraint analysis of cashew production in South Konkan region of Maharashtra. *The Cashew*, 20 (3): 11-22.

Venkattakumar, R. (2006). Socio-economic impact of cashew cultivation in Kannur district of Kerala. *J. Plantation Crops,* 34 (3): 708-714.

Venkattakumar, R. (2009). Socio-Economic Factors for Cashew Production and Implicative Strategies: An Overview.*Indian Res. J. Ext. Edu.* 9 (3): 55-62.

Venkattakumar, R., Ravi Prasad, T.N and Nayak M.G. (2005). Perception of cashew demonstration farmers towards recommended soil and water conservation and plant protection measures. *Journal of Plantation Crops,* 33 (2): 135-137.

Waller, J.M., Nathaniels, N.Q.R., Sijaona, M.E.R., and Shomari, S.H. (1992). Cashew powdery mildew (Oidium anacardii) in Tanzania. *Tropical Pest Management*, 38.160-163.

Wambura, R., Acker, D. and Mwasyete, K. (2012). Extension Systems in Tanzania: Identifying Gaps in Research.

Wambura, J.B. (2004). Socio economic factors influencing the adoption of agro- forestry practices in Nyanja Division, Musoma rural. Dissertation for of MSc Degree at Sokoine University of Agriculture, Morogoro, Tanzania. 87 pp.

Wennink, B. and Heemskerk, W. (2006). Farmers' Organizations and Agricultural Innovation: Case Studies from Benin, Rwanda and Tanzania. Bulletin No. 374. Royal Tropical Institute. Amsterdam.

Wiebe, K.D., Soule, M.J. and Schimmelpfennig, D. (2001). Agricultural Productivity for Sustainable Food Security in Sub-Saharan Africa. In Zepeda L (ed), Agricultural Investment and Productivity in Developing Countries, FAO, Rome.

World Bank (1997). Rural Development: From Vision to Action. *Sector Strategy, Environmentally and Socially Sustainable Development Studies and Monographs Series 12.* Washington, D.C.

World Bank (2001). *Cashew production and marketing in the smallholder sector in Mozambique*, World Bank, Washington DC.

Yaron, D., Dinar, A. and Voet, H. (1992). Innovations on Family farms: The Nazareth Region in Israel. *American Journal of Agricultural Economics,* 8: 361-370.

Zijp, W. (1994). *Improving The Transfer and use of Agricultural Information: A Guide to Information Technology.* World Bank Discussion Paper 247. Washington, DC: The World Bank.

Zijp, W. (1997). Extension: Empowerment through Communication. Paper presented at symposium "Rural Knowledge Systems for the 21st Century: The future of Rural Extension in Western, Central, and Eastern Europe." Reading, Cambridge, and Edinburgh, U.K.

Zutter, P., Cabero, J. and Wiener, H. (2006). *Poverty, How to Accelerate Change:* experience, results and focus of an innovative methodology from Latin America. Cusco, Peru, DEXCEL Book Fund. 159 pp.

APPENDICES

Appendix 1: Farmer's interview schedule

QUESTIONNAIRE FOR DISSEMINATED CASHEW-NUT PRODUCTION TECHNOLOGIES ON CASHEW-NUT PRODUCTIVITY IN MKINGA DISTRICT

SECTION A. BACKGROUNG INFORMATION

A1. Date …….

A2. Interviewer ……..

A3. Questionnaire No.……

A4. Name of Village.....

A5. Name of Ward.....

A6. Name of Division.....

A 7.Name of District ……..

A 8. Name of Region.....

A.9 Relation to household head ……

SECTION B: SOCIAL ECONOMIC CHARACTERISTICS (PUT APPROPRIATE NUMBER IN THE BOX PROVIDED)

B1. Age of Respondent in Years

1. 18-27
2. 28-37 ☐
3. 38-47
4. 48-57
5. Above 58

B2. Sex of Respondent

1. Male

2. Female

B3. Marital Status of Respondent

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

B4. Level of Education of Respondent

1. Primary school education
2. Secondary school education
3. Adult education
4. Tertiary education
5. Non Formal education.

B5. What is the size of your Cashew-nut farm?

1. Less than an acre
2. Between 1 and 2 acres
3. More than 1 ha

B6. How many cashew trees are there in your cashew farm ?

1. Less than 28 trees
2. Between 28 and 70
3. More than 70

B7. How did you acquire your farm?

1. Inherited it
2. Bought it
3. Hired
4. Allocated by the village government

B8. What is the size of your household (Number)……

B9. What is the Estimated Monthly income of your household?

1. Below 120 000Tsh
2. Between 120 000 and 200 000Tsh
3. Above 200 000Tsh

SECTION C. CHALLENGES IN INTERGRATING DISSEMINATED CASHEW-NUT PRODUCTION TECHNOLOGIES (PUT APPROPRIATE NUMBER IN THE BOX PROVIDED)

C1. Do you attend any workshops to learn about cashew technologies and practices?

1. Yes
2. No [**IF NO, WHY**]

C2. Do you afford to buy Cashew-nut inputs?

1.Yes
2. No [**IF NO GO TO QUESTION C4]**

C3. Where do you get income for buying Cashew.nut inputs? [**MENTION]**

i. ……
ii. ……

C4. Why do you not afford to buy cashew- nut in put

1. Expensive
2. In put supplier shops are very far
3. Not available
4. It is not important for cashew-nut production

C5. Are there any constraints that may make you not to continue using the cashew-nut technologies and practices?

1. Yes
2. No

C6. What constrain hinder you not to use cashew technologies and good practises

1. No enough knowledge of using it
2. Expensive
3. Not important for cashew production
4. Complicated
5. Others [Mention three of them]

C7. Do you use any fertilizer in your cashew nut farm?

1. Yes
2. No **(IF NO GO TO QUESTION C9)**

C8. What type of fertilizer are you using?

1. Organic fertilizer
2. Inorganic fertilizer

C9. What is/are the reasons for not using fertilizer?

1. Not readily available
2. They are expensive
3. My soil is still fertile
4. Lack of Awareness
5. Others specify.....

C10. For the last 5 years did you planted new cashew-nut

1.Yes
2.No **[IF NO GO TO QUESTION C10]**

C11. Which cashew-nut varieties did you planted?

1.Improved varieties
2.Local varieties

C12. Where did you get the improved cashew-nut varieties?

1.From Agro- Dealers

2.Government

3.Other farmers

4.Others

C13. Why didn't you plant new cashew-nut varieties?

1. Not available

2. Expensive

3. I have enough old cashew-nut trees

4. Others, Specify

C14. Do you use any Fungicides or Insecticides in your farm?

1. Yes

2. No **[GO TO QUESTION C17]**

C15. Where did you get Fungicides/insecticides?

1. From Agro- Dealers

2.Government

3.Other farmers

4.Others

C16. When did you apply Fungicides/insecticides in your cashew nut farm?

1. during flowering

2. When plants are mature

3. When plants are young

4. Frequency

5. Others, Specify

C17. Why do you not apply fungicides/insecticides in your cashew farm?

1. Expensive
2. Not available
3. Not knowledgeable
4. Others

C18. How many times do you weed your cashew-nut farm in a season?

1. One time
2. Two times
3. Three times
4. More than three times
5. Weeding is not important

C19. Which of the following agricultural practises do you use frequently in your cashew nut farm?

1. Mulching
2. Pruning
3. Top working or Grafting
5. Non-of above [Explain why]

SECTION D. IN PUT PROVIDERS AND TYPE OF EXTENSION SERVICES TO CASHEW NUT GROWERS (PUT APPROPRIATE NUMBER IN THE BOX PROVIDED)

D1.From which organisations have you most received extension services during the last two seasons

1. District
2. NGO or Private Provider
3. Inputs supplier
4. All of the Above
5. Others, [Please mention]

D2. Do you have a village agricultural extension officer?

1. Yes
2. No

D3. In your opinion, do you think it is important to have an extension officer in your village?

(1) Yes

(2) No

D4. If Yes to the question D3 above, why do you think so?

……..

……..

D5. If question D3 is not, why?

…….

……

D6. How many times per week /month/ year do you get in contact with the extension officer?

1. One time/week/month/year

2. Two times/week/ month/year

3. Not at all

4. Other (specify)……

D7. How do you get in contact with the extension officer?

1. When he/she visits my farm

2. I drop by his /her house to ask for advice

3. In village meetings

4. I drop by his/her office when I need help

5. Other, Please specify.....

D8. What kind of issues do you hear /learn from the extension officer?

1. S/he only gives comments based on what s/he observes on the farm

2. S/he advices on new technologies and motivate us to try them

3. Any other (mention)……

D9. Do extension officer taught to you on cashew-nut production technology and Agricultural practices?

1. Yes
2. No

D10. Do you find the information received from the extension officer useful in overcoming cashew- production?

1. Very useful

2. Moderately useful

3. Not useful, I am learning nothing new

D11. What other sources of information (apart from the extension officer) do you use to learn about cashew-nut production? (Tick more than one)

1. Radio

2. Television

3. Newspapers

4. Any other (Mention)……

SECTION E. ACCESS TO MARKET AND CREDIT TO CASHEW- GROWERS

(PUT APPROPRIATE NUMBER IN THE BOX PROVIDED)

E1. Do you attend any workshops to learn about cashew marketing?

1. Yes

2. No [**IF NO WHY**]

E2. When do you sell your cashew nuts?

1. Sold in a farm before harvest

2. Immediately after harvest

3. Store and wait for a better price

4. Already had a deal before harvest

E3. In which marketing channel do you usually use for selling your cashew produce?

1. Formal markets (WRS)

2. Informal markets (specify).....

E4. Do you have regular customers who always buy your cashew nuts?

1. Yes

2. No

E5. Do you have any contractual agreement with those buyers you always trade with them?

1. Yes

2. No

E6. How do you rank the performance of market you usually use? Tick as appropriate.

1. Good

2. Fair

3. Bad

E7. Do you always find a market for all your raw cashew nuts?

1. Yes
2. No

E8. If Question E7 is no, what happens to the unsold raw produce?

1. Lose to spoilage
2. Eat (Family and relatives)
3. Sell at low prices
4. Store and sell later
5. Process it

E9. If question E7is yes, how difficult is it to look for buyers?

1. Easy
2. Fair
3. Difficult

E10. Do you have access to credit?

1. Yes
2. No

E11. If yes, where do you acquire credit?

1. Family and friends
2. Informal saving and credit groups
3. Microfinance institutions
4. Commercial Banks
5. Others (specify) .....

E12. What was your main source of capital for cashew Production?

1. Personal saving from other activities
2. Cashew sales
3. Loans

4. Credits

5. others (specify

SECTION F. CURRENT CASHEW-NUT PRODUCTIVITY (PUT APPROPRIATE NUMBER IN THE BOX PROVIDED)

F1.Are you a member of FFS cashew-nut production group?

1. Yes
2. No

F2. If the answer in F1 above is yes how you find Knowledge you get in cashew production

1. Very helpful
2. Helpful
3. Not helpful

F3. How many kilograms of cashew nut do you harvest in your cashew nut farm per year.....Kg

F4. What is the trend of cashew nut production have you experienced for the past three years

1. Increasing
2. Decreasing
3. Remaining the same

F5. If production increasing what do you think are the reasons?

1. Coincidence of good climate
2. Improved Technologies/ practices (e.g. improved seeds, fertilizer, Weeding, pest and diseases control)
3. Good soil
4. Others specify

F6. If the answer of F4 is 1, how do you rate the contribution of the extension officer on the performance of your farm particularly on addressing production constraints?

1. Has a big role to play
2. Has a small contribution
3. No contribution at all

F7. If the answer to question F4 is 2 or 3, what could be the underlying causes?

1. Poor weather (Rainfall/Temperature)
2. Poor farm management/ Poor disseminated Technology
3. No Capital
4. Other (Please mention)…

F8. Is there any government assistance in meeting production costs?

1. Yes
2. No

F9. What assistance did you get this year?

1. ……..
2. ……..
3. …….

Thank you for your cooperation

Appendix 2: Check list for key informants

A. Checklist for Village/Ward extension officers

1. For how long have you been in this village?
2. Did you attend any cashew-nut production training?
3. Mention the training you have attended
4. What cashew-nut technologies have you disseminated to farmers?
5. Which technologies in cashew-nut are mostly adopted?
6. Is there any change in productivity since farmers stated adopting new cashew-nut technologies and practises? Give records for at least three years back.
7. Which method do you use in dissemination of cashew technologies to farmers
8. How many exchange visits do you perform and what farmers share amongst them?
9. How many field days do you perform in one crop cycle?
10. What did participants learn during those occasions?
11. What challenges do you face in your working environment especially in the dissemination of technologies
12. What other support and motivations do you get from the District council/NGOs?
13. What needs to be improved?

Thank you for your cooperation

B. **Checklist for District extension officers**

1. How long have you been serving the farmers in this District …… year
2. What was your area of study in collage?
3. To what extent is cashew-nut production is carried out in this district?
4. What are the cashew-nut technologies and practises carried out by smallholder farmer in this district?
5. To what extent does cashew nut production contribute to reduction of poverty at household level?
6. How do you rate the relevance of the content of materials covered in class in addressing the cashew-nut production in the field field?
7. How do you update yourself with new cashew-nut development technologies?
8. What kind of methods or approaches do you use to communicate the technical knowledge to farmers/field officers?
9. What challenges do you encounter with respect to the method you use on question above?
10. What means of transport do you use to reach the farmers/field officer on your daily routine?
11. What technical assistance is offered by village/ward extension officer?
12. Do farmers get access to markets of their produce? Where do they sell?
13. Do farmers get access to credit facilities to meet production costs?
14. Is there any difference in crop productivity between farmers adopted cashew-nut technologies/practises and those who do not?
15. What are the rewards for those complying with the rules and regulations?
16. What are the punishments for those going against the rules and regulations?
17. What do you suggest on ways to improve cashew-nut production?

Thank you for your cooperation