INFORMATION-SEEKING BEHAVIOUR AND ADOPTION OF ORGANIC FARMING PRACTICES AMONG VEGETABLE FARMERS IN SOUTH WESTERN NIGERIA

BY

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SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURE (AGRICULTURAL EXTENSION), AGRICULTURAL ECONOMICS AND EXTENSION PROGRAMME, FACULTY OF AGRICULTURE, SCIENCE AND TECHNOLOGY, NORTH WEST UNIVERSITY, MAFIKENG CAMPUS

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DECLARATION

I, Sijuwade Adebukola Adebayo declare that the thesis for the degree of PhD in Agricultural Extension at the North-West University hereby submitted, has not previously been submitted by me at this or any other university, that it is my own work in design and execution and that all material contained herein has been duly acknowledged.

.....SAAdebayo..... 12/4/2013

SIJUWADE ADEBUKOLA ADEBAYO

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ABSTRACT

This study analysed information-seeking behaviour and adoption of organic farming practices among vegetable farmers in South-Western Nigeria. This is based on the fact that conventional intensive agricultural systems have side–effects which compromise food production in terms of quality and safety. As a result, many are now stating that conventional agriculture represents an unsustainable long-term option. Specifically, the study identified the personal characteristics of the farmers, profile organic farming practices, determined the sources of information about organic agricultural practices, evaluated the attitude of vegetable growers towards organic agriculture, and identified factors that influence farmers' adoption of organic agriculture, estimated the adoption rate for organic agricultural practices and determined the knowledge of value chain among vegetable farmers.

The research design of the study is descriptive and quantitative. The population of the study was the entire population of vegetable farmers in the South Western Nigeria. A cluster sampling technique was used to select 450 farmers covering three out of six states present in South Western Nigeria. Data for this study was generated from primary sources based on the objective of the study. A structured questionnaire consisting of seven sections comprising sections namely; personal characteristics, profile organic farming practices, attitude of vegetable growers towards organic agriculture, factors influencing farmers' adoption of organic agriculture, source of information about organic agricultural practices, intensity of adoption of organic agriculture technologies and knowledge of value chain among vegetable farmers was used to collect data. The questionnaire was face validated by panel of experts on agricultural extension, agronomist and organic agricultural research. Data were analyzed by using the Statistical Package for Social Sciences (SPSS) 18.0. Descriptive statistics such as frequency distribution and percentages, mean and standard deviation were used to describe the personal characteristics of vegetable farmers. Ranking was used to identify the prominent source of information used by the farmers. Tables were used to summarize the data and enhance the readability of the results. The statistical tools used in the analysis are probit model, ordinal regression model and linear regression model.

The results showed that majority of the respondents were male between 40 and 49 years of age, married and had family household sizes of 6 to 10 members. Most of the farmers possess secondary education as their highest educational qualification; they also have a working experience of 1-15 years. The results further showed that the farm size ranges between 0.5-3.4 acres (80.4%); and most commonly used organic farming practices are tillage (80.9%), crop rotation (80.7%), sanitation (69.8%), and intercropping (66.2%), and green manure (60.9%), cover crop (55.8%), and fire (53.6%). The results revealed the most prominent attitudinal statement as ranked by the farmers were statements that organic agriculture improves soil fertility and soil structure' (M=4.38), 'organic agriculture encourages the use of indigenous knowledge' (M=4.38). Furthermore, the results on adoption intensity showed that nine out of fourteen organic farming technologies studied were practiced on ≤50% acres of land. These include crop rotation, cover crop, animal manures among others. Factors influencing the intensity of adoption of organic agriculture practices frequency of contact (t= -1.01, $p<0.01$) with extension agent, farming experience (t= .064, $p<0.01$), farm size (t= .282, $p<0.01$), age (t= -.028, $p<0.05$) and subsidy received (t= 1.494, $p<0.1$). The study among others recommends that the constraints limiting the adoption and the intensity of adoption of organic farming practices must be removed.

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DEFINITION OF ACRONYMS AND ABBREVIATIONS

ADP : Agricultural Development Programme

AKIS : Agricultural Knowledge and Information Systems

CPHM : Cox Proportional Hazard Model

CT : Conventional Tillage

ESA : Environmentally Sensitive Areas

FAO : Food and Agricultural Organization

FAOSAPA : Food and Agricultural Organization Sub-Regional Office for the Pacific

ICT : Information Communication Technology

IFAD /UN : International Fund for Agricultural Development of the United Nations

IFOAM : International Federation of Organic Agricultural Movement

MLE : Maximum Likelihood Estimation

NARP : National Agricultural Research Project

NGO : Non-Governmental Organization

NOP : National Organic Programme

OA : Organic Agriculture

OVF : Organic Vegetable Farming

PAN : Pesticides Action Network

REFILS : Research-Extension-Farmers-Linkage-System

SOM : Soil Organic Matter

UNCTAD : United Nations Conference on Trade and Development

UNEP : United Nations Environment Programme

WHO : World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background to the study

Organic agriculture and biotechnology are two key innovations that are considered to have beneficial impacts on the future sustainability of agriculture (Wheeler, 2005). Conventional farming has played an important role in improving food and fibre productivity to meet human demands but has been largely dependent on intensive inputs of synthetic fertilizers and pesticides (Tu, Louws, Creamer, Mueller, Brownie, Fager, Bell and Shuijin, 2006). Moreover, the conventional intensive agricultural systems have side–effects which compromise food production in terms of quality and safety. Therefore, problems arising from conventional practices have led to the development and promotion of organic farming systems that account for the environment and public health as main concerns (Melero, Ruiz Porras, Herencia and Madejon, 2005). Besides, traditional subsistence smallholding farming can no longer meet the needs and expectations of the ever-increasing population of Nigeria (Adomi, Monday-Ogbomo and Inoni, 2003). Increasing agricultural productivity, self-sufficiency and poverty alleviation depend on the acceptance and full utilization of modern technology-based agricultural-production system. The important role of inputs, particularly seeds, has long been recognized and policy formulation and implementation have been done (Aina 2007). The-Research-Extension-Farmers-Linkage-System (REFILS) has been able to ensure some awareness about the use of modern agro-inputs (Oladele, Sakagomi and Kazunobu 2006).

Organic farming represents a deliberate attempt to make the best use of local natural resources and is an environmental friendly system of farming. It relies much on ecosystem management which excludes external input, especially synthetic ones. Anderson, Jolly and

Green (2005) stated that organic farming is a production system that excludes the use of synthetically manufactured fertilizer, pesticides, growth regulators and livestock feed additives. The system relies on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests. According to Agbamu (2002), organic farming technology is frequently regarded as the solution to environmental problems related to agriculture and food safety. Furthermore, Connor (2004) pointed out that organic farming developed as a response to what was perceived to be polluting food supply by modern farming methods and the ensuing degradation of the environment with chemical and other by-products of the industry.

Soil quality is a necessary indicator for the sustainability of land. The two farming systems (organic and conventional) studied at farm level in Central Italy emphasized interesting differences on soil quality. It became obvious that organic management affects soil microbiological and chemical properties by increasing soil nutrient availability, microbial biomass and microbial activity, representing a set of sensitive indicators of soil quality (Marinari, Mancinelli, Campiglia, Grego, 2006). The bacterial biomass that perform soil functions and resist environmental stress occurring under organic farms scores higher than in other farming systems (Mulder, De Zwart, Van Wijnen, Schouten, Breure, 2003). Furthermore, the results confirm the positive effects of organic manures and diversified crop rotations on soil quality aspects. Rigby and Ca'ceres (2001) and Defoer (2002) reported that organic agriculture tends to conserve soil fertility and system stability better than conventional farming systems. The Food and Agriculture Organization of the United Nations regards organic agriculture as an effective strategy for mitigating climate change and building robust soils that are better adapted to extreme weather conditions associated with climate changes (IFOAM, 2009; Pretty, 1999).

In the practice of organic methods, information has been recognized as an essential component to adoption. Available information and the source of such information have been one of the critical factors affecting adoption rates of innovation among farmers (IFOAM, 2003). Information is knowledge, skill and/or attitude obtained from a source (a person or print or electronic media), either deliberately or incidentally. The receiver can choose to either accept or reject the information or put it aside for later use if possible (Kilpatrick and Rosenblast, 1998). Seeking information is a part of almost every learning project resulting in some changes to farm business management. Most changes to practice are influenced by interaction with, and information from a number of sources, including print and electronic media, peers, experts and training activities (Kilpatrick, 1996).

Information seeking is a complex information and communication activity requiring access to diverse sources of information to deal with personal, social and work-related problems. Spink and Cole (2001) in their work among the largely low-income African American households, discovered that residents' information-seeking behaviour focused on their family and neighbours, with a lower use of external channels, except for health and employment information issues. Bamberry, Dunn and Lamout (1997) reported that farmers used a range of information sources and learning processes, and the sources and processes varied from farmer to farmer according to the purpose of the learning. Furthermore, they noted that farmers prefer to obtain information and learn from people and perceived that to be a cost effective way of gaining relevant information source. Other studies including those by Ashton (1995), Thomas, Ladewig and McIntosh (1990) have also found that farmers consult a range of information sources in decision –making. Information from neighbours is more likely to be compatible with existing life-world experiences. Many studies have found that those who seek most of their information from peers, tend to have lower socio-economic status and

small farms (Buttel, Larson and Gillespie, 1990; Thomas et al, 1990). Bamberry et al, (1997) also found that triggers for learning focused on problem-solving and opportunities specific to a farmer's circumstance at a particular time. Extended courses are often perceived as offering a considerable amount of generic information, not necessarily relevant to the context of a specific farming enterprise (Grannall, 1995).

The changing information environment calls for meeting the needs of information users and that information professional acquire expertise to cope with the operational management of information resources. To ensure this, there is urgent need to understand and grasp the complex process of identifying information need which is very vital in the chain of operations from information gathering to dissemination. Oladele (2002) and Dulle (2000) noted that the quality of agricultural information disseminating system was not effective. The effectiveness of an information system depends on the extent to which the system characteristics are in congruence with the situation of the user and on how much the potential user of the system is willing and able to make use of the services provided by the information system.

Information needs are affected by a variety of factors such as : the range of information sources available, the uses to which the information will be put, the background, motivation, professional orientation and other individual characteristics of the users, the social, economic, legal and regulatory systems surrounding the users and the consequences of information use (Ozowa,1995). Information gathering reduces the farmer's uncertainty about innovation (organic farming). As information is generated in the process of innovation implementation and spreads gradually among potential adopters, the number of adopters will increase. Individual's differences in adoption rate are explained by differences in information gathering behaviour and interpretation of the information. Information is an important aspect

in the decision-making process. The search for information makes the decision-makers aware of new ideas and helps them to evaluate in an objective way whether they will be better or worse off by adoption (De Cock, 2005; Boz and Ozcatallas, 2010).

Information-seeking behaviour is a way of gathering sufficient data to address perceived information gaps. These gaps are the agricultural information needs of the farmers or inadequacies in their knowledge of certain technical, marketing and social information. It involves a face-to-face communication with others as well as the passive reception such as adverts and watching television, radio, newspaper, posters and leaflets (Yahaya, 2003; Zossou, Van Mele, Vodouhe and Wanvoeke, 2009). Information accumulation improves farmers' knowledge on farming practices which in turn reduces uncertainty and induces new technology adoption by risk-averse farmers. On the other hand, farmers' choice to adopt or not a particular innovation, affects their decision to gather technical information from various sources. Farmers who are interested in applying new technology (e.g. farming practices) have a clear incentive to search for relevant information either through information network established during the years involved in farming or by actively seeking for new information sources (Genius, Pantzios and Tzouvelekas, 2006).

Information is provided through sources and channels such as extension officers, scientists, academics, private consultants and other farmers. Studies have illustrated quantitatively the positive role that extension officers play in diffusing agricultural innovations (Fuglie and Kascak, 2001; Marsh, Pannell and Lindner, 2000; Kromm and White, 1991). Agricultural research also plays a critical role in creating and developing new innovations for farmer adoption (Njoku, 2004). As Fisher and Arnold (1996) argued, farmers might see innovations

only through 'windows' that provide limited vision. Such vision may be affected by the source of information used, and thus influenced by the perceptions of the sources themselves. Okwu, Kuku, and Aba (2007) and others (Udoh and Omonona 2008; Aktara, Chowdhuryb, Zakariac and Vogla, 2010) identified personal and social characteristics of farmers, such as age, gender, educational level, income, attitudes and social participation as determinants for use of agricultural information. Knowledge about information seeking behaviour of farmers is crucial for effectively meeting their information needs and to increase productivity. In view of these, it is important to examine the farmers' information-seeking behaviour to determine how it affects adoption of organic farming practices.

1.2 Problem statement

Organic agriculture promotes food safety and quality. The past decade has been characterized by escalating public concern towards nutrition, health and food safety issues (Crutchfield & Roberts, 2000). As a result, consumers perceive relatively high risks associated with the consumption of conventionally grown produce compared with other public health hazards (Williams & Hammitt, 2000, 2001). Mitchell, Hong, Koli, Barrett, Bryant, Denison and Kaffka (2007) discovered that fruits and vegetables produced organically have increased levels of flavonoids which are reported to protect against cardiovascular disease (Hertog and Hollman, 1996) and to a lesser extent, against cancer (Knekt, Kumpulainen, Jarvinen, Rissanen, Heliovaara, Reunanen, Hakulinen and Aromaa, 2002) and other age-related diseases such as dementia (Commenges, Scotet, Renaud, Jacqmin-Gadda, Barberger-Gateau and Dartigues, 2000) whereas the levels of flavonoids did not vary significantly in conventional treatment. Furthermore, Lumpkin (2005) noted that the use of chemicals in vegetable production has been identified as a major source of health risk and a cause of extensive environmental damage.

Organic agriculture improves ecological health because farmers maintain nutrient balances in soil through locally available organic materials or recycled farm wastes (Park, Stabler and Jones, 2008; Hynes, 2009). Stolze, Piorr, Harring and Dabbert (2000) and Olsson et al (2001) concluded that nutrient balances on organic farms are often close to zero and that energy efficiency is found to be higher in organic farming than in conventional farming. It also encourages ecosystem service which sustains agricultural productivity and resilience and advocates production intensification through ecosystem management. Fertility management in organic farming relies on a long-term integrated approach rather than the more short-term targeted solutions common in conventional agriculture (Watson et al., 2002). The practice of organic agriculture has been associated with returns on investment because it offers farmers a much more secure income than when they rely on only one or two inputs (Osborne, 2009; Mcguirk, 1990). Besides, organic farm precludes purchases of organic inputs, loans and thus the profit margin made by farmers increases and farmers are better off financially (Sanchez and Swaiminathan, 2005; Mei, Jewison and Greene, 2006).

Unlike organic agriculture, which emphasizes effective soil management and biodiversity, conventional agriculture (also referred to as intensive agriculture) relies on farming a single crop year after year. To overcome the imbalance imposed upon a conventional farm's ecosystem, harmful agents, such as pesticides and synthetic nitrogen fertilizers are used. Unfortunately, conventional agricultural practices exacerbate rather than alleviate the effects of climate change. The consequence of conventional farming's ecological imbalance is a decline in soil organic matter, soil structure, fertility, microbial and faunal biodiversity. Combined, these impacts with the nutrient overload that ultimately ends up in waterways, deforestation, and overgrazing that occur due to changes in land use, and it is not difficult to

see why many are now stating that conventional agriculture represents an unsustainable long-term option.

However, despite the several benefits of organic agriculture, the coverage of the practice is still low. This may be as a result of lack of awareness of the potentials of organic agricultural practices. According to Oyekanmi, Coyne and Fawole (2008), the poor performance of Nigerian farmers is attributed to their lack of awareness and use of sustainable agricultural practices. Many scientists now believe that conventional agricultural practices are unsustainable. Therefore, availability of relevant information on the economic importance of organic agriculture practices could enhance its adoption among the farmers, thereby increasing the coverage area.

The fruit and vegetable sector is in the midst of a major revolution, is bringing about profound changes in how fruits and vegetables are produced, processed, distributed, and marketed in the United States and abroad (Burnham and Ep-person, 1998; Caswell and Hooker, 1996). Managers in the fruit and vegetable sector are being challenged by increased risk and uncertainty. The vegetables play a crucial role in income generation and subsistence. Through greater production and consumption of indigenous vegetables, malnutrition can be eliminated while healthy diets can be promoted in Africa. Nonetheless, there is no explicit government policy that attempts to promote production and marketing of these products in high-demand areas. Although there is resurgence in demand, the diversity of indigenous leafy vegetables and fruits of Africa, has in the past, been seriously eroded as a result of multiplicity of environmental, political and socio-economic factors (Adebooye and Opabode, 2004). Moreover, the knowledge on constraints in the horticultural seed production and

distribution chain remains limited in many countries, making it difficult to enter into target-oriented promotion of vegetable, fruit seed and seedling sector. A solid understanding of the issues within fruit and vegetable seed sector, both private and public are necessary in order to identify constraints that this sector faces and to formulate a strategy for its sustainable development (Weinberger and Lumpkin, 2005).

The description of organic agriculture in the preceding section has led to the generation of research output recommended by Agricultural Knowledge and Information Systems (AKIS) in order to enhance organic agriculture and make it more sustainable and profitable. The information generated on organic agriculture by various AKIS has created the need for vegetable farmers to fill the information needs and bridge the gap in their production activities. The way in which information is sought is information seeking behaviour. The study attempts to analyse the information seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria.

1.3 Objectives of the study

The main objective of the study was to examine information seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria. The specific objectives were to:

- Identify the personal characteristics of vegetable growers;
- Describe organic farming practices in South Western Nigeria;
- Determine the sources of information about organic agricultural practices;
- Evaluate the attitude of vegetable growers towards organic agriculture;
- Identify the factors influencing the adoption of organic agriculture practices ;

- Estimate the factors influencing the adoption intensity of organic agricultural practices; and
- Determine the knowledge of value chain among vegetable farmers.

1.4 Hypotheses

The following hypotheses stated in the null form will be tested in the study.

There is no significant relationship between personal characteristics of farmers and adoption of organic agricultural practices.

There is no significant relationship between personal characteristics of farmers and their attitude towards organic agricultural practices.

There is no significant relationship between personal characteristics of farmers and intensity of adoption of organic agricultural practices.

1.5 Research questions

In order to achieve the stated objectives, the following research questions were addressed:

- Which of the organic agricultural practices are practiced in South Western Nigeria?
- How do farmers obtain information about organic farming?
- What is the attitude of vegetable growers towards organic agriculture?
- What factors influence farmers' adoption of organic agriculture?
- What is the adoption intensity of organic farming methods?
- How knowledgeable are the vegetable farmers on value chain?

1.6 Outline of the thesis

The thesis consists of five chapters. Chapter one presents the background of the study, the problem statement, objectives of the study, hypotheses and research questions. Chapter two provides a review of previous studies on the subject matter, sustainable agriculture, organic agriculture, organic agriculture and global context and organic agriculture and Africa. It also discusses the economic importance of organic agriculture, application of organic agricultural practices in other countries, knowledge system and information seeking behaviour of farmers, and adoption of agricultural innovation. Furthermore, literature was reviewed on vegetable production and value chain analysis. The first part of chapter three describes the study area while the second section deals with research methodologies and data analysis. Chapter four presents the results and discussion. Chapter five consists of the summary, conclusions and recommendations.

1.7 Definition of terms

Information: Information can be defined as message, document, resources or data that can change a person's knowledge .It can be verbal or non-verbal.

Behaviour: This is a fairly consistent pattern of reaction or response to a given problem or phenomenon by a person or group of person.

Information-seeking behaviour: is a strategy for gathering sufficient data to address the perceived information gap.

Adoption: Adoption of an innovation is a process whereby a farmer becomes aware of the innovation, evaluates the attributes of an innovation, takes decision to adopt the innovation or not and finally adapts the innovation to his own farm environment.

Innovation: can be defined as a process whereby existing technology is adjusted or new technology created to solve a specific research problem.

Organic agriculture: Organic agriculture is a production system that sustains the health of soils, ecosystems, biodiversity and people. It relies on ecological processes and nutrient cycles adapted to local conditions, rather than the use of external inputs with adverse effects.

Vegetable: A commercial crop and regular income generator.

Crop rotation is the practice of growing a series of dissimilar types of crops in the same area in sequential seasons. It confers various benefits to the soil which include the replenishment of nitrogen through the use of green manure in sequence with cereals and other crops and can also improve soil structure and fertility by alternating deep-rooted and shallow-rooted plants.

Green manure is the planting of seasonal crops usually legumes like beans and plowing them under at their tender age during flowering and early fruiting when they are rich in nutrients. Plowing under weeds and grasses, allowing them to decompose is also green manure.

Cover cropping is the growing of low crawling plants usually leguminous vines like centrocema pubisence and kudsu to protect the soil surface from water erosion, prevent the growth of noxious weeds and help increase soil fertility.

Animal manure is a mixture of chicken litter and sawdust or other bedding material. It also includes the application of cow dung to enrich soil fertility.

Compositing is the process of making a heap of wetted organic matter (leaves, food waste) and waiting for the materials to break down into humus after a period of weeks or months. It is beneficial for the land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil.

Intercropping is defined as the growth of two or more crops in proximity in the same field during a growing season to promote interaction between them. The more efficient utilization of growth resources leads to yield advantages and increased stability compared to sole cropping.

Biological control is defined as the reduction of pest populations by natural enemies and typically involves an active human role. It is the use of living plant and animals or living organisms to control pest and diseases.

Farmscaping is a whole-farm, ecological approach to increase and manage biodiversity with the goal of increasing the presence of beneficial organisms.

Mulching is the covering of the soil surface to slow down soil moisture evaporation or conserve soil moisture, prevent growth of weeds and keep the soil soft and friable. In the process, beneficial microorganisms digesting cellulose are protected from the sun and continue their work of converting organic materials in the soil into organic fertilizer.

Sanitation is keeping the field clean which helps in preventing the growth and multiplication of weed, pest and diseases. All plant waste and droppings should be gathered in one place to be composted and converted into organic fertilizer

Minimum tillage is the practice that minimises the disturbance of the soil. The soil is not tilled intensively thereby improving the soil structure.

Fire is an agricultural technique which involves cutting and burning of forests or woodlands to create fields.

Natural pesticide is the herbal preparations to control pest and diseases made by farmers themselves.

Organic fertilizers are fertilizers made from fermented and decomposed organic materials. They are very nutritious safe fertilizers and enrich the soil plant food nutrients, improve the texture for easier root growth and preserve the soil life such as beneficial bacteria and fungi.

1.8 Chapter summary

This chapter introduces the research titled 'Information-seeking behaviour and adoption of organic farming practices among vegetable farmers in South-Western Nigeria. The chapter explained that organic agriculture is an environmental friendly system of farming that makes the best use of local natural resources. It was discovered that information accumulation improves farmer's knowledge on farming practices which in turn reduces uncertainty and therefore influences technology adoption by risk-averse farmers. Therefore, knowledge about information-seeking behaviour of farmers is crucial in effectively meeting their information needs and to increase productivity.

In this chapter, the statement of problem also revealed that conventional intensive agricultural systems have side–effects which compromise food production in terms of quality and safety. It was discovered that conventional agricultural practices exacerbate rather than alleviate the effects of climate change. The statement of the problem also showed that despite the crucial role that vegetable play in nutrition, income generation and subsistence, nonetheless, there is

no explicit government policy that attempts to promote production and marketing of these products in high-demand areas. Moreover, the knowledge on constraints in the horticultural seed production and distribution chain remains limited in many countries, making it difficult to enter into target-oriented promotion of the vegetable, fruit seed and seedling sector.

The study objectives were broadened to analyse the information seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria. The sub-objectives focus on the identification of personal characteristics of the farmers, profile of organic farming practices, attitude of vegetable farmers to organic farming practices, information-seeking behaviour of the farmers as well as the knowledge of value chain among vegetable farmers in South Western Nigeria.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature review involves the systematic identification, location and summary of written material that contains information on a research problem (Polit and Hungler, 1997). In this respect, this chapter presents a critical review of the literature on information seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria. This chapter describes in general terms, sustainable agriculture, organic agriculture, organic agriculture and the global context, organic agriculture and Africa, economic importance of organic agriculture, lessons from other countries, knowledge system and information-seeking behaviour of farmers, adoption of agricultural innovation, vegetable production and value chain analysis, theoretical framework and definitions of organic agriculture technology used in the study.

2.2 Sustainable Agriculture

Like sustainable development, the more general term from which it springs, sustainable agriculture is a complex concept that has been interpreted (as a philosophy) and applied (as a set of techniques) within various environmental, social, and economic contexts (Smit and Smithers 1992). Environmental stewardship, economic viability, and human welfare all fall within the domain of a sustainable agriculture. Thus, the Science Council of Canada (1992) reported that "sustainable agri-food systems are those that are economically viable, and meet society's needs for safe and nutritious food, while conserving and enhancing natural resources and the quality of the environment for future generations. Tilman et al, (2002) reported sustainable agriculture as practices that meet current and future societal needs for food and

fibre, for ecosystem services, and for healthy lives, and that do so by maximizing the net benefit to society when all costs and benefits of the practices are considered. If society is to maximize the net benefits of agriculture, there must be a fuller accounting of both the costs and the benefits of alternative agricultural practices, and such an accounting must become the basis of policy, ethics and action. Additionally, the development of sustainable agriculture must accompany advances in the sustainability of energy use, manufacturing, transportation and other economic sectors that also have significant environmental impacts.

Furthermore, Heitschmidt et al., (1996) broadly defined sustainable agriculture as ecologically sound agriculture and narrowly defined it as eternal agriculture, that is, agriculture that can be practiced continually for eternity. It is those forms of agriculture that do not necessarily require exogenous energy subsidies to function. It is about the issue of how we can maintain high yields of agricultural products while maintaining high levels of ecological efficiencies. However, according to Goodland (1997), environmental sustainability means improving our lifestyle in order to maintain natural capital. Keeping natural capital constant means maintaining the two source and sink environmental services unimpaired. Agricultural systems high in sustainability can be taken as those that aim to make the best use of environmental goods and services while not damaging the main assets – particularly natural, social and human capitals (Tutkun et al, 2006).

Sustainability in agricultural systems incorporates concepts of both resilience (the capacity of systems to resist shocks and stresses) and persistence (the capacity of systems to continue over long periods), and addresses many wider economic, social and environmental outcomes. Agricultural systems with high levels of social and human assets are more able to adapt to change and innovate in the face of uncertainty. This suggests that there are likely to be many

pathways towards agricultural sustainability, and so no single system of technologies, inputs or ecological management is more likely to be widely applicable than another. Agricultural sustainability then implies the need to fit these factors (economic, social, environmental, natural and human) to the specific circumstances of different local agricultural systems (Bunch and Lopez, 1999).

Most of the agricultural practices are not sustainable, and there is little agreement on what sustainability is applied to the agriculture sector (FAO, 1995, 1996). Worldwide topsoil loss, salination, water logging, depleting aquifers, overgrazing, and agrochemical pollution exemplify lack of sustainability in the agriculture sector. The environmental impact of the agriculture sector probably exceeds the impacts of all other sectors, even manufacturing and industry, in many countries. Agriculture has degraded more natural capital and caused more extinction of species than any other sector. Agriculture uses more water than other sectors of the economy in many nations. Many agricultural practices pollute the environment (e.g. feedlot runoff, abattoirs, effluent from oil palm, rubber, coffee processing). The energy consumption of agriculture is substantial in industrial countries, considering diesel (tractors, pumps), energy contents of fertilizers and biocides, and transport infrastructure (Cleveland, 1995).

In the more affluent parts of the world, where consumers will pay more for what they regard as healthier food produced with minimal impact on the environment, more extensive production systems typified by 'organic farming' may prove to be sustainable, provided adequate and acceptable sources to replace exported nutrients can be found (Goulding et al.2008). Organic agriculture (OA) is an alternative, which builds on a non-industrialized

understanding of the relationship between food production and nature. Organic farming therefore has a potential for a more sustainable development.

2.3 Organic agriculture

Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system (FAO, 1999). The FAO/WHO Codex Alimentarius guideline defines organic agriculture as "a holistic production management [whose] primary goal is to optimize the health and productivity of interdependent communities of soil life, plants, animals and people".

Similarly, the International Federation of Organic Agricultural Movements, with over 750 member organizations in 108 countries, defines it as "a whole system approach based upon sustainable ecosystems, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs (IFOAM, 2006; IFOAM, 2002). The aim of organic farming is to create integrated, humane, environmentally and economically viable agriculture systems in which maximum reliance is put on local or on-farm renewable resources, and the management of ecological and biological processes. The use of external inputs, whether inorganic or organic, is reduced as far as possible.

Certified organic food and fiber products are those that have been produced according to documented standards. They are foods that are guaranteed to have been produced and

processed in a manner that avoids the use of synthetic fertilizers, pesticides, hormones, genetically modified organisms and irradiation, and which strives to enhance natural biological cycles and meet minimum animal welfare standards.

"Certified organic agriculture" is defined as a certified system of agricultural production that seeks to promote and enhance ecosystem health while minimizing adverse effects on natural resources. It is seen not just as a modification of existing conventional practices, but as a restructuring of whole farm systems. However, "organic agriculture" is not limited to certified organic farms and products but can include all productive agricultural systems that use sustainable, natural processes, rather than external inputs, to enhance agricultural productivity (Scialabba and Hattam, 2002).

Organic farmers adopt practices to conserve resources, enhance biodiversity, and maintain the ecosystem for sustainable production and can lead to increased food production. In many cases, we have seen a doubling of yields, which makes an important contribution to increasing the food security of a region (Park et al, 2008). Therefore, 'Non-certified organic agriculture' is defined as local, often traditional agriculture that is managed more or less in accordance with the principles of organic agriculture, but is not based on certification, trade and premium prices and promises an alternative development path in rural areas of low-income countries (Halberg et al., 2006).

The principles of organic agriculture according to IFOAM are as follows:

- Principle of Health- Organic agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one indivisible;

- Principle of Ecology-Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them;
- Principle of Fairness- Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities; and
- Principle of Care-Organic agriculture should be managed in a precautionary and responsible manner to protect health and the well-being of current and future generations and the environment.

2.4 Organic agriculture in the global context

Global food production at present would be sufficient to provide everyone with minimum calorie needs if available food was distributed according to need (Von Braun et al., 2003). However, a recent report on food insecurity in the world showed that there are still 848 million people undernourished in the world (830 million in developing countries), most of them living in rural areas (FAO, 2008). Thus, other ways of improving food access than merely increasing external inputs is needed and organic agriculture can be part of such solution. The FAO conference on OA and food security (May 2007) observed that OA has the potential to contribute to sustainable food security through improved household nutrient intake, resilience to food emergency situation and contribution to healthy diets (Scialabba 2007).

The organic food system has over the past two decades, been transformed from a loosely coordinated local network of producers and consumers to a globalized system of formally regulated trade, which links socially and spatially distant sites of production and consumption (Dabbert *et al.*, 2004; Raynolds, 2004). According to Raynolds (2000), international organic agriculture and fair trade movements represent important challenges to the ecologically and

socially destructive relations that characterize the global agro-food system. Both movements critique conventional agricultural production and consumption patterns and seek to create a more sustainable world agro-food system. Allen et al, (2000) reported that the organics market is a powerful engine for positive change because it promotes greater environmental awareness and responsibility among producers and consumers alike. Given its environmental benefits and ability to use and alter capitalist markets, organic agriculture is currently a positive force for environmentalism. The environment of organic agriculture as a market niche is the global market. Organic agriculture is often considered a part of the global market system like any other kind of special agricultural production. Here, 'market' not only denotes a section in society that organic agriculture has to cope with (Michelsen, 2001a); it also denotes a way of thinking: a certain perspective on organic agriculture.

The successful transformation of organic agriculture from a series of scientific experiments in the 1950s to a US$ 55 billion industry today can be partially attributed to the concern over food safety cares, damage to workers' health and the loss of biodiversity from intensified agriculture. Consumers are willing to pay more for a way of farming that promotes healthy agro ecosystems and avoids the use of agrochemicals. There is still considerable potential for organic agriculture to grow but it requires a more favourable policy environment. For this to happen, policy makers, civic society, and the private sector rely on credible information to support their decision-making (Willer and Kilcher , 2011).

2.5 Organic agriculture and Africa

Organic agriculture can contribute significantly to improving food security among smallholder farmers in developing countries, and a large-scale conversion has the potential to reduce the future dependence on food imports in Sub-Saharan Africa (Peramaiyan et al, 2009). The recent UNEP-UNCTAD, (2008) report says that 'organic agriculture is a good

option for food security in Africa'. Organic farming is now also being promoted by non-governmental organizations (NGOs) in tropical countries, and farmers' groups are adopting organic methods of cultivation to improve their food security and their income (Kilcher, 2007). As reported by a number of authors in Kenya, that diffusion is centralized as NGOs train interested farmers and decentralized as adopters share information with friends, neighbours and fellow farmers (Goldberger, 2007 and Bett and Freyer, 2007).

Organic agriculture has a significant role to play in addressing the pressing problems of food security and climate change in Africa. The findings of Mmbaga and Friesen, (2003) in Tanzania showed that the inclusion of legumes in small-scale maize production improves yields through soil amelioration and restriction of livestock, thus reducing soil degradation. Furthermore, Yamano (2008) reported that the intensive dairy and banana cropping system is an appropriate farming system in Uganda where soil degradation is severe and mineral fertilizer expensive. Banana farmers applied more organic fertilizer on less fertile soils which improves the soil organic matter in the long-run and has a long-term impact on the banana yield.

The knowledge gained over the past decade on the role of organic resource quality in influencing soil nutrient availability patterns (Synchrony Principle) and Soil Organic Matter maintenance (SOM Principle) provides a strong scientific basis on which to develop management tools (Palm et al, 2001). A study carried out in Egypt by El-shakweer et al, (1998) tested the efficiency of four local organic conditioners (biogas residues (precipitates), poultry manure, sewage sludge and composted town refuse) for improvement on the physical and chemical properties of four soils at El-Fayoum area, known as soils below the production levels, discovered the optimum improvement effect within used organic conditioners with

each of the tested soils. It was reported that the existed improvement efficiencies are not only the gains of using the organic materials and wastes but also the prevention of continuous pollution to the environment of the agricultural sector.

In addition, there is sustainability of agriculture through improvement of soil fertility and nutrient availability. Bolwig et al, (2009) reporting the superior profitability of certified organic farming for smallholders in tropical Africa, discovered that positive revenue effects does not arise only from the scheme itself, but also from the specific application of organic techniques. Besides, from the investigation conducted in Egypt by Oelofse et al, (2010) on the impact of the adoption of certified organic agriculture on farm nutrient flows and nutrient budgets, it was discovered that a positive nutrient budget provides indicative evidence that soil fertility management practices on organic farms are not depleting soil reserves. Therefore, the benefits of organic farming for Africa are numerous, from increasing yields and conserving water in semi-arid areas and combating desertification, to debt reduction for farmers, strengthening of social systems and maximizing environmental services.

The report of the interview of organic farmers by Svotwa et al, (2007) in Zimbabwe, establish the fact that most farmers viewed organic farming as a cheap and convenient means of growing crops. The perceptions shared by farmers are that organic crops do not spread diseases. Also, Awad et al, (2006) proposed organic farming as one of the strategies to ensure the establishment of sustainable farming community in Lake Nasser region in Egypt because organic farming could provide higher family income even if farmers were subjected to up to 60% decrease in their yields. However, organic agriculture in an organized manner is still young in Africa; practitioners are still few despite the great potential for organic agriculture (Willer and Kilcher, 2009).

2.6 Economic importance of organic agriculture

Organic agriculture is fast emerging as the only sustainable long-term approach to food production. Its emphasis on recycling techniques, biodiversity, low external input and high level output strategies make it an ideal replacement for the petroleum intensive agricultural methods that are currently contributing to global warming (IFOAM, 2008; Swift et al, 2004). There are a number of factors indicating that organic agriculture is far more future proof than conventional agriculture.

2.6.1 Ecosystem services

The advantages of the organic system in terms of both ecosystem conservation and economic performance have been demonstrated by numerous studies (Pimentel et al, 2005 and Stolze et al, 2000). For instance in Tanzania, Mmbaga and Friesen, (2003), discovered that the inclusion of legumes in small-scale maize production improves yields through soil amelioration and restriction of livestock, thus reducing soil degradation. The ecological and economic value of some of the ecosystem service can be maintained and enhanced on arable farmland by adopting sustainable practices such as organic farming (Kristiansen et al, 2006) which is vital for the sustainable supply of food and fibre. The high level of diversity of organic farms provides many ecological services that significantly enhance farm resilience and in wild life habitat (Bengtsson et al, 2005; and Hole et al, 2005). Organic farming leads to many improvements to the natural environment, including increased water retention in soils, improvements in the water table (with more drinking water in the dry season), reduced soil erosion combined with improved organic matter in soils, leading to better carbon sequestration, and increased agro-biodiversity (Hine and Pretty, 2007).

2.6.2 Ecological health

Ecosystem health has been defined in terms of ecosystem stability and resilience in response to a disturbance or stress. Disease suppression can be viewed as a manifestation of ecosystem stability and health. Assessed on an area basis, organic farming shows a more favorable environmental profile. Related to conventional farming, important potential for environmental improvements are in optimizing the farm nutrient flows, reducing pesticide use and increasing its self-supporting capacity (Backer et al, 2009). Better ecological balance is achieved through mandatory crop rotations, use of adapted seeds/breeds and rehabilitation of functional biodiversity (D'Agostino and Sovacool, 2011). The addition of elements of agro- forestry, check dams and terracing (amongst other methods) also stabilizes the soil and thus reduces soil erosion. As a result, soils are healthier, more able to sustain plant growth, higher in nutrient content, better able to hold water and more stable which enables farmers to grow crops for longer periods, with higher yields and when conditions are marginal. This of course can make a major impact on reducing food insecurity of a region.

2.6.3 Soil fertility and system stability

Reddy, (2010) discovered that enhanced soil fertility and higher biodiversity found in organic plots may render these systems less dependent on external inputs because the use of recycled organic wastes as alternative soil fertility amendments can result in increased organic matter and biological activity in soils. Furthermore, Bulluck, Brosius, Evanylo and Ristaino, (2002) noted that the use of alternative soil amendments can result in a higher quality soil and greater plant disease suppressiveness. Organic resources play a critical role in both short-term nutrient availability, longer-term maintenance and increase nutrient stocks in smaller holder farming systems in the tropics (Steiner et al, 2007).

Extensive research, Mader et al, (2002) and Lotter et al, (2003) concluded that soils under organic management retain significantly more rainwater due to the "sponge-like" properties of trapped organic matter thus decreasing irrigation requirements and enhancing crop yields in drought periods. Lampkin and Padel, (1994) argued that one of the key characteristics of organic farming is the extensive management of livestock, paying full regard to their evolutionary adaptations, behavioral needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing.

2.6.4 Mitigating climate change

Organic agriculture could contribute significantly to reduce GHG releases and to sequester carbon in soils and biomass by privileging closed energy and nutrient cycles at the farm and by promoting short supply chains (FiBL, 2007). Apart from being self-sufficient in nitrogen, organic farming has been found to reduce atmospheric carbon dioxide by pulling it from the air and storing it within the soil as carbon (Lee, 2005). Besides, the financial requirements of Organic Agriculture as an Adaptation Strategy or Mitigation Strategy are low (Muller, 2009). As opposed to the focus of conservation agriculture on a single technology, Organic Agriculture follows a site-specific and systematic approach that includes a comprehensive set of integrated technologies (Kotchi and Muller-Samann, 2004).

Khor, (2009) concludes that: "Within agriculture, organic agriculture holds an especially favorable position, since it has mitigation and adaptation potential, particularly with regard to soil capacity, increasing yields in areas with medium to low input agriculture and in agro forestry, and by enhancing farmers' adaptive capacity. Paying farmers for carbon sequestration may be considered a win-win-win situation as carbon dioxide is removed from the atmosphere (mitigation); higher organic matter levels in soil enhance their resilience (adaptation), and improved soil organic matter levels lead to better crop yield (production)."

2.6.5 Food safety and quality

Organic foods tend to have higher micronutrient contents and more plant secondary metabolites and conjugated fatty acids that contribute to better human health, including lower incidences of non-communicable diseases (Gallagher et al, 2005). The preference for organic food has been associated with multiple factors that, in general, reflect an increased interest towards personal health, animal welfare, and environmental protection. Organic food buyers considered themselves more responsible for their own health and were more likely to undertake preventive health action than the general population. Wholesomeness, absence of chemicals, environment friendliness, and a better taste were the primary reasons to buy organic foods (Makatouni, 2002; Magnusson et al, 2001 and Torjusen et al, 2001). Health-related issues seem to assume greater importance than other concerns, and notions about food safety are fundamental for purchasing organics (Lohr, 2001). Consumers are questioning the ability of the modern food system to provide safe food (Anderson, 2000), and perceive relatively high risks associated with the consumption of conventionally grown produce compared with other public health hazards (Williams and Hammitt, 2001). From a nutritional and toxicological point of view, Hoefkens et al, (2009) organic vegetables and potato in general are not significantly better than conventional vegetables and potatoes.

2.6.6 Return on investment and poverty alleviation

Farmers start out as organic producers or convert to organic techniques for a variety of reasons, including concerns about their family's health; concerns about husbandry (e.g. soil degradation, animal welfare); lifestyle choice (ideological, philosophical, religious); and financial considerations (Rigby and Caceres, 2001). Organic agriculture can be a tool to alleviate rural poverty (Giovannuci, 2005). The International Fund for Agricultural Development and the United Nations advocate conversion to organic as a strategy of alleviating poverty in Third World countries (Hak-Su, 2002).

The practice also enhances economic efficiency through savings on inputs but more labor is required. The production and selling of food surpluses at local markets or by barter schemes means that farmers benefit from extra incomes increasing their purchasing power and fresh organic produce is available to more people in the wider community. Bateman, (1993) reported that an important benefit of organic farming is the creation of jobs in the rural economy. He concluded that although organic farming involves a reduction in inputs and hence input-output related employment, this is more than offset by the increases in on-farm employment and in processing activities. Padel, (1994) found that the number of full time workers used per 100 hr was in the long-term about ten percent higher than on conventional.

2.6.7 Consumer preferences

There is an increasing demand for organic produce in recent years (Willer and Youssefi, 2007) because it is perceived as less damaging to the environment and healthier than conventionally grown food products by a growing number of consumers (Chen, 2007 and Mondelaers et al, 2009). Verhoef, (2005) concluded that perceived quality positively influences the purchase intention of organic meat. As indicated by Roberts (1996), the majority of people are not prepared to compromise on other functional characteristics like quality and convenience for a better environment. It was discovered that households with children under the age of eighteen were more likely to choose organic produce whereas shoppers with graduate or professional degrees were less likely to purchase organic produce (Loureiro et al, 2001).

The findings of Zakowska-Biemans, (2011) showed that health risk was the primary concern of consumers to buy organic produce. Besides, consumers support the banning of Genetically Modified Organisms in organic food and are willing to pay a premium to avoid them (Conner and Christy, 2004). The study of Pellegrini and Farinello, (2009) confirmed a

marked willingness among consumers to accept higher costs in order to buy organic products. However, Zepeda and Deal, (2009) reported that knowledge (K), information seeking (IS) and habit (H) are also important in understanding why consumers choose organic and local foods.

2.6.8 Value addition

Value-added products can take many forms; in essence, these can be raw products that farmers grow, modify, enhance or change; in this process, the raw product can change significantly and fetch a higher value (Ohmart, 2003). One of the reasons for the growth and importance given to such activities is that consumers are becoming more quality focused and demanding in how foods are grown and processed (Babcock, 2008). The findings of Reganold et al (2001) reveal that the organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency. Also, Mitchell et al, (2007) reported the levels of flavonoids increased over time in samples from organic treatments, whereas the levels of flavonoids did not vary significantly in conventional treatments. In organic orchards, leaf nutrient content was within the optimum range for most nutrients, except nitrogen. Given that nitrogen is an essential element that can greatly affect yield and its addition is required on an annual basis, special attention should be given to nitrogen in organic olive orchards. Green manures and / or supplementary cultural practices such as for example appropriate pruning can help to increase nitrogen levels (Loupassaki, 2005).

2.6.9 Market niche

In the market perspective, organic agriculture is a set of market opportunities and networks: a market niche based on standards that specify the special conditions for production and processing, certification and control and branding of the products as alternative brands (Alroe and Noe, 2008). Organic farming enables new and different groups in a community to get involved in agricultural production and trade where previously they were excluded for

financial or cultural reasons. The market for organic foods is developing fast throughout Europe (Wier and Calverley, 2002). Market demand for organic agriculture products pulls agriculture production policies towards a more sustainable direction and links demand and supply.

Organic agriculture generates incomes through international exports or by saving production costs (Scialabba, 2000). Farmers' decision to adopt organic cultivation and create niche markets is their response to the changing notions of quality and the gradual abandonment of the productivist logic in agriculture (Dimara et al, 2003). Today, the organic food market is described by industry analysts as the most dynamic and rapidly growing sector of the global food industry - what was once a small-scale niche market is now a $23 billion global enterprise (Macey, 2004). The results show that short supply chains and focus on regional organic shops may be an indication of an earlier stage of market development, likely to be followed by integration into mainstream outlets and involvement of multiple retailers (Padel and Midmore, (2005).

2.6.10 Indigenous knowledge

Organic farmers apply traditional skills and indigenous knowledge, observation, personal experience and intuition to their culture and environment. This enables them to get the best out of complex agro-ecosystems, for breeding locally adjusted seeds and livestock, and for producing on-farm fertilizers (compost, manure, green manure) and inexpensive nature-derived pesticides. Such knowledge has also been described as a 'reservoir of adaptations' (Tengo and Belfrage, (2004). Besides, applied research or farmer's experience in organic agriculture is also used to teach farmers (IFOAM, 2003).

are not depleting soil reserves. Awad et al, (2006) proposed organic farming as one of the strategies to ensure the establishment of sustainable farming community in Lake Nasser region because organic farming could provide higher family income even if farmers were subjected up to 60% decrease in their yields.

To ensure that organic farming was successfully adopted in the area, the model replaced all conventional farming practices by organic farming of all crops. Besides, training courses and other awareness programmes to help the farmers' understanding the methods of cultivation and the usefulness of such farming practice were put in place. El-shakweer et al, (1998) tested the efficiency of four local organic conditioners (biogas residues (precipitates), poultry manure, sewage sludge and composted town refuse) for improvement on the physical and chemical properties of four soils at El-Fayoum area, known as soils below the production levels, and discovered the optimum improvement effect within the used organic conditioners with each of the tested soils.

It was reported that the existed improvement efficiencies are not only the gains of using the organic materials and wastes but also prevention of continuous pollution to the environment of the agricultural sector. In addition, there is sustainability of agriculture through improvement of soil fertility and nutrient availability. Using a duration analysis approach, the Cox Proportional Hazard Model (CPHM), to determine the main factors affecting both the occurrence and the timing of organic agriculture adoption in upper- Egypt, Radwan et al, (2004) discovered that maximum hazard of adopting organic agriculture takes place during the first few years after the construction of the farm. Manager characteristics such as

education level and risk behaviour together with the farm size seem to be the most significant factors affecting the likelihood of organic agriculture adoption in Egypt.

2.7.2 Tunisia

Mokni-Tlili et al. (2009) noted that the application of organic amendment significantly increased the number and affected the diversity of actinomycetes involved in the decomposition of polymeric substances such as cellulose, hemicellulose, lignin and chitin, which are the main components of agricultural and urban waste materials. Laajimi et al. (2008) comparing the sustainability level of organic with conventional farms of the Tunisian olive-growing farms reported a greater ranking for the organic farms. The analysis indicated the sustainability of organic farming on the three scales adopted; ecological scale, through the soil fertility and reduction of pollution, socio-territorial scale through employment creation, reinforcement of the spirit of collective work and the products quality, and finally on the economic scale by enhancing profitability, responding to demand and prices allowing organic farming adopters to reach better incomes.

Machraoui et al, (2010) reported the superior effect of no-tillage in comparison to conventional tillage. This is because no-tillage clearly reduces production costs relative to conventional tillage (CT) and improves soil properties and crop yield. Mrabet et al. (2008) reported consumer preference for organic date paste because compared to conventional paste, organic paste is potentially a better food- manufacturing ingredient, since consumers are not tolerant to any form of contamination that may occur during the handling and manufacturing process.

Many consumers also rely on high manufacturing and processing standards, particularly to know which ingredients and contaminants are present, because of dietary, nutritional requirements or medical conditions. To boost organic farming and raise awareness about the

health benefits of its products, some measures were put in place among which are increased campaigns at home and abroad, partnership meetings to make known Tunisian biological products, broaden the experience of fields-schools network in major production areas, etc. (Bechri, and Naccache, 2003.)

2.7.3 Kenya

Goldberger (2008) indicated that NGOs are by far the most important source of organic agriculture information in this semi- arid region. Social networks (i.e. friends, neighbours, self-help group members and fellow farmers) are also an important information source for nearly all of the farming techniques studied. Kibwezi farmers do not adopt organic agriculture as a single technological package. Rather, they adopt different sets of practices based on their personal preferences, farm characteristics, perceived needs, level of knowledge, labour availability, and other factors. Therefore, each organic farming technique is associated with a different adoption rate and set of perceived adoption constraints.

Adoption rates are highest for mixed cropping, water harvesting and the use of indigenous crops. Diffusion is centralized as NGOs train interested farmers and decentralized as adopters share information with friends, neighbours and fellow farmers (Goldberger, 2007 and Bett et al, 2007). Mugwe et al. (2009) and Kangai (2003), on assessment of adoption potential of selected organic resources for improving soil fertility discovered that cattle manure and tithonia either solely applied or combined with inorganic fertilizer, were found to be the organic materials with the highest adoption potential for soil fertility improvement. They produced the highest yields and were most profitable. The study confirms the importance of participatory approaches in development of technologies for soil fertility management and the complementary role of on-farm trials. Besides, continuous monitoring of farmers especially

during the growing season generates information that would otherwise be lost if done only at the end of the season.

Using farmer participatory methods to develop and disseminate low cost soil fertility, improving technologies for vegetable production to alleviate household food security and poverty in smallholder farms in northwestern Kenya, Wambani et al. (2006) compared the effect of farmyard manure application with recommended rate of inorganic fertilizer and it was discovered that the recommended rate of organic manure was the most profitable and preferred by farmers because of their low cost, availability of organic manure and longer persistence of kales under these treatments.

It was reported also that the Farmer Field School approach strengthened the link between stakeholders, increasing the information flow and awareness on agricultural technologies. Onyango et al. (2000) educate farmers through demonstrations and field visits on the importance of soil fertility in crop production. On-farm trials using organic fertilizers and in combination with inorganic fertilizer were compared to determine their effects on maize yield. It was discovered that combining organic and inorganic fertilizers is the best option of realizing high yields in the study area.

2.7.4 Tanzania

Mbaga-Semgalawe and Folmer, (2000) show that participation in promotional activities of soil and water conservation (SWC) programmes influences the adoption decision process of improved soil conservation measures. Also, problem of soil erosion in agricultural production, participation in labour- sharing groups and on-farm income influence the willingness and ability to use improved soil conservation technologies and soil conservation effort. Matata et al. (2010) identifies farmer training through workshops and seminars,

enforcement of village by-laws on animal grazing, and facilitation of farmers' access to credit as the major approaches to enhance the adoption of the improved fallows technology.

Mmbaga and Friesen (2003) discovered that the inclusion of legumes in small-scale maize production improves yields through soil amelioration and restriction of livestock, thus reducing soil degradation. Dolichos lablab is more adaptable in the target areas due to its multiple benefits of increasing maize yields, provision of additional income and acceptability in the communities by all gender categories. Mowo et al. (2006) noted that participatory approaches as used by research for development projects have shown that there is an opportunity to reverse the declining trends in soil fertility in smallholder farms in northern Tanzania. This is because the approaches allow for participation of all stakeholders and notably farmers whose indigenous knowledge and experience are useful in soil fertility evaluation and management.

2.7.5 Uganda

Yamano (2008) reported that the intensive dairy and banana cropping system is an appropriate farming system in Uganda where soil degradation is severe and mineral fertilizer expensive. The banana farmers applied more organic fertilizer on less fertile soils which improves the soil organic matter in the long-run and has a long-term impact on e banana yield. Organic development in Uganda has focused more on the crop sector than livestock sector and has primarily involved the private sector, like organic products, export companies and non-governmental organizations (Nalubwama et al, 2011).

Farmers managed on-farm demonstration of soil fertility replenishment technologies were used to evaluate technologies with farmers and to act as demonstrations and training sites with farmers, NGOs and extension personnel. Results presented for the use of Tithonia and

legume cover crops show increase grain yields significantly in Eastern Uganda (Delve ad Jama, 2002). According to Buyinza and Wambede (2008), factors that influenced farmers' adoption of improved technologies were age of the household held, educational level, extension contacts, family labour force and gender. It was concluded that improving the quality of the extension systems is of paramount importance in Uganda.

2.7.6 South Africa

The analysis of the survey carried out among farmers in South Africa found that young and more educated farmers tend to adopt organic farming methods more quickly than less educated farmers. Most of the farms converted in South Africa were horticultural holdings and smaller than the average commercial farms. The organic farmers were not mainly motivated by financial reasons, but more by concerns about the environment and soil fertility. Information sources which supported this process and helped farmers to gather knowledge about organic farming were mainly their own education, conversations with other organic farmers and books addressing organic farming issues (Niemeyer, and Lombard, 2003).

The findings of Mkhabela and Materechera (2001) established the factors that influence the use of cattle and chicken manure for managing soil fertility. The major factors that positively influenced the farmers' decision to use manure were availability of manure, herd size, farmers' experience in farming and the availability of extension services. Kisaka- Lwayo (2007) noted that farmers with higher household size, incomes, input costs per hectare and number of chickens owned, locations further from innovators and less risk aversion were more likely to be certified as organic.

2.7.7 Cameroon

Binam et al., (2004) estimating technical efficiency among small holder farmers in the slash and burn agriculture zone of Cameroon, reported existence of substantial gains in output

and/or decreases in cost with available technology and resources. The efficiency differences are explained significantly by credit, soil fertility, social capital, distance of the plot from the access road and extension services. Furthermore, Tonye et al, (1997) in their experiment of fallow management in Yaounde, Cameroon, discovered the beneficial role that residues play in soil fertility improvement process. It was discovered that he highest net return, was obtained from the residue incorporated treatment, whereas the highest return to labour, was associated with burning of residues.

2.7.8 Zimbabwe

The report of the interview of the organic farmer by Svotwa et al. (2007) establish the fact that most farmers viewed organic farming as a cheap and convenient means of growing crops. The perceptions shared by farmers are that organic crops do not spread diseases. The benefits of organic farming were not well pronounced by farmers, who noted that some of them were not performing so well and that success or progress deteriorated as farm visits and problem-solving aspects had decreased. However, farmers who confirmed success in organic farming said they realized good crop quality, yields in leaf crops and improvements in the farming operation.

2.7.9 Sudan

Muneer (2008) reported that farmers' adoption of agro forestry farming system in Northern Kordofan state was significantly affected by the farmers' level of formal education, contact with extension agents, level of environmental awareness, cosmopoliteness, and total area of owned land and extent of social participation. The fact that the farmers' level of formal education, contact with extension agents and level of environmental awareness are the three most important determinants of the farmers' differential rate of innovativeness regarding adoption of agro forestry farming system, reflects the important role that extension

programmes can play in enhancing adoption of natural resources sustainable management innovations.

2.7.10 India

Sherief, et al (2008) revealed that adoption of organic agricultural practice in these homesteads greatly depend on the socio-psychological characteristics of these farmers .It is evident from this study that the socio-psychological characteristics of farmers like the education level, innovativeness, risk-orientation, market perception, self-confidence, information-seeking behaviour, awareness, knowledge and attitude towards organic farming have high influence on the adoption of organic agriculture in coconut-based homesteads in Kerala. Among these factors, knowledge about organic farming practices, market perception, attitude towards organic farming practices, and self-confidence have more influence on the adoption. Hence efforts should be made to create more knowledge and understanding among the farmers about organic farming practices, its advantages and marketing possibilities, which in turn will develop more positive attitudes, and improve the self-confidence of the farmers, leading to increased adoption of organic farming practices in coconut-based homesteads of humid tropics

2.8.1 Information-seeking behavior of farmers

Understanding differences in the number and type of information sources and the frequency of their usage is of vital importance to information providers because this knowledge is critical in developing appropriate educational and informational strategies to respond to different search strategies (Ford et al 2001). Knowledge about the information-seeking behaviour and information use of individuals is crucial for effectively meeting their information needs. This knowledge may also lead to the discovery of novel information behaviour and user profiles that can be used to enhance existing information models or even develop new ones Pezeshki-Rad, and Zamani, (2005).

Information-seeking behaviour is defined as the complete range of human behaviour as it relates to the search for information in a purposeful way to meet an information gap (Wilson, 2000). According to Pettigrew (1996), information-seeking behaviour involves personal reasons for seeking information, the kinds of information which are being sought, and the ways and sources with which needed information is being sought. Barriers that prevent individuals from seeking and getting information are also of great importance in understanding the information-seeking behaviour of individuals and organizations. A more atomistic learning process occurs when people actively seek out information through their networks. To locate specific information, they need to make important decisions. Such individual information-seeking may benefit from mobilization of what is known in the social networks literature as "weak ties", i.e., people with whom one has only sporadic contact at best, but with whom one can establish contact when needed (Hogset,2005). Fisher, (2004) using interpersonal information-seeking among migrant Hispanic farm workers and their families, discovered that personal networks having various levels of credibility were used more readily than any other type of information source.

Case (2002) similarly explained that '...many people use formal sources rarely, relying instead on informal sources such as friends and family, or knowledgeable colleagues at work'. Regarding the information needs and information seeking behaviour of the poor in different lines of work, it was found that the primary information needs of the poor in industries are related to occupation as well as basic survival. Additionally, these citizens, regardless of geographic location or line of work, rely overwhelmingly upon informal social networks to meet their information needs. For example, Nigerian fishermen (Njoku 2004) are concerned with where and how to obtain credit facilities so that they can afford their fishing equipment.

Those in the fishing industry in Uganda (Ikoja-Odongo & Ocholla, 2003) search for information related to death on the job, islands that claim fishing equipment, the cost of equipment, illiteracy, hygiene, natural disasters, and loss of harvest due to rudimentary preservation methods. Most citizens related to the fishing industry in both of these countries rely on conversations with friends, relatives, and neighbours to meet their information needs. Momodu, (2002) in his work on information needs and information seeking behaviour of rural dwellers in Nigeria discovered that radio, television, and newspapers are considered less reliable since many believe this information is influenced by the government's selfish interests, so informal networks are considered by users to be the best source for reliable and authentic information. Beside illiteracy which he considered as the primary barrier to fulfilling information needs, he also noted that lack of information access and a serious language barrier compounds the problem to fulfilling information needs particularly in regions where there is not one local language but several ethnic groups with different dialects.

Additionally, the findings of Kalusopa, (2005) among small-scale farmers' information needs in Zambia, showed that the most helpful information sources are non-government organizations (NGOs), which act as information intermediaries. He noted further that the farmers' information sources remain primarily informal networks (family, friends, and colleagues) because computer technology is scarce in rural areas and these farmers rely on indigenous methods of farming. The literature suggests that a number of demographic, socio-economic, and business-related factors determine farmers' information search (Nwankwo, 2009). The factors, however, provide only limited insight into farmers' strategies for information search activities.

2.8.2 Knowledge System of the Farmers

Today's farmers have access to a wide array of potential information sources ranging from informal to highly formalized sources, and from traditional offline to online delivery methods. Farmers are expected to display differing levels of demands for the different information sources and delivery methods based on their demographic, socio-economic, and attitudinal characteristics. Farming continues to become more complex and information intensive. As a result, demands on farmers' decision-making in acquiring, evaluating, and processing information are increasing. Farmers have rapidly adopted emerging information and communication technologies over the last decade and have better access to information than ever before. Different types of information are likely to have different economic value to farmers. To be used, information must demonstrate that it is relevant and meaningful. This includes that information is packaged and delivered in a way most desired by users (Heinstrom, 2003).

Lack of knowledge of organic and sustainable agricultural techniques is often a limiting factor in the spread of organic production. Farming systems become more productive when human capital increases, particularly in the form of the capacity of farmers to innovate and adapt their farm systems. Sustainable organic agriculture is not a defined set of particular technologies, nor is it a simple model to be widely applied with time. Lack of information on agroecology and the necessary skills to manage diverse farming systems can be a major barrier to the adoption of organic agriculture (Pretty and Ward 2001; Röling and Wagemakers 1997; Pretty, 2002). Adoption of new technologies is also not a costless process for some farmers, as often they cannot simply cut their existing use of fertilizer or pesticides and hope to maintain outputs immediately.

However, this may be offset to a certain extent by the savings incurred as a result of no longer having to buy expensive, synthetic pesticides and fertilizers. One of the reasons that these transition costs arise is that farmers must first invest in learning. Lack of information and system management skills can therefore be a major barrier to the adoption of organic agriculture. During the transition period, farmers must experiment more, and so incur the costs of making mistakes as well as those of acquiring new knowledge and information (Lieblin et al., 2004; Bawden, 2005; Gallagher et al., 2005). In addition, lack of knowledge and information about organic agriculture among government bureaucrats and other influential actors in educational and research institutions, also leads to poor appreciation of the potential for organic and near organic agriculture in poverty eradication and tackling food security issues. One of the greatest constraints faced by farmers changing to organic and near organic systems is that they lack knowledge, information sources, and technical support.

Greater government investment in appropriate research and extension services would help overcome these constraints (Altieri, 2002). Besides, participatory development approach should be used to introduce organic agriculture to farmers. This is because the process by which farmers learn about alternative ways of farming is crucial. If alternatives are enforced or coerced, then farmers may only adopt them for a limited period. But if the process is participatory and enhances farmers' capacity to learn about their farm and its resources, then the foundation for change and continuous innovation is laid (Bunch and Lòpez, 1996).

2.9 Adoption of Agricultural innovation

The findings of Rogers (1995) showed that the innovation-decision process is not passive but is basically an information-seeking and information- processing activity in which the individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation. He emphasizes the role of information, risk factors, and the social position of the decision maker in the community. It was also reported that economic costs and benefits alone are not sufficient to predict the entire adoption decision process but characteristics of the innovation, of the media of communication and of the potential user play an important role. The model depicts the adoption of an innovation as spreading among farmers with different predispositions to innovate. Studies have shown that availability of information to producers and the level of education and experience of prospective adopters are better determinants of adoption than income (Caviglia and Kahn, 2001; Upadhyay et al, 2003).

Farmers use a wide range of channels for receiving agricultural information; while mass media and face-to-face channels are very important, online methods are increasingly gaining acceptance (Tucker and Napier, 2002). In the early stage of the innovation- decision process, mass media is highly useful to create awareness, but it is too general to provide specific how-to answers for which professional sand experienced peers are invaluable sources of knowledge (Rogers, 1995). Available information and the sources of such information have been one of the critical factors affecting adoption rates of innovations among farmers (IFOAM, 2003). Farmers make decisions based on multiple criteria that generally change with time and differ between individuals (Pannell, 1995; Kroma and Flora, 2001). A farmer's decision on whether to farm conventionally or organically can be considered as a choice between two available technologies.

A wide range of factors are investigated which influence the adoption decision of a farmer and explaining the heterogeneity between individuals (Quizzon et al, 2001). At a certain moment in time, differences in adoption benefits between potential adopters explain the variation in individual innovation decisions. These differences in benefits can vary among potential adopters due to differences in farm characteristics and personal characteristics. Diffusion of the innovation over time comes when either the characteristics of the adopter or the benefits of adoption change over time (Diederen et al., 2003). Choice is seen as a process of comparing and selecting among the benefits associated with each alternative. Often, these benefits are restricted to economic gains but also social benefits as convenience, satisfaction can play an important role (Marsh, 1998; Feder et al, 2004).

Motivations behind adopting conservation technologies (and organic farming) are likely tied to recognition of the complex impact of conventional farming on the environment and society. This involves deeply held values but also does not exclude profit-making motives. Depending on the characteristics of the innovation, the innovation will be evaluated positively or negatively. The perception of the farmer about these characteristics will determine their attitude towards the innovation (Rogers, 1995). This perception can be different for each individual and influenced by personal characteristics of the farmer (Rogers, 2003; Burton et al., 1999). On the other hand, an innovation may have superior characteristics compared to existing practices but when translated to the real farm situation and after calculating economic farm benefits, it may be difficult to imply.

Furthermore, our traditional research and development methods must be complemented with suitable farmer participation as well as whole-system evaluations. Effective involvement of farmers can help determine appropriate criteria for cropping-system evaluation, farmer needs

and preferences, improved methods of dissemination and extension, and feedback. Such participatory elements can provide improved linkage and overlap between the planning, research, dissemination, and adoption–adaptation phases (van de Fliert and Braun, 2002).

The concept of stages of innovation can be useful when dealing with the potential differences that might exist within a community as it changes over time. All individuals within a community are not necessarily at the same stage of readiness to change behaviour. This is an important notion to understand before and during a community engagement effort (Wilt et al. 2008).

Rogers offered one of the earliest formulations of this idea with his 1962 work, 'Diffusion of Innovations' by stating that all individuals do not adopt innovations at the same rate or with the same willingness. Stages of innovation, in general, can help implementers of engagement efforts to match strategies to the readiness of a community to adopt them. In applying these concepts to organic farming, for example, desired outcomes are predicated upon the farmers working through a number of phases, including raising awareness of the severity of problems of conventional farming, transforming awareness into concern for the problems, establishing an organic farming intervention initiative, and developing the necessary infrastructure so that information on organic farming practices remain extensive and constant in reaching farmers.

2.10 Vegetable production and value chain analysis

The vegetables play a crucial role in income generation and subsistence. Through greater production and consumption of indigenous vegetables, malnutrition can be eliminated while healthy diets can be promoted in Africa (Adebooye and Opabode, 2004). However, the knowledge on constraints in the horticultural seed production and distribution chain remains limited in many countries, making it difficult to enter into target-oriented promotion of the vegetable and fruit seed and seedling sector.

2.10.1 Vegetable production and its constraints

Low levels of fruit and vegetable consumption in some parts of the world have devastating health effects. It is estimated that insufficient fruit and vegetable intake, and the micronutrient deficiencies that often result from such shortages, cause some 2.7 million deaths each year, making it one of the top risk factors contributing to mortality (Ezzati et al, 2002). According to the report of the World Health Organization, (2003), 52 per cent of pregnant women and 39 per cent of pre-school aged children are irons deficient. The diverse array of micronutrients offered by horticultural products is an answer to these deficiencies. For example, indigenous vegetables constitute an important source of micronutrients, contributing between 30 per cent and 50 per cent of iron and vitamin A consumed, respectively, in poor households (Gockowski et al, 2003).

Increase in fruit and vegetables traded worldwide have been dramatic (FAO,2004) and the total value of horticultural crops traded at present is more than double that of cereal crops, reaching nearly 21 per cent of total value exported from developing countries (Weinberger et al, 2005). Demand for horticultural produce is rising, both in domestic and international markets. This market is changing rapidly, partially fuelled by the spread of supermarkets (Reardon and Barrett, 2000). In developed countries, a desire for year-round availability and increased diversity of foods, as well as a growing awareness of the relationship between diet and health, all contribute to the increased consumption of these commodities (Lumpkin et al, 2005).

Developing countries are taking advantage of this trend, and over the past decade, the increase of their processed food exports has exceeded that from developed regions (Rae and Josling, 2003). Horticultural crops are often highly perishable, restricting the ability of

producers to store to cope with price fluctuations. The findings of Kader (2003) showed that postharvest losses of vegetables vary greatly among commodities, production areas and seasons, however, it was estimated that between 20 to 50 per cent of crops are lost in the varied steps from farmer to consumer. A study in Brazil, found that an average of 200g/capita/day were lost in fruit and vegetables between harvest and consumption (Fehr and Romao, 2001).

In order to minimize postharvest losses, Flores and Gast, (1997) suggested that areas such as handling, packing, storage and transport can require costly equipment and extensive research into areas like controlled atmosphere storage and quality assessment. A major limitation to fruit and vegetable production in many developing countries is the lack of access to good quality open-pollinated or hybrid seeds of exotic and indigenous varieties. Therefore, production of indigenous horticultural crops often takes place under low-input conditions and yet contributes substantially to household food and livelihood security, particularly for resource-poor farmers (Cavendish, 2000). Dolan and Sorby, (2003) in their work in Chile, Ecuador, Guatemala, Kenya, Mexico, South Africa and Zimbabwe reported that evidence suggests that women occupy at least 50 per cent or more of the employment in horticultural products. Also, McCulloch and Ota, (2002) noted that poor and landless women have been able to capitalize on new labour market opportunities associated with production or processing of high value horticultural products.

However, growth in the horticultural sector does not always favour the poor. This is because small producers frequently lack the resources and the skills to access and interpret market information, and adequate financial, human or social capital to develop the linkages to succeed in the market. Most growth and development in the horticulture sector which

presents opportunities for small farmers and rural economies occurs in local and regional markets. The rapidly changing dynamics and criteria of global horticultural markets often act as barriers to their participation in the global value chain (Lumpkin et al, 2005)

2.10.2 Value chain analysis

A value chain is the full range of activities required to bring a product or service from conception, through the different phases of production, transformation and delivery to final consumers and to final disposal after use. A value chain is made up of a series of actors from input suppliers, producers and processors, to exporters and buyers engaged in the activities required to bring a product from its inception to its end use (Kaplinsky and Morris, 2001). A value chain orientation is relevant because it increases the likelihood that interventions and innovations will help to close the insufficiency and inefficiency gaps of rural finance, by recognizing and incorporating market realities rather than distorting them. Furthermore, Fries and Akin, (2004) noted that the orientation of value chain, will help to close the feasibility gap. And since value chain involves a participatory approach, it incorporates the perspectives and taps the energy of critical stakeholders and champions of promising interventions, increasing the likelihood that interventions will build on existing innovations and relationships and receive the buy-in they need to be successful. In the past, much of the agricultural production was consumed by the farmers' household but increasingly, farmers are producing for urban consumers in their country and for the world market. They have to compete in the home market with farmers from other countries.

Whereas traditional open market system is characterized by loose trading relationships in wholesale markets, value chain system is characterized by tightly structured supply chains with a handful of large retailers. However, small producers frequently lack the resources and

the skills to access and interpret market information, and adequate financial, human or social capital to develop the linkages to succeed in the market. There are many examples of farmers who have developed new ideas to overcome logistical barriers in the value chains to successfully identify and develop markets for their produce (FAO SAPA, 2005). Therefore, to ensure that small-scale and resource-poor farmers stand a chance to participate in these expanding markets, policy makers and researchers must place greater attention towards the needs of poor small landholders and tenant farmers.

2.11 Theoretical framework

Literature suggest that the farm, farmer and institutional factors drive farmers to adopt new technologies (De Francesco, Gatto, Runge and Tretini, 2008; Rehman, Mckemey,Yates, Cooke, Garforth, Tranter, Park and Dorward, 2007; Hattam, 2006). Factors such as the financial and social-economic impacts of new technologies, effects of new technologies on the risk of the farm, available resources and technology transfer programmes also have an effect on the decision of the farmer to adopt new technologies .There are many econometric studies dealing with economic and environmental aspects of conversion to more sustainable farming systems such as organic farming. It is clear that the majority of the reviewed econometric studies are oriented towards supporting policy making (Feder et al; 1985).

Using ordinal regression model, De Cock (2005) shows that attitude towards organic farming, perceived attitude of the social environment and perceived feasibility of the organic production standards can be used to predict the intention of conventional farmers to convert to organic farming methods. Quality and environmental oriented farmers are more likely to convert to organic farming than farmers who do not put this objective as important in their decision process. The effect of the organic farming information seeking behaviour may

reflect that the better farmers are informed about organic farming, the faster they convert to organic farming.

The result of stochastic dominance analysis supported the contention that sustainable farming practices enhance productivity and proved to be superior to the use of chemical fertilizers as reported by Kassie et al, (2009) who further identified the factors influencing farmers' decisions to adopt sustainable agricultural production practices, with a particular focus on conservation tillage and compost. It was discovered that poverty and access to information, the age of the household head, availability of household labour conditions, land rights among other factors, impact the choice of farming practices significantly. It was noted further that the impact of gender on technology adoption is technology-specific, while the significance of plot characteristics indicated that the decision to adopt particular technologies is location-specific.

The output of the multiple regression models as used by Kafle, (2011) for the determinants of adoption of organic vegetable farming reveals that farmers' participation in organic farming related trainings and visits, farm size and compatibility of Organic Vegetable Farming have significant influences on level of adoption. It was also discovered that lack of adequate information on organic agriculture seems to be the major reason for non-adoption of OVF by the conventional farmers. Among the various sources of farm information, neighbours receive greater credibility from the farmers.

Belknap and Saupe (1988) used maximum likelihood to estimate a probit model relating variables to the probability that a farm operator used conservation tillage. Farmers were defined as having adopted conservation tillage if conservation tillage was used as part of the farm. Independent variables were classified as being the physical characteristics of the farm, farm business characteristics and human resources characteristics. Other authors that have used this methodology include Isin, Cukur and Armagan (2007) and Hattam and Holloway (2004) for the estimation of conversion to organic dried fig agriculture system in Turkey respectively.

Lohr and Salomonsson (2000) focused on analyzing the factors that determine whether a subsidy is required to motivate organic conversion by using a utility difference model with Swedish date. From these results, it was concluded that services rather than subsidies may be used to encourage conversion to organic agriculture. Pietola and Oude-Lansink (2001) focused on analyzing the factors determining the choice between conventional and organic farming technology in Finland using a Bellman equation. The choice probabilities were estimated in a closed form by an endogenous Probit-type switching model using Maximum Likelihood Estimation (MLE).

Logistic regression was used by van Vuuren, Larue and Ketchaba (1995) to determine the impact tenant, contract and land characteristics have on adoption of farm practices that enhance productivity and environmental husbandry on rented land. The logit model was also successfully used by Parra and Calatrava (2005) to identify factors related to the adoption of organic farming in Spanish olive orchards. Rigby and Young used logit model to establish why some agricultural producers abandon organic production systems. Wynn, Crabtree and

Potts (2001) aimed to model the entry decisions of farmers and the speed of entry to Environmentally Sensitive Areas (ESA) in Scotland. A multinomial logit model was used for modeling entry decisions and a duration analysis was made to qualify the relative speed at which the farmers joined the ESA scheme. They concluded that the logit and duration models were reasonably successful in explaining probability and speed of entry to the scheme respectively.

2.12 Chapter summary

The literature explained that organic agriculture (OA) is an alternative, which builds on a non-industrialized understanding of the relationship between food production and nature. Organic farming therefore has a potential for a more sustainable development. Literature revealed that organic agriculture can be part of such a solution to food insecurity in the world by improving food access. Moreover, it was revealed that the benefits of organic farming for Africa are numerous, from increasing yields and conserving water in semi-arid areas and combating desertification, to debt reduction for farmers, strengthening of social systems and maximization of environmental services. The economic importance of organic agriculture was also reviewed and it was discovered that organic agriculture is far more future proof than conventional agriculture.

Literature further revealed that available information and the source of such information have been one of the critical factors affecting adoption rates of innovation among farmers and that lack of information and system management skills can therefore be a major barrier to the adoption of organic agriculture. Literature also supports the fact that farmers' information sources remain primarily informal networks (family, friends, and colleagues). As regards the adoption of agricultural innovation, literature explained that economic costs and benefits

alone are not sufficient to predict the entire adoption decision process but characteristics of the innovation, of the media of communication and of the potential user play an important role. Literature showed that growth in the horticultural sector does not always favour the poor. This is because small producers frequently lack the resources and the skills to access and interpret market information, and adequate financial, human or social capital to develop the linkages to succeed in the market. Moreover, the rapidly changing dynamics and criteria of global horticultural markets often act as barriers to their participation in the global value chain.

Literature further revealed theories that have been used in other studies to predict the adoption of organic farming practices. These include among others, multiple regression models, logistic regression, logit model, multinomial logit model, probit model and ordinal regression model.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter consists of the complete description of the methods and the procedure followed in this thesis. This study is quantitative in nature and utilizes data from the primary survey from vegetable farmers in South Western Nigeria. This chapter outlines the study area, research design, and population of the study, sampling procedure which includes sampling technique and sample size, the data collection strategy and instrument used for data collection, ethical considerations of the study as well as data analysis.

3.2 Study area

The area of study is southwestern Nigeria which comprises of six states namely: Oyo, Osun, Ogun, Ondo, Ekiti and Lagos states. Southwest is situated mainly in the Tropical Rainforest Zone, though with swamp forest in the coastal regions in Lagos, Ogun, Ondo and Delta states. The agricultural sector forms the base of the overall development thrust of the zone. The zone covers an area ranging from swamp forest to western up lands, in between are rain forests and the northern parts of Oyo and Ogun states having derived Guinea savannah vegetation. The areas lie between latitudes 5 degrees and 9 degrees North and longitude 2 degrees and 8 degrees East. It is bounded by the Atlantic Ocean in the south, Kwara and Kogi states in the north, Eastern Nigeria in the east and Republic of Benin in the west. It has a land area of about 114,271km square representing 12% of the country's total land area. The high concentration of agricultural activities justifies the choice of the study area (NARP, 1996).

3.2.1 Ogun state area

Ogun State is located in South-western Nigeria. It has been in existence since the 70's, with 20 Local Government Areas and Abeokuta as its capital. The state borders Lagos State to the south, Oyo and Osun states to the North, Ondo State to the east and the Republic of Benin to the west. Ogun state is in the tropical rain forest zone and is blessed with good climatic conditions and soil formation. All these make the state one of the major agricultural zones of Nigeria. There are numerous markets in which a considerable trade is done in native products and articles of European manufacture. Timber, cocoa, cassava, palm-oil, rubber, yams and shea-butter are the chief articles of trade. It is one of the largest cassava producing states in Nigeria, and Nigeria is the World's largest producer of cassava. The industry generates US $5 billion in revenue annually.

Natural resources of the state include an extensive fertile soil suitable for agriculture and mineral deposits. The climate and soil of the state are suitable for the cultivation of a wide range of crops. The major food crops include rice, maize, cassava, yam and banana. The main cash crops include cocoa, kolanut, rubber, palm oil and palm kernels. Ogun State is one of the largest producers of kolanut in the country. It also produces timber and rubber on a large scale. About 20% of its total area is constituted of forest reserve suitable for livestock. The state is famous for its Adire (tie and dye) textile products and also the Aso-Oke materials.

The state has enormous industrial potentials. Its natural resources, manpower and geographical proximity to Lagos make it a potential industrial zone to the nation. Its extensive limestone deposit according to scientists can last for some five hundred years. The multi-million naira cement factory in Sagamu is the largest cement factory in West Africa. Both this factory and Ewekoro Cement factory depend on the local lime stone resources for

raw materials. Other mineral resources available include chalk, phosphate, high quality stones and gravels for construction works. There are also other modern industries producing high quality beer, bicycle tyres, ceramic goods, high quality clay bricks, and carpet and clothing materials. The state is a good reflection of a border state (Idiroko border post between Nigeria and the Benin Republic) and characterized by a variety of human activities, which range from agricultural, industrial, commercial, municipal, and domestic activities (PAN, NIGERIA, 2007).

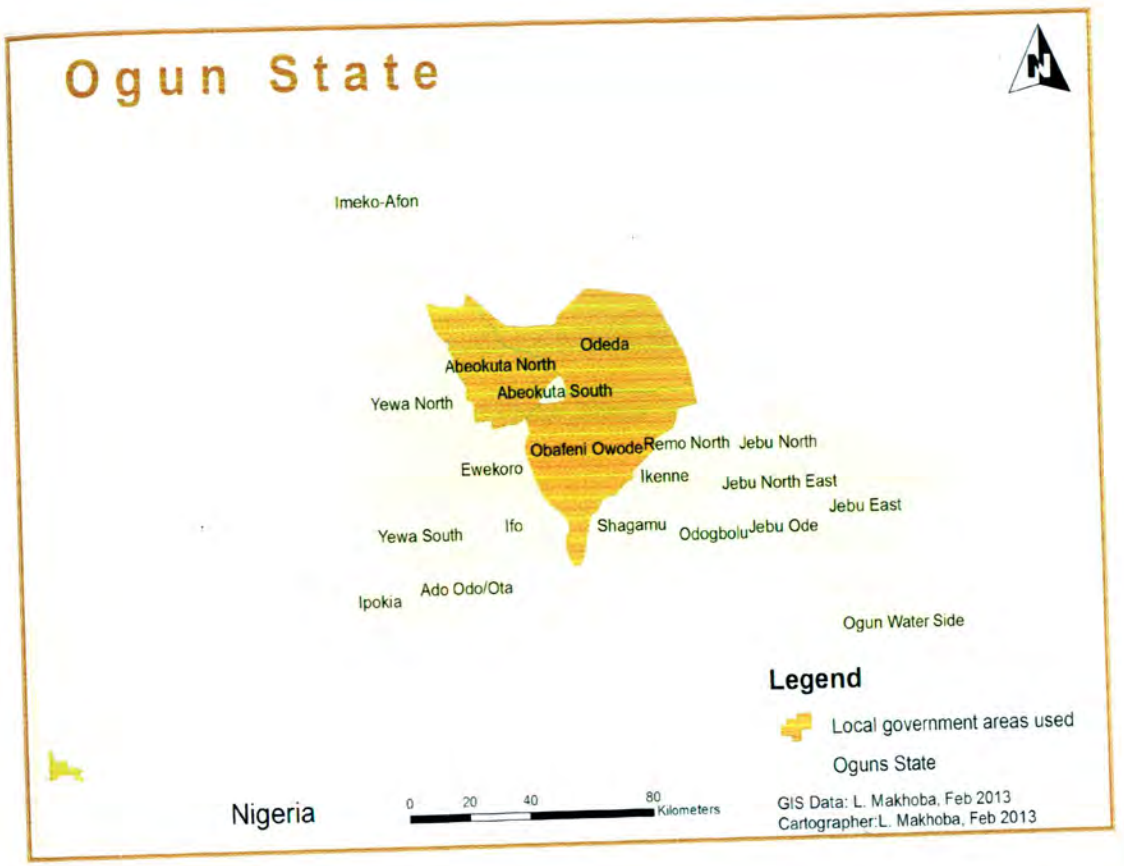


Figure 1: Map of Ogun State Nigeria

3.2.2 Ondo State Area

Ondo State is also one of the six states that lie to the South Western part of Nigeria along with others such as Ogun, Lagos, Oyo, Osun and Ekiti States. The state came into being on 3rd February 1976 when it was carved out from the Old Western State. Another state, Ekiti State was carved out of the State in 1996. With an area of 14,769Km2, it has eighteen Local Government Council Areas. It is bounded by Kwara, Kogi and Ekiti States in the North, Edo and Delta in the East, Ogun, Oyo and Osun States in the West and in the South by the Atlantic Ocean. The state has large drainage basins composed of rivers and creeks such as Oni, Owena, Ala, Ofosu, Ose and Ogbese. Embedded in the bowels of the sedimentary rocks, basement complex and granite rocks are exploitable economic mineral resources ranging from kaolin to bitumen and crude oil. Generally, the land rises from the Coastal part of Ilaje, Ese-Odo and Okitipupa Areas of the state.

The climate is tropical with two distinct seasons of wet and dry. The wet season lasts from April – October while the dry season lasts from November – March. The August break which represents a period of lower rainfall in the midst of the rainy season, is recorded in August. The global climatic change is however gradually impacting on the climate of the state to the extent that minor alternations are now noticeable in the rainfall regimes. The state is blessed with a 12 diurnal sunshine hours and a moderate year round temperature of 25^{0}C. The annual rainfall varies from 2,000mm in the Southern parts to 1,150mm in the Northern extremes. The adequate rainfall encourages the growth of luxuriant forest vegetation to the South and most parts of the state while we have traces of the derived savanna to the Northern extreme which offers attraction to cattle herders. Ondo State therefore traverses various biomes and ecosystems thus placing the state as a veritable point in the study of the dynamics in

ecosystem structure and functioning. These favourable climatic conditions have made it possible for the people to engage in a wide variety of economic activities all the year round.

Ondo State which is indeed a microcosm of the Nigerian nation is blessed with abundant natural resources coupled with a resourceful, industrious and hospitable people. Her crop of educated elites has led to her being classified as one of the most educationally advantaged states in Nigeria. The people of Ondo State are mostly the Yoruba speaking tribes comprising mainly Owos, Ondos, Akokos, Ikales, Ilajes, Akures and Idanres. Others are the Apois and the Arogbos who are the Ijaw-speaking people. Generally, the people of the State have almost the same life patterns. The languages spoken are Yoruba, Ijaw and English. Although varying dialects of Yoruba Language are spoken locally, all are understood by nearly all inhabitants of the State. The people are mainly subsistence farmers, fishermen, lumbermen and palm wine tappers (PAN, NIGERIA, 2007).

Figure 2: The map of Ondo state Nigeria

3.2.3 Oyo State Area

Ọyọ State is an inland state in south-western Nigeria, with its capital at Ibadan. It is bounded in the north by Kwara State, in the east by Osun State, in the south by Ogun State and in the west partly by Ogun State and partly by the Republic of Benin. Oyo State covers approximately an area of 28,454 square kilometers and is ranked 14th by size. The landscape consists of old hard rocks and dome shaped hills, which rise gently from about 500 meters in the southern part and reaching a height of about 1,219 metre above sea level in the northern part. It was formed in 1976 from the former Western State, and originally included Ọsun State, which was split off in 1991 (OYO STATE, NIGERIA, 2013).

The topography of the state is of gentle rolling low land in the South, rising to a plateau of about 40metres. The state is well drained with rivers flowing from the upland in the North-South direction. Oyo State has an equatorial climate with dry and wet seasons and relatively high humidity. The dry season lasts from November to March while the wet season starts from April and ends in October. Average daily temperature ranges between 25 °C (77.0 °F) and 35 °C (95.0 °F), almost throughout the year. The vegetation pattern of Oyo State is that of rain forest in the south and guinea savannah in the north. Thick forest in the south gives way to grassland interspersed with trees in the North. The climate in the state favours the cultivation of crops like maize, yam, cassava, millet, rice, plantain, cocoa tree, palm tree and cashew. There are a number of government farm settlements in Ipapo, Ilora, Sepeteri, Eruwa, Ogbomosho, Iresaadu, Ijaiye, Akufo and Lalupon (OYO STATE, NIGERIA, 2012)

The majority of the people are Yorubas while other ethnic groups constitute a smaller proportion of the population. Over fifty percent are Muslims while others are Christians and a small proportion are adherents of traditional African religions. Most of the people are

engaged in petty trading and small-scale business, while others are civil/public servants. Ibadan has several research institutes such as the International Institute for Tropical Agriculture (IITA), National Institute of Horticultural Research and Training (NIHORT), Cocoa Research Institute of Nigeria (CRIN), Forestry Research Institute of Nigeria (FRIN), Institute of Agricultural Research and Training (IAR&T), National Cereal Research Institute (NCRI) among others (PAN, NIGERIA, 2007).

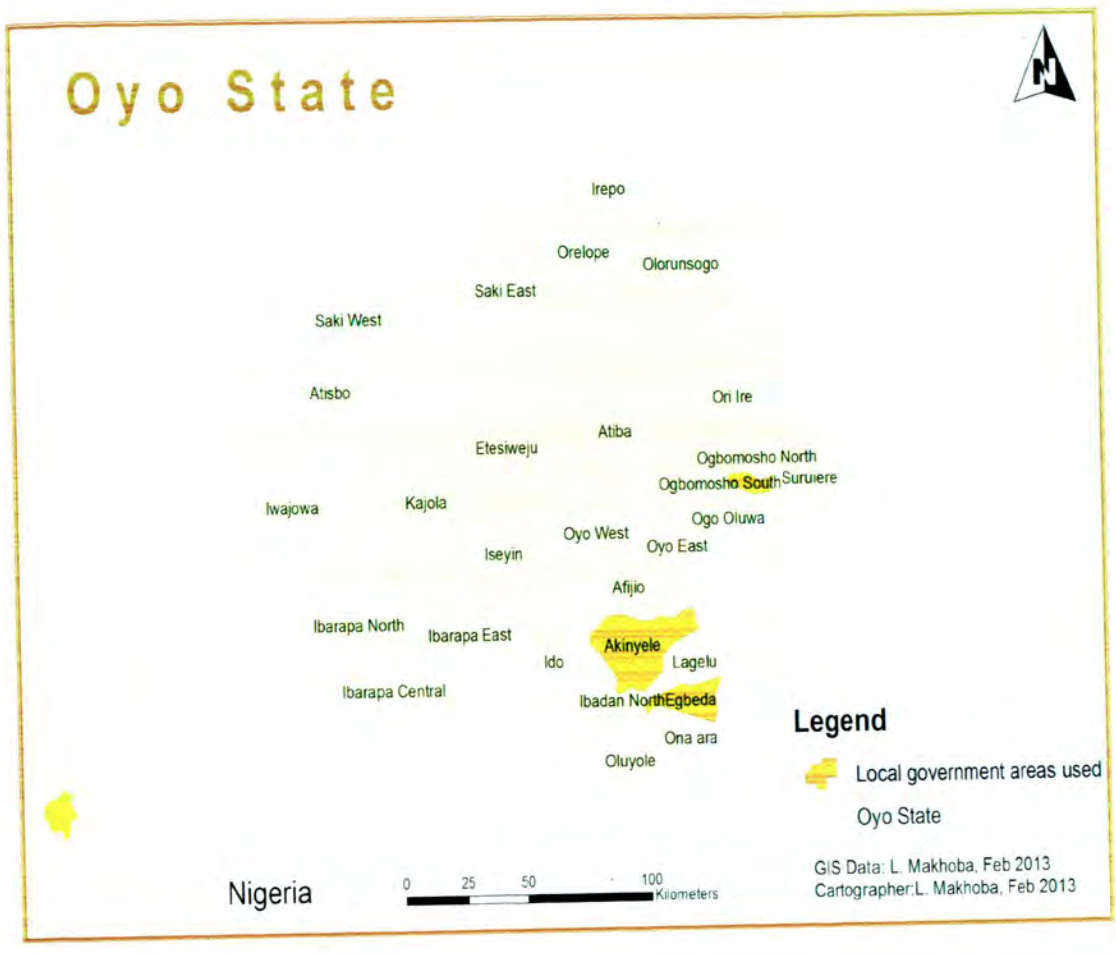


Figure 3: Map of Oyo state Nigeria

3.3 Research design

The research design of the study is descriptive and quantitative which is defined by Bless and Higson-Smith (2000) as a study concerned with the condition that exist, practices that prevail, beliefs and attitudes that are held, processes that are on-going and trends that are developing. The study ascertained the information-seeking behaviour, adoption of organic farming practices and knowledge of value chain among vegetable farmers in South Western Nigeria. Furthermore, it identified the personal characteristics of the farmers, profile organic farming practices in southwestern Nigeria, evaluated the attitude of vegetable growers towards organic agriculture, identified factors that influence farmers' adoption of organic agriculture, determined the various ways by which the farmers obtain information about improved organic agricultural practices, estimated the adoption rate and intensity of adoption of organic agricultural practices and determined the knowledge of value chain among vegetable farmers in the study areas.

3.4 Population of the study

The population of the study comprises of vegetable farmers in South Western Nigeria.

3.5 Sampling procedure and sample size

Cluster sampling technique was adopted for selecting the required sample of both urban and peri-urban vegetable producers. From literature and preliminary surveys, vegetable production in urban areas that is market-oriented is mostly carried out along perennial sources of water or lowlands. This constrains farmers to clusters around these sources of water. Therefore, cluster sampling is considered appropriate. The sampling technique involves random selection of three states in the southwestern Nigeria which were Oyo, Ogun and Ondo. Three local government areas in the urban area were selected from each state to

give a total number of nine local government areas used for the study. The choice of these Local government areas is based on the dominance of vegetable producers in the different areas. The three local government areas chosen in Oyo state were Akinyele, Egbeda and Ogbomoso South. The three local government areas chosen in Ogun state were Odeda, Obafemi Owode and Abeokuta North. The three local government areas selected in Ondo state were Akure South, Akure North and Ifedore. Cluster sampling is a probability sampling procedure in which elements of the population are randomly selected in naturally occurring groupings (clusters). Cluster sampling involves the selection of population elements not individually, but in aggregates (Johnnie, 2012). In this study, the vegetable farmers were identified based on their geographical areas in each of the local government areas. The numbers of clusters available in each of the local government areas were also identified. A cluster of vegetable producers was selected from each of the local government areas to give a total of nine clusters. Fifty producers were randomly selected from each of the nine clusters to give a total sample size of four hundred and fifty respondents for the study. Table one shows the distribution of the respondents by state, local government areas and number of farmers from each of the local government area.

Table 1: Distribution of the respondents by state and local government areas

States	LGAs	Clusters	Sampled farmers
Ogun	Odeda	1	50
	Abeokuta North	1	50
	Obefemi owode	1	50
Ondo	Akure north	1	50
	Akure south	1	50
	Ifedore	1	50
Oyo	Egbeda	1	50
	Akinyele	1	50
	Ogbomoso south	1	50

3.6 Data collection

3.6.1 Data collection instrument

Data for this study was generated from primary sources based on the objective of the study. Interview schedule was used to elicit information from the respondents (The questionnaire was subdivided into the following sections):

Section A- Respondents were to indicate the categories they belong to on their personal characteristics.

Section B- Consists of 14 organic farming practices in southwestern Nigeria. Respondents were requested to indicate whether or not they use the technology. Also, they were requested to indicate frequency of use. Use (2), Non-use (1), Frequency of use, Every season (2), Every other season (1)

These practices are crop rotation, green manure, cover crop, animal manure, compositing, inter cropping, bio control, farn scaping, mulching, sanitation, minimum tillage, fire, natural pesticide and organic fertilizer.

Section C- evaluated the attitude of vegetable growers towards organic agriculture using a 5 point scale of Strongly Agree (1), Agree (2), Undecided (3), Disagree (4) and Strongly Disagree (5) consisting of 25 attitude statements. The maximum score was 125 and the minimum score was 25. Both negative and positive statements were included. The scores were reversed for negative statements.

Section D- determined the source of information about organic agricultural practices by respondents indicating Yes (2), and No (1). Also, the frequency of use was measured as regularly (3), Often (2) and rarely (1) consisting of 21 sources of information.

Section E- determined the intensity of adoption for each of the technologies. This was based on the proportion of farm size allocated to organic agriculture technology by indicating ≤ 50 (1), 50-75 (2) and ≥ 75 (3) for each of the farm size.

Section F- determined the knowledge of value chain among vegetable farmers by the respondents indicating yes (2) and No (1). It consists of six sub groups of concept of value chain, cooperative production, sales channels, inputs and outputs, post-harvest and trading.

3.7 Reliability

To ensure the reliability of the questionnaire, a split half technique was used to determine the reliability coefficient. Scores obtained from this pre-test were subjected to Cronbach α test reliability estimates and a reliability coefficient of 0.72 was obtained. Split half technique estimate gives reliability coefficient of 0.92. The final version of the questionnaire was administered to the sampled farmers. Participation was purely voluntary.

3.8 Validity

The questionnaire was face-validated by a panel of experts which consisted of lecturers in agricultural extension and Agronomy. For the attitude section of the instrument specifically, they were to judge the extent to which the statements represented all degrees of favourableness and unfavourableness to the environmental issues in organic agriculture, as well as the extent to which they convey nearly the same meaning to everyone. The questionnaire was tailored to the needs of the subject to whom it is intended (Bless and Higson-Smith, 2000).

3.9 Ethical considerations

The study took into account the ethical consideration which was addressed through voluntary participation: the respondents' right to privacy was exercised by obtaining direct consent

from them. Anonymity was also ensured to avoid biased responses from the respondents. Permission was sought from University ethics committee and the Programme Managers of Agricultural Development Programmes in the different states used for the study.

3.10 Data analysis

Data were analyzed by using the Statistical Package for Social Sciences (SPSS) version 18.0. Descriptive statistics such as frequency distribution and percentages, mean and standard deviation were used to describe the personal characteristics of vegetable farmers. Ranking was used to determine sources of information used by the farmers. Tables were used to summarize the data and enhance the readability of the results. The inferential statistical tools used in the analysis were probit model, ordinal regression model, linear regression model and one-way analysis of variance. From literature, to identify the socio-economic variables influencing both adoption and intensity of adoption, the probit and ordinal regression models are preferred (Nicholas and Sanders, 1996; Adesina and Zinnah, 1993).

Therefore, in this study, the probit analysis was used to determine the factors influencing the attitude of vegetable farmers towards organic agricultural practices and the factors influencing the adoption of organic agriculture practices. Ordinal regression model was used to determine factors affecting the adoption rate and intensity of adoption of organic agricultural practices. Linear regression model was used to isolate the predictors of the knowledge of value chain among vegetable farmers in this study. One-way analysis of variance was used to establish intra- comparison of adoption, attitude and knowledge on organic agriculture among farmers across study areas. The choice of explanatory variables (socio-economic characteristics) was based on literature on past studies and the characteristics found among the respondents.

3.10.1 Model specification

The different models used in the analysis are linear regression model, Probit and Ordinal regression model.

3.10.2 Linear regression model estimating knowledge of vegetable farmers on value chain

Factors influencing the knowledge of value chain among farmer were isolated using linear regression model. The dependent variable considered in the analysis is a numerical index, which is assumed to vary from one farmer to another according to the variation in their characteristics with a minimum and maximum value on the scale. Linear regression is an appropriate statistical tool to determine the influence of independent variables on dependent variable as it allows the contribution of each independent variable to the regression model to be examined (Hair et al., 1998; Mardia et al., 1982; Mehta & Kellert, 1998). The dependent variable, knowledge of value chain, is hypothesized as being influenced by seven independent variables: age (X_1), farm size (X_2), Household size (X_3), Dependants (X_4), Distance to farm centre (X_5), subsidy received (X_6), and information (X_7).

The model is specified as follows:

$Y = b_0 + b_1 X_1 + b_2X_2 + b_3X_3 + \ldots\ldots\ldots\ldots\ldots\ldots b_7 X_7$

Where, Y is the dependent variable (knowledge of value chain) (knowledgeable=1, not knowledgeable=0)

b_0 is the intercept

$b_1, b_2 \ldots$ bn are the coefficients of the explanatory variables $X_1, X_2, \ldots, X_7$.

X_1= age (years)

X_2= farm size (hectares)

X_3= household size (number of person)

X_4= dependants (number on person)

X_5= distance to farm center (km)

X_6= subsidy received (Naira)

X_7= information (number of sources)

3.10.3.1 Probit model determining factors influencing attitude of vegetable farmers to organic agriculture practices

In this study, probit model was used to determine factors influencing the attitude of vegetable farmers towards organic agricultural practices. For the purpose of this study, it was assumed that farmers make adoption decisions on the basis of their attitude to the organic farming techniques. Comparing various technologies that are adopted, farmers will adopt a technology if they are aware and believe in the potentials of such technology over the existing practice. The probability that a farmer adopts a technology is a function of their attitude.

Attitude toward a technology may possibly affect adoption (Cochrane, 1993). Attitude toward a practice is measured by perception of usefulness. An attitude of confidence can lead to a better understanding of the technology's usefulness, thus leading to a propensity to adopt these technologies. Raising the confidence level of producers can affect the way the producers view the technology in both usage and complexity of tools (Heiniger et al, 2002). Furthermore, the omission of farmers' attitudes towards the technologies studied may lead to biased results (Adesina and Zinnah, 1993). Many of these methodologies borrow from the

Theory of Reason Action (TRA), which suggests that attitude (the individual's beliefs) can explain behaviour (Fishbein and Ajzen, 1975) and Theory of Diffusion (Rogers, 1983), which suggests that adoption of an innovation is dependent on an individual's perception about the innovation.

This problem was addressed using the probit model as follows:

The function for the Probit Model is

$Pi=\beta qi+ \mu i$, where $Pi=1$ for $Xi \geq Z$; $i=1,2.....,n$;

qi is a vector of explanatory variables and β is the vector of parameters. The probit model computes the Maximum Likelihood Estimator of β given the non-linear probability distribution of the random error μi. Attitude was dichotomized into favourable (1) and unfavourable (2). The dependent variable Pi is a dichotomous variable which is 1 when a farmer's attitude was favorable and 0 if otherwise. The explanatory variables are:

Y=Attitude of vegetable farmers towards organic agricultural technology (favourable= 1, unfavourable= 0)

X_1=age (in years),

X_2 dummy variable for educational level (educated=1, not educated=0);

X_3= dummy variable for membership of farmers group (member=1, non-member=0);

X_4=farm size (in hectares)

X_5=farming experience (in years),

X_6=household size (in number of persons),

X_7=gender (male=1 0 if otherwise)

X_8=Number of Dependent (in persons)

X_9=Extension contacts

3.10.3.2 Probit model determining factors affecting adoption of organic farming practices

Farm and farmer attributes were hypothesized to affect the decision to or not to adopt the organic farming practices. As observed elsewhere, (Jabbar et al, 1998; Kaliba et al, 1998; Ntege-Nanyeenya et al, 1997; Salasya et al; 1998), the following factors were hypothesized to influence the adoption of the use of organic and inorganic fertilizers: age of the household head; access to information, off-farm employment, hired labour, land security, credit and gender. According to Mussei et al, (2001), farm and farmers associated attributes are some of the factors influencing the adoption of new agricultural technologies. These factors include the farmer's education level, age and household and farm size. The explanatory variables are:

Y=Adoption of Organic farming practices (Adopt=1 non- adoption=0)

X_1=age (in years),

X_2 dummy variable for educational level (educated=1, not educated=0);

X_3= dummy variable for membership of farmers group (member=1, non-member=0);

X_4=farm size (in hectares)

X_5=farming experience (in years),

X_6=household size (in number of persons),

X_7=gender (male =1; 0 if otherwise)

X_8=Number of Dependants (in persons)

X_9=Extension contacts

3.10.4 Ordinal regression model estimating intensity of adoption of organic farming practices

Ordinal regression model was used in this study to determine the intensity of adoption of organic farming practices among farmers. This model was based on the hypothesis that not all the land areas of the farmers are under organic farming practices, or farmers apply the new technology only to one portion rather than to the whole farm (Leathers and Smale, 1991). Besides, it is assumed that several variables determine the intensity of adoption of organic farming practices among the farmers.

This study sought to estimate the adoption intensity of the different components of organic farming practices. The study analyzed the intensity of farmers' adoption of these organic farming practices and determined the factors contributing to variations in intensity levels or the ability to adopt all the technology. Ordinal regression model was used to analyze the influence of different household socioeconomic and farm characteristics on adoption intensity of organic farming practices. Regression methods such as linear, logistic and ordinal regression are useful tools to analyze the relationship between multiple explanatory variables (Thomas and Galamos, 2002; and Hummei and Lichtenberg, 2001). The ordinal regression model may be written in the form as follows if the logit link is applied.

The function for ordinal regression model is

$$F[Y_j(X)]=\log\{Y_j(X)/[1-Yj(X)]\}=\log\{[P(Y\leq y_j/X)]/[P(Y>yj/X)]\}=aj+\beta X$$

Where j= 1,2……., k-1 and

$Y_j(X) = e^{(aj+\beta X)} / [1+e^{(aj+\beta X)}]$ where j indexes the cut-off points for all categories (k) of the outcome variables. If multiple explanatory variables are applied to the ordinal regression model, βX is replaced by the linear combination of $\beta_1X_1+\beta_2X_2 +.....+ \beta_pX_p$ (Bender and Benner, 2000). The function $f[y_j(X)]$ is called the link function that connects the systematic components (i.e $a_j + \beta X$) of the linear model (Gill, 2001). The alpha aj represents a separate intercept or threshold for each cumulative probability. The threshold (a_j) and the regression coefficient (β) are unknown parameters to be estimated by means of the maximum likelihood methods.

The socioeconomic factors that influenced the intensity of adoption of organic farming technology included both farmer and farm characteristics. These factors in literature have been classified as personal, physical, institutional and socioeconomic (Napier et al., 1991; Sheikh et al., 2003).These characteristics used in this study are listed in Table 2 along with the measurement.

The model was specified for each of the Organic agriculture practices

Crop rotation= $X_1\ X_2\ X_3\ X_4\ X_5\ X_6$.....$X_9$

Green manure= $X_1\ X_2\ X_3\ X_4\ X_5\ X_6$.....$X_9$

Cover crop = $X_1\ X_2\ X_3\ X_4\ X_5\ X_6$.....$X_9$

Table 2: Definition of empirical variables used in adoption analysis

Factors	Type of question/level of measurement
Education	Education level of respondent (1-4 classification)
Gender	2 if the respondent is male; 1 if the respondent is female
Age	Actual age of the respondent was mentioned
Farming experience	Number of years in farming
Distance	Distance to the farm service center in kilometer
Contact with extension agent	2= yes; 1=no
Household size	Household size in numbers
Member of farmers organization	2= yes; 1= no
Dependent members	Dependent members of household in number
Farm size	Farm size in hectares
Marital status	Marital status of respondents (1-4 classification)
Religion	Religion of respondents (1-3 classification)

3.11 Chapter summary

This chapter provided a detailed description of the study area. The study area is South-Western Nigeria which comprises of six states namely: Oyo, Osun, Ogun, Ondo, Ekiti and Lagos States. Southwest is situated mainly in the Tropical Rainforest Zone, though with swamp forest in the coastal regions in Lagos, Ogun, Ondo and Delta States. The agricultural sector forms the base of the overall development thrust of the zone. The zone covers an area ranging from swamp forest to western up lands, in between are rain forests and the northern parts of Oyo and Ogun states having derived Guinea savannah vegetation. The high concentration of agricultural activities justifies the choice of the study areas. The crops grown in these areas include amaranthus, spinach, okra, cucumber, tomatoes, and pumpkin.

Furthermore, the chapter outlined the detailed research methodology for the study area. Cluster sampling technique was adopted for selecting the required sample of urban vegetable producers. Interviewer administered questionnaire was developed and interview schedule was used to elicit information from 450 respondents. The questionnaire was subdivided into six sections which are the personal characteristics of the respondents, profile of organic farming technology, attitude of vegetable farmers towards organic farming practices, information-seeking behavior of the farmers, intensity of adoption of organic agriculture practices and knowledge of vegetable farmers on value chain.

Descriptive statistics such as frequency distribution and percentages, mean and standard deviation were used to describe the personal characteristics of vegetable farmers. Ranking was used to identify the prominent source of information used by the farmers. Tables were used to summarize the data and enhance the readability of the results. The probit analysis was used to determine the factors influencing the attitude of vegetable farmers towards organic

agricultural practices and the factors influencing the adoption of organic agricultural practices. Ordinal regression model was used to determine factors affecting the adoption rate and intensity of adoption of organic agricultural practices. Linear regression model was used to isolate the predictors of the knowledge of value chain among vegetable farmers in this study. One-way analysis of variance was used to establish intra- comparison of adoption, attitude and knowledge on organic agriculture among farmers across study areas.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

In this chapter, the findings of the study are presented. The chapter is divided into five sections. The first section focuses on the results and discussion of the descriptive statistics of the respondents. There are six sub divisions under this section which include the personal characteristics of the respondents, the profile of organic agriculture technologies, attitude of vegetable farmers towards organic farming practices, information-seeking behaviour of the vegetable farmers, intensity of adoption of organic agriculture technology and knowledge of value chain among vegetable farmers. The second section focuses on the probit model regression results determining factors influencing the attitude of vegetable farmers towards organic agriculture practices and factors influencing adoption of organic agriculture practices. The third section focuses on linear regression model determining knowledge of value chain among vegetable farmers. The fourth section focuses on ordinal regression model determining factors affecting rate and intensity of adoption of organic agriculture practices. The fifth section focuses on ANOVA result comparing adoption, attitude and knowledge level across the study area.

4.2.1 Personal characteristics of vegetable farmers

This first section shows the descriptive statistics of the respondents. It is sub divided into six sections which include the personal characteristics of the respondents, the profile of organic agriculture technologies, and attitude of vegetable farmers towards organic farming practices among others. The section is summed up with the distribution of respondents on adoption, attitude and knowledge scale.

Table 3 shows the results of the personal characteristics of vegetable farmers. The section outlines the different variables that were analyzed and discussed. These variables are: gender, marital status, religion, educational level and farming experience.

4.2.1.1 Gender

From the results in Table 3, majority of the respondents were male (63.1%) while 36.9% were female. This may be as a result of the fact that the demand for farm work in the study area is tasking and energy consuming because farm operations are still at the rudimentary; crude farm implements are still in use. Therefore, men are stronger to face this task than women particularly at the onset of planting season when the land has to be prepared. This result agrees with findings of Nwankwo, Peters and Bokelmann (2009) that showed that male gender still dominated farming activities in Nigeria.

4.2.1.2 Age

The findings of the study show that the prominent age bracket of the respondents ranged from 40-49 years (32.2%) and the least age bracket of the respondents ranged from 20-29 (5.8%). This result shows that many of the respondents are in their middle age and still full of energy to carry out work. The findings of the study also show that the population of the older farmers 50-59 (27.8%) and 60&above (15.1%) who were committed to farm work is reducing gradually. This may be as a result of old age setting in and the strength is no longer as before to face the rigour of farm work. Also, the demand of new farming techniques, new hybrid of crops, information, market and climate change challenges have affected the production of these older farmers since many of them are less educated. Besides, ill health and even death have affected their population. This result is supported by the findings of Ofuoku et al (2009) in Delta state, Nigeria and Egri (1999) in Canada who discovered the average age of farmer

to be 43and 45 respectively but contradicts the findings of Oladele (2010) which reported the involvement of older people in farming in Ogun state, Nigeria.

4.2.1.3 Marital status

Married respondents formed the majority, with 91.8 per cent while 4.7 per cent were single. The reason for this large number of married respondents may be because of the cultural values placed on marriage and provision of additional labour through family labour. The society attaches much importance and respect to marital status; therefore, those who are married are seen as responsible in the community. They are more involved in decision making. In addition, married respondents have children, wives and even dependants to cater for which will also make them to be more committed to their farming activities. The single respondents are not many in farming activities. This may be as a result of the respondents going for further studies or changing jobs. It is easier for unmarried farmers to leave farm work to seek off farm income since they may not have dependents they are catering for and therefore, can take risks.

4.2.1.4 Religion

The predominant religion in the states was Christianity (70.4%) while Islam is 27.8%. This may be as a result of the fact that the study location i.e southwestern Nigeria is predominantly Christian. The Islamic religion is more prevalent in the northern part of Nigeria. The traditional religion is also represented in this study (1.8%). This shows farming as an occupation that cut across all religions, and brings man closer to nature and invariably closer to God.

4.2.1.5 Educational level

From the standpoint of educational background, the results showed that 53.6% of the respondents had secondary education, 29.8% had primary education, and 10.4% had adult

education while 6.2% of the respondents had tertiary education. The results show that farmers in this study areas are less educated and do not go beyond secondary school education except for a few of them who had tertiary education. The reason for this may be because of orientation of farmers towards western education. This is more applicable to a female child in the family. Some farmers believe that spending on female education is a waste because she will end up in their husband's home and in the kitchen. Therefore, they will rather give their daughter away for marriage as early as possible. However, in a situation where there is room to send a child for further studies, a male child preferably the first child or first son will be preferred because they believe when he finishes his studies he can assist in taking care of the younger ones. On the other hand, finance can be a barrier to the farmer to further his education. Some farmers would have loved to continue their education but do not have the financial support.

Besides, once a child finishes secondary school, the parents accord him a form of independence, apart from assisting the parents on their farm, he has his own portion allotted from where he can use the proceeds to take care of himself. Therefore, the immediate reward obtained from such proceeds obtained from the farm really influences the farmers from furthering their education. From the result, 6.2% of respondents had tertiary education. This may be those who attend the college of agriculture or those who studied agriculture or related courses at this tertiary institution. The implication of these results is that the majority of farmers with limited education will not be able to stand the test of time and the challenges of the current trends e.g information gathering, market situations, new technology among others which demands higher knowledge and so will find it difficult to compete favorably in the larger market. The result is in agreement with the findings of Singh and George (2012) among the organic farmers in India and Ofuoku et al among the farmers in Nigeria (2009)

who reported that largest percentage of organic farmers were high school educated and a few were college educated.

4.2.1.6 Farming experience

The study reveals that 49.8% of respondents had farming experience ranging between 1-15 years, 42.4% of the respondents had farming experience ranging between 16-30 years while 7.8% of the respondents had farming experience ranging between 31-45 years. The reason for having many respondents with 1-15 years may be because majority of the respondents in the study areas were in their middle age; between ages 40-49. As a result, their years of farming experience will not be too long particularly as independent farmers. This is because some of them will have been serving and supporting their parents before operating their own farm independently. The percentage of the respondents with 16-30 years was 42.4%. These are old farmers who are committed to farming and have long years of farming experience. By virtue of their experience, they are able to understand and overcome some difficulties in farming activities e.g soil fertility, control of pest, weather among others.

The percentage of respondents with 31-45 years of farming experience was 7.8%. These sets of farmers are older and can be seen as a rich source of indigenous knowledge. As a result of long years in farming and through their observations with time, they have a better understanding of nature, the environment, soil, rain and even climate as these affect their agricultural production and they are able to proffer solutions to some of the difficulties though some of these solutions are elementary but serve as bases for researchers and scientists to use in order to solve farmers technical problems. However, from the results, it can be observed that the percentage of older farmers is reducing gradually. This may be as a

result of age, ill-health and even mortality. The result is similar to the findings of Egri (1999) in Canada who reported the average farming experience of the organic farmers to be 17 years.

Table 3: Personal characteristics of the respondents (n=450)

Gender	**Frequency**	**Percentage**
Female	106	36.9
Male	284	63.1
Non response	60	
Age		
20-29	26	5.8
30-39	86	19.1
40-49	145	32.2
50-59	125	27.8
60&above	68	15.1
Marital status		
Single	21	4.7
Married	413	91.8
Divorced	4	0.9
Widowed	12	2.7
Religion		
Islam	125	27.8
Christianity	317	70.4
Traditional	8	1.8
Educational level		
Adult Education	47	10.4
Primary Education	134	29.8
Secondary Education	241	53.6
Tertiary Education	28	6.2
Farming Experience		
1-15	224	49.8
16-30	191	42.4
31-45	35	7.8

4.2.1.7 Farm size

The findings of the study reveal that 80.4% of farmers had farm size ranging between 0.5-3.4 acres, 12.7% of the respondents had farm size ranging between 3.5-6.4 acres and 4.0% of the respondents had farm size above 9.4 acres. There are a number of reasons for the prevalence of small farm size (0.5-3.4 acres). The issue of land tenure system in which there is continuous division of land among the children of deceased farmers usually affects availability of land for agricultural production. Finance is another major constraint which makes farmers to cultivate small farm lands. The cost of farm inputs, seeds, hired labour needed for successful farm operation is much and farmers lack collaterals to obtain loans from financial institutions. Also, manual labour can cause drudgery to the farmer himself and will affect the size of the farm he can prepare for cultivation.

The results showed that 4.0% of the respondents had farm size above 9.4 acres. These may likely be the progressive farmers and few commercial farmers in the study areas. These sets of farmers are more buoyant financially. Some can afford to hire tractors to clear and cultivate their land. Therefore, they can cultivate big acres of land. Besides, some of these farmers have hired labourers who work for them on the farm constantly and are paid wages daily. These sets of farmers are able to source for and paid for information or services that will enhance their farm performance. This result supports the findings of Aliber, Baipethi and Jacobs, (2009) who showed that as a proportion of total farmers in South Africa, subsistence farmers are the majority and commercial farmers a minority with emerging farmers, those with desire to produce on a commercial scale, sandwiched in between. A number of authors reported that majority of sub-Sahara population living in rural areas can be considered as smallholders mainly because of their limited resource endowments relative to other farmers in the same sector (Dixon, Taniguchi, Wattenbach and Tanyeri-Arbur, 2004).

4.2.1.8 Household size

The result shows that 63.3% of the respondents had household size of 6-10 members, 31.8% of the respondents had household size of 1-5 members and 0.7% of the respondents had household size ranging between 16-20 members. The reason for the most prevalent household size may be because of the presence of hired servants and extended family that lived in the farmers' household to assist on the farm. The reason for respondents having 1-5 members may be because there is no extended family staying with them except farmers' own children. The respondents having household size of 16-20 members were 0.7%. The reason for this may be due to the fact that farmers allow their children to go to school so that they could be more educated than they are. Therefore, the services of such children are no longer available on the farm as family labour. Besides, many of the children and youth have drifted from agricultural production to non- farm work which they believe will enhance better and faster returns. As a result, the farmers' household size has greatly reduced.

4.2.1.9 Dependants

The findings of the study reveal that majority of the respondents had six dependants and below (76.0%). About 22.4% of respondents had 6-11 dependants, and 1.6% of respondents had 12-17 dependants staying with them. The result shows that most of the farmers had few numbers of dependants. Therefore, family labour is not readily available again as in the past. This may be as a result of farmers sending their children to school so that they could be more educated than they are. Another reason for the reduction of dependants in the farmers' household could be as result of drift of the children and the youth to non-farm work like driving, sales representatives among others, which they believe will yield quick and better returns to them. Therefore, making the farmers to be involved in farm work alone or depend on hired labour which is scarce and even expensive. The result is similar to the work of

Omodara and Alff, (2006) in Nigeria who noted that many youth have left agricultural production for driving in order to make quick money.

4.2.1.10 Membership of organization

The results show that 72% of respondents indicated that they belonged to an organization while 27.8% do not belong to any organization. The reason for this large percentage in organization membership is because farmers have always worked in groups in order to enjoy many benefits together. Working together as a group fosters unity, strength, solidarity, bulk purchase of farm inputs and collective decision-making as it affects their agricultural production. Caviglia and Kahn, (2001) in Brazil and Oladele (2002) in Nigeria have shown the importance of farmer associations and unions as one of the major sources of information available to farmers, for collective pooling of resources and labour supply.

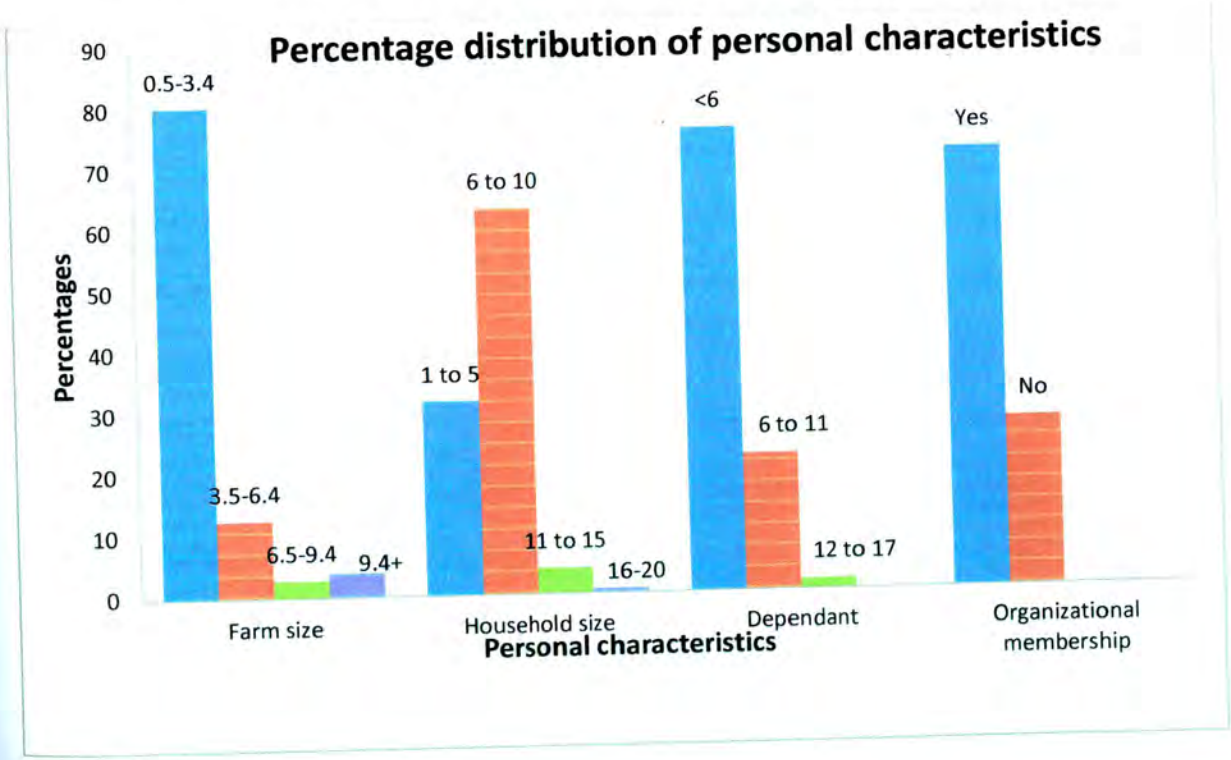


Figure 4: Distribution of the respondents by farm size, household size, dependants and organizational membership

4.2.1.11 Contact with extension agents and frequency of contacts

Majority of the respondents (98.2%) had contacts with extension agents with 85.3% of the respondents having very regular contacts with the extension agent. The result also reveals that 1.8% of the respondents had no contact with extension agents and 2.0 % of the respondents seldom contact extension agents. This result shows that the extension agent is well known to the farmers in the study areas. Farmers are reluctant to interact with people they are not familiar with but they are more familiar with the extension agent as a result of their regular visits and interaction with the farmers. The results support the findings of Adesina et al., (2000) in Cameroon and Honlonkou, (2004) in Benin on the important role extension agents play in the dissemination of innovation among farmers.

4.2.1.12 Distance covered to farm centres

The result shows that most of the respondents cover distances of 0.5- 5.4 to the farm centre (83.3%) and 1.3% of the respondents cover distances above 20.4. This shows the proximity and centrality of the farm centre to the farmers which will equally determine how fast innovation will reach the farmers and how frequent the farmers will visit the farm centre for information, advisory and consultation service. However, the frequency of visits of the respondents who stay farther away from the farm centre will be minimal and may have to depend more on their fellow farmers as a source of information and counsellors. Rogers (2003) found that the farther away, farmers are from the focal point where the technology was introduced, the longer technology diffusion takes.

4.2.1.13 Subsidy received and frequency of subsidy received

The result reveals that majority of the respondents (71.1%) never received any subsidy from the government. About 28.9% of respondents had received subsidy from the government. This result shows that farmers have been operating their farm through self-effort despite little or no help from the government. However, availability of subsidy to the farmers can enhance

adoption of innovation because subsidy received can reduce the cost of production. The findings of Parra López, (2003) among the organic olive growers in Spain showed that adoption rate of organic olive-growing appear to be closely related to the subsidies available, especially in less productive regions.

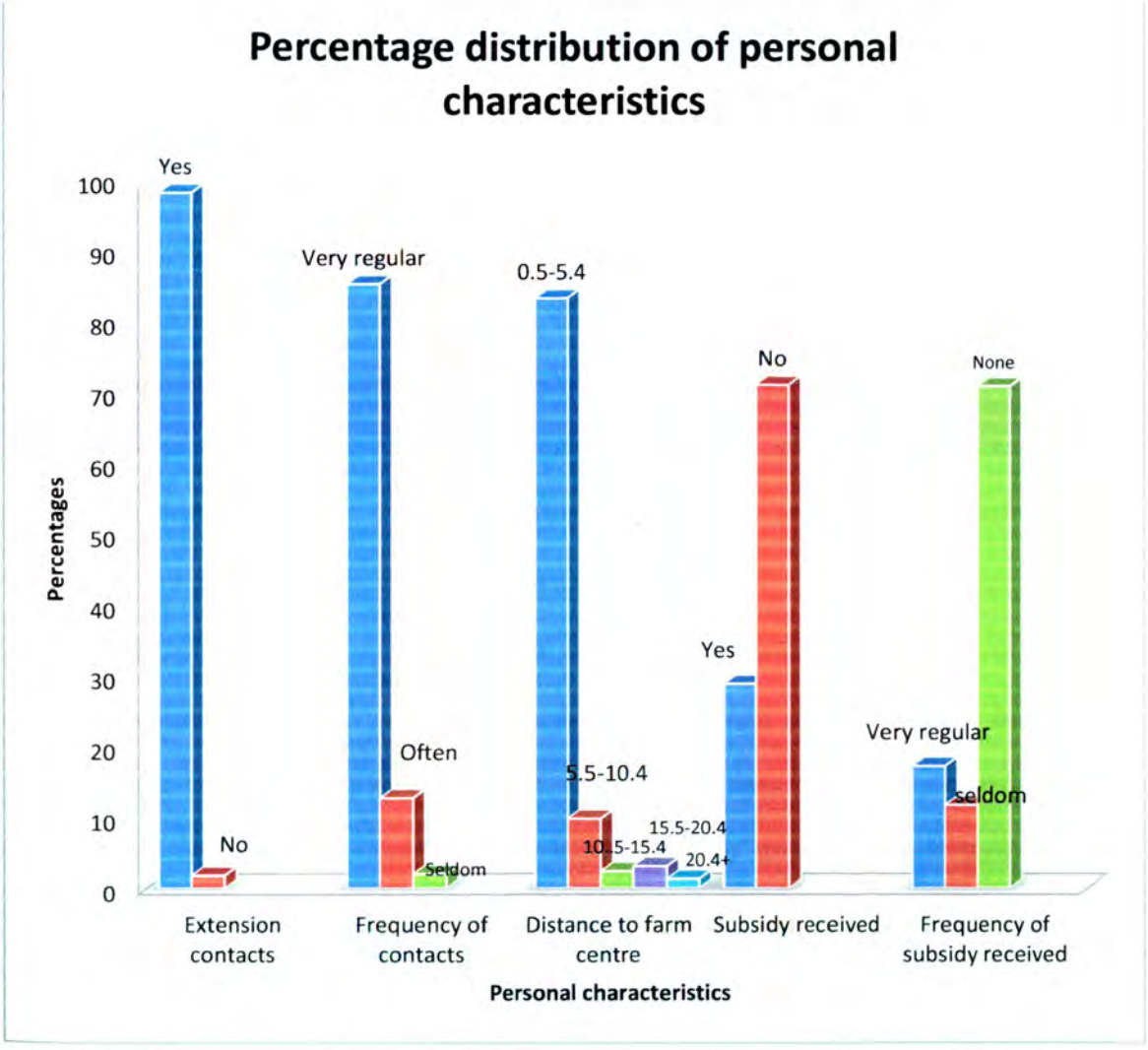


Figure 5: Distribution of the respondents by extension contacts, frequency of contacts, distance to farm centre, subsidy received

4.2.2 Use of organic agriculture technology in South Western Nigeria

This section shows the results of organic agriculture technologies in South Western Nigeria. The section outlines the different organic agriculture technologies that were analyzed with charts and discussed. These technologies are: minimum tillage, crop rotation, sanitation, intercropping, green manure, cover crop, fire, compositing, organic fertilizer, animal manure, mulching, natural pesticides, farm scaping and bio-control. Out of 14 listed organic farming practices, only 7 were indicated by at least 50% of respondents on the use of these practices.

4.2.2.1 Minimum Tillage practices

The result reveals that majority of the respondents (80.9%) practiced Minimum tillage. The reason for this may be because farm operations are usually carried out manually using crude farm implements. Minimum tillage is the practice that minimises the disturbance of the soil. The soil is not tilled intensively thereby improving the soil structure. It is a cultivation operation whereby soil is disturbed as little as possible to produce crops. Mulch residue from the previous crop is left on the soil surface which aids in retarding weed growth, conserving moisture, and controlling erosion. Therefore, the practice of minimum tillage is a common operation among the farmers; usually carried out in order to prepare the soil before the planting exercise. Baldwin (2006) noted that many organic farmers typically manage weeds mechanically and, therefore, cannot focus on building soil structure in the same way as conservational tillage practitioners which often relies on herbicides for weed control. Instead, organic farmers use innovative practices such as crop rotations, green manuring, and biological pest control to improve the soil structure and conserve soil organic carbon.

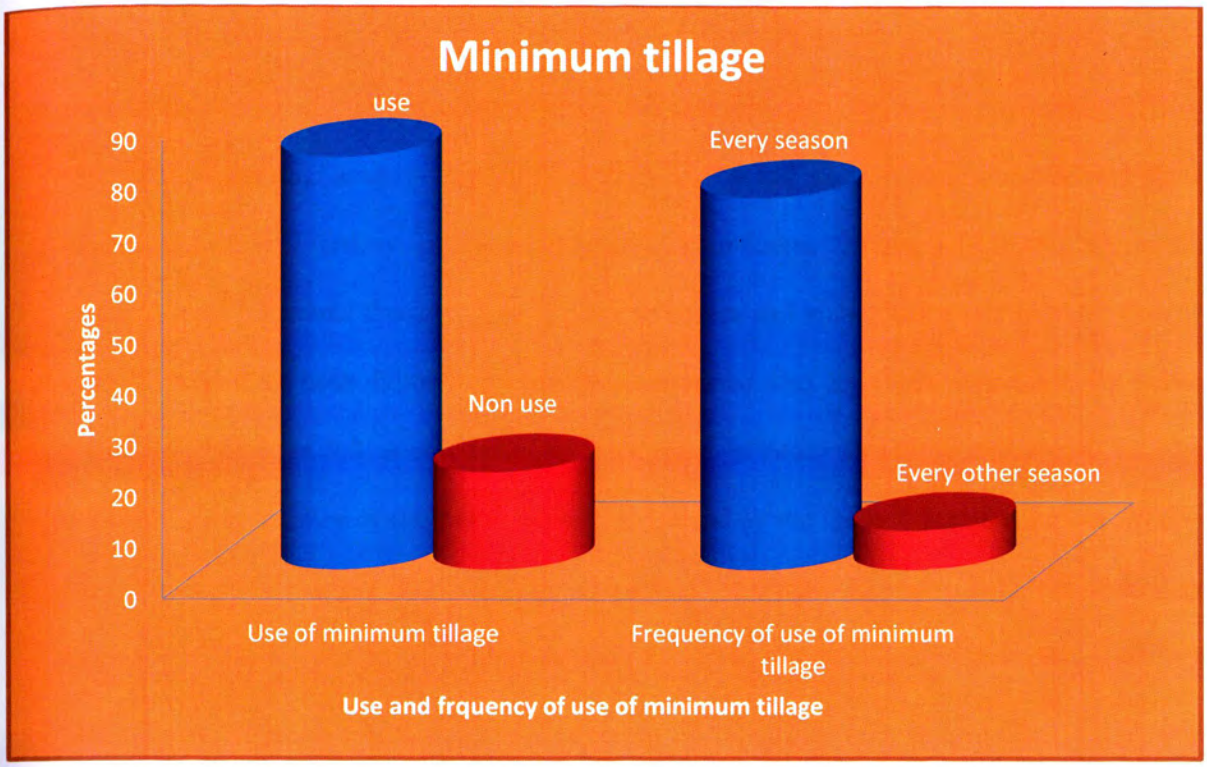


Figure 6: Distribution of the respondents by use and frequency of use of minimum tillage

4.2.2.2 Crop rotation

Crop rotation is the next prevalent practice that was indicated by the respondents (80.7%). The reason for this may be because of farmers' belief on soil maintenance and their observation on soil fertility. Based on indigenous knowledge, farmers believe that soil needs rest and some measures should be put in place to ensure soil maintenance and fertility. One of such measures is bush fallowing whereby a farmland that has been cultivated for some number of years is left uncultivated for few years in order to fallow and regain its lost nutrients. Crop rotation is another measure that is used by the farmers for this purpose. In this case, the farm-land is not abandoned but crops that are cultivated on the farm are planted in sequence in order to maintain soil fertility. Crop rotation is a practice that is as old as farming practice itself. Subba Rao (1999) and Stockdale, et al (2000) observed that crop rotations and varieties are selected to suit local conditions having the potential to sufficiently balance the nitrogen demand of crops. Furthermore, Bending and Lincoln, (1999) in their work among US farmers noted that organic growers commonly plant rapeseed, mustard, and other brassicas as rotation crops to 'clean up' soil during the winter months. Besides, crop rotations comprising both grass-clover fields and arable crops have proven to be relatively robust in relation to most problems with weeds, pests and diseases (Dubois et al, 1999).

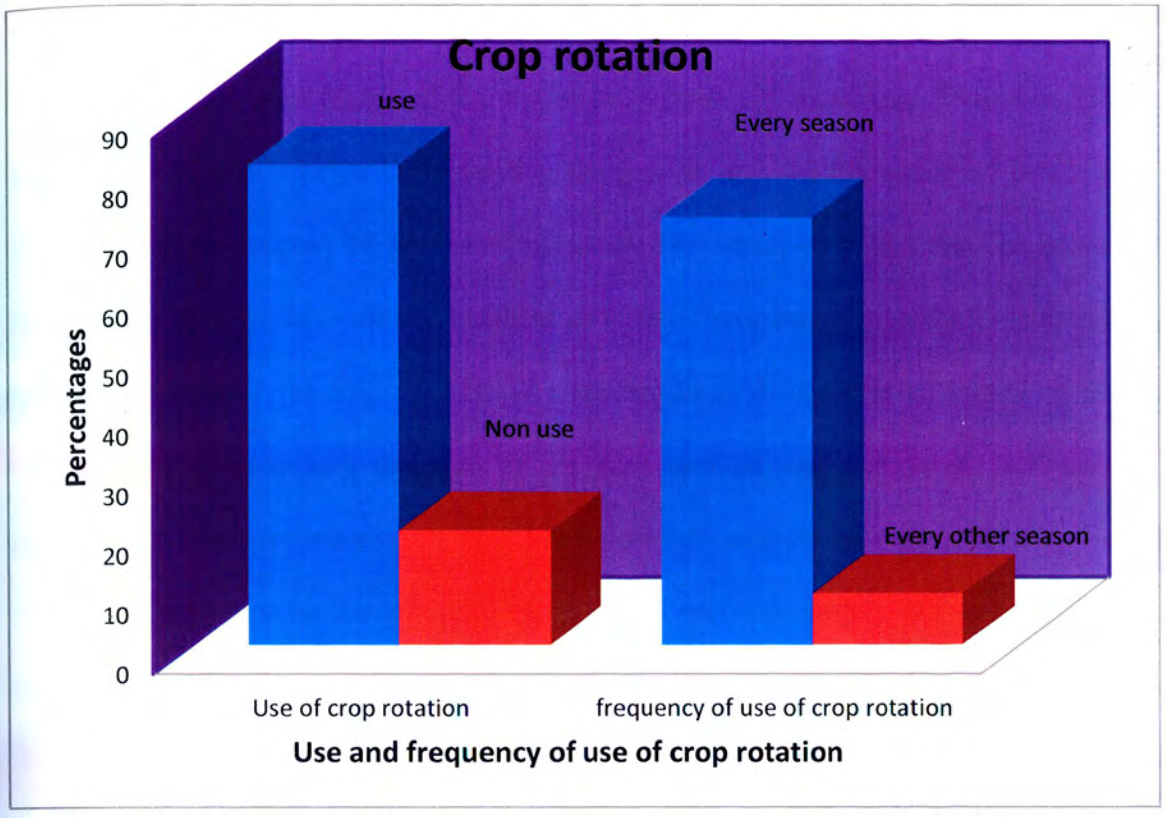


Figure 7: Distribution of the respondents by use and frequency of use of crop rotation

4.2.2.3 Sanitation

The findings show that 69.8% of the respondents practiced sanitation. Sanitation is keeping the field clean which helps in preventing the growth and multiplication of weed, pest and diseases. The reason may be because farmers are also aware of things that can prevent them from having good yield or output. Farmers go to farm everyday even after the planting period to weed at intervals, remove any form of crop residue or decay of dead animal on their farm that can attract pests and diseases to the crop planted and can cause pollution in the environment. Farmers are aware that if weeds are left to grow on their plot, it will compete with the crop planted for the available nutrients and will reduce yield during harvest. Besides, some weeds affect the crop leaving a residual effect on the crop which can affect the taste or the appearance of the crop. Whenever this happened, the farmer will run at a loss because such crop will not attract buyers and may have to be sold at a ridiculous price.

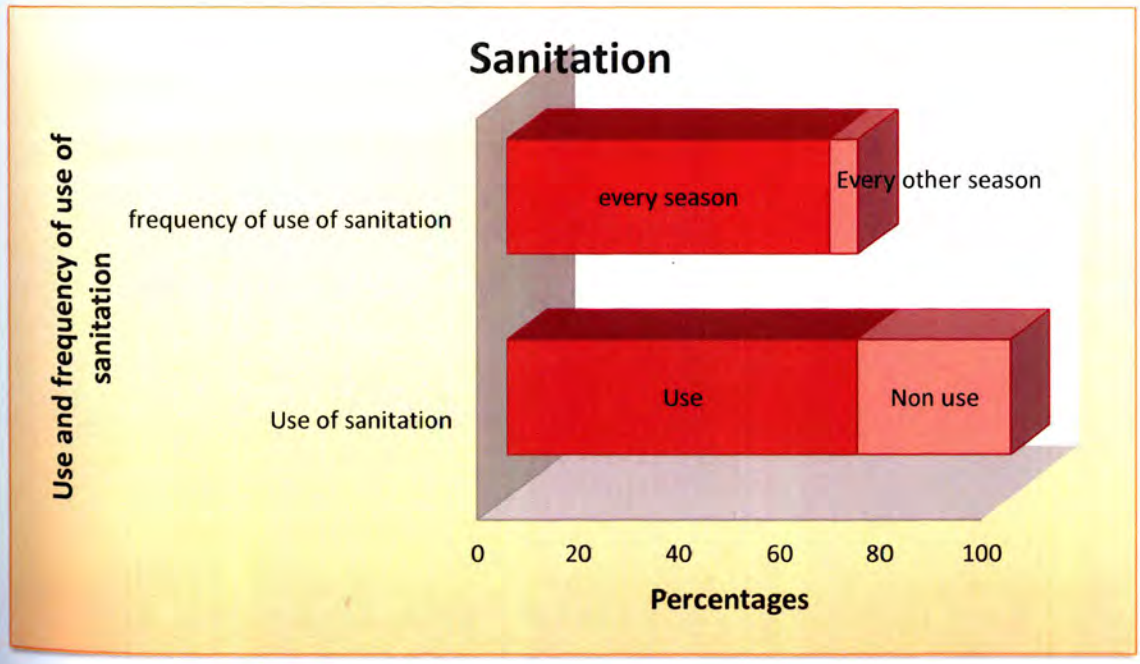


Figure 8: Distribution of the respondents by use and frequency of use of sanitation

4.2.2.4 Intercropping

The result reveals that 66.2% of the respondents practice intercropping The reason for this practice may be because the practice can reduce pest attacks on the crops since variety of crops are planted on the same land. In a situation when there is outbreak of pests and diseases, farmers will not lose completely because some crops which are not host to such pests or diseases can be spared. Besides, intercropping ensures diversity of income to the farmers. This is because the crops are not all ready for the market at the same time because of the differences in the time of maturation. While farmers wait for crops with long time of maturation, they harvest those with short time of maturation at intervals and take to the market for sales, thereby have income consistently. This is the more reason that vegetable is intercropped with other crops because it has a short time of maturation. The work of Baumann et al., (2000) showed that intercropping as a cultural method can be used to suppress weeds and reduces pest population because of the diversity of crops grown. According to Sullivan (2003), if susceptible plants are separated by non- host plants that can act as a physical barrier to the pest, the susceptible plant will suffer less damage. Furthermore, intercropping reduces the nitrate content in the soil profile as intercropping uses soil nutrients more efficiently than sole cropping (Zhang and Long Li, 2003).

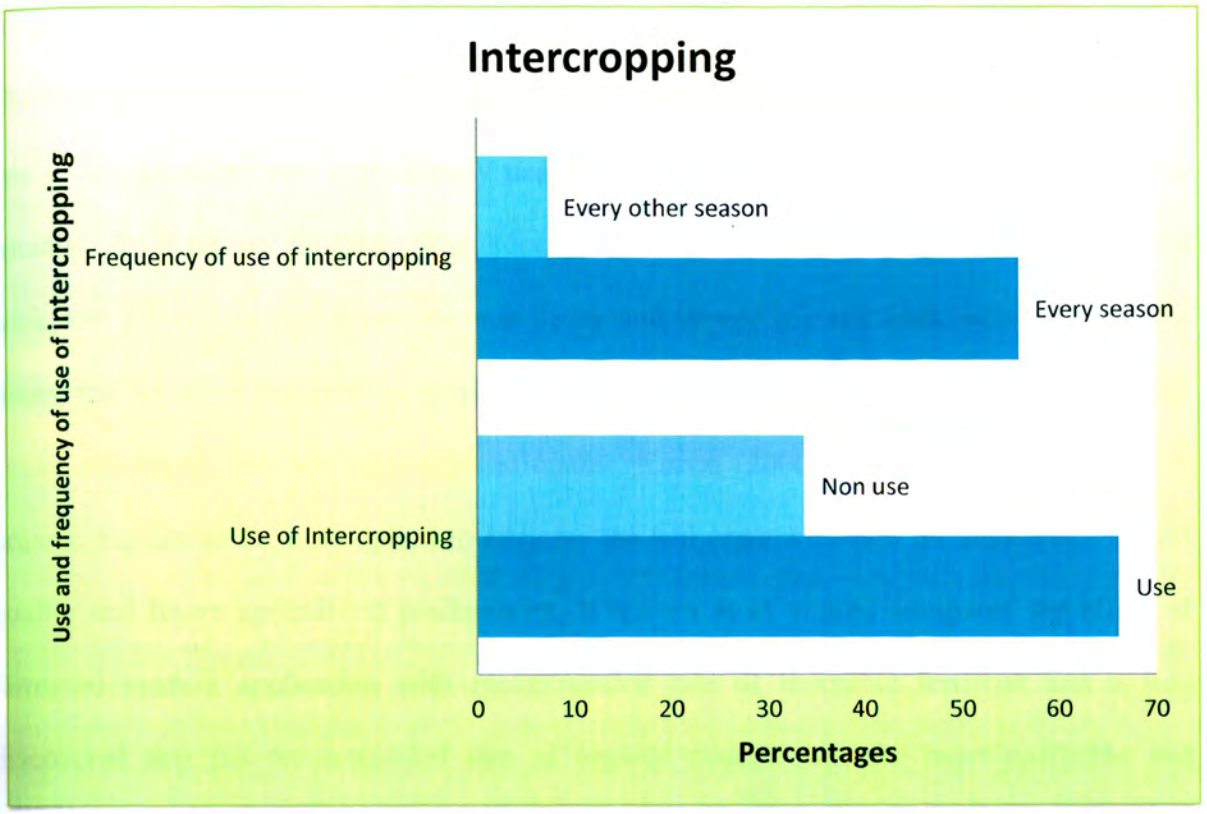


Figure 9: Distribution of the respondents by use and frequency of use of intercropping

4.2.2.5 Green manure

The findings of the study show that 60.9% of the respondents practiced green manure. This is one of the practices that is frequently used by respondents because it is a practice that is usually carried out on the farm. Whenever, the farmers weed the farm, the weeds are buried back into the soil so that it can become decay and supply the soil back with nutrients. At times, the leaves of leguminous crops are incorporated back into the soil which eventually decay and supply the soil with organic matter. Katyal (2000) reported the application of organic manure as the only option to improve the soil organic carbon for sustenance of soil quality and future agricultural productivity. Wambani et al. (2006) compared the effect of farmyard manure application with recommended rate of inorganic fertilizer and it was discovered that the recommended rate of organic manure was the most profitable and preferred by farmers because of their low cost, availability of organic manure and longer persistence of kales under these treatments.

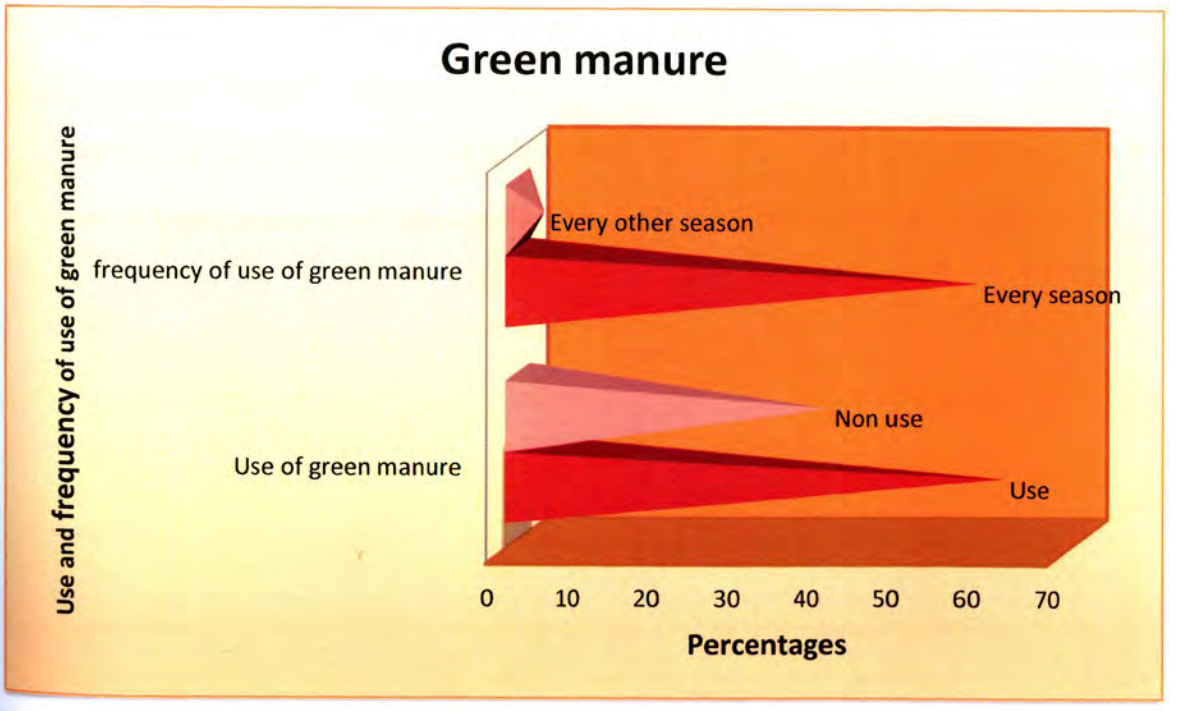


Figure 10: Distribution of the respondents by use and frequency of use of green manure

4.2.2.6 Cover crop

About 55.8% of the respondents indicated to practice the use of cover crop. The reason for the use of this practice may be because farmers are knowledgeable on the relevance of cover crop in conservation of soil water. Based on their indigenous knowledge, farmers usually plant cover crop to prevent direct sun rays on the soil which can cause evapo-transpiration i.e a process whereby water is lost from the soil surface through evaporation and on the other hand, from the crop by transpiration. Therefore, farmers usually grow cover crop as intercrop with other crops so as to cover the soil. Such crops are crawling, creeping crop e.g water melon, melon and cucumber. Cremer et al; (1996a) showed that cover crop residues interfere with the emergence of weed through the allelopathic effect. In addition, Langdale et al. (1991) concluded that cover crops reduced soil erosion by 62 per cent based on a comparison of bare soil and soil planted with a cover crop in the south eastern United States. Results presented for the use of Tithonia and legume cover crops show increase grain yields significantly in Eastern Uganda (Delve and Jama, 2002). Moreover, cover crops can improve soil quality (Dabney et al., 2001), and when planted at the beginning of the transition phase, may provide essential soil-building properties and improve weed suppression (Barberi 2002; Martini et al. 2004); however, soil quality effects and ability of cover crops to suppress weed species varies among cover crop species (Melander et al, 2005; Snapp et al, 2005).

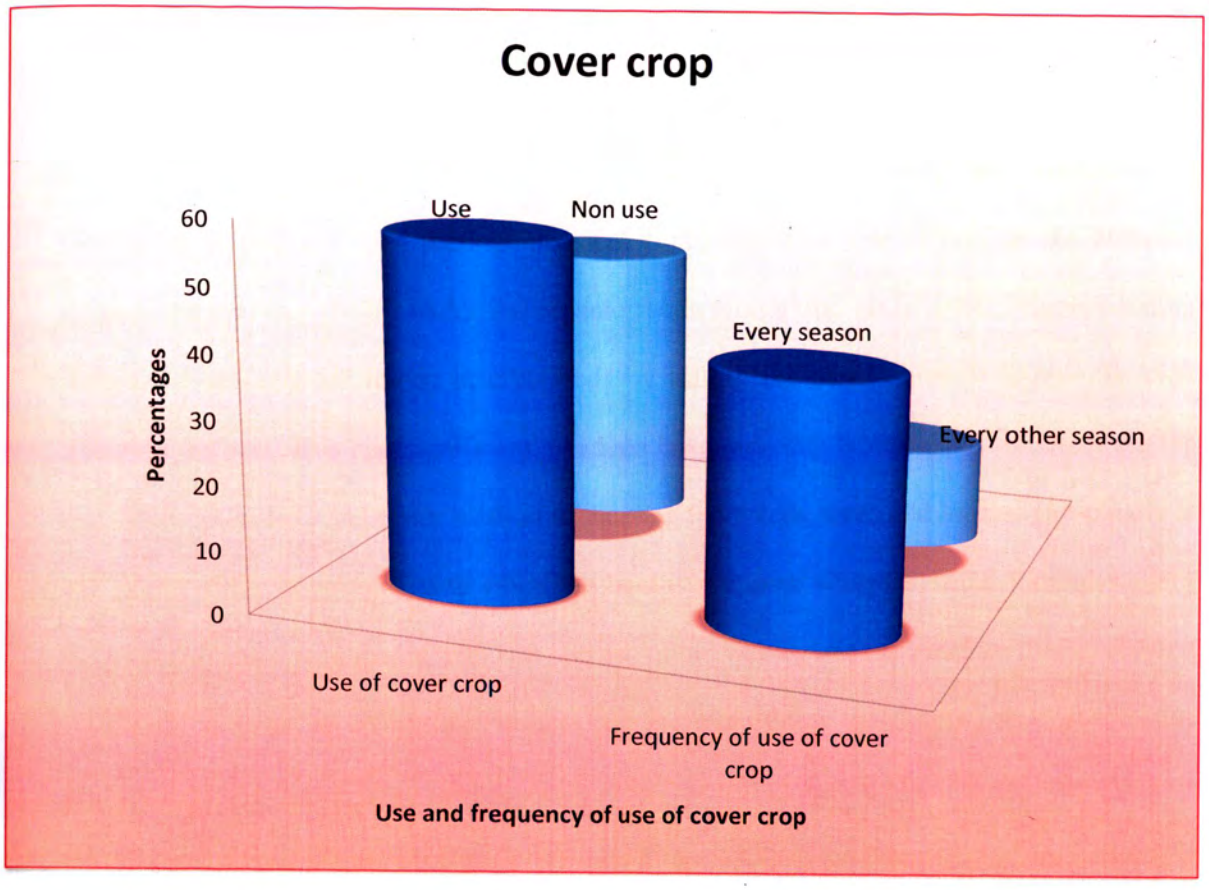


Figure 11: Distribution of the respondents by use and frequency of use of cover crop

4.2.2.7 Fire

The result shows that 53.6% of the respondents used fire. Fire was used by farmers for land clearing and preparation. Wilson (2007) found that flame weeding also called flame cultivation or flaming, is a thermal physical control method that is part of the National Organic Programme (NOP) under the organic foods production act of 1990. Flame weeding delays the presence of weeds in crop beds by killing the weeds present before the crop breaches the soil. This can significantly reduce hand-weeding labour costs. Farmers see the use of fire as an easy and faster method of clearing the weeds, trees and bushes particularly at the on-set of the planting season when the land is prepared. Besides, some farmers believe that when the land is prepared with fire, the ash of the weeds, trees or residues that were burnt will make the soil to be fertile. Farmers see the use of fire for clearing as cost-effective compared to the use of hired labour. Anon (1999) reported that in Iowa, farmer feedback on flame weeding has been positive, however, burning as labour-saving tool to clear land and to prevent weed infestation is now being brought into question and many development agencies now advocate no-burning. In the communities, however, it is less a question of burning or no-burning but rather when, where, and how to reduce its negative impact (Aalangdong et al., 1999). Some northern farmers have made a conscious decision to cease bush burning with the aim of regenerating organic material (Millar et al 1996).

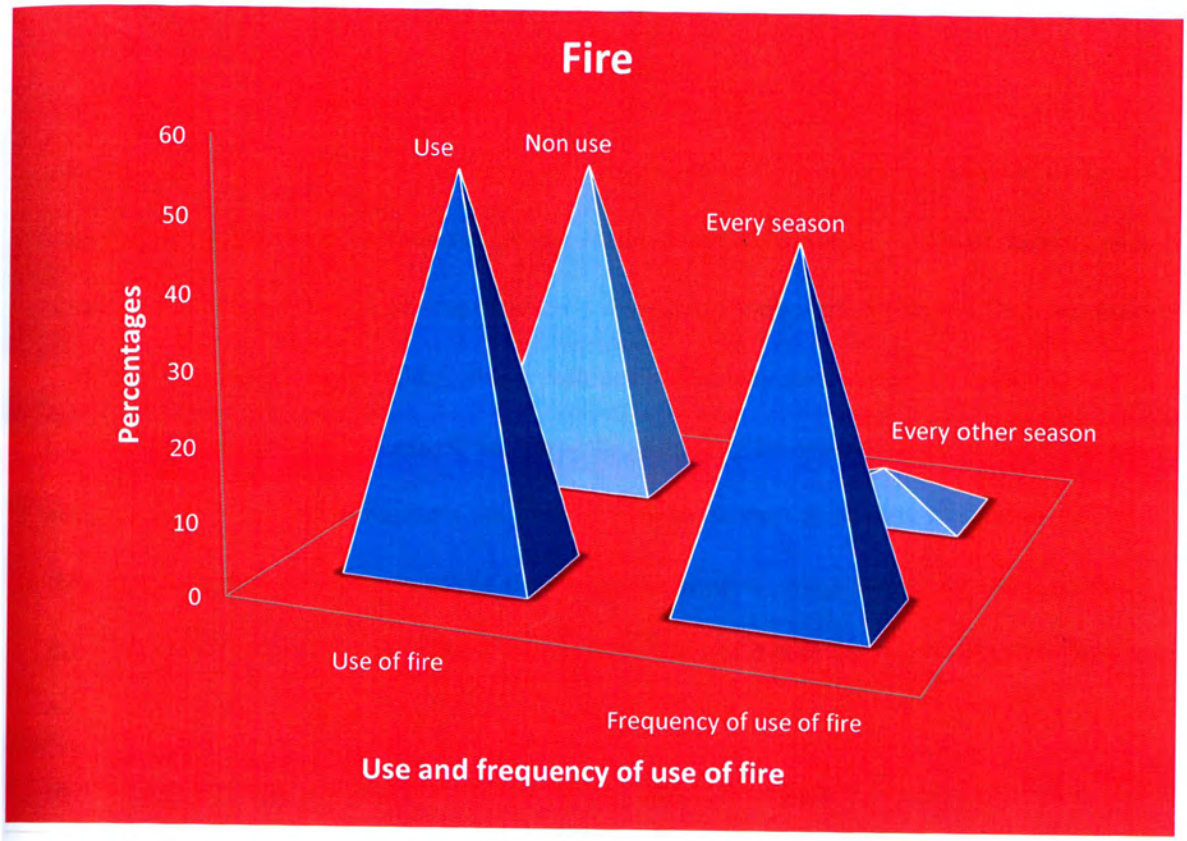


Figure 12: Distribution of the respondents by use and frequency of use of fire

4.2.2.8 Compositing

From the result, it can be observed that 60.4% of the respondents do not practice compositing. This may be as a result of stress involved in making compost or because compost though a form of manure, is not ready made substitutes. Compost making which involves the decomposition of plant and crop residue no longer useful on the farm are usually collected and put as heaps where these residues will decay and later incorporated back into the soil as manure. The process of decomposition usually takes some time to allow the entire compound to breakdown. Farmers may not be able to depend on the use of compost alone for their soil maintenance because of the time it takes. Besides, compost can be stressful because the farmer will have to transfer the compost from the site it was decomposed to the farm site. Therefore, the farmers may not see it as a better alternative. Also, there are technicalities involved in compost making and not all farmers are knowledgeable about this. Singh (2003) in his work among the India organic farmers' reported the capacity of manure (compost) to fulfil nutrient demand of crops adequately and promote the activity of beneficial macro- and micro-flora in the soil. Also, Ouédraogo et al (2001) showed that farmers were aware of the role of compost in sustaining yield and improving soil quality. However, lack of equipment and adequate organic material for making compost, land tenure and the intensive labour required for making compost are major constraints for the adoption of compost technology.

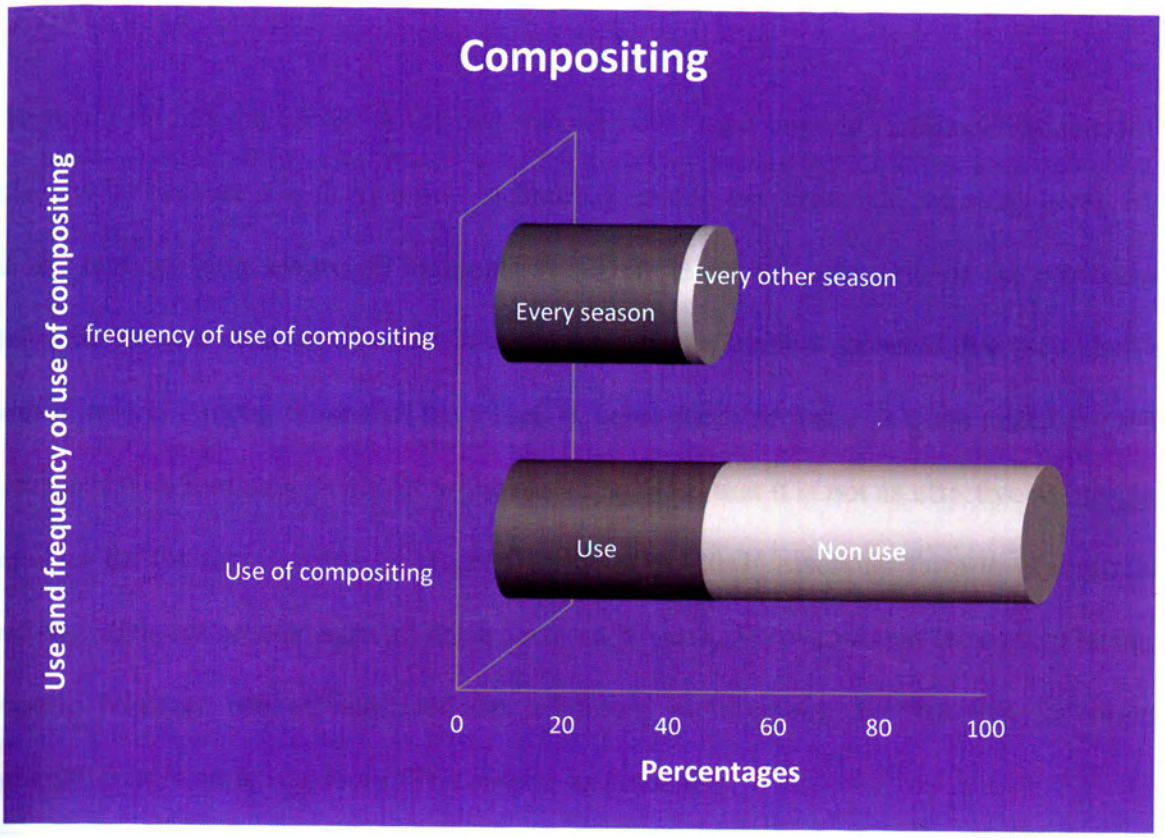


Figure 13: Distribution of the respondents by use and frequency of use of compositing

4.2.2.9 Organic fertilizer

The result reveals the 68.9% of the respondents never used organic fertilizer. The reason for this may be because it is fairly a new technology among the farmers in the study areas. Most of the farmers were aware of inorganic fertilizer. However, only few of the respondents indicated to have used organic fertilizer (31.1%). Some farmers reported that they have not seen it before. Among those that have used it, some reported that it is quite expensive when compared with inorganic fertilizer while others reported that it is not as effective as inorganic fertilizer for the rapid growth of crops. Olayide et al (2011) assessing farm-level limitations and potentials for organic agriculture in northern Nigeria, discovered that the current levels of organic fertilizer use as share of the minimum requirements for take-off for organic agriculture in Nigeria was low (37%) despite its potentials.

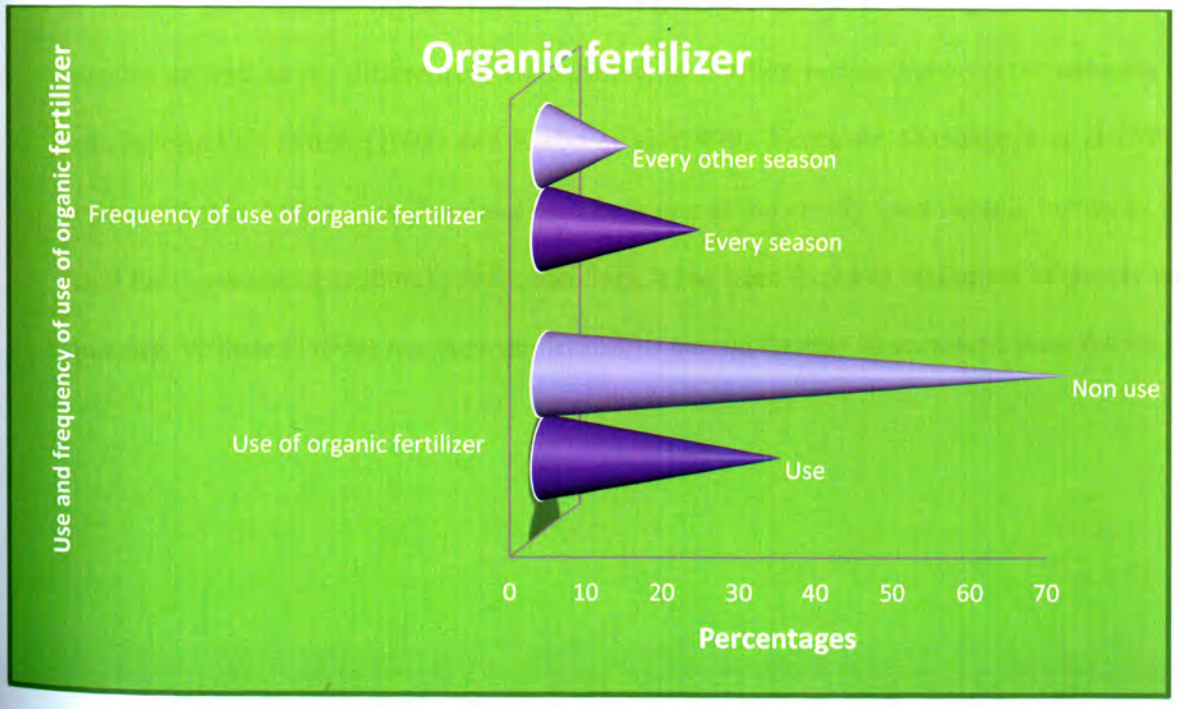


Figure 14: Distribution of the respondents by use and frequency of use of organic fertilizer

4.2.2.10 Animal manure

Animal manure is not a common practice in the study areas as indicated by 71.3% of the respondents. Many farmers in the study areas are aware of the potential of animal manure for soil fertility but the quantity available at a point in time is small compared to what was required on the farm. This is because most farmers do not rear birds or keep animals for their dung but have to depend on poultry houses for chicken litter or herds' men for cow dung and usually, the quantity supply is not always enough for their farms. Besides, there is difficulty in transporting the animal manure to the farms. The animal manure is usually packed inside sacks and transported to the farm site by motor bikes or hired vehicles paid by the farmers. As reported by Vanlauwe (2004), livestock manure is important in maintaining soil organic matter levels, a critical factor in soil health. Additionally, Omiti et al, (1999) noted that animal manure compost is the most common source of soil amendment in organic agriculture in Nigeria and indeed Africa. Farmers are fully aware of the fertilizing value of animal manure as well as the differences, for example, in nutrient release between the manures as also reported by Dittoh (1999) and Karbo et al. (1999). However, Mafongoya et al (2006) reported that in Africa, though animal manure is one of the mostly used organic inputs, as the need for increased agricultural production rises, it has been found to be limited in quality and quantity. Williams (1999) reported similar results among farmers in semi-arid West Africa.

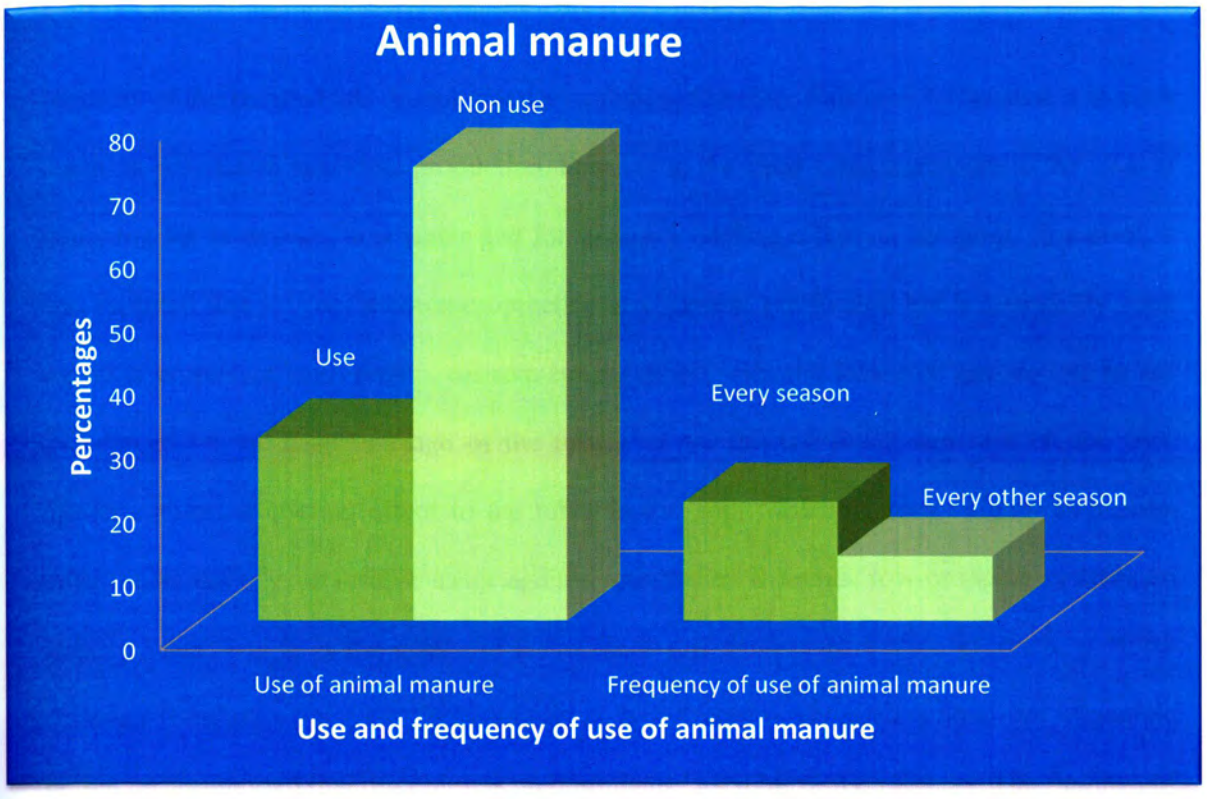


Figure 15: Distribution of the respondents by use and frequency of use of animal manure

4.2.2. 11 Mulching

Majority of the respondents do not practice mulching (79.6%). This may be because it is not a common practice in vegetable production. Farmers in the study areas are aware of the uses of mulching for preserving soil water and for giving a cooling effect on the crop. However, it was reported that it is not a common practice in vegetable production but is commonly used for tuber crops like yam, potato, cassava among others whereby leaves or grasses can be cut and spread on the heap or ridge of the tubers to prevent too much sun rays on the soil, thereby, giving a cooling effect to the tuber in the soil. Mulching ranks highly as a cost-effective means of crop residue usage against soil erosion in annual row-cropping systems on sloping lands; and is at the centre of a resurgent soil conservation ethic in much of North America (Shelton et al., 1995). However, it is not commonly used among the vegetable farmers who reported that mulching is predominantly used by yam producers. The findings of Junge et al. (2009) showed that mulching and cover cropping were mostly regarded as not labour-intensive, highly cost-effective, compatible and easy and cheap to adopt. The farmers had a positive impression of the effectiveness as erosion control measures and also mentioned additional advantages, such as increased soil fertility from the decomposition of organic material and the release of nutrients. However, the disadvantage of mulching was seen in the amount of grass required, the main material used as mulch in the area.

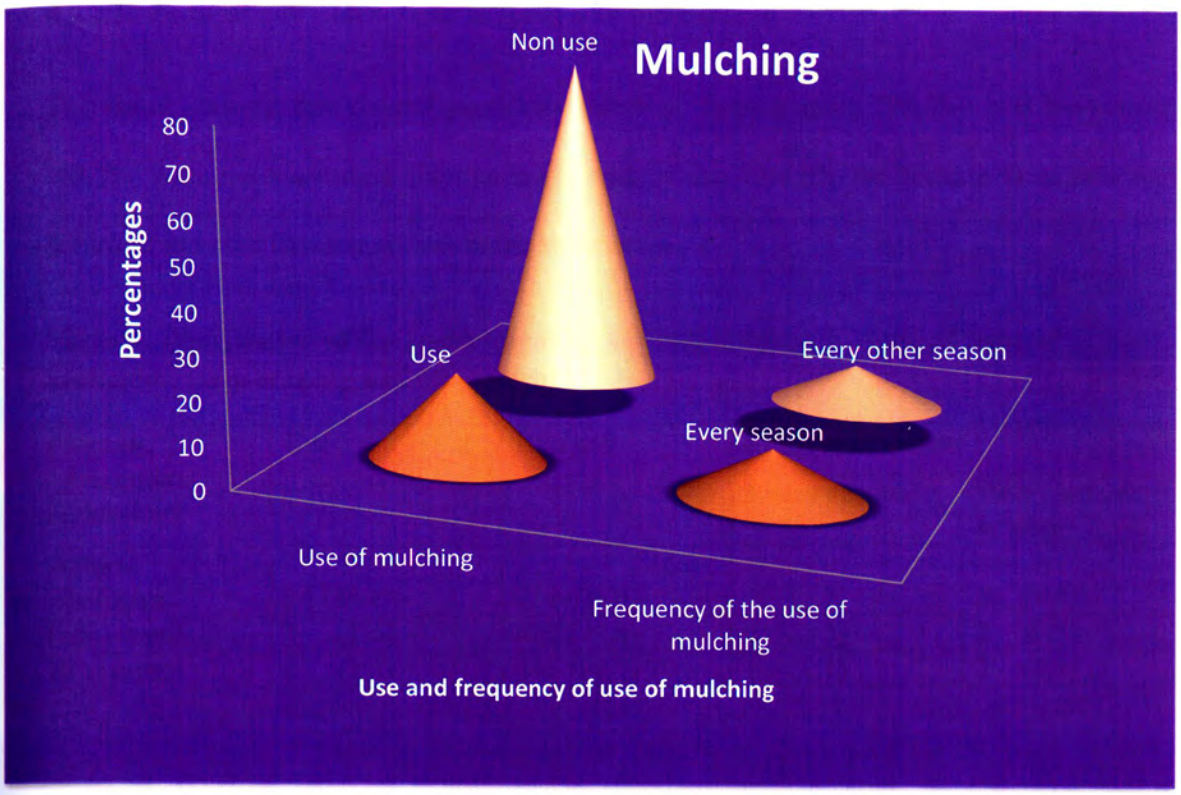


Figure 16: Distribution of the respondents by use and frequency of use of mulching

4.2.2.12 Natural pesticides, farm scaping and bio-control

The result showed that natural pesticides (96.4%), farm scaping (98.4%) and bio-control (98.7%) were not a common practice in the study areas. This may be because these practices do not fit in to the farming system in the study areas.

Table 4: Distribution of the respondents by use and frequency of use of natural pesticides, farm scaping and bio control

Organic agriculture technology	Use	Non use	Frequency of use	
			Every season	Every other season
Natural pesticides	16 (3.6)	434 (96.4)	12 (2.7)	5 (1.1)
Farm scaping	7 (1.6)	443 (98.4)	6 (1.3)	3 (0.7)
Bio control	6 (1.3)	444 (98.7)	5 (1.1)	2 (0.4)

4.2.2.13 Position of farmers on adoption scale

The mean scores on the entire scale of each respondent were obtained to gain insight into the relative position of respondents amongst themselves. The lowest and the highest scores for the respondents were obtained. On the adoption scale, the lowest and highest scores of the respondents are 16 and 26 respectively and the mean score is 21. The findings showed that there is no wide gap between the lowest score of the respondents (16) and the mean score (21). Likewise, the result shows a close gap between the highest score of the respondents (26) and the mean score (21). This result indicated that very good numbers of the farmers are innovative.

Table 5: Distribution of farmers by their total scores on adoption scale

Range of score	Number	Mean
Adoption		
Low	16	21
High	26	
Total	42	

4.2.3.1 Attitude of vegetable farmers towards organic agriculture practices

In table 6, farmers' response to the attitude statements on organic agricultural practices were rated on a 5-point scale. The respondents were asked to rate the statements using the 5 point Likert scale as follows; 1 (strongly disagree), 2 (Disagree), 3 (Undecided), 4 (Agree) and 5 (Strongly agree). The scores were reversed for negative statements. The actual mean is 3.00 due to the rating scale and a mean greater than 3.00 denoted a positive attitude while a mean less than 3.00 denoted negative attitude towards organic farming practices.

The results revealed an overwhelming general positive attitude by farmers towards organic agriculture. All the means for the attitudinal statements were above the cut-off point of 3.00. The most prominent attitudinal statement as ranked by the farmers were statements that organic agriculture improves soil fertility and soil structure' (4.38), 'organic agriculture encourages the use of indigenous knowledge' (4.38), 'OA reduces input costs of farming' (4.34), 'OA increases agricultural productivity' (4.33), OA increases soil organic matter and nutrient' (4.31), 'OA raises the income of farmers with low cost' (4.27), OA ensures food security (4.17), OA promotes the health of farmers (4.16), OA promotes value addition to agricultural produce (4.15) and OA enhances food safety and quality (4.12). The mean score of the remaining items ranged from 3.92- 4.11. These items were related to other potentials of organic agriculture; system stability, mitigation of the effect of climate change, stops environmental degradation, and minimizes pollution and source of foreign exchange.

Organic agriculture improves soil fertility and soil structure' (4.38) was ranked by the respondents as the most prominent attitudinal statement. This may be because farmers'

livelihoods depend on the soil since the seed is usually planted in the soil. Therefore, farmers are always interested in those practices that will improve their soil fertility and enhance their production performance. Palm et al, (2001) reported that organic resources play a critical role in both short-term nutrient availability and longer-term maintenance of soil organic matter in smaller holder farming systems in the tropics. 'Organic agriculture encourages the use of indigenous knowledge' (4.38) as ranked by the respondents have mean score above the actual mean. The reason for this response may be because they have been able to diagnose and solve some problems they are encountered with on the farm based on their observation, experience and reasoning without scientific approach. Several studies have shown the importance of indigenous knowledge in agricultural research and extension (De Boef et al., 1993; Scoones and Thompson, 1994) and farmers' point of view can also guide the economic assessment of soil organic matter loss (Drechsel and Gyiele, 1999).

'OA reduces input costs of farming' (4.34) is the next statement that was positively ranked by the farmers. The reason for this may be because the cost the farmers would have incurred through the purchase of fertilizer is avoided or drastically reduced. Also, the farmers were able to produce seed themselves. From the report of the farmers in South Western Nigeria, it was reported that farms who practice organic agriculture will be able to sustain the seeds of the vegetables for the next planting season but those who use fertilizer for their production, though they will experience bountiful harvest, the seeds of such vegetables will not be available for the next planting season, it would have died. Bateman (1993) reported that organic farming involves a reduction in inputs and hence input-output related employment. 'OA increases agricultural productivity' (4.33) was positively ranked by the respondents. This may be as a result of the soil organic matter that these practices supply for crop production. Gliessman, (2005) showed that farms using organic practices have healthier soil

Table 6: Distribution of vegetable farmers in terms of attitude towards OA

Attitude Statements	S A	A	U	D	S D	Mean score	Std. dev.
Organic agriculture enhances system stability	152 (33.8)	218 (48.4)	72 (16.0)	8 (1.8)	-	4.14	.742
OA mitigates the effects of climate change.	103 (22.9)	230 (51.1)	100 (22.2)	13 (2.9)	4 (0.9)	3.92	.801
OA improves ecological health	117 (26.0)	238 (52.9)	74 (16.4)	17 (3.8)	4 (0.9)	3.99	.811
OA increases soil organic matter and nutrient	199 (44.2)	192 (42.7)	58 (12.9)	-	1 (0.2)	4.31	.706
OA stops environmental degradation	135 (30.0)	217 (48.2)	80 (17.8)	12 (2.7)	6 (1.3)	4.03	.840
OA has great prospects for environmental conservation	143 (31.8)	214 (47.6)	77 (17.1)	11 (2.4)	5 (1.1)	4.06	.827
Organic manure is effective in the control of pests and diseases	129 (28.7)	215 (47.8)	73 (16.2)	18 (4.0)	15 (3.3)	3.94	.953
OA increases agricultural productivity	205 (45.6)	192 (42.7)	52 (11.6)	-	1 (0.2)	4.33	.694
OA raises income of farmers with low cost	198 (44.0)	192 (42.7)	51(11.3)	2 (0.4)	6 (1.3)	4.28	.785
OA can be a source of foreign exchange	116 (25.8)	212 (47.1)	97(21.6)	21 (4.7)	4 (0.9)	3.92	.858
OA yields returns on investment	141 (31.3)	242 (53.8)	61(13.6)	4 (0.9)	2 (0.4)	4.15	.710
OA creates market niche	119 (26.4)	227 (50.4)	82(18.2)	19 (4.2)	3 (0.7)	3.98	.823
OA ensures food security	161 (35.8)	213 (47.3)	69(15.3)	5 (1.1)	2 (0.4)	4.17	.754
OA enhances food safety and quality	151 (33.6)	221 (49.1)	64 (14.2)	11 (2.4)	3 (0.7)	4.12	.788

OA promotes value addition to agricultural produce	176 (39.1)	191 (42.4)	66 (14.7)	8 (1.8)	9 (2.0)	4.15	.877
OA encourages consumer preferences	168 (37.3)	196 (43.6)	63 (14.0)	10 (2.2)	12 (2.7)	4.11	.913
OA minimizes all forms of pollution	159 (35.3)	175 (38.9)	87 (19.3)	17 (3.8)	12 (2.7)	4.00	.969
OA promotes the health of farmers	188 (41.8)	180 (40.0)	58 (12.9)	13 (2.9)	11 (2.4)	4.16	.927
OA encourages the use of Indigenous knowledge	227 (50.4)	168 (37.3)	53 (11.8)	2 (0.4)	-	4.38	.706
OA reduces input costs of farming	212 (47.1)	182 (40.4)	51 (11.3)	5 (1.1)	-	4.34	.719
OA increases diversity of income sources	174 (38.7)	172 (38.2)	91 (20.2)	6 (1.3)	7 (1.6)	4.11	.878
OA allows soil carbon sequestration	175 (38.9)	136 (30.2)	119 (26.4)	16 (3.6)	4 (0.9)	4.03	.936
OA improves soil fertility and soil structure	233 (51.8)	160 (35.6)	53 (11.8)	3 (0.7)	1 (0.2)	4.38	.734
OA product is easily markets	180 (40.0)	191 (42.4)	64 (14.2)	7 (1.6)	8 (1.8)	4.17	.858
There is high demand for OA products	169 (37.6)	178 (39.6)	81 (18.0)	15 (3.3)	7 (1.6)	4.08	.908

SA: Strongly Agree, **A**: Agree, **U**: Undecided, **D**: Disagree, **SD**: Strongly Disagree,

OA: Organic Agriculture

which is able to sustain plant growth, higher in nutrient content and enables the farmer to grow crops for longer periods, with higher yields and during marginal conditions.

'OA increases soil organic matter and nutrient' (4.31) was positively ranked by the respondents and has a mean that is higher than the actual mean. The reason for this may be because organic agricultural practices like green manure, compost, cover crop and crop rotation have potential to build up soil organic matter and nutrients. The findings of Katyal (2000) which showed that application of organic manure is the only option to improve the soil organic carbon for sustenance of soil quality and future agricultural productivity, confirm this result. 'OA raises the income of farmers with low cost' (4.27) was positively ranked by the respondents. The reason for this may be because this practice encourages income diversity. For instance, practice like intercropping will ensure income stability for the farmer because short term and long term crops are cultivated together so that while one is not yet ready for the market, the other would be ready so that farmers can enjoy income stability. Giovannuci, (2005) and Hak-Su, (2002) reported that organic agriculture can be a tool to alleviate poverty in the rural area and in the third world countries.

'OA ensures food security' (4.17) was positively ranked by the respondents. This may be because the practice ensures that soil fertility is maintained because of the constant supply of organic matter in the soil. This will in turn improve the yield of the agricultural production, thereby ensuring food security. 'OA promotes the health of farmers' (4.16) was ranked positively by the farmers with the mean score greater than the actual mean. The reason for this may be because farmers are aware of the harmful effect of agro-chemicals on their health. Farmers' health has been hazarded through the application of these agro-chemicals as

a result of them not taking all the necessary precautions when applying them. For instance, where farmers needed to use nose gauze, they may not use it and will inhale some agro-chemicals which are detrimental to the health. Furthermore, the consumption of contaminated vegetables after spraying can be hazardous to the health of farmers. However, organic agricultural practices do not involve the use of agro-chemicals but make use of cultural practices that purely depend on nature, therefore, promoting the health of the farmers. 'OA promotes value addition to agricultural produce' (4.15) was ranked positively by the respondents with a mean greater than the actual mean. The reason for this may be because of the nutrient contained in organic food.

'OA enhances food safety and quality' (4.12) was also ranked positively by the respondents with a mean greater than the actual mean. The reason for this may be because the farmers are aware of the differences in quality between crops grown using organic practices without the use of fertilizer and those that were grown with the use of fertilizers. Based on the experience of farmers in South Western Nigeria, it was reported that vegetable grown without the use of fertilizer (organically produced) is sweeter and can stay for some days even after it has been harvested from the farm. It does not get spoilt easily. Although, it was observed by the farmers that leafs of organically produced vegetable are not as big as those grown with the application of fertilizer. As reported by the farmers in the study areas, vegetables grown with the application of fertilizer have bigger leaves and brighter appearance making them more attractive than organic vegetables. However, the farmers noted that vegetables grown with the application of fertilizer get spoilt easily once they have been harvested. Besides, by the following day, the leaves would have fallen off and the colour changed and decayed. Mondelaers et al, (2009) noted in his findings that organic vegetables are perceived as

containing less contaminants and more nutrients, and as such, are healthier and safer compared to conventional vegetables.

The results of this research are in line with the findings of Sharma (2005) which points out that the major factors encouraging the farmers to adopt organic agriculture are no side effects of organic products, no pollution, efficient use of local resources, maintenance of soil fertility, lower economic burden to the farmers, tasty and nutritious products, longer durability in storage, balance of pest and predators and drawing foreign currency. It can be inferred from this result that the respondents were more cognizant about the potentials of organic farming practices.

4.2.3.2 Positions of vegetable farmers on attitude scale

On the attitude scale, the lowest and the highest scores of the respondents are 53 and 125 respectively and the mean score is 89. These results showed a close gap between the lowest score of the respondents and the mean score. This means that a little below the average number of the respondents have low attitude towards organic agriculture practices. However, the result shows a wide gap between the highest score of the respondents and the mean score. This means that many of the respondents have high attitude i.e they are favorably disposed to the practice of organic agriculture.

Table 7: Distribution of farmers by their total scores on attitude scale

Range of score	Number	Mean
Attitude		
Low	53	89
High	125	
Total	178	

4.2.4 Information sources and information-seeking behaviour of organic vegetable farmers

For the purpose of this research, information-seeking behaviour of the respondents was based on the premise that farmers obtain their information from formal or informal sources of information. Case (2002) similarly explained that '...many people use formal sources rarely, relying instead on informal sources such as friends and family, or knowledgeable colleagues at work'. In this research work, 21 sources of information (both formal and informal sources) were identified. The respondents were asked to identify the sources they use. They also identify the frequency of use of these sources of information. The sources of information were discussed based on contacts sources (individual or group) of information and mass media sources of information. The information-seeking behaviour of the respondents was discussed based on the frequency of use of the sources of information identified.

4.2.4.1 Individual and group contact sources of information on organic agricultural practices

Table 8 shows the individual and group contacts sources of information used by the respondents and the frequency of use of the information sources. From the result, out of the 21 listed sources, 8 sources were discussed under individual and group contacts, out of which only 5 sources had at least 50% usage by farmers. The most prominent individual and group contacts sources of information on organic agricultural practices were extension agents (99.8%), contact farmers (88.7%), neighbours (76.7%), farmers' organizations (68.4%), and family members (66.2%). However, the least used individual and group contacts sources of information were sales agents (64.9%), farm centres (70.0%) and meetings/demonstrations (71.3%).

Extension agents were ranked first by the respondents. The reason for its emergence as the first source of information may be because of the regular interaction between the farmers and the extension agents which enable the farmers to know the extension agent better and are able to distinguish them from other private or community workers. As a result of this regular interaction between the extension agents and the farmers, a strong relationship is built such that other community workers or private institutions that have any help or information for the farmers will prefer to work with the extension agents so as to enjoy the full cooperation of the farmers. This is because farmers can be sceptical and reluctant to work with anyone they are not familiar with. Bruening (1991) discovered that Iowa farmers rated Extension agents, chemical dealers, and the Soil Conservation Service as the most useful sources of environmental information.

Contact farmers emerge as the second on the list of sources of information (88.7%). The reason for this may be because contact farmers are very close to extension agents. In fact, they would have been chosen by the extension agents based on some qualities they possess. The contact farmers usually have privileged information from the extension agents before all the farmers hear about the information. The farmers are likely to rely more on the information from the contact farmers because of this opportunity. At times, the contact farmers are even leaders in the community which makes their fellow-farmers to confide in them for information.

Neighbours (76.7%) are the third on the list of individual and group contacts sources of information identified. The reason for this may be because the neighbours are close by and farmers easily reach out to the fellow farmer who shares boundaries with them on the farm whenever he is in search of relevant information. Farmers rely more on the information

received from neighbours particularly those that have experienced the difficulty they have before. Besides, information obtained from the neighbours does not cost farmers money and is faster because of the proximity and saves time. Therefore, the farmers perceive neighbouring farmers as more demonstrative, frequently contactable and easily available source of information. The findings of Abadi and Pannell, (1999) revealed that factors influencing adoption of agricultural innovations are personal or social factors, risk aversion of individuals and neighbours' influence. Furthermore, the study of Ozcatalbas and Gurgen, (1992) which sought information sources of maize growers showed that farmers' own personal experiences and other farmers were the most important sources of technical information whereas input providers and crop purchasers were the most important sources of economic information.

Farmers' organizations (68.4%) emerge as the fourth on the list of sources of information. The reason for this result may be because farmers usually form themselves into groups to enjoy some benefits like communal labour, bulk purchase, credits, and information sharing among others. In this case, they can pull their strength together to work on the farm of each member of the group until every member has been served. Also, they can pull their resources together to buy farm input in bulk so that they can share based on what individuals contribute. Besides, the farmers' group can be formed for solidarity. In the process of all the services enjoyed in farmers' group, awareness and information sharing on innovation and new technology also occur. Lopez and Reguena (2005) reported that the adopters of organic farming practices in Spanish olive orchards were more commonly members of agricultural associations and had received more information and trainings about organic practices.

Family members (66.2%) were the fifth on the list of individual and group contacts sources of information identified by the respondents. The reason for this result may be because some of the farmers have parents, brothers and extended family relations engaged in farming. Therefore, they find it reasonable to consult them for advice or to seek information from them because they are engaged in the same occupation and can supply relevant information to them by virtue of their experience in agricultural production. The study conducted by Boz (2002) found that neighbour farmers and farmers' own family members were the most important source of soil preparation, seed techniques, pest management, and irrigation, fertilizing, and harvesting information among Kahramanmaras maize producers.

On the other hand, the least used individual and group contact sources of information identified by the respondents were meetings/demonstrations (71.3%). The reason may be because farmers hardly take time out from their farm or home to attend to other social issues. Therefore, most of the time, farmers do not make themselves available for meetings outside their domain as such; they easily miss relevant information from such meetings. The result shows that 70.0% of the respondents do not use the farm centres as a source of information. The reason for this may be because of proximity of the centres to the farmers' farm, if the farm center is far, diffusion of innovation to the farmer may be delayed. Besides, farmers may not visit the centre frequently to seek for technical information. Whereas, if the farm centre is closer to the farmers, diffusion of innovation may be rapid and adoption enhanced. The result reveals that 64.9% of the respondents do not make use of sales agents as source of information. The reason for this may be because organic farming practices is knowledge based and need more of technical information and not information on agro-chemicals that can easily be obtained from sales agents.

Table 8: Distribution of the respondents on the basis of individual and group contacts information sources

Information sources	Use of Information		Frequency of use		
	Yes	No	Regular	Often	Rarely
Extension agents	449 (99.8)	1 (0.2)	395 (87.8)	50 (11.1)	4 (0.9)
Contacts farmers	399 (88.7)	51 (11.3)	289 (64.2)	104 (23.1)	6 (1.3)
Neighbours	345 (76.7)	105 (23.3)	257 (57.1)	66 (14.7)	22 (4.9)
Farmer' organization	308 (68.4)	142 (31.6)	187 (41.6)	109 (24.2)	14 (3.1)
Family members	298 (66.2)	152 (33.8)	218 (48.4)	65 (14.4)	22 (4.9)
Sales agents	158 (35.1)	292 (64.9)	64 (14.2)	74 (16.4)	20 (4.4)
Farm centres	135 (30.0)	315 (70.0)	55 (12.2)	55 (12.2)	25 (5.6)
Meetings/demonstrations	129 (28.7)	321 (71.3)	18 (4.0)	44 (9.8)	67 (14.9)

4.2.4.2 Mass media sources of information on organic agricultural practices

Table 9 shows the mass media sources of information used by the respondents and the frequency of use of the information sources. From the result, out of the 21 listed sources, 13 sources were discussed under the mass media out of which only 2 sources had at least 50% usage by farmers. The most prominent mass media sources of information on organic agricultural practices were mobile phone (62.4%) and radio adverts/jingles (57.8%). Conversely, the least used sources of information as identified by the respondents were mobile cinema (99.3%), Universities, colleges of education (95.1%), agric. manure and journals (94.7%), internet (92.2%), and newspaper adverts (90.4%).

Mobile phone (62.4%) was the first on the list of the mass media sources of information identified by the respondents. The reason for the use of mobile phone by the respondents may be because of the benefits it has over radio, leaflet, or individual contact. The use of mobile phone can save the farmers cost of travelling to the service centre to consult the extension agent for agricultural information. Farmers can also call or receive friends, family and neighbour for information without going to see them or them coming to him except where it is very necessary. As a result of this, time is saved, cost is saved and energy is conserved. Besides, with Information Communication Technology (ICT) revolution and accessibility to mobile phone, different organizations have been able to reach the farmers through mobile phone. Gakuru et al, (2009), in their work on the use of ICT for farmers' advisory service, noted the relevance of ICT in African agriculture, especially in the area of farmers' access to market information. Moreover, they reported a number of innovative projects that utilize ICTs in delivering information to farmers, particularly mobile phone which offers various means of providing agricultural information in areas where internet infrastructure is limited and unreliable.

Radio adverts/ jingles (57.8%) were the second on the list of the mass media sources of information identified by the farmers. The reason for the use of radio as a source of information may be because of the capability to draw the attention of diverse audience to new ideas, techniques and latest information requiring urgent attention and wide coverage. Announcements, agricultural programmes used to educate farmers are run on radio using both English and native languages for farmers to get the best information needed. Radios are available in urban and rural centres and are equally available in different sizes affordable by farmers. Farmers who do not have access to electricity can still use battery-operated transistor radios. Therefore, the advantages make the radio a powerful source of information among the farmers. Nwachukwu (2010) and Agwu et al. (2008) noted that the radio farmer agricultural programme enhanced the extent of adoption of organic agricultural technologies.

Mobile cinema (99.3%) was rarely used by the respondents. This shows that the respondents do not watch cinema for information. The reason for this may be because mobile cinema concentrates mainly in main urban centres where there are many people and where access to electricity is easier to operate some of the gadget used for the cinema. To reach out to farmers in their different farm settlements or probably bringing them together in a central place to use the mobile cinema may be costly. Whereas, the mobile cinema could have been a very effective source of information to the farmers because it involves both audio and visual and the action seen in cinema will be registered longer in their minds but the lack of finance to sponsor such programme is another factor that can hinder the use of the mobile cinema among the farmers.

'Universities, colleges of education' (95.1%) though research institutions where many discoveries have been made by scientists and researchers in different fields that can assist the farmers in agricultural production, the university or colleges of education were hardly used by the respondents. The reason for this result may be because the discoveries are published and the publication is usually in English or a foreign language and not in the native language. Therefore, farmers who are illiterate do not have access to these information. Another factor that limits the use of research in the university particularly those that have to do with agriculture like agronomy, soil science, livestock, weed science, entomology among others, is the failure to incorporate extension department into their programme. This is because the department has professionals who have been trained to reach out to the farmers. If the findings in other departments can be put in packages and extension personnel are carried along, they will be able to train field workers better and who will in turn teach and train the farmers so that the innovation will reach out to the end user.

Agricultural manuals and journals (94.7%) were not used by many of the respondents. The reason for this may be because of the language used in writing many of these journals which (English) and only educated respondents can understand the information or respondents who have people to interpret the information for them. But this is not always easy and at times, some of the information is lost in the course of interpretation. Another reason that limits the use of agricultural journals and manuals is the style of writing the publications. Most often, scientific terms are used without writing the common name or the local name. This makes the information not to be well understood even to the educated respondents particularly if they cannot interpret some of these scientific terms in between lines. However, if publications can be written in a way that a lay man can easily digest it or translated into the local language, then it will not only benefit the farmers but the entire public.

Internet (92.2%) was rarely used by the respondents. The reason for this may be because of the level of education of the farmers in the study areas. Most of the farmers were secondary school leavers. As a result, some of them may not have exposure to the internet. However, some respondents who had exposure to the internet did not also have access to it. Newspaper adverts (90.4%) were not common mass media sources of information used by the respondents. The reason may be because of the high level of illiteracy among the farmers and the cost of acquiring the newspaper.

In summary, the reason for these sources of information not being popularly used among farmers could be the high illiteracy level as noted by Chakrabarti (2001) who concluded that the main obstacles rural-dwellers face in accessing information is illiteracy and ignorance. Another reason that makes those sources of information to be rarely used could be the existence of a poor linkage among researchers, extension agents and farmers as reported by Oladele et al (2006).

Table 9: Distribution of the respondents on the basis of mass media sources of information usage

Information sources	Use of Information		Frequency of use		
	Yes	No	Regular	Often	Rarely
Mobile phone	281 (62.4)	169 (37.6)	230 (51.1)	49 (10.9)	2 (0.4)
Radio advert/jingles	260 (57.8)	190 (42.20	133 (29.6)	87 (19.3)	40 (8.9)
TV adverts	157 (34.9)	293 (65.1)	73 (16.2)	47 (10.4)	36 (8.0)
Agriculture show/exhibition	139 (30.9)	311 (69.1)	37 (8.20	36 (8.0)	67 (14.9)
Non-governmental organization	94 (20.9)	356 (79.1)	6 (1.3)	21 (4.7)	66 (14.7)
Posters	71 (15.8)	379 (84.2)	16 (3.6)	20 (4.4)	36 (8.0)
Leaflets/pamphlets	61 (13.6)	389 (86.2)	16 (3.6)	10 (2.2)	35 (7.8)
Research institute	48 (10.7)	401 (89.1)	2 (0.4)	15 (3.3)	31 (6.9)
Newspaper adverts	43 (9.6)	407 (90.4)	19 (4.2)	11 (2.4)	13 (2.9)
Internet	35 (7.8)	415 (92.2)	25 (5.6)	5 (1.1)	5 (1.1)
Agricultural manuals/journals	24 (5.3)	426 (94.7)	5 (1.1)	3 (0.7)	16 (3.6)
Universities, colleges of education	22 (4.9)	428 (95.1)	8 (1.8)	2 (0.4)	12 (2.7)
Mobile cinemas	3 (0.7)	447 (99.3)	2 (0.4)	-	1 (0.2)

4.2.4.4 Information-seeking behaviour of organic vegetable farmers

It is clear from the sources of information used by the organic vegetable farmers that, their information-seeking behaviour is mainly informal. This result is similar to the findings of Njoku (2004) regarding the information needs and information-seeking behaviour of the poor in different lines of work. It was found that the primary information needs of the poor in industries are related to occupation as well as basic survival. Additionally, these citizens, rely overwhelmingly on informal social networks to meet their information needs. Ikoja-Odongo & Ocholla,(2003) reporting similar results noted that most citizens related to the fishing industry rely on conversations with friends, relatives, and neighbours to meet their information needs.

The information-seeking behaviour of the organic vegetable farmers align more on information received from contact farmers (64.2%), neighbours (51.1%), farmers' organizations (41.6%) and family members (48.4%). Contact farmers are informal source of information because it does not need any written document to be submitted before consultation. There is no time restriction and the farmer is very familiar with the farmer who is the source of information. Fisher, (2004) using interpersonal information-seeking among migrant Hispanic farm workers and their families, discovered that personal networks having various levels of credibility were used more readily than any other type of information source. Neighbour is another source of informal source of information commonly used by the respondents. The reason for this pattern of results could be accessibility, affordability, cost-effectiveness and credibility of source. Langyintuo and Mekuria (2008) reported that neighborhood effects, such as farmers sharing information about a technology, are responsible for spatial homogeneity that influences adoption decisions.

Farmers' organization (68.4%) was another informal source of information used by the respondents. The reason for this may be because farmers' groups serve as forums through which farmers share information and experience on life issues together. The change agents find it easier to disseminate innovations through the group rather than through individual contacts. Kalusopa, (2005) in his findings among small-scale farmers' information needs in Zambia, noted that the farmers' information sources remain primarily informal networks (family, friends, and colleagues) because computer technology is scarce in rural areas and these farmers rely on indigenous methods of farming.

Family members (66.2%) are another informal source frequently used by the respondents. The reason for this may be because many farmers have relatives who are engaged in farming from whom they can obtain relevant information when necessary. Besides, Weijland, (1999) noted that extended family networks are especially important when small-scale enterprises are all located in specific hamlets where certain families have been living for generations. In summary, Momodu, (2002) in his work on information needs and information-seeking behaviour of rural dwellers in Nigeria discovered that informal networks are considered by users to be the best source for reliable and authentic information.

The major formal way the farmers in this study seek information are extension agents (87.8%), mobile phone (51.1%) and radio adverts/jingles (29.6%). Extension agent is a formal source of information frequently used by the respondents. The reason may be because of the regular visits extension agents pay to the farmers. Extension agents receive directives on what to teach the farmers at a point in time. They cannot design any programme for farmers outside the goal of their ministry or organization. The line of command is strictly top-bottom approach. At times, farmers' problems that need immediate attention is delayed

because of the failure of the superior officer to give instructions on what to do. This is the reason extension agents are considered as a formal source of information.

Mobile phone (51.1%) is considered as a formal source of information because the farmer may call the extension agent to receive information even when they are not too familiar or close to the extension agents. When there is need for urgent information to address certain problems, farmers may get the phone number of the agent from their friends or contact farmers and call him/her for assistance. Besides, with the advent of information communication technology (ICT), some research organizations make use of the mobile phones to send information to the farmers. According to Peter and Peter (2006), mobile phone can facilitate the democratic process as groups can use the enhanced communication tools for political and community action, thereby, reducing the reliance on conventional and often government controlled media.

Radio adverts/jingles (29.6%) were formal sources of information frequently used by the respondents. The reason for this may be because radio provides the opportunity for agricultural programmes which serve to educate the farmers and as source of awareness on innovations to the farmers. Some of the agricultural programmes are discussed using the local language in order to enable farmers to better understand the information required in the programme. Olaleye et al, (2009) in their findings on the effectiveness of radio in the dissemination of agricultural information, showed that radio is a useful source of agricultural information but it needs improvement in the areas of service delivery with a view to overcoming language barrier, poor presentation of key points and improper interpretation of scientific terms / units of measurements.

However, these formal sources of information have many barriers which include high rate of illiteracy among the farmers, inability to access formal channels of information due to poverty, lack of adequate and efficient information delivery mechanisms.

Table 10: Ranking of information sources as used by the respondents

Information sources	**Rank**
Extension agents	1st
Contacts farmers	2nd
Neighbours	3rd
Farmers' organization	4th
Family members	5th
Mobile phone	6th
Radio adverts/jingles	7th
Sales agents	8th
TV adverts	9th
Agriculture show/exhibition	10th
Farm centers	11th
Meetings/demonstrations	12th
Non-Governmental Organization	13th
Posters	14th
Leaflets/pamphlets	15th
Research institute	16th
Newspaper adverts	17th
Internet	18th
Agricultural manuals/journals	19th
Universities, colleges of education	20th
Mobile cinemas	21st

4.2.5 Adoption intensity of organic agricultural practices

This section discusses the intensity of adoption of organic agricultural practices. In technology adoption, farmers often choose to adopt only parts of an innovation rather than the entire package (Yaron, Dinar, and Voet, 1992) or they opt to apply the new technology only to one portion rather than the whole farm (Leathers and Smale, 1991). In the case of organic farming adoption, it is common practice for farmers to convert only a portion of the farm (or only one of the farm's activities) to organic. Therefore, a useful criterion regarding organic farming adoption is the intensity (or degree) of adoption with respect to the size of the farm operation. Intensity was measured in this study as the percentage of the farm land used for organic farming practices. For the purpose of this analysis, it was assumed that organic farming techniques were applied to certain portions of the farm's total acreage which is $\leq$ 50 % acres of land, 50-70 % acres of land and on $\geq$ 75 % acres of land. The n values indicate the score (%) of each of the organic agriculture technology as used by the respondents.

4.2.5.1 Adoption intensity of minimum tillage

Figure 17 shows intensity of adoption of each of the organic farming practices. The results revealed that minimum tillage practice has the highest score (n=80.9%). For the adoption intensity, it can be observed that minimum tillage techniques practiced on ≤ 50% acres of land was (9.6%), on 50-70 % acres of land was (30.1%) and on ≥ 75 % acres of land was (41.2%). It is seen clearly from this result that adoption intensity of minimum tillage practice was high on ≥ 75 % acres of land. The reason for this may be because the farmers in the study area depend on the use of crude farm implements for soil preparation like plough, ridge, and removal of stump and weed before planting which makes tillage a common practice among the farmers. Baldwin (2006) noted that many organic farmers typically manage weeds mechanically and, therefore, cannot focus on building soil structure in the same way as conservational tillage practitioners which often relies on herbicides for weed control.

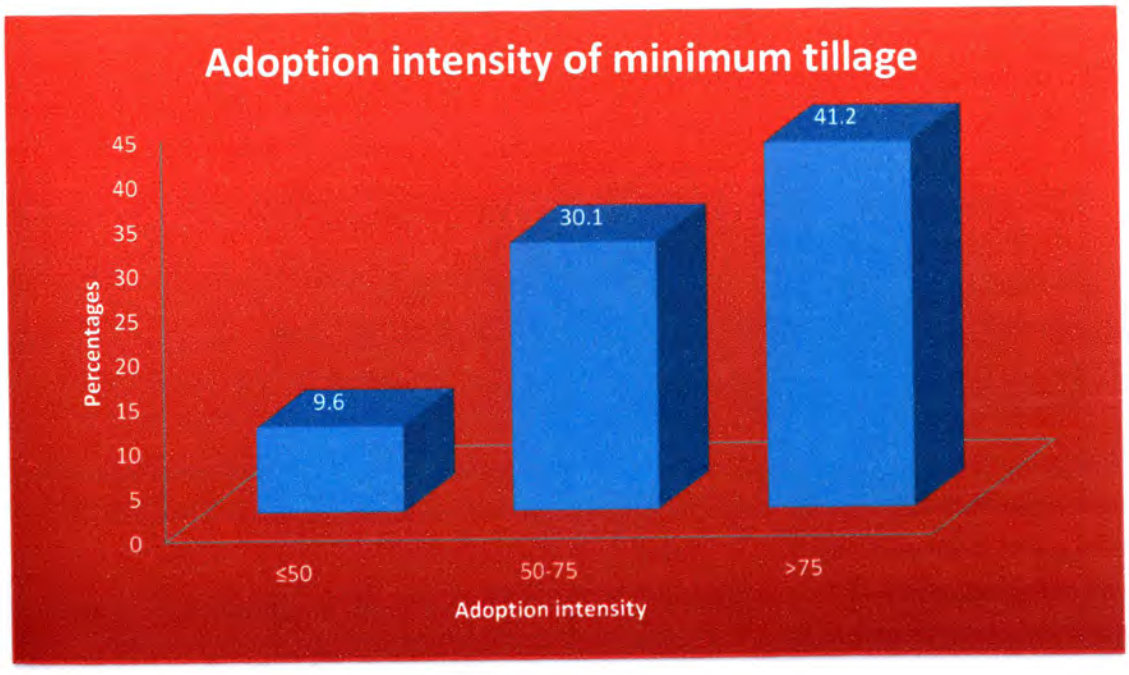


Figure 17: Distribution of the respondents by adoption intensity of minimum tillage

4.2.5.2 Adoption intensity of crop rotation

Figure 18 shows adoption intensity of crop rotation. The score of crop rotation as used by respondents was 80.7%. The intensity of adoption of crop rotation showed that 38.7% of farmers practiced crop rotation on ≤ 50 % acres of land, 23.6% of farmers practiced crop rotation on 50-70 % acres of land and 18.7% of farmers practiced crop rotation on≥ 75 % acres of land. This result revealed that crop rotation was mainly practiced on ≤ 50 per cent acres of land. The reason for this may be because of the cost of land preparation and inputs for different crops at different planting seasons. Bending and Lincoln, (1999) in their work among US farmers noted that organic growers commonly plant rapeseed, mustard, and other brassicas as rotation crops to 'clean up' soil during the winter months.

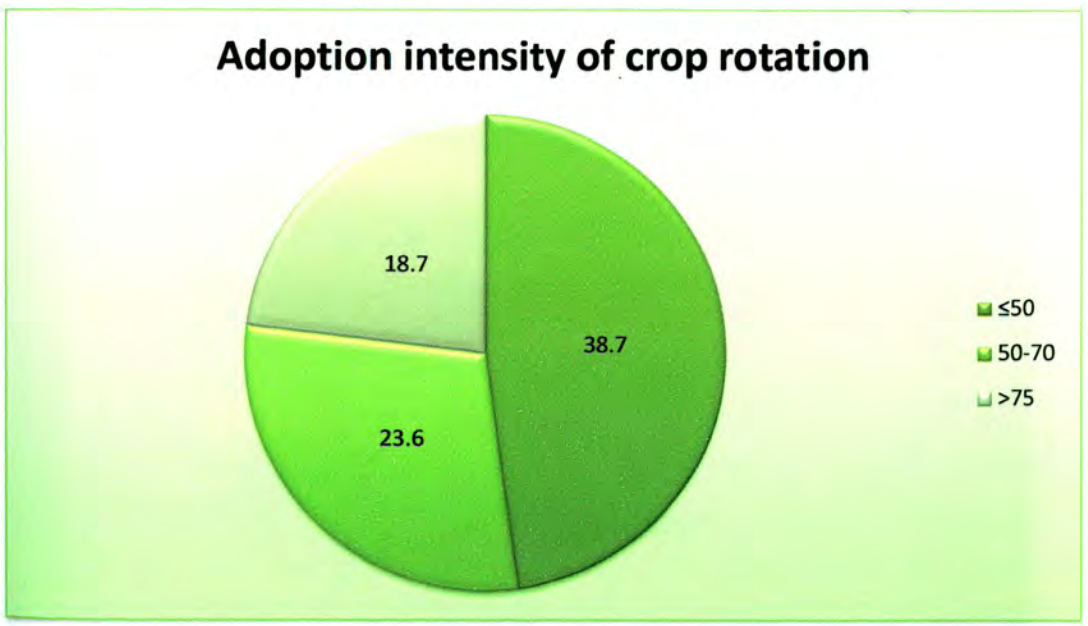


Figure 18: Distribution of the respondents by adoption intensity of crop rotation

4.2.5.3 Adoption intensity of sanitation

Sanitation with score of 69.8% is another organic agriculture technology that was mainly practiced by the respondents. The intensity of adoption of sanitation revealed that 9.3% of the farmers practiced sanitation on ≤ 50 % acres of land, 15.3% of the respondents practiced sanitation on 50-70 % acres of land and 45.6% of the respondents practiced sanitation on ≥ 75 per cent acres of land. The result showed that sanitation was practiced on a large portion of the farm i.e the practice of sanitation had high intensity. The reason for this high intensity may be because of the knowledge of the respondents on the importance of neat and healthy farm land which prevents the growth of weed, pest and diseases. Farmers' must have known the danger of bushy and polluted environments on their health and farm production. Therefore, farmers do not allow their farms to grow bushy in order for farm yield to improve.

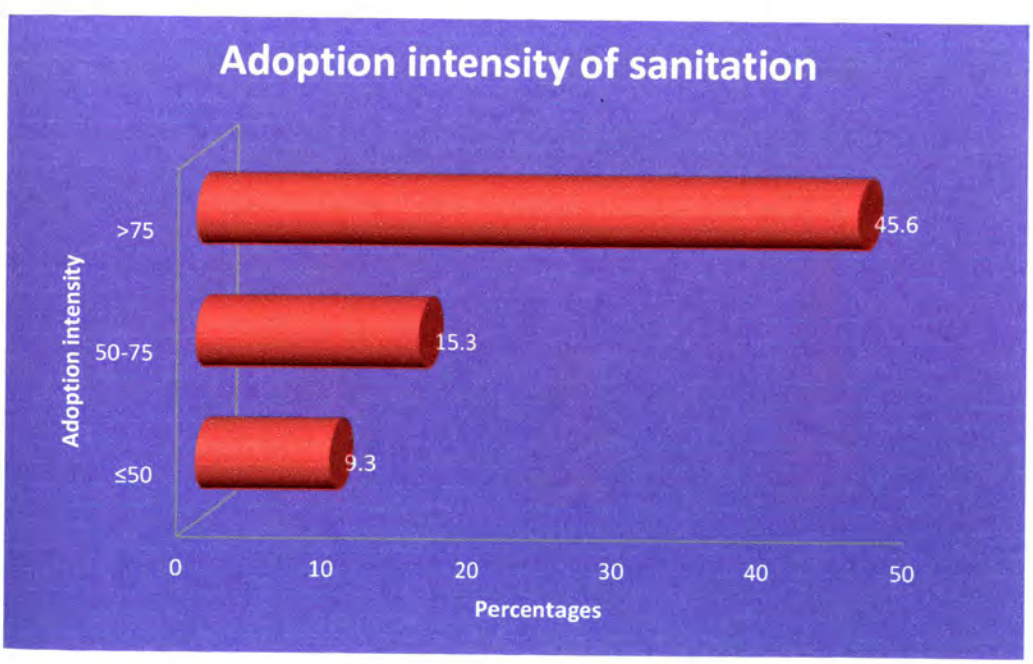


Figure 19: Distribution of the respondents by adoption intensity of sanitation

4.2.5.4 Adoption intensity of intercropping

The score of intercropping as used by the respondents was 66.2%. From figure 20, the intensity of adoption of intercropping showed that 24.9% of the respondents practiced intercropping on ≤ 50 % acres of land, 14.0% of the respondents practiced intercropping on 50-70 % acres of land and 24.2% of the respondents practiced intercropping on ≥ 75 % acres of land. The result showed that intercropping can be practiced both on small proportion of land and large proportion of land. The reason for this result may be because of the income diversity that the farmers enjoyed from this practice of intercropping as a result of planting different crops together on the same farm land. The work of Baumann et al., (2000) showed that intercropping as a cultural method, can be used to suppress weeds and reduces pest population because of the diversity of crops grown.

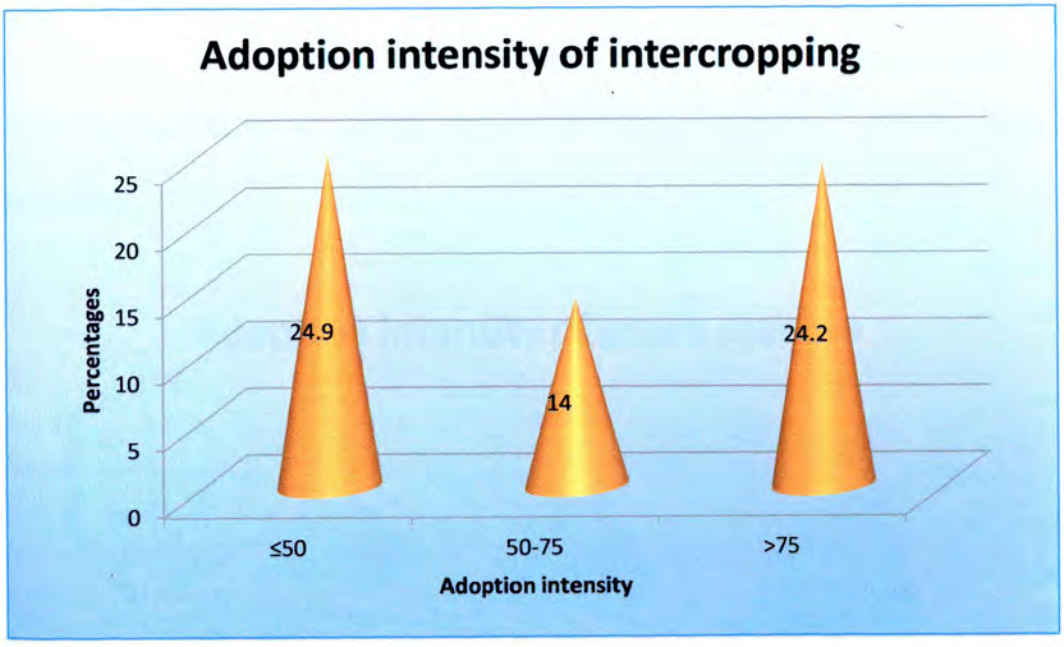


Figure 20: Distribution of the respondents by adoption intensity of intercropping

4.2.5.5 Adoption intensity of green manure

The score of green manure as used by respondents was 60.9%. The intensity of adoption of green manure showed that 12.9% of farmers practiced green manure on ≤ 50 % acres of land, 19.8% of farmers practiced green manure on 50-70 % acres of land and 28.2% of farmers practiced green manure on ≥ 75 % acres of land. The result revealed that adoption intensity of green manure was more on ≥ 75 % acres of land. The reason for this result may be because of the knowledge of the farmers on the potentials of green manure for soil fertility. This practice is common among the farmers because when they weed their farms, they usually incorporate the grasses back into the soil for it to decay and improve the soil organic matter. At times, the leaves of leguminous crops are incorporated back into the soil to enrich the soil organic matter content. Wambani et al. (2006) compared the effect of farmyard manure application with recommended rate of inorganic fertilizer and it was discovered that the recommended rate of organic manure was the most profitable and preferred by the farmers because of their low cost, availability of organic manure and longer persistence of kales under these treatments.

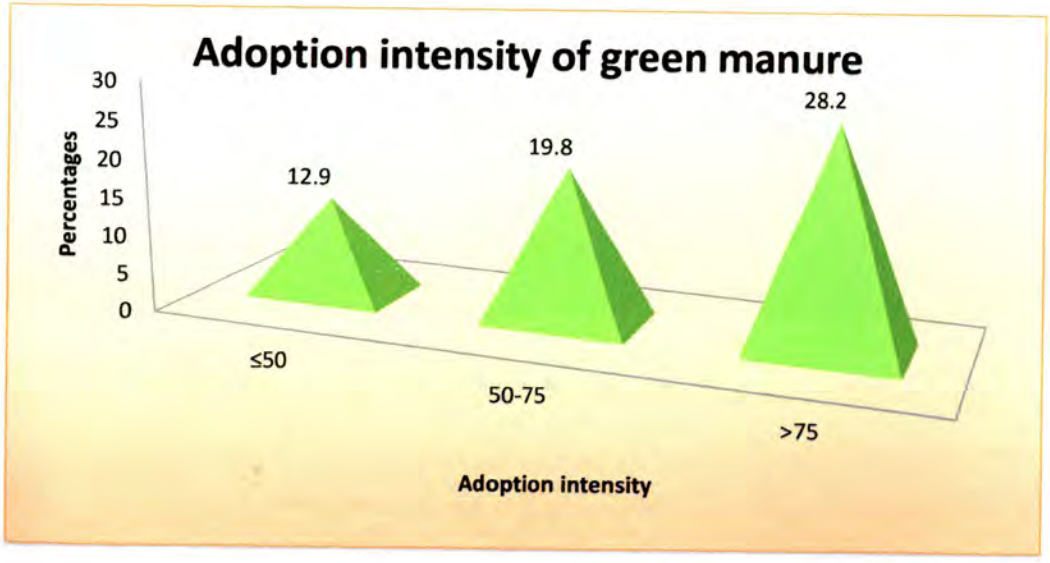


Figure 21: Distribution of the respondents by adoption intensity of green manure

4.2.5.6 Adoption intensity of cover crop

The score of cover crop as used by respondents was 55.8%. The results revealed that 36.9% of farmers practiced cover crop on ≤ 50 % acres of land, 13.6% of farmers practiced cover crop on 50-70 % acres of land and 6.2% of farmers practiced cover crop on ≥ 75% acres of land. The results showed that intensity of adoption of cover crop was more on small portions of farm land. The reason may be because cover crops are usually planted as intercrop with other crops to serve as cover against intense heat, erosion and provide cooling effect for the crops it is intercropped with. Therefore, it may not be cultivated on large acreage. Langdale et al. (1991) concluded that cover crops reduced soil erosion by 62 per cent based on a comparison of bare soil and soil planted with a cover crop in the south eastern United States.

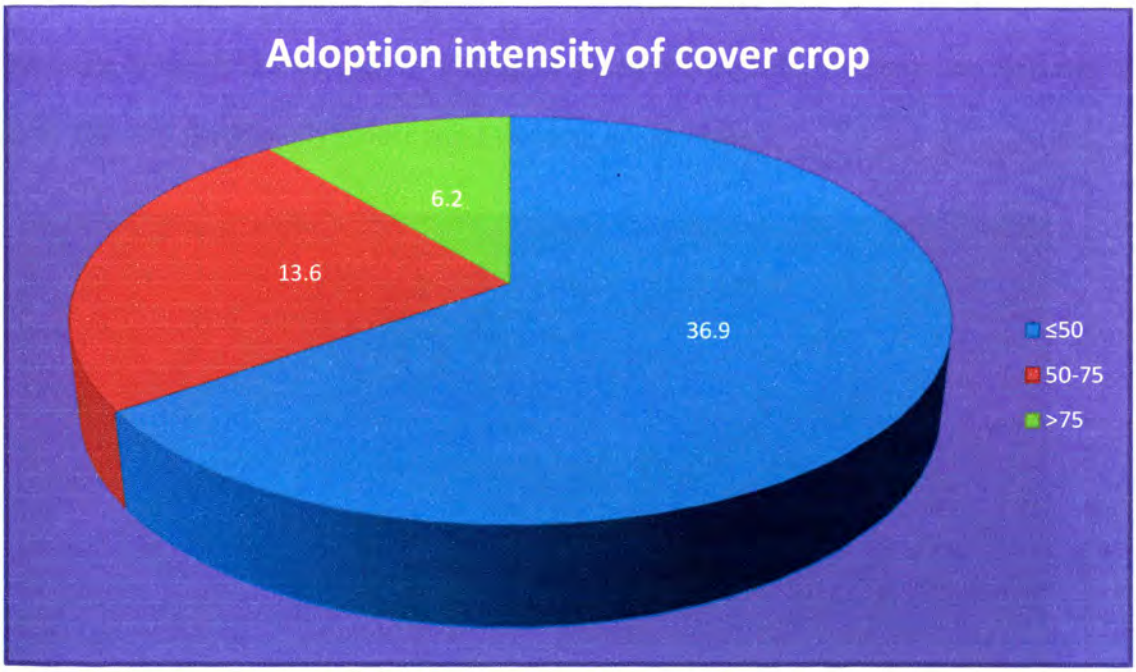


Figure 22: Distribution of the respondents by adoption intensity of cover crop

4.2.5.7 Adoption intensity of fire

The score of fire as used by the respondents was 53.6%. The intensity of adoption of fire showed that 11.8% of farmers used fire on ≤ 50 % acres of land, 24.0% of farmers used fire on 50-70 % acres of land and 18.0% of farmers used fire on ≥ 75 % acres of land. The results showed that fire was practiced more on 50-75 % acres of land. The reason may be because farmers find the use of fire as an easy method of clearing the land particularly at the onset of the planting season when the land is being prepared. Besides, fire can be used to clear virgin vegetation that has not been used for planting before. However, farmers prefer to clear the portion of the land they will cultivate and so will not clear the entire farm land with fire, if not, the portion that is left uncultivated will grow bushy again rapidly. Therefore, fire can be used to clear the land moderately. According to Wilson, (2007), flame weeding delays the presence of weeds in crop beds by killing the weeds present before the crop has breached the soil. This can significantly reduce hand-weeding labour costs.

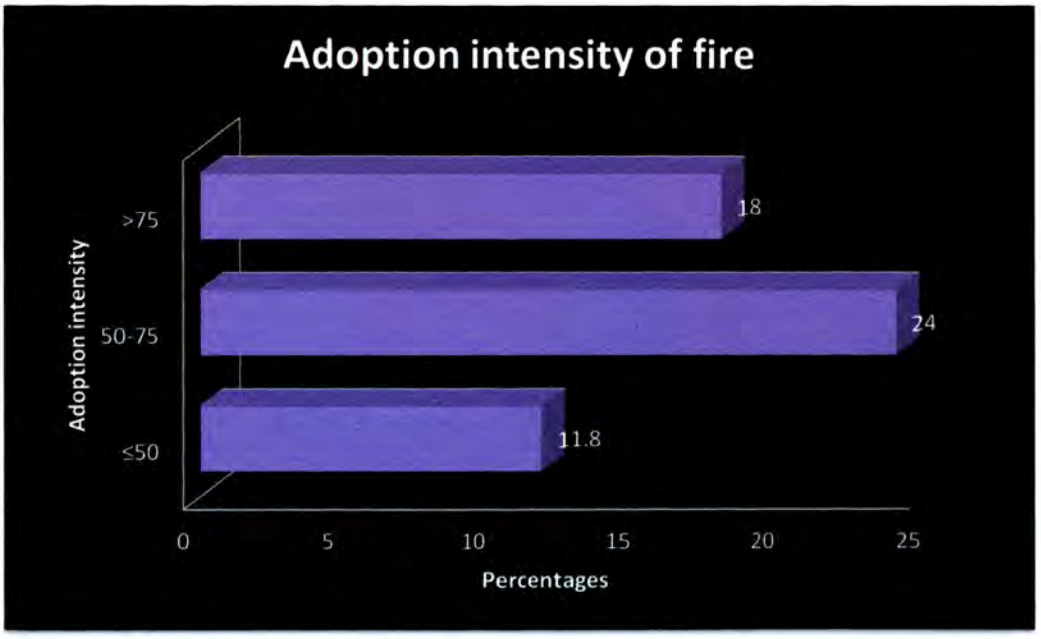


Figure 23: Distribution of the respondents by adoption intensity of fire

4.2.5.8 Adoption intensity of compositing

The score of compositing as used by respondents was 39.6%. From table 6, the intensity of adoption of compositing revealed that 13.1% of farmers practiced compositing on ≤ 50 % acres of land, 7.8% of farmers practiced compositing on 50-70 % acres of land and 18.4% of farmers practiced compositing on ≥ 75 % of land. The result showed that adoption intensity of compositing was high on ≥ 75 per cent acres of land. The reason may be because farmers with big farms are more likely to have crop residues that can be used to make compost. This is because compost making involves the decomposition of crop residues, plant or animal waste materials which are later used for soil fertility and a large portion of farm land may be able to gather enough compost materials. Singh (2003) in his work among India organic farmers, reported the capacity of manure (compost) to fulfil nutrient demand of crops adequately and promote the activity of beneficial macro- and micro-flora in the soil.

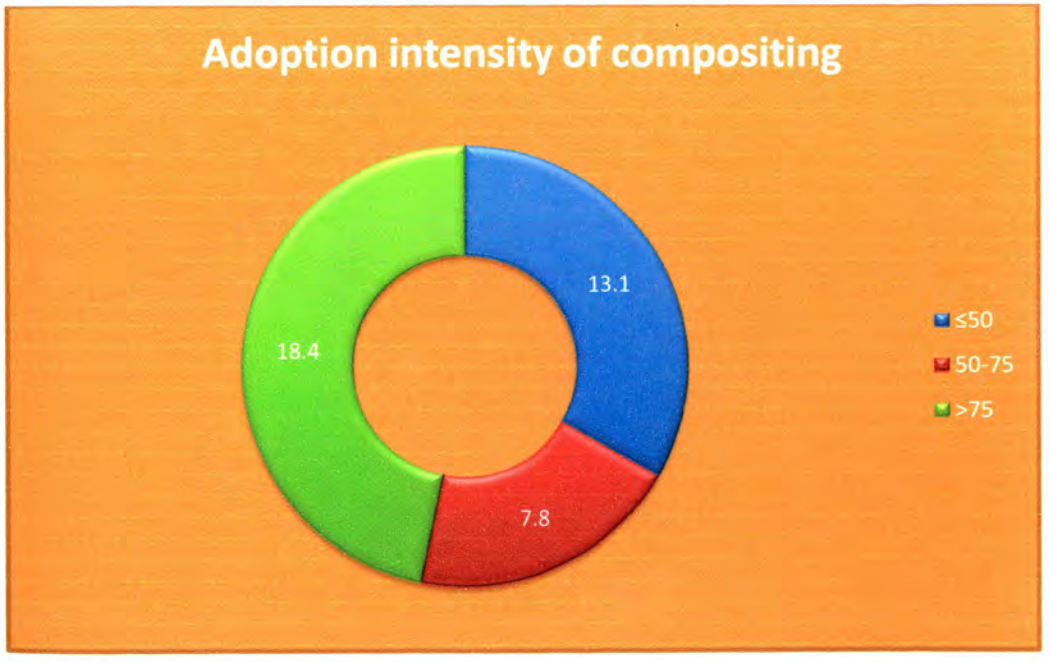


Figure 24: Distribution of the respondents by adoption intensity of compositing

4.2.5.9 Adoption intensity of organic fertilizer

The score of organic fertilizer as used by respondents was 31.1%. The intensity of adoption of organic fertilizer showed that 15.3% of farmers used organic fertilizer on ≤ 50 % acres of land, 10.3% of farmers used organic fertilizer on 50-70 % acres of land and 4.4% of farmers used organic fertilizer on ≥ 75 % acres of land. The result showed that the intensity of adoption was high on a small portion of farm land. The reason may be because the technology was relatively new in the study areas. Most of the farmers were familiar with inorganic fertilizers. Respondents who used organic fertilizer tried it to check it effectiveness. However, some of them reported that it is quite expensive compared with inorganic fertilizer. Olayide et al., (2011) assessing farm-level limitations and potentials for organic agriculture in northern Nigeria, discovered that the current levels of organic fertilizer use as share of the minimum requirements for take-off for organic agriculture in Nigeria was low (37%) despite its potentials.

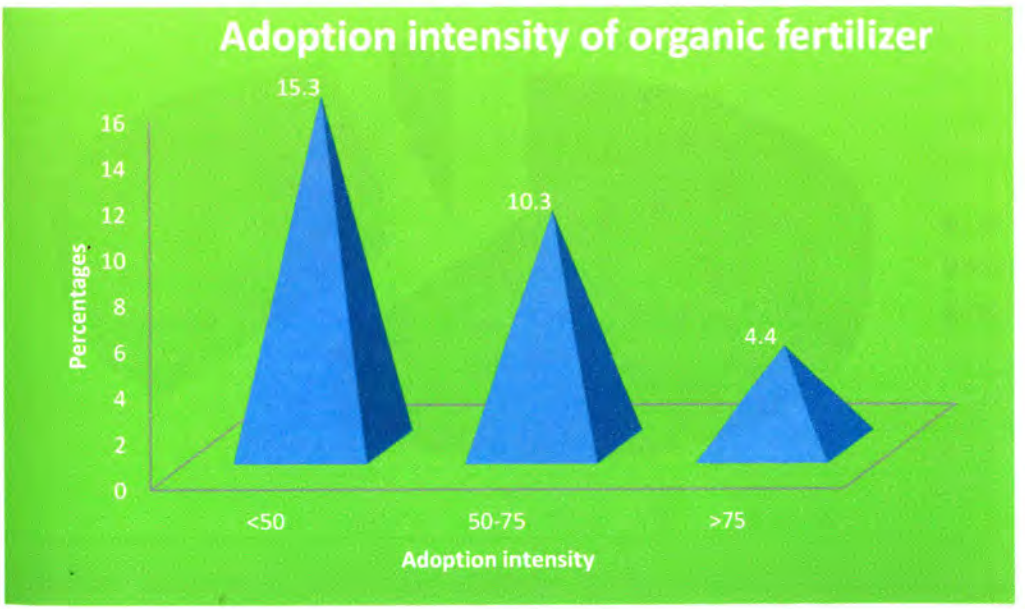


Figure 25: Distribution of the respondents by adoption intensity of organic fertilizer

4.2.5.10 Adoption intensity of animal manure

The score for animal manure as used by respondents was 28.7%. The intensity of adoption of animal manure revealed that 17.6% of respondents used animal manure on ≤ 50 % acres of land, 10.7% of respondents used animal manure on 50-70 % acres of land and 1.1% of respondents used animal manure on ≥ 75 % acres of land. The result revealed that intensity of adoption is high on a small portion of farm land. The reason may be because animal manure obtained was not sufficient for their farms. This is because most of the farmers do not keep animals themselves, they depend on poultry houses for manure or herds men for cow dung; but the quantity supplied is usually not sufficient for the farm production. Mafongoya et al (2006) reported that in Africa, though animal manure is one of the most used organic inputs, as the need for increased agricultural production rises, it has been found to be limited in quality and quantity.

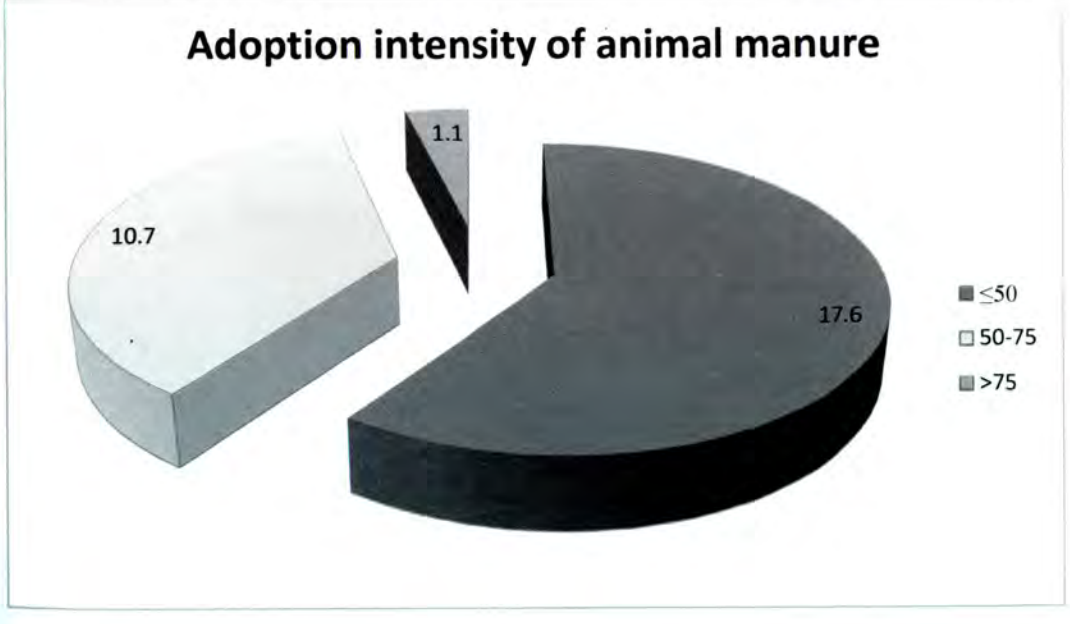
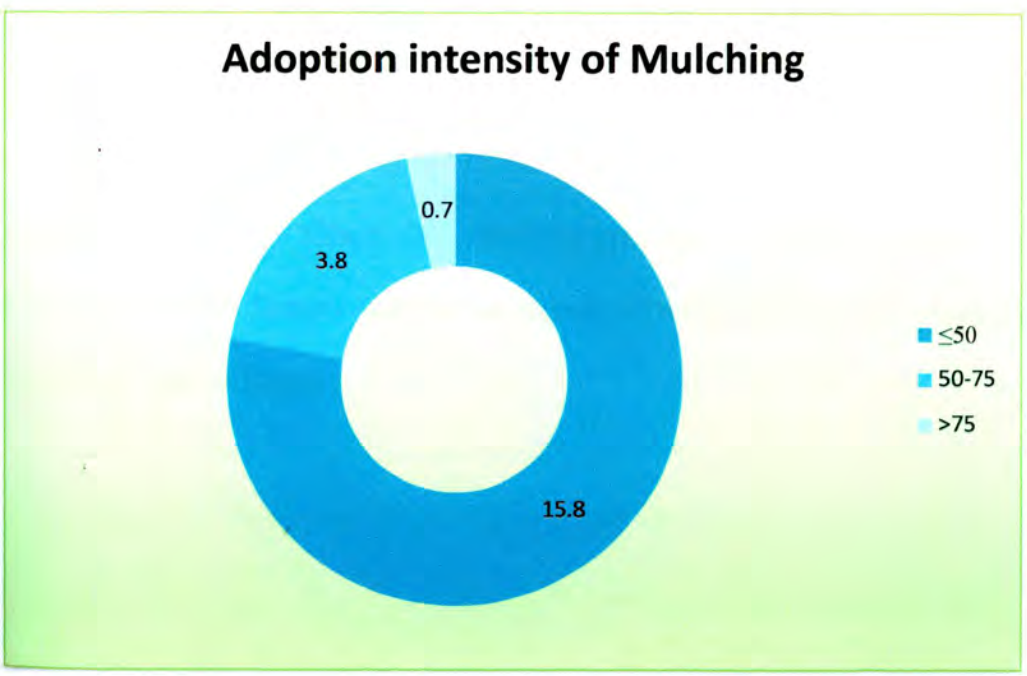


Figure 26: Distribution of the respondents by adoption intensity of animal manure

4.2.5.11 Adoption intensity of mulching

The score for mulching was 20.4%. The intensity of adoption of mulching showed that 15.8% of respondents used mulching on ≤ 50 % acres of land, 3.8% of respondents used mulching on 50-70 % acres of land and 0.7% of respondents used mulching on ≥ 75 % acres of land. The result revealed that intensity of adoption is high on a small portion of farm land. The reason may be because of the mulching of the amount of grasses required in making mulch. Junge et al, (2009) showed that mulching and cover cropping were mostly regarded as not labour-intensive, highly cost-effective, compatible and easy and cheap to adopt. The farmers had a positive impression of the effectiveness as erosion control measures and also mentioned additional advantages, such as, increased soil fertility from the decomposition of organic material and the release of nutrients. However, the disadvantage of mulching was seen in the amount of grass required, the main material used as mulch in the area.



4.2.5.12 Adoption intensity of natural pesticide, farm scaping and bio-control

The result reveals that the practices of these technologies were not significant in the study areas.

Table 11: Distribution of the respondents by adoption intensity of natural pesticides, farm scaping and bio-control

Organic agriculture technology	n	≤50	50-75	>75
Natural pesticides	16	8 (1.8)	4 (0.9)	4 (0.9)
Farm scaping	7	3 (0.7)	3 (0.7)	1 (0.2)
Bio-control	6	3 (0.7)	1 (0.2)	-

It can be observed from the results that out of fourteen organic farming technologies studied, nine were practiced on ≤ 50 % acres of land. These were crop rotation, cover crop, animal manure, intercropping, bio-control, farm scape, sanitation, natural pesticides and organic fertilizer. Four were practiced on ≥ 75 % acres of land which were green manure, compositing, mulching and tillage. Only fire was practiced on 50-75 % acres of land. The results showed that the farmers carried out organic farming practices on relatively smaller portions of their land holdings.

4.2.6.1 Knowledge of vegetable farmers on value chain

This section discusses knowledge of value chain among vegetable farmers under six sub groups of concept of value chain, cooperative production, sales channels, inputs and outputs, post-harvest and trading. Table 12 shows the results on the knowledge on the concept of value chain, cooperative production and sales channels.

The results on knowledge on concept of value chain showed 73.3% of the respondents work closely with the supplier before they produce. Majority of the respondents (91.8%) received feedback from the consumer through the retailer on consumer preference. About 95.8% of the respondents have access to information, 61.3% have been trained to improve their production performance and 91.6% have indicated increase in income from sales of their products. This result implies that the respondents have an idea about value chain although about 50% do not work with consumer preference before they produce. This is not a principle of value chain because value chain works with the ultimate aim of satisfying the consumer.

The results show that majority of the respondents do not belong to any cooperative producer group (72.0%) and do not sell their produce collectively (76.9%). As a result, the respondents do not enjoy the benefits of cooperative production like guarantee produce quality (77.6%), strengthened bargaining position vis-à-vis customers (74.2%), continuous supply to customers (75.6%), strengthened bargaining position vis-à-vis suppliers (73.1%) and development of new products (74.9%). This result shows that the respondents do not produce or sell collectively. They still operate traditional marketing system which allows individual production and direct sales to the consumers. However, in value chain, there is collective sale

of the produce because value chain involves many role players which carry out their roles at every stage of the chain.

From table 12, it can be observed that 68.7% of the respondents sell directly to consumers, majority of the respondents (98.7%) sell to retailers who then sell to the consumers, 84.2% sell to street vendors and 38.0% of the respondents sell to alternative channels like supermarkets, chefs or caterers. The direct sales of the products to consumers give room for middlemen who take advantage of the farmers particularly those involved in horticultural crops like fruits and vegetables that are perishable.

Table 12: Knowledge of concept, cooperative production and sales channel in value chain among vegetable farmers

Concept of value chain	Yes	No
Plant your vegetables based on consumer's preference	223 (49.6)	227 (50.4)
Work closely with the suppliers before you produce	330 (73.3)	120 (26.7)
Receive feedback from retailers on consumers' preference	413 (91.8)	37 (8.2)
Have access to information on market outlets	430 (95.8)	19 (4.2)
Training organized to improve production performance	276 (61.3)	174 (38.7)
Experienced some increase in your income since started selling my products	412 (91.6)	38 (8.4)
Cooperative production		
Belong to cooperative producer group	126 (28.0)	324 (72.0)
There is collective sale of my products with other farmers to market operators or retailers	104 (23.1)	346 (76.9)
Cooperative production with other farmers guarantee product quality	101 (22.4)	349 (77.6)
cooperative production strengthen your bargaining position vis-à-vis customers	116 (25.8)	334 (74.2)
Cooperative production with other farmers guarantee continuous supply to customers	110 (24.4)	340 (75.6)
Cooperative production with other farmers strengthen your bargaining position vis-à-vis suppliers	121 (26.9)	329 (73.1)
Cooperative production with other farmers enhance the development of new products	113 (25.1)	337 (74.9)
Sales channels		
Sell directly to the consumers	309 (68.7)	141 (31.3)
Sell to retailers who then sell to the consumers	443 (98.4)	7 (1.6)
Sell your vegetable to street vendors	379 (84.2)	71 (15.8)
Sell to alternative sales channels	171 (38.0)	279 (62.0)

4.2.6.2 Knowledge of input, post-harvest and trading in value chain among vegetable farmers

Table 13 shows the knowledge of input, post-harvest and trading in value chain among vegetable farmers. The result also reveals that 81.3% of the respondents produce their seed themselves while 75.6% reported to purchase their seeds from agricultural suppliers. These results show a multiple response. This implies that the farmers produce the seeds themselves but still buy from the agricultural supplier to complement their own. This is in line with the report of FAO, (2006) which showed that most smallholder farm families are used to being responsible for the production, selection, storage and distribution or exchange of their own seeds. Furthermore, Cavendish (2000) reported that farmers themselves often produce seeds of locally preferred or indigenous varieties, as individual markets are too small to attract the interest of large commercial companies.

Therefore, production of indigenous horticultural crops often takes place under low-input conditions and yet contributes substantially to household food and livelihood security, particularly for resource-poor farmers. Several authors have also reported that there is lack of timeliness in seed delivery (particularly at the planting time) to farmers (Longtau, 2003; Odoemenem and Obinne, 2010; Omonona, 2006; Saka et al., 2005). The results also show that 56.7% of the respondents paid for land and 92.7% paid for labor. It can be inferred from this that more than half of the farmers operate on rented land, therefore, have to pay rents. Besides, the result shows that family labour is no longer available to the farmers as a result of youth drift to non-farm activities which makes hired labour to be scarce and expensive at the same time.

From the result in table 13, it was discovered that knowledge of post-harvest activity was very low. This causes a lot of damage and waste of the farm produce particularly horticultural crops which are perishable. There is no special package of the produce (73.1%). Majority of the respondents make use of local packaging for their produce like sacks (87.8%) and baskets (72.4%). About 51% of the respondents have hired transport to convey their produce to the market centre. There is no storage, sorting or packaging facilities as indicated by majority of the respondents (81.6%, 80.9%, and 72.4% respectively). These imply that the respondents at times sell the produce at ridiculous prices or are forced to sell on credit once there is no market for the produce and no storage facilities. However, for sorting and packaging, it is done manually before the produce is taken to the market centre for sale. A lot of time and stress is wasted and experienced during these activities. Post-harvest losses of vegetables vary greatly among commodities, production areas and seasons. However, it is estimated that between 20 to 50 per cent of crops are lost in the varied steps from farmer to consumer (Kader, 2003). A study in Brazil found that an average of 200g/capital/day were lost in fruit and vegetables between harvest and consumption (Fehr et al; 2001). Reducing post-harvest losses would make diversification into vegetable production less risky and more attractive for small scale farmers. Therefore, in order to minimize post-harvest losses, Flores et al (1997) suggested that areas such as handling, packing, storage and transport can require costly equipment and extensive research into areas like controlled atmosphere storage and quality assessment.

The result also reveals the majority of the respondents (98.9%) collect their payments at the point of sales. This shows that the vegetable farmers in the study area do not practice value chain but are still operating traditional open market systems. In value chain market, the farmers do not have direct transaction with the consumers but payment for their produce will

be paid as agreed upon by the role players involved in the chain. 56.0% of the respondents sell on credit while 53.6% of the respondents sell with discount. This shows that more than half of the respondents sell on credit and with discount. This usually happens to the farmer when there are no buyers and since there are no storage facilities to preserve the produce, they will be forced to sell on credit. However, the farmers at times sell with discount to their regular customers.

Most of the respondents (84.7%) do not sell on cash deposit. The reason for this may be because of lack of price control in the market. In case the farmers have collected deposits from the retailers, when price of the produce increases, it will favour the buyers but the farmers will be at a loss. Majority of the respondents (97.1%) reported that price is based on demand and supply which means that prices are lower when there is surplus in the market and this favours the retailer and consumer whereas prices are higher when there is scarcity in the market and the buyers are more, and this favours the farmers. The farmers do not have permanent customers because the retailers are free to buy from anybody they wish (95.8%). Many of the respondents (84.9%) indicated that there is increased bargaining power on the retailer's node than the farmers' node. This may be as a result of market fluctuations which will usually make the farmers to sell their produce at a cheaper price or on credit rather than allowing the produce to waste.

In conclusion, it can be seen from the result that the knowledge of the vegetable farmers on value chain in the study areas is still very low. They are still engaged in the traditional open-market system which allows middlemen to take advantages of vegetable farmers and make gains even more than the producers.

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Table 13: Knowledge of input, post-harvest and trading in Value chain among vegetable farmers

Input	Yes	No
Purchase of seeds/seedlings from agricultural suppliers	340 (75.6)	110 (24.4)
Produce seed/seedlings myself	366 (81.3)	84 (18.7)
Pay for land use for production	255 (56.7)	195 (43.3)
Pay for labour	417 (92.7)	33 (7.3)
Post-Harvest		
Use of special package for products	121 (26.9)	329 (73.1)
Use of sack for packaging	395 (87.8)	55 (12.2)
Use of basket for packaging	326 (72.4)	124 (27.6)
Use of wooden box for packaging	48 (10.7)	402 (89.3)
Have transport to convey product to the market centers	230 (51.1)	220 (48.9)
Use of storage facilities for product	83 (18.4)	367 (81.6)
Sorting of products	86 (19.1)	364 (80.9)
Have facilities for bagging/packaging	124 (27.6)	326 (72.4)
Trading		
Sell on cash deposit before harvesting your products	69 (15.3)	381 (84.7)
Collect cash immediately at the point of sales	445 (98.9)	5 (1.1)
Sell product on credit to collect cash later	198 (44.0)	252 (56.0)
Sell with discount	241 (53.6)	209 (46.4)
Prices are based on demand and supply	437 (97.1)	13 (2.9)
Retailers are free to buy from whom they want	431 (95.8)	19 (4.2)
There is increased bargaining power on the retailer's node than producers	382 (84.9)	68 (15.1)

4.2.6.3 Position of vegetable farmers on knowledge scale

On the knowledge scale, the lowest and the highest scores of the respondents are 46 and 71 respectively and the mean score is 58.5. The result shows a close gap between the lowest score of the respondents (46) and the mean score (58.5). The result reveals that almost average number of the respondents have low knowledge of value chan. This means that sizeable numbers of the respondents lack knowledge of value chain. From the result, it can be observed that the gap between the highest score of the respondents (71) and the mean score (58.5) is moderate. Therefore, it can be concluded that the knowledge of the farmers on value chain is moderate.

Table 14: Distribution of farmers by their total scores on knowledge scale

Range of score	Number	Mean
Knowledge		
Low	46	58.5
High	71	
Total	117	

4.3.1 Determinants of vegetable farmers' attitude towards organic farming practices in South West Nigeria.

To identify factors influencing vegetable farmers' attitude towards organic farming practices, a probit regression model was used. The results of the probit model as indicated in table 15 revealed that farming experience (t=.093, $p<0.01$), farm size (t=.281. $p<0.01$), household size (t=.117, $p<0.01$), organization membership (t=.572, $p<0.01$), frequency of extension contacts t=.469, $p<0.05$), frequency of subsidy received (t=2.83, $p<0.01$) and information source (t=.032, $p<0.01$) of the farmers showed significantly positive relationship with attitude to organic farming practices. Farming experience (t=.093, $p<0.01$) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers with longer years of experience in farming are more likely to have favourable attitudes to organic farming practices compared to farmers with fewer years in farming. This position is also supported by Marra and Carlson (1990) who observed that risk-averse farmers are reluctant to invest in innovations in which they have little first-hand experience.

Farm size (t=.281. $p<0.01$) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers with large farm sizes are more likely to use organic farming practices than farmers with small farm sizes. This may not be surprising because farmers with big farm sizes may easily practice the technique on part of the farm before finally adopting it on the entire farm land whereas small scale farmers cannot afford to take risks on their farms at any time unless they are very sure of the outcomes. Several studies have established a positive relationship between the farm size of farmers and their attitude to sustainable farming practices (Kassie et al, 2008 and Osinem, 1996). However, this result is contrary to the opinion of Barker and Herdt (1978), Ahmed (1981) and Allaudin and Tisdell (1988b) who noted that small farmers utilize their limited resources more efficiently and adopt new technologies at a faster rate.

Furthermore, Household size (t=.117, p<0.01) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers with large household sizes are more likely to practice organic techniques than those with small household sizes. This is because organic farming is labour-intensive and needs sufficient labour to handle the practices successfully. The findings of this study confirm the position of the extant empirical literature that organic farming is labour intensive (Obeta and Nwagbo 1991, Shiferaw and Holden 1998). Organization membership (t=.572, p<0.01) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers belonging to organisations are more likely to adopt organic farming techniques than farmers who do not belong to any organisation. This is because farmers' organisation is a forum where new ideas, innovations and information are obtained by farmers. The findings support the results of Versteeg and Koudokpon (1993) who observed a higher success rate of agro-forestry extension and development projects when working through farmer groups.

Additionally, frequency of extension contacts (t=.469, p<0.05) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers who had contact with extension agents frequently are more likely to have good disposition to organic farming techniques compared with farmers that hardly have contacts with extension agents. This is because extension agents are still the most prominent source of information to farmers on new innovation, information or technology. This result also confirms the earlier position of Adesina and Chianu (2002) and Njoku (1991) who emphasized the importance of high intensity of extension contact for technology transfer. Frequency of subsidy received (t=2.83, p<0.01) shows a significantly positive relationship with farmers' attitude to organic farming practices. This implies that farmers who received subsidies are more likely to practice organic farming. This is because once some of the inputs are provided, the cost of production will be reduced to the bearest minimum.

Finally, the results show a significantly positive relationship between information and farmers' attitude to organic farming practices (t=.032, p<0.01). This implies that farmers' exposure to information on organic farming technology will determine their attitude to such technology. The reliability of the source of information also matters. The findings correspond with that of Place and Dewees (1999) who noted that access to information on new technologies is crucial in creating awareness and attitudes towards technology adoption.

Furthermore, the results of the probit model revealed that age (t=-.066, p<0.01), marital status (t=-.424, p<0.01), education (t=-.261, p<0.01), dependants (t=-.393, p<0.01), extension contacts (t=-1.95, p<0.01), distance to farm centre (t=-.991, p<0.01), and subsidy received (t=-5.098, p<0.01) showed significantly negative relationship with attitude to organic farming practices. Age (t=-.066, p<0.01) shows a significantly negative relationship with farmers' attitude to organic farming practices. This implies that compared to younger farmers, older farmers are less likely to practice organic farming practices. The findings support prior reports that young farmers are more innovative than older farmers who are sceptical about innovations (Kristjanson et al. 2005 and Kassie et al, 2008). Marital status (t=-.424, p<0.01) shows a significantly negative relationship with farmers' attitude to organic farming practices. This implies that married respondents are less likely to practice organic farming techniques compared to unmarried respondents. This may be because married respondents have a family and dependants to cater for and are careful to undertake risk of new practices in order to avoid anything that will affect the welfare of their household. However, unmarried farmers can easily practice organic farming because they may not have any dependants to cater for and can undertake risks. Besides, most unmarried farmers are young and more innovative. The report is similar to that of Obeta and Nwagbo (1991) who noted that human beings are generally more flexible and adventurous when young.

Education (t=-.261, p<0.01) shows a significantly negative relationship with farmers' attitude to organic farming practices. This implies that farmers, who are less educated, are more likely to practice organic farming compared to well-educated farmers. This may be because less educated farmers are used to traditional farming methods of farming which is close to organic farming techniques and they are not well informed about current innovations as a result of illiteracy. This result is similar to the work of Bussolo (2007) who showed that less educated farmers were more likely to adopt coffee farming. However, this result is contrary to the findings of Ekwe and Nwachukwu (2006) who reported the crucial role of education in farmers' knowledge, attitude and productivity. It was said that a well-informed farmer is a reservoir of knowledge and can practice new techniques. Dependants (t=-.393, p<0.01) shows a significantly negative relationship with farmers' attitude to organic farming practices. This implies that farmers with few dependants are more likely to adopt organic techniques compared to farmers with large number of dependants. This contradicts the fact that organic farming needs large number of labour to work in organic farms (Staal et al, 2002).

Extension contacts (t=-1.95, p<0.01) shows a significantly negative relationship with farmers' attitude to organic farming practices. This implies that farmers who had extension contacts are less likely to practice organic farming techniques. This is surprising because extension contacts will enhance farmers' knowledge about new technology. This is supported by the findings of Floyd et al., (1999) who revealed that in the Western Hills of Nepal, the level of adoption of technologies was consistently and significantly affected by the level of extension input. Distance to the farm service centre shows a significantly negative relationship with farmers' attitude to organic farming techniques (t=-.991, p<0.01). This implies that farmers who are far from the service centre are more likely to practice organic farming. This may be as a result of not visiting the farm service centre for information and

just continuing in the traditional farming methods. Rogers (2003) found that the farther farmers are from the focal point where the technology was introduced, the longer technology diffusion takes. However, proximity to the farm service centre will ensure fast information dissemination and advisory service on new practices from the change agent to the farmers. Subsidy received shows a significantly negative relationship with farmers' attitude to organic techniques (t=-5.098, p<0.01). This implies that those who did not receive subsidy are more likely to practice organic farming. This is not true because subsidy will encourage the farmers to adopt organic farming techniques.

Table 15: Probit model regression results of factors influencing vegetable farmers' attitude towards organic farming practices

Parameters	Estimates	Std Error	Z	Sig
Gender	-.032	.111	-.288	.774
Age	-.066	.006	-10.210	.000
Marital status	-.424	.138	-3.069	.002
Religion	.115	.087	1.316	.188
Education	-.261	.076	-3.422	.001
Farming Experience	.093	.009	10.729	.000
Farm size	.281	.020	14.323	.000
Household size	.117	.020	5.921	.000
Dependants	-.393	.025	-15.607	.000
Membership of organization	.572	.136	4.194	.000
Extension contacts	-1.949	.480	-4.057	.000
Contacts frequency	.469	.184	2.553	.011
Distance to farm service center	-.991	.024	-41.220	.000
Subsidy received	-5.098	.381	-13.385	.000
Frequency of subsidy	2.832	.207	13.690	.000
Information sources	.032	.004	7.433	.000
Intercept	2.162	.823	2.627	.009

***P< 0.01, **P< 0.05, *P< 0.10, Chi square= 2.881E+098

PROBIT model: PROBIT (p) =Intercept + BX

4.3.2 Factors influencing adoption of organic farming practices in South West Nigeria

To identify factors influencing adoption of organic agriculture, a probit regression model was used. The results of the probit model reveal that farming experience (t=.142, p<0.01), farm size (t= .197, p<0.01), dependants (t=.092, p<0.01), membership of organization (t=3.81, p<0.01), subsidy (t=2.71, p<0.01) and information (t=.061, p<0.01) showed significantly positive relationship with adoption of organic farming practices whereas, gender (t=-1.34, p<0.01), age (t=-.088, p<0.01), marital status (t=-.483, p<0.01), religion (t=-.999, p<0.01), household size (t=-.137, p<0.01), extension contacts (t=-2.601, p<0.01), frequency of contacts (t=-.668, p<0.01), distance to farm centre (t=-.210, p<0.01) and frequency of subsidy received (t=-.610, p<0.01) showed significantly negative relationship with adoption of organic farming practices.

Farming experience (t=.142, p<0.01) shows a significantly positive relationship with adoption of organic farming practices. This implies that farmers with long years of farming experience are more likely to adopt organic farming practices. This may be as a result of the indigenous knowledge they would have gathered over the years that would have made them to understand organic farming better. According to Barry et al (1995), greater years of farming experience increases the possibility of adoption. Farm size shows a significantly positive relationship with farmers' adoption of organic farming practices (t= .197, p<0.01). This implies that farmers having big farm sizes are more likely to adopt organic farming practices compared to farmers having small farm sizes. The reason may be because farmers with big farms can try organic farming practice on small portions of their farms so as to observe its effectiveness before deciding to use the practice on their entire farm. The analysis of Daberkow and McBride (2003) shows that given the uncertainty and the fixed transaction and information costs associated with innovations, there may be a critical lower limit on farm

size which prevents smaller farms from adopting. Therefore, adoption of an innovation will tend to take place earlier on larger farms than on smaller farms.

Dependants ($t=.092$, $p<0.01$) shows a significantly positive relationship with farmers' adoption of organic farming practices. This implies that availability of dependants will influence the adoption of organic farming practices. The reason for this result may be because of labour intensive activities that are involved in organic farming practices. Therefore, farmers having dependants will have helping hands to undertake some of the activities so that the work will not be cumbersome on the farmer alone. The result is supported with the findings of Shiferaw and Holden (1998) who reported the importance of labour availability in technology adoption. Membership of organisation shows a significantly positive relationship with farmers' adoption of organic farming practices ($t=3.81$, $p<0.01$). This implies that farmers who belong to an organisation, farmers' group and association, are more likely to adopt organic farming practices than farmers who do not belong to any organisation. The reason may be because of the information and awareness of innovation that farmers get from the farmers' group through fellow farmers or through extension agents who work with the group. Besides, farmers have a way of working collectively to assist each other on the farm. The findings of Sandee, (1994) and Schmitz, (1995) reveal that small-scale producers in clusters may profit from proximity of colleagues, share information, enjoy the possibilities to purchase inputs together, pull their resources together particularly when there are rush orders that need additional labour at short notice.

Subsidy received is significant and positively related to adoption of organic farming practices ($t=2.71$, $p<0.01$). This implies that availability of subsidy to the farmers can influence the

adoption of organic farming practices. The reason may be because where subsidy is given to the farmers; it can reduce the cost of production. Therefore, farmers are encouraged to adopt new practices when subsidy is given to them. This result is similar to the findings of Parra López, (2003) among the organic olive growers that the adoption rate of organic olive-growing appears to be closely related to the subsidies available, especially in less productive regions. Information is significant and positively related to adoption of organic farming technology ($t=.061$, $p<0.01$). This implies that a well-informed farmer is more innovative than farmers who are ignorant. Therefore, information either through extension agents, other farmers or even through the experience of the farmers over the years, can influence the adoption of organic farming technology. Utilization of social networks and access to information were positively related to farmer adoption rates (Knowler and Bradshaw 2007). In summary, Paswel and Christopher (2007) showed that the size of the farm owned by a household, the value of its livestock, off-farm income, family labour supply, the educational attainment and gender of the household head all had significant positive effects on the likelihood of adoption.

Gender shows a significantly negative relationship with the adoption of organic farming technology ($t=-1.34$, $p<0.01$). This implies that females are more likely to adopt organic farming practice than males. The reason for this may be because of the general home chores of the women which makes them more observant of their environment. Raudsepp (2001) found that women were significantly more likely than men to be concerned with environmental problems. Age is significant and negatively related to the adoption of organic farming technology ($t=-.088$, $p<0.01$). This means that young farmers are more likely to adopt organic farming technology than old farmers. The reason may be because young people are more innovative and more ready to try new things than old farmers who are reluctant to

change. Batte and Johnson, (1993) reported that increasing age reduces the probability of adoption because of factors inherent in the aging process. Younger farmers tend to have more education and are more willing to innovate. Marital status shows a significantly negative relationship with the adoption of organic farming technology ($t=-.483$, $p<0.01$). This means that single farmers are more likely to adopt organic farming technologies than married farmers who will usually consider their family before taking any decision. The reason may be because of the fact that single farmers are younger and are more willing to innovate. Besides, they may not have responsibilities of dependants to cater for which makes it easier for them to undertake risks.

Household size is negatively related to the adoption of organic farming technology ($t=-.137$, $p<0.01$). This implies that a small household is likely to adopt organic farming practices than a big household. The reason may be because small households may have few dependants and are able to undertake risk than large households with many dependants. However, this result is contradictory to the vantage position that a big household has over a small household size. This is because big households may likely have dependants who can assist in labour-intensive activities on the farm. Extension contacts ($t=-2.601$, $p<0.01$) and frequency of contacts ($t=-.668$, $p<0.01$) show significantly negative relationships with the adoption of organic farming technology. This implies that farmers who do not receive contacts with extension agents are more likely to adopt organic farming technology than farmers who frequently receive extension contacts. This may be because of the constant information received from other informal network like family, friends and other farmers which may influence their adoption of innovation. However, the position of extension agents in technology-transfer cannot be overemphasized.

Distance to the farm centre shows significantly negative relationships with the adoption of organic farming practices ($t=-.210$, $p<0.01$). This implies that farmers, who stay farther from the farm centre, are more likely to adopt organic farming practice compared to farmers who stay closer. The reason for this may be because of the information received from other farmers or their neighbours. However, proximity to the farm centre will ensure better and faster flow of information to the farmers. Religion also shows a significantly negative relationship with the adoption of organic farming practices ($t=-.999$, $p<0.01$). This implies that farmers, who are not religious, are more likely to adopt organic farming practices than farmers who believe in religion. The reason may be because of the different beliefs available in different religions which do not only affect the lifestyle of the worshippers, but sometimes, their dealings with the environment. However, Alhamidi et al. (2003) indicates that integration of deeply rooted religious beliefs and human knowledge, when applied by skilled farmers, leads to a management of natural resources in an altruistic fashion and not merely for economic ends which makes agriculture meaningful and sustainable.

Table 16: Probit model parameter estimate of factors influencing adoption of organic farming practices in South West Nigeria

Parameter	Estimate	Std. Error	Z	Sig
Gender	-1.338	.106	-12.675	.000
Age	-.088	.007	-12.963	.000
Marital status	-.483	.093	-5.194	.000
Religion	-.999	.086	-11.568	.000
Education	.057	.063	.906	.365
Farming experience	.142	.008	18.131	.000
Farm size	.197	.017	11.922	.000
Household size	-.137	.026	-5.310	.000
Dependent	.092	.026	3.540	.000
Organizational Membership	3.814	.156	24.388	.000
Extension contacts	-2.601	.445	-5.839	.000
Frequency of contacts	-.668	.142	-4.695	.000
Distance from farm centre	-.210	.015	-14.257	.000
Subsidy received	2.706	.194	13.971	.000
Freq of subsidy	-.610	.114	-5.337	.000
Information	.061	.004	16.815	.000
Intercept	-5.114	.794	-6.437	.000

***P< 0.01, **P< 0.05, *P< 0.10, Chi square= 1.614E+ 045

PROBIT model: PROBIT (p)=Intercept + BX

4.4. Determinants of knowledge of value chain among vegetable farmers in south west Nigeria

The result of linear regression of the knowledge of value chain among vegetable farmers is presented in table 17. The independent variables are significantly related to knowledge of value chain among vegetable farmers with an F value of 10.73, $P< 0.05$. Also, the correlation coefficient (R) value of 0.53 showed that there was an average correlation between independent variables and knowledge of value chain among vegetable farmers. The results accounted for 28 per cent of the variation for knowledge of value chain among vegetable farmers. Significant variables were age (t=-3.70), farm size (t=4.81), household size (t=4.68), dependants (t=-9.25), distance to farm center (t=-5.35), subsidy received (t=-1.82) and information (t=-2.46). Farm size (t=4.81) and household size (t=4.68) are significant. This implies that the bigger the farm size and household size, the higher the knowledge on value chain. The reason for this result may be because farmers who have big farm and household sizes may likely have more labour for labour intensive activities on the farm and are more likely to produce not only for their family consumption, but also for the domestic and international markets. Therefore, they have more opportunities to be involved in the value chain.

Furthermore, farmers' age (t=-3.70), dependants (t=-9.25), and subsidy received (t=-1.82) are significant. This implies that as the farmers' age, dependants and subsidy received decrease, the lower the knowledge on value chain. The reason for this result may be because a young farmer without dependants to assist on the farm and receive little or no subsidy, may likely produce only for his own consumption and for the local market. Therefore, he may not have the knowledge of value chain. Distance to farm center (t=-5.35) and information sources (t=-2.46) are significant. This implies that, the farther farmers are from farm service centres and credible information sources, the lower the knowledge on value chain. The findings of

Shideed, (1999) and Semgalawe, (1998) showed that the farther farmers are from the source of technology, the longer the diffusion of technology. Goswami and Sagar (1994) identified some factors associated with knowledge level of an innovation as educational level, family educational status, innovation proneness and utilization of mass media to be positively and significantly correlated with knowledge level.

Table 17: Linear model regression result of the knowledge of value chain among vegetable farmers

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std Error	Beta		
(Constant)	62.040	4.048		15.326	.000
Gender	-.405	.508	-.037	-.798	.425
Age	-.106	.029	-.215	-3.700	.000
Marital status	-.643	.575	-.049	-1.118	.264
Religion	.640	.464	.058	1.381	.168
Education	-.022	.326	-.003	-.068	.946
Farming Experience	.055	.035	.098	1.552	.121
Farm size	.537	.112	.239	4.809	.000
Household size	.662	.141	.320	4.683	.000
Dependants	-1.187	.128	-.589	-9.245	.000
Membership of Organization	.656	.549	.055	1.195	.233
Extension contacts	.257	2.118	.006	.121	.904
Contacts frequency	.838	.689	.067	1.215	.225
Distance to farm centre	-.291	.054	-.230	-5.350	.000
Subsidy received	-2.638	1.449	-.225	-1.820	.069
Frequency of subsidy	1.342	.863	.195	1.555	.121
Information sources	-.053	.021	-.111	-2.462	.014
R	0.53				
R square	0.28				
Adjusted R square	0.28				
F	10.73				
P	0.00				

4.5 Factors influencing the adoption intensity of organic agriculture among vegetable farmers in South West Nigeria.

The results of ordinal regression model on farmers' intensity of adoption of organic agriculture technologies as pooled data are presented in Table 18. The chi square value is 122.692 with a significance level of 0.000. The value of -2LL is 488.243. The model as a whole explained between 23.9 per cent (Cox and Snell R square) and 32.1 per cent (Nagelkerke R square) of the variability in the farmers' adoption of organic agriculture practices.

From the fifteen variables that are included in the model, only five are significant, with frequency of contact (t= -1.01, $p<0.01$) with extension agent, farming experience (t= .064, $p<0.01$) and farm size (t= .282, $p<0.01$) indicating a very strong significance. This implies that extension visits will help reinforce the message and enhance accuracy of implementation of technology packages. Agbamu, (2002) reported that agricultural extension is the most important source of information to farmers in most African countries and plays a significant role in affecting farmers' adoption of innovation (Van den Ban and Hawkins, 1998). Besides, available information and the sources of such information have been one of the critical factors affecting adoption rates of innovations among farmers (IFOAM, 2003).The results indicated that farmers who have been in farming for a long time, have the potential for adopting organic agricultural practices. This result is supported with the report of Rao and Rao (1996) who found a positive and significant association between age, farming experience, training received and adoption.

The results showed also that intensity of adoption is more likely among farmers with large farms who can easily convert a portion of their farm to organic for trial before adopting organic farming techniques fully compared with farmers with small farms. Abdul et al (1993)

reported a significant relationship between landholdings and adoption. The age (t= -.028, $p<0.05$) of the farmer and the intensity of adoption of organic farming practices are significant. Wetengere (2009) showed that young and middle-aged farmers are aggressive and energetic people who are more willing to adopt new technology than older farmers who are conservative, risk-averse and unlikely to try new ideas. The subsidy received is significant at 10%. The findings of Prokopy et al, (2008) reveal that educational level, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks emerge as some of the variables that are more often positively, rather than negatively, associated with adoption intensity.

Table 18: Ordinal regression model showing the pooled data of adoption intensity of organic agricultural practices among vegetable farmers

Variables	B	S. E.	Wald	df	Sig.
Gender	.035	.249	.020	1	.888
Age	-.028	.015	3.671	1	.055
Marital status	.536	.330	2.633	1	.105
Religion	-.334	.240	1.935	1	.164
Education	-.042	.165	.065	1	.798
F. Experience	.064	.018	12.507	1	.000
Farm size	.282	.076	13.743	1	.000
Household size	-.015	.075	.039	1	.844
Dependants	-.005	.067	.005	1	.942
Membership of org.	.420	.268	2.455	1	.117
Extension contacts	.997	1.021	.954	1	.329
Freq of contacts	-1.010	.353	8.189	1	.004
Distance to farm centre	-.031	.029	1.219	1	.270
Subsidy received	1.494	.870	2.948	1	.086
Freq of subsidy	.131	.514	.065	1	.799
Constant	-2.121	1.943	1.192	1	.275
Observation	450				
Correct prediction	74.0 percent				
-2 log likelihood	488.24				
Cox and Snell R square	0.24				
Nagelkerke R square	0.32				
Chi-square	122.69				
Sig.	.00				

4.5.1 Parameter estimates of adoption intensity of crop rotation

The results of ordinal regression model on intensity of adoption of crop rotation are presented in Table 18.1. Chi-square statistics is 238.923 and it is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending upon the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.198), Cox and Snell (0.412) and Nagelkerke (0.442) in the model with complementary Log-log link.

From the fifteen variables that are included in the model, only eight are significant which are gender (t=.390, $p<0.05$), marital status (t= .436, $p<0.05$), religion (t= .720, $p<0.01$), farming experience (t= .090, $p<0.01$), farm size (t=-.209, $p<0.01$), distance to farm center (t=.234, 0.01), adoption (t=.253, $p<0.01$) and attitude (t=.066, $p<0.01$). From these variables, religion, farming experience, farm size, distance to farm centres, adoption and attitude indicate a very strong significance on intensity of adoption of crop rotation. These results imply that farmers who have been long in farming must have been familiar with different sustainable agricultural practices. Therefore, they are more likely to practice crop rotation on a large portion of land. Farm size indicating a strong significance implies that farmers with small farm sizes are more likely to practice crop rotation than farmers with big farm sizes. This is because farmers with small farms can easily prepare the land for the next planting season to plant another crop. Distance to farm service centres shows a strong significance

which implies that the closer the farm centres to the farmer, the more frequently they are likely to receive up-to-date information on organic farming techniques which can influence the intensity of adoption of such practices. Adoption and attitude were both significant. The implication of this finding is that adoption potential and the attitude of the respondents will determine the intensity of adoption of crop rotation. Respondents who are innovative and have favourable attitudes towards the practice of crop rotation are more likely to practice it on large portions of their land than respondents who are passive and skeptical about innovations. Gender was also significant, which implies that the intensity of adoption of crop rotation is more likely to be high among the males than females. The reason may be because males are more energetic to prepare the land for another crop every planting season whereas females may not have such strength.

Table 18.1: Ordinal regression model showing adoption intensity of crop rotation

Variables	Estimates	Std. Error	Wald	df	Sig.
[crop rotation=.00]	14.828	2.470	36.027	1	.000
[crop rotation=1.00]	17.499	2.514	48.467	1	.000
[crop rotation=2.00]	18.976	2.533	56.104	1	.000
Gender	.390	.212	3.398	1	.065
Age	-.013	.013	1.088	1	.297
Marital status	.436	.240	3.306	1	.069
Religion	.720	.201	12.799	1	.000
Education	.034	.134	.064	1	.801
Farm experience	.090	.016	31.415	1	.000
Farm size	-.209	.050	17.697	1	.000
Household size	-.021	.059	.124	1	.725
Dependants	.047	.058	.652	1	.419
Membership of organization	.326	.228	2.038	1	.153
Extension contacts	-.238	.698	.116	1	.733
Distance to farm centre	.234	.032	52.344	1	.000
Adoption	.253	.060	17.552	1	.000
Attitude	.066	.009	51.613	1	.000
Knowledge	.006	.023	.074	1	.786
Observation	N=364				
Correct prediction	75.0 percent				
Cox and Snell R square	0.41				
Nagelkerke R square	0.44				
McFadden	0.19				
Chi-square	238.92				
df	15				
Sig.	.00				

4.5.2 Parameter estimates of adoption intensity of green manure

The results of ordinal regression model on intensity of adoption of green manure are presented in Table 18.2. Chi-square statistics is 216.868 and it is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.184), Cox and Snell (0.382) and Nagelkerke (0.413) in the model with complementary Log-log link.

From the fifteen variables included in the model, eight which are significant are education (t=.378, $p<0.01$), farming experience (t= .064, $p<0.01$), farm size (t= .114, $p<0.05$), household size (t= -.103, $p<0.1$), dependants (t= -.175, $p<0.01$), adoption (t= .501, $p<0.01$), attitude (t= .034, $p<0.01$) and knowledge (t= -.073, $p<0.01$). From these variables, education, farming experience, dependants, adoption, attitude and knowledge show a very strong significance on intensity of adoption of green manure. These results imply that the more educated farmer will be more innovative than an unlearned farmer. The education that farmer received may be formal education obtained from a formal institution or informal education which the farmers can receive from extension agents or from other farmers. Therefore, when a farmer is well informed on the potentials of green manure, adoption intensity is likely to be high. Farming experience shows a very strong significance on intensity of adoption of green manure. This means that farmers who have longer years of farming experience are well-

informed in indigenous knowledge gained through observation on their farm operations and the environments. Therefore, farmers with long years of farming experience are more likely to have high adoption intensity for green manure i.e they are more likely to practice it on large portions on their farms. Dependants indicate a very strong significance implies that respondents with family labour to work with on the farm are more likely to make use of green manure on large portions of their land. This is because the practice of green manure is labour-intensive. Farmers with dependants can cover large portions on their land to incorporate the grasses, leaves and leguminous plants back into the soil to build the soil organic matter. However, farmers who have no dependants to work with, may not be able to cover large portions on their farm land with the practice of green manure.

The adoption behaviour and the attitude of the farmers towards the practice of green manure can also influence the intensity of adoption of this practice. This means that the level of innovativeness of the farmers and their willingness to try new practice will determine the intensity of adoption of green manure on their farm. Farm size is significant on the intensity of adoption of green manure. This result implies that respondents with small farm sizes are more likely to have high adoption intensity of green manure on their farms because they can easily weed their farms and incorporate the grasses, leaves and leguminous plants back into the land but farmers with big farm sizes may only find it convenient to apply green manure on some portions of their farm because they may not be able to weed the whole farm at once. Household size is also significant on intensity of adoption of green manure. This means that farmers with large household sizes have people who are available to assist with labour-intensive activities that the practice requires, are more likely to have high intensity of adoption of green manure. Muhr et al, (2001) studied the acceptability of forage legumes in Oyo State, Nigeria, and found that the ease of establishing innovation was important to local

farmers. Dittoh, (1999) reports from northern Ghana, that, women farmers have virtually no access to farmyard manure or household refuse for their own plots. Furthermore, Millar et al. (1996) argued that men confiscate enriched fields of their women to grow their own crops.

Table 18.2: Ordinal regression model showing adoption intensity of green manure

Variables	Estimates	Std. Error	Wald	df	Sig.
[Green manure=.00]	8.209	2.480	10.953	1	.001
[Green manure=1.00]	8.981	2.486	13.049	1	.000
[Green manure=2.00]	10.175	2.496	16.623	1	.000
Gender	-.350	.218	2.592	1	.107
Age	.007	.013	.269	1	.604
Marital status	-.405	.249	2.633	1	.105
Religion	-.042	.202	.043	1	.836
Education	.378	.139	7.353	1	.007
Farming experience	.064	.017	14.855	1	.000
Farm size	.114	.053	4.590	1	.032
Household size	-.103	.062	2.761	1	.097
Dependants	-.175	.061	8.359	1	.004
Membership of organization	.009	.237	.002	1	.969
Extension contacts	-.492	.708	.484	1	.487
Distance to farm centre	.015	.030	.255	1	.613
Adoption	.501	.065	58.587	1	.000
Attitude	.034	.009	13.104	1	.000
Knowledge	-.073	.025	8.838	1	.003
Observation	N=274				
Correct prediction	75.0 percent				
Cox and Snell R square	0.38				
Nagelkerke R square	0.41				
McFadden	0.18				
Chi-square	216.87				
df	15				
Sig.	.00				

4.5.3 Parameter estimates of adoption intensity of cover crop

The results of ordinal regression model on intensity of adoption of cover crop are presented in Table 18.3. Chi-square statistics is 249.364 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.236), Cox and Snell (0.425) and Nagelkerke (0.470) in the model with complementary Log-log link.

From the variables included in the model, only eight are significant which are marital status ($t= -.586$, $p<0.05$), education ($t= -.265$, $p<0.1$), farm size ($t= .179$, $p<0.01$), membership of organization ($t=-.733$, $p<0.01$), distance to farm center ($t= .120$, $p< 0.01$), adoption ($t= .540$, $p<0.01$), attitude ($t= .037$, $p< 0.01$) and knowledge ($t= .099$, $p<0.01$). From these variables, farm size, membership of organization, distance to farm centre, adoption, attitude and knowledge show a very strong significance on intensity of adoption of cover crop. These results imply that intensity of adoption of cover crop may likely be high on large farms compared to small farms. This is because the practice of cover crop will need a large portion of farm land that will allow the cover crop to spread evenly on the floor in order to protect the soil from excessive heat of the sun thereby providing a cooling effect. However, small farm lands without sufficient space may not have high intensity of adoption of cover crop. Membership of organization shows a very strong significance on intensity of adoption of

cover crop. This means that farmers who belong to organizations are more likely to have high intensity of adoption of cover crop because farmers' organization serves as forum through which farmers are updated and educated on new practices. The change agents find it safer, faster and less time consuming to work with groups, associations or organizations in the dissemination of new practices. Therefore, farmers belonging to groups or organizations are more likely to be current with new practices than farmers who do not belong to any group.

Distance to the farm centres shows a very strong significance on the intensity of adoption of cover crop. This result implies that the proximity of the farm service centre to the farmer's farm may influence the intensity of adoption of cover crop. The reason may be because of rapid flow of information from the centre to the farmer's household if the farm centre is at close range. However, farmers who are far away from the farm service centre may not get up-to-date information on time and may rather depend on information received from neighbour or other farmers. Adoption, attitude and knowledge show a very strong significance on intensity of adoption of cover crop. This means adoption characteristics of the farmers, their attitude towards organic practice and the level of knowledge can influence the intensity of their adoption of cover crop. Marital status and education were also significant indicating that respondents who are married are more likely to practice cover cropping on large intensity.

Also, educated farmers are more likely to practice cover cropping on large portions of land than uneducated farmers. Junge et al, (2009) reported that farmers recognized the value of cover crops as additional sources of food for man and animal. But they also saw these crops as competitors for soil nutrients and providing shelter for insects, pests and diseases which

might be transmitted to the main crops. Some farmers also mentioned that cover crops overgrow the main crops and could decrease yields.

Table 18.3: Ordinal regression model showing adoption intensity of Cover crop

Variables	Estimates	Std. Error	Wald	df	Sig.
[Cover crop=.00]	19.252	2.740	49.360	1	.000
[Cover crop=1.00]	21.786	2.791	60.942	1	.000
[Cover crop=2.00]	23.505	2.824	69.269	1	.000
Gender	-.180	.226	.637	1	.425
Age	.003	.014	.052	1	.819
Marital status	-.586	.270	4.692	1	.030
Religion	.267	.209	1.636	1	.201
Education	-.265	.142	3.462	1	.063
Farming experience	-.022	.018	1.566	1	.211
Farm size	.179	.050	12.581	1	.000
Household size	.011	.061	.033	1	.857
Dependants	-.015	.060	.066	1	.797
Membership of organization	-.733	.242	9.210	1	.002
Extension contacts	.578	.767	.569	1	.451
Distance to farm centre	.120	.030	16.493	1	.000
Adoption	.540	.068	62.758	1	.000
Attitude	.037	.010	13.890	1	.000
Knowledge	.099	.025	16.113	1	.000
Observation	N=255				
Correct prediction	75.0 percent				
Cox and Snell R square	0.425				
Nagelkerke R square	0.470				
McFadden	0.236				
Chi-square	249.36				
df	15				
Sig.	.00				

4.5.4 Parameter estimates of adoption intensity of animal manure

The results of ordinal regression model on intensity of adoption of animal manure are presented in Table 18.4. Chi-square statistics is 239.254 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.317), Cox and Snell (0.412) and Nagelkerke (0.507) in the model with complementary Log-log link.

From the variables included in the model, ten which are significant are gender (t= -.707, $p<0.05$, marital status (t= -.688, $p<0.1$), farming experience (t= -.076, $p<0.01$), household size (t= -.482, $p<0.01$), dependants (t= .210, $p<0.05$), membership of organization (t= -1.248, $p<0.01$), and distance to farm centre (t= -.109, $p<0.05$), adoption (t= .773, $p<0.01$), attitude (t= -.038, $p<0.01$) and knowledge (t= .167, $p<0.01$). From these variables, farming experience, household size, membership of organization, adoption, attitude and knowledge show a very strong significance on intensity of adoption of animal manure. Farming experience shows a significantly negative relationship with intensity of adoption of animal manure. These results imply that farming experience of the farmers can influence the intensity of adoption of animal manure. The reason may be because application of animal manure needs some technicalities in handling and treatment before applying to the farm.

Therefore, experienced farmers would have known these technicalities over the years compared to a farmer who is new in the use of animal manure. Household size reveals a significantly negative relationship on the intensity of adoption of animal manure. The reason for this may be because of the availability of family labour that a large household will have to carry out labour intensive activities on the farm compared with a small household having little or no family labour to work with. Farmers having household members to work with may find it easy to collect the animal manure from the poultry house and herd men and can make use of their labour in the application of the animal manure, thereby covering large portions of their farm. Manyong and Houndekon (1997) found household size to be positively related to technology adoption decisions while Owu, (1995) claimed that the variable had a negative relation with technology adoption.

Membership of organization shows a very strong significance on the intensity of adoption of animal manure. This means that being a member of an organization can influence the intensity of adoption of animal manure. The reason for this result may be because of the benefits members of organizations enjoyed. Apart from the information and awareness on new practices, farmers can pull their resources together to do labour work on each other's farm until it goes round. Therefore, farmers who enjoy such kind of communal labour may have high intensity of adoption of animal manure. Awe, (1997) reported that membership of associations such as cooperative societies and farmers' organization has been found to enhance the interaction and exchange of ideas among farmers. Adoption, attitude and knowledge show a very strong significance on intensity of adoption of animal manure. This means that the level of innovativeness of the farmers, their attitude and knowledge about a practice or innovation can determine their intensity of adoption of such practice. Gender shows a significantly negative relationship on the intensity of adoption of animal manure.

The reason may be because female farmers are more likely to use animal manure than male farmers. This is because females can take time to search for manure anywhere they can get but male farmers do not have the time and patience and look for faster alternatives that can save time and energy. Marital status shows a significantly negative relationship on the intensity of adoption of animal manure. This implies that respondents who are married may have children and dependants to cater for, are reluctant to adopt new practices that will affect their production whereas, unmarried respondents can undertake risks.

Dependants show a significantly positive relationship on intensity of adoption of animal manure. This implies that farmers with dependants to assist on the farm can apply animal manure on large portions compared to farmers who would applied the manure all alone. According to Crowley et al, (1996), availability of casual labour will allow farmers to open more land or improve management practices such as land preparation, weeding and application of fertilizers or manure. Distance to farm service centre shows a significantly negative relationship on the intensity of adoption of animal manure. The proximity of the farm centre to the farmer will also determine the flow of information to the farmers and how the farmers' problem gets to the researcher. Nwosu, (1995) reported that proximity to the source of technology has some cost implications which according to Bamire et al, (2002), include transportation and risk, which increases as distance travelled by farmers increases.

According to Williams (1999), the major factors that positively influence farmers' manuring decisions are the farmer's own herd size, contractual arrangements between herders and farmers for manure, seasonal migration and its effect on livestock investment and the proportion of cultivated land owned by the farmer. Factors found to negatively affect manure

use are farm size, distance of fields to the homestead, the proportion of cultivated land recently under fallow and land-labour ratio.

Table 18.4: Ordinal regression model showing adoption intensity of Animal manure

Variables	Estimates	Std. Error	Wald	df	Sig.
[Animal manure=.00]	14.714	3.258	20.394	1	.000
[Animal manure=1.00]	16.643	3.292	25.553	1	.000
[Animal manure=2.00]	19.640	3.354	34.280	1	.000
Gender	-.707	.282	6.294	1	.012
Age	.006	.019	.106	1	.745
Marital status	-.688	.365	3.544	1	.060
Religion	-.251	.264	.903	1	.342
Education	.051	.174	.084	1	.771
Farming experience	-.076	.024	9.623	1	.002
Farm size	.081	.068	1.444	1	.230
Household size	-.482	.097	24.818	1	.000
Dependants	.210	.094	4.994	1	.025
Membership of organization	-1.248	.300	17.328	1	.000
Extension contacts	.049	.975	.003	1	.960
Distance to farm centre	-.109	.046	5.493	1	.019
Adoption	.773	.091	72.406	1	.000
Attitude	-.038	.013	8.491	1	.004
Knowledge	.167	.033	26.451	1	.000
Observation	N=132				
Correct prediction	75.0 percent				
Cox and Snell R square	0.41				
Nagelkerke R square	0.51				
McFadden	0.32				
Chi-square	239.25				
df	15				
Sig.	.00				

4.5.5 Parameter estimates of adoption intensity of compositing

The results of ordinal regression model on intensity of adoption of compositing are presented in Table 18.5. Chi-square statistics is 186.331 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.192), Cox and Snell (0.339) and Nagelkerke (0.383) in the model with complementary Log-log link.

From the variables included in the model, nine which are significant are gender ($t= -.468$, $p<0.05$), religion ($t= -.544$, $p<0.05$), education ($t= .467$, $p<0.01$), farming experience ($t=.033$, $p<0.1$), dependants ($t= -.331$, $p<0.01$), distance to farm centre ($t= -.386$, $p<0.01$), adoption ($t= .446$, $p<0.01$), attitude ($t= .026$, $p<0.05$) and knowledge ($t= -.088$, $p<0.01$). From these variables, education, dependants, distance to farm centre, adoption and knowledge show a very strong significance on intensity of adoption of compositing. Education shows a significantly positive relationship on the intensity of adoption of compositing. This result implies that educated farmers are more likely to practice compositing on high intensity on his farm. This may be because of the techniques required for compost making. Educated farmers may be able to follow all the procedure involved to make compost successfully. Dependants show a significantly negative relationship on intensity of adoption compositing. This implies that availability of dependants to assist in the making of compost can influence the intensity

of adoption of compositing. The reason may be because compost making can be very stressful. Apart from the techniques involved in making compost, some construction may have to be done (in case of pit compost). Therefore, farmers with dependants to assist in the operations involved in compost making are more likely to have high intensity for the adoption of compost. The findings of Roger, (1995) showed that active family labour force has a positive impact on adoption of agro-forestry.

Distance to the farm centre shows a significantly negative relationship on the intensity of adoption of compositing. The nearness of the farm centre to the farmer will enhance adequate information and technical knowledge for the farmers on how they can make compost successfully, thereby improving the intensity of adoption of compost. Adoption and knowledge also show a very strong significance on intensity of adoption of compost. This means that adoption behaviour of the farmers and the level of knowledge they have about a practice will determine the intensity of adoption of such practice. Gender is significant on the intensity of adoption of compositing. The reason may be because of the rigorous exercise involved in making compost. Therefore, it is more likely that male farmers will have high intensity of adoption of compost than female farmers who may not be able to undertake all the rigour.

Attitude is significant on the intensity of adoption of composting. This means that the perceived usefulness of the practice by the farmers can determine the intensity of adoption of the practice. Therefore, the intensity of adoption of compost will be high if the farmers are aware of its usefulness on their farms. Mose et al, (2000) investigating factors influencing the adoption of organic and inorganic fertilizers, discovered that the adoption of the various

components of the organic and inorganic fertilizer technology was site specific and depended much on the prevailing farmer circumstances such as access to fertilising materials, credit and labour. Farmers with larger farms and household sizes tend to positively adopt these technologies. However, inadequate availability of organic manure and information limited fast adoption of the technologies.

Table 18.5: Ordinal regression model showing adoption intensity of compositing

Variables	Estimates	Std. Error	Wald	df	Sig.
[Compositing=.00]	9.986	3.273	9.307	1	.002
[Compositing=1.00]	10.835	3.279	10.918	1	.001
[Compositing=2.00]	11.423	3.282	12.110	1	.001
Gender	-.468	.239	3.818	1	.051
Age	.005	.015	.128	1	.721
Marital status	.243	.289	.707	1	.400
Religion	-.544	.225	5.855	1	.016
Education	.467	.160	8.516	1	.004
Farming experience	.033	.019	3.212	1	.073
Farm size	-.036	.065	.297	1	.586
Household size	.049	.069	.511	1	.475
Dependants	-.331	.070	22.316	1	.000
Membership of organization	.447	.279	2.565	1	.109
Extension contacts	1.566	1.043	2.255	1	.133
Distance to farm centre	-.386	.067	33.213	1	.000
Adoption	.446	.078	32.887	1	.000
Attitude	.026	.012	4.736	1	.030
Knowledge	-.088	.027	10.405	1	.001
Observation	N=177				
Correct prediction	75.0 percent				
Cox and Snell R square	0.34				
Nagelkerke R square	0.38				
McFadden	0.19				
Chi-square	186.33				
df	15				
Sig.	.00				

4.5.6 Parameter estimates of adoption intensity of intercropping

The results of ordinal regression model on intensity of adoption of intercropping are presented in Table 18.6. Chi-square statistics is 275.981 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.23), Cox and Snell (0.46) and Nagelkerke (0.49) in the model with complementary Log-log link.

From the variables included in the model, eight which are significant are gender (t= -.611, $p<0.01$), age (t= -.027, $p<0.05$), marital status (t= .517, $p<0.05$), education (t= .254, $p<0.1$), farming experience (t= .095, $p<0.01$), membership of organization (t= 1.335, $p<0.01$), adoption (t= .637, $p<0.01$) and knowledge (t= -.049, $p<0.05$). From these variables, gender, farming experience, membership of organization and adoption show a very strong significance on intensity of adoption of intercropping. The gender variable showed a negative coefficient that the probability of adoption was higher for male than female farmers. It has been reported that women in sub-Saharan Africa face challenges in managing improved fallow tree species and maize (Nyirenda et al, 2001) due to gender bias in land allocation and inheritance system rights to plant and own a tree. Furthermore, women-headed households are constrained by lack of active labour force (Masangano, 1996). Studies conducted in Kenya (Swinkel et al, 2002) showed that the average female-headed household did not adopt

agro-forestry technology compared to the male-headed farm household. Age of the farmers showed a significantly negative relationship on intensity of adoption of intercropping. This is because younger households are ready to take risks relative to older households and thus likely to adopt intercropping. This finding is consistent with previous studies (Alavalapati et al, 1995; Adesina et al, 2001; Doss and Morris, 2001) that reported that adoption decreases with advanced age.

Farming experience shows a significantly positive relationship on intensity of adoption of intercropping. This means that farmers with longer years of experience in farming would have had more knowledge on intercropping, probably knowing the best crops to intercrop together compared with farmers who have fewer numbers of farming experience. Membership of organization shows a significantly positive relationship on intensity of adoption of intercropping. The reason may be because of the influence that group exerts on their members which usually affect the adoption behaviour of farmers about innovations. Therefore, farmers belonging to an organization that is innovative and is aware of the potential of intercropping, may likely practice intercropping on high intensity compared with farmers that do not belong to any group. The reason may be because of the wealth of experience that elderly farmers would have gathered over the years that will help them better in the agricultural practices.

Education shows a significantly positive relationship on intensity of adoption of intercropping which means that well-informed farmers can understand technical information that will assist them to better understand the nutrient cycling processes underlying the practice of intercropping. Similar findings (Thangata, 1998; Nyirenda et al, 2001;

Masangano, 1996; Ayuk, 1997) reported that education is positively associated with probability to adopt agro-forestry technologies. The report of their findings was based on the fact that formal and informal training have the potential to increase the rate of adoption by directly increasing awareness, imparting skills and knowledge of the new technology. Buyinza and Wambede, (2008) investigating the adoption of mixed intercropping and agro-forestry trees species and maize in Uganda discovered that factors that influenced adoption were age of the household head, educational level, extension contacts, family labour force and gender.

Table 18.6: Ordinal regression model showing adoption intensity of intercropping

Variables	Estimates	Std. Error	Wald	df	Sig.
[Intercropping=.00]	11.066	2.498	19.621	1	.000
[Intercropping=1.00]	12.714	2.518	25.502	1	.000
[Intercropping=2.00]	13.655	2.527	29.197	1	.000
Gender	-.611	.220	7.698	1	.006
Age	-.027	.013	4.089	1	.043
Marital status	.517	.266	3.778	1	.052
Religion	-.077	.203	.143	1	.705
Education	.254	.143	3.179	1	.075
Farming experience	.095	.017	32.750	1	.000
Farm size	.009	.052	.028	1	.868
Household size	.003	.062	.003	1	.955
Dependants	-.075	.059	1.596	1	.207
Membership of organization	1.335	.249	29.662	1	.000
Extension contacts	-.886	.708	1.564	1	.211
Distance to farm centre	.032	.029	1.191	1	.275
Adoption	.637	.069	86.282	1	.000
Attitude	-.001	.009	.004	1	.951
Knowledge	-.049	.025	3.942	1	.047
Observation	N=284				
Correct prediction	75.0 percent				
Cox and Snell R square	0.46				
Nagelkerke R square	0.49				
McFadden	0.23				
Chi-square	275.98				
df	15				
Sig.	.00				

4.5.7 Parameter estimates of adoption intensity of sanitation

The results of ordinal regression model on intensity of adoption of sanitation are presented in Table 18.7. Chi-square statistics is 193.571 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.18), Cox and Snell (0.35) and Nagelkerke (0.38) in the model with complementary Log-log link.

From the variables included in the model, ten which are significant are gender (t= .729, $p<0.01$), marital status (t= .549, $p<0.05$), education (t= -.805, $p<0.01$), farm size (t= .317, $p<0.01$), household size (t= .314, $p<0.01$), dependants (t= -.232, $p<0.01$), and membership of organization (t= -1.425, $p<0.01$), adoption (t= .189, $p<0.01$), attitude (t= -.025, $p<0.01$) and knowledge (t= -.085, $p<0.01$). From these variables, gender, education, farm size, household size, dependants, and membership of organization, adoption, attitude and knowledge show a very strong significance on intensity of adoption of intercropping. These results imply that intensity of adoption of sanitation is likely to be high among male than female farmers. The reason may be because of the job demand of sanitation. Mainly men are involved in clearing and weeding of the farm because of the rigour involved. Besides, even where the farmers will engage hired labour to clear the farm, they are usually males. Education is significant on intensity of adoption of sanitation. The reason may be because educated farmers can understand the law of hygiene and how it relates to their own health and agricultural

production better. Therefore, farmers who are well-informed on the necessity of sanitation on their farms, may likely have intensity of adoption of sanitation. Farm size also shows a strong significance on intensity of adoption of sanitation. This implies that small farms are more likely to have high intensity of adoption of sanitation than big farms. The reason may be because of the difference in size. It may be easy to clean the entire farm in small portions more regularly than cleaning the entire farm in a large farm. Large farms may likely clean up portions gradually.

Likewise, the household size shows a very strong significance on intensity of adoption of sanitation. This means that farmers with big household sizes are more likely to have high intensity of adoption of sanitation compared with farmers with small household sizes. The reason may be because of the availability of family labour that big households may likely have that can assist in the cleaning of the farm at regular intervals compared with small households that may not have family labour to use on the farm. Dependants show a strong significance on the intensity of adoption of sanitation which implies that availability of dependents to assist in the cleaning of the farm can ensure high intensity of adoption of sanitation. This is because there will be enough hands to clean the farm from growing weedy. Membership of organization shows a very strong significance on the intensity of adoption of sanitation. This is because the organization or group can pull their resources together and engage in communal labour where they can work on the members' farm until it goes round every member of the group. Adoption, attitude and knowledge show a very strong significance on the intensity of adoption of sanitation. This means that the attitude of the farmers to the state of their farm and their level of knowledge on the law of hygiene can determine the neatness of their farms.

Table 18.7: Ordinal regression model showing adoption intensity of sanitation

Variables	Estimates	Std. Error	Wald	df	Sig.
[Sanitation=.00]	-4.587	2.514	3.330	1	.068
[Sanitation=1.00]	-3.991	2.511	2.526	1	.112
[Sanitation=2.00]	-3.122	2.509	1.549	1	.213
Gender	.729	.222	10.761	1	.001
Age	-.010	.013	.553	1	.457
Marital status	.549	.287	3.653	1	.056
Religion	-.209	.216	.935	1	.334
Education	-.805	.150	28.892	1	.000
Farming experience	-.001	.016	.003	1	.955
Farm size	.317	.069	21.212	1	.000
Household size	.314	.071	19.403	1	.000
Dependants	-.232	.067	12.004	1	.001
Membership of organization	-1.425	.255	31.133	1	.000
Extension contacts	.718	.737	.950	1	.330
Distance to farm centre	-.040	.030	1.852	1	.174
Adoption	.189	.065	8.447	1	.004
Attitude	-.025	.009	7.741	1	.005
Knowledge	-.085	.026	10.752	1	.001
Observation	N=316				
Correct prediction	74.9 percent				
Cox and Snell R square	0.35				
Nagelkerke R square	0.38				
McFadden	0.18				
Chi-square	193.57				
df	15				
Sig.	.00				

4.5.8 Parameter estimates of adoption intensity of minimum tillage

The results of ordinal regression model on intensity of adoption of tillage are presented in Table 18.8. Chi-square statistics is 154.178 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.14), Cox and Snell (0.29) and Nagelkerke (0.32) in the model with complementary Log-log link.

From the variables included in the model, ten which are significant are gender (t= .678, $p<0.01$), marital status (t= .465, $p<0.1$), education (t= -.614, $p<0.01$), farm size (t= .141, $p<0.05$), household size (t= .220, $p<0.01$), dependants (t= -.119, $p<0.05$), and membership of organization (t= -.714, $p<0.01$), extension contact (t= 1.147, $p<0.1$), adoption (t= .166, $p<0.01$) and knowledge (t= -.111, $p<0.01$). From these variables, gender, education, household size, membership of organization, adoption, and knowledge show a very strong significance on intensity of adoption of tillage. These results imply that intensity of adoption of tillage practice is likely to be high among males than the females. The reason may be because of the rigorous activities involved in this practice which can easily be carried out by men. Education shows a very strong significance on the intensity of adoption of tillage practices. This means that farmers who are well enlightened, can easily understand the principle involved in the practice of tillage better than unlearned farmers. Household size shows a very strong significance on the practice of tillage. The reason may be because of the

assistance the members of a large household will offer on the farm during the tillage practice most especially where the farm is not mechanized and farm operations are done manually. Membership of organization shows a very strong significance on the intensity of adoption of tillage. The reason may be because of the communal labour that organizations or groups design to assist one another on the farm. Therefore, farmers belonging to a group can enjoy such service when necessary.

Adoption and knowledge show a very strong significance on the intensity of adoption of tillage. This means that the level of farmers' knowledge about the practice and their readiness to apply this practice will influence the intensity of adoption. Farm size is significant on the intensity of adoption of tillage practice. This means that small farm sizes may likely undertake the tillage practice on their farm but a big farm may not be able to carry out tillage practice on the entire farm but may have to do small portions at a time. Dependant is significant on the intensity of adoption of tillage. This means that availability of dependants to carry out these activities will determine the extent of the farm land that the farmers can till at a time. Extension contact is also significant on the intensity of the adoption of tillage. This is because of the technical information that extension agents will give farmers on tillage practice which will make them knowledgeable on the practice thereby ensuring their intensity of adoption.

Mandiringana et al, (2006) investigated the acceptance of conservation of tillage in South Africa and recorded that high labour input requirements generally reduce the adoption rate of techniques, even if their potential for soil and water conservation was high. Besides, Contour tillage was accepted as a compatible methodology that was easier and cheaper to adopt and to

practice, as the equipment, a common hoe, was available but many of the farmers regarded it as highly labour-intensive, time-consuming, tedious and costly as hired labourers had to maintain the channels regularly. The report also showed that women regarded this technology as not gender sensitive, since preparing the soil with tools generally belongs to male farmers (Junge et al, 2009).

Table 18.8 Ordinal regression model showing adoption intensity of minimum tillage

Variables	Estimates	Std. Error	Wald	df	Sig.
[Tillage=.00]	-.565	2.348	.058	1	.810
[Tillage=1.00]	.152	2.348	.004	1	.948
[Tillage=2.00]	1.749	2.351	.554	1	.457
Gender	.678	.210	10.461	1	.001
Age	.015	.013	1.498	1	.221
Marital status	.465	.257	3.280	1	.070
Religion	.167	.202	.688	1	.407
Education	-.614	.139	19.556	1	.000
Farming experience	.008	.016	.289	1	.591
Farm size	.141	.058	5.981	1	.014
Household size	.220	.065	11.579	1	.001
Dependants	-.119	.062	3.763	1	.052
Membership of organization	-.714	.233	9.426	1	.002
Extension contacts	1.147	.695	2.726	1	.099
Distance to farm centre	.024	.029	.720	1	.396
Adoption	.166	.061	7.534	1	.006
Attitude	-.001	.008	.005	1	.945
Knowledge	-.111	.025	20.317	1	.000
Observation	N=363				
Correct prediction	74.9 percent				
Cox and Snell R square	0.29				
Nagelkerke R square	0.32				
McFadden	0.14				
Chi-square	154.18				
df	15				
Sig.	.00				

4.5.9 Parameter estimates of adoption intensity of fire

The results of ordinal regression model on intensity of adoption of fire are presented in Table 18.9. Chi-square statistics is 203.350 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.179), Cox and Snell (0.364) and Nagelkerke (0.395) in the model with complementary Log-log link.

From the variables included in the model, eight which are significant are gender (t= .535, $p<0.05$), education (t= -.450, $p<0.01$), household size (t= -.219, $p<0.01$), dependant (t= .354, $p<0.01$), distance to farm centre (t= -.134, $p<0.01$), adoption (t= .494, $p<0.01$), attitude (t= -.025, $p<0.01$) and knowledge (t= -.108, $p<0.01$). From these variables, education, household size, dependants, distance to the farm centre, adoption, attitude and knowledge show a very strong significance on intensity of adoption of tillage. These results imply that intensity of adoption of fire is influenced by the level of education of the farmer. The reason may be because educated farmers easily understand the principles that guide farm operations than unlearned farmers who may find it difficult to interpret principles of farm operations.

Household size and dependants show strong significance on the intensity of adoption of fire. The reason may be because of the availability of dependants in big households who can assist

on the farm with clearing. Distance to the farm centre is very significant because it determines the flow of current information on new farm practices to the farmers. Adoption, attitude and knowledge are also very significant on the intensity of adoption of fire. This is because readiness of the farmers to new farm practice, their perception about the practice and their level of knowledge about the practice will influence the intensity of adoption of such practice. Gender is significant on the intensity of adoption of fire. This shows that males are more likely to be involved in the practice of fire than females. The reason may be because of the risks involved in the practice.

Table 18.9: Ordinal regression model showing adoption intensity of fire

Variables	Estimates	Std. Error	Wald	df	Sig.
[Fire=.00]	1.020	2.461	.172	1	.678
[Fire=1.00]	1.741	2.462	.500	1	.479
[Fire=2.00]	3.282	2.467	1.770	1	.183
Gender	.535	.226	5.602	1	.018
Age	.020	.013	2.407	1	.121
Marital status	.034	.260	.018	1	.895
Religion	.312	.213	2.133	1	.144
Education	-.450	.140	10.279	1	.001
Farming experience	.021	.016	1.764	1	.184
Farm size	.003	.050	.005	1	.945
Household size	-.219	.064	11.566	1	.001
Dependants	.354	.063	31.700	1	.000
Membership of organization	-.369	.250	2.175	1	.140
Extension contacts	-.516	.704	.537	1	.464
Distance to farm centre	-.134	.031	18.365	1	.000
Adoption	.494	.069	50.807	1	.000
Attitude	-.025	.009	7.495	1	.006
Knowledge	-.108	.028	14.439	1	.000
Observation	N=242				
Correct prediction	74.9 percent				
Cox and Snell R square	0.36				
Nagelkerke R square	0.40				
McFadden	0.18				
Chi-square	203.35				
df	15				
Sig.	.00				

4.5.10 Parameter estimates of adoption intensity of organic fertilizer

The results of ordinal regression model on intensity of adoption of organic fertilizer are presented in Table 18.10. Chi-square statistics is 186.331 and is significant at 0.05. We can conclude that there is the association between the dependent and independent variables. The model-fitting statistics, namely the pseudo R square, measured the success of the model in explaining the variations in the data. The pseudo R square was calculated depending on the likelihood ratio. McFadden's R square compared the likelihood for the intercept only model to the likelihood for the model with the independent variables in order to assess the model goodness of fit. The pseudo R square indicated that the proportion of variations in the dependent variable was accounted for by the independent variables. The larger the pseudo R square was, the better the model fitting was. The pseudo R squares for McFadden (0.192), Cox and Snell (0.339) and Nagelkerke (0.383) in the model with complementary Log-log link.

From the variables included in the model, five which are significant are marital status (t= -.663, $p<0.05$), religion (t= -.667, $p<0.01$), farming experience (t= -.043, $p<0.05$), dependants (t= -.360, $p<0.01$) and adoption (t= .547, $p<0.01$). From these variables, religion and dependants show a very strong significance on intensity of adoption of organic fertilizer. Religion shows a significantly negative relationship on the intensity of adoption of organic fertilizer. This result implies that the religious beliefs of the farmers as they affect the application of organic fertilizer can influence their intensity of adoption of organic fertilizer. Dependants show a significantly negative relationship on the intensity of adoption of organic fertilizer which means that availability of dependants to assist in the application of the organic fertilizer can influence the intensity of its adoption on the farm. Marital status shows a significantly negative relationship on the intensity of adoption of organic fertilizer. This result indicates that unmarried farmers are more likely to have high intensity of adoption of

organic fertilizer than farmers who are married. The reason may be because unmarried farmers are younger and can undertake risk.

It can also be observed from the results that farming experience shows a significantly negative relationship on the adoption intensity of organic fertilizer. This may likely be because of the knowledge about the soil and the environment that experienced farmers would have gained through time. With more experience, a farmer can become more or less risk-averse when judging new technology (Mussei et al, 2001). The adoption potentials of the farmers show a significantly positive relationship on the intensity of adoption of organic fertilizer. This means that the readiness of the farmer to try new practices will influence their intensity. According to Mussei et al, (2001), farm and farmers associated attributes are some of the factors influencing the adoption of new agricultural technologies. Ajewole, (2010) in his work on farmer's response to adoption of commercially available organic fertilizers in Oyo state, Nigeria discovered that number of years spent in acquiring formal education, farming experience, household size, and farm size, number of extension visits and distance of farm from the source of commercial organic fertilizers are significant variables that influence farmers' willingness to adopt and use commercial organic fertilizer.

Table 18.10: Ordinal regression model showing adoption intensity of organic fertilizer

Variables	Estimates	Std. Error	Wald	df	Sig.
[Organic fertilizer=.00]	38.241	2.536	227.342	1	.000
[Organic fertilizer=1.00]	39.534	2.549	240.480	1	.000
[Organic fertilizer=2.00]	41.129	2.566	256.981	1	.000
Gender	-.425	.260	2.686	1	.101
Age	.001	.018	.005	1	.942
Marital status	-.663	.318	4.338	1	.037
Religion	-.667	.239	7.805	1	.005
Education	-.061	.165	.137	1	.711
Farming experience	-.043	.022	3.797	1	.051
Farm size	.081	.062	1.676	1	.195
Household size	-.087	.074	1.388	1	.239
Dependants	-.360	.083	18.934	1	.000
Membership of organization	-.124	.279	.197	1	.657
Extension contacts	14.684	.000		1	
Distance to farm centre	.049	.035	1.885	1	.170
Adoption	.547	.077	50.115	1	.000
Attitude	-.002	.012	.027	1	.869
Knowledge	.038	.028	1.761	1	.184
Observation	N=138				
Correct prediction	75.0 percent				
Cox and Snell R square	0.34				
Nagelkerke R square	0.40				
Mcfadden	0.23				
Chi-square	186.90				
df	15				
Sig.	.00				

4.6 Comparison of adoption, attitude and knowledge on organic agriculture practices among farmers across study areas

The comparison of adoption, attitude and knowledge on organic agriculture among farmers across the study areas showed that there are differences in attitude and knowledge level across the states but there is no significant difference in adoption level across the states. The result of Post hoc tests also confirms that attitude and knowledge level in the states differed significantly, whereas, adoption level in the states did not reach statistical significance.

Attitude was measured as a pooled score and responses to attitudinal statements were made on a five point Likert scale. Scores for 'positive' items (i.e. items that indicated a favourable disposition to environmental issues) were scored thus: strongly agree (SA) = 5; agree (A) = 4; undecided/neutral (U) = 3; disagree (D) = 2; strongly disagree (SD) = 1. For 'negative' items (i.e. items that indicated an unfavourable environmental disposition), the scores were reversed. Scores on all items were then totalled to yield a composite attitude score for each farmer. It was then possible to obtain the means of the three states. These means were compared using a one-way ANOVA and result shows the three states differ significantly in their attitude [$F(449)=40.42$, $p<0.05$)]. The result of the post hoc analysis shows that the three states scored means that were different from one another, with Oyo state showing the highest score.

Adoption was determined through the variables included in the study. The variables used in the study were used to investigate factors influencing organic farming technology and the extent to which each technology was practiced. These variables include age, gender, marital status, farm size, household size, extension contacts among others. The results of the one way

ANOVA indicate that there is no significant difference in the adoption levels [F (449) =1.97, $p<0.05$)]. Likewise, the result of the post hoc shows that adoption potentials of the farmers in the three states (Ogun, Ondo and Oyo) did not differ significantly from one another, however, Oyo state had a higher mean than the other two states.

Knowledge was also determined by awarding marks for correct response. In analysing the knowledge component of the questionnaire, two marks were awarded for each correct response on concept of value chain, cooperative production, sales channels, input and output, post-harvest and trading (a total of 35 items). This yielded a maximum possible knowledge score of 70. Means were obtained for the three states separately and a one-way analysis of variance (ANOVA) was used to compare these means. The ANOVA summary shows that the three states differ significantly in their knowledge [F (449) =54.81, $p<0.05$)]. To pinpoint the exact source of this difference, a post hoc analysis was done. The results show that while Ondo and Oyo states do not differ significantly, each state scores significantly higher means than Ogun state.

Table 19 shows the results of analysis of variance (ANOVA) on the adoption, attitude and knowledge (between groups, within groups and total), the degrees of freedom, the mean square value, F value, and the P value. The F value and the P value are the criteria for determining if there is significant difference among the farmers across the study areas. If the F value is greater than the critical value or if the P value (Sig) is less than 0.05, we conclude there is significant difference among the farmers across the states. The result of an analysis of variance techniques used in comparing the significant difference among the farmers across study areas in South West Nigeria showed that there is a significant difference in attitude and knowledge level across the states but there is no significant difference in adoption level

across the states. This is observed in adoption level as the P value was 0.14 at 5% level of significance. The result shows a significant difference in attitude level as the P value was 0.00 at 5% level of significance. Also, the knowledge level shows a significant difference with P value of 0.00 at 5% level of significance.

A post hoc test via the Duncan multiple range test was conducted to determine the extent of the differences. The post hoc shows that the attitude and knowledge level across the states differed significantly, however, the adoption level in the states did not reach statistical significance.

The mean of the adoption level for Ogun, Ondo and Oyo states were 20.77, 20.79 and 21.17 respectively. The results of the post hoc test show that there was no significant difference adoption level across the states. However, Oyo state had the highest score out of the three states. The implication of these results is that individual farmer's level of adoption was higher in Oyo state compared with Ogun and Ondo States. The results reveal that all the states had adoption potentials, however, for Oyo state having the highest score may be because it is mainly an agrarian state compared with Ogun and Ondo states that engage in Mining and Fishing apart from agricultural production.

A further comparison of attitude of farmers across the three states is presented in Table 19. The table shows that among the mean scores for the states, Oyo state accounted for 110.45, Ondo state accounted for 104.52 and Ogun state accounted for 94.75. The result shows that all the states have favourable attitude towards organic agriculture. The result of the post hoc test shows that there was a significant difference in attitude of farmers across the three states. However, Oyo state had the highest score. This result implies that individual farmer's attitude was higher in Oyo state compared with Ogun and Ondo states. The reason may be because of

the availability of many research institutes in Oyo state which may serve as sources of agricultural innovations to farmers in the state.

The mean of the knowledge level for Ogun, Ondo and Oyo states were 53.05, 57.93 and 58.15 respectively. The results of the post hoc test show that there was a significant difference between level of knowledge in Ogun and Ondo as was also the case between Ogun and Oyo. However, there was no significant difference in knowledge level between Ondo and Oyo states. The implication of these results is that individual farmer's level of knowledge was higher in Ondo and Oyo states compared with Ogun states.

Table 19: ANOVA table comparing adoption, attitude and knowledge level in the states

		Sum of squares	df	Mean square	F	P	Post hoc	Means
Adoption	Between groups	14.964	2	7.482	1.97	.14	Ogun	20.77[a]
	Within groups	1698.300	447	3.799			Ondo	20.79[a]
	Total	1713.264	449				Oyo	21.17[a]
Attitude	Between groups	18854.111	2	9427.056	40.42	0.00	Ogun	94.75[a]
	Within groups	104260.487	447	233.245			Ondo	104.52[b]
	Total	123114.598	449				Oyo	110.45[c]
Knowledge	Between groups	2500.298	2	1250.149	54.81	0.00	Ogun	53.05[a]
	Within groups	10195.480	447	22.809			Ondo	57.93[b]
	Total	12695.778	449				Oyo	58.15[b]

*Means with the same superscript down the column are not significantly different, $p<0.05$

NB: when $p<0.05$ there is significant difference

when $p>0.05$ there is no significant difference

4.7 Chapter summary

This chapter examined information seeking behaviour and adoption of organic farming practices among vegetable farmers in South West Nigeria. The analysis showed that majority of respondents were males between the ages of 40-49, married with household sizes of 6-10 members and farm sizes of 0.5-3.4 acres. It was further revealed that majority of the respondents had secondary school educational qualifications, belonged to organizations and had contact with extension agents. However, majority of the respondents never received any subsidy from the government. The findings of the study further showed organic agricultural practices mostly used in the study areas as indicated by the respondents are minimum tillage (80.9%), crop rotation (80.7%), green manure (60.9%), sanitation (69.8%), fire (53.6%) and cover crop (55.8%) whereas, compositing (60.4%), organic fertilizer (68.9%), animal manure (71.3%) and mulching (79.6%) were rarely used by the respondents. The study also revealed an overwhelming general positive attitude by farmers towards organic agriculture.

All the means for the attitudinal statements were above the cut-off point of 3. The most prominent attitudinal statement as ranked by the farmers were statements that organic agriculture improves soil fertility and soil structure' (4.38), 'organic agriculture encourages the use of indigenous knowledge' (4.38). It can be inferred from this result that the respondents were very cognizant of the potentials of organic farming practices. The findings further showed that information-seeking behaviour of the respondents was mainly informal and that majority of the respondents practice organic agriculture on small portions of their farms. The results revealed that the knowledge of the vegetable farmers on value chain in the study areas was still very low. The linear model regression results show that that there was an average correlation between independent variables and knowledge of value chain among

vegetable farmers (R= 0.53). The results accounted for 28 per cent of the variation for knowledge of value chain among vegetable farmers. Significant variables were age (t=-3.70), farm size (t=4.81), household size (t=4.68), dependants (t=-9.25), distance to farm centre (t=-5.35), subsidy received (t=-1.82) and information (t=-2.46).

The results of the probit model reveal that farming experience (t=.142, p<0.01), farm size (t= .197, p<0.01), dependants (t=.092, p<0.01), membership of organization (t=3.81, p<0.01), subsidy (t=2.71, p<0.01) and information (t=.061, p<0.01) showed a significantly positive relationship with adoption of organic farming practices whereas, gender (t=-1.34, p<0.01), age (t=-.088, p<0.01), marital status (t=-.483, p<0.01), religion (t=-.999, p<0.01), household size (t=-.137, p<0.01), extension contacts (t=-2.601, p<0.01), frequency of contacts (t=-.668, p<0.01), distance to farm centre (t=-.210, p<0.01) and frequency of subsidy received (t=-.610, p<0.01) showed a significantly negative relationship with adoption of organic farming practices. The results of the probit model revealed that farming experience (t=.093, p<0.01), farm size (t=.281. p<0.01), household size (t=.117, p<0.01), organization membership (t=.572, p<0.01), frequency of extension contacts t=.469, p<0.05), frequency of subsidy received t=2.83, p<0.01) and information source (t=.032, p<0.01) of the farmers showed a significantly positive relationship with attitude to organic farming practices whereas age (t=-.066, p<0.01), marital status (t=-.424, p<0.01), education (t=-.261, p<0.01), dependants (t=-.393, p<0.01), extension contacts (t=-1.95, p<0.01), distance to farm centre (t=-.991, p<0.01), and subsidy received (t=-5.098, p<0.01) showed a significantly negative relationship with attitude to organic farming practices.

The results of ordinal regression model on farmers' intensity of adoption of organic agricultural technologies showed that frequency of contact (t= -1.01, $p<0.01$) with extension agents, farming experience (t= .064, $p<0.01$), farm size (t= .282, $p<0.01$), age (t= -.028, $p<0.05$) and subsidy received (t= 1.494, $p<0.1$) were significant.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally-adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system (FAO, 1999). Anderson et al (2005) stated that organic farming is a production system that excludes the use of synthetically manufactured fertilizer, pesticides, growth regulators and livestock feed additives.

The system relies on crop rotation, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and control insects, weeds and other pests. Unlike organic agriculture, which emphasizes effective soil management and biodiversity, conventional agriculture (also referred to as intensive agriculture) relies on farming a single crop year in year out. To overcome the imbalance imposed upon a conventional farm's ecosystem, harmful agents, such as pesticides and synthetic nitrogen fertilizers are used. The consequence of conventional farming's ecological imbalance is a decline in soil organic matter, soil structure, fertility, microbial and faunal biodiversity. In the practice of organic methods, information has been recognized as an essential component to

adoption. Available information and the source of such information have been one of the critical factors affecting adoption rates of innovation among farmers (IFOAM, 2003).

The main objective of the study was to examine information-seeking behaviour and adoption of organic farming practices among vegetable farmers in South Western Nigeria. The specific objectives were to describe the personal characteristics of the farmers, profile organic farming practices in southwestern Nigeria, determine the sources of information about organic agricultural practices, evaluate the attitude of vegetable growers towards organic agriculture, identify factors that influence farmers' adoption of organic agriculture, estimate the adoption rate for organic agricultural practices and determine the knowledge of value chain among vegetable farmers.

The study area is South- Western Nigeria which comprises of six states namely: Oyo, Osun, Ogun, Ondo, Ekiti and Lagos States. Southwest is situated mainly in the Tropical Rainforest Zone, though with swamp forest in the coastal regions in Lagos, Ogun, Ondo and Delta States. The high concentration of agricultural activities justifies the choice of the study areas. The crops grown in these areas among others include amaranthus, spinach, okro, cucumber, tomatoes, and pumpkin. Cluster sampling technique was adopted for selecting the required sample of urban vegetable producers. Interviewer administered questionnaire was developed and interview schedules used to elicit information from 450 respondents. Econometric models including linear regression model, probit model and ordinal regression model were used for analysis as outlined in the study.

5.2 Summary of major findings

The results showed that the majority of the respondents were males (63.1%), married (91.8%) and had a household size of 6-10 members (63.3%), predominantly Christians (70.4%) and had a farm size of 0.5-3.4 acres (80.4%). The results showed that most (32.2%) of the respondents' age ranged from 40-49 years. Furthermore, the results showed that the majority (53.6%) of the respondents possess secondary school certificate as their highest educational qualification. The findings revealed that most of the respondents have farming experience of 1-15 years (49.8%). Moreover, the results showed that majority (72%) of the respondents belonged to organizations, had contacts with extension agents (98.2%) and covered distances between 0.5- 5.4 kilometers to the farm service centre (83.3%). Majority of the respondents (71.1%) never received any subsidy from the government.

The findings of the results showed that out of 14 listed organic farming practices, only 7 were indicated by at least 50 per cent of respondents on the use of these practices. These are tillage (80.9%), crop rotation (80.7%), sanitation (69.8%), and intercropping (66.2%), and green manure (60.9%), cover crop (55.8%), and fire (53.6%). Furthermore, the results revealed an overwhelming general positive attitude by vegetable farmers towards organic farming practices. All the means for the attitudinal statements were above the cut-off point of 3.00. The most prominent attitudinal statement as ranked by the farmers were statements that organic agriculture improves soil fertility and soil structure' (M=4.38), 'organic agriculture encourages the use of indigenous knowledge' (M=4.38). The results showed that the respondents' information-seeking behaviour is mainly informal. The result of this study align more on information obtained from contact farmers (88.7%), friends/peers (79.8%), neighbours (76.7%), farmers' organizations (68.4%) and family members (66.2%).

The results showed that the farmers carried out organic farming on relatively smaller portions of their land holdings. Out of fourteen organic farming technologies studied, nine were practiced on ≤ 50 per cent acres of land. Furthermore, the results revealed that the knowledge of the vegetable farmers on value chain in the study areas is still very low. Although majority of the respondents (91.8%) received feedback from consumers through the retailer on consumer preference, but 50 per cent do not work with consumer preference before they produce. The results showed that majority of the respondents do not belong to any cooperative producer group (72.0%) and do not sell their produce collectively (76.9%). Majority of the respondents (98.7%) sell to retailers who then sell to consumers.

The probit model regression showed that farming experience, farm size, dependants, membership of organization, subsidy and information show a significantly positive relationship with adoption of organic farming practices. The linear model regression results show that that there was an average correlation between independent variables and knowledge of value chain among vegetable farmers (R= 0.53). Significant variables were age (t=-3.70), farm size (t=4.81), household size (t=4.68), dependants (t=-9.25), distance to farm centre (t=-5.35), subsidy received (t=-1.82) and information (t=-2.46). The ordinal regression model showed factors influencing the intensity of adoption of organic farming practices which include among others; gender, dependents, attitude, knowledge, and marital status, education, farming experience, distance to the farm service centre and organization membership.

5.3 Conclusions

The results of the research showed that more male farmers than female farmers adopt new technology. Also, young farmers are discovered to be more innovative than old farmers. Most

of the farmers operate small farm holdings and still use crude farm implements for their farm operations. The research findings also showed that farmers practice organic farming, however, there are constraints limiting the adoption of these practices. It was also discovered that the farmers have favourable attitudes to organic farming practices and are well-informed on the potentials of these practices. Farmers tended to depend more on one another for information than other sources. Informal source of information is more preferred by the farmers. Extension agents play a great role in the dissemination of agricultural information to farmers in the study areas. The study showed that majority of the farmers practice organic farming techniques on small portions of their farms. Many factors influence the adoption intensity which includes among others; farm size, farming experience, age, dependants in the family which will determine availability of labour, household size. The knowledge of the farmers on value chain is low because most of the vegetable farmers still practice traditional marketing systems that give room for middle men to exploit them. The results of the probit regression model showed the factors influencing the attitude of vegetable farmers towards organic farming techniques and the factors influencing the adoption of the organic farming practices. The linear regression model reveals the factors that determine the knowledge of value chain among vegetable farmers while the ordinal regression model was used to determine the rate and intensity of adoption of organic farming practices.

5.4 Recommendations

Based on the findings, the study recommends the following:

As the adoption of innovations is generally higher among younger farmers than among elderly people, organic agriculture should be introduced to non-adopting category and women. In order to meet the level of education, there should be training activities towards farmers' improvement. There should be exposure of the farmers to

organic agricultural techniques and value chain systems through regular training. The information-seeking behaviour of the respondents was mainly informal. They depend more on information from contact farmers, friends, family and neighbours. Therefore, extension agents should work hand in hand with contact farmers to disseminate the innovation and adoption of organic farming practices. Furthermore, these main sources of information should disseminate more information on organic agriculture. Moreover, training of extension agents should include organic agriculture and value chain messages.

REFERENCES

AALANGDONG, O, I., KOMBIOK, J, M., & SALIFU, A, Z., 1999, Assessment of non-burning and organic-manuring practices, ILEIA newsletter, 15(1/2): 47–48

ABADI, GHADIM, A, K., & PANNELL, D, J., 1999, A Conceptual Framework of adoption of an agricultural innovation, *Agricultural Economics* 21: 145-154

ABDUL, R, Q., ASHFAQ, H, M., & SULTAN, A, C., 1993, Framers characteristics affecting adoption of agricultural innovations, Journal *of Rural Development and Administration* 25 (3): 111-113

ADEBOOYE, O., & OPABODE, J., 2004, Status of conservation of the indigenous leaf vegetables and fruits of Africa in *African Journal of Biotechnology* [Online], 3 (12): 700-705.

ADESINA, A, A., & ZINNAH M, M., 1993, Technology characteristics, farmers' perceptions and adoption decisions: a Tobit model application in Sierra Leone, Agricultural *Economics,* 9: 291–311

ADESINA, A, A., & CHIANU, J., 2002, Determinants of Farmers' Adoption and Adaptation of Alley Farming Technology in Nigeria, *Agroforestry Systems*, 55(2): 99-112.

ADESINA, A, A., MBILA, D., NKAMLEU, G, B., & ENDAMANA, D., 2000, Econometric Analysis of the Determinants of Adoption of Alley Farming by Farmers in the Forest Zone of Southwest Cameroon, *Agriculture, Ecosystems and Environment* 80: 255–65

ADOMI, E, E; MONDAY,- OGBOMO, O., & O.E .INONI, O, E., 2003, Gender factors in crop farmers' access to agricultural information in rural areas of Delta State, Nigeria, *library Review* 52(8):388-93.

AGBAMU, J, U., 2002, Agricultural Research Extension Farmer Linkages in Japan: "Policy issues for Sustainable Agricultural Development in Developing Countries" *International Journal of Social and Policy Issues,* 1: 252-263.

AGWU, A, E., EKWUEME, J, N., & ANYANWU, A. C., 2008, Adoption of improved agricultural technologies disseminated via radio farmer programme by farmers in Enugu State, Nigeria, African Journal of Biotechnology, 7 (9): 1277-1286.

AHMED, I., 1981, Technological change and agrarian structure: a study of Bangladesh. Geneva: ILO.

AINA, L, O., 2007, Globalization and small-scale farming in Africa: What role for information centers. World Library and Information Congress: 73rd IFLA General Conference and Council, Durban, South Africa, August 19-23, 2007. Accessed February 6, 2010.http://www.ifla.org/iv/ifla73/index.html.

AJEWOLE, O, C., 2010, Farmer's response to adoption of commercially available organic fertilizers in Oyo state, Nigeria, *African Journal of Agricultural Research* 5(18): 2497-2503, 18 September, 2010 Available online at http://www.academicjournals.org/AJAR ©2010 Academic Journals.

AKTARA, R., CHOWDHURYB A., ZAKARIAC A, K, M., & VOGLA, C, R., 2010, Seed information and communication networks of male and female farmers: A micro level study. In Bangladesh 9th European IFSA Symposium, Vienna, Austria, July 4-7, 2010: WS1.8-*Knowledge systems, innovations and social learning in organic farming*, 760-69.

ALAVALAPATI, J, R, R., LUCKERT, M, K., & GILLS, D, S., 1995, Adoption of agroforestry practices: A case study of Andra Pradesh, India, Agro *forestry systems* 32: 1-14

ALHAMIDI, S, K., GUSTAFSSON, M., LARSSON, H., & HILLBUR, P., 2003, The cultural background of the sustainability of the traditional farming system in the Ghouta, the oasis of Damascus, Syria, *Agriculture and Human Values,* 20, 231–240.

ALI, A, M, S., 2003, Farmers' knowledge of soils and the sustainability of agriculture in a saline water ecosystem in Southwestern Bangladesh, Geoderma 111, 333–353 www.elsevier.com/locate/geoderma

ALIBER, M., BAIPETHI, M., & JACOBS, P., 2009, Agricultural employment scenarios, In Hall, R (ed.), Another country side: policy options for land and agrarian reform in South Africa. Cape Town: Institute for poverty, Land and Agrarian Studies, School of Government, University of the Western Cape.

ALLAUDDIN, M., & TISDELL, C, A., 1988b, Dynamics of adoption and diffusion of HYV technology in Bangladesh, Occasional Paper No. 155, Department of Economics, the University of New Castle, NWS, Australia.

ALLEN, P., & KOVACH, M., 2000, The capitalist composition of organic: The potential of markets in fulfilling the promise of organic agriculture. Agriculture and Human Values Alphabet Theory, *International Journal of Consumer Studies* 33, 697–705

ALRØE, H, F., & NOE, E., 2008, What Makes Organic Agriculture Move: Protest, Meaning or Market? A Polyocular Approach to the Dynamics and Governance of Organic Agriculture, *International Journal of Agricultural Resources, Governance and Ecology,* 7, (1/2), 2008

ALTIERI, M, A., 2002, Non-certified agriculture in developing countries in Sciallaba N El H & HATTAM, C., 2002, Organic Agriculture, Environment and Food Security, FAO, Rome.

ANDERSON, J, B., JOLLY, D, A., & GREEN, R., 2005, Determinants of farmer adoption of organic production methods in the fresh-market produce sector in California: A logistic regression analysis. A paper presented at the Western Agricultural Economics Association 2005 Annual Meeting, July 6-8, 2005, San Francisco, California. http:// ageconsearch.umn.edu/bitstream/36319/1/sp05an01.pdf, accessed July 2011.

ANDERSON, W, A., 2000, The future relationship between the media, the food industry and the consumer, *British Medical. Bulletin* 56:254–268.

ANON, 1999, Flame weeding for weed management. The Practical Farmer [Practical Farm ers of Iowa], Winter. p.17.

ASHTON, D., 1995, Crop Monitoring Groups Farm Surveys Report 1995. Australian Bureau of Resource Economics, Canberra, pp. 86-88.

AWAD, M, A., DOPPLER, W., & SCHLAUDERER, R., 2006, Impact assessment of future development strategies to improve natural resources conservation and living standards of farmers in Lake Nasser region, Egypt, Tropentag, October 11-13, 2006, Bonn.

AWE, O, A., 1997, Soil fertility management using organic fertilizers and low-external-input techniques, Paper presented at the National Workshop on soil conservation and soil fertility management for sustainable rural development, Nigeria 5 – 7 November.

AYUK, E, T., 1997, Adoption of agroforestry technology: the case of live hedges in the Central Plateau of Burkina Faso, Agricultural System 54 (2): 189–206.

BABCOCK, J., 2008, "Redeveloping a Montana food processing industry: The role of food innovation Centers", Unpublished Master's Thesis. 113p. University of Montana – Missoula, Retrieved November 3 2009 from http://www.growmontana.ncat.org/docs/Babcock_Food_Innovation_Ctrs_12.08.pdf

BACKER, E, D., AERTSENS, J., VERGUCHT, S., & STEURBAUT, W., 2009, Assessing the ecological soundness of organic and conventional agriculture by means of life cycle assessment. *British Food Journal* 111 (10):1028-1061.

BALDWIN, K, R., 2006, Organic Production- Conservation of Tillage on Organic Farms, Published by North Carolina Cooperative Extension Service.

BAMBERRY, G., DUNN, T., & LAMONT, A., 1997, A pilot study of the relationship between farmer education and good farm management, RIRDC Research Paper No. 97/30.Rural Industries Research and Development Corporation, Canberra.

BAMIRE, A, S., FABIYI, Y, L., MANYONG, V, M., 2002, Adoption pattern of fertilizer technology among farmers in the ecological zones of South Western Nigeria: a Tobit analysis, *Australian Journal Agricultural Response*, 53: 901-910.

BARBERI, P., 2002, Weed management in organic agriculture: are we addressing the right issues? *Weed Response* 42:177–193.

BARKER, R., & HERDT, R, W., 1978, Adoption of HYV in Bangladesh, *Bangladesh Development Studies,* 7: 23-25

BARRY, P, J., ELLINGER, P, N., HOPKINS, J, A., & BAKER, C, B., 1995, Financial management in Agriculture, 5th Edn, (Interstate Publisher, Inc., Danville, IL, USA)

BATEMAN, D, I., 1993, Organic Farming and Society: An economic perspective. 45pp. In: The economics of organic farming: An international perspective, Lampkin, N. H., and Padel, S. (Eds). CAB International pp. 280-282, 4pp.

BATTE, M., & JOHNSON, R., 1993, Technology and its impact on American agriculture, In: Size, Structure and the changing Face of American Agriculture, edited by A. Hallum (West View Press Inc., Boulder, CO, USA)

BAUMANN, D, T., BASTIAANS, L., & KROPFF, M, J., 2000, Competition and Crop Performance in a Leek–Celery Intercropping System, *Crop Science* 41:764–774.

BAWDEN R., 2005, The Hawkesbury experience: tales from a road less travelled. In Pretty J (ed). The Earthscan Reader in Sustainable Agriculture. Earthscan.

BECHRI, M, Z., & NACCACHE, S., 2003, The Political Economy of Development Policy in Tunisia, GRP/ERF.

BELKNAP, J., & SAUPE, W, E., 1988, Farm family resources and the adoption of no-plough tillage in south-western Wisconsin, *North Central Journal of Agricultural Economics*, 10: 13-23

BENDER, R., & BENNER, 2000, A calculating ordinal regression models in SAS and S-Plus, *Biometrical Journal* 42, 6, 677-699.

BENDING, G, D., & LINCOLN, S, D., 1999, Characterization of volatile sulphur containing compounds produced during decomposition of Brassica juncea tissues in soil, *Soil Biology and Biochemistry*, 31: 695-703

BENGTSSON, J., AHNSTROM, J., & WEIBULL, A, C., 2005, "The effects of organic agriculture on biodiversity and abundance: a meta-analysis", *Journal of Applied Ecology*, 42 (2): 261-9.

BETT, K, E., & FREYER, B., 2007, Recognizing and realizing the potential of organic agriculture in Kenya, Archived at http://orgprints.org/9816/

BINAM, J, N., TONYE, J., WANDJI, N., NYAMBI, G., & AKOA, M., 2004, Factors affecting the technical efficiency among smallholder farmers in the slash and burn agriculture zone of Cameroon, Food Policy 29 (2004) 531–545

BLESS, C., & HIGSON-SMITH, C., 2000, Fundamentals of social research methods: An African Perspective, 3rd Edition, Juta Education (Pty) Ltd, Cape Town, pp.37-42

BOLWIG, S., GIBBON, P., & JONES, S., 2009, The Economics of Smallholder Organic Contract Farming in Tropical Africa, *World Development* 37 (6): 1094–1104, 2009

BOZ, I., 2002, Does early adoption influence farmers' use of the extension service? *Journal of International Agricultural Extension Education,* 9: 77-82

BOZ, I., & OZCATALBAS, O., 2010, Determining information sources used by crop producers: A case study of Gaziantep province in Turkey, *Africa Journal of Agricultural Research* 5(10): 980-987

BRUENING, T, H., 1991, Communicating with farmers about environmental issues, *Journal of Applied Communication* 75, 34–41.

BULLUCK III, L, R., BROSIUS, M., EVANYLO, G, K., & RISTAINO, J, B., 2002, Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. *Applied Soil Ecology* 19 (2002) 147–160

BUNCH, R., & LÓPEZ, G., 1999, Soil recuperation in central America: How innovation was sustained after project intervention. In: Hinchcliffe, F., Thompson, J., Pretty, J., Guijt, I. and Shah, P. (eds). Fertile Ground: The Impacts of Participatory Watershed Management, pp. 32-41, Intermediate Technology Publications, London, UK.

BURNHAM, J, C., & EPPERSON, J, E., 1998, 'A Profile of Foreign Direct Investment by the U.S Fruit and Vegetable Industry", *Agribusiness International Journal* 14(5): 379-388

BURTON, M., RIGBY, D., YOUNG, T., 1999, Analysis of the determination of adoption of organic horticulture techniques in the UK, *Journal of Agricultural Economics* 50(1): 47-63.

BUSSOLO, M., GODART, O., LAY, J., THIELE, R., 2007, The impact of coffee price changes on rural household in Uganda, *Agricultural Economics* 37: 293-303.

BUTTEL, F., LARSON O., & GILLESPIE, G., 1990, The sociology of agriculture, New York, Greenwood Press.

BUYINZA, M., & WAMBEDE, N., 2008, Extension for agroforestry technology adoption: Mixed intercropping of crotalaria (*Crotalaria grahamiana*) and maize (*Zea mays* L.) in Kabale District, Uganda, *Environmental Response Journal* **2**(3):131-137.

CASE, D, O., 2002, Looking for information: A survey of research on information seeking, needs, and behaviour. Amsterdam: Academic Press

CASWELL, J, A., & HOOKER, N, H., 1996, 'HACCP as an International Trade Standard,' *American Journal of Agricultural Economics* 78 (3): 775-779

CAVENDISH, W., 2000, Empirical regularities in the poverty-environment relationship of poor households: Evidence from Zimbabwe, *World Development* 28:1979–2003.

CAVIGLIA, J, L., & KAHN, J, R., 2001, Diffusion of Sustainable Agriculture in the Brazilian Rain Forest: A Discrete Choice Analysis, *Economic Development and Cultural Change* 49: 311–33.

CHAKRABARTI, A., 2001, The determinants of foreign direct investment: Sensitivity analyses of cross-country regressions, *Kyklos*, *54*, 89–113.

CHEN, M, F., 2007, "Consumer attitudes and purchase intentions in relation to organic foods in Taiwan: moderating effects of food-related personality traits", *Food Quality and Preference*, 18 (7): 1008-21.

CLEVELAND, C, J., 1995, Resource degradation, technical change, and the productivity of energy use in US agriculture, *Ecological Economics* 13, 185–201.

COCHRANE, W., 1993, The development of American Agriculture: A Historical Analysis. University of Minnesota, Pess, Minneapolis, MN

COMMENGES, D., SCOTET, V., RENAUD, S., JACQMIN-GADDA, H., BARBERGER-GATEAU, P., & DARTIGUES, J, F., 2000, Intake of flavonoids and risk of dementia, *European Journal of Epidemiology*, *16*, 357-363

CONNER, D., & CHRISTY, R., 2004, The Organic Label: How to Reconcile its Meaning with Consumer Preferences, *Journal of Food Distribution Research 35(1)* 40-43, 4p.

CONNOR, J, O., 2004, Organic Matter ,Bi-monthly Magazine of Irish Organic farmers and a growers association West Cork, waterfall, Beara. 2(14)

CREAMER, N, G., BENNETT, M, A., STINNER, B, R., CARDINA J., & REGNIER, E, E., 1996a, Mechanisms of weed suppression in cover crop-based production systems, *Horticultural Science,* 31:410-413

CROWLEY, E, L., SOULE, M, J., & CARTER, S, E., 1996, Off-farm income and farming in western Kenya. Report tp USAID/Kenya, Nairobi

CRUTCHFIELD, S., BUZBY J., FRENZEN P., ALLSHOUSE J., &ROBERTS D., 2000, The Economics of Food Safety and International Trade in Food Products, United States Department of Agriculture Economic Research Service 1800 M Street NW Washington, DC, 20036

D'AGOSTINO, A, L., & SOVACOOL, B, K., 2011, Sewing climate-resilient seeds: implementing climate change adaptation best practices in rural Cambodia, Mitigation Adaptive Strategy Global Change DOI 10.1007/s11027-011-9289-7Springer Science+Business Media B.V. 2011

DABBERT, S., HÄRING, A, M., & ZANOLI, R., 2004, Organic Farming: Policies and Prospects, Zed Books, London and New York. 175p.

DABERKOW, S, G., & MCBRIDE, W, D., 2003, Farm and operator characteristics affecting the awareness and adoption of precision agriculture technologies in the US, *Precision Agriculture* 4, 164-177.

DABNEY, S, M., DELGADO, J, A., & REEVES, D, W., 2001, Using winter cover crops to improve soil and water quality, *Communication Soil Science Plant Analysis* 32:1221–1250.

DE BOEF, W., AMANOR, K., WELLARD, K., & BEBBINGTON, A., 1993, Cultivating Knowledge, London: CGN/ODI/WAU/IT Publications, 206 pp

DE COCK, L., 2005, Determinants of organic farming conversion. Paper prepared for poster presentation at the XIth International Congress of the EAAE (European Association of Agricultural Economists), 'The Future of Rural Europe in the Global Agri-Food System', Copenhagen, Denmark, August 24-27, 2005.

DE FRANCESCO, E., GATTO, P., RUNGE, F., & TRESTINI, S., 2008, Factors affecting farmers' participation in agri-environmental measures: A Northern Italian perspective, *Journal of Agricultural Economics*, 59: 114- 131.

DEFOER, T., 2002, Learning about methodology development for integrated soil fertility management, *Agricultural Systems,* 73: 57–81

DELVE, R., & BASHIR, J., 2002, Developing organic resource management options with farmers in eastern Uganda, 17th WCSS, 14-21 August 2002, Thailand, pp. 1173(1)-1173(7).

DELVE, R, J., & JAMA, B., 2002, Developing organic resource management options with farmers in eastern Uganda, Proceedings of the 17th World Congress of Soil Science, Bangkok, Thailand, 2002

DIEDEREN, P.,VAN MEIJL, H., WOLTERS, A., & BIJAK, K., 2003, Innovation adoption in agriculture: innovators, early adopters and laggards. *Cahiers d'economie et sociologie rurales*, 67: 29-50

DIMARA, E., PETROU, A., & SKURAS, D., 2003, The socio-economics of niche market creation A social ecology paradigm for the adoption of organic cultivation in Greece, *International Journal of Social Economics* 30 (3): 219-235

DITTOH, S., 1999, Sustainable soil fertility management: Lessons from action research. ILEIA newsletter 15(1/2): 51–52

DIXON, J., TANIGUCHI, K., WATTENBACH, W., & TANYERI-ARBUR, A., 2004, Small-holders, globalization and policy analysis, AGSF Occasional Paper 5, [online], http:www.fao.org/docrep/007/y5784e/y5784e00.htm#Contents. Accessed 9 may 2010.

DOLAN, C, S., & SORBY, K., 2003, Gender and employment in high-value agriculture industries, Agriculture and Rural Development *Working Paper No. 7*. Washington D.C.: World Bank

DOSS, C, R., MORRIS, M, L., 2001, How does gender affect the adoption of agricultural innovation? The case of improved maize technology in Ghana, *Agricultural Economics,* 25, 27–39

DRECHSEL, P., & GYIELE, L., 1999, The economic assessment of soil nutrient depletion, Analytical issues for framework development, Issues in sustainable land management, no. 7. Bangkok: IBSRAM, 80 pp

DUBOIS, D., GUNST, L., FRIED, P., STAUFFER, W., SPIESS, E., MADER, P., ALFOLDI, T., FLIEBBACH, A., FREI. R., & NIGGLI, U., 1999, DOK-Versuch: Ertragsentwicklung und Energieeffizienz. Agrarforschung 6, 71-74

DULLE, F, W., 2000, The extension triad approach in disseminating agricultural information to extension workers: some experiences from the Southern Highlands Dairy Development Project, Tanzania. *Journal of Information Science*, April 2000 26 (2): 121-128.

EGRI, C, P., 1999, 'Attitudes, Backgrounds and Information Preferences of Canadian Organic and Conventional Farmers: Implications for Organic Farming Advocacy and Extension,' *Journal of Sustainable Agriculture* 13(3): 45–72.

EKWE, K,C., & NWACHUKWU, I., 2006. Influence of household factors on the Utilization of Improved Garri Processing Technology in South-eastern Nigeria, *Journal of Agricultural. Extension,* 9:134-141.

EL-SHAKWEER, M, H, A., EL-SAYAD, E, A., & EWEES, M, S, A., 1998, Soil and plant analysis as a guide for interpretation of the improvement efficiency of organic conditioners added to different soils in Egypt. *Communications in Soil Science and Plant Analysis* 29(11):2067-2088.

EZZATI, M., LOPEZ, A, D., RODGERS, A., HOORN, S, V., & MURRAY, C, J, L., 2002, Selected major risk factors and global and regional burden of disease, Lancet 360 (9343): 1347 1360.

FAO (Food and Agriculture Organization of the United Nations) 2004, FAOSTAT data accessed November 2004, <http://www.fao.org>

FAO, 1999, Organic Agriculture, Food and Agriculture Organization of the United Nations, Rome, <http://www.fao.org/unfao/bodies/COAG/COAG15/X0075E.htm>. Accessed [26 February 1999]

FAO, 2008, The state of food insecurity in the world. 59pp. Accessed http://www.fao.org/docrep/011/i0291e/i0291e00.htm

FAO, 2006, Local seed systems and external influences: A case study from the United Republic of Tanzania. Links Project Report No. 52. Rome: Food and Agriculture Organization.

FAO, 1995, Livestock: a driving force for food security and sustainable development. In. Sansoucy, R. (Ed.), Feed Resources Group. FAO, Rome, World Animal Review: Corporate Document Repository 84:85, pp. 5–17.

FAOSAPA (Food and Agriculture Organization Sub-Regional Office for the Pacific), 2005, Helping small farmers think about better growing and marketing: Case studies on commercialization of small farmers, Pacific Farm Management and Marketing Series, No. 5, FAO Sub Regional Office for the Pacific, Apia, Samoa.

FEDER, G., JUST, R., & ZILBERMAN, D., 1985, Adoption of agricultural innovations in developing countries: a survey, *Economic Development and Cultural Change*, 33: 255-297.

FEDER, G., MURGAI, R., & QUIZON, J, B., 2004, The acquisition and diffusion of knowledge: the case of pest management training in farmer field schools, Indonesia. *Journal of Agricultural Economics* 55: 221–243

FEHR, M., & ROMAO, D, C., 2001, Measurement of Fruit and Vegetable Losses in Brazil: A Case Study. *Environment, Development and Sustainability* 3 (3): 253-263.

FiBL, 2007, Organic farming saves resources and the climate – Promoting organic farming means mitigating climate change!, At BioFach 2007 in Nuremberg, the world's largest trade fair for organic farming and food, a workshop tackles the issue of Climate Change and Organic Farming.

FISCHER, A., & ARNOLD A., 1996, "Information and the Speed of Innovation Adoption", American *Journal of Agricultural Economics*, 78 (4), 1073-1082.

FISHBEIN, M., & AJZEN, I., 1975, Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Reading, MA: Addison- Wesley.

FISHER, K, E., 2004, "Information behaviour of Migrant Hispanic Farm Workers and Their Families in the Pacific Northwest" *Information Research*, 10(1) paper 199 [Available at http://InformationR.net/ir/10-1/paper199.html]

FLORES, R, A., & GAST, K, L, B., 1997, Postharvest management of commercial horticulture crops:storage options –fruits and vegetables. Kansas State University Agricultural Experiment Station and Cooperative Extension Service MF1030: 1-6.

FLOYD, C, N., HARDING, A, H., PADDLE, K, C., RASCAL, D, P., SUBEDI, K, D., & SUBBEDI, P, P., 1999, The adoption and associated impacts of technologies in the Western Hills of Nepal, Agricultural Research and Extension Network. Paper No. 90 London: Overseas Development Institute, pp: 3-7.

FORD, N., MILLER, D., & MOSS, N., 2001, The role of individual differences in internet searching :an empirical study, *Journal of the American Society for Information Science and Technology*, 52(12), 1049-1066.

FRIES & AKIN, 2004, Value chain and their significance for addressing the rural finance challenge, Accelerated Micro enterprise Advancement Project (AMAP)

FUGLIE, K., & KASCAK, C., 2001, Adoption and diffusion of natural- resource-conserving agricultural technology, *Review of Agricultural Economics* **23**(2):386-403.

GAKURU, M., WINTERS, K., & STEPMAN, F., 2009, Innovative Farmer Advisory Services using ICT, *W3C Workshop "Africa Perspective on the Role of Mobile Technologies in Fostering Social Development" April 1-2 2009, Maputo, Mozambique,* 13pp.

GALLAGHER, K., OOI, P., MEW, T., BORROMEO, E., KENMORE, P., & KETELAAR, J, W., 2005, Ecological basis for low-toxicity integrated pest management (IPM) in rice and vegetables, In The pesticide detox (ed. J. Pretty), London,UK: Earthscan pp.116-134, 294pp.

GENIUS, M., PANTZIOS, C., & TZOUVELEKAS, V., 2006, Information Acquisition and Adoption Of Organic Farming Practices, *Journal Of Agricultural And Resource Economics*, 31(1): 93-113.

GILL, J., 2001, Generalized linear model: A unified approach, Thousand Oaks, Califonia, Sage Publication,

GIOVANNUCI, D., 2005, Organic agriculture and poverty reduction in Asia: China and India focus, International Fund for Agricultural Development (IFAD), Rome. 138p.

GLIESSMAN, S, R., 2005, Agroecology and agroecosystems, In The earthscan reader in sustainable agriculture (ed. J. Pretty). London, UK: Earthscan.

GOCKOWSKI, J, J., MBAZO'O, G., MBAH, & MOULENDE, T., 2003, African traditional leafy vegetables and the urban and peri-urban poor, *Food Policy* 28:221–235

GOLDBERGER, J, R., 2007, Non-governmental organizations strategic bridge building and the scientization of organic agriculture in Kenya, *Agriculture and Human Values* **25**:271-289

GOLDBERGER, J, R., 2008, Diffusion and adoption of non-certified organic agriculture: A case study from semi-arid Makueni District, Kenya, *Journal of Sustainable Agriculture* **32**(4):531-564.

GOODLAND, R., 1997, "Environmental sustainability in agriculture: diet matters', *Ecological Economics*, 23: 189-200.

GOSWAMI, A., & SAGAR, R, L., 1994, "Factors related with knowledge about feeding of green fodder and concentrates in relation to nutritional status, *Indian Journal of Animal Health.* 33 (1): 45-48.

GOULDING, K., JARVIS, S., & WHITMORE, A., 2008, Optimizing nutrient management for farm systems, *Philosophical Transactions of the Royal Society B* 2008 **363**, 667-680

GRANNALL, D., 1995, Rural participation in vocational education and training, Sydney, Rural training council of NSW Ltd

HAIR, J, F., ANDERSON, R, E., TATHAM, R, L., & BLACK, W, C., 1998, Multivariate Data Analysis, New Jersey: Prentice Hall Inc.

HAK-SU, K., 2002, Organic agriculture and rural poverty alleviation, Potential and best practices in Asia, United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Bangkok 21p.

HALBERG, N., ALRØE, H, F., KNUDSEN, M, T., & KRISTENSEN, E, S., 2006, Synthesis: prospects for organic agriculture in a global context, CAB International 2006. *Global* Development of Organic Agriculture: Challenges and Prospects pp.343-357

HATTAM, C., 2006, Adopting certified organic production: evidence from small-scale avocado producers in Michoacaan, Mexico, Unpublished PhD Thesis, University of Reading.

HATTAM, C., & HOLLOWAY, G., 2004, Adoption of certified organic production: evidence from Mexico, *Working Paper No. 4367*, Department of Agricultural and Food Economics, University of Reading, UK.

HEINIGER, R, W., HAVLIN, J, L., CROUSE, D, A., KVIEN, C., & KNOWLES, T., 2002, Seeing is believing: the role of field days and tours in precision agriculture education, *Precision Agriculture*, 3 (2002), 309–318

HEINSTROM, J., 2003, Five personality dimensions and their influence on information behaviour, *Information Research*, 9(1), paper 165

HEITSCHMIDT, R, K., SHORT, R, E., & GRINGS, E, E., 1996, Ecosystems, sustainability, and animal agriculture, *Journal of Animal Science* 1996, 74:1395-1405.

HERTOG, M, G, L., & HOLLMAN, P, C, H., 1996, Potential health effects of the dietary flavonol quercetin, *European Journal of Clinical Nutrition* **1996**, *50*, 63- 71

HINE, R., & PRETTY, J., 2007, Capacity Building Study 3: Organic Agriculture and Food Security in East Africa. In 'Promoting Production and Trading Opportunities for Organic Agricultural Products in East Africa'. University of Essex, Horticultural techniques in the UK, *Journal of Agricultural Economics*, 50(1), 47-63.

HOEFKENS, C., VERBEKE, W., AERTSENS, J., MONDELAERS, K., & VAN CAMP, J., 2009, The nutritional and toxicological value of organic vegetables Consumer perception versus scientific evidence, *British Food Journal* 111 (10): 1062-1077

HOGSET, H., 2005, Social Networks and Technology Adoption, A project among Cornell University, the Kenya Agricultural Research Institute and the World Agroforestry Centre, funded by the USAID BASIS Collaborative Research Support Program. Policy Brief No. 6

HOLE, D, G., PERKINS, A,J., WILSON, J, D., ALEXANDER, I, H., GRICE, F., & EVANS, A, D., 2005, "Does organic farming benefit biodiversity?" *Biological Conservation*, 122 (1): 113-30.

HONLONKOU, A, N., 2004, Modelling Adoption of Natural Resources Management Technologies: The Case of Fallow Systems, *Environment and Development Economics* 9: 289–314

HUMMEL, T, J., & LICHTENBERG, J, W., 2001, Predicting categories of improvement among counselling center clients, Paper presented at the annual meeting of the American Educational Research Association, Seattle, W. A.

HYNES, 2009, Organic farming, Encarta Encyclopaedia

IFOAM, 2002, IFOAM – Norms for Organic Production and Processing, International Federation of Organic Agriculture Movements, Bonn (www.ifoam.org)

IFOAM, 2009, Global Organic Agriculture: Continued Growth. BioFach World Organic Trade Fair 2009 in Nurenberg, Germany

IFOAM, 2008, Cultivate the future, IFOAM organic world congress, Modena, June 2008

IFOAM, 2003, Organic and Like-Minded Movement in Africa, International Federation of Organic Agriculture Movements (IFOAM), Bonn, 2003: 102-108

IKOJA-ODONGO, R., & OCHOLLA, D, N., 2003, Information needs and information-seeking behavior of artisan fisher folk in Uganda, *Library & Information Science Research,* 25(1), 89e105

ISIN, F., CUKUR, T., & ARMAGAN, G., 2007, Factors affecting the adoption of the organic dried fig agricultural system in Turkey, *Journal of Applied Science*, 7: 748-754.

JABBAR, M, A., BEYENE, H., SALEEM, M, A, M., & GEBRESELASSIE, S., 1998, Adoption pathway for new agricultural technologies: An approach and an application to vertisol management technology in Ethiopia, Socio-economic and policy research working paper No. 23. Livestock policy analysis project, ILRI, Addis Ababa, Ethiopia

JUNGE, B., DEJI, O., ABAIDOO, R., CHIKOYE, D., & STAHR, K., 2009, Farmers' Adoption of Soil Conservation Technologies: A Case Study from Osun State, Nigeria, The *Journal of Agricultural Education and Extension,* 15:3, 257-274

KADER, A., 2003, A Perspective on Postharvest Horticulture (1978–2003), *Horticultural Science* 38 (5): 1004- 1008.

KAFLE, B., 2011, Diffusion of Uncertified Organic Vegetable Farming among Small Farmers in Chitwan District, Nepal: A Case of Phoolbari Village. *International Journal of Agriculture: Research and Review.* 1 (4), 157-163, 2011 Available online at http://www.ecisi.com ISSN 2228-7973 ©2011 ECISI Journals

KALIBA, A, R, M., FEATHERSTONE, A, M., & NORMAN, D, W., 1998, Profitability of Milk Production Using Improved Stall-Fed Cattle in Semiarid Central Tanzania, Regional *Journal of Agricultural Economics and Development* 2: 3-12.

KALUSOPA, T, 2005,"The challenges of utilizing information communication technologies (ICTs) for the small-scale farmers in Zambia", *Library Hi Tech*, 23 (3): 414 – 424

KANGAI, R, A., MUGENDI, D, N., MUCHERU, M, W., OTOR, S, C, J., WASWA, B, S., & KUNG'U, J., 2003, Trends in adoption of soil fertility improvement strategies in Chuka, Eastern Kenya, African Crop Science Conference Proceedings **6**:661-667.

KAPLINSKY, R., & MORRIS, M., 2001, A Handbook for value chain Research, Institute of Development Studies, Brighton

KARBO, N., BRUCE, J., & OTCHERE, E, O., 1999, The role of livestock in sustaining soil fertility in northern Ghana, ILEIA newsletter 15(1/2): 49–50

KASSIE, M., ZIKHALI, P., MANJUR, K., & EDWARDS, S., 2009, Adoption of sustainable agriculture practices: Evidence from semi-arid region of Ethiopia, *Natural Resources Forum* 33(3): 189-198

KASSIE, M., YESUF, M., & KOHLIN, G., 2008, The role of production of risk in sustainable land management technology adoption in the Ethiopian highlands, EfD Discussion paper 08-15. Resources for the Future, Washington DC

KATYAL, J. C., 2000, Organic matter maintenance: Mainstay of soil quality, *Journal of the Indian Society of Soil Science*, 2000, 48, 704–716.

KHOR, M., 2009, The Food Crisis, Climate Change and the Importance of Sustainable Agriculture, Environment and Development Series 8, Third World Network 131 Jalan Macalister 10400 Penang, Malaysia. 10p. Website: www.twnside.org.sg

KILCHER, L., 2007, How organic agriculture contributes to sustainable development, *Journal of Agricultural Research in the Tropics and Subtropics, Supplement* 89:31-49

KILPATRICK, S., & ROSENBLATT, T., 1998, Information vs training: Issues in farmer learning, The *Journal of Agricultural Education and Extension*, 5:1, 39-51

KILPATRICK, S., 1996, Change, Training and Farm Profitability, Canberra, National Farmers Federation

KISAKA-LWAYO, M., 2007, A discriminant analysis of factors associated with the adoption of certified organic farming by smallholder farmers in Kwazulu-Natal, South Africa. AAAE Conference Proceedings, pp. 411- 416

KNEKT, P., KUMPULAINEN, J., JARVINEN, R., RISSANEN, H., HELIOVAARA, M., REUNANEN, A., HAKULINEN, T., AROMAA, A., 2002, Flavonoid intake and risk of chronic disease, *American Journal of Clinical Nutrition* **2002**, *76*, 560-568

KNOWLER, D., & BRADSHAW, B., 2007, Farmers' adoption of conservation agriculture: A review and synthesis of recent research, *Food Policy* 32 (1): 25-48

KOTSCHI, J., & MÜLLER-SÄMANN, K., 2004, The Role of Organic Agriculture in Mitigating Climate Change. IFOAM, Bonn. 64 p. available at www.ifoam.org/Neil: PATH ??

KRISTIANSEN, P., TAJI, A., REGANOLD, J., 2006, Organic agriculture: opportunities and challenges. In: Kristiansen, P., Taji, A., Reganold, J. (Eds.), Organic Agriculture: A Global Perspective. CSIRO Publishing, Australia, pp. 421–441.

KRISTJANSON, P., OKIKE, I., TARAWALI, S., SINGH, B.B. & MANYONG, V.M., 2005, Farmers' Perceptions of benefits and factors affecting the adoption of improved dual-purpose cowpea in the dry Savannahs of Nigeria, *Agricultural Economics*, 32: 195-210

KROMA, M, M., & FLORA, C, B., 2001, An assessment of SARE-funded farmer research on sustainable agriculture in the north central U.S, *American Journal of Alterative Agriculture* 16:73–80.

KROMM, D., & WHITE, S., 1991, Reliance on sources of information for water-saving practices by irrigators in the high plains of the USA, *Journal of Rural Studies* **7**(4):411-421.

LAAJIMI, A., BEN NASR, J., & GUESMI, A., 2008, Assessment of sustainability in organic and conventional farms in Tunisia: The case of olive-growing farms in the region of Sfax. 12th EAAE Congress 'People, Food and Environments: Global Trends and European Strategies', Gent, Belgium, 26-29 August 2008.

LAMPKIN, N, H., & PADEL, S., 1994, The economics of organic farming: An International Perspective. CAB International: Wallingford, UK. XVl, 468 p.

LANGDALE, G. W., BLEVINS R. L., KARLEN D. L MCCOOL K.K., NEARING M.A, SKIDMORE E.L., THOMAS A.W., TYLER D.D., & WILLIAMS J.R. 1991, Cover crop effects on soil erosion by wind and water, In W.L. Hargrove (Ed.), *Cover Crops for Clean Water*, Pp. 15-22, Soil and Water Conservation Society, Ankeny, IA.

LANGYINTUO, A, S., & MUNGOMA, C., 2008, The effect of household wealth on the adoption of improved maize varieties in Zambia, *Food Policy*, 33: 550-559

LEATHERS, H, D., & SMALE, M., 1991, A Bayesian approach to explaining sequencial adoption of components of a Technological Package, *American Journal of Agricultural Economics*, 68: 519-527.

LEE, D, R., 2005, Agricultural sustainability and technology adoption: Issues and policies for developing countries, *American Journal of Agricultural Economics* 87 (5):1325-1334

LIEBLIN, G., ØSTERGAARD, E., & FRANCIS, C., 2004, Becoming an agro ecologist through action education. *International Journal of Agricultural Sustainability* 2(3), 147-153

LOHR, L., 2001, Factors affecting international demand and trade in organic food products, In: Regmi, A., Ed.. *Changing Structure of Global Food Consumption and Trade*, Washington, DC: United States Department of Agriculture (USDA), Economic Research Service pp. 67–79, 106p

LOHR, L., & SALOMOSSON, L., 2000, Conversion subsidies for organic production: results from Sweden and lesson for the United States, *Agricultural Economics*, 22: 133-146.

LONGTAU, S, R., 2003, A review and Description of Rice Production System in Nigeria, Eco-Systems Development Organisation, Jos, Plateau State, Nigeria, pp 50. http://www:odi.org.UK/resources/download/3045 pdf retrieved 9/01/2011.

LOPEZ & REGUENA, 2005, Diffusion and Adoption of Organic Farming in the Southern Spanish Olive Groves, Journal of Sustainable Agriculture, 30 (1): 2007.

LOTTER, D., SEIDEL, R., & LIEBHARDT, W., 2003, The Performance of Organic and Conventional Cropping Systems in an Extreme Climate Year, *American Journal of Alternative Agriculture* 18 (3): 146 – 154.

LOUPASSAKI, M, H., DIGALAKI, N, B., PSARRAS, G., & ANDROULAKIS, I, I., 2005, Nutrient Requirements, Fertilizing Practices used and Nutritional Status of Organic and Conventional Olive Orchards in the Area of Crete, ISOFAR: Proceedings of the Conference "Researching Sustainable Systems", Adelaide 2005 pp. 197-235, 657p.

LOUREIRO, M, L., MCCLUSKEY, J, J., & MITTELHAMMER, R, C., 2001, Assessing Consumer Preferences for Organic, Eco-labeled, and Regular Apples, *Journal of Agricultural and Resource Economics* 26(2):404-416 Copyright 2001 Western Agricultural Economics Association

LUMPKIN, T, A., WEINBERGER, K., & MOORE, S., 2005, Increasing income through fruit and vegetable production opportunities and challenges, Consultative group on international agricultural research science forum cgiar priorities: science for the poor.

LUMPKIN, H., 2005, Organic Vegetable Production: A Theme for International Agricultural Research. Seminar on production and export of organic fruit and vegetables in Asia, FAO corporate Document Repository, http:www.fao.org/DOCREP/006/AD429E/ad429e13.htm

MACEY, A., 2004, "Certified Organic" The Status of the Canadian Organic Market in 2003. Report to Agriculture & Agri-Food Canada Contract # 01B6830423 March 2004. 32p.

MACHRAOUI, S, B, M., ERROUISSI, F., BEN-HAMMOUDA, M., & NOUIRA, S., 2010, Comparative effects of conventional and no-tillage management on some soil properties under Mediterranean semi-arid conditions in north-western Tunisia, *Soil & Tillage Research* **106**:247–253.

MADER, P., FLIESSBACH, A., DUBOIS, D., GUNST, L., FRIED, P., & NIGGLI, U., 2002, "The ins and outs of organic farming", *Science*, 298 (5600): 1889-90.

MAFONGOYA, P, L., BATIONO, A., KIHARA, J., WASWA, B, S., 2006, Appropriate technologies to replenish Soil fertility in Southern Africa, *Nutrient Cycling in Agro ecosystem* 76: 127-151

MAGNUSSON, M, K., ARVOLA, A., & KOIVISTO-HURSTI, U, K., 2001, Attitudes towards organic foods among Swedish consumers, *British Food Journal*, 103:209– 226

MAKATOUNI, A., 2002, What motivates consumers to buy organic food in the UK?: Results from a qualitative study, *British Food Journal,* 104:345–352.

MANDIRINGANA, O.T., MABI, M. & SIMALENGA, T.E. 2006, Evaluation of Soil Water Conservation Tillage Systems for Communal Farmers in the Eastern Cape, South Africa, AMA, *Agricultural Mechanization in Asia, Africa and Latin America,* 37(4): 27-32

MANYONG, V, M., & HOUNDEKON, A, V., 1997, Land Tenure systems and the adoption of mucuna planted fallow in the derived savannas of West Africa, Paper presented at the Workshop on property rights, collective action and technology adoption. 2 – 25 November. (ICARDA: Aleppo, Syria).

MARDIA, K, V., KENT, J., & BIBBY, J, M., 1982, Multivariate Analysis, London: Academic Press.

MARINARI, S., MANCINELLI, R., CAMPIGLIA, E., & GREGO, S., 2006, Chemical and biological indicators of soil quality in organic and conventional farming systems in Central Italy, *Ecological Indicators* 6 (2006) 701–711

MARRA, M., & CARLSON, G., 1990, The decision to double crop: an application of expected utility using stein's theorem, *American Journal of Agricultural Economics*, 72: 337-345.

MARSH, S., PANNELL, D., & LINDNER, R., 2000, The impact of agricultural extension on adoption and diffusion of lupines as a new crop in WA, *Australian Journal of Experimental Agriculture* **40**:571-583.

MARSH, S, P., 1998, What can agricultural researchers do to encourage the adoption of sustainable conversion from conventional to sustainable agriculture, *Advances in Agronomy*, 43, 155-198AND G

MARTINI, E, A., BUYER, J, S., BRYANT, D, C., HARTZ, T, K., & DENISON, R, F., 2004, Yield increases during the organic transition: improving soil quality or increasing experience? *Field Crops Research* 86:255–266.

MASANGANO, C., 1996, Diffusion of Agro-forestry Technologies, Online document at URL http: //www.msu.edu/user/masangn/agrof.html.

MATATA, P, Z., AJAYI, O, C., ODUOL, P, A., & AGUMYA, A., 2010, Socio economic factors influencing adoption of improved fallow practices among smallholder farmers in western Tanzania, *African Journal of Agricultural Research* **5**(8):818-823.

MBAGA-SEMGALAWE, Z., & FOLMER, H., 2000, Household adoption behaviour of improved soil conservation: The case of the North Pare and West Usambara Mountains of Tanzania. *Land Use Policy* **17**:321-336.

MCCULLOCH, N., & OTA, M., 2002, Export horticulture and poverty in Kenya" IDS Working Paper 174, Brighton, Sussex: Institute of Development Studies.

MCGUIRK, A, M., PRESTON, W, P., & MCCORMICK, A., 1990, Toward the development of marketing strategies for safety attributers, *Agribusiness*, 6(4): 297-308.

MEHTA, J, N., & KELLERT, S, R., 1998, Local attitudes towards community-based conservation policy and programs in Nepal: A case study in the Makalu-barun conservation area. *Environmental Conservation* 25, 320–333.

MEI, Y., JEWISON, M., & REENE, C., 2006, Organic products market in China, USADA Foreign Agricultural Service, GAIN Report, CH6405, June

MELANDER, B., RASMUSSEN, I, A., & BARBERI, P., 2005, Integrating physical and cultural methods of weed control—examples from European research, *Weed Science* 53:369–381

MELERO, S., RUIZ PORRAS, J, C., HERENCIA, J, F., & MADEJON, E., 2005, Chemical and biochemical properties in a silty loam soil under conventional and organic management, *Soil & Tillage Research* 90 (2006) 162–170

MICHELSEN, J., 2001a, 'Recent development and political acceptance of organic farming in Europe', *Sociologia Ruralis,* 41 (1): 3–20.

MILLAR, D., AYARIGA, R., & ANAMOH, B., 1996, Grandfather's way of doing: gender relations and the yaba-itgo system in Upper East Region, Ghana. In: Reij C, Scoones I and Toulmin C (eds) Sustaining the soil, Indigenous soil and water conservation in Africa, pp 117-125. London: Earthscan Publications

MITCHELL, A, E., HONG, Y, J., KOH, E., BARRETT, D, M., BRYANT, D, E., DENISON, R, F., & KAFFKA, S., 2007, Ten-Year Comparison of the Influence of Organic and Conventional Crop Management Practices on the Content of Flavonoids in Tomatoes, *Journal of Agricultural and Food Chemistry* 2007, 55, 6154-6159

MKHABELA, T, S., & MATERECHERA, S, A., 2001, Factors influencing the utilization of cattle and chicken manure for soil fertility management by emergent farmers in the moist

Midlands of KwaZulu-Natal Province, South Africa, *Nutrient Cycling in Agro Ecosystems* **65**:151-162.

MMBAGA, T, E., & FRIESEN, D., 2003, Maize/legume systems for improved maize production in northern Tanzania, African Crop Science Conference Proceedings **6**:587-591

MOKNI-TLILI, S., JAOUA, L., MURANO, F., JEDIDI, N., & HASSEN, A., 2009, Study of the effects of urban organic residues on the distribution of culturable actinomycetes in a Tunisian agricultural soil, *Waste Management and Research* **27**:224–232.

MOMODU, M, O., 2002, Information needs and information seeking behaviour of rural dwellers in Nigeria: a case study of Ekpoma in Esan West local government area of Edo State, Nigeria, *Library Review* 51(8).

MONDELAERS, K., VERBEKE, W., & VAN HUYLENBROECK, G., 2009, Importance of health and environment as quality traits in the buying decision of organic products, *British Food Journal* 111 (10): 1120-1139 *q* Emerald Group Publishing LIMITED

MOSE, L, O., NZABI, W., ONYANGO, M., GOR, A, B., MORURI, S, A, N., MAKWORO, S, O., OKOKO, E, N, K., and KWACH, D, J, K., 2000, Inorganic and Organic Fertiliser Use: Potential for Adoption at Smallholder Level in South West Kenya, Kenya agricultural information network 9pp

MOWO, J, G., JANSSEN, B, H., OENEMA, O., GERMAN, L, A., MREMA, J, P., & SHEMDOE, R, S., 2006, Soil fertility evaluation and management by smallholder farmer communities in northern Tanzania, *Agriculture, Ecosystems and Environment* **116**:47–59.

MRABET, A., REJILI, M., LACHIHEB, B., TOIVONEN, P., CHAIRA, N., & FERCHICHI, A., 2008, Microbiological and chemical characterizations of organic and conventional date pastes (*Phoenix dactylifera* L.) from Tunisia. *Annals of Microbiology* **58**(3):453-459.

MUGWE, J., MUCHERU-MUNA, M., MUGENDI, D., KUNG'U, J., MAIRURA, F., & BATIONO, A., 2009, Adoption potential of selected organic resources for improving soil fertility in the central highlands of Kenya, *Agro forest Systems* **76**:467-485

MUHR, L., TARAWALI, S, A., PETERS, M., & SCHULZE-KRAFT, R., 2001, Acceptability of Forage Legumes for Improved Fallows- First experiences of agro-pastoralists in Sub humid South West Nigeria, *Experimental Agriculture* 37 (4): 495-507

MULDER, C, H., DE ZWART, D., VAN WIJNEN, H, J., SCHOUTEN, A, J., & BREURE, A, M., 2003, Observational and simulated evidence of ecological shifts within the soil nematode community of agro ecosystems under conventional and organic farming, *Functional Ecology* 17 (4): 516-525.

MULLER, A., 2009, Benefits of organic agriculture as a climate change adaptation and mitigation strategy in developing countries, *Earth and Environmental Science* **6** (2009) 372032

MUNEER S., 2008, Factors Affecting Adoption of Agroforestry Farming System as a Mean for Sustainable Agricultural Development and Environment Conservation in Arid Areas of Northern Kordofan State, Sudan, Saudi Journal of Biological Sciences 15 (1) 137-145 June, 2008

MUSSEI, A.J., NWANGA, W., MWANGI, H., VERKUIJI, R., MONGI, A., & ELANGA, 2001, Adoption of improved wheat technologies by small-scale farmers in Mbeya District, Southern Highlands. Tanzania Mexico D.F. International maize and Wheat improvement center (CIMMYT) and the United Republic of Tanzania.

NALUBWAMA, S, M., MUGISHA, A., & VAARST, M., 2011, Organic livestock production in Uganda: Potentials, challenges and prospects, *Tropical Animal Health Production* **43**:749-757.

NAPIER, T, L., NAPIER, A, S., TUCKER, M, A., 1991, The social, economic and institutional factors affecting adoption of soil conservation practices: Asian experiences, *Soil Tillage Response* 20, 365–382.

NARP, 1996, Staff Appraisal Report, National Agricultural Research Project: Newman, and Newman, J. (1985). Information work: the new divouris. *British Journals of Sociology*, 36 (4): 497-515.

NICHOLAS, T., & SANDERS, J, H., 1996, A probit analysis of the determinants of adoption when inputs are rationed: The Gerica experience with hybrid sorghum, *Science, Technology, and Development*, 14: 107-119.

NIEMEYER, K., & LOMBARD, J., 2003, Identifying problems and potential of the conversion to organic farming in South Africa, The 41st Annual Conference of the Agricultural Economic Association of South Africa (AEASA), October 2-3th, 2003, Pretoria, South Africa.

NJOKU, I, F., 2004, The information needs and information-seeking behaviour of fishermen in Lagos State, Nigeria, *The International Information and Library Review* **36**:297-307.

NJOKU, J, E., 1991, Factors Influencing the Adoption of Improved Oil Palm Production Technologies by Small-holders in Imo State, Nigeria, Proceeding of 4th National Conference of Farming Systems Research Network. Calabar, Nigeria.

NTEGE-NANYEENYA, W., MUGISA-MUTETIKKA, M., MWANGI, W., & VERKUIJI H., 1997, An assessment of factors affecting adoption of maize production technologies in Iganga district, Uganda, Addis Ababa, Ethiopia: National Agricultural Research Organization (NARO) and International Maize and Wheat Centre (CIMMYT).

NWACHUKWU, C, A., 2010, Adoption of Organic Agricultural Technologies: Implications for Radio farmer Agricultural Extension Programmes in Imo State, Nigeria, Scientific and Technical Information and Rural Development IAALD XIIIth World Congress, Montpellier,

NWANKWO, U, M., PETERS, K, J., & BOKELMANN, 2009, Information access and relevance affect adoption decision: Rethinking adopter categorization, *Research Journal of Agriculture and Biological Sciences* 5:411-22.

NWOSU, A, C 1995, Fertilizer supply and distribution policy in Nigeria, In sustainable agriculture and economic development in Nigeria ARSSRN, (Winrock International Institute for Agricultural Development: Arlington, U.S.A.).

NYIRENDA, M., KANYAMA, G., BOHRIGER, A., & HAULE, C., 2001, Economic performance of improved fallow agroforestry technology for smallholder maize production in central Malawi, *Journal of African Crop Science,* 5: 638-687

OBETA, M, E., & NWAGBO, F, C. 1991, The Adoption of Agricultural Innovations in Anambra State, Nigeria: *A Case Study of Improved IITA Cassava Technology Package, Proceedings of 4th Conference of National Farming System Network Calabar, Nigeria.*

ODOEMENEM, I, U., & OBINNE, C, P, O., 2010, Assessing the factors influencing the utilization of improved cereal crop production technologies by small scale farmers in Nigeria, *Indian Journal of Science and Technology* 3 (1) (Jan 2010)

OELOFSE, M., DE NEERGAARD, A., HØGH-JENSEN, H., ABREU, L, S., ALMEIDA, G, F., EL-ARABY, A., & HUI, Q, Y., 2010, A comparative study of farm nutrient budgets and nutrient flows of certified organic and non-organic farms in China, Brazil and Egypt, *Nutrient Cycling in Agro ecosystems* 87:455- 470.

OFUOKU, A, U., EGHO, E, O., & ENUJEKE, E, C., 2009, Integrated Pest Management (IPM) Adoption among Farmers in Central Agro-Ecological Zone of Delta State, Nigeria, *Advances in Biological Research* 3 (1-2): 29-33, 2009

OHMART, J, L., 2003, "Direct Marketing with Value-added products (or: "Give me the biggest one of those berry tarts!")", University of California Sustainable Agriculture Research and Education Program.

OKWU, O., KUKU, A, A., & ABA, J, L., 2007, An assessment of use of radio in agricultural information dissemination: A case study of radio Benue in Nigeria, *Africa Journal of Agricultural Research* 2(1): 14-18

OLADELE, O, I., 2010, Determinants of farmers' information seeking and utilization on seeds and Planting Materials in Lagos and Ogun States, Nigeria, *Journal of New Seeds*, 11: 1-10, 2010

OLADELE, O, I., JUN-ICHI, S., & KAZUNOBU, T., 2006, Research –extension-farmer-linkage system in South western Nigeria, *Journal of Food, Agriculture & Environment* 4(1):99-102

OLADELE, O, I., 2002, Communication links in research-extension-farmers interface in south western Nigeria, *Journal of Extension Systems India* 18(June):89-100.

OLALEYE , R, S., GANA, F, S., UMAR, I, S., NDANISA, M, A., & PETER, E, W., 2009, Effectiveness of Radio in the Dissemination of Agricultural Information among farmers in Edu Local Government Area of Kwara State, Nigeria, *Continental Journal of Agricultural Science* 3: 1 - 6, 2009, © Wilolud Online Journals, 2009.

OLAYIDE, O, E., ANTHONY, E, I., AREGA, D, A., & VINCENT, A., 2011, Assessing Farm-level limitations and Potentials for Organic Agriculture by Agro-ecological Zones and Development Domains in Northern Nigeria of West Africa, *Journal of Human Ecology*, 34(2): 75-85 (2011)

OLSSON, P., & FOLKE, P., 2001, Local ecological knowledge and Institutional dynamics for ecosystem management, Study of Lake Racken water shed, Sweden, *Ecosystems* 4: 85-104

OMITI, J, M., FREEMAN, H, A., KAGUONGO, W., BETT, C., 1999, Soil Fertility Maintenance in Eastern Kenya: Current Practices, Constraints, and Opportunities, CARMASAK Working Paper No. 1. KARI/ICRISAT, Kenya

OMODARA, F., & ALFF, U., 2006, Evaluation of Ibadan Provincial Rural Development Programme, Ibadan, Nigeria: Report, Justice, Development and Peace (JDP) Commission.

OMONONA, B, T., 2006, Cost and Returns to Contract Seed Production in Nigeria: Evidence from Osun State, *Journal of Central European Agriculture.* 7 (3): 475-478 (2006)

ONYANGO, R, M, A., MWANGI, T, J., WANYONYI, M., BARKUTWO, J, K., & LUNZALU, E, N., 2000, Verifying the Potential Use of Inorganic and Organic Fertilisers and Their Combinations in Small Holder Maize Production Farms in Trans Nzoia District. Kenya Agricultural Research Institute, National Agricultural Research Centre, Kitale.

OSBAHR, H., & ALLAN, C., 2003, Indigenous knowledge of soil fertility management in southwest Niger, www.elsevier.com/locate/geoderma Geoderma 111(2003) 457-479

OSBORNE, B., 2009, Organic farming, Encarta encyclopaedia

OSINEM, E, C., 1996, School Related Factors Influencing the Adoption of Soil Conservation Technologies in School Farms in Anambra State, *Journal of Agriculture, Technology and Education,* 1(2): 126-129.

OUÉDRAOGO, E., MANDO, A., & ZOMBRÉ, N, P., 2001, Use of compost to improve soil properties and crop productivity under low input agricultural system in West Africa, *Agriculture, Ecosystems & Environment*, 84 (3): 259-266.

OWU, D, O., 1995, Farmer adoption of improved soil conservation technologies under international agriculture in Imo State, Research report to Fourth ARSSRN programme

OYEKANMI, E, O., COYNE, D, L., & FAWOLE, B., 2008, Utilization of the Potentials of Selected Microorganisms as Bio control and Bio fertilizer for Enhanced crop Improvement, *Journal of Biological Sciences* 8(4):746-752

OYO STATE, NIGERIA, 2012, www.google.co.za/search?q= detailed map

OYO STATE NIGERIA, 2013 http://en.wikipedia.org/wiki/Oyo_State

OZCATALBAS, O., & GURGEN, Y., 1992, Information sources of maize growers in the lower Seyhan project area, Journal of the Faculty of Agriculture, Cukurova University, Adana Turkey; 7: 63-78

OZOWA, V, N., 1995, Information Needs of Small Scale Farmers in Africa: The Nigerian Example, Quarterly Bulletin of the International Association of Agricultural Information Specialists, IAALD/CABI (v. 40, No.1, 1995).

PADEL, S., & MIDMORE, P., 2005, The development of the European market for organic products: insights from a Delphi study. *British Food Journal* 107 (8): 626-647

PADEL, S., 1994, Adoption of organic farming as an example of the diffusion of an innovation, Centre for Organic Husbandry and Agro ecology, University of Wales, Discussion Paper 94/1.

PALM, C, A., GILLER, K, E., MAFONGOYA, P., L., & SWIFT, M, J., 2001, Management of organic matter in the tropics: translating theory into practice, *Nutrient Cycling in Agro ecosystems* 61: 63–75, 2001.

PAN, NIGERIA, 2007, Strategic Assessment of the Status of POPs Pesticides Trading in South Western Nigeria, The African Stockpile Programme, 52pp

PANNELL, D, J., 1995, Economic aspects of legume management and legume research in dry land farming systems of southern Australia, *Agricultural Syst*ems 49:217–236.

PARK, STABLER, JONES, 2008, Evaluating the role of environmental quality in the sustainable rural economic development of England, *Environment, Development And Sustainability* .10, 69-88

PARRA LÓPEZ C., 2003, Sistemas de producción ecológica, integrada y convencional en olivar: Estudio de diffusion de innovaciones y evaluación multifuncional [Organic, Integrated

and Conventional Agricultural Systems in Olive Grove: A Diffusion of Innovations Analysis and Multifunctional Assessment]. Doctoral thesis, Univ. of Córdoba, Spain

PARRA, C., & CALATRAVA, J., 2005, Factors related to the adoption of organic farming in Spanish olive orchards. *Spanish Journal of Agricultural Research*, 3: 5-16.

PASWEL, P, M., & CHRISTOPHER, B, B., 2007, Household-level determinants of adoption of improved natural resources management practices among smallholder farmers in western Kenya, *Food Policy* 32 (2007) 515–536

PELLEGRINI, G., & FARINELLO, F., 2009, Organic consumers and new Life styles An Italian country survey on consumption patterns, *British Food Journal* 111 (9): 948-974 *q* Emerald Group Publishing Limited

PERAMAIYAN, P., HALBERG, N., & HERMANSEN, J, E., 2009, Organic agriculture in relation to food security of developing countries, 1st Nordic Organic Conference, Towards increased sustainability in the food supply chain, Centrum for Uthalligt Lanthbruk, pp. 149-151

PETER, A, K, K., & PETER, K, L., 2006, Transforming recent gains in the digital divine into digital opportunities: African and the Boom in mobile phone subscription, EJISDC 28, 5, 1-16.

PETTIGREW, K, E., 1996, Modelling the information seeking of professionals, *Library Quarterly*, 66(2), 161-193.

PEZESHKI-RAD, G., & ZAMANI, N., 2005, "Information-seeking behaviour of Iranian extension managers and specialists" *Information Research*, 10(3) paper 229 [Available at http://InformationR.net/ir/10-3/paper229.html]

PIETOLA, K, S., & OUDE-LANSINK, A., 2001, Farmer response to policies promoting organic farming technologies in Finland, *European Review of agricultural Economics*, 28: 1-15

PIMENTEL, D., HEPPERLY, P., & SEIDEL, R., 2005, "Environmental, energetic, and economic comparisons of organic and conventional farming systems", *Bioscience,* Vol. 55 No. 7, pp. 573-83, policies for developing countries, *American Journal of Agricultural Economics* produce: Pesticides, pathogens, and natural toxins, *Risk Analysis* 21:319– 330.

PLACE, F., & DEWEES, P., 1999, Policies and Incentives for the Adoption of Improved Fallows, *Agroforestry Systems,* 47: 323–43

POLIT, D., & HUNGLER, B., 1997, Essentials of nursing research: methods, appraisal, and utilization (4th ed). J.B.Lippincott Company: Philadelphia, Pennsylvania, USA.

PRETTY, J, N., & WARD, H., 2001, Social capital and the environment, *World Development* 29 (2), 209-227

PRETTY, J., 2002, Agri-Culture: Reconnecting People, Land and Nature. Earthscan: London.

PRETTY, J., 1999, Can sustainable agriculture feed Africa? New evidence on progress, processes and impacts, *Environment, Development and Sustainability* 1: 253–274.

PROKOPY, L, S., FLORESS, K., KLOTTHOR-WEINKAUF, D., & BAUMGART-GETZ. A., 2008, Determinants of agricultural best management practice adoption: Evidence from the literature, *Journal of soil and Water Conservation* 63 (5): 300-311, doi:10.2489/jswc.63.5.300.

QUANSAH, C., DRECHSEL, P., YIRENKYI, B, B., & ASANTE-MENSAH, S., 2001, Farmers' perceptions and management of soil organic matter – a case study from West Africa, *Nutrient Cycling in Agro ecosystems* 61: 205–213, 2001.

QUIZON, J., FEDER, G., & MURGAI, R., 2001, Fiscal sustainability of agricultural extension: the case of the farmer field school approach, *Journal of International Agricultural and Extension Education* 8: 13–23.

RADWAN, A., GIL, J, M., YASER, A., DIAB, A., & ABO-NAHOUL, M, A., 2004, Determinants of the adaption of organic agriculture in Egypt using a duration analysis technique, The Agricultural Economics Society (AES) 78th Annual Conference

RAE, A., & JOSLING, T., 2003, Processed food trade and developing countries: protection and trade liberalization, *Food Policy* 28 (2003) 147–166

RAO, P, P., & RAO, V, G, K., 1996, "Adoption of rice production technology by the tribal farmers, *Journal of research and ANGRAU* 24(1-2): 21-25

RAUDSEPP, M., 2001, Some socio-demographic and socio-psychological predictors of environmentalism, Trames, 3, 335–367.

RAYNOLDS, L, T., 2000, Re-embedding global agriculture: The international organic and fair trade movements, *Agriculture and Human Values* 17: 297–309, 2000.

REARDON, T., & BARRETT, C, B., 2000, "Agro industrialization, globalization, and international development: An overview of issues, patterns, and determinants". *Agricultural Economics* 23: 195-205

REDDY, B, S., 2010, Organic Farming: Status, Issues and Prospects-A Review. *Agricultural Economics Research Review* Vol. 23 July-December 2010 pp 343-358

REGANOLD, J, P., GLOVER, J, D., ANDREWS, P, K., & HINMAN, H, R., 2001, Sustainability of three apple production systems, *Nature* 410: 926-930 [Accessed 19 April 2001], www.nature.com

REHMAN, T., McKEMEY, K., YATES, C.M., COOKE, R.J., GARFORTH, C.J., TRANTER, R.B., PARK, J.R., and DORWARD, P.T 2007. Identifying and understanding factors influencing the uptake of new technologies on dairy farms in SW England using the theory of reasoned action, *Agricultural Systems*, 94: 287- 290.

RIGBY, D., & CACERES, D., 2001, "Organic farming and the sustainability of agricultural systems", *Agricultural Systems*, 68 (1): 21-40.

ROBERTS, J, A., 1996, "Green consumers in the 1990s: profile and implications for advertising", *Journal of Business Research,* 36: 217-31.

ROGERS, E, M., 1995, Diffusion of Innovations, 4, Auflage, Free Press, New York, London

ROGERS, E, M., 2003, Diffusion of Innovations, 5th edition, Free Press, New York

ROGERS, E, M., 1983, Diffusion of Innovation's third ed, The Free Press, New York, NY.

RÖLING, N, G., & WAGEMAKERS, M, A, E., (EDS) 1997, Facilitating Sustainable Agriculture, Cambridge University Press, Cambridge

SAKA, J, O., OKORUWA, V, O., LAWAL, B, O., & AJIJOLA, S., 2005, Adoption of Improved Rice Varieties among Small-Holder Farmers in South-Western Nigeria, *World Journal of Agricultural Sciences* 1 (1): 42-49, 2005 ISSN 1817-3047

SALASYA, B, D, S., MWANGI, W., VERKUIJI, H., ODENDO, M, A., & ODENYA, J, O., 1998, An assessment of the adoption of seed and fertilizer packages and the role of credit in smallholder maize production in Kakamega and Vihiga Districts, Kenya, Mexico, D.F.: CIMMYT and Kenya Agricultural Research Institute.

SANCHEZ, P, A., & SWAMINATHAN, M, S., 2005, Hunger in Africa: The link between unhealthy people and unhealthy soils, The lancets 365:442-444

SANDEE, H., 1994, "The Impact of Technological Change on Iner-firm Linkages: A case study of Clustered Rural Small-Scale Roof Tile Enterprises in Central Java" in P.O. Pedersen et al. (eds.), *Flexible Specialization:* The Dynamics of Small-scale Industries in South, London: Intermediate Technology Publications.

SCHMITZ, H., 1995, 'Collective Efficiency: Growth Path for Small-scale Industry", *The Journal of Development Studies,* 31 (4): 529-66.

SCIALABBA, N., 2000, Factors Influencing Organic Agriculture Policies with a focus on Developing Countries, IFOAM 2000 Scientific Conference, Basel, Switzerland, 28-31 August 2000. 13p.

SCIALABBA, N., 2007, Organic agriculture and food security, In International conference on organic agriculture and food security, 3-5 May, 2007, Food and Agriculture Organization of the United Nations, Italy. (OFS/2007/5), available at www.fao.org/organicag

SCIALABBA, N, E., & HATTAM, C., 2002, Organic agriculture, environment and food security, Rome: Food and Agriculture Organization of the United Nations soundness of organic and conventional agriculture by means of life cycle assessment, *British Food Journal* 111 (10): 1028-1061

SCOONES, I., & THOMPSON, J., 1994, Beyond farmers first, IT publication, London: IIED, 301 pp

SEMGALAWE, Z., 1998, Wageningen Dissertation Abstracts. WAU Dissertation No. 2485, Adoption of soil conservation in the North Pare and East Usambara Mt, Tanz*ania*

SHARMA, G., 2005, Organic agriculture in Nepal: An analysis into status, policy, technology and psychology. In: G. Sharma and P.B. Thapa, (Eds.), Proceedings of the National Workshop on Organic Agriculture and Food Security, 13- 15 December 2005, Katmandu, Nepal, 5-17.

SHEIKH, A.D., REHMAN, T., YATES, C.M., 2003, Logit models for identifying the factor that influence the uptake of new 'No-Tillage' technologies by farmers in the rice-wheat and the cotton-wheat farming systems of Pakistan's Punjab. *Agricultural Systems* 75, 79–95.

SHELTON, D, P., DICKEY, E, C., HACHMAN, S, D., STEVEN, D., & FAIRBANKS, K, D., 1995, Corn residue cover on soil surface after planting for various tillage and planting systems, *Journal of Soil Water Conservation* 50, 399–404.

SHERIEF, A. K.; ANILKUMAR, A. S.; HUSAIN, A. S.; & JAYAWARDANA, J. K. J. P., 2008, Socio-psychological characteristics of farmers in the adoption of organic farming practices in coconut based homesteads of humid tropics, Proceedings of the Second Scientific Conference of the International Society of Organic Agriculture Research (ISOFAR), held at the 16th IFOAM Organic World Conference in Cooperation with the International Federation of Organic Agriculture Movements (IFOAM) and the Consorzio ModenaBio in Modena, Italy, 18-20 June, 2008 2008 pp. 767-770

SHIDEED, K., 1999, Adoption of barley production technologies in Iraq: a farm level analysis. In Haddad, N., Tutwiler, R., Thomson, E. (Eds). Improvement of Crop-Livestock Integration Systems in West Asia and North Africa, ICARDA, Pp.467–476

SHIFERAW, B., & HOLDEN, S, T., 1998, Resource Degradation and Adoption of Land Conservation Technologies in the Ethiopian Highlands: A Case Study in AnditTid, North Shewa," *Agricultural Economics* 18: 233–47.

SINGH, M., 2003, Organic farming prospects in Indian agriculture, Souvenir of 68th Annual Convention of Indian Society Soil Science, CSAU&T, Kanpur, 4–8 November 2003, pp. 52–60.

SINGH, S., & GEORGE, R., 2012, Organic Farming: Awareness and Beliefs of Farmers in Uttarakhand, India, *Journal of Human Ecology*, 37(2): 139-149 (2012)

SMIT, B., & SMITHERS, J., 1992, "Adoption of Soil Conservation Practices: An Empirical Analysis in Ontario, Canada", *Land Degradation and Rehabilitation,* forthcoming.

SNAPP, S, S., SWINTON, S, M., LABARTA, R., MUTCH, D., BLACK, J, R., LEEP, R., NYIRANEZA, J., & O'NEIL, K., 2005, Evaluating cover crops for benefits, costs and performance within cropping system niches, *Agronomy Journal*, 97:322–332.

SPINK, A., & COLE, C., 2001, Information and Poverty: information-seeking channels used by African American low-income households, *Library and Information Science Research* 23 (2001) 45-25

STAAL, S, J., BALTENWECK, I., WAITHAKA, M, M, DEWOLFF, T., & NJOROGE, L., 2002, Location and uptake: Integrated household and GIS analysis of technology adoption and land use, with application to smallholder dairy farms in Kenya, *Journal of Agricultural Economics*, 27: 295-315.

STEINER, C., NEHLS, T., ZECH, W., TEIXEIRA, W, G., DE MACÊDO, J, L, V., LEHMANN, J., & BLUM W, E, H., 2007, Long term effects of manure, charcoal and mineral fertilization on crop production and fertility on a highly weathered Central Amazonian upland soil. *Plant Soil* (2007) 291:275–290 DOI 10.1007/s11104-007-9193-9

STOCKDALE, E., et al., Agronomic and environmental implications of organic farming systems, Advanced Agronomy, 2000, 70, 261–327

STOLZE, M., PIORR, A., HA¨RING, A., & DABBERT, S. 2000, "The environmental impact of organic farming in Europe", Organic Farming in Europe, *Economics and Policy*, 6: 23-86 University of Hohenheim, Hohenheim

SUBBA RAO, I, V., 1999, Soil and environmental pollution – A threat to sustainable agriculture, Journal of Indian Society of Soil Science, 1999, 47, 611–633.

SULLIVAN, P., 2003, Intercropping principles and production practices. Agronomy systems guide, ATTRA (Appropriate Technology Transfer to Rural Areas), 12 pp (http:// www.attra.ncat.org)

SVOTWA, E., BAIPAI, R., & JIYANE, J., 2007, organic farming in the small holder farming sector of Zimbabwe, *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 6 (2), 2007. [1820-1827].

SWIFT, M, J., IZAC, A, M, N., & VAN NOORDWIJK, M., 2004, Biodiversity and ecosystem services in agricultural landscapes—are we asking the right questions? *Agriculture, Ecosystems and Environment* 104 (2004) 113–134

SWINKELS, R.A., SHEPHERD K.D., FRANZEL S., NDUFA, J, K., OHLSSON, E., & SJOGREN, H., 2002, Assessing the adoption potential of Hedgerow intercropping for improved soil fertility in Western Kenya.

TENGO, M., & BELFRAGE, K., 2004, Local management practices for dealing with change and uncertainty: a cross-scale comparison of cases in Sweden and Tanzania. *Ecology and Society*, 9(3):4, 22p. Available at www.ecologyandsociety.org/vol9/iss3/art4

THAGATA, P., 1998, Farmers' perception to agroforestry adoption for soil erosion control: A case study from Malawi, The World Bank/ WBI's CB NRM Initiative.

THOMAS, EMILY, H., GALAMBOS, NORA, 2002, What satisfies students? Mining student-opinion data with regression and decision-three analysis, Stony Brook, New York: Stony Brook University.

THOMAS, J., LADEWIG, H., & MCLNTOSH, W. 1990, The adoption of integrated pest management among Texas cotton growers, *Rural Sociology* **55**(3):395-410.

TILMAN, D., CASSMAN, G., MATSON, P, A., NAYLOR, R., POLASKY, S., 2002, Agricultural sustainability and intensive production practices, *Nature* 418, 671–677

TONYE, J., IBEWIRO, B., & DUGUMA, B., 1997, Residue management of a planted fallow on an acid soil in Cameroon: crop yields and soil organic matter fractions, *Agroforestry Systems* **37**: 199–207, 1997.

TORJUSEN, H., LIEBLEIN, G., WANDEL, M., & FRANCIS, C, A., 2001, Food system orientation and quality perception among consumers and producers of organic food in Hedmark County, Norway, *Food Quality and Preference* 12:207–216.

TU, C., LOUWS, F, J., CREAMER, N, G., MUELLER, J, P., BROWNIE, C., FAGER, K., BELL, M., & SHUIJIN, HU, 2006, Responses of soil microbial biomass and N availability to transition strategies from conventional to organic farming systems, *Agriculture, Ecosystems and Environment* 113 (2006) 206–215

TUCKER, M, & NAPIER, T, L., Preferred sources and channels of soil and water conservation information among farmers in three mid-western US watersheds, *Agriculture, Ecosystems & Environment* , 2002;92:297–313.

TUTKUN, A., LEHMANN, B., SCHMIDT, P., 2006, Explaining the conversion to organic farming of farmers of the Obwalden Canton, Switzerland – Extension of the Theory of Planned Behavior within a Structural Equation Modeling Approach. A paper presented at the 80th Annual Conference of the Agricultural Economics Society, 30th and 31th March 2006, Paris-Grignon 14p.

UDOH, E.J., & OMONONA, B, T., 2008, Improved rice variety adoption and its welfare impact on rural farming households in Akwa Ibom State Nigeria, *Journal of New Seeds* 1(2): 156-73

UNCTAD& UNEP. 2008. *Organic agriculture and food security in Africa.* UNEP-

UPADHYAY, B, M., YOUNG, D, L., WANG, H, H., & WANDSCHNEIDER, P., 2003, How do farmers who adopt multiple conservation practices differ from their neighbours. *American Journal of Alternative Agriculture* 18 (1): 27-36.

VAN DE FLIERT, E., & BRAUN, A, R., 2002, Conceptualizing integrative, farmer participatory research for sustainable agriculture: From opportunities to impact. *Agricultural and Human Values* 19:25–38.

VAN DEN BAN, A., & HAWKINS, H., 1998, Agricultural Extension, Longman Scientific and Technical, Essex 1998: 25-36

VAN VUUREN, W., LARUE, B., & KETCHABA, E, H., 1995, Factors influencing productivity enhancing and environmental husbandry on rented land, *Canadian Journal of Agricultural Economics*, 43: 73-85.

VANLAUWE, B., 2004, Integrated soil fertility management research at TSBF: the framework, the principles, and their application. In: Bationo, A. (Ed.), Managing Nutrient Cycles to Sustain Soil Fertility in Sub-Saharan Africa, Academy Science Publishers, Nairobi.

VERHOEF, P, C., 2005, "Explaining purchases of organic meat by Dutch consumers", *European Review of Agricultural Economics*, 32: 245-67.

VERSTEEG, M, N., & KOUDOKPON, V., 1993, Participative farmer testing of four low external input technologies, to address soil fertility decline in Mono province (Benin), *Agricultural Systems* 42: 265–276.

VON BRAUN, JOACHIM, M, S., SWAMINATHAN, & MARK W. R., 2003, Agriculture, Food Security, Nutrition and the Millennium Development Goals. New York: International Food Policy Research Institute (IFPRI), 2003.

WAMBANI, H., NYAMBATI, E. M., & KAMIDI, M., 2006, Participatory development and scaling up of organic and inorganic fertilizers for kale (*Brassica oleraceae* var. *acephala*) production in Northwestern Kenya, Proceedings of the 10th KARI Biennial Scientific Conference, 13th to 17th November 2006, Nairobi, Kenya. kari.org

WATSON, C, A., ATKINSON, D., GOSLING, P., JACKSON, L., & RAYNS, F, W., 2002. Managing soil fertility in organic farming systems, *Soil Use & Management* 18: 239-247

WEIJLAND, H., 1999, 'Micro enterprise Clusters in Rural Indonesia: Industrial Seedbed and Policy Target', *World Development,* 27 (9): 1515-30.

WEINBERGER, K., & LUMPKIN, T, A., 2005, Horticulture for Poverty Alleviation: The Unfunded Revolution, *Working Paper No. 15.* Shanhua: AVRDC - The World Vegetable Center.

WETENGERE, 2009, Socio-economic factors critical for adoption of fish farming technology: The case of selected villages in Eastern Tanzania, *International Journal of Fisheries and Aquaculture* 1 (3), 028-037, August, 2009

WHEELER, S., 2005, Factors Influencing Agricultural Professionals' Attitudes Towards Organic Agriculture and Biotechnology

WHO (World Health Organization), 2003, Diet, nutrition and the prevention of chronic diseases, Report of a joint FAO/WHO expert consultation, WHO Technical Report Series 916, Geneva: WHO.

WIER, M., & CALVERLEY, C., 2002, Market potential for organic foods in Europe, *British Food Journal,* 104: 45–62

WILLER, H., & KILCHER, L., (EDS.) 2011, The World of Organic Agriculture. Statistics and Emerging Trends 2011, IFOAM, Bonn, & FiBL, Frick 34pp.

WILLER, H., & KLICHER, L., (EDS) 2009, The World of Organic Agriculture: Statistics and Emerging Trends, IfOM, Bonn, FiBL, Frick, ITC, Geneva. 299pp.

WILLER, H. AND YOUSSEFI, M. 2007, The World of Organic Agriculture – Statistics and Emerging Trends, International Federation of Organic Agriculture Movements (IFOAM), Germany and Research Institute of Organic Agriculture FiBL, Bonn. 77p.

WILLIAMS, T, O., 1999, Factors influencing manure application by farmers in semi-arid west Africa, *Nutrient Cycling in Agro ecosystems* 55: 15–22, 1999.

WILLIAMS, P, R., & HAMMITT, J, K., 2001, Perceived risks of conventional and organic Produce: Pesticides, Pathogens and Natural toxins, *Risk Analysis* 21 (2): 319-330.

WILLIAMS, P, R, D., HAMMITT, J, K., 2000, A comparison of organic and conventional fresh produce buyers in Boston Area, *Risk Analysis* 20 (5), 735–746.

WILSON, T, D., 2000, Human Information Behaviour, *Informing Science*, 3(2), 49-56 Retieved October 8, 2003, from http://209.68.25.5/Articles/Vol.3/v3n2p49-56.pdf.

Wilson, J., 2007, "Flame Weeding as a Method for Weed Control in Organic Farming." Cal Poly San Luis Obispo, Master's Thesis June

WITT, R., PEMSL, D, E., & WAIBEL, H., 2008, The farmer field school in Senegal: Does training intensity affect diffusion of innovation? *Journal of International Agricultural and Extension Education* 15(2): 47–60.

WYNN, G., CRABTREE, G., & POTTS, J., 2001, Modeling farmer entry into the environmentally sensitive area schemes in Scotland. *Journal of Agricultural Economics*, 52: 65-82.

YAHAYA, M, K., 2003, Development communication: lesson from change and social engineering projects Ibadan Corporate Graphics Ltd, pp 129-130.

YAMANO, T., 2008, Dairy-banana integration and organic fertilizer use in Uganda, GRIPS Policy Information Center, Discussion Paper, pp. 8- 3.

YARON, D., DINAR, A., & VOET, H., "Innovations on Family Farms: The Nazareth Region in Israel." *American Journal of Agricultural Economics*74 (1992):361-370.

ZAKOWSKA-BIEMANS, S., 2011, Polish consumer food choices and beliefs about organic food, *British Food Journal* 113 (1), 122-137 *q* Emerald Group Publishing Limited 0007-070X DOI 10.1108/00070701111097385

ZEPEDA, L., & DEAL, D., 2009, Organic and local food consumer behaviour: Alphabet Theory. *International Journal of Consumer Studies* 33: 697-705.

ZHANG, F., & LONG LI, 2003, Using competitive and facilitative interactions in intercropping systems enhances crop productivity and nutrient-use efficiency, *Plant and Soil* 248: 305–312, 2003.

ZOSSOU, E., VAN MELE, P., VODOUHE, S, D., & WANVOEKE, J., 2009, The power of video to trigger innovation: rice processing in central Benin, *International Journal of Agricultural Sustainability* 7(2): 119–129.

QUESTIONNAIRE

TITLE: INFORMATION SEEKING BEHAVIOR AND ADOPTION OF ORGANIC FARMING PRACTICES AMONG VEGETABLE FARMERS IN SOUTH WESTERN NIGERIA.

Dear Respondents,

I am conducting a research on the above topic. You are assured that your response will be treated with all confidentiality. Thanks.

A. Personal Characteristics

1. Gender

Male	Female

2. Your age in years

3. Marital status

Single	Married	Divorced	Widowed

4. What is your religion?

Islam	Christianity	Traditional

5. What is your highest qualification?

Adult education	Primary	Secondary	Tertiary

6. Indicate your farming experience in Years .....

7. Indicate your farm size (in acres) .....

8. How many people live in your household? .....

9. How many dependant have you in your household? .....

10. Do you belong to any farmers' association? .....

11. Do you have contact with extension agents?

Yes	No

12. Indicate the frequency of contact with the extension agents.

Very Regular	Often	Seldom

13. Indicate the distance from Farm Service Center to your farm (in Km).
.....

14. Do you enjoy any form of subsidies for your farm enterprise? (NGO, Govt., Research institute).

Very regular	Seldom	None

15. If yes, how frequent do you enjoy such subsidies?

Very regular	Seldom	None

B. Profile of Organic farming Practices in Southwestern Nigeria.

Please indicate your use of each of the following Organic Agricultural Practices and the frequency of use.

Organic Farming Technology	Use	Non Use	Frequency of Use	
			Every Season	Every other season
Crop Rotation				
Green Manure				
Cover Crop				
Animal Manure				
Compositing				
Intercropping				
Bio control				
Farm Scaping				
Mulching				
Sanitation				
Tillage				
Fire				
Natural Pesticide				
Organic fertilizer				

C. Evaluating the Attitude of Vegetable Farmers towards Organic Agriculture

Please indicate your attitude towards Organic Agricultural Practices in terms of the following statements.

Attitude Statements	Strongly agree	Agree	Undecided	Disagree	Strongly Disagree
Organic agriculture enhances system stability					
OA mitigates the effects of climate change.					
OA improves ecological health					
OA increases soil organic matter and nutrient					
OA stops environmental degradation					
OA has great prospects for environmental conservation					
Organic manure is effective in the control of pests and diseases					
OA increases agricultural productivity					
OA raises income of farmers with low cost					
OA can be a source of foreign exchange					
OA yields returns on investment					
OA creates market niche					
OA ensures food security					
OA enhances food safety and quality					

OA promotes value addition to agricultural produce					
OA encourages consumer preferences					
OA minimizes all forms of pollution					
OA promotes the health of farmers					
OA encourages the use of Indigenous knowledge					
OA reduces input costs of farming					
OA increases diversity of income sources					
OA allows soil carbon sequestration					
OA improves soil fertility and soil structure					
OA product is easily markets					
There is high demand for OA products					

D: Sources of Information

Please indicate your sources of information on Organic Agricultural Practices and the frequency of use of each of the sources.

Information Sources	Use of Information		Frequency of Use		
	Yes	No	Regular	Often	Rarely
Extension Agent					
Sales Agents					
Radio Adverts / Jingles					
TV Adverts					
Newspaper adverts					
Family Members					
Neighbors					
Contacts Farmers					
Farmers Organization					
Agriculture show/ exhibition					
Posters					
Leaflets/pamphlets					
Research Institute					
Non-governmental Organization					
Universities, colleges of education					
Farm centers					
Mobile cinemas					
Agricultural manuals/journals					
Internet					

Meetings/ demonstrations					
Mobile phone					

E: Adoption intensity of Organic Agricultural Practices

Please indicate the proportion of your farm you use for the practices of each of the following organic Agricultural Practices.

Organic Agricultural Technology	<50% of land	50-75% of land	>75% of land
Crop rotation			
Green manure			
Cover crop			
Animal manure			
Compositing			
Intercropping			
Bio Control			
Farm Scaping			
Mulching			
Sanitation			
Minimum Tillage			
Fire			
Natural Pesticide			
Organic fertilizer			

F: Knowledge of Value chain among vegetable farmers

Concept of value chain	**Yes**	**No**
Do you plant your vegetables based on consumer's preference?		
Do you work closely with the suppliers before you produce?		
Do the retailers give you feedback on consumers' preference?		
Do you have access to information on market outlets?		
Is there any form of training organized to improve production performance?		
Have you experienced some increase in your income since you started selling your products to market operators or procurement officers rather than selling them to the consumers yourself?		
Cooperative production		
Do you belong to any cooperative producer group?		
Is there any collective sale of your products with other farmers to market operators or retailers?		
Does your cooperative production with other farmers guarantee product quality?		
Does your cooperative production strengthen your bargaining position vis-à-vis customers?		
Does your cooperative production with other farmers guarantee continuous supply to customers?		
Does your cooperative production with other farmers strengthen your bargaining position vis-à-vis suppliers?		
Does your cooperative production with other farmers enhance the development of new products?		
Sales channels		
Do you sell directly to the consumers?		
Do you sell to retailers who then sell to the consumers?		
Do you sell your vegetable to street vendors?		
Do you sell to alternative sales channels?		

Input and output		
Do you purchase your seeds/seedlings from agricultural suppliers?		
Do you produce your seed/seedlings yourself?		
Do you pay for land use for your production?		
Do you pay for labor?		
Post-Harvest		
Is there any special package of your products?		
Do you make use of sack for your packaging?		
Do you make use of basket for your packaging?		
Do you make use of wooden box for your packaging?		
Do you have transport to convey your product to the market centers?		
Do you have storage facilities for your product?		
Do you have facilities for sorting out your products?		
Do you have facilities for bagging/packaging?		
Trading		
Do you sell on cash deposit before harvesting your products?		
Do you collect your cash immediately at the point of sales?		
Do you sell your product on credit to collect your cash later?		
Do you sell with discount?		
Are your prices based on demand and supply?		
Are the retailers free to buy from whom they want?		
Is there increased bargaining power on the retailer´s node than yours (producers)?		

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Dear Sir/Madam,

TO WHOM IT MAY CONCERN

This is to introduce Adebayo Sijuwade Adebukola, a PhD student in the Department of Agricultural Economics and Extension, North-West University, Mafikeng Campus, South Africa. She is currently on her research work with the vegetable farmers. Therefore, your assistance and cooperation is highly solicited for. Thank you for your envisioned understanding.

Yours faithfully,

Prof O.I. Oladele

Head of Department

The researcher interacting with vegetable farmers as they prepare for market

Extension agents interrogating vegetable farmers sorting the vegetables

The extension agent interviewing the vegetable farmers

Cross section of the researcher and vegetable farmers

Vegetable farmer sorting out the vegetables

The researcher interviewing the vegetable farmer (Ondo state, Nigeria)

Vegetable farmers using sacks for packaging

Vegetable farmers packing the vegetables to market centre

The researcher at the centre with farmers on their farms

The extension agent at the centre with farmers on their farms

The extension agent interviewing vegetable farmer

Cross section of the researcher and vegetable farmers on their farms

The researcher interacting with vegetable farmer (Oyo state, Nigeria)

The researcher interacting with vegetable farmer (Ogun state, Nigeria

Vegetable farmers in Abeokuta north (Ogun state, Nigeria)

Cross sections of vegetable farm (Spinanch)

Cross section of pumpkin vegetables

Picture of spinach grown with inorganic fertilizers

Picture of spinach grown organically without inorganic fertilizers

Vegetable farmer preparing the bed for the vegetables