AGRICULTURAL LAND USE MANAGEMENT PRACTICES AMONG ARABLE CROP FARMERS IN ADP ZONE ONE, TARABA STATE, NIGERIA

BY

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CHAPTER ONE
INTRODUCTION

1.1 Background to the study

There has been growing concern for environmental risks associated with modern agriculture since the Rio De Janeiro earth summit in 1992. Most modern practices related to the control of pests and productivity of soil may also have harmful effects on the long-term sustainability of agro-ecological systems, This may lead to decrease in farm output, loss of forests, vegetation cover, shrinkage of water bodies and sometimes, flooding due to excessive rainfall and depletion

of several natural resources that were once a means of livelihood of the people. Most of these happen as a result of unsustainable practices that farmers engaged in. Strategies aimed at dealing with these problems were increasingly addressed under the term, sustainable agriculture. According to United Nation's Asia and Pacific Centre for Agricultural Engineering and Machinery, APCAEM (2007), agriculture is an essential occupation needed to feed the world's population. However, agriculture may create negative impact when practised without regard to the condition of the soil it depends on.

Sustainable agriculture refers to an agricultural system adapted to a particular area so that crop and animal production do not decline over time and are reasonably stable over normal fluctuations of weather (Donahue and Troch, 2003). In the opinion of Francis and Youngberg (1990) sustainable agriculture is that agricultural practice which satisfy human needs for fibre and food, protect natural resources and environmental quality. It is based on understanding the long term impact of activities on the environment and other species, which invariably guide the application of resources, conserving equitable farm system, maintains rural community and quality of life. Sustainable agriculture according to Titilola (2000), is based on practices that reduce environmental degradation, deteriorating range land and dwindling forest resources, provides an adequate and dependable farm income thereby reducing poverty. Based on these definitions, agricultural land use management practices could be the antidote to damages suffered by the environment and agricultural production by a way of ensuring long term use of natural resource base and poverty alleviation.

Sustainable land management (SLM) component of sustainable agriculture according to Earning (2000); is the use of land resources such as soils, water, animals and plants for the production of goods to meet changing human needs, while assuring the long-term productive potential of these resources, and the maintenance of their environmental functions. In view of the importance of this strategic component of sustainable agriculture, Dumanski (1997), regarded (SLM) as the foundation of sustainable agriculture, and a strategic component of sustainable development and poverty alleviation. The use of agricultural land management practices by farmers in the study area may go a

long way to reduce land degradation and agriculture-driven environmental damages in the study area.

1.2 Statement of the problem

Conventional agriculture as practised by most farmers in Nigeria is characterized by intensive tillage, straw burning and the use of external inputs. According to APCAEM (2007), the mechanization and intensification of the traditional, tillage-based system of agriculture has often been accompanied by numerous adverse impacts on soil systems. Tillage left the soil bare exposing it to wind and water erosions, carrying away the top soil containing vital nutrients that are required for plant growth. Excessive usage of fertilizers and irrigation practices to boast crop yields on degraded soils may lead to soil pollution and health problems. For agriculture to provide food and raw materials required by man without adverse impact on the environment and health of farm workers there's need to exploit land use management practices that are economically profitable and environmentally friendly. It is against this background that the study ascertained the awareness, information sources, attitudes and constraints associated with agricultural land use management practices for optimum agricultural productivity. The study provided empirical answers to the following research questions:

i. What were the socio-economic characteristics of arable crop farmers in the study area?
ii. Were the respondents aware of agricultural land use management practices?
iii. What were the respondents' sources of information on agricultural land use management practices?
iv. What were the respondents' attitudes toward land use management practices in the study area?
v. What were the agricultural land use management practices among the respondents in the study area?
vi. What were the constraints experienced by the respondents in the use of agricultural land management practices in the study area?
vii. What were the independent variables that had the likelihood of influencing agricultural land use management practices in the study area?

1.3 Objectives of the study

The general objective of this study was to asses agricultural land use management practices among arable crop farmers in ADP Zone one, Taraba State, Nigeria. The specific objectives of the study were to:

i. Describe the socio-economic characteristics of the respondents in the study area;
ii. Ascertain the respondents' awareness of agricultural land use management practices in the study area;
iii. Determine the respondents' sources of information on agricultural land use management practices;
iv. Determine the respondents' attitude toward agricultural land use management practices in the study area;
v. Identify agricultural use land management practices among the respondents in the study area, and
vi. Identify constraints experienced by the respondents in the use of agricultural land management practices in the study area;
vii. Identify independent variables influencing agricultural land use management practices.

1.4 Hypothesis of the study

Ho: There is no significant relationship between socio-economic characteristics of the respondents and their use of agricultural land management practices.

1.5 Significance of the study

The challenge of agriculture globally, is how to feed the ever increasing world population which is projected to reach nine billion people by the year 2050 and at the same time conserve the environment that is presently facing the challenge of constant degradation (Spore, 2012). Developing countries mostly in sub Saharan Africa find it difficult to provide food for their citizens as a result of natural disasters such as drought, flood and unsustainable agricultural practices which led to land degradation and low agricultural productivity. In an effort to provide lasting solution to this problem, this study was conducted believing that, the findings of the study will be used as baseline information for policy formulation on agricultural land use management practices among arable crop farmers in the study area. Farmers and extension workers will find this work a useful guide in implementing agricultural land use management practices, while researchers will find it a useful reference material.

CHAPTER TWO
LITERATURE REVIEW

2.1 Sustainable land management

According to the World Bank (2008), Sustainable land management is a knowledge-based procedure that helps to integrate land, water, biodiversity, and environmental management. Improper land management can lead to land degradation and a significant reduction in their productive and service functions (World Bank, 2006). In lay terms, sustainable land management involves the following activities:

- Preserving and enhancing the productive capabilities of cropland, forestland, and grazing land (such as upland areas, down-slope areas, flatlands, and bottomlands)
- Sustaining productive forest areas and potentially commercial and noncommercial forest reserves;
- Maintaining the integrity of watersheds for water supply and hydropower-generation needs and water conservation zones; and
- Maintaining the ability of aquifers to serve the needs of farm and other productive activities.

In addition, sustainable land management includes actions to stop and reverse degradation or at least to mitigate the adverse effects of earlier misuse. Such actions are increasingly important in uplands and watersheds especially those where pressure from the resident populations are severe and where the destructive consequences of upland degradation are being felt in far more densely populated areas downstream. Fortunately scientific advances and the application of improved knowledge and technologies by land managers and some farmers have resulted in significant total and per capita food increases, reduced food prices , and the sparing of new land that otherwise would have been needed to achieve the same level of production (Evenson and Gollin, 2003).

2.2 Need for sustainable land management

Land-use activities whether converting natural landscapes for human use or changing management practices on human-dominated lands have transformed a large proportion of the planet's land surface. By clearing tropical forests,

practicing subsistence agriculture, intensifying farmland under cultivation, or expanding urban centers, humans are changing the world's landscapes (World Bank, 2008). Although land-use practices vary greatly across the world, their ultimate outcome is generally the same: (a) to produce food and fiber and (b) to acquire natural resources for immediate human needs.

It is known that, challenges to sustaining land management will need to be resolved in the face of significant but highly unpredictable changes in global climate a key factor in natural and agro-ecosystem productivity. Other major issues that will influence how land use evolves to meet the challenge of food security include globalization of markets and trade, increasing market orientation of agriculture, significant technological changes, and increasing public concern about the effects of unsustainable natural resource management. Several decades of research have revealed the environmental impacts of land use throughout the globe. These impacts range from changes in atmospheric composition to the extensive modification of Earth's ecosystems. For example, land-use practices have played a role in changing the global carbon cycle and, possibly, the global climate: Since the year1850, about 35 percent of anthropogenic carbon dioxide emissions resulted directly from land use. Changes in land cover also affect regional climates by affecting surface energy and water balance (World Bank, 2008).

2.3 Principles of sustainable land management

For rain-fed systems of sustainable land management, a number of studies including (Dixon, Gulliver and Gibbon, 2001) have identified a set of principles. According to these studies, good land management requires an integrated and synergistic resource management approach that embraces locally appropriate combinations of the following technical options:

- Buildup surface mulch, enriched fallows, agro-forestry, cover crops, and crop residue management;
- Integrate plant nutrition management with locally appropriate and cost effective combinations of organic or inorganic and on-farm or off-farm sources of plant nutrients (such as use of organic manures, crop residues, and rhizobial nitrogen fixation; transfer of nutrients released by weathering in the deeper soil layers to the surface by way of tree roots and leaf litter; and use of rock phosphate, lime, and mineral fertilizer);

- Better crop management using improved seeds of appropriated varieties; improved crop establishment at the beginning of the rains (to increase protective ground cover, thereby reducing water loss and soil erosion); effective weed control; and integrated pest management;
- Better rainwater management to increase infiltration and eliminate or reduce runoff so as to improve soil moisture conditions within the rooting zone, thereby lessening the risk of moisture stress during dry spells, while reducing erosion;
- Improvement of soil rooting depth and permeability through breaking of cultivation-induced compacted soil layers (hoe or plow pan) by means of conservation tillage practices (using tractor-drawn sub-soilers, ox-drawn chisel plows, or hand-hoe planting pits or double-dug beds or inter-planting deep-rooted perennial crops, trees, and shrubs); and
- Reclamation, where appropriate (that is, if technically feasible and cost-effective), of cultivated land that has been severely degraded by such processes as gullying, loss of topsoil from sheet erosion, soil compaction, acidification, or Salinization.

2.4 Causes of land degradation

2.4.1 Proximate causes of land degradation

Biophysical factors

The important biophysical factors that affect land degradation include topography, land cover, climate, soil erodibility, pests, and diseases. The magnitude of soil erosion is a function of slope length and steepness (Wischemeier, 1978; Voortman *et al*., 2000). Sloped lands are vulnerable to soil erosion if they have inadequate vegetative cover and no physical barriers to runoff. For example, Magunda and Tenywa (1999) noted that the densely populated areas on steep slopes of the southwestern and eastern highlands (including parts of Kabale, Kisoro, Bundibugyo, Kasese, Kabarole, Kapchorwa, and Mbale districts) are severely affected by soil erosion. However, in most cases, the highlands experience good rains, which contribute to good vegetative cover and high soil organic matter. These attributes improve the water-holding capacity of the soil, reduce surface runoff, and increase the soil's physical stability, all of which help to reduce soil erosion (Voortman *et al*., 2000).

Climate is also an important biophysical factor that affects land degradation. Voortman *et al*. (2000) noted that high temperatures and intense rainstorms in the tropics subject soils to climate-induced degradation. Magunda and Tenywa (1999) noted that rainfall intensity is one of the most important determinants of soil erosion in the tropics, as it is very intense in some parts of the country. Intensities of more than 300 millimeters per hour have been recorded (Magunda and Tenywa, 1999; Zake *et al*., 1997). Even in drier areas, rainfall often occurs in intense bursts, and because vegetative cover is poor in these areas, the soil is exposed to severe water and wind erosion. High and intensive rainfall may cause considerable leaching, which also leads to land degradation. In such high rainfall areas as the southwestern highlands, the eastern highlands, and the Lake Victoria crescent region, leaching is a significant problem, especially in sandy and loamy soils (NEMA, 1998). Soil physical characteristics also affect land degradation by influencing the susceptibility of the soil to erosion and other forms of degradation. For example, soil erodibility depends on topsoil texture, shear strength, aggregate stability, and organic-matter content. Pest and disease pressure can also contribute to land degradation. For example, the practice of using coffee husks for mulching as a means of soil erosion control and recycling of soil nutrients has been discouraged, for fear that the practice spreads coffee wilt disease (CWD). Pests and diseases may also limit the response of crop yield to fertilizer, thus reducing farmers' use of such inputs. For example, such pests as nematodes that attack the root system of crops limit the ability of plants to absorb nutrients, thereby decreasing the returns to fertilizer and discouraging its use. Use of manure may increase the risk of pest attack by creating favorable breeding conditions for pests. However, failure to use replenishing inputs (manure and inorganic fertilizers) depletes the soil of its fertility, making crops more susceptible to disease and pest attack (Sserunkuuma *et al*., 2001). Thus, soil fertility, disease and pest problems may need to be addressed concurrently.

Unsustainable land management practices

Traditionally, soils in the tropics were cultivated until crop yields deteriorated to unacceptable levels and the "tired" pieces of land were then fallowed to restore fertility. This helped to increase soil organic matter, recycle leached nutrients, improve soil physical properties, and restore soil fertility

(Jones, 1972). However, fallowing is becoming less common as population pressure increases. Only 6 percent of households used fallow strips in the late 1990s, and average fallow times decreased from 2.2 years in the late 1980s to 0.7 years in the late 1990s (Pender *et al.*, 2001). In addition, various soil conservation measures were widely practiced prior to the 1970s, promoted by educational programs and often enforced by local administrators. These practices helped to maintain the fertility of Uganda's soils, which were considered to be among the most fertile in the tropics (Chenery, 1960). However, a combination of several factors (including two decades of political turmoil) led to the neglect or destruction of old investments (for example, terraces) and discouraged new investments in soil conservation, resulting in serious soil erosion (Zake et al 1992).

Cultivating steep slopes and hilltops without adequate protection of the soil from erosion has contributed to increased soil erosion, particularly in the densely populated southwestern mountain regions (Sserunkuuma *et al*., 2001). A small proportion of smallholder farmers use inorganic or organic fertilizer or other fertility management technologies. The total NPK fertilizer use in Uganda of 5,800 metric tons per year (in 2001), although higher than in the recent past, is much lower than it was 30 years ago, and is very low by international standards (for example, Kenya and Malawi used about 144,542 and 22,756 metric tons, respectively, in 2001) (IFDC, 2001; FAO, 2004). Worse still, 95 percent of the total fertilizer use in Uganda is by large-scale farmers and the operators of tea and sugar estates (NARO and FAO, 1999). The low adoption by small landholders of soil fertility management technologies contributes to soil fertility mining and soil erosion. In addition to decreasing agricultural productivity directly, low fertility creates a conduicive environment for weeds, such as witch weed (*Striga* spp.). *Striga* is a parasitic weed found in marginal, semiarid areas (Esilaba *et al*., 1997).

Deforestation is an important determinant of land degradation, as it leads to reduced vegetation cover. Deforestation also reduces water-catchment potential and promotes landslides and siltation of water bodies (NEMA, 2001). It is estimated that 0.8 percent of forest area is lost annually in Uganda. Most of this loss occurs in woodlands, which are not gazetted (NEMA, 2001). Increased demand for charcoal and fuel wood (for cooking, brick making, curing tobacco,

and other uses) is contributing to deforestation and causing soil erosion in many areas. Other major problems that contribute tom land degradation are overgrazing and bush burning. There is evidence of overgrazing in the cattle corridor that runs from northeastern to southwestern Uganda. NEMA (2001) and Muhereza and Otim (2002) note increasing emergence of unpalatable grass species in some parts of the cattle corridor. This is a sign of overgrazing, which contributes to soil erosion and compaction, because it reduces land cover (NEMA, 2001). Farmers also burn bushes to encourage growth of new grass for their livestock or to clear land for cultivation. Bush burning destroys perennial vegetation and other vegetative matter, exposing the soil to water and wind erosion (NEAP, 1992).

2.4.2 Underlying causes of land degradation

The underlying causes of land degradation are less well understood, but understanding their impacts is a key to designing strategies to address the land degradation problem, increase agricultural production, and reduce poverty. Many socioeconomic and policy-related factors are commonly hypothesized as affecting the proximate causes of land degradation, including population pressure; poverty; agricultural commercialization; high purchased-input costs; lack of access to rural finance, markets, and public services; decentralization; privatization of the delivery of basic services, including technical assistance; land-tenure relationships; and general policy reforms (Sserunkuuma *et al*., 2001).

2.5 Socio- economic characteristics of arable crop farmers.

Socio economic status (characteristics) refers to assessment of a person's education, occupation and income position within a particular social system. Social and economic status attainment on the other hand refers to the achievement of person's relative position of education, Occupation and income within that particular social system. This implies that, social-economic grouping in the society is a function of human times and climes. According to Guarancha and Pelto, *et al.,* (1998), there exists variation in socio economic status between and within families. This implies that socio-economic status, is not only a function of time and climes, but also of inter-community, inter household and intra household differences in the status with regard to the position an individual

occupies with respect to amount of cultural possessions, effective income, marital possessions, prestige and social participation.

Variation in socio-economic status across class, caste, religion, race and region, may be due to inequality in property, power and opportunity distribution in the hierarchical and social structure in every society. For instance in most cultures, women and minority groups are said to have low socio-economic status because they lack access to land properties and resources in their communities and they mostly engage in miniature job/trade as means of livelihood. Likewise some communities are economically better off than others as the result of natural resource endowment of such areas.

Socio-economic characteristics or status of farmers play a greater role in technology adoption and utilization. Studies indicated that categories among farmers are based on their identified socio-economic characteristics. Swanson *et al.* (1984), noted that the innovators are young, better educated, better off, have more land and physical resources at their disposal, have more contract with farm related organizations and societies. These characteristics make them to see the need for change quickly and they are willing to take entrepreneurial risk in trying new innovation and make a lot of sacrifices for substantial gains. At the extreme end are the laggards, which rank opposite on each of the socio-economic characteristics listed, while the other categories (the early majority and the late majority) rank between, the two extremes.

In view of the above analysis agricultural extension as a vehicle for transferring proven farm innovations and technologies to farmers should identify socio-economic characteristics/indictors for each farmers categories and tailor farm innovations to meet the specific information needs of each category.

2.6 Awareness of agricultural land use management practices.

Awareness is the knowledge of existence of a phenomenon. To create awareness on government policies and programmes, public enlightenment organs such as the mass media, National Orientation Agency (NOA), Ministry of Information and Agricultural Extension Service were formed, funded and charged with the responsibility of information dissemination. Without awareness campaigns, knowledge and ideas may hardly reach those in need of it.

The importance of awareness creation as a component of agricultural extension in introducing new ideas, technologies and practices has since been

recognized and given premium. Awareness is the first step in the adoption process when considering new ideas or technology (Behrens *et al.*, 1984, Jibowo, 1999). At the level of awareness, mass media tools such as radio, newspaper, magazine, television, motion pictures, slide shows, exhibits and printed materials are used to introduce new ideas and practices and alert people on emergencies. Although the awareness stage gives little information about the idea it portrays, it serves as an appetizer, catalyst and stimulant that arouse clients' interest to seek additional information on the idea in the subsequent stages of the adoption process. The success or failure of the other stages of the adoption process which include interest, evaluation, and, trial depends on how the awareness stage is managed. Awareness creation is therefore a critical issue that needs to be considered before selling any idea to its consumers.

Land degradation and other negatives impacts of agricultural intensification on water and soil resources as well as ecological imbalance might be as a result of lack of awareness. Prager and Posthumus, (2010), reported that it was only in 1980s, that awareness on the negative impacts of agricultural intensification on water and soil resources was incorporated into agricultural policies and soil conservation interventions. Prior to this period, attention was geared toward the Productivity paradigm with little or no attention on its harmful effects.

2.7 Information sources on agricultural land use management practices

According to Ogunbameru (2001), rural peoples obtain technical information from four main sources.

i. Mass media;
ii. Government agencies;
iii. Neighbors and friends and
iv. Commercial sources.

Among these sources of information, Edeoghan *et al.* (2008), identified radio (a form of electronic medium) and extension agents (government agency) as the most significant sources of information among arable crop farmers in Ikopba Okha Local Government Area of Edo state. These findings agree with the of finding by Osabuomen and Okoedu, (2011), who discovered that 34% of arable crop farmers in Edo state of Nigeria, got information on environment and environment matters during their school days, 25.4% of them got information

from electronic and print media, 21.7% of them got information from the Agricultural Development Programme (ADP) while only 18.6% of the respondents obtained technical related matters from friends.

2.8 Attitude of the respondents toward agricultural land use management practices.

According to Fakoya *et al.,* (2000), attitude is the predisposition to feel, think or act in a particular way with some degree of consistency, while Hyyatia and Kola, (2005), stressed that attitudes are important because they provide direction and purpose to behavior and performance.

In a study on attitudes of women farmers towards sustainable land management practices in south western Nigeria, Fakoya *et al.* (2007), found a positive ($r = 0.63$, $p < 0.05$) correlation between attitude by women farmers and use of sustainable agricultural land management practices in the study area. The study also revealed that majority (64%) of the respondents show neutral attitude to sustainable land management practices, however, respondents that have favourable attitudes to cultural land management practises were found to perform more land management practices than those with low attitude (un favourable) score.

2.9 Use of agricultural land management practices.

According to Onasanya (2007), majority of crop farmers in Ogun state (55.5%, 69.0% and 60%) do not practice composting, planting of cover crops and soil erosion control respectively. However, Edeaghan *et al.* (2008), revealed that mixed cropping, minimum tillage and cover cropping were the most used sustainable agricultural practices by arable crop farmers in Ikpoba local government area of Edo state. In the same vein, Anyawuyi and Ogunlade (2010) reported that crop rotation, mulching and planting of cover crops were the sustainable crop production practices used by farmers in Shaki agricultural zone of Oyo state Nigeria. These indicate that usage of agricultural land use management practices among arable crop farmers in Nigeria vary from one region to another or from one region depending on the ecological condition of the area and farmers awareness of such practices.

2.10 Constraints to agricultural land use management practices.

It is generally believed that the adoption of any technology by farmers depends on its net economic benefit in relation to other options available.

However external constraints may impede the adoption of profitable technologies. According to Menale and Precious (2009), the main constraint to the adoption of agricultural land use management practices are;

- Heterogeneity in agro-climatic environment;
- Biomass availability;
- Economic incentive;
- Access to information;
- Land issues;
- Lack of proper extension service, and
- Political constraints.

Other constraints include; lack of equipment, lack of finance and lack of knowledge (APCAEM 2007, Edeaghon et.al 2008)

2.11 Conceptual framework

The conceptual framework is a structure that is designed to guide the research by articulating the relationships that exist between the variables of the study. The variables of the study were categorized into three. These include the independent variables, intervening variables and the dependent variables. The independent variables are the variables manipulated by the researcher to determine their relationships with the observed state of affairs. These variables include:

i. Socio-economic characteristics of the respondents;
ii. Awareness of agricultural land use management practices;
iii. Sources of information on agricultural land use management practices;
iv. Attitudes of the respondents toward agricultural land use management practices; and
v. Constraints associated to the use of agricultural land management practices.

The intervening variables consist of variables that are uncontrollable and are not measured directly yet, they influence other variables of the study and have significant effects on the outcome of the research. The intervening variables of this study include government policy on agricultural land use management practices, tradition and culture of the people in relation to agricultural land use management practices. The dependent variable is the predicted arable crop farmers' use of

agricultural land management practices. The framework articulates the relationships between and within the variables of the study as shown in figure 2.1

2.11.1 How the conceptual framework works

The independent variables (socio-economic characteristics, awareness, information source, attitude and constraints) influence the dependent variable of the study (agricultural land use management practices). It can also be observed that the independent variables influence each other to give a strong effect on the dependent variable of the study. Socio-economic characteristics such as age, sex, educational attainment, occupation, household size, farm size and years of farming experience have strong bearing on the type of information needed by the respondents. The type of information and its source have strong effect on awareness of agricultural land use management practices. The type of information and its source is capable of influencing the attitudes of the respondents positively or negatively, to accept or reject agricultural land use management practices. The type of information accessed by the respondents is also dependent on the constraints faced by the respondents.

Generally all the independent variables influences each other positively or negatively to affect the dependent variable of the study. For instance, the socio-economic characteristics directly influence the information type and its sources. This indirectly affects the level of awareness and attitude of the respondents urging them to overcome their constraints so as to adopt agricultural land use management practices. Likewise awareness and attitude of the respondents will enable them to seek information on agricultural land use management practices.

Although the intervening variables are uncontrollable and are not measured directly, they play significant roles on the outcome of the research. For instance, a deliberate policy by government to provide incentives to farmers in terms of soft loans and equipment to adopt agricultural land use management practices will enhance the adoption of such practices by the respondent. The tradition and culture of the people usually expressed in terms of their indigenous knowledge is a powerful instrument for motivating farmers to develop positive attitude to farm innovations leading to its adoption if such practices are compatible to the farmers' culture or indigenous knowledge.

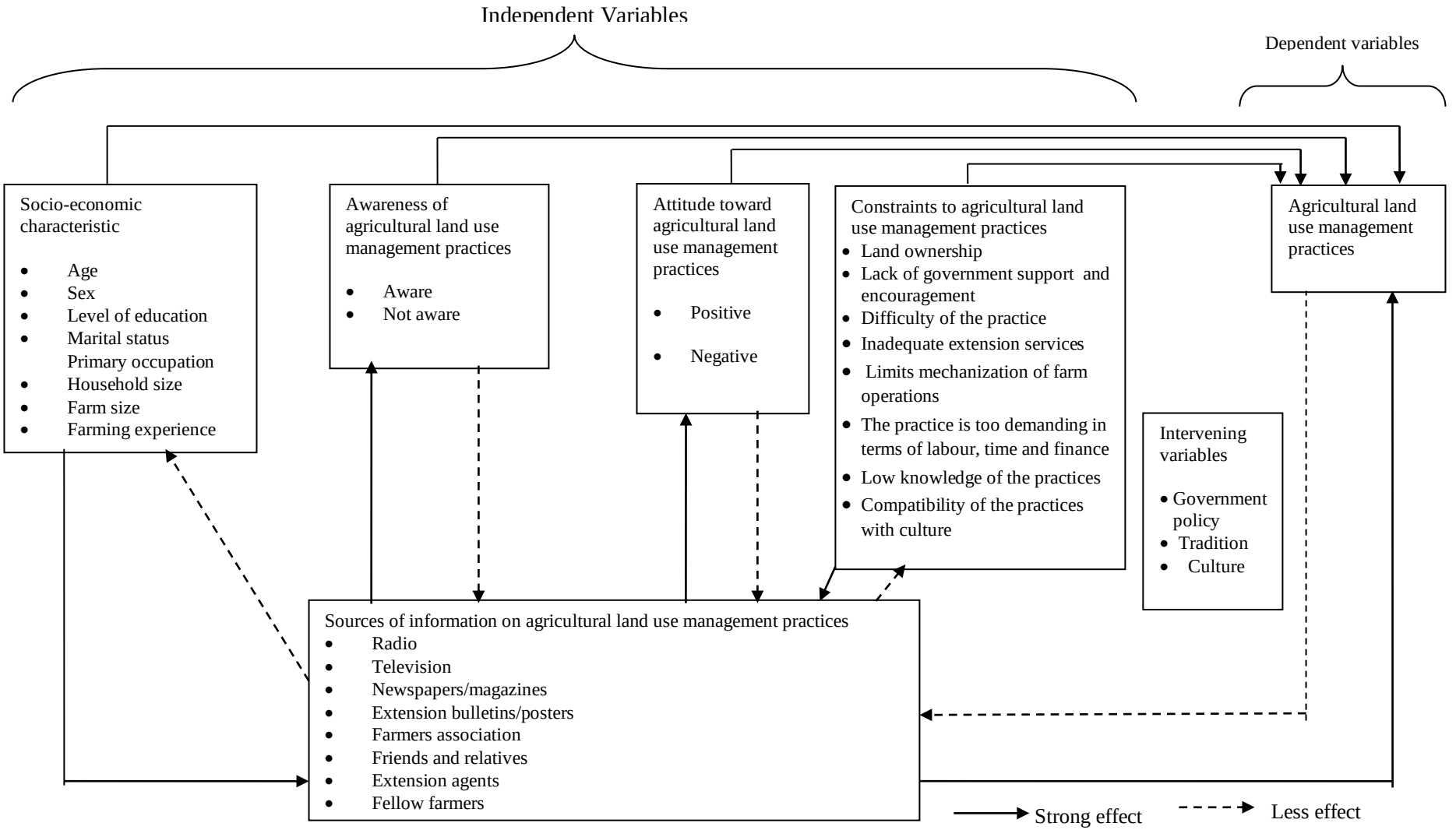

Fig 2.1: Conceptual Framework for Agricultural Land Use Management Practices Among Arable Crop Farmers in ADP Zone One, Taraba State, Nigeria.

CHAPTER THREE
METHODOLOGY

3.1 The study area

Taraba State Agricultural Development Programme (TADP) consists of four agricultural zones namely; Zone One, Zone Two, Zone Three and Zone Four. The study was carried out in Zone One which has its Headquarters at Zing. The Zone lies within the geographical co-ordinates of Longitudes10^0 12^l – 11^0 52^l East and Latitudes8^0 35^l - 9^0 40^l North. It consists of six Local Government areas namely; Ardo Kola, Jalingo, Karim Lamido, Lau, Yorro and Zing. It has eight Extension Blocks, namely; Iware Block in Ardo Kola Local Government Area, Jen and Karim Lamido Blocks in Karim Lamido Local Government Area, Lau and Kunini Blocks in Lau Local Government Area, Kpanti Sawa Block in Yorro Local Government Area as well as Zing and Jalingo blocks in Zing and Jalingo Local Government Areas respectively. The Zone is made up of 53 cell areas evenly distributed in the block areas. Taraba State ADP Zone One, shares boundary with Bauchi and Gombe States in the north-east, Adamawa State on the east and Plateau State in the north-west. The Zone is also bounded to the south and south east by Bali Local Government Area, as well as Gassol and Ibi Local Government Areas to the South west (figure 3.1).

The dry/rainy season is the dominant climatic feature of the study area as is common in tropical regions. The rainy season begins in April and ends in October. The average annual rainfall is 100mm, the months of August and September recording the highest rain. The dry season begins in November and terminates in March. The vegetation of the area is of the sub-Sudan type characterized by short grasses interspersed with short trees. The rich alluvial soil found in most parts of the study area supports the cultivation of both food and cash crops.

The zone have a projected population figure of 786,433.726 (2012 projected population census figure) and an estimated total land mass of13348.726 square kilometers. The major occupation of the people in the study area is agriculture. Crops produced in the area include, groundnuts, maize , rice, sorghum , millet, cassava, and yam. Beside crops the inhabitants also keep livestock such as cattle, sheep and goats, poultry and pig farming .Communities living on the banks of River Benue engage in fishing all year round. Other occupational activities include pottery, cloth-weaving, dyeing, mat-making, carving, embroidery and blacksmithing.

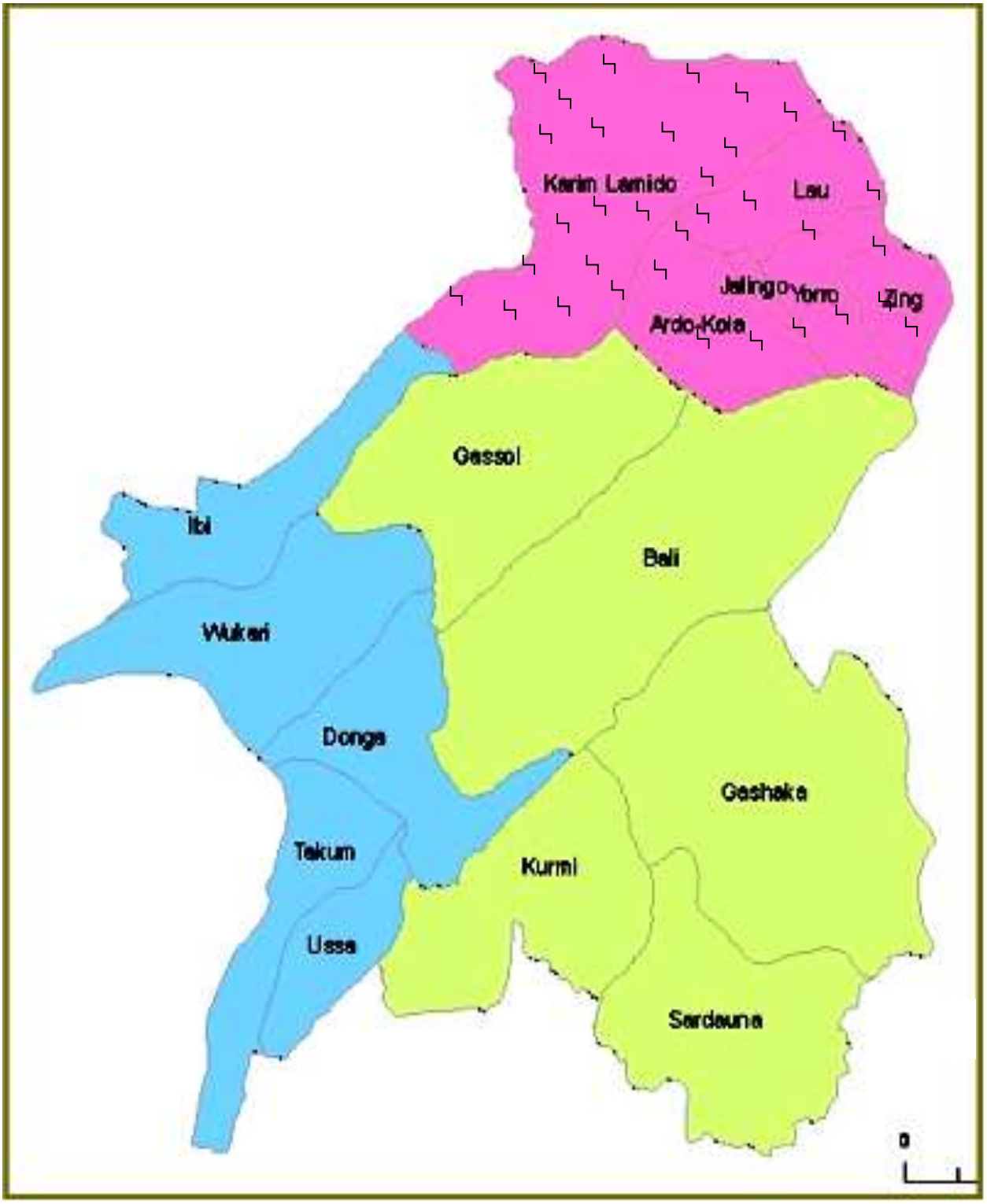

Figure 3.1 Map of Taraba State showing the Study Area

Source: Ministry of Land and Survey, Jalingo, Taraba State, 2005

3.2 Sources of Data

The data for the study were sourced using structured questionnaire administered to the individual respondents.

3.3 Study population and sample size

The Population of the study comprised of arable crop farmers in ADP Zone One, Taraba State, Nigeria.

A multistage sampling technique was used in selecting the respondents for the study.

Stage 1: All the blocks in ADP Zone One, Taraba State, Nigeria were considered for the study.

Stage 2: 25% of Cells in each Block in the Zone were randomly selected.

Stage 3: Involve systematic sampling of 15 respondents from each of the 16 cells selected by taking respondent from every third house. In all, a total of 240 respondents were sampled for the study as summarized in Table 3.1.

Table 3.1: Selected arable crop farmers in the study area:

Selected Zone	Block Areas	No. of Cells	25% of Cells	Selected Cells	No. of questionnaire distributed	No. of questionnaire returned
Zone 1	Iware	8	2	Iware	15	15
				Mallum	15	14
	Jalingo	8	2	Jalingo	15	15
				Kona	15	15
	Jen	8	2	Jen	15	15
				Bambuka	15	14
	K/Lamido	8	2	K. Lamido	15	15
				Mutum daya	15	13
	Kunini	6	2	Kunini	15	14
				Mayo lope	15	13
	Lau	7	2	Garin doga	15	15
				Minda	15	15
	Kpanti-sawa	7	2	Kpanti-sawa	15	14
				Pupule	15	15
	Zing	8	2	Zing	15	14
				Monkin	15	15
Total	8	60	16		240	230

Source: Field survey, 2012

3.4 Methods of data analysis

Both descriptive and inferential statistics were used in analyzing the data. The descriptive statistics used include mean, frequency and percentage. Descriptive statistics were used in analyzing the data to achieve objectives one to six. Chi square and logit regression were the inferential statistical tools used in the study. Chi Square was used to test the hypothesis of the study at 0.05 level of significance while the logit regression analysis was used to determine the specific contribution of each independent variable to explain the variance in the respondents' use of agricultural land management practices in the study area.

The mean is given by:

$\sum Xi/n$…….(1)

Where $\sum Xi$ = Sum of observed values

N = Number of observations

The Chi-square is mathematically expressed as:

$$\chi^2 = \frac{\sum(0-E)^2}{E} \quad \text{…….(2)}$$

Where: 0 is the observed frequency

E is the expected frequency

$\sum$ = summation

The logit regression equation is given by;

$Y = a + b_1X_1 + b_2X_2 + \text{……} b_{10}X_{10}$ .....(4)

Where,

Y = Predicted arable crop farmers' use of sustainable agricultural land management practices (proxy by the proportionate level of utilization of land use management practices).

a = Regression constant

$b_1, b_2, \text{……} b_{10}$ = Regression coefficient attached to variable $X_1, X_2, \text{…..} X_{10}$.

X_3, X_7, X_8, and X_9 = Independent variables that significantly contributed to variance of the independent variables; and

X_1 = Age (years);

X_2 = Sex (proxy by male = 1, female = 0);

X_3 = Educational attainment, (proxy by number of years spent in school);

X_4 = Household size, (number of persons in a household).

X_5 = Farm size, (hectares).

X_6 = Farming experience, (years).

X_7 = Awareness, (proxy by aware =1, not aware =0)

X_8 = Information source, (proxy by use = 1, do not use = 0)

X_9 = Attitude, (proxy by positive =1, negative =0) and

X_{10} = Constraints, (proxy by constraint =1, not a constraint =0).

3.5 Measurement of Variables

3.5.1 Measurement of respondents' awareness of agricultural land use management Practices

The level of awareness of agricultural land use management practices among the respondents was measured on a two point rating scale of Aware A (1) and Not Aware NA (0).The cut off mean was calculated and was compared with the mean score for each practice. Any practice that had mean value greater than the cut-off mean indicate high level of awareness of such practice and any practice that have mean value less than the cut-off mean indicate low level of awareness of such practice among the respondents.

3.5.2 Measurement of respondents' attitude toward agricultural land use management practices

The respondents' attitude toward agricultural land use management practices was measured on a five- point Likert scale of strongly agree through strongly disagree. The score attached to each scale is as follows: Strongly Agree SA (5), Agree A (4), Undecided U (3), Disagree D (2) and Strongly Disagree SD (1). The respondents indicated their opinion to 30 attitudinal statements on the rating scale provided .The cut - off mean was calculated and compared with the mean for each statement. Any mean that falls below the actual mean indicate respondents' negative attitude for that statement. Any mean that falls above the cutoff mean indicates the respondents' favourable attitude for that particular statement. To determine the overall attitude of the respondents toward agricultural land use management practices, the grand mean was calculated and compared with the cut off mean.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents considered in this study include; age, sex, marital status, educational attainment, household size, primary occupation, secondary occupation, farm size, years of farming experience, and types of arable crop cultivated.

4.1.1 Age distribution of the respondents

Table 4.1 reveals that majority (34.3%) of the respondents were within the ages of 36 – 45 years, 21.3% were within the age bracket of 46-55 years, and 20.9% were within the age bracket of 26-35 years and the mean age was 43 years. This shows that, majority of the respondents were within the productive age. This finding corroborates Ofuoku (2011) who reported that most arable crop farmers were within their prime age. This implies that, farmers in the study area were capable of using agricultural land management practices.

4.1.2 Respondents' sex.

The respondents' sex distribution in Table 4.1 reveals that majority (71.7%) of the respondents were male and 28.3% were female. This shows that, male were more involved in arable crop production in the study area than their female counterpart as the result of their access to land and other production inputs. This agrees with the findings of Edeoghon *et al*, (2008) that majority of the arable crop famers in Ikpoba Okha Local Government Area of Edo State were male. In contrast, Ofuoku (2011) reported that most of the arable crop farmers in Central Agricultural Zone of Delta State were female. According to the study, women dominated arable crop production while men concentrated on permanent crops and livestock farming. This may be for the fact that men in the study area have greater access to production inputs such as land and credit facilities.

4.1.3 Marital status of the respondents.

Table 4.1 also indicates that majority (70%) of the respondents were married, 13% of the respondents were single while widows and widowers constituted 12.6% of the respondent. This may be attributed to the belief that getting married will help to reduce the cost of hired labour on the farm as family members will also help. Marriage is also regarded as mark of honour and dignity which is held in high esteem in the study area.

Table 4.1: Socio-economic characteristics of the respondents

Variables	Frequency	Percentages	
Age(years)			
≤25	16	7.0	**Mean Age = 43**
26-35	48	20.9	
36-45	79	34.3	
46-55	49	21.3	
>55	38	16.5	
Total	**230**	**100**	
Sex			
Male	165	71.7	
Female	65	28.3	
Total	230	100	
Marital status			
Single	30	13.0	
Married	161	70.0	
Widows/widowers	29	12.6	
Divorced	10	4.3	
Total	**230**	**100**	
Educational attainment			
No formal education	69	30.0	
Primary education	32	13.9	
SSCE	46	20.0	
NCE/Diploma	62	27.0	
B.Sc./HND	21	9.1	
Total	**230**	**100**	
Household size			
1-5	76	33.1	
6-10	86	37.4	
11-15	45	19.5	
>15	23	10.0	
Total	230	100	Mean Household Sixe = 9 persons
Primary Occupation			
Farming	148	64.4	
Civil service	63	27.4	
Trading	12	5.2	
Artisan	22	9.6	
Student	2	0.8	
Total	**230**	**100**	
Secondary occupation			
Farming	82	35.7	
Civil service	15	6.5	
Trading	40	17.4	
Artisan	24	10.4	
Student	2	0.9	
No secondary occupation	67	29.1	
Total	**230**	**100**	
Farm size (ha)			
1-2	83	36.1	
3-4	83	36.1	
5-6	37	16.1	
>6	27	11.7	
Total	**230**	**100.0**	**Mean Farm Size = 4 ha**
Farming experience			
1-10	58	25.2	
11-20	79	34.3	
21-30	56	24.3	
31-40	23	10.3	
41-50	10	4.4	
>50	4	1.8	
Total	**230**	**100**	

Source: Field Survey, 2012.

4.1.4 Respondents' educational attainment

Table 4.1 further reveals that only 30% of the respondents had no formal education while the remaining 70% had one form of formal education or the other. This agrees with the findings of Adesoji and Farinde (2006) who reported that most of the arable crop farmers in Osun State of Nigeria were literate. This high literacy rate was expected to influence farmers' attitudes toward agricultural land use management practices. This finding is also an advantage for extension in which more respondents could read and interpret instructions and labels on chemical, fertilizers and seeds, among other information delivery activities that will enhance the diffusion and adoption of agricultural innovations.

4.1.5 Respondents' household size

Table 4.1 also reveals that, majority (37.4%) of the respondents had household size within the range of 6 - 10 persons while 10% of the respondents had household size with more than fifteen persons with the mean household size of nine persons. This has implication for the fact that household size determines the availability of cheap family labour compared to hired labour in situations where all the family members are involved in farming.

4.1.6 Respondents' primary occupations

Table 4.1 reveals that majority (64.4%) of the respondents had farming as their primary occupation as is common in most parts of rural Nigeria. Also 27.4% of the respondents were civil servants, while artisans, traders and students, collectively constituted 8.3% of the respondents. The fact that high proportion of the population hadfarming as their primary occupation would exert pressure on land and may pose threat to sustainable use of land. Extension agents would have to undergo serious work in training and retraining of these farmers on agricultural land use management practices.

4.1.7 Respondents' secondary occupations

Table 4.1 further reveals that majority (35.7%) of the respondents were engaged in farming as their secondary occupation, 21.9% of them had no secondary occupation, 17.4% were engaged in trading as their secondary occupation, 10.4% were artisans while 0.9% were student. The fact that majority of the respondents had farming as their secondary occupation brings to bare the need to train them on agricultural land use management practices.

4.1.8 Respondents' farm size

Table 4.1 indicates that majority (72.2%) of the respondents had farm size of 1 – 4 hectares, between 5 – 6 hectares were cultivated by 16.1% of them and only 11.7% of the respondents had farm size more than 6 hectares with mean farm size of four hectares. This concurs with findings of Ephraim (2009) and Kadafa (2012) who reported that, majority of farmers in Karim Lamido Local Government Area of Taraba State, Nigeria and Hong Local Government Area of Adamawa State, Nigeria, had farm sizes of 0.5- 5 hectares and less than 2 hectares, respectively. This shows that majority of the arable crop farmers in the study area were operating at subsistence level. Therefore, extension packages regarding agricultural land use management practices in the study area should be geared toward the need of small - scale farmers who are usually constrained with inadequate resources of land, labour and capital to carry out their farming activities.

4.1.9 Respondents' years of farming experience

Table 4.1 also indicates that majority (34.3%) of the respondents had farming experience between 11 – 20 years, 25.3% of them had farming experience between 1 – 10 years, 24.3% had 21 – 30 years of farming experience, 10% of the respondents had 31 – 40 years of farming experience, 4.4% had 41 – 50 years of farming experience and only 1.8% had more than 50 years of farming experience with the mean farming experience of 21 years. This shows that, most of the respondents were experienced farmers who may likely use agricultural land management practices to boast their productivity.

4.1.10 Types of crops cultivated by the respondents

Table 4.2 indicates that 20.1%, 19.5% and 17.3% of the respondents produced groundnut, rice and sorghum, respectively while 11.7%, 10.9%, 9.4% and 8.6% of them produced cowpea, maize, yam, and millet, respectively. This is because the environment supports the cultivation of such crops which form the major staple food of the people of the study area. This confirms Ndaghu (2011), who reported that the vegetation of North- eastern Nigeria supports the cultivation of such crops.

Table 4.2: Types of Crops Cultivated by the respondents

Types of crops cultivated		
Rice	123	19.5
Yam	59	9.4
Sorghum	109	17.3
Groundnut	127	20.1
Cowpea	74	11.7
Millet	54	8.6
Cassava	16	2.5
Maize	69	10.9
Total	**631***	**100**

***Multiple responses**
Source: Field Survey, 2012.

4.2 Awareness of agricultural land use management practices

Table 4.3 reveals that all the respondents (100%) were aware of the use of crop residue, 95.7% of them were aware of intercropping and bush fallow, 94.3% were aware of planting of legume crops as agricultural land use management practices. Conversely, 59.6%, 57.8% and 50% of the respondents were not aware of alley cropping, liming and green manuring as agricultural land use management practices respectively. The analysis revealed that the mean scores for all the practices except liming (mean = 0.42) and alley cropping (mean = 0.40) fall above the cut off mean of 0.5.

This implies that there is a high level of awareness of agricultural land use management practices in the study area. This high level of awareness is an added advantage to agricultural extension, as awareness of a practice is the first step in learning how to use it, followed by interest stage which urges the clientele to seek more information about the practice. This leads to the evaluation stage. When the client is convinced of the value of the practice in his own situation, he tries it on a small scale. If the trial is successful, he adopts the practice or uses it until a better innovation is discovered. However, Ani (2007), added that the relative advantage of an innovation, its complexity, trialability, and observability also enhance the diffusion of an innovation from one place to another leading to its adoption or rejection.

Table 4.3: Respondents' awareness of agricultural land use management practices

Practice	Aware		Not aware		
	(F)	%	(F)	%	Mean scores
Crop rotation	193	83.9	37	16.1	0.84
Inter cropping	220	95.7	10	4.3	0.96
Organic manuring	219	95.2	11	4.8	0.95
Mulching	180	78.3	50	21.7	0.78
Minimum tillage	191	83.0	39	17.0	0.83
Green manuring	115	50.0	115	50.0	0.50
Terracing	131	57.0	99	43.0	0.57
Contour bounding	169	73.5	61	26.5	0.74
A forestation	200	87.0	30	13.0	0.87
Use of compost manure	153	66.5	77	33.5	0.67
Liming	97	42.2	133	57.8	0.42
Bush fallow	220	95.7	10	4.3	0.96
Planting of cover crops	214	93.0	16	7.0	0.93
Planting of legume crops	217	94.3	13	5.7	0.94
Use of crop resistant varieties	190	82.6	40	17.4	0.83
Alley cropping	93	40.4	137	59.6	0.40
Use of crop residues	230	100.0	0	0	1.0

Source: Field survey, 2012.

Cut - off mean = 0.5 F = Frequency % = Percentage

4.3 Information sources on agricultural land use management practices

Sources of information on agricultural land use management practices and their level of use by the respondents were presented in Table 4.4. The table reveals that friends/relations (mean = 4.26), fellow farmers (mean = 4.21), radio (mean = 2.65) and agricultural extension agents (mean = 1.99), were the sources of information used by the respondents in that order. The internet (mean= 1.521) as well as extension bulletins and posters (mean = 1.67), were not significantly used by the respondents. The fact that most of the information sources were not significant utilized by the respondents implies that arable crop farmers in the study area may lack technical information on agricultural land use management practices.

Table 4.4: Information sources used by the respondents

Sources of information	Daily		Weekly		Fortnightly		Monthly		Don't use		Mean scores
	(F)	%	(F)	%	(F)	%	(F)	%	(F)	%	
Radio	102	44.7	53	23..00	11	4.8	21	9.1	43	18.7	2.63
Television	32	13.9	48	20.9	14	6.1	35	15.2	101	43.9	2.46
Newspapers/magazines	9	3.9	27	11.7	22	9.6	39	17.0	133	57.8	1.87
Extension bulletins/ posters	7	3.0	13	5.7	20	8.7	46	20.0	144	62.6	1.67
Farmers' association	28	12.2	27	11.7	37	16.1	59	25.7	79	34.3	2.41
Friends and relatives	149	64.8	34	14.8	19	8.3	14	6.1	14	6.1	4.26
Extension agents	21	9.1	14	6.1	21	9.1	60	26.1	113	49.1	1.99
Fellow farmers	155	67.4	30	13.0	15	6.5	14	6.1	16	7.0	4.21
GSM phones	51	22.2	8	3.5	5	2.2	19	8.3	147	63.9	2.12
Internet	16	7.0	6	2.6	7	3.0	24	10.0	177	77.0	1.52

Cut- off mean = 3.00

Source: Field survey, 2012. **F= Frequency; % = Percentage.**

4.4 Respondents' attitudes to agricultural land use management practices

Table 4.5 shows the mean scores for the attitudinal statements analyzed. The table reveals that the respondents expressed favourable attitudes to nineteen out of the thirty attitudinal statements whose mean values were above the cut off mean of 3.00. To determine the overall attitude of the respondents, the grand mean was calculated to be 3.46, which was above the cut off mean of 3.00 indicating that the respondents had favourable attitude toward agricultural land use management practices. This favourable attitude of the respondents implies that, there will be little or no resistance to agricultural land use management innovations, contrary to the common belief that farmers were resistant to innovations or change.

Table 4.5: Respondents' attitude towards agricultural land use management practices

Attitudinal statement	SA (F)	SA %	A (F)	A %	U (F)	U %	D (F)	D %	SD (F)	SD %	Mean scores
Tree planting is good for proper land use	176	76.5	40	17.4	2	0.9	6	2.6	6	2.6	4.57
Land management can only be practiced by farmers	38	16.5	83	36.1	15	6.5	50	21.7	44	19.1	3.09
Mulching reduces evaporation	94	40.9	101	43.9	12	5.2	17	7.4	6	2.6	4.13
Agricultural land use management practices should be backed by a legislation.	77	33.5	76	33.0	33	14.3	28	12.2	16	7.0	3.73
Planting of legumes improves soil fertility	160	69.9	63	27.4	2	.9	2	.9	3	1.3	5.60
Trees should be in forest, not on farms	41	17.8	46	20.0	15	6.5	71	30.9	57	24.8	4.63
Organic manure improves water conservation in the soil	75	32.6	108	47.0	23	10.0	12	5.2	12	5.2	3.96
It is not necessary to use compost, since fertilizer is still used to replenish the soil	45	19.6	38	16.5	21	9.1	88	38.3	38	16.5	2.84
Environmental problems may hinder agricultural productivity	134	58.3	64	27.8	8	3.5	10	4.3	14	6.1	4.27
Without the use of chemicals, agriculture is not possible	21	9.1	14	6.1	8	3.5	78	33.9	109	47.4	1.95
Nutrient loses due to run off can be prevent by mulching	59	25.7	110	47.8	29	12.6	21	9.6	11	4.8	4.58
Agricultural land use management practices encourage the exploitation of land resources for short gains and profits.	25	10.9	41	17.8	64	27.8	50	21.7	50	21.7	2.74
Only land owners can plant trees	72	31.3	61	26.5	11	4.8	58	25.2	28	12.2	2.16
Land tenure constitute problem to agricultural land use management	140	60.9	51	22.2	14	6.1	15	6.5	12	5.2	4.29
Drainage, prevent water logging in the soil.	108	47.0	100	43.5	4	1.7	12	5.2	6	2.6	4.26
Bush fallow expose soil to erosion	18	7.8	18	7.8	19	8.3	52	22.6	121	52.6	1.93
Use of organic manure enhances weed development	100	43.5	61	26.5	12	5.2	36	15.7	21	9.	3.79
Agricultural land use management practices should only be practice by large scale farmers	21	9.1	36	15.7	12	5.2	61	26.5	100	43.5	2.20
Bush fallow helps in maintains soil fertility	106	46.1	59	25.7	28	12.2	20	8.7	17	7.4	3.94
Food security can be achieved without employing agricultural land use management practices.	7	3.0	24	10.4	49	21.3	61	26.5	89	38.7	2.12
A balanced ecosystem sustains agricultural land	83	36.1	99	43.0	29	12.6	13	5.7	6	2.6	3.18
Legumes act as weeds to disturb crops	27	11.7	47	20.0	21	8.7	69	30.0	67	29.1	2.16
Agricultural land use management practices are recommended, because fertilizers are very expensive	87	37.8	65	28.3	25	10.9	21	9.1	32	13.9	3.67
Agricultural land use management practices are capital intensive	62	27.0	101	43.9	12	5.2	34	14.8	21	9.1	3.64
Bush fallow helps in preventing soil erosion	187	81.3	30	13.0	3	1.3	5	2.2	5	2.2	4.69
Use of organic manure pollutes the farm and its environment	17	7.4	46	20.0	13	5.7	50	21.7	104	45.5	2.22
Agricultural land use management practices should be encouraged by every one	139	60.4	67	29.1	14	6.1	6	2.6	4	1.7	4.43
Crop rotation is labour demanding	30	13.0	93	40.4	9	3.9	59	25.7	39	17.0	3.06
Application of organic manure reduces water conservation in the soil	28	12.2	42	18.3	31	13.5	42	8.3	91	39.6	2.50
Mulching encourages nutrient loss in the soil	36	15.7	23	10.0	9	3.9	36	15.7	127	55.2	2.16

Cut - off mean = 3.00 **Grand mean = 3.46**

Source: Field survey, 2012

4.5 Use of agricultural land management practices

Table 4.6 reveals that: intercropping (mean = 2.60), planting of legumes (mean = 2.40), planting of cover crops (mēan = 2.14), crop rotation (mean = 2.08) and minimum tillage (mean = 2.06) were the agricultural land use management practices that were significantly used by the respondents. The high level of use of these practices may be due to the high level of their awareness (Table 4.3).

Practices such as liming (mean = 1.37), use of compost (mean = 1.37), Alley cropping (mean = 1.42) green manuring (mean = 1.50), terracing (mean = 1.40) and afforestation (mean = 1.56) were not significantly used by the respondents. The low level of use of liming and green manuring may be due to the low level of their awareness (Table4.3). The non- use of terracing despite high level of awareness (table 4.3) may be due to the fact that the practice is commonly used in highlands or sloppy areas which the study area is not. This imply that agricultural land use management practices are site specific and are related to the physical nature of the agro ecological environment. (Titilola, 2000, APCAEM, 2007). From the mean scores displayed in table 4.6, there was low usage of agricultural land management practices in the study area as most of the mean scores fall below the cut- off mean of 2.0. This implies that, there was low level of use of agricultural land management practices in the study area despite high level of awareness recorded in Table 4.3. This may be attributed to several constraints experienced by the respondents (Table 4.7).

Table 4.6: Respondent's use of agricultural land management practices

Practice	Regularly		Sometimes		Never		
	(F)	%	(F)	%	(F)	%	Mean scores
Crop rotation	83	36.1	83	36.1	64	27.8	2.08
Inter- cropping	149	64.8	71	30.9	10	4.3	2.60
Organic manuring	59	25.7	129	56.1	42	18.3	2.07
Mulching	43	18.7	104	45.2	83	36.1	1.83
Minimum tillage	75	32.6	94	40.9	61	26.5	2.06
Green manuring	32	13.9	50	21.7	148	64.3	1.50
Terracing	18	7.8	56	24.3	156	67.8	1.40
Contour bounding	37	16.1	113	49.1	80	34.8	1.81
Aforestation	28	12.2	73	31.7	129	56.1	1.56
Use of compost manure	35	15.2	92	40.0	103	44.8	1.67
Liming	14	6.1	57	24.8	159	69.1	1.37
Bush fallow	45	19.6	123	53.5	62	27	1.93
planting of cover crops	66	28.7	130	56.5	34	14.8	2.14
planting of legume crops	113	49.1	96	41.7	21	9.1	2.40
Use of crop resistant varieties	46	20.0	124	53.9	60	26.1	1.93
Alley cropping	28	12.2	42	18.3	160	69.6	1.43
Use of crop residues			228	99.1	2	.9	1.99

Cut- off mean = 2.00

Source: Field survey, 2012.

4.6 Constraints to agricultural land management practices

Table 4.7 reveals that inadequate extension services (mean = 2.67), lack of government support and encouragement (mean = 2.67), inadequate finance (mean=2.58) were the major constraints to use of sustainable agricultural land management practices in the study area. This corroborates Edeoghon *et al.* (2008), who outlined lack of government support and encouragement, finance and capital intensiveness of agricultural land use management practices as barriers to its use. In the same vein, Drost *et al.* (1996) identified financial impediment as the major barrier to the use of sustainable agricultural practices among the farmers in Utah. Respondents did not consider compatibility of the practices to culture (mean = 1.620) and time (mean = 1.93) as significant constraints to agricultural land use management practices in the study area.

Table 4.7: Constraints to agricultural land use management practices

Constraints	Very Severe (F)	%	Severe (F)	%	Not severe (F)	%	Mean scores
Land ownership	130	56.5	55	23.9	45	19.6	2.36
Lack of Government Support & encouragement	165	71.7	53	23.0	12	5.2	2.67
Difficulty of the practice	110	47.8	84	36.5	36	15.7	2.32
Ineffective extension services	167	72.6	49	21.3	14	6.1	2.67
It limits mechanization of farm operations	138	60.0	67	29.1	25	10.9	2.49
The practice is too demanding in terms of labour	99	43.0	79	34.3	52	22.6	2.20
The practice is too demanding in terms of time	70	30.4	75	32.6	85	37	1.93
Inadequate finance	149	64.8	67	29.1	14	6.1	2.58
Low knowledge of the practices	122	53.0	82	35.7	26	11.3	2.41
Compatibility of the practices to culture	44	19.1	56	24.3	130	56.5	1.62

Source: Field survey, 2012. Cut- off mean = 2.00. F = Frequency. % = Percentage.

4.7 Test of hypothesis.

H_0: There is no significant relationship between the respondents' socio-economic characteristics and their use of agricultural land management practices.

The socio-economic characteristics considered in this study were age, marital status, educational attainment, size of household, primary occupation and secondary occupation. The chi-Square analysis presented in Table 4.8 reveals significant relationship between, educational attainment (X^2 = 38.645, P < 0.05), primary occupation (X^2 = 22.452, P < 0.05) and secondary occupation (X^2 = 20.750, P < 0.05). Therefore the null hypothesis was rejected with respect to respondents' educational attainment, primary occupation and secondary occupation implying that these socio-economic variables significantly influence the respondents' involvement in agricultural land use management practices.

The chi-square result in Table 4.6 further revealed no significant relationship between respondents' age (X^2 = 46.996, P>0.05), marital status (X^2 = 8.646, P>0.05) and size of household (X^2 = 25.014, P>0.05) respectively. Therefore the null hypothesis was accepted with respect to age, marital status and household size.

Table 4.8: Chi Square results of the relationships between socio-economic characteristics of respondents and their use of agricultural land management practices

Variable	X^2	df	P value	Contingency value	Decision
Age	46.996	49	0.555	0.060	
Marital status	8.646	4	0.071	0.097	
Educational attainment	38.645	4	0.000	0.000	**
Size of household	25.014	24	0.405	0.639	
Primary occupation	22.452	5	0.000	0.005	**
Secondary occupation	20.750	6	0.002	0.609	**

Source: Field survey, 2012.

****Significant at 0.05 level**

Logit regression analysis

The result of the logit regression analysis presented in Table 4.9 reveals that, educational

Level (x_3) and attitude (x_9) were statistically significant at 0.05 level. Likewise, awarenes (x_7) and information sources (x_8) were statistically significant at 0.01level. This implies that, a unit increase in level of these variables lead to corresponding increase agricultural land use management practices in the study area. Variables such as the respondents' household size (x_4) and farm size also indicate positive contributions to agricultural land use management practices in the study area. However, variables such as the respondents' age (x_1), sex (x_2), farming experience (x_6) and constraints (x_{10}) indicate negative contribution or inverse relation.

Table 4.9: Logit regression analysis of variables influencing the use of sustainable agricultural land management practices

Variables	Coefficient	Standard error	T value	P value	Decision
Constant	- 0.825	0.355	- 2.321	0.020	
Age (X_1)	- 0.002	0.003	- 0.672	0.501	
Sex(X_2)	- 0.041	0.067	- 0.608	0.544	
Educational level(X_3)	0.052	0.025	2.064	0.039	**
Household size(X_4)	0.004	0.006	0.705	0.480	
Farm size(X_5)	0.003	0.007	0.442	0.659	
Farming experience(X_6)	- 0.002	0.003	- 0.579	0.562	
Awareness(X_7)	0.057	0.012	4.747	0.000	*
Information source(X_8)	0.011	0.003	3.243	0.001	*
Attitude(X_9)	0.007	0.003	2.036	0.041	**
Constraints(X_{10})	- 0.008	0.009	- 0.890	0.373	

***Coefficient significant at 0.01 level.**

****Coefficient significant at 0.05 level**

Source: Computer printout of Logit analysis for field survey, 2012.

CHAPTER FIVE

SUMMARY, CONCLUSION, RECOMMENDATIONS, AND CONTRIBUTIONS TO KNOWLEDGE

5.1 Summary

This study investigated the agricultural land use management practices among arable crop farmers in ADP Zone One, Taraba State, Nigeria. The study specifically described the socio-economic characteristics of the respondents, ascertained respondents' awareness of agricultural land use management practices, determined the respondents' sources of information on agricultural land use management practices, determined the respondents' attitudes toward agricultural land use management practices, identified constraints experienced in the use of agricultural land management practices and also identified the variables that had the likelihood of influencing the use of agricultural land management practices in the study area. Hypothesis predicting relationships between socio-economic characteristics of the respondents and agricultural land use management practices was also tested.

The population of the study was arable crop farmers in the study area, who were sampled using multi-stage sampling technique to draw 230 respondents that were used in the study. The primary data for the study were generated through the use of questionnaire. Both descriptive and inferential statistics were used in analyzing the data. The descriptive statistics used include frequency count, mean and percentage, while the inferential statistics used were chi-square, and logit regression.

The chi-square test revealed significant relationship between educational attainment (χ^2 = 38.645, P<0.05), primary occupation (χ^2 = 22.452, P<0.05) and secondary occupation (χ^2 = 20.750, P<0.05). The chi-square analysis also revealed no significant relationship between age (χ^2 =46.996, P>0.05), marital status (χ^2 = 8.646, P>0.05), and household size (χ^2 = 25.014, P>0.05). The logit regression analysis revealed that, educational level (x_3), awareness (x_7), information sources (x_8) household size (x_5) made positive contributions to agricultural land use management practices among the respondents. However, variables such as age (x_1), sex (x_2), farming experience (x_6), and constraints (x_{10}) indicated negative contributions or inverse relations.

5.2 Conclusion

Majority of the arable crop farmers were male in their prime ages that had attained one level of education or the other, married with small family sizes and had farming as their primary or secondary occupations. Rice, sorghum, groundnut and maize were the major crops cultivated in that order. Majority of the respondents were experienced farmers. Friends / relations and fellow farmers were the major sources of farm information. There was high level of awareness of agricultural land use management practices among the respondents. The respondents also had favourable attitude toward agricultural land use management practices. Unfortunately, there was low level of use of such practices due to the constraints such as ineffective extension services, insufficient support or encouragement from government, inadequate financial resources, low access to land ownership and difficulty of the practices experienced by the respondents.

5.3 Recommendations

Based on the study, the following recommendations were made.

- Agricultural policies and programmes on agricultural land use should be tailored to the needs of small- scale farmers who constituted the majority of arable crop farmers in the study area.
- Extension agents should package extension messages to farmers on agricultural land use management with respect to rice, sorghum, groundnut, millet and maize, being the most cultivated crops in the study area.
- Contact farmers should be used in relaying farm information to farmers, as friends / relations and fellow farmers constituted the most used sources of farm information by the respondents.
- Government at all levels should be sensitized on the significance of channeling parts of their ecological funds to tackling environmental problems affecting farmers. This will create greater opportunity for agricultural land use management practices.
- Government should carry out land reforms to make land accessible to landless farmers. This will enable them have access to land for agricultural production.
- Farmers need to be trained and retrained on agricultural land use management practices to overcome the difficulties of the practices.
- Agricultural extension services in the study area should be revived as most farmers no longer receive farm information from extension agents.

- Farmers in the study area should be enlightened on how to access the available funds in Commercial Banks, Bank of Agriculture as well as in the Bank of Industry to enable them carry out agricultural land use management practices on their farms.
- Agricultural land use management practices should be backed by legislation to ensure strict compliance by all agricultural land land users.
- Governments, Non- Governmental Organizations (NGO_S), community leaders and development partners such as World Bank (WB) and African Development Bank (ADB) should collaborate in tackling problems associated with agricultural land use management practices as it is an enormous task.

5.4 Contributions to knowledge

The study had made the following contributions to knowledge:-

- Most respondents had one form of education or another
- Respondent's education and occupation had likelihood of increasing agricultural land use management practices.
- Respondents were mostly small scale farmers.
- Groundnut, Rice and Sorghum were the most cultivated crops
- Friends/Relations, fellow farmers, radio and agricultural extension agents were the respondents' major sources of information.

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APPENDIX

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION
MODIBBO ADAMA UNIVERSITY OF TECHNOLOGY, YOLA

QUESTIONNAIRE ON AGRICULTURAL LAND USE MANAGEMENT PRACTICES AMONG ARABLE CROP FARMERS IN ADP ZONE ONE, TARABA STATE, NIGERIA

Instruction: Please tick/ fill in the spaces provided below as applicable to you

Questionnaire Number……..

Local Government Area……..……

SECTION A: Socio- Economic Characteristics

1. Age: _____years
2. Sex: (a) Male [ ] (b) Female [ ]
3. Religion: (a) Christianity [ ] (b) Islam [ ] (c) Traditional [ ] (d) Others, (specify)_____
4. Marital Status: (a) Single [ ] (b) Married [ ] (c) Widowed [ ] Widower [ ] (d) divorced [ ]
5. Educational qualification:
   (a) No formal education [ ] (b) Primary education [ ] (c) SSCE [ ]
   (d) NCE/Diploma [ ] (e) BSc./ HND [ ] (e) others (specify)_____
6. Size of household:_____ persons
7. Primary occupation: (a) farming [ ] (b) Civil servant [ ] (c) Trading [ ] (d) Artisan [ ] (e) Others (specify)_____
8. Secondary occupation (a) farming [ ] (b) Civil servant [ ] (c) Trading [ ] (d) Artisan [ ] (e) others (specify)_____
9. Crops cultivated (a) Rice [ ] (b) Yam [ ] (c) Sorghum [ ] Groundnut [ ] (d) Cowpea [ ] (d) Millet [ ];
   (e) others (specify)_____
10. Farm Size: _____hectares)
11. Farming experience: _____ years.

SECTION B: Awareness of Agricultural Land Use Management Practices.

S/NO	Practice	Aware	Not aware
1.	Crop rotation		
2.	Inter cropping		
3.	Organic Manuering		
4.	Mulching		
5.	Minimum tillage		
6.	Green manuering		
7.	Terracing		
8.	Contour bounding		
9.	A forestation		
10.	Use of compost manure		
11.	Liming		
12.	Bush fallow		
13.	Planting of cover crops		
14.	Planting of legume crops		
15	Use of crop resistant varieties		
16	Alley cropping		
17	Use of crop residue		

SECTION C: How often do you use the following sources of information on Agricultural Land Use Management Practices?

S/N	Sources of information	Frequency of use				
		Don't use	Daily	Weekly	Monthly	Once in several months
1.	Radio					
2.	Television					
3.	Newspapers/magazines					
4.	Extension bulletins/ posters					
5.	Farmers' association					
6.	Friends and relatives					
7.	Extension agents					
8.	Fellow farmers					
9.	GSM phones					
10.	Internet					

SECTION D: Respondents attitudes towards agricultural land use management practices

S/N	Attitudinal statement	SA	A	U	D	SD	Mean
1.	Tree planting is good for proper land use						
2.	Land management can only be practiced by farmers						
3.	Mulching reduces evaporation						
4.	Agricultural land use management practices should be backed by legislation.						
5.	Planting of legumes improves soil fertility						
6.	Trees should be in forest, not on farms						
7.	Organic manure improves water conservation in the soil						
8.	It is not necessary to use compost, since fertilizer is still used to replenish the soil						
9.	Environmental problems may hinder agricultural productivity						
10.	Without the use of chemicals, agriculture will not be viable						
11.	Nutrient loses due to run off can be prevent by mulching						
12.	Agricultural landuse management practices encourages the exploitation of land resources for short gains and profits.						
13.	Only land owners can plant trees						
14.	Land tenure constitute problem to agricultural land use management practices						
15.	Drainage, prevent water logging in the soil.						
16.	Bush fallow expose soil to erosion						
17.	Use of organic manure enhances weed development						
18.	Agricultural land use management practices should only be practiced by large scale farmers						
19.	Bush fallow helps in maintains soil fertility						
20.	Food security can be achieved without agricultural land use management practices						
21.	A balanced ecosystem sustains agricultural land						
22.	Legumes act as weeds to disturb crops						
23.	Agricultural land use management practices are recommended, because fertilizers are very expensive.						
24.	Agricultural land use management practices are capital intensive						

25.	Bush fallow helps in preventing soil erosion						
26.	Use of organic manure pollutes the farm and its environment						
27	Agricultural land use management practices should be encouraged by every one						
28	Crop rotation is labour demanding						
29	Application of organic manure reduces water conservation in the soil						
30	Mulching encourages nutrient loss in the soil						

SA = Strongly Agreed, A = Agreed, U = Undecided, D = Disagreed and SD = Strongly Disagreed

SECTION E: Which of these constraints do you encounter in the use of agricultural land management practices?

S/NO	**Constraints**	**Level of severity**		
		Very Severe	**Severe**	**Not severe**
1.	Land ownership			
2.	Lack of Government Support & encouragement			
3.	Difficulty of the practice			
4.	Ineffective extension services			
5.	It limits mechanization of farm operations			
6.	The practice is too demanding in terms of labour			
7.	The practice is too demanding in terms of time			
8.	Lack of Finance			
9.	Low knowledge of the practices			
1 0.	Compatibility of the practices to culture			

SECTION F: Which of these agricultural land use management practices do you use?

S/NO	Practice	Never	Sometimes	Regularly
1.	Crop rotation			
2.	Inter- cropping			
3.	Organic manuring			
4.	Mulching			
5.	Minimum tillage			
6.	Green manuring			
7.	Terracing			
8.	Contour bounding			
9.	A forestation			
10.	Use of compost manure			
11.	Liming			
12.	Bush fallow			
13.	planting of cover crops			
14	planting of legume crops			
15	Use of crop resistant varieties			
16	Alley cropping			
17	Use of crop residue			

Thank you,

Simon, Barnabas Panya