Thesis

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Socio-economic factors associated with the adoption of alley farming technology by small-scale farmers in Osun-State of Nigeria

1998

SOCIO-ECONOMIC FACTORS ASSOCIATED WITH THE ADOPTION OF ALLEY FARMING TECHNOLOGY BY SMALL-SCALE FARMERS IN OSUN-STATE OF NIGERIA

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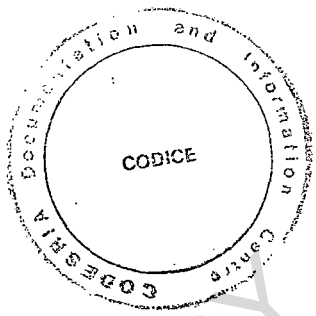

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DEDICATION

This thesis is dedicated to the LORD JESUS CHRIST for his mercies, provisions and divine protection over me and the entire members of my family;

My wife - Mrs. Olayemi Olufemi Ogunwale

My Parents, Mr. John O. Babalola, and Mrs. Kikelomo A. Babalola.

My father-in law - Mr. Joshua A. Dele, and

My children, Segun, Kemi and Bunmi Ogunwale-Babalola

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"For this GOD is our LORD, forever and ever, He will be our guide, for now even until death. But we will bless the LORD from this time forth and for evermore, Praise the LORD.

O PRAISE the LORD, all ye nations.

Praise him, all ye people,

For his merciful kindness is great toward us,

and the truth of the LORD endureth for ever.

Praise ye the LORD.

O GIVE thanks unto the LORD, for he is good.

Because his mercy endureth for ever" AMEN.

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OGUNWALE, ABEL BABALOLA.

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ABSTRACT

Alley farming technology is relatively new among Nigerian small-scale farmers, and its adoption by farmers in Nigeria has not been encouraging. The main objective of the study is to examine the socio-economic factors that may influence the adoption of the technology among farmers in Osun-State. The specific objectives of the study were to identify personal and socio-economic factors and agricultural production constraints in the study area which may influence the adoption of alley farming; investigate the influence of community structure and its differentiation on adoption; and determine the personal and socio-economic factors associated with adoption.

Data were collected from randomly selected 115 adopters and 75 non-adopters of alley farming in three communities within the International Livestock Research Institute, Humid-zone programme in Osun-state. Personal interview method with a structured interview schedule and participant observation technique were used for data collection. Chi-square, correlation and multiple regession analyses were used in data analysis.

The study showed that there was a positive and significant correlation at ($P < 0.05$) between adoption of alley farming and the followings: marital status ($r = 0.349$); age of farmer ($r = 0.462$); number of children assisting on farm ($r = 0.446$); family size ($r = 0.236$); farming experience ($r = 0.293$); level of education attained ($r = 0.221$); literacy ($r = 0.388$); total farm size ($r = 0.240$); years of residence in the locality ($r = 0.384$); occupational characteristics ($r = 0.258$); farming system practice ($r = 0.504$); soil fertility improvement methods

used (r = 0.350); land ownership status (r = 0.267); ownership of livestock (r = 0.350); livestock feeding system (r = 0.442); sources of knowledge on alley farming technology (r = 0.275); land-use pattern (r = 0.204); tree-tenure system (r = 0.260); availability of farm labour (r = 0.387) and membership of social-groups (r = 0.318).

Apropos, the findings further showed a negative and significant correlation between adoption of alley farming and the following: marriage pattern (r = -0.225); family structure (r = -0.202); household decision making process (r = -0.242); and environmental/agricultural production constraints (r = -0.441) at 0.05 level of probability.

It was found that more men adopted alley farming than women, and some adopters had discontinued the adoption of the technology. The study revealed the need for effective extension service to encourage and promote adoption of alley farming among the farmers.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

In many parts of the humid and sub-humid areas of sub-saharan Africa, the dominant food crop production pattern is the bush-fallow system. The bush fallow system, in addition to its main function of restoring lost soil fertility and suppressing weeds, also provides firewood, poles, rafters, fodder, herbal medicine and other materials needed by the traditional farmer.

Although this system of food crop production could be sustainable and ecologically sound (Kang, et al, 1984), it appears to operate effectively only when there is abundant land to allow a long fallow period to restore soil fertility and productivity which are degraded during the short cropping phases. The rapid population growth, which has reached alarming proportions in many countries in the sub-region, has put greater pressure on the availability of land and has led to increased deforestation and reduced fallow period. The Food and Agricultural Organization of the United Nations (FAO) estimated that shifting cultivation accounts for almost 70% of the deforestation in tropical Africa, and forest fallows resulting from shifting cultivation practised in recent times occupy about 28.5% of the remaining closed forest (FAO, 1982).

The problem of land degradation is further intensified by overgrazing and extensive firewood gathering particularly in the savanna areas. The practice of repeated and frequent burning in the traditional system combined with the use of

(Kang and Wilson, 1987). The trees or shrubs - preferably fast-growing, leguminous (nitrogen-fixing) species are established in hedgerows which are 4-8m from one another. The trees are periodically pruned during the cropping phase to prevent shading of the companion crops. The foliage and soft twigs are incorporated into the soil as green manure or applied on the soil surface as mulch. Some portion of the tree foliage can be harvested and fed to livestock, particularly small ruminants. This system is well adapted to prevailing soil and climatic conditions in tropical Africa and can meet local needs for food and other products.

Alley farming is a sustainable alternative to the traditional bush fallow system. It requires adoption of new management techniques such as tree planting, pruning, mulching and cut-and-carry feeding for livestock. The trees or shrubs are managed in such a way as to minimize competition with the associated crops and yet retain the functions observed in the bush-fallow, such as nutrient recycling, weed suppression, and erosion control on slopy lands (Kang et al op cit). Nevertheless, the technology as it is practised now is very labour intensive and requires high management inputs.

Farmers have been practising hedgerow intercropping system, while experience has shown that, given information and advice, farmers are willing to adopt, and even to experiment with this new system of agroforestry (Atta-Krah, 1990). Despite this, the adoption of alley farming technology by the small-scale peasant farmers who make-up the larger segment of the farming population in Nigeria has not been encouraging.

Onazi (1973) stated that "the process of adoption of innovations and practices, and the transfer of improved and modern technology to the predominantly traditional farming populace of this country is one of the greatest challenges facing agricultural scientists and extension service in Nigeria". In the field of agricultural development, if we are to achieve self sufficiency in the production of food and fibre, we must seek to understand the farmer and his social environment and determine those factors which may influence the adoption of agricultural innovations in crops, livestock, forestry, agroforestry and fisheries, etc so as to be able to manipulate these factors for maximum advantage to the farmer and to the country as a whole (Alao, 1980). Nigerian farmers do respond to change, provided that first it does not conflict with their time honoured value, belief and secondly if it is profitable.

The lack of relevance to the farmer of agricultural research findings in this country stems from several factors. A great majority of agroforeestry research to date has concentrated on the biological and physical factors that affect productivity. There is a serious lack of reliable information based on actual farm conditions of the socio-economic factors that are claimed inherent of many agroforestry combinations. Also, a substantial proportion of the research studies are conceived and executed outside the context of the farmers' social, economic and cultural realities. The technical competence of the farmer, his economic conditions, and the level of economic risk of the innovation which affect farmers' decision to adopt or not are often not considered.

Furthermore, while traditional agroforestry systems may have proven economically viable under the conditions in which they originally evolved, increasing land pressure, changing social perceptions, and modern land-use options all underscore the need for adoption of many existing systems. Thus, the need for a study to determine socio-economic factors associated with adoption of alley farming technology by small-scale farmers becomes imperative.

1.2 Historical Background of the Study

For centuries, farmers in the tropics, based on shifting cultivation, have harvested low but consistent crop yields with little or no chemical nitrogen fertilizer input. In recent years, the worldwide concern for the sustainability of crop productivity as lands are called upon to produce higher yields from a single crop and higher total annual yields under intensive cropping system called to question the continued reliance on chemical fertilisers as sole source of nutrients.

Major research investigation on alley cropping have been carried out by the International Institute of Tropical Agriculture (I.I.T.A.) Ibadan, Nigeria. The International Livestock Research Institute, (ILRI) has modified it into alley farming by incorporating animals into the system. After several years of on-station work, both institutions and International Centre for Research in Agroforestry (ICRAF) started on-farm research to undertake adaptive research in actual farm conditions. It was anticipated that on-farm research would provide a basis for wider diffusion and adoption of the technology, but apparently that is not happening. Alley farming is a complex technology and it is still being refined. Therefore, its wide

diffusion and adoption may require time and may depend on a wide variety of biological and socio-economic factors (Jabbar, 1992).

In the early years of adoption research studies, the research on the adoption process that had been conducted had tended to focus on the attributes of the individual farmer, on the relationship of different personal variables to rates of adoption and on stages in the adoption process. Also, most of the research was designed and implemented to identify the socio-economic and socio-psychological characteristics of the farmers (Williams, 1969; Akinbode and Dorling, 1969 and Rogers, 1983). Thus, previous adoption studies have examined several and by no means all, dimensions of innovator characteristics. However, studies on how innovation, change agent, socio-economic factors and community characteristics are associated with innovation adoption, are not as many as one will like to see. This emphasis appears to overlook the critical factor that adoption of technical innovations requires a conducive environment and an overt act, as well as a favourable mental attitude (Alao, 1971).

Moreover, farmers do consider the costs of changing from one practice to another and the economic benefits resulting from that changes. The outcome of this appraisal, together with other socio-cultural factors will determine the willingness of the farmer to adopt the innovation. The decision to adopt or not to adopt depends largely on these considerations. Thus, a rational farmer usually uses this approach to appraise new technologies including alley farming.

1.3 Statement of the problem

In the first decades of this century, agricultural research in Nigeria focussed on the improvements in soil fertility with the use of mucuna as cover crop. However, this was not acceptable to the generality of the Nigerian farmers because its advantages were not clearly manifested to them. In view of the increasing population pressure on the limited available land, it has dawned on all those involved in agricultural development that the traditional method of shifting cultivation is no longer sustainable (Kang et al op cit). Therefore, a new farming system that is environmentally sustainable, and acceptable to the generality of farmers have to be evolved. Alley farming technology possess these characteristics.

For over a decade now a lot of basic research on alley farming has been conducted in southern Nigeria for the potential benefit of small holders farmers. (Okali, 1984; Aken'Ova and Atta-Krah, 1986; and Cobbina et al , 1989). Whatever may be the potential benefits of any agricultural innovation, it will serve no useful purpose until it has been placed in the hands of potential users (farmers) and they have been persuaded to accept it and use as recommended (Alao, Op Cit). One is naturally concerned about how small scale farmers reacted to the innovation of alley farming technology in areas where it has been introduced.

Therefore, some pertinent questions naturally arise

(i) What factors motivate farmers to adopt/reject recommendations for the use of alley farming technology?

(ii) To what extent are small-scale farmers in southern Nigeria ready to

integrate the production of livestock (small ruminants) with crop production.

(iii) How informed are the farmers about the benefits of alley farming technonology?

1.4 The Objectives of the Study

The main objective of the study is to investigate the socio-economic factors associated with the adoption of alley farming technology among selected farmers in Osun state.

The specific objectives are

(i) To identify the personal and socio-economic characteristics of the sampled small-scale farmers, and how these are associated with the adoption of alley farming.

(ii) To determine the influence of community structure or structural differentiation on adoption of alley farming.

(iii) To identify the agricultural production constraints imposed by the environment which influence the adoption of alley farming. and

(iv) To determine peasant farmers' reasons for adoption and non-adoption of alley farming.

1.5 The formulation of Hypotheses

There is little evidence that lack of knowledge about innovations actually delays their adoption. However, innovation characteristics, characteristics of

adopters, community characteristics, change agent characteristics and environmental characteristics are factors which are associated with the adoption of an innovation (Jibowo and Francis, 1989).

The following hypotheses stated in the null form are formulated to test the relationship between adoption of alley farming technology and selected socio-economic characteristics of farmers on one hand, and community structure and its differentiation on the other.

Hypothesis 1

Research has shown that earlier adopters are younger in age, have higher social status, have more favourable financial position, have more experience and have a type of mental ability different from that of late adopters (Rogers, op. cit). Evidence indicates that there is a positive and significant correlation between adoption of farm practices and social participation in farmers' group, on one hand, and contact between friends and relatives on the other (Basu 1969). Therefore, it is hypoothesized that there is no significant relationship between adoption of alley farming and some selected socio-economic characteristics of farmers.

Hypothesis 2

Alley farming has been considered as an improved agroforestry system over traditional shifting cultivation and bush-fallow systems, and provide solutions to problems arising from poor soil fertility; lack of staking materials and scarcity of firewood and fodder. For instance, farmers who own and keep livestock would be expected to accept alley farming to secure fodder and fencing materials for their stock. Thus, it is hypothesized that there is no significant relationship between

adoption of alley farming and environmental/agricultural production constraints.

Hypothesis 3

Stienberger (1990) established that types of allocated land rights and rights in trees and group rights influenced the adoption of alley farming. The values of land security, and land/tree-use pattern in the traditional farming communities are found to be asociated with adoption of farm innovations. Therefore, it is hypothesized that there is no significant relationship between adoption of alley farming and land rights, and tree-use related factors, such as land-use pattern, (ii) tree-tenure system; (iii) length of fallow period; and (iv) tree planting activities.

Hypothesis 4

Research has indicated that there was a positive significant correlation between adoption of farm practices and several village factors (Clark and Akinbode, 1968). Social groups can usually be expected to facilitate interpersonal communication among community members about farming problems and questions. Thus, it is hypothesized that there is no significant relationship between adoption of alley farming and community structure in the area of study.

Hypothesis 5

Hoffer and Gibson (1960) found that farm practice adoption rates were higher in community favourable to change than those that were not. Also, it has been shown that acceptable technology to farmers should prove beneficial to soil and environment, fit the farmers' resources base, be adapted to the site's physical and biological conditions, and be socially accpetable (Zandstra et al, 1981). Thus, it is hypothesized that there is no significant relationship between adoption of alley

farming and community level of structural differentiation.

1.6 The assumptions of the study.

The assumptions on which this study is based are that

(i) alley farming can be used to address farm interrelated issues including soil fertility improvement, food production, firewood and staking materials needs, and fodder scarcity that confront small scale farmers.

(ii) farmers have diverse production constraints which alley farming can minimize or reduce.

(iii) Nigerian farmers, like any other farmers everywhere, are rational and will therefore accept improved agricultural technologies with demonstrable higher comparative advantage over their traditional practices.

(iv) Farmers possess the technical competence to manage alley farming successfully, and

(v) alley farming is a sustainable agricultural production technology which needs to be promoted among Nigerian farmers.

1.7 The significance of the study

As there is a relatively slow adoption rate for alley farming technology when compared with other farm technologies such as chemical fertilizers, and improved maize varieties among Nigerian farmers, socio-economic studies are

technologies. The ultimate test of success for technology generation and transfer systems is the adoption by the clients (farmers). However, the adoption of alley farming by all and sundry of resource-poor, small-scale farmers has not been thoroughly researched. Therefore, this process merits investigation.

1.8 Limitations of the Study

This study investigated the socio-economic factors which influence adoption of alley farming. The restrictions leave all technical factors which may influence adoption and limit the findings in some respects. Also, inability of the principal researcher and the two enumerators to reach all the farmers who adopted alley farming on their farms due to transportation problem limited the sample size.

Furthermore, this study did not investigate the following

(i) the actual farm size put into alley farming system by adopters; hence could not calculate cost-benefit ratio from alley farm plots,

(ii) the farmers' technical skills required to manage alley farms successfully, and

(iii) biophysical factors such as rainfall pattern, soil pH, soil fertility level etc that may influence adoption of alley farming.

Also, level of income was not investigated in the study, hence one cannot accurately predict the financial implications of adoption of alley farming for the farmers.

Therefore the result of this study could not be regarded as the full range of factors which influenced adoption of alley farming technology by small-scale

required to determine constraints to adoption at the farm level and to develop suitable transfer mechanisms. Also, understanding the adoption behaviour and factors associated with it should lead to suggesting policies to facilitate increased adoption.

This study will provide interpretative information from farmers about localized production constraints imposed by their environment and to determine how to remove them. It is hoped that the findings would open to the extension services and development organizations, the full scope of factors that influence the adoption of farm technology, and provide basis for recommendations, for adoption of technical innovations.

Furthermore, the study will help expand our current knowledge about adoption behaviour of Nigerian farmers and ways to influence it. Thus, the study will explore related issues that might widen an understanding of the adoption act, help design more effective strategies for influencing adoption of innovations, and improve the quality of policy and programming decisions at various levels in science-oriented agricultural production systems.

The methodology used in this study in the author's view, provided information on the impact of alley farming technology, and should guide the development and use of research technique, and extension methods appropriate to various situations.

Moreover, the study would contribute to the theoretical knowledge that exists on adoption of farm technologies and particularly increase the knowledge of change agents and extension officers on factors that influence adoption of farm

farmers in Osun-state.

1.9 Definitions of Terms

The following terms are defined as they were used in this study.

(i) Agroforestry system

This refers to a farming system that involves integration of food crops and tree-crops on the same piece of land at the same time to improve soil fertility and ensure continous cropping of the land.

(ii) Alley Croping

This is an agroforestry system in which food crops are grown in the "alley" between hedgerows of fast-growing leguminous trees or shrubs in order to ensure continous cropping of the land.

(iii) Alley farming

This is an agroforestry system in which food or forage crops are grown in the "alley" between degerows of fast-growing leguminous trees or shrubs. The hedgerows trees are periodically pruned during the cropping season to prevent shading of the companion crops, and provide foliage and soft twigs which are incorporated into the soil as green manure or applied on the soil surface as mulch, or fed to livestock, particularly small ruminants.

(iv) Shifting cultivation system

This is a farming system in which farmers cultivate a piece of land

for 3 to 4 years, and abandon the farmland for 3 to 5 years in order to allow the cultivated farmland a period to regain its lost fertility during fallow phase.

(v) Bush fallow system

This is a farm practice in which cultivated farmlands are allowed a period of time to rest so as to regain their fertility before cropping the land.

(vi) Community Structure

This refers to people and community characteristics in the area of study.

(vii) Community level of infrastructural differentiation

This refers to the degree of availability of basic social amenities in the communities within the area of study.

(viii) Small-Scale farmers

This refers to the category of farmers who are operating small hectrage of farmland with simple farm tools and implements mostly for subsistence with little for commercial purpose.

(ix) Contractual or task labour

This is a form of labour supply in which a piece of farm operation is charged on bargaining basis and not per mandays (daily basis).

(x) Adoption

It refers to a decision to continue full use of an innovation by an individual farmer. This definition implies that the adopter is satisfied with

the innovation.

(xi) Discontinuance

This refers to an act on the part of an adopter of innovation to discontinue practising the innovation or idea after a period of adoption of the innovatioh.

CHAPTER TWO

2.0 REVIEW OF LITERATURE

This chapter reviews studies and publications on various aspect of alley farming technology and adoption of innovations under the following sub-headings.

2.1 The concept of alley Farming and its benefits

2.2 Relevance, workability and social acceptability of alley farming

2.3 Alley farming research activities in Osun State

2.4 Adoption behaviour and adoption of innovation

2.5 Reason for adoption and non-adoption of farm technologies by small-scale farmers, and

2.6 Theoretical Framework.

2.1 The Concept of Alley Farming and its benefits

Alley farming has been described as an intervention that is economically viable and ecologically sound (Sumberg et al. 1985); to benefit both crops and livestock (Reynolds and Atta-Krah, 1989, and Reynolds and Adediran, 1988) and to benefit cropping (Kang and Reynolds, 1989).

The present recommendation domains for alley farming reflect the conditions in the areas where it has received most research attention, but as testing is extended to other areas and to other tree species, it is likely that alley farming will prove suitable to a wider farming community. Early research focused almost exclusively on two leguminous, nitrogen-fixing trees native to Central America -

Leucaena leucocephala and Gliricidia sepium. Alley farming is recommended for areas with rainfall of over 1200mm with a bimodal distribution, a soil pH of over 5.2, where farms are small (around 2 ha) and cultivated by hand or with limited mechanization (Kang et al., 1990). Low in-put agriculture should be the norm. It has proved suitable for both male and female farmers, tenants and land owners. In West Africa, small ruminants livestock are widely owned in the areas where alley farming has proved acceptable, and the livestock management systems have allowed both free roaming and confined systems.

Alley farming is a composite technology that is made up of several interdependent elements that cannot be considered in isolation. There are three classes of technology, single component or elementary; composite, and package (Mutsaers, 1984). Alley farming has potential to achieve the following:

(i) reduce farming cost by improving soil fertility, thus minimising fertilizer requirement and ensuring continuous cropping;

(ii) increase savings on land clearing and deforestation;

(iii) stabilize soil and reduce erosion hence increase crop productivity and returns to farmers;

(iv) provide browse for livestock and fuelwood for energy;

(v) better use of limited resources resulting in higher yields per unit area and per unit of time;

(vi) increased yield stability and reduced probability of incomes falling below the subsistence level; and,

(vii) reduced crop losses due to weeds, pests and diseases.

Specifically, Kang and Wilson (op cit) listed the advantages of alley cropping as:

(i) cropping and fallow phases are combined;

(ii) rapid effective soil fertility regeneration with more efficient plant species and reduced nutrient leaching;

(iii) longer cropping period and increased land intensity;

(iv) reduced requirements for external inputs such as chemical fertilizers and,

(v) the system is scale neutral, being flexible enough for use by small-scale farmer and for large-scale mechanized production.

Alley farming can be considered as an improved bush fallow system but its major advantage over traditional shifting cultivation and bush-fallow systems is that the cropping and fallow phases can take place concurrently on the same land. This allows the farmer to crop the land for an extended period without returning to fallow (Adeola and Ogunwale, 1992). It can also be used to check erosion. With this background, it can be appreciated that alley farming makes for a sustainable farming system.

2.2 Relevance, workability and Social acceptability of alley farming

Research had demonstrated relevance, workability and social acceptability of alley farming. (Atta-Krah and Francis, 1987 and Francis and Atta-Krah, 1989). Currently, alley farming is practiced in southern Nigeria where it has been promoted in a systematic fashion, and mainly in the context of on-farm research activities.

Francis and Atta-Krah (ibid) assessed alley farming to be of only limited acceptability. The finding was traced to a number of edaphic, sociological and institutional factors., These include low soil fertility with high acidity levels, incompatibility of woody species tested with established cropping patterns and rotation practices, the division of labour and the decision-making process within the household, and land and tree tenure rules.

Osemebo (1987) established that social acceptability of alley farming is also closely linked with economic feasibility of the system. He concluded that prospects are high for the integration of tree planting into the traditional farming system, social acceptability relies very heavily on cost-sharing devices between government and rural farmers, as well as on the availability of an active extension service and the potential for some direct economic output from the trees in the system. Farmers indicated their willingness to plant trees under three conditions:

(i) Ability to secure tree seedlings at no cost

(ii) Possibility of interplanting trees with food crops without adverse effects in crop yields.

(iii) Possibility of earning some income from the trees.

Okali and Sumberg (1985) established that given a supply of seeds and extension guidance, alley farming can be taken on by farmers of forest and forest-savanna transition zones of Nigeria, without any form of credit or direct financial support. Kang et al (1985) reported sustained increase in crop yield, while supplementary feeding of browse has also contributed to the productivity of small ruminants.

Hoekstra (1982) claimed that alley farming is highly labour intensive and its adoption on farms where labour supply is low would be difficult. He also believed that the cost of production may increase considerably if the additional labour has to be hired and/or supplied by the family labour pool at peak labour season. Additional labour in alley farming is required for planting, establishing trees and for regular pruning. Alley farming, however, may reduce labour required for regular forest clearing for cultivation, for weeding and for collecting animal feed from the bush.

Atta-Krah (1983) reported the use of two browse legumes, namely Leucaena leucocephala and Gliricidia sepium in four meter alternative rows with staple food crops, for alley farming within the Fashola and Badeku/Ikire areas in south-west Nigeria. Also, Atta-Krah (1986) enumerated the problems in data collection and analysis, soil variability, management variability, problems of labour estimation, land clearing and preparation, planting and management, tree pruning and utilization, monitoring and evaluating procedures in on-farm alley farming research in the humid zone of Nigeria. The studies, however, did not consider farmers' characteristics which may influence the adoption of alley farming.

Okali et al (ibid) established that farmers' access to land and labour, the social organisation of mixed farming enterprises and the technical requirements of tree cultivation played very important roles in incorporation of leguminous fodder trees into existing farming systems.

Francis (1989) distinguished between the land and tree rights that are necessary to practice alley farming. First, the prospective alley farmer with the right to plant trees on a certain piece of land requires access to this land. Secondly, rights over these trees must be sufficiently secured to justify the planting effort. Thirdly, the farmer's right to harvest and use the trees' foliage must be exclusive enough to ensure an adequate return on investment. Fourthly, rights to plant arable crops on the land where the trees are established must be of sufficient duration and security to enable the farmer to benefit from the system's ability to maintain or improve soil fertility.

In another study, Francis (1987) ascertained that the land rights that any person holds depend on the means by which access to the land was obtained (inheritance, purchase, loan, lease or pledge). Thus, the implications of adopting alley farming for tenants, strangers, and pledgees may differ from those for landowners and indigenes. Furthermore, status within the household may determine rights over land and trees. The rights of men may differ from those of women, the rights of household heads may differ f rom those of other household members, and the rights of the first-born child may differ f rom those of the other children. The study also presented case studies including communities, social constitutions and farming systems, and an outline of the relevant features of the land tenure system.

Stienberger (op cit) reported that types of allocated land rights and rights in trees and group rights influenced the adoption of alley farming in Nigeria. He examined gender factors in tree tenure, rights and roles of women and intra-

household decisions. He further established that in Nigeria, alley farms were most likely to be established on land held under primary forms of land tenure, such as purchased land, inherited land, and gift land. Customary tenure generally regards tree planting as a prerogative of landownership. As such, successful establishment of trees by tenants can be interpreted as an asertion by tenants of primary rights. While, Kang et al (op cit) described the uses of trees and shrubs in fallow systems, hedgerow establishment, management and benefits for crop production and livestock.

A land tenure system is the body of rights and duties that regulates the use and control of land (Fabiyi, 1979). Land tenure systems govern a multiplicity of land use and may be extremely complex. Most African customary property systems distinguish between trees and the land on which they are planted. Rights to the one may be held and transferred independently of rights to the other. Thus, parallel and distinct systems of land and tree tenure may exist. However, because trees are, for practical purposes attached to the land on which they stand, the two systems are not entirely separate. Once planted, however, trees are generally considered the property of the planter. In some circumstances, therefore, tree planting may increase the security of rights to land. This in essence has a lot of implications for adoption of alley farming by tenants, strangers and pledgees.

It has been found that household sizes, occupations of adult residents, animal population in sample households, labour costs for areas farmed in one cropping year, and cost of rented land influenced farmers' perception of browse utilization in an integrated crop and livestock farming system. While, Reynolds

et al (1991) established that feed-back from on-farm research which includes investigations in land tenure and availability, participation by women, agronomic practices, livestock feeding and tree management were important in farming system research. The study also presented data on characteristics of alley farmers and conventional farmers, characteristics of farms, and farmers' perception and uses of alley farms.

Lawry et al (1991) identified five research issues as the effects of land tenure security and tree tenure security on farmer adoption of alley farming, effects of overlying community use rights to farm land, and the nature and implications of gender-based differences in land and tree right on adoption of alley farming by men and women farmers, and the effects of state regulation on tree use on adoption of alley farming.

Zandstra et al (op cit) maintained that acceptable technology to farmers should prove beneficial to soil and environment, fit the farmer's resources (Capital, Labour, Cash and Management), be adapted to the site's physical and biological conditions, be stable over time and fit in with other management practices, be simple enough to be understood, and be socially acceptable.

Bunderson et al (1990) reported that Leucaena seed treatment, nursery management, hedgerow establishment and spacing, pruning practices and the timing and method of applying leaf manure affected the practice of alley cropping in Malawi. The benefits and limitations of alley cropping with Leuceana were also discussed in relation to potential farmer adoption. Evidence suggests that alley cropping with Leucaena and maize is a practical option for improving maize yields

under small holder conditions.

Basic agronomic research had been conducted on alley farming, and it has been reported that alley farming may have a higher chance of being accepted in areas with soils of low fertility (Wilson and Kang, 1981; and Kang et al, 1984); a sloping topography with livestock as a component of the farming systems (Ngambeki and Wilson, 1984; and Atta-Krah, 1985), where it is ecologically suitable and economically viable (Singh, et al, 1986 and Sumberg, et al, 1985), and where farmers have rights and access to land (Francis, 1984 and Stienbarger, op. cit). However, inadequate attention has been paid to socio-economic factors which influence the adoption of alley farming by farming populace.

Pegorie (1990) asserted that the shorter the establishment and development phase, the more attractive an agroforestry technology would be to the farmer. He went further to say that the higher the anticipated benefit - cost ratio, the more rapid is the adoption of the agroforestry.

The novelty of alley farming has critical implications for the adoption of the technology. Although farmers are familiar with the management of trees in the context of a bush-fallow system, the adoption of alley farming implies a number of innovations in farming practice. These include planting and establishing trees within arable farms, their management for mulch and fodder production, cutting and carrying browse for animals, and altering land use and rotation patterns.

Previous researchers focused mainly on edaphic and ecological factors that determine adoption of alley farming technology, while economic and social factors

were rarely investigated. Moreover, the issue is not simply one of managerial innovation and the acquisition of new skills. In adopting a new system, attitudinal, sociological and institutional factors such as the distribution of the benefits derived from the technology among household members or the implications of land and tree tenure systems should be taken into consideration.

This study aims at investigating socio-economic factors that influence the adoption of alley farming as the most crucial test of its acceptability to farmers. The present research focuses attention on the small-scale farmers, as the end users, instead of the technology itself. The hope is that the findings will encourage and inspire agricultural researchers to develop farm technologies that will meet the needs of the small-scale, resource - poor farmers and provide essential interface between the farmers and improved productive technology, so as to encourage agricultural communities to accept and adopt new farm technology.

2.3 Alley Farming research activities in Osun-State

In 1983, 12 alley farms were established on farmers' fields with researcher-farmer participation in Badeku/Ikire areas. Both Leucaena and Gliricidia were established from seeds. The two tree species grew well under farm conditions. Although participating farmers managed their alley farms successfully, the technology was not adopted by the generality of farmers in the area.

The villages of Owu-Ile and Iwo-Ate Isale were in Ejigbo Local Government Area, and fall within International Livestock Research Institute (ILRI), Humid Zone Programme, Ibadan, Nigeria. The International Livestock

Research Institute, Humid Zone Programme, has been conducting research on alley farming in these villages for more than a decade. Forty-Five (45) farmers in Owu-Ile and 33 in Iwo-Ate Isale registered for participation in alley farming in 1984. As of July, 1985, 65 alley farms were initiated by the programme with the use of Leucaena and Gliricidia shrubs. By January, 1986, 60 farmers were still being monitored in the two villages. Drop-outs after planting as at January, 1986 was 16. More farmers obtained seeds for planting while farms being monitored by March, 1986 was 100 in the two villages.

The Leventis Foundation (Nigeria) Agricultural School, Ilesa in collaboration with Alley Farming Network for Tropical Africa. (AFNETA), Ibadan established on-station trials within the school at Ilesa in 1990, and On-farm trials on alley farming at Orita-Iloko, about 10km to Ilesa in 1992. Five farmers were involved in the on-farm trials at the moment, while many farmers in the area and Esa-Oke farm settlement had indicated their willingness to participate in the trials. Also, Osun-state Agricultural Development Programme (OSSADEP) has initiated some on-farm trials on alley farming with small-scale farmers in some locations such as Erinmo and Ajagunlase within the state.

Woody species that have been mostly used for alley farming in the state are Leucaena and Gliricidia while species commonly tested in the system worldwide include Leucaena leucocephala; Gliricida sepium; cassia siamea; sesbania sesban; acacia albida; Calliandra callothyrsus; Flemengia macrophylla and Acacia auriculiformis. Some indigenous African tree species such as Alchornea cordifolia and Acioa barteri have also been studied in alley farming trials (Owino, 1991).

2.4 Adoption behaviour and adoption of innovations

Pampel and Van Es (1977) in their research on "Environmental Quality and Issues of Adoption" came out with the following three explanations of adoption behaviour.

(1) Profitability orientation:

This states that adoption of new practices is determined by the farmer's orientation toward profit. Therefore, farmers who are most profit oriented

will adopt new practices while less profit oriented farmers will adopt fewer. This explanation predicts that the adoption of profitable commercial practices will be related to the farmers' orientation toward profit.

2. Psychological innovativeness:

This states that the type of practice is not as important as the orientation of the farmer toward new ideas. Thus, the cause of innovative behaviour is an underlying willingness to change, to try new ideas, hence to adopt new practices. Rogers and Shoemakers (1968) concluded that early adopters of innovations have a more favourable attitude toward change and risk, are less fatalistic and have higher levels of achievement motivation.

3. Farming orientation:

This makes a distinction between farmers who view farming strictly as a business venture and those who view farming as a way of life rather than as a business enterprise, and views adoption of innovation as a consequence of orientation toward farming and farmlife. The business oriented farmer will be inclined to use practices which are part of his farm business and involve close participation in the agro-business commercial-marketing system. On the other hand, one who views farming as a way of life is motivated more by normative concerns of social responsibility and attachment to farming.

Alao (1971) studied Nigerian farmers and established that, the following variables are predictive of adoption behaviour among Nigerian farmers.

(1) The level of awareness of the new agricultural practices

(2) The size of farm operation.

(3) Level of social participation.

(4) Frequent contact between the farmer and the Agricultural Extension Agent, and

(5) Literacy (i.e. ability to read and write).

The study, however, showed that there is no association between personal characteristics such as age and education on one hand, and adoption score of farmers on the other. Also, the following independent variables showed no significant relationship with adoption score of farmers.

(1) Willingness on the part of the farmer to innovate

(2) The furthest place ever visited by the farmer

(3) Whether the farmer had lived in a larger community before moving into the village.

Rogers (1965) stated that innovations that are relatively simple in nature, divisible for trial, and compatible with previous experiences may have a shorter adoption period than innovations without these characteristics. He also made the following generalizations.

(1) The awareness to trial period is shorter for relatively earlier adopters than for later adopters.

(2) The trial to adoption period is longer for relatively earlier adopters than for later adopters.

(3) Earlier adopters try innovations on a smaller scale than later adopters.

Rogers (ibid) further reported that innovators tend to be relatively young, better educated and "better off". They tend to have more land and other physical resources at their disposal. They tend to have more contact with farm related organizations such as co-operatives, and to have more contact with a range of information sources. Conversely, laggards tend to rank at the opposite extreme on each of the characteristics listed, and the other adopter categories (i.e. Early adopter, Early majority and Late majority) rank between the two extremes. Basu (op cit) showed that correlation exists between adoption of farm practices on the one hand, and contact between friends and relatives, and participation in formal organisations such as farmers' group, on the other.

Bahudkar (1962) reported that personality and background characteristics of extension agents and farmers, and physical and institutional factors influenced their contact with one another. This contact with one another influences the adoption of farm practices. Individual or personal factors include, age, years of schooling completed, attitude toward self and job, and such selected psychological characteristics as mental flexibility and orientation toward farming as a business.

Furthermore, the socio-economic characteristics of clientele usually tend to limit contact with extension agents. Farmers of high socio-economic status have more contacts with extension agents than those of low socio-economic status. However, it has been argued that traditional socio-economic factors such as size of farm and owner's age, education, level of income, and family size generally influence adoption behaviour only indirectly. It is evident that these factors do create conditions that may influence the adoption of subsequent agricultural

innovations. Money and personalized information appear to be the most significant of the socio-economic factors. Galjart (1971) affirmed that in addition to unwillingness to adopt innovations, one should raise questions about inability to adopt. The fact that a farmer is a tenant may mean that he or she is not free to make certain decisions. Economic constraints frequently prevent individual from acting in adoption process. A person may have a strong desire to adopt something once he or she is made aware of the advantages of adoption, but he/she may be unable to do so due to economic constraints (Lancelle and Rodefield, 1980). Hook et al (1983) clearly indicated that the economic constraint factors, especially those representing past investments in technologies are much better predictors of existing farm technologies. This implies that adoption research on farm technologies should place primary emphasis on the economic constraints factors influencing adoption behaviour.

Lionberger (1960) established that social factors, such as neighbourhoods, communities, family social cliques, reference groups, and formal groups; cultural factors, such as values and attitudes; personal factors, including age, education, psychological characteristics; and situational factors, including farm income, size of farm, tenure status, community prestige, and level of living are among the factors that encourage or discourage changes in behaviour of rural people.

Alao (op cit) found that personal characteristics as literacy in English, number of children and number of wives of farmers were associated with adoption of farm practices like cocoa and poultry farming among some Nigerian farmers. Alao (1973) further established that community structure was associated with

innovativeness. Physical characteristics such as topography and ecological characteristics, the effect of which will be expected to reflect through the type of vegetation, will also be expected to influence adoption behaviour.

Kidd (1968) found positive and significant correlations between adoption of farm practices and total number of dependents, material possession, experience abroad, communication index, social participation, farm size, value of farm sales, knowledge of farm practices and contact with extension agent in Western Nigeria.

In Nigeria, Clark and Akinbode (op cit) discovered that several village factors were found to have positive influence on the adoption of agricultural practices by farmers. The village have been free of major personal, political and tribal conflicts, and several tribes of peace-loving, agriculturally oriented people are present while levels of education, literacy and social amenities are above average and a high proportion of the village people participate in church activities, while there are farmer co-operatives that are actively and honestly operated as well as access roads and market facilities.

Alao (op cit) resolved the individual community attributes to three dimensions of community structure. These are structural differentiation, social solidarity and centrality. The study demonstrated concretely that community structure exerts contextual influence on all the other dimensions of explanatory variables in adoption study such as size of farm, innovation proneness, social participation, mass media exposure and cosmopolitism. The study concluded that nine important individual level and community level factors are closely associated with adoption of innovations in Nigeria. These are (i) family size, (ii) social

participation, (iii) Literacy, (iv) community structure (v) innovation - proneness (vi) farmer - extension agent contact (vii) mass-media exposure, (viii) cosmopoliteness and (ix) participation in agriculturally relevant teaching and learning experiences.

Williams, Fenley and Williams (1984) recognised leadership structure in a community as a factor affecting adoption process. They posited that the success of many programmes depends on the approval of formal and informal leaders. The level of education, economic status, change proneness, cosmopoliteness, farm size and the socio-cultural situation of farmers are possible factors that could affect adoption of innovation. However, Ogunfiditimi (1981) stated that there was a negative relationship between farm size and adoption of cassava-related innovations in rural areas of Oyo and Ondo states in Nigeria.

Consequently, there is a huge diversity in adoption behaviour response under different geographical, socio-cultural, economic and institutional environments, so that adoption is hardly ever a straight forward process.

2.5 Reasons for adoption and non-adoption of farm technologies by small-scale farmers.

The results of research do not serve useful purpose until they have been introduced to the farmers, accepted by them and put into practice on their farms to produce useful results. In reality, many factors come into play in the adoption process of farm technologies. This is because the reasons for change are many and complex. Some relate to the individual himself, some are social and cultural,

and some are situational in nature.

Igodan and Jabbar (1993) reported that researchers indicated the following constraints to the practice of alley farming technology. Land tenure (33%); effect of shading and pruning (14%); soil acidity (2%); poor establishment of seedling (2%); stem cuttings by error (5%); and lack of funding from their institutions (44%). The responses for the extensionists were mainly lack of funding.

The researchers and extensionists further provided perceived or real reasons for limiting factors or constraints to the dissemination of the technology, a combination of factors was chosen as the most limiting to the technology dissemination. Among the researchers, the reasons included, lack of farmer knowledge of alley farming (68%); farmers' lack of information and education (25%); and non-interest about the technology by extension services in the states investigated (7%). The extensionist reasons were; lack of posters for farmers to see and use (71%); lack of information and education of farmers ((20%), and farmers' resistance to innovation of the technology (9%).

Mellor et al (1968) suggested that farmer's adoption of new technology and implementation of the necessary programmes depend on several factors that are major pre-requisites of technological changes in agriculture.

(i) an incentive system that encourages acceptance of innovations

(ii) a set of improved production processes created for local conditions

(iii) an educational system to teach farmers how to choose and adapt technology to specific conditions, and

(iv) efficient supply to farmers of added inputs in which technological change is embodied.

Leagans (1979) presented a summary of reasons given for adoption of recommended farm practice (incentives), and for non-adoption of recommended farm practice (disincentives) by adopters and non-adopters as primary influences of their responses to recommended technical innovations. The incentives include the following: increase in crop yield (72.5%); increases income (56.4%); used by neighbours (44.6%); labour available (40.2%); technical guidance available (39.5%); credit available (20.0%); better quality of seed (18.8%); supply of inputs on time (16.8%); saved labour (12.5%); not risky (12.0%); innovation simple to adopt (10.3%); irrigation water available (6.3%); and recognition in community (5.5%).

While the disincentives include the following: lack of technical guidance (37.4%); lack of irrigation water (31.9%); more labour required (30.1%); lack of knowledge (24.4%); lack of credit (26.2%); too many pests and diseases (25.5%); supplies not on time (23.3%); inadequate equipment (21.0%); too expensive (19.7%); very complex to adopt (14.6%); neighbours do not use (11.5%); land not adequate (7.9%); labour not available (9.4%); and risky to adopt (9.3%). Thus numerous variables usually intervene and that they are highly situational in kind, relationship, and the relative influence they exert on the adoption behaviour of individuals.

2.6 Theoretical Framework

Several social theories have advanced explanations for human behaviour during the process of social, economic and technological change. Educational Psychologists believe that behaviour changes because of a lack of harmony or an imbalance between a person's aspirations and his environmental accommodations. This condition produces tension, and a need to reduce tension induces a change in behaviour. This process has three phases: disequilibrium (uneven tension or need) a goal and action directed at achieving the goal.

Sociologists suggest that change occurs by the alternation of goals, structures or processes in a social system (Miles, 1964). Change, therefore, from the sociologists' point of view, is basically a group behavioural change which include a change in group goals, norms, values, relationships and structures. while, cultural anthropologists view it as "spontaneous change" caused by the diffusion process. They suggest that change is inevitable as long as there is contact and when there are elements (cultures, facts, materials and social structures) to be diffused.

Many economists support a theory of economic determinism. They view man as an economic being and regard his economic need as a motivating basis for change. The social psychologists believe that interaction among human beings is the basis for social change. Interaction is dynamic and change is its product. Interaction is described as "the process by which people influence one another through mutual interchange of thoughts, feelings and reactions (Lambert and Lambert, 1966).

The considerations of the discipline-oriented theories and concepts of the behavioural change process show that the essence of the behavioural change process is the dynamic interaction of two sets of opposing forces perceived cumulatively as incentives for change and disincentives for change. These opposing influences create tensions that motivate action. However, there is a need to look for additional sources of theory related to explaining the forces that cause systems to change, most especially on the relationship between human behaviour and socio-economic environment.

The purpose here is to articulate a view of the variables currently influencing farmer adoption of modern production technologies that is larger than previous adoption research has revealed, characterize an innovative theory and a research design that concentrate on the influences of the incentive (reasons favourable for adoption) and disincentives (reasons favourable for maintaining status quo) regarded by farmers as the primary determinants of their adoption behaviour.

The immediate physical and resource constraints imposed by environmental conditions often determine why a farmer does or does not adopt a recommended technical practice. The effects of variations in the availability of production essentials will be felt differently by individuals within an environment. Also, sources of influence (i.e. reasons that functionally trigger adoption behaviour) are personal (internal) and environmental (external) to any particular individual. Thus, there is a need to look beyond disciplinary boundaries and focus on a more interdisciplinary approach to theory building, the design of model for adoption

research and strategy formulations to influence technical innovations by target audience.

Some fundamental assumptions that guided the development of this model are the following:

1. Human beings are able to educate themselves and alter their physical environment.
2. All social, economic, physical and technical systems tend to be interrelated.
3. People live in a complex environment and are usually subject to many forces, their response to which patterns their behaviour as individuals, groups or communities.
4. Individuals in a community will vary greatly in how they perceive what is presumably one set of environmental conditions.
5. Behavioral change results from the interaction of two sets of opposing forces-change incentives and change inhibitors (disincentives), and
6. The use of alley farming is dependent upon understanding, acceptance and application by those in a position to use it.

The initial questions that guided the development of this theoretical model are:

1. Whose behaviour is to be examined?
2. Who in the household and the community will make decisions and implement the changes associated with alley farming?
3. Are there any potential conflicts with customs such as those affecting tree or land management and use? and

4. What are the necessary actions to increase the incentives so as to encourage the adoption of alley farming.

In this study, the term "adoption" means acceptance and use of any variant of alley farming by farmers as the best course of action available at the time of this study.

The variants of alley farming include the following:

(i) Alley farming with food crops and livestock

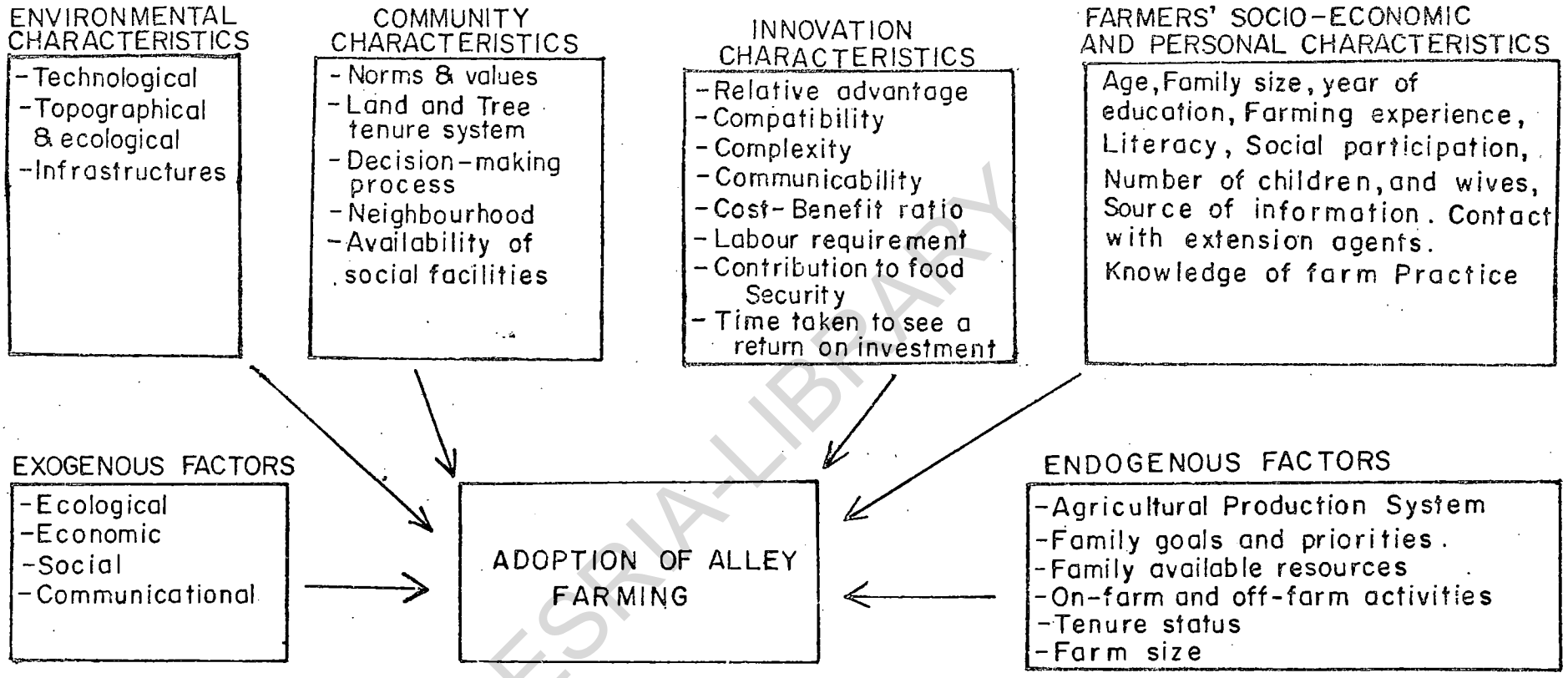
(ii) Alley farming with grass and livestock (alley grazing),

(iii) Intensive feed gardens; and

(iv) Fodder Tree Banks.

Also, the study will seek to know the reasons for adoption, (incentives) and reasons for nonadoption (disincentives) from small-scale farmers. The way and manner, through which social factors such as family, neighbourhood, formal group and communities; personal factors such as age, education, socio-economic characteristics; and situational factors such s tenure status, size of farm among others, encourage or discourage adoption behaviour will be examined.

In this study, the theory evolved is an attempt to accommodate environmental, community, innovation and farmer's socio-economic and personal characteristics that influence human adoption behaviour. The theory also includes exogenous and endogenous factors of the farming system and the intervening variables described as the incentives and disincentives related to adoption behaviour. Thus, the design of the model in Fig. 2.1 is "Interdisciplinary" in approach and it is through this process that farmers' adoption behaviour will be



Key – ⟶ Direct and Primary influence of the prior variables on the following variables.

Adapted from researches on adoption behaviour and Literature on the nature of human behavioural change (Rogers, 1965; Alao, 1971; Alao, 1973; Lionberger, 1960; Leagan, 1979)

Fig. 2·1 : Hypothetical Model of Farmer's adoption of Alley Farming Technology in the study area.

researched and directed in the study.

The design of this model involves a wide range of theoretical considerations from various adoption researches (Rogers, 1965; Alao 1971; Alao, 1973; Lionberger, 1960; Leageon, 1979). The model is formulated on the environmental, community, innovation, and farmer's socio-economic and personal characteristics which influence adoption. The circumstances in which farmers learn about a new agricultural practice and decide whether to adopt it tend to be unique to each individual. But the individuality with which agricultural innovations are considered and decided upon is the ultimate manifestation of numerous interrelated influences. Investigations of all the relative effects of these influences on adoption behaviour is highly desirable for this research purpose.

The model includes seven major components, which include the following:

1 Environmental Characteristics: These refer to the general environmental factors related to adoption of agricultural technology. These include technological, topographical/ecological relief features, vegetation, infrastructural support and services. Soil fertility structure, land topography and vegetation pattern are factors that are likely to affect adoption of alley farming.

2. Community characteristics: The individual is a product of a group to which he belongs. Farmers are part of a social milieu which influences their behaviour, aspirations, and decision-making process. Social system norms and values, land and Tree tenure system, decision-making process, innovativeness and neighbourhood do influence adoption behaviour of

individual in rural society.

The household belongs to larger communities such as village. Emanating from these relationships are societal rules, institutionalized patterns of behaviour and expectations that must be adhered to by every member of the community. These rules and patterns extend to the control and use of resources (land, trees, livestock etc). Thus, the social environment shapes and influences the behaviour, priorities and aspirations, of the household and the farmer.

3. Innovation characteristics: The characteristics of the innovation which influence adoption are relative advantage, compatibility, contribution to food security, complexity, divisibility, communicability, labour requirement, time taken to see a return on investment and cost-benefit ratio as perceived by the innovators. Farmers have multiple criteria for assessing new technologies. To be widely adopted, alley farming should perform better in meeting these criteria than existing alternative technologies.

4. Farmers characteristics: The farmer's characteristics that influence adoption behaviour include his personal, social, economic and psychological attributes. These include age, family size, years of education, farming experience, literacy, social participation, source of information, contact with extension agents, income, access to credit facilities, farmers perception and self image and attitude towards new agricultural practices, knowledge of the importance and technique of agricultural practices.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Area of Study

The study was conducted in areas where alley farming technology has gained prominence in Osun state. These areas include Orita-Iloko, Ilesa and communities within International Livestock Research Institute, Humid zone Programme which include Ife-Odan, Owu-ile and Iwo-Ate Isale in the state.

Osun state is situated in the south-western part of Nigeria. It lies between Longitudes 4°01'E and 5°04'E and Latitudes 6°59' and 8°10'N. It is bounded in the East and West by Ondo and Oyo states respectively, while Kwara and Ogun states are its boundaries in the North and south respectively.

Land area and Population: The state has an area of 8,802 square kilometers and a population of 2,203,016 by 1991 census. The estimated number of farming families in the state is 256,000. The predominant population of the study area is the Yoruba ethnic group.

Rainfall, Climate and Vegetation: The average annual rainfall ranges between 1125mm in the Derived savannah agro-ecology to 1475mm in the rain-forest belt. There are two distinct seasons. The rainy season from March to October and dry season from November to February. The pattern of the rainfall is bimodal. The

5. Exogenous factors include ecological, economic, social and communicational that are external to the farming system but constitute an integral part of the farmer's immediate environment.

6. Endogenous factors are the internal conditions of the farmers' farming system. These factors, although situational, conditioned the farming system and constitute its integral part. They include agricultural production system (crops and/or livestock), family goals and priorities, family available resources, and on- and off-farm activities.

Family goals and priorities deal with physical and psychological needs, which may be summarized as, security of basic needs such as food, clothing and shelter, recognition and acceptance in the community e.t.c. The resources employed by the household to achieve its objectives are land, labour, capital and management. A farming system usually includes a mixture of on- and off farm enterprises due to the household's need to diversify, spread and reduce risks, and to try to optimize use of scarce resources, and

7. Adoption of alley farming: This is an observable result of adoption behavioural change and it is the dependent variable of the study.

The model includes a network of relationships that exist among the major components. The need for a new formulation of theory to explain the nature of adoption behaviour arises from the consequent need for a more inter-disciplinary model that can accommodate a wider range of significant variables and, hence provide a more functional theoretical framework for designing research, analyzing data and deriving implications for policy decisions.

first rainy segment is from March to July, while the second is from August to October. This also affects the cropping pattern with the second cropping season shorter than the early season. Short duration annual crops like maize, and rice can be cropped twice in a year. There is generally a high humidity trend throughout the year. The mean annual temperature ranges between 27.2°C in the month of June and 39.0°C in December. Annual and tree crops are cultivated in the area.

There are two major vegetation types viz:- Rainforest and Derived Savannah. However, the continuous cultivation of the forest region has led to a continuous expansion of the savannah vegetation through over-cropping and indiscriminate annual bush burning. Also, the slash and burn method of land preparation had turned more area into virtually derived savannah.

Soils: Most of the soils are Alfsoils, low in nitrogen and phosphorus, and under continuous land use, micro nutrients have become low and also low in water holding capacity. The soils generally have a relatively high sand content, silt and clay being usually less than 40%. The soil structure is easily altered by the action of rain, finer particles tend to be separated and washed away with run-off. The water holding capacity is generally very poor. These attributes make the soils lose their productivity at a high rate after removal of the top vegetations. Alley farming holds considerable promise in this area (Adeola and Ogunwale, op cit).

3.2 Development of Instrument

One set of instrument was developed for the purpose of this study. The interview schedule was directed generally towards the farmers. Structured, open-ended and close-ended questions were included in the instrument. The farmers' interview schedule sought information on the farmers' personal, socio-economic characteristics, household composition, occupation characteristics, land-use pattern, land and tree tenure systems, types of crops grown and cropping pattern.

Other things included were livestock ownership and feeding system, labour sources and types, contact with extension agent, membership of social-groups, sources of information, household decision making process, community level of infrastructure differentiation, community structure, environmental/agricultural production constraints facing the farmers and knowledge of agricultural practices. Attitudes of farmers towards alley, farming adoption, and reasons for adoption or non-adoption of the technology were also sought for by the interview schedule.

3.3 Content Validity test and reliability test

To validate the instrument developed for the study, a group of judges comprising graduate students and lecturers from the field of Agricultural Extension and Rural Sociology critically examined and reviewed the instrument. The comments and suggestions made were utilized in restructuring the interview schedule for data collection.

Also, ten farmers around Orita-Iloko where Leventis Foundation Agricultural School had on-farm alley farming trials with collaborating farmers

were used to pretest the instrument, after which the instrument was modified and made ready for data collection process. Validation of the research instrument was necessary in order to ensure that it measures what it was designed to measure within the context of the research objectives. Having incorporated suggestions, corrections and ideas made on the instrument by cohort of experts, the final interview schedules were taken to the field for actual data collection process in the study area. To determine the reliability of the interview schedule, the instrument was used to collect information from small-scale farmers within Esa-Oke Farm settlement. After an interval of about 2 weeks, the same respondents originally served with the instrument were served with the same instrument again. Results obtained in the two exercises were then subjected to spearman's rank order correlation analysis. A r-value of 0.843 obtained was considered high enough to accept the instrument as reliable.

3.4 Data Collection and sampling techniques

The small-scale farmers in the area of study constituted the primary source of data. The extension agents and research publications from International Institute for Livestock Research (ILRI) constituted sources of secondary data.

Osun-state has been divided into six zones for agricultural purposes namely, Osogbo, Ede, Iwo, Ikirun, Ilesa and Ile-Ife with Headquarters of Osun-State Agricultural Development Programme, (OSSADEP)located at Iwo. The zones were sub-divided into blocks, while blocks were further divided into areas. Areas were sub-divided into cells in line with Training and Visit (T&V) extension

system. A cell is being supervised by a village extension agent of the programme. The study area falls under Iwo zone. Two village extension agents in the study area were first identified and personal interviews with them revealed the existence of farmers' cooperative societies that comprised both alley farming adopters and non-adopters in the area. Four farmers' cooperative meetings were attended at Ife-Odan, Owu-ile and Iwo-Ate Isale, where the aims of the study were explained to the farmers so as to solicit for their cooperation.

Respondent farmers were then selected by systematic technique with a random start from the lists of cooperative members with the assistance of cooperative society secretaries, and from the lists of farmers provided by the two extension agents in the area. The systematic random sampling method used was to pick the first person on each list as first respondent and every subsequent third persons on each list. Thereafter, farmers were individually visited in their various houses and farms for indept interview and personal observations by the principal investigator and two enumerators who had received one year training in vocational agriculture. The respondents were then categorised into two groups based on their adoption/non-adoption of alley farming technology.

3.5 Designation of the Sample and Sample Size

The population for the study were small-scale farmers in the communities within International Livestock Research Institute Humid-Zone programme, with prior knowledge of alley farming technology. The area was purposely chosen to study adoption of the farm technology within the immediate surroundings where

most of the on-farm research and adoption processes on alley farming had been carried out.

To be eligible for interview, a farmer must have been actively involved in farming in the area. The sample size for the study depended on the population size of farmers on the lists secured from Co-operative secretaies and two extension agents in the area of study. From the lists of membership of four co-operative societies, 51 farmers were earmarked for interview among co-operative members, while 139 farmers were randomly selected from the eight lists provided by two extension agents in the area of study. A total of 190 farmers comprising 115 adopters and 75 non-adopters of alley farming were interviwed in the study. At least 40% of the farmers on the lists obtained were interviewed for the study. The questions in the interview schedules were translated to local language at the point of data collection.

3.6 Data analysis

The analytical tools employed in this study were descriptive in nature. In analysing the data, descriptive statistics such as frequency counts, means percentages and tables were used. However, in testing research hypotheses, the results obtained from interview schedules were coded and subjected to inferential statistical analyses to reach valid conclusions. The inferential statistical tools used in testing hypotheses include chi-square, linear correlation, and multiple regression analyses. Student-t- distribution was used to determine the significance of regression co-efficients.

3.7 Justification for the use of statistical tools and specification of stastical models

(i) Chi-square (X^2) - Chi-square is a non-parameteric statistic used when nothing is implied about the shape of a distribution. It is used when data are categorized and there is a need to test for statiscal significance. It is a test of the independence of the variables in a sense and tells us nothing about the magnitude of the relation. Before we can use chi-square to test for independence we need a contigency table.

$$X^2 = \sum\left(\frac{(fo-fe)^2}{fe}\right)$$

where; fo = observed frequency

fe = Expected frequency

The decision rule for X^2 is

Reject Ho if sample $X^2_{cal} > X2_{tab}$ V.

where = level of significance of text.

V = Degree of freedom i.e. (r-1)(c-1)

where r = number of rows; while c = number of columns.

The co-efficient of contingency C, tells us the strength or magnitude of association or relation between categ orical variables. If C is greater than 0.3, it means there is high strength of relationship. However, if C is lesser than 0.3, it means there is low strength of relation.

The coefficient of contingency,

$$C = \frac{\sqrt{X^2}}{X^2+N}$$

where X^2 = calculated values of X^2.

N = Sample size.

(ii) Correlation analysis and Multiple regression analysis

One of the important preoccupations of researchers is to investigate the relationships among variables. In this endeavour, answers are sought to one or both of two related questions. The firt is the degree to which variables are related and the second is how variables are related. The first question seeks a weaker and less specific answer than the second. The second question not only seeks a stronger answer than the first but the answer also subsumes that of the first in a way. The first question is what correlation analysis is about. The second belongs to regression analysis.

Correlation analysis attempts to find out the degree to which variables are associated. It attempts to find out the degree or extent to which variables tend to move together. But in addition to this, correlation analysis often serves as a supporting technique in regression analysis.

In correlation analysis, cause-and-effect relationships can be inferred. Any two variables X and Y may be correlated for many reasons. It may be because X

affects Y; because Y affects X; neither X nor Y affect each other but they are under the influence of a third common factor which affects both of them; and finally, it may be because X and Y are correlated by chance.

Correlation may be positive, negative or zero. It may be single, partial or multiple. It may also be linear or nonlinear.

(a) Positive linear correlation

If two variables are positively correlated, their values tend to rise or fall together.

(b) Negative linear correlation

A negative correlation between X and Y implies that the two variables tend to co-move in opposite direction.

(c) Zero correlation

This i mplies a complete absence of joint linear movement in either direction between variables.

Correlation coefficients express quantitatively the extent to which two variables are related. A linear relationship is a straight line relationship.

Simple linear correlation coefficient

$$rxy = \frac{Cor(x,Y)}{SxSy}$$

This measure of correlation coefficient is known as the Pearson (product-

moment) correlation coefficient. It is an index of the direction and magnitude of a relation.

If the correlation coefficient is squared, we obtain the coefficient of determination which tells the amount of variation in one variable which is explained by other variable as a result of their linear relationship. By definition, coefficient of determination is the proportion of the total variation in Y explained by the X variable.

3.8 Methodology for testing hypotheses

To test for relationships between adoption of alley farming and personal and socio-economic factors of respondents, community structure and infrastructure differentiation as advanced in the hypotheses, chi-square, correlation analysis and multiple regression analysis were carried out.

The raw data obtained from the interview schedules were coded and entered on data sheet for computer analysis. Computer analysis was carried out at Department of Computer Science, Ladoke Akintola University of Technology, Ogbomoso, using SAS statistical package.

A chi-square analysis of the relationship between adoption and the socio-economic characteristics was carried out with the use of computer. Also, the adoption scores of farmers were correlated with each independent variable score by using pearson product moments correlation analysis to obtain the value of "r". Multiple regression of adoption scores of farmers was calculated to determine the contributions of each variable to adoption behaviour of farmers.

3.9 Measurement of Variables

The dependent variable in the study is adoption of alley farming technology. This was operationalized by individual stage in the adoption process. Three stages of adoption process open for any adopter were used and coded as follows:

(i) Awareness stage - 0 (ii) Complete adoption stage - 1 point; and (iii) Discontinuance stage - 2 points.

The independent variables were measured by coding respondents responses to each of the variables. The codes used for the computer analysis were derived by the following format.

1. Age:- The age of farmer was recorded in years as given by respondent.
2. The Level of education attained:- Education was expressed as exposure to formal schooling and level reached in the acquisition of formal education. Respondent that had never attended school was assigned 0 point. 2 points were further assigned for each level of possible events in acquisition of formal education. Thus, 2 points were assigned to each respondent as he/she advanced in educational pursuit as follows

(ii)	Primary school (uncompleted)	2 points
(iii)	Primary school (completed)	4 points
(iv)	Secondary Modern School	6 points

(v) Secondary Grammar School 8 points

(vi) Teacher Grade II/OND/NCE/B.Sc/Others 10 points

Thus, the point score increases as the level of education increases.

3. Literacy:- Literacy was expressed as ability to read and/or write Yoruba and/or English, and coded as follows

(i) Cannot read or write - 0 point

(ii) Can read and write Yoruba only - 2 points

(iii) can read and write both Yoruba and English - 4 points

Thus, 2 points were assigned as literacy level increases.

4. Farming experience:- The years of farming experience of farmer was recorded in years as given by each respondent.

5. Family Size:- This was expressed as the total number of persons living together under the same household and recorded by the actual number given by respondent.

6. Family structure:- This was expressed as type of family maintained by respondent whether nuclear or extended, and coded as follow.

(i) Extended - 0 and nuclear - 1 point.

7. Marriage pattern:- This refers to type of marriage of the respondent at the time of study, and coded as follow

(i) Polygny - 0 and Monogamy - 1.

8. Marital Status:- It was expressed as whether the respondent is married or not, and coded

(i) Single - 0 and married - 1

9. Number of children assisting on farm work:- This was expressed as the specific number of children available for farm work on respondent's farm and recorded by the absolute number given by respondent.

10. Occupation characteristics:- This was expressed as primary and secondary occupations engaged in by the respondent either solely or combination as the case may be. Farming was assigned 2 points as it was recognised as the primary occupation of the respondents, while the following vocations were assigned different scores to allow for distinctions (i) Trading - 1 point, Fishing - 2 points; hunting - 3 points; Carpentry/Tailoring - 4 points; Food processing - 5 points and Herbalist - 6 points. The points were then added for various combinations as the case for each respondent required for categorization and analysis.

11. Total Farm size: This was expressed as total farm cultivated by farmer all put together, and it was recorded in specific acreage given by the respondent.

12. Years of residence in the locality:- This was expressed as the total number of years spent at the time of study by the respondent in the area of study, and was recorded in actual number of years given by the respondent.

13. Cosmopoliteness:- This was expressed as frequency of outside contacts or exposure to outside communities by the respondent, and coded as follow:

(i) Not often - 0 when the respondent hardly leaves his/her community

(ii) Once per month - 2 point, when it is not as often

(iii) Once per week - 4 points when the respondent leaves the community as often

(iv) Twice per week - 8 points when the respondents can afford to travel out as often as possible.

14. Sex - Sex of respondent was coded as follows

Male - 1 or Female - 0

15. Sources of Information used:- This was expressed as various sources and media for farm information. It was recorded as the total number of sources or media used by the respondent. 1 point was assigned to each possible source of information which include extension agent, programme officials, radio, friends/neighbours, wives, school children and produce buyers.

16. Contact with extension agent. This was expressed as addition of scores obtained from whether the respondent had personal contact with extension agent in recent time or not, and the number of times of such contacts by the respondent for the last six months to the time of study.

For respondent who had never met extension agent - 0 point was assigned while 2 points were assigned to those that had met extension agent. These were then sum together with the number of times such contacts were made within the last six months for contact score.

17. Cropping system:- This was expressed as the most applicable cropping system practised by the respondent on his/her farm, and coded as follow

(i) sole cropping - 2 points

(ii) Mixed cropping (two at a time) 4 points

(iii) Multiple cropping (more than two) 6 points

18. Soil fertility improvement method:- This was expressed as whether the respondent makes efforts to improve soil fertility on his/her farm or not. No-response was assigned 0 point while Yes response was assigned 2 points. And if Yes, the total number of various methods used was added to the Yes-response to get the soil fertility score for each respondent.

19. Status within household. This was expressed as the position of the respondent in his/her family of orientation. This was coded as follow:

(i) First born in the family - 2 points

(ii) In-between i.e. 2nd, 3rd, etc but not last - 4 points

(iii) Last-born in the family - 6 points

The heads of family and housewives who participated in the study were assigned 8 and 10 points respectively for the purpose of distinction and categorization.

20. Membership of social groups:- This was expressed as respondent active involvement or membership in socio-groups for which he/she identified himself or herself and have membership rights. 1 point was assigned to each group mentioned and the total number of groups given by the respondent was indexed as his/her score for membership.

21. Level of contacts between friends, relatives and neighbours. This was indexed as the total number of times the respondent had contacted or sought for farm related information from friends, relatives, and neighbours

in the last six months and whether or not he/she normally contact friends, relatives and neighbours on farm related matters. No-response to contact was assigned 0, while Yes-response was assigned 2 points. The total sum then constituted the score for level of contact of the respondent.

22. Farming system practice:- This was expressed as the aggregate of various types of farm activities and enterprises of the respondent. 1 point differential was assigned to various farm activities/enterprises, and the aggregate sum was indexed for farming system practice. Thus, codes used were as follows

(i) Vegetable crops - 1 points

(ii) Annual/food crops production - maize, yam etc - 2 points

(iii) Permanent crops production - e.g. oil palm, cashew, cocoa, orange - 3 points.

(iv) Livestock production - e.g. sheep, goat, etc - 4 points

Thus, a farmer who engaged in any one type will be assigned the corresponding score, while one who engaged in combinations will be assigned the sum of the scores accordingly for distinction and categorization.

23. Livestock ownership:- This was expressed as whether the respondent possess livestock or not in his/her farming enterprise. If Yes - 1 point was assigned, and if No - 0 point was assigned. The types of animals kept on farm were assigned 1 point each, and the total number of types of animals mentioned was added to Yes - response point to get the total score for

livestock ownership score for the respondent.

24. Livestock feeding system:- This was expressed as the feeding practice used by respondent to feed his/her animals. Points were assigned to each possible practice. Such as (i) waste-farm products - 1 points, (ii) formulated feed - 2 points (iii) free-roaming - 3 points (iv) Household/Background feeding 4 points (v) cut and carry system - 5 points and (vi) Grazing system - 6 points. In cases where respondent used more than one system, the summation of points assigned to systems indicated was used as livestock feeding system score.

25. Availability of farm labour: This was expressed as sources of farm labour available to respondent. Points were assigned to each possible source of farm labour and summation of points was indexed as score for availability of farm labour. Among the possible sources of labour and their codes were (i) Family - 1 point; (ii) Hired labour - 2 point; (iii) Friend/relative/neighbour - 3 points; (iv) Peer group - 4 points; (v) contractual labour - 5 points, and (vi) communal labour on reciprocal basis - 6 points.

26. Labour shortage experience:- This was indexed as the total number of farm operations or activities for which the respondent usually experience labour shortage or problems. 1 point was assigned to each mentioned operation or activity, and the total sum was indexed as the score for labour shortage experience.

27. Household decision making process: This was expressed as involvement of members of the family in decisions making process on farm related matters or those that were responsible for decision making. It was coded as follows

(i) Family head takes decision alone - 2 points

(ii) Husband and wife take decision on farm related matters - 4 points.

(iii) Husband, wife and children take decision on farm related matters- 6 points.

(iv) Friends, relatives and neighbours help make decision on farm matters - 8 points

(v) Village head or community leader helps make decision on farm matters - 10 points.

In cases where a respondent indicated more than one possible options, the total points were summed up to be the score for the respondent.

28. Land acquisition pattern:- This was expressed in terms of outsiders accessibility to village land and the possible means of acquiring such land for use. In case of Yes-response to outsider, 2 points were assigned, while 0 point was assigned to No-response. In case of Yes-response, possible means of land acquisition such as gift, loan, rent, pledge, purchase and lease were assigned 1 point each, and the total sum of possible means was added to Yes-response to be the score for land acquisition pattern for the respondent.

29. Land ownership status:- This was expressed as the status of the respondent on the land he or she was cultivating at the time of study. This was coded as follows:

(i)	Tenant	- 1 point
(ii)	Pledge	- 2 points
(iii)	Inheritance	- 3 points
(iv)	Landowner	- 4 points

The respondents were advised to consider the option most applicable to them.

30. Land tenure system:- This was expressed as the way or manner the lands in the village were controlled. The various possible ways were coded as follows:

(i)	Leaseholding	- 2 points
(ii)	Outright purchase	- 4 points
(iii)	Familyholding/inheritance	- 6 points
(iv)	Community holding	- 8 points
(v)	Government	- 10 points

The respondents were advised to consider the option most applicable in their communities/villages. In case of multiple choice, by a respondent, the total sum of points for the options ticked was recorded for him or her.

31. Tree-tenure system:- This was expressed in terms of those who have access to and control over the economic trees such as oil palm, coconut, kolanut, cocoa etc on cultivated farmlands. It was categorised and coded as

follows:

(i) Only men in the family have access to trees on cultivated farm lands - 2 points

(ii) Both men and women have equal access to economic trees - 4 points

(iii) Buyers of farm lands have access to economic trees - 6 points

(iv) Trees are properties of the planters - 8 points

32 Length of fallow period:- This was expressed as the inclusion of fallow period on the cultivated land and the usual number of years to rest a farmland after cropping. In case of inclusion of fallow period, if yes - 2 points were assigned and if No, 0 point was assigned, and the actual number of years for fallow mentioned was added to Yes points to get the score for the fallow system.

33. Tree Planting activities: This was expressed as whether or not a respondent usually cut all trees on farmland and/or deliberately plant trees on farmland or in fallow fields. For those who leave and/or plant trees- 2 points were assigned while 0 point was assigned to those who cut all trees and/or plant no trees on farmland or fallow fields.

34. Knowledge of agricultural practices: This was expressed as the respondent's knowledge of new farm practices introduced to him or her, 1-point was assigned to each farm practice or technology mentioned, and the total number of farm practices/technologies mentioned by a respondent constituted his/her score for knowledge of agricultural practices.

35. Sources of knowledge on alley farming technology:- This was expressed in terms of respondent's knowledge and source of information on alley farming. 2 points were assigned to respondent who have knowledge of alley farming, The possible sources of knowledge were coded as follows.

(i) I don't know - 1 point

(ii) Friends/relatives/Neighbours - 2 points

(iii) Extension agents in the area - 3 points

(iv) Whiteman/Officials of ILRI/IITA/ - 4 points

36. Environmental/Agricultural production constraints: This was indexed by the responses of respondents to possible farming problems. The respondents were asked to say Yes or No to 14 statements of possible farming problems that they experienced. Each farm problem was assigned 1 point and the total number of farm problems indicated Yes for was indexed as score for each respondent. The posible farming problems were:-

(i) Poor soil fertility

(ii) Land topography/Hilly/Sloping land

(iii) Soil erosion problem

(iv) Lack of staking mateials for crops

(v) Shortage of labour

(vi) Scarcity of land

(vii) Lack of browse and fodder for livestock

(viii) Lack of fuelwood for domestic purpose

(ix) Lack of land for permanent cropping

(x) Lack of farm inputs such as fertilizers

(xi) Lack of finance or credit for farming

(xii) Lack of fencing mateials for compound and livestock

(xiii) Inability to control week problems

(xiv) High cost of farm inputs, such as seeds and chemicals.

37. Farmers' attitude towards alley farming adoption:- In this study, attitude was determined in terms of respondent's positive or negative inclination towards the technology. Farmers' disposition or attitude toward alley farming cold be expected to enhance or limit their knowledge or understanding of it. By a favourable attitude, it means that farmer has a positive inclination or disposition toward the technology, while a negative inclination only occurred because of an unfavourable attitude while a neutral means no disposition or direction towards the technology. Attitude was determined by advancing a number of possible reasons for adoption and non-adoption of alley farming to which each respondent was asked to say Yes or No. The possible reasons for practising alley farming include the following:-

(i) It increases crop yield

(ii) It preserves soil structure

(iii) It provides fodder for livestock

(iv) Neighbours are practising it

(v) There are labour for managing it

(vi) It increases soil fertility

(vii) Technical guidance available for it

(viii) It controls soil erosion

(ix) Provision of staking and fuelwood materials

(x) It provides recognition in the community

(xi) It provides additional income

While the possible reasons for not tryng alley farming on personal farms include:

(i) Lack of technical guidance

(ii) It requires more labour

(iii) Lack of knowledge on alley farming practice

(iv) Lack of seed for planting

(v) Lack of land for personal use

(vi) Lack of access to trees on the land

(vii) It is very complex to adopt

(viii) Neighbours do not practice it

(ix) Land is not suitable

(x) Labour is not available

(xi) It is risky to adopt

(xii) I do not have livestock/animals on farm

Then, the summation of Yes- and No- responses were calculated and NO-response result was subtracted from Yes-response result. The result was then used to determine the attitude of respondents, as follows:

(i) If the result is negative, it means unfavourable attitude - 0 point

(ii) If the result is zero, it means neutral attitude - 1 point

(iii) If the result is positive, it means favourable attitude - 2 points.

38. Adoption Period:- This was expressed as the length of time (i.e. number of years) it took an individual from the first time of hearing about or awareness of alley farming to the time he or she actually tried the technology on his or her own farm. This was recorded in years as given by each respondent.

39. Community level of infrastructure differentiation: This was indexed as the availability of some basic social amenities in the community of respondent. Some social amenities were mentioned, to which responsidents were asked to say "Yes" if such amenities were available, and "No" if not. The total number of Yes-responses were calculatedand recorded for each respondent. The social amenities are the following:

(i) Good drinking water

(ii) Electricity

(iii) Primary school

(iv) Secondary school

(v) Maternity/Health Centre

(vi) Post office

(vii) Commercial or Community Bank

(viii) Local market

(ix) Supermarkets/stores

(x) Recreation/Relaxation Centres

40. Community structure:- This was measured in terms of respondent perceptions of people and community characteristics in the study area. 14 statements of possible characteristics of the people and the community and its environs in which respondents were living were expressed. The possible community characteistics include the following

(i) Society's culture is favourable to change

(ii) System of values and attitudes of people are conducive to innovation adoption.

(iii) There are heterogeneous neighbourhoods, ethnic and religious in the community.

(iv) Organizations in the community are being used for educational purposes

(v) The social structure and culture of locality groups are the major factors influencing the adoption of new farm practices

(vi) The standard of living is relatively high

(vii) There is lack of disputes in the community

(viii) Presence of formal social organisations

(ix) A diversity of religious traditions in the community.

(x) Presence of a number of political parties

(xi) The presence of a number of voluntary organisations

(xii) Incentives are provided in form of subsidy to farmers in this area.

(xiii) Inadequate or poor storage facilities

(xiv) Absence of effective market for farm produce.

To each of the statements, respondents were asked to say Yes or No to each as the statement may seem to him or her. The total sum of Yes-responses and No-responses were calculated and recorded for each respondents.

CHAPTER FOUR

4.0 ANALYSIS OF DATA AND DISCUSSION

This chapter presents the analysis, description and interpretation of data, based, on five sub-headings with respect to the socio-economic factors associated with adoption of alley farming technology by small scale farmers. These are

(i) the personal and socio-economic characteristics of sample farmers

(ii) Environmental and agricultural production constraints.

(iii) Farmers reasons for the adoption non-adoption and discontinuance of alley farming technology,

(iv) The testing of the hypotheses which investigated the relationship between land and tree use related factors; the personal and socio-economic characteristics, community structure and its infrastructural differentiation and the adoption of alley farming, and

(v) General discussion of the socio-economic factors which influence adoption of alley farming.

The total sample size for each set of respondents with respect to community locations was presented in Table 1.

Table 1: Total Sample Size of each Category of Respondents According to Community Locations

Category of Respondents	Community Locations			
	Ife Odoan	Owu-Ile	Iwo-Ate Isale	Total
Alley farming adopters	42	48	25	115
Alley farming non-adopters	28	32	15	75
Total	70	80	40	190

Source: Field survey, 1996

Table 1 reveals that a total sum of one hundred and fifteen alley farming adopters and seventy-five alley farming non-adopters constituted the total sample size for the study. The communities used for data collection have been exposed to alley farming technology for more than 10 years to the time of this study, hence they can be used for data collection on alley farming adoption study. Thus, out of 190 farmers that constituted the sample size, 115 farmers (60.53%) were alley farming adopters, while the remaining 75 farmers (39.47%) were non-adopters of alley farming technology. The use of same interview schedule for both categories of respondents was based on the assumption that the parameters relevant in determining the influence of socio-economic factors associated with adoption of innovation by farmers living in the same locale are logically similar. The data analysis and discussion on each sub-heading now follows.

4.1 The Personal and Socio-Economic Characteristics of Sample Farmers

The pattern of analysis used was to examine the characteristics of each category of farmers so as to identify socio-economic factors associated with adoption of alley farming by small-scale farmers. The study investigated the age, sex, marital status, marriage pattern, family structure, level of education, literacy level, years of farming experience, total farm size, family size, number of children assisting in farm work, labour availability, source of labour, years of residence in the locality, status-within household, occupation characteristics, and farming system practice.

Other characteristics studied include ownership of livestock, livestock feeding system, socio-status on land, membership of social-groups, level of contacts with friends, neighbours and relatives, contact with extension agents, cosmopoliteness, cropping pattern, land tenure system, tree-tenure system, sources of knowledge on alley farming, number of sources of information used, and household decision making process.

Table 2 reveals that 84.35% adopters were males. Also, it can be seen that female proportion was high among non-adopters' category. The findings showed that male farmers adopted alley farming technology than their female counterparts. This was supported by personal observations during data collection exercise. The finding may be connected with female land-tenure and ownership status, and the fact that they were more engaged in off-farm activities such as food processing and marketing of farm produce than males.

Table 2 further shows that 71.43% adopters and 72.00% non-adopters were within the age-group of 50-69 years. While only 13.05% adopters and 12.00% non-adopters were within the age-group of 30-49 years. The average age of adopters was 60.2 years while that of non-adopters was 69.8 years. This findings show that non-adopters were older than the adopters of alley farming. Also, 43.48% adopters were below 59 years, while 56.52% adopters were above 60 years of age.

The means of farmers age in the two groups are above 60 years. This shows that young able bodied were not involved in farming in the area.

The data on Table 2 further shows that 49.57% adopters and 62.67% non-

adopters had more than 20 years of farming experience. Also, 40.00% adopters and 29.33% non-adopters had less than 20 years of farming experience. The means of years of farming experience for adopters was 21.26 years while that of non-adopters was 23.07 years. This shows that non-adopters of alley farming had more years of farming experience than the adopters of alley farming. The findings also show that the farmers possessed a wealth of experience in farming, and this could be a solid base for on-farm adaptive research if their experiences could be adequately utilized in formulating research programmes.

The data further shows that 74.78% adopters and 70.67% non-adopters were cultivating between 2.1ha and 5.0ha. Also 18.26% adopters and 22.67% non-adopters were cultivating between 5.1ha and 7.0ha. The average farm size for adopters was 3.7ha while that of non-adopters was 3.81ha. Thus, non-adopters were cultivating slightly larger farms than the adopters of alley farming. The data shows that only 6.96% adopters and 6.67% non-adopters were cultivating between 1.0 and 2ha farmlands.

Table 2 also reveals that 77.39% adopters and 88.00% non-adopters had spent more than 20 years in their areas of locality; while 22.61% adopters and 12.00% non-adopters had spent less than 20 years. The average years of residence for adopters of alley farming was 30.8 years while that of non-adopters was 35.9 years.

Table 2: Frequency and Percentage Distribution of Each Category of Farmers by Sex, Age, Years of Farming, Experience, Total Farm Size, and Years of Residence in the Locality.

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Sex of farmers				
(i) Male	97	84.35	50	66.67
(ii) Female	18	15.65	25	33.33
(b) Age of farmer				
(i) 20-29 years	0	0.00	0	0.00
(ii) 30-39 years	3	2.61	3	4.00
(iii) 40-49 years	12	10.44	6	8.00
(iv) 50-59 years	35	30.43	22	29.33
(v) 60-69 years	46	40.0	32	42.67
(vi) 70-79 years	19	16.52	12	16.00
(c) Years of farming experience				
(i) 1-5 years	3	2.61	0	0.00
(ii) 6-10 years	9	7.83	6	8.00
(iii) 11-15 years	6	5.22	3	4.00
(iv) 16-20 years	40	34.78	19	25.33
(v) 21-25 years	6	5.22	3	4.00
(vi) 26-30 years	51	44.35	44	58.67
(d) Total farm size				
(i) 1.0-2ha	8	6.96	5	6.67
(ii) 2.1-3.0ha	28	24.35	21	28.00
(iii) 3.1-4.0ha	42	36.52	18	24.00
(iv) 4.1-5.0ha	16	13.91	14	18.67
(v) 5.1-6.0ha	14	12.17	12	16.00
(vi) 6.1-7.0ha	7	6.09	5	6.67
(e) Years of residence				
(i) 1-10 years	9	7.83	0	0.00
(ii) 11-20 years	17	14.78	9	12.00
(iii) 21-30 years	43	37.39	25	33.33
(iv) 31-40 years	11	9.57	9	12.00
(v) 41-50 years	20	17.39	18	24.00
(vi) 51-60 years	15	13.04	14	18.67

Source: Field survey, 1996.

NOTES: (i) The age and years of farming experience of respondents were adjusted to the nearest whole number in some cases.

(ii) The farm hectrage was obtained from acreage provided by the respondent.

The observations of Table 3 show that majority of sample farmers were married. The Table further shows that majority of non-adopters were from polygamous families, while only 46.96% adopters came from polygamous families at the time of study. These show that majority of non-adopters of alley farming were from polygamous families. This may influence the amount of land subsequently available to individual members of the family as a result of possible land fragmentation.

The Table also shows that 50.43% adopters and 44.44% non-adopters maintained nuclear family structure, while 46.96% adopters and 55.56% non-adopter's maintained extended family structure. The average family size for adopters was 6.5 while that of non-adopters was 6.7. Also, 96.51% adopters and 86.00% non-adopters had above 5 members in their families. The increase in family size will increase the amount of locally available labour for farm work. However, the increase in family size may have a negative effect on land availability in the area. This finding shows that non-adopters of alley farming had larger family size than the adopters.

The information on Table 3 further shows that 67.83% adopters and 48.00% non-adopters had between 1 and 2 children available for farm work, while only 16.52% adopters and 21.33% non-adopters had between 3 and 4 children available for farm work. Thus, while the average family size was larger for non-adopters of alley farming, the average number of children available for farm work was 1.6 for adopters and 1.4 for non-adopters. Therefore alley farming adopters had more children available for their farm work than non-adopters. Among the non-adopter', 30.67% did not have children assisting on farms, while only 16.65% adopters did not have children assisting them in farm work. It may be adduced from the findings that majority of the children might have left the farm to stay elsewhere as majority of non-adopters maintained polygamous family structures and large family sizes.

The implication of the above findings is that there may be labour shortage on farms at peak periods. The pattern of demand for labour for farm operations usually follow cropping season. Labour supply may be critically short and wages could rise, since the able bodied youths are migrating away from rural to urban areas. This will have an influence on the adoption of farm technologies that require more labour inputs at any stage of adoption. Also, the aged farmers who have no children available for farm work, may be selective in adopting farm technologies, even if it is good and economical for them.

Table 3: Frequency and Percentage Distribution of Each Category of Farmers by Marital Status, Marriage Pattern, Family Structure, Family Size and Number of Children available for Farm Work.

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Marital Status				
(i) Single	3	2.61	3	4.00
(ii) Married	112	97.39	72	96.00
(b) Marriage Pattern*				
(i) Monogany	58	50.43	18	24.00
(ii) Polygyny	54	46.96	54	72.00
(c) Family Structure				
(i) Nuclear System	58	50.43	32	44.44
(ii) Extended System	54	46.96	40	55.56
(d) Family Size				
(i) 3-4 members	4	3.48	3	4.00
(ii) 5-6 members	64	55.65	26	34.67
(iii) 7-8 members	35	30.43	46	61.33
(iv) 9-10 members	12	10.43	0	0.00
(e) Number of children available for farmwork				
(i) None	18	16.65	23	30.67
(ii) 1-2 children	78	67.83	36	48.00
(iii) 3-4 children	19	16.52	16	21.33

Source: Field survey, 1996
Note * - N is 112 for adopters and 72 for non-opters.

Table 4 shows that 39.15% adopters and 20.00% non-adopters had completed at least primary education. It also shows that 28.69% adopters and 48.00% non-adopters never went to school. The Table further reveals that none of the non-adopters went beyond primary education. Thus, a large proportion of adopters were more educated than non-adopters of alley farming.

The Table further shows that 39.13% adopters cannot read or write Yoruba or English, while 56.00% non-adopters also fell into this group. The Table also reveals that 45.22% adopters and 36.00% non-adopters can read and write Yoruba only, while only 15.65% adopters and 8.00% non-adopters can read and write both Yoruba and English. These findings show that majority of non-adopters cannot read or write, hence they may not be expected to find adoption of farm technologies that require instructional materials or diagram quite easy. The farmers in the study area had been exposed to instructional materials and diagrams on alley farming planting and management techniques. These instructional materials were produced by the programme that is promoting adoption of alley farming in the area. The ability to read instructional materials and displays might have influenced the adoption of alley farming by majority of the adopters.

The information on Table 4 further shows that 67.83% adopters and 60.00% non-adopters usually travelled out of their localities once per month, while 20.87% adopters and 22.67% non-adopters usually travelled out of localities once per week. Only 7.83% adopters and 4.00% non-adopters usually travelled out twice per week. The comparison of the two categories of respondents shows that adopters were more exposed to outside communities than non-adopters. This

implies that the possible external exposure and high degree of outside contacts of adopters might have enabled them to adopt the farm technology introduced to them in the area. Thus, arranging visitations and tours to other areas outside farmers' immediate environment where alley farming has benefited farmers may be used to encourage adoption of the farm technology.

The data on the Table also shows that 58.26% adopters had more than 10 times of contacts with friends, neighbours and relatives, while only 33.33% non-adopters had similar number of contacts within three months to the time of study. Majority of non-adopters (66.67%) had between 5 to 9 times of contacts while 41.74% adopters also had similar contacts with friends, neighbours and relatives. Those who maintain neighbourhood are usually more disposed to information and farm technologies than those who usually isolate themselves from others. Thus, the majority of adopters might have been influenced to adopt alley farming by their friends, neighbours or relatives who had favourable disposition towards alley farming.

Table 4 further shows that 60.87% adopters and 48.00% non-adopters had above 11 times of contacts with extension agents. Also, 86.09% adopters and 64.00% non-adopters had more than six times of contacts with extension agents in the last six months to the time of study. Only 6.09% adopters and 25.33% non-adopters claimed that they had never met with extension agents in recent times.

Extension agents are supposed to be within the locality of farmers. However, it was gathered that, due to poor infrastructural facilities in the area of study, the two extension agents were living outside the communities and only

visited farmers on schedule. Thus the normal farm visitation exercise might not be adequate to have personal contacts with farmers on their farms. Also, the fact that majority of the farmers claimed to have had contacts with extension agents showed that farmers still depended on extension advisory services to get farm advice, information and technologies.

Table 4: Frequency and Percentage Distribution of Each Category of Farmers by Level of Education Attained, Literary Level, Cosmopoliteness, Level of contacts With Friends/Relatives on Farm Matters and contacts Made With Extension Agents

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters, N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Level of education				
(i) Never attended school	33	28.69	36	48.00
(ii) Primary school (uncompleted)	37	32.17	24	32.00
(iii) Primary School completed	30	26.09	15	20.00
(iii) Secondary Modern School	9	7.83	0	0.00
(iv) Secondary Gram./High Sch.	3	2.61	0	0.00
(v) Others, e.g. Teacher Grade II, Adult Ed. Programme	3	2.61	0	0.00
(b) Literacy Level				
(i) Cannot read or write	45	39.13	42	56.00
(ii) Can read and write Yoruba only	52	45.22	27	36.00
(iii) Can read and write both Yoruba and English	18	15.65	6	8.00
(c) Cosmopoliteness				
(i) Not often	24	20.87	10	13.33
(ii) Once per month	78	67.83	45	60.00
(iii) Once per week	24	20.87	17	22.67
(iv) Twice per week	9	7.83	3	4.00
(d) Level of contacts with friends/neighbours/relatives on farm related matters				
(i) 5-9 times	48	41.74	50	66.67
(ii) 10-14 times	42	36.52	13	17.33
(iii) 15-19 times	22	19.13	12	16.00
(iv) 20-24 times	3	2.61	0	0.00
(e) Level of Contacts made with extension agents				
(i) Never	7	6.09	19	25.33
(ii) 1 - 5	9	7.83	8	10.67
(iii) 6 - 10	29	25.22	12	16.00
(iv) 11 - 15	64	55.65	15	20.00
(v) 16 - 20	6	5.22	21	28.00

Source: Field survey, 1996.

Table 5 shows that majority of adopters planted the following crops together on the same piece of farmland, maize and cassava (80.00%); Leucaena/maize/cowpea (73.91%); Gliricidia/maize/cowpea (62.61%); oilpalm/kolanut/citrus/cocoa (67.83%); Cocoa/cocoyam/plantain (60.00%); and sorghum and Yam (56.52%). The non-adopters also engaged in the following crop mixture, maize and cassava (86.67%); oilpalm/kolanut/citrus/cocoa (69.33%); cocoa/cocoyam/plantain (73.33%); and sorghum and yam (82.67%). However, non-adopters did not engage in leucaena/maize/cowpea and Glincidia/maize/cowpea crop mixtures.

The finding shows that multiple cropping was more prominent in the farming systems of the small-scale farmers in the area of study. Alley farming has been found to be more profitable where sole cropping has been adopted. The Table further reveals that majority of both adopters and non-adopters engaged in food crops and tree crops productions. Whereas, adopters of alley farming were more engaged in mixed farming than the non-adopters. 82.61% adopters and 49.33% non-adopters engaged in mixed farming (crops and livestock) in the study. The implication of this finding is that more of the adopters may be relying on their alley farms to provide browse or fodder for their livestock. Hence, many of them might have adopted alley farming in order to provide supplementary diets for their stocks.

The Table further reveals different types of feedings systems being used by the farmers. Among the adopters, waste-farm product (53.05%); cut and carry feeding (49.57%) and free-range (40.00%) systems were the three major systems

being practised, while waste-farm products (42.67%) and free-range (28.00%) were the two major systems being practised by non-adopters. The implication of these findings was that alley farming adopters might have depended on their alley farms for feeding their livestock as cut and carry feeding constituted a major feeding system for them. Very few non-adopters (12.33%) who practised cut and carry-feeding system might have depended on the good-will of those who adopted alley farming on their farms.

The Table also provides information on sources of farm labour. Hired and family constituted major sources of labour to both categories. Contractual was another major source of labour while very few of adopters (18.26%) and non-adopters (5.33%) solely depended on family and relatives for labour. 56.52% adopters and 70.66% non-adopters indicated hired and family as source of labour, while 47.83% adopters and 72.00% non-adopters indicated task labour as a major source.

Table 5: Frequency and Percentage Distribution of Each Category of Farmers by Crop Mixture, Farming System Practice, Live-stock Feeding system, and Source of Farm Labour

Variables	Categories of Farmers			
	Adopters, N = 15		Non-adopters, N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Crop Mixture				
(i) Maize and Cassava*	92	80.00	65	86.67
(ii) Leucaena/maize/cowpea**	85	73.91	0	0.00
(iii) Gliricidia/maize/cowpea**	72	62.61	0	0.00
(iv) Pigeon pea/Vegetables*	35	30.43	24	32.00
(v) Oil palm/Kolanut/citrus/cocoa	78	67.83	52	69.33
(vi) Cocoa/cocoyam/plantain*	69	60.00	55	73.33
(vii) Sorghum and Yam*	65	56.52	62	82.67
(viii)Pigeon pea/maize/yam*	42	36.52	35	46.67
(b) Farming system Practice				
(i) Food crops/Vegetables Farming	3	2.61	0	0.00
(ii) Food crops/Tree Crops Farming	78	67.83	52	69.33
(iii) Mixed Farming (Crops/Livestocks)	95	82.61	37	49.33
(c) Livestock Feeding System:y				
(i) Waste-farm products	61	53.04	32	42.67
(ii) Free-range	46	40.00	21	28.00
(iii) Household/backyard feeding	35	30.43	6	8.00
(iv) Cut and Carry feeding	57	49.57	16	12.33
(d) Source of farm labour				
(i) Hired and family	65	56.52	53	70.66
(ii) Family and relatives	27	18.26	18	5.33
(iii) Contractual	55	47.83	54	72.00

NOTES: (i) * - Traditional Crop mixtures
(ii) ** - Recommended alley farming mixtures
(iii) y - Respondents indicated more than one livestock feeding system.

Source: Field survey, 1996

Table 6 shows that large proportion of adopters (72.17%) inherited their farm lands from parents/family. This was also the case for non-adopters (58.66%). Those who had personal access to land, probably through purchase or division of land among family members, constituted 20.87% among adopters and 14.67% among non-adopters. Very few farmers were tenants and pledgees on their farm lands among both categories. However, the proportion of non-adopters that were tenants and pledgees on their farmlands was higher than that of adopters' category. These findings revealed that majority of the sample farmers had access to their farm lands through inheritance.

The Table further reveals that inheritance and family helding were the two major land tenure systems in the area of study. This is seen from the fact that 94.78% and 73.04% adopters indicated family holding and inheritance tenure system respectively while 85.33% and 86.67% non-adopters indicated family holding and inheritance land-tenure systems respectively. Individual holding by purchase and free-leasehold were not as common as any of the two systems. The implication of this finding is that only those with permanent right on land may be able to adopt any farm technology that requires the use of land on long-term basis. Therefore, the potential adoption of alley farming by those who have no permanent right to land may be threatened as found by Fabiyi and Idowu (1990).

Table 6: Frequency And Percentage Distribution of Each Category of Farmers by Socio-Status on Land, Means of Land Acquisition and Land Tenure Systems.

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters, N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Social-Status on land				
(i) Land owner/landlord	24	20.87	11	14.67
(ii) Inherited from parents/family	83	72.17	44	58.66
(iii) Tenant	5	4.35	8	10.67
(iv) Pledgees	3	2.61	12	16.00
(b) Means of land acquisition*				
(i) Loan	3	2.61	4	5.33
(ii) Pledge	3	2.61	12	16.00
(iii) Purchase	20	17.39	8	10.67
(iv) Lease	15	13.04	28	37.33
(v) Inheritance	85	73.91	65	86.67
(c) Land tenure Systems*				
(i) Family holding	109	94.78	64	85.38
(ii) Free Leasehold	28	24.35	14	18.67
(iii) Individual holding by Purchase	37	32.17	24	32.00
(iv) Inheritance	84	73.04	65	86.67

Note:* Some respondents indicated more than one means of land acquisition and land tenure systems.

Source: Field survey, 1996.

Information on Table 7 reveals that economic trees on farm lands are properties of the planters and that access can be secured by purchase of farmlands. 60.00 adopters and 77.33% non-adopters indicated that economic trees are properties of the planters. Also 67.83% adopters and 69.33% non-adopters indicated that other household members have access to economic trees on farmlands. Also 62.61% adopters and 73.33% non-adopters indicated that access can be secured by purchase of farmlands. The two categories of farmers shared the same opinions on this issue.

Table 7: Frequency And Percentage Distribution of Tree-Tenure Systems Indicated By Each Category of Farmers.

Tree-tenure systems*	Categories of Farmers			
	Adopters, N = 115		Non-adopters, N = 75	
	Freq.	Percentage	Freq.	Percentage
(i) Only men have access to trees on farmland	42	36.52	3	46.67
(ii) Both men and women have equal access to trees	65	56.52	62	82.67
(iii) Access can be secured by purchase of land	72	62.61	0	73.33
(iv) Only household heads have access to trees	35	30.43	24	32.00
(v) Other household members have access to trees	78	67.83	52	69.33
(vii) Trees are properties of the planters	69	60.00	55	73.33

Source: Field survey, 1996

NOTE:*- Respondents indicated more than one system in some cases.

Table 8 shows that husbands wives and children were usually involved in decision making process. 72.17% adopters and 69.00% non-adopters claimed that husbands, wives and children take decision on farm related matters. Also, 62.61% adopters and 64.00% non-adopters claimed that husbands and wives take decision on farm related matters. The implication of this finding is that farm technology that benefits many household members may have high tendency for adoption than those that are beneficial to only a few members. Also, wives and children may be instrumental to rapid adoption of farm technologies by farmers as they were involved in taking decisions on farm matters.

The Table further reveals that 47.83% adopters and 67.33% non-adopters claimed that friends, relatives and neighbours help them make decision on farm matters, while family heads, village head and community leaders were not usually involved in individual family/household decision making process. This finding reveals that friends, relatives and neighbours promoted the dissemination and adoption of alley farming in the study area.

Table 8: Frequency And Percentage Distribution of Household Decision Making Process Indicated by Each Category of Farmers

	Household decision making process*	Categories of Farmers: Adopters, N = 115 Freq.	%	Non-adopters, N = 75 Freq	%
(i)	Family head takes decision alone	25	21.74	14	18.67
(ii)	Husband and wife take decision on farm related matters	72	62.61	48	64.00
(iii)	Husband, wife and children take decision on farm related matters.	83	72.17	52	69.00
(iv)	Friends, relatives and neighbours help make decision on farm matters.	55	47.83	43	67.33
(v)	Village head or Community leader helps make decision on farm matters.	12	0.43	7	9.33

*Some respondents indicated more than one process.

Source: Field survey, 1996

The data on Table 9 reveals that 53.04% adopters took farming only as their occupation while 72.00% non-adopters took same as their occupation. Also, 31.30% adopters and 6.67% non-adopters were engaged in farming and hunting while 10.43% adopters and 10.67% non-adopters also engaged in farming and food processing. Thus, farming and hunting are the two main occupations engaged in by the majority of farmers in both categories.

The proportions actually engaged in other vocations such as food processing, carpentry and traditional medicine along with farming were very small. Thus, 84.34% adopters and 78.67% non-adopters could be said to be actively involved in farming as hunting is usually complementary to farming in the real sense of rural life. Thus, more of adopters were actively involved in farming than non-adopters.

The Table further reveals the number of groups to which individual farmer belongs. It was revealed that 73.91% adopters and 38.67% non-adopters were in at least five groups at the time of study, while 23.48% adopters and 56.00% non-adopters were in three or four groups. It was also revealed that 2.61% adopters and 5.33% non-adopters were in one or two groups as at the time of study. The comparison of the two sets of farmers shows that majority of adopters were in many social groups. Such groups mentioned include religious groups, and co-operative societies.

Group membership has been found to increase social-participation and enlarge the degree of influence of individuals in the group. Group members

interact and discuss new farm technologies, and if such technologies are favourable to majority of the people concerned, then they are likely to be adopted by the generality of people in the area. Usually, farmers' groups are being used in introducing new farm technologies in rural areas, hence the members of a croup stand a better chance to benefit from new farm technologies than non-members.

Table 9: Frequency and Percentage Distribution of Each Category of Farmers by Occupational Characteristics and Membership of Social-Groups

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters, N = 75	
	Frequency	Percentage	Frequency	Percentage
(a) Occupational Characteristics				
(i) Farming only	61	53.04	54	72.00
(ii) Farming and Hunting	36	31.30	5	6.67
(iii) Farming and Carpentry	3	2.61	3	4.00
(iv) Farming and Food Processing	12	10.43	8	10.67
(v) Farming and Traditional medicine practitional	3	2.61		
(b) Membership of Social-groups				
(i) 1 - 2 groups	3	2.61	4	5.33
(ii) 3 - 4 groups	27	23.48	42	56.00
(iii) 5 groups and above	85	73.91	29	38.67

Source: Field survey, 1996

4.2 Environmental and Agricultural Production Constraints in the study area

Environmental and agricultural production constraints were investigated in an attempt to know those conditions that influenced the farmers to accept and adopt alley farming or behaved otherwise in the communities within the area of study. The findings were presented in Table 10.

Table 10 shows that more than 50% of respondents in the three communities mentioned the following problems:(i) high cost of farm inputs such as seeds and fertilizers, (ii) lack of finance or credit for farming,(iii) shortage of labour/high cost of wages and (iv) lack of farm inputs such as fertilizers. The findings further revealed that above 40% of the respondents mentioned (i) poor soil fertility, (ii) lack of fuelwood for domestic purpose, (iii) lack of browse and fodder for livestock and (iv) lack of fencing materials for compound and livestock, in at least two communities in the area. It could be observed that some of the problems mentioned, for example, poor soil fertility, lack of fertilizers, lack of browse and fodder for livestock, lack of fencing materials, and lack of fuelwood for domestic purpose could be solved with the adoption of alley farming by farmers in the area.

Other problems mentioned by few farmers include land topography/hilly/sloping land, soil erosion problem, lack of staking materials for crops and inability to control weeds. Alley farming can also be used to address these problems. However, availability of land for cropping was not considered as major problem in the area of study. This implies that the farmers can still practise shifting cultivation system as a result of availability of land.

Table 10: Frequency and Percentage Distribution of Environmental/Agricultural Production Constraints in the Communities within The Area of Study As Indicated by Farmers.

ENVIRONMENTAL/AGRICULTURAL* PRODUCTION CONSTRAINTS	Communities within the area studied					
	Ife-Odan N=70		Owu-Ile N=80		Iwo-Ate Isale N=40	
	Freq	%	Freq	%	Freq	%
i. High cost of farm inputs such as seeds/Fertilizers	48	68.57	55	68.75	23	57.50
ii. Lack of finance/credit for farming	48	68.57	53	66.25	28	70.00
iii shortage of labour/high cost of wages	48	68.57	59	73.75	28	70.00
iv. Lack of farm inputs such as fertilizers	45	64,29	49	61.25	31	77.50
v Lack of browse and fodder for livestock	42	60.00	31	38.75	18	45.00
vi Lack of fuelwood for domestic purpose	36	51,43	31	42.50	25	62.50
vii Poor soil fertility	32	45.71	34	28.75	18	45.00
viii Lack of fencing materials for compound and livestock	32	45.71	23	42.50	16	40.00
ix Land topography/Hilly/Sloping land	18	25.71	15	18.75	19	47.50
x Inability to control weed problems	16	22.86	19	23,75	18	45.00
xi Lack of staking materials for crops production	15	21.43	18	22.50	12	30.00
xii Lack of land for permanent cropping	15	21.43	19	23.75	15	37.50
xiii Soil erosion problem	13	18.57	17	21.25	21	52.50
xiv Scarcity of land	12	17.14	10	12.50	14	35.00

Source: Field survey, 1996.

4.3 Farmers' reasons for the adoption, non-adoption and discontinuance of alley farming technology.

Table 11 shows that friends and neighbours constituted the major sources of knowledge on alley farming to majority of farmers. 63.48% adopters and 90.67% non-adopters indicated friends and neighbours as their major sources of knowledge, while 46.96% adopters and 25.67% non-adopters claimed that extension agents constituted their sources of knowledge on alley farming. Other sources mentioned by 41.74% adopters and 30.67% non-adopters include whitemen/officials of International Livestock Research Institute (ILRI) and International Institute of Tropical Agriculture (IITA). It was gathered during data collection exercise that officials of ILRI and IITA were responsible for initial introduction of alley farming in the area of study through on-farms research project at Ife-Odan, Owu-Ile and Iwo-Ate environs.

Attempts were made to investigate the number of different sources of information used by individual farmer. It was revealed that 94.78% adopters and 92.00% non-adopters used three or four sources of information, while 5.22% adopters and 8.00% non-adopters used five or more sources. The sources of information used by farmers include radio, extension agents, friends and neighbours, children and wives, and produce buyers.

Table 11 further reveals that 89.56% adopters and 37.33% non-adopters were favourably predisposed toward alley farming adoption, while only 7.83% adopters and 58.67% non-adopters maintained unfavourable attitude. Also, 2.61% adopters and 4.00% non-adopters maintained neutral position. Farmers'

disposition or attitude towards a farm technology could be expected to hinder or enhance his or her knowledge, understanding and acceptance or subsequent adoption of that technology. Thus, it was not suprising that majority of adopters (89.56%) maintained favourable attitude while majority of non-adopters (58.67%) maintained unfavourable attitude towards alley farming adoption.

Table 11: Frequency and Percentage Distribution of Each Category of Farmers by Sources of Knowledge on Alley Farming And Farmers' Attitude Towards Alley Farming Adoption

Variables	Categories of Farmers			
	Adopters, N = 115		Non-adopters, N = 75	
	Freq.	Percentage	Freq.	Percentage
(a) Sources of Knowledge*				
(i) Friends and neighbours	73	63.48	68	90.67
(ii) Extension agents	54	46.96	19	25.67
(iii) Others (ILRI/IITA Officials)	48	41.74	23	30.67
(b) Attitude of farmers				
(i) Favourable	103	89.56	28	37.33
(ii) Neutral	3	2.61	3	4.00
(iii) Unfavourable	9	7.83	44	58.67

NOTE:* Respondents indicated more than one source of knowledge in some cases.

Source: Field survey, 1996

The farmers were specifically asked for their reasons for adopting alley farming, or reasons for not adopting the technology in case of non-adopters. The responses of each category of farmers were collated and tabulated on Tables 12 and 13 respectively.

Table 12 shows that the four main reasons for adoption of alley farming by farmers are (i) provision of fodder for livestock, (79.13%); (ii) neighbours were practising it (63.48%); (iii) it increases crop yields, (63.48%) and (iv) it increases soil fertility (49.57%). Also, above 40.00% adopters mentioned that it protect soil structure (47.83%) and provides staking, firewood, and fencing materials (44.35%). Only a very few adopters mentioned the following reasons for practising alley farming (i) availability of technical guidance (27.83%); (ii) control of soil erosion (21.73%); (iii) Provision of recognition in the community (12.17%) and (iv) availability of labour for management (10.43%). However, no farmers mentioned provision of additional incomes as reasons for practising alley farming in the study.

The reasons mentioned by adopters were such that will benefit farmers in crops and livestock production. Also, the farmers recognised the effect of alley farming on crop yields and soil fertility. This effect, if the technology is well managed, can allow farmers to use the same piece of land for several years. Also, the increase in soil fertility will eventually reduce the need for chemical fertilizers. The need to look into possible areas of income generation by way of selling the staking materials, becomes imminent as this can encourage and sustain adoption of alley farming by small-scale farmers.

Table 12: Frequency and Percentage Distribution of Reasons Mentioned for Adoption of Alley Farming by Adopters N = 115.

Reasons*		Frequency	Percentage
i.	It provides fodder for livestock	91	79.13
ii.	Neighbours were practising it	73	63.48
iii.	It increases crop yields	73	63.48
iv.	It increases soil fertility	57	49.57
v.	It protects soil structure	55	47.83
vi	It provides staking, firewood, and fencing materials	51	44.35
vii	Technical guidance available for it	32	27.83
viii	It controls soil erosion	25	21.73
ix	It provides recognition in the community	14	12.17
x.	There is labour for management	12	10.43

Source: Field survey, 1996.

* Some rrespondent indicated more than one reasons for adoption of alley farming.

The non-adopters of alley farming also mentioned their reasons for maintaining status-quo in the area.

The observation of Table 13 shows that above 50% non-adopters mentioned the following reasons for not practising alley farming on their farms: (i). It requires more labour (62.67%); (ii) It is very complex to adopt (58.67%); (iii) Labour was not available (57.33%); (iv) It takes time to get benefits (57.33%) (v) Lack of technical guidance (52.00%); (vi) I did not have animals materials (50.67%). Also, above 40% of the non-adopters indicated that it is risky to adopt alley farming because of future maintenance (42.67%). While less than 40.00% non-adopters mentioned the following reasons, lack of knowledge on alley farming practice (30.67%); lack of seeds for planting (22.67%); lack of land for personal use (20.00%); lack of access to trees on the land (16.00%); neighbours were not practising it (14.67%) and land was not suitable (10.67%) for not practising alley farming on their farms.

It can be noted that lack of technical guidance, and perceived complex and risky nature of the technology were mentioned by non-adopters of the technology among others. These can be overcome with appropriate extension recommendation packages on alley farming. This means instituting effective extension service that is fully equipped with technical details on alley farming, seeds for planting and adequate transport facilities can encourage and promote adoption of alley farming by the small-scale farmers.

Table 13: Frequency and Percentage Distribution of Reasons Mentioned for Non-Adoption of Alley Farming by Non-Adopters N = 75.

Reasons*		Frequency	Percentage
i.	It requires more labour	47	62.67
ii.	It is very complex to adopt	44	58.67
iii.	Labour was not available	43	57.33
iv.	It takes time to get benefits	43	57.33
v.	Lack of technical guidance	39	52.00
vi	I did not have animals materials	38	50.67
vii	It is risky to adopt because of future maintenance	32	42.67
viii	Lack of knowledge on alley farming practice	23	30.67
ix	Lack of seeds for planting in the community	17	22.67
x.	Lack of land for personal use	15	20.00
xi.	Lack of access to trees on the land	12	16.00
xii.	Neighbours were not practising it	11	14.67
xiii.	Land was not suitable	8	10.67

Source - Field survey, 1996

* Some respondents indicated more than one reason for non-adoption of alley farming.

The study further investigated the stage of adoption of individual adopter in an attempt to know the sustainability of adoption of alley farming by those who were practising it on their farms. It was revealed that three 2.61% adopters out of 115 adopters were on trial acceptance stage, 76 adopters (66.09%) were on complete adoption stage, while 36 adopters (31.30%) expressed dissastifaction with the technology, and hence were on discontinuance stage. Those who were on discontinuance stage were further asked to state reasons for abandoning or uprooting the shrubs on their alley farms. The reasons were collated and tabulated on Table 14.

The Table shows that 36(31.30%) of the adopters of alley farming has discontinued it for the following reasons: (i) lack of adequate time for proper maintenance and management of alley farms (58.33%); (ii) other farms required more attention (52.78%); and (iii) seeds dispersal caused weed problems (50.00%). Other reasons mentioned include (i) rooting system prevents the use of tractor, (44.44%); (ii) it hinders tuber crops production e.g. yam and cassava (38.89%); (iii) lack of labour for frequent pruning (36.11%); and (iv) no monetary gains from hedgerow shrubs (33.33%) among others.

The extent of discontinuance seems to vary with the nature of the innovation and the characteristics of the individual adopting (Alao, op cit). He also noted that discontinuance may occur as a result of the prevailing circumstance of the farmer or the innovation. Rejection may be caused by improper appreciation of the importance of the innovation, lack of resources to practice the innovation, inadequate knowledge of the techniques involved in adopting the idea

reasons. Jibowo (1980) reported that poor yield owning to improper application of the innovation, shortage of crop land in case of crops, crop pests and diseases, and ill-health of adopters were reasons responsible for discontinuance of adoption of 056 rice variety in Ife Division of Osun state, Nigeria.

Table 14: Frequency and Percentage Distribution of Reasons for Discontinuance of Alley Farming as Mentioned by some Adopters N = 36

Reasons*		Frequency	Percentage
i.	Lack of adequate time for proper maintenance and management of alley farms	21	58.33
ii.	Other farms required more attention	19	52.78
iii.	Seeds dispersal caused weed problems	18	50.00
iv.	Rooting system prevents the use of tractor	16	44.44
v.	It hinders tuber crops production e.g. yam and cassava	14	38.89
vi	Lack of labour for frequent pruning	13	36.11
vii	No monetary gains from hedgerow shrubs maintenance	12	33.33
viii	Hedgerow is difficult to prune after some times	9	25.00
ix	Seeds dispersal is difficult to control	6	16.67
x.	Seeds dispersal causes dispute with neighbours	4	11.11

* Some respondents indicated more than one reason for discotinuance

Source - Field survey, 1996.

The reasons mentioned by this group of adopters portrayed a lack of efficient extension service to assist the farmers on how to manage their alley farms and follow-up adoption of the technology. Quite often, farmers have been left to decide on what to do shortly after their adoption of farm technologies, and this has accounted for increase in the rate of discontinuance of many farm technologies especially agroforestry technologies. Thus, the need to strengthen the extension service at farms level in the area becomes more important so as to check discontinuance and encourage sustainability of adoption of alley farming by small-scale farmers. This is more imminent in view of the fact that it is quite possible for the farmers in the area of study may shift to the age-long practice of shifting cultivation system since there is no shortage of land in the area at the present time.

4.4 The Testing of the Null Hypotheses

The study determined the relationships between adoption of alley farming technology and the following:-

1. selected socio-economic characteristics of sample farmers
2. environmental/agricultural production constraints
3. land and tree-use related factors
4. community structure in the area of study, and
5. community's level of structural differentiation.

Hypothesis One

The relationships were investigated with the use of Chi-square, correlation analysis, 2-tailed significant and multiple regression analysis. The results of the analyses were summarized and presented on Table 15, 16, and 17 respectively.

Hypothesi 1: There is no significant relationship between adoption of alley farming and some selected socio-economic characteristics of farmers.

Table 15: Summary of Chi-Square Results of Relationships Between Some Selected Socio-Economic Characteristics of Farmers, and Adoption of Alley Farming

1. Socio-economic

Characteristic		X^2cal	Df	X^2tab	C.	Remark at 0.05 level of significance
i.	Sex of farmer	54.270	1	3.841	0.57*	Sig.
ii.	Marital status	103.313	1	3.841	0.69*	"
iii.	Age of farmer	54.774	15	24.995	0.57*	"
iv.	Number of children assisting on farm	61.913	4	9.488	0.59*	"
v.	Family size	48.774	5	11.071	0.55*	"
vi.	Marriage Pattern	0.217	1	3.841	0.04	N/S
vii.	Family Structure	0.009	1	3.841	0.01	N/S
viii	Level of education attained	65.365	5	11.071	0.6*	Sig.
ix.	Literacy	16.817	2	5.992	0.36*	"
x.	Farming experience	100.043	9	16.919	0.68*	"
xi.	Cosmopoliteness	44.896	3	7.815	0.53*	"
xii.	Total farm size	135.539	11	19.675	0.74*	"
xiii	Years of residence in the locality	49.435	9	16.919	0.55*	"
xiv	Number of sources of information used	72.226	2	5.992	0.62*	"
xv	Contact with extension agent	80.826	7	14.067	0.64*	"
xvi	Cropping system	109.009	2	5.992	0.7*	
xvii	Status within household	16.191	2	5.992	0.35*	"
xviii	Occupational Characteristics	106.374	5	11.071	0.69*	"
xix	Farming system practice	149.861	2	5.992	0.75*	"
xx	Household decision making process	130.174	4	9.488	0.73*	"
xxi	Knowledge of agricultural practices	83.087	3	7.815	0.65*	"
xxii	Ownership of livestock	154.974	2	5.992	0.76*	"
xxiii	Livestock feeding system	28.713	2	5.992	0.45*	"
xxiv	Sources of knowledge on alley farming	58.765	2	5.992	0.58*	"
xxv	Availability of farm labour	99.461	2	5.992	0.68*	"
xxvi	Labour shortage experience	61.583	2	5.992	0.59*	"
xxvii	Level of contacts with friends/neighbours/relatives	88.2	7	14.067	0.66*	"
xxviii	Membership of social groups	140.478	3	7.815	0.74*	"
xxix	socio-status on land	144.861	3	7.815	0.75*	"
xxx	soil fertility improvement methods used	19.209	1	3.841	0.38*	"
xxxi	Farmer's attitude toward alley farming adoption.	164.104	2	5.992	0.77*	"

(i) X^2cal = X^2 calculated

(ii) X^2tab = X^2 tabulated

(iii) D.f = Degree of freedom

(iv) C = Contingency Coefficient which measures the extent of association or relationship between two sets of attributes.

(v) *.C>0.3 i.e. high strength of relationship.

(vi) Level of significance = 0.05.

In cases where X^2cal (calculated value) was less than X^2tab (tabulated value), we conclude that the null hypothesis is true. In such cases, the null hypotheses hold. Hence, on the Table 16, marriage pattern and family structure had no significant relationship with adoption of alley farming by small-scale farmers in the area of study. However, the same Table reveals that the tabulated values of all the remaining variables were less than the calculated values, hence the null hypotheses, are invalid and therefore, the alternative hypotheses hold. So, all the variables except marriage pattern and family structure have significant relationship with the adoption of alley farming technology by the sample farmers.

The data was further subjected to correlation analysis to determine the direction of relationship and how changes in some variables were associated with adoption of alley farming. The results were summarized and presented in Table 16.

1. Socio-economic: There is no significant relationship etween adoption of alley farming and some selected socio-economic characteristics of farmers.

Table 16: Correlation Analysis Showing Linear Relationship Between Adopters' Variables and Their Adoption of Alley Farming

Characteristic		Correlation Coefficient (r)	Co-efficient determination (r^2)
i	Sex of farmer	-0.0933	0.0087048
ii.	Marital status	0.3491*	0.1218708
iii.	Age of farmer	0.4618*	0.2132592
iv.	Number of children assisting on farm	0.4461*	0.1990052
v.	Family size	0.2236*	0.0499969
vi.	Marriage Pattern	-0.2254*	0.050805
vii.	Family Structure	0.2021*	0.0408444
viii	Level of education attained	0.2208*	0.0487526
ix.	Literacy	0.3883*	0.1507768
x.	Farming experience	0.2928*	0.0857316
xi.	Cosmopoliteness	0.0056	0.0000313
xii.	Total farm size	0.2400*	0.0576
xiii	Years of residence in the locality	0.3841*	0.1475326
xiv	Number of sources of information used	0.0265	0.0007022
xv	Contact with extension agent	0.0367	0.0013408
xvi	Cropping system	-0.0484	0.0023425
xvii	Status within household	-0.0171	0.0002924
xviii	Occupational Characteristics	0.2581*	0.0660256
xix	Farming system practice	0.5038*	0.2538144
xx	Household decision making process	-0.2415*	0.0607372
xxi	Knowledge of agricultural practices	0.1415	0.0200222
xxii	Ownership of livestock	0.3502*	0.12264
xxiii	Livestock feeding system	0.4422*	0.1955408
xxiv	Sources of knowledge on alley farming	0.2746*	0.075405
xxv	Availability of farm labour	0.3867*	0.1495368
xxvi	Labour shortage experience	0.1637	0.0267976
xxvii	Level of contacts with friends/neighbours/relatives	0.0542	0.0029376
xxviii	Membership of social groups	0.3181*	0.1011876
xxix	socio-status on land	0.2660*	0.0710755
xxx	soil fertility improvement methods used	0.3504*	0.122780
xxxi	Farmer's attitude toward alley farming adoption.	-0.1735	0.0301022

The degree of freedom refers to the excess of the number of observations over the number of parameters estimated. i.e. d.f. = n-k or r-k/ where r = number of respondent; k = constant = 1.

On the statistical table used, the highest sample size was 102 with d.f = 100. This gives the critical value of r = 0.195 at 0.05 level of significance. r = correlation Co-efficient; characterizes the relationship and shows the degree to which two variables vary together either positively or negatively.

r^2 = Co=efficient of determination which implies the actual proportion of variance that two measures have in common.

Data on Table 16 show a positive and significant correlation between adoption of alley farming and marital status (0.3491); age of farmer (0.4618); number of children assisting on farm (0.4461); family size (0.2236); level of education (0.2208); literacy (0.3883); farming experience (0.2928); total farm size (0.2400); years of residence in the locality (0.3841); occupational characteristics (0.2581); farming system practice (0.5038); Ownership of livestock (0.3502); livestock feeding system (0.4422); sources of knowledge on alley farming (0.2746); availability of farm labour (0.3867); membership of social groups (0.3181); socio-status on land (0.2660) and soil fertility improvement methods used (0.3504). This means that the greater the magnitude of these variables the higher the rate of the adoption of alley farming and vice-versa.

The data also show that cosmopoliteness (0.0056); number of sources of information used (0.0265); contact with extension agent (0.0367); and knowledge of agricultural practices (0.1415); labour shortage experience (0.1637); level of contact with friends/neighbours/relatives (0.0542); have positive but non-significant relationship with adoption of alley farming.

However, the data further show a negative and significant correlation between adoption of alley farming and marriage pattern (-0.2254) family structure (-0.2021); and household decision making process (-0.2415). While there were negative but non-significant correlation between adoption of alley farming and sex of farmer (-0.0933); cropping system (-0.0484); status within household (0.0171); farmer's attitude toward alley farming (-0.1735). This means that these variables were inversely related to adoption of alley farming in the area but the relationships

were not significant.

r^2(co-efficient of determination) in Table 17 shows the percentage variation in adoption of alley farming as explained by each of the independent variables in the study. Thus, the percentage variation in adoption were attributed to the following factors; marital status (12.2%); age of farmer (21.32%); number of children assisting on farm (19.9%); literacy (15.0%); years of residence in the locality (14.7%); soil fertility improvement methods used (12.2%); farming system practice (25.4%); membership of social groups (10.1%); livestock feeding system (19.5%); ownership of livestock (12.3%); and availability of farm labour (14.9%).

The contributions of other factors with positive and significant relationship with adoption are as follows family size (5.0%); level of education attained (4.9%); farming experience (8.6%); total farm size (5.7%); occupational characteristics (6.6%); socio-status on land (7.1%) and sources of knowledge on ally farming (7.5%). Also, those with negative and significant relationship made the following contributions marriage pattern (5.0%); family structure (4.00%) and household decision making process (6.0%).

The data was further subjected to multiple regression analysis to determine the magnitude of change in the adoption of alley farming brought about by all the independent variables put together. This shows the effect of each variable in the relationship between the adoption of alley farming and all the factors included in the study. The results obtained was summarised and presented in Table 18.

1. Socio-economic There is no significant relationship between adoption of alley farming and some selected socio-economic characteristics of farmers.

Table 17: Multiple Regression Analysis Showing Causal Relationship Between Adopter's Variables and Their Adoption of Alley Farming.

Characteristic		Regression Coefficient	T-Value for Ho
i	Sex of farmer	0.046874	0.461
ii.	Marital status	0.118058	0.775
iii.	Number of children assisting on farm	0.051299	0.839
iv.	Age of farmer	-0.009293	-1.333
v.	Family size	0.065186	1.231
vi.	Marriage Pattern	-0.406051	-3.885*
vii.	Family Structure	0.255442	2.853*
viii	Level of education attained	0.030585	0.764
ix.	Literacy	0.048817	2.354*
x.	Farming experience	-0.002634	-0.394
xi.	Cosmopoliteness	0.053658	2.770*
xii.	Total farm size	-0.009737	-1.478
xiii	Years of residence in the locality	0.035161	7.010*
xiv	Number of sources of information used	-0.346567	4.591*
xv	Contact with extension agent	0.10492	9.565*
xvi	Cropping system	-0.266513	-4.564*
xvii	Status within household	0.041135	1.122
xviii	Occupational Characteristics	0.084025	3.165*
xix	Farming system practice	1.566868	8.871*
xx	Household decision making process	-0.015374	-1.258
xxi	Knowledge of agricultural practices	-0.405114	-7.348*
xxii	Ownership of livestock	0.576865	5.541*
xxiii	Livestock feeding system	0.286294	7.040*
xxiv	Sources of knowledge on alley farming	0.016741	0.225
xxv	Availability of farm labour	-0.104249	-1.816
xxvi	Labour shortage experience	0.298415	4.440*
xxvii	Level of contacts with friends/neighbours/relatives	0.036977	1.724
xxviii	Membership of social groups	-0.048797	-0.412
xxix	Land Ownership status	-0.004208	-0.142
xxx	soil fertility improvement methods used	0.066608	0.830
xxxi	Farmer's attitude toward alley farming adoption.	-0.002293	-0.028

Multiple R = .99288; R^2 = .98580.

Adjusted R^2 = .97842; Standard Error = .17442.

The degree of freedom, d.f. = n - 2, where n = sample size = 115; Therefore,

d.f = 115-2 = 113.

t-value at 0.05 level of significance = 1.96

*The values were significant at 0.05 level of significance.

*Intercept (a) of the regression line = 18.106

T-value for Ho refers to calculated t-values to determine the significance of Regression coefficient.

Multiple R gives the power of explanation of particular variable in the study. R-square gives the total percentage variations (98.58%) in the dependent variable as explained by the joint contributions of the independent variables that showed significant relationship with adoption. The variables are (i) marriage pattern (-3.885); (ii) Family structure (2.853); (iii) Literacy (2.354); (iv) Cosmopoliteness (2.770); (v) years of residence in the locality (7.010); (vi) number of sources of information used (-4.591); (vii) contact with extension agent (9.565); (viii) cropping system (-4.564); (ix) Occupational characteristics (3.165); (x) Farming system practice (8.871); (xi) knowledge of agricultural practice (-7.348); (xii) Ownership of livestock (5.541); (xiii) Livestock feeding system (7.040) and (xiv) labour shortage experience (4.440). The high value of R^2 may be due to the high correlation existing between the independent variables, thus increasing or improving their joint contribution to farmers' adoption of alley farming (Richard, 1988).

The data on Table 17 also show that the regression coefficient of the following independent variables were positive (i) sex of farmer (0.047); (ii) marital status (0.118); (iii) number of children assisting in farm work (0.051); (iv) family

size (0.065); (v) family structure (0.255); (vi) level of education attained (0.031); (vii) literacy (0.049); (viii) cosmopoliteness (0.054); (ix) years of residence in the locality (0.035); (x) contact with extension agent (0.105); (xi) status within household (0.041); (xii) occupational characteristics (0.084); (xiii) Farming system practice (1.567); (xiv) Ownership of livestock (0.577); (xv) Livestock feeding system (0.286); (xvi) sources of knowledge on alley farming (0.017); (xvii) level of contact with friends/neighbours/relatives (0.037); (xviii) Soil fertility improvement methods used (0.067) and (xix) labour shortage experience (0.298). These results show that

(i) sex of farmer has something to do with his or her ability to adopt alley farming. This result may be true if the sex of the farmer has to do with his or her rights on land and tree-use in the community. Also, the initial labour requirement for planting the hedgerow and subsequent pruning may place men at an advantage position over women in adopting alley farming. In this study, it was revealed that 84.35% adopters were males, while 15.65% adopters were females. This shows that more males adopted alley farming than females.

(ii) marital status influences the adoption of alley farming. This result may be true if wives who possessed livestock influenced their husbands decisions to adopt alley farming so as to provide browse and fodder for livestock. Thus, married farmers were likely to be more receptive to alley farming than unmarried farmers in view of its benefits to other household members. In this study, it was revealed that 97.39% adopters were married while

only 2.61% adopters were unmarried.

(iii) number of children assisting in farm work influences adoption of alley farming. This result may be true if the available hands can assist in initial planting and subsequently pruning of the hedgerows. Also, the children may be able to perform other farm operations, so the adopter can have more time for managing the alley farms. In this study, 67.83% adopters had one or two children assisting them in farm work.

(iv) family size, influences the adoption of alley farming. This result may be true if the family size include the housewives who possess livestock and available children who assist in farm work. Thus, with the availability of children to assist in farm work; and the need for browse and fodder to feed the animals, alley farming has more chances of being adopted.

(v) the family structure of an individual farmer influences his or her adoption of alley farming. This result may be true if the family structure influences decision making process on matters relating to the use of land and trees by the family members. In this study, it was revealed that 50.44% adopters maintained nuclear family structure, while 55.56% non-adopters maintained extended family structure.

(vi) level of education attained by individual farmer influences his or her adoption of alley farming. Education liberates the minds from taboos and uncritical beliefs, and enlightens the minds toward progress and development. This result may be true for adoption of alley farming, if the level of education attained makes the farmers more receptive to innovations

in the area and activate them to take actions toward adopting such innovations. This study revealed that a large proportion of adopters were more educated than non-adopters of alley farming.

(vii) literacy influences the adoption of alley farming. This result may be true if the ability to read and write Yoruba or English or both of an individual farmer propelled him or her to read instructional materials and other publications on alley farming so as to adopt the technology. The study reveals that majority of non-adopters cannot read or write. Thus, the ability to read instructional materials and displays on alley farming might have influenced the adoption of alley farming by majority of the adopters.

(viii) Cosmopoliteness influences adoption of alley farming. The more the exposure of an individual to outside environment, the more the likelihood of adopting new farm practice if such practice is affordable and compatible with existing practices. This result may be true if an individual has been exposed to areas where alley farming has been adopted with proven benefits to the adopters. Thus, the desire of such individual to benefit from the technology may induce him or her to accept and subsequently adopt alley farming. This study revealed that 67.83% adopters usually travelled out of their locality at least once per month.

(ix) the years of residence of a farmer in a locality, influences his or her adoption of alley farming. This result may be true if the farmer is an indigene of the locality or has an unquestionable right to use the land on which he or she is cultivating. Therefore other factors come into play

when a resident farmer is to make decision to adopt alley farming in his/her locality.

(x) contacts with extension agents influences the adoption of alley farming. This result may be true if the extension agent disseminates production recommendations on alley farming and maintain constant visits to induce and sustain the adoption of alley farming. This study revealed that majority of adopters had more contacts with extension agent than non-adopters of alley farming.

(xi) the position of an individual in the household influences his or her ability to adopt alley farming. This result may be true in the sense that the rights and privileges of household members especially on land matters are not usually the same. Thus, the first son of the family may use the family land and trees at his discretion, while others may have to seek permission to do so especially when permanent crops are involved.

(xii) Occupational characteristics influence adoption of alley farming. Occupationally, the more the involvement of an individual in active farming,,the more his or her potential of adopting farm innovations that can benefit him or her. This result may be true, of alley farming if the farmer desires to maintain his soil fertility for sustainable production and provide fodder for his livestock needs. This study reveals that 84.37% adopters and 78.67% non-adopters were actively involved in farming.

(xiii) the farming system practices influence adoption of alley farming. The

more integrated the farming system practised by farmer, the more his or her potential of adopting alley farming. This result may be true if the farming system practised involves the production of crops and livestock. The need to maintain soil fertility and provide browse for livestock may induce the adoption of alley farming by small-scale farmers. This study reveals that 82.61% adopters were crops and livestock farmers.

(xiv) Ownership of livestock influences adoption of alley farming. The more the number of animals own by farmer, the greater the need for fodder and other livestock feed, hence the more the potential adoption of alley farming by the farmer concerned. This may be true in the sense that alley farming provides browse and fodder as supplementary feeds for animals. This study reveals that 88.7% adopters own livestock on their farms.

(xv) Livestock feeding system influences the adoption of alley farming. This result may be true if the farmer adopts cut-and-carry feeding system in which fodders should be provided for animals in-situ. The needs for fodder might have influenced the adoption of alley farming by farmers who posessed far animals. This study reveals that 49.57% adopters and 12.33% non-adopters adopted cut-and-carry feeding system for their livestock in the study area.

(xvi) the source of knowledge on alley farming influences its subsequent adoption. This result may be true if the source is well known to farmer or has other things to offer to farmers in order to promote the adoption of the technology. It was gathered during data collection exercise that

International Livestock Research Institute (ILRI) offered freely life-animals along side with seeds for planting to the first set of farmers involved in alley farming on-farm project in the area of study.

(xvii) Soil fertility improvement methods used influences adoption of alley farming. This result may be true if the farmers desire to adopt soil fertility improvement measures that will allow them to use their farm lands for considerable number of years without returning them to fallow.

(xviii) labour shortage experience influences adoption of alley farming. This result may be true in the sense that alley farming provides a ready source of fodder for livestock and also reduce the need for labour for frequent weeding. While it may be reasoned that adoption of alley farming may be hindered in the absence of labour. This is only applicable to initial labour requirement for clearing new lands for farming.

(xix) Contacts with friends, neighbours and relatives influenced adoption of alley farming. This result may be true if friends and neighbours with whom a farmer interacts were well informed about benefits of alley farming, and have positive attitude toward its adoption on their own farms. In this study, it was revealed that majority of adopters (58.26%) had more than 10times of contacts with friends, neighbours and relatives in the last 3 months to the time of study. Also, 63.4% adopters claimed that friends, neighbours and relatives constituted the sources of their knowledge on alley farming.

A significant observation from the multiple regression analysis of factors associated with adoption of alley farming was that it enables one to have been able to explain only a small part of the variation in adoption by factors conventionally considered.

Hypotheses 2 and 3

The relationships were investigated with the use of chi-square, correlation analysis and multiple regression analysis. The result of the analyses were summarized and presented on Tables 18 and 19.

Table 18: Summary of Chi-Square Results of Relationship Between Adoption of Alley Farming and Environmental/Agricultural Production Constraints; and Land and Tree-Use Related Factors.

Variables	X^2_{cal}	D.f	X^2_{tab}	C.	Remark at 0.05. Level of Sig.
Hypothesis 2					
Environmental/Agricultural production constraints	53.791	6	12.592	0.57*	Sig.
Hypothesis 3					
Land and tree-use related factors					
(i) Land use pattern	135.148	2	5.992	0.74*	"
(ii) Tree-tenure system	445.087	9	16.919	0.89*	"
(iii) Length of fallow period	92.73	2	5.992	0.67*	"
(iv) Tree planting activities	112.765	2	5.992	0.7*	"

(i) X^2_{cal} = X^2 calculated

(ii) X^2_{tab} = X^2 tabulated.

(iii) D.f = Degree of freedom

(iv) C = Contingency Coefficient

(v) *C > .3 = High strength of relationship

(vi) Level of significance, P > = 0.05.

Table 18 reveals that the tabulated values were less than the calculated values for all the variables considered, hence we fail to accept the null hypotheses. Therefore the alternative hypotheses hold. Thus, environmental/agricultural production constraints and the land and tree-use related factors considered in this study have significant relationship with the adoption of alley farming technology by the sample farmers.

The data were further subjected to linear correlation and multiple regression analyses and the results were presented in Table 19.

Table 19: Summary of Linear Correlation and Multiple Regression Analyses of Individual Adoption Scores and Environmental/Agricultural Production Constraints, And Land and Tree-Use Related Factors.

Variables	Correlation Coefficient (r)	Co-efficient of determination (r^2)	Regression Co-efficient	T-value for Ho
Environmental/agricultural production constraints	-0.4410[z]	0.19448	-0.289038	-11.450*
Land and tree-use related factors				
(i) Land use pattern	0.2039[z]	0.0415752	-1.298569	-8,045*
(ii) Tree tenure system	0.2602[z]	0.067704	-0.123833	-6.717*
(iii) Length of fallow period	-0.1194	0.0142563	0.548313	4.802*
(iv) Tree planting activities	0.0533	0.0028408	0.355935	3.711*

Number of independent variables = 5

Number of respondent = 115

T-value at d.f.∞ = 1.96 at 0.05 level of significance.

Critical values of r at 0.05 at 110 degree of freedom = 0.195

* T-values were significant at 0.05 level of significance

z. The values of (r) were significant at 0.05 level of significance.

The independent variables that showed significant relationship with adoption are (i) environmental/agricultural production constraints (-11.450); (ii) land-use pattern (-8.045); (iii) tree-tenure system (-6.717), (iv) length of fallow period (4.803) and (v) tree planting activities (3.711).

The data on Table 21 further shows that the regression coefficient of the following independent variables were positive. (i) length of fallow period, and (ii) tree-planting activities. These show that

(i) length of fallow period influences adoption of alley farming. This result may be true if the fallow period has been shortened and/or affected by increase in demand for arable lands. As population increases, relative to available arable land, the need to adopt alley farming which allows cropping and fallow phases at the same time becomes imperative for sustainable food-crop production.

(ii) tree-planting activities influence adoption of alley farming. The more the involvement of an individual in tree planting activities the more his or her potential adoption of alley farming. This result may be true if the farmer realises the beneficial effects of alley farming to crops and livestock production among other available agroforestry systems. Once a new technology is compatible with existing practice, it stands a better chance of being adopted.

Hypotheses 4 and 5

The relationship between adoption of alley farming and community structure on one hand, and level of social infrastructural differentiation on the other are presented in Table 20.

Table 20: Summary of Linear Correlation and Multiple Regression Analyses of Individual Adoption Scores and Community Structure, and Level of Social Infrastructural Differentiation.

Community Variables	Correlation Coefficient (r)	Co-efficient of determination (r^2)	Regression Co-efficient	T-Value for Ho
(1) Community Structure	0.0457	0.0020884	-0.172982	-2.174*
(2) Level of Social infrastructural differentiation	0.295*	0.0874384	00.222665	-3.201*

(i) Number of independent variables = 2

(ii) Number of respondent = 115

(iii) Degree of freedom = 113

(iv) Level of significance = 0.05

(v) T-value at d.f = 1.96 at 0.5 leve of significance

(vi) Critical value of r at 0.05 and 113 d.f = 0.195

Information on Table 20 reveals that there was significant relationship between community structure and adoption of alley farming on one hand, and between adoption of alley farming and level of social infrastructural differentiation on the other. This implies that community strucutre and level of infrastrutural facilities influenced the adoption of alley farming within the communities in the area of study.

4.5 General discussion of the socio-economic factors associated with adoption of alley farming.

The study identified the following socio-economic factors to be associated with the adoption of alley farming by small-scale farmers in Osun State, Nigeria. (i) Marital-status; (ii) Age; (iii) Number of Children assisting in farm work; (iv) Literacy; (v) Farming experience; (vi) Total farm size; (vii) Years of residence in the locality; (viii) soil fertility improvement methods used; (ix) Membership of social-groups; (x) Occupational characteristics; (xi) Farming system practice; (xii) Ownership of livestock; (xiii) Livestock feeding system; (xiv) Availability of farm labour; (xv) Household decision making process; (xvi) land ownership status; (xvii) Tree-tenure system; (xviii) Land-use pattern (xix) sources of knowledge on alley farming; (xx) environmental/agricultural production constraints; and (xxi) level of community infrastructural differentiation.

These factors are now discussed in relation with studies on adoption of farm technologies by small-scale farmers.

(i) Marital Status

Marital status does not usually independently influence adoption of farm practices. Studies confirming its independent influence on adoption of farm practices are very rare. However, it is very likely that it has interrelationship with family size, the influence of wives in decision making process and the number of children assisting on farm work. Alao (ibid) established that number of wives was associated with adoption behaviour of Nigerian farmers. Thus, it is very likely that special combination of these factors may have significant relationship with adoption of alley farming by small-scale farmers.

(ii) Age of farmer

The study established that 86.95% of adopters were above 50 years of age while 13.05% were below 50 years. Jibowo (op cit) found a positive association between age of farmers and adoption of 05-6 variety of rice. Young farmers who may desire to make changes in farming or adopt new farm technology are not always in a position to do so because of capital restriction or final decisions on land matters may rest with heads of family. Wilson and Gallup (1955) concluded that highest adoption occurred at middle age. Also, Agbamu (1993) reported that a large proportion (63.0%) of the farmers who adopted soil management innovations in Nigeria were between 31 and 50 years of age, while Gross and Taves (1952) showed that elderly farmers seem to be somewhat less inclined to adopt new farm practices than younger once. Although, elderly farmers have different problems than middle-age and younger ones, but effective extension programming can be directed to their special needs to promote adoption.

(iii) Number of children assisting in farm work

The availability of children for assistance on farm is positively associated with high adoption rate of farm technologies. Labour are usually scare at peak periods with attendant high labour wages, and this may have negative influence on farm practice adoption rates. Abell (1951) established that families with children tended to have higher adoption scores than those without. Wilkening (1953) identified enrolment of children in farm projects, and encouragement of new practices by children to be positively related to farm practice adoption rates. Also Alao (op cit) found that personal characteristics such as number of children and number of wives of farmers are associated with adoption of farm practices like cocoa and poultry farming among some Nigerian farmers.

(iv) Literacy

The ability to read instructional materials and/or symbols has been positively associated with adoption of farm practice. Alao (op cit), and Clark and Akinbode (op cit) identified literacy among other factors to have positive influence on the adoption of agricultural practice by farmers. Illiteracy has been found among other factors to limit the farmer's ability to adopt new practices and effectiveness of a range of extension methods.

(v) Farming experience

Experience in farming has a lot to do with successful adoption of any farm innovation. Kidd (1968) found a positive and significant correlation between adoption of farm practices and experience abroad. Experience is among other personal factors that can sustain the adoption of farm practice. Also, it affects

mental flexibility of an individual and orientation toward farming as a business.

(vi) Total Farm Size

Size of farm is usually positively related to the adoption of new practices. Early adopters tend to have larger farms than average for the areas where they live. Also, use of improved farm practices produces economic benefits which permit expansion of farming operations, which in turn makes it economically possible to use more improved farm practices. Alao (1971) found total farm size to be positively associated with adoption of farm innovations. However, Ogunfiditimi (1981) stated that there was a negative relationship between farm size and adoption of cassava-related innovations in rural areas of Oyo and Ondo states. Thus, it can be inferred that the relationship between farm size and adoption of farm practice depends on the practice involved and particular locality.

(vii) Years of residence in the locality

People live in conglomerate and dependent on each other's influence. The more the number of years one lives in a neighbourhood or community, the more the number of friends and neighbours with whom one is likely to interact. Lionberger (1964) affirmed that since neighbourhoods differ in the importance attached by residents to the acceptance of change in farming, and to the status accorded persons who are quick to adopt new farm practices, their influence on change may be considerable.

(viii) Soil fertility improvement method used.

This has to do with compatibility of the new practice with existing methods of improving soil fertility. Planting of trees was not new to farmers in an effort

to improve soil fertility, especially during fallow periods. Thus, the introduction of alley farming and its adoption might have improved existing methods of traditional ways of maintaining soil fertility.

(ix) Membership of social-groups

Membership of a formal group has been found to have positive influence on adoption of farm practice. Alao (op cit) established that socio-participation among other factors positively influenced adoption of farm practice in Nigeria. Beal and Bohlen (1957) reported that farmers inclined to late adoption ordinarily participate very little in formal groups except the church, of which they are more likely than not to be a member. Basu (op cit) showed that corelation exists between adoption of farm practices and participation in formal organisations such as farmers' group.

(x) Occupational Characteristics

The extent of involvement in active farming activities usually influence the readiness with which an individual will adopt one or more new farm practices. Lionberger (op cit) reported that early adopters tend to have larger farms than average for the areas where they live and have the necessary capital and willingness to take risks in farming. While, Pampel and Van Es (op cit) viewed adoption of innovation as a consequence of orientation toward farming and farm life.

(xi) Farming system practice

The more integrated the farming system practised by farmer, the more the adoption of alley farming. The integration of crops and livestock in farming

system calls for the need to maintain soil fertility, and provision of fodder for livestock. Once, a new technology is compatible with the existing farming system there is likelihood of adopting such technology by majority of farmers. This study revealed that majority of adopters were crops and livestock farmers in the area of study.

(xii) Ownership of Livestock

Ownership of livestock creates the need to provide fodder for the stock. Need has been found to be among other reasons why farmers adopt new farm practice. Ownership of livestock calls for the need to feed them. This need will influence the adoption of farm practice that can supply the need, hence the adoption of alley farming by those who owned livestock. Kang et al (Op Cit) reported sustained increase in crop yield, while supplementary feeding of browse has also contributed to the productivity of small ruminant.

(xiii) Livestock feeding system

The integration of livestock into farming system calls for the need to provide high quality fodder for sheep, goats and/or cattle. Thus, one would expect that livestock farmers will embrace alley farming which provides the required fodder than those who did not rear animals. The study revealed that 82.61% of adopters of alley farming possessed livestock. Kang et al (ibid) described the uses of trees and shrubs in crop and livestock production as sustainable farm enterprise.

(xvi) Availability of farm labour

The relationship between adoption of farm practice and availability of farm labour depends upon the type of farm practice involved. Labour is normally

required for various farm operations and its availability when required will ease the adoption of farm innovations. In cases where the adoption of a farm practice requires additional labour, then the extent of adoption of such practice will be subject to the availability of farm labour. Hoekstra (op cit) claimed that alley farming is highly labour intensive and its adoption on farms where labour supply is low would be difficult.

(xv) Household decision making process.

Household decision making process has a lot of influence on adoption of farm practice. Where adoption of a farm innovation will benefit a large proportion of household members, one would expect high adoption rate of such innovation. Values and attitudes of household members do influence their decisions for or against adoption of farm innovation. The case of alley farming is such that where children are available for assistance on farm and women are actively involved in livestock keeping, then decision to adopt the technology by farmer may be favoured by household members.

(xvi) Land-Ownership status

It is a fact that rights over the use of land for land-owners are not the same for tenants. Tenants may have to seek permission or approval before he or she can adopt certain farm practices. This is particularly true where long term security on land is required for the adoption of new farm practice. However, differences between owners and tenants are likely to vary according to areas or locations due to differences in tenancy arrangements and freedom accorded the tenants to make decisions. Francis (op. cit) maintained that land tenure problems are important but

that generalization cannot be made because of the relative flexibility of the customary laws. Galjart (Op Cit) affirmed that the fact that a farmer is a tenant may mean that he or she is not free to make certain decision on land.

(xvii) Tree-tenure system

Most customary property systems in Nigeria distinguish between trees and the land on which they are planted. Right to the one may be held and transferred independently of rights to the other. The adoption of alley farming requires long term security to the land and trees to derive maximum benefits from the technology. Tree planting may increase the security of rights to land. Francis (op. cit) established that prospective alley farmer's right to harvest and use the trees' foliage must be exclusive enough to ensure an adequate return on investment.

(xviii) Land-use pattern

Land use pattern in a community has been found to exert influence on the adoption of farm practice. Young people may have to seek permission and approval, before they can use a piece of land in some farming communities. Also, where lands have to be divided among family members on yearly basis, adoption of farm innovation that require land on long-term basis may be hindered. The Tenants and/or strangers in certain communities are not usually allow to use farm land on long term basis, and in some cases they have to pay annual dues to family heads so as to control the use of farm land.

(xix) Sources of Knowledge on alley farming

Source of knowledge on particular farm practice has been found to be

positively correlated with adoption of farm practice. Too often, reliance on relatives and friends to the exclusion of other more successful farmers perpetuates a relatively low level of knowledge regarding the technology of farming. Lionberger (1951) reported that number of sources used or contacts with information sources was positively related to adoption rates. Copp et al (1958) established a high positive correlation between adoption of farm practice and the use of such sources as the county agent, the college of agriculture, and vocational agriculture teachers.

(xx) Environmental/agricultural production constraints

Agricultural production constraints have been noted to create needs that must be satisfied for sustainable crops and livestock production. The more the production constraints the more the desires of the farmers to satisfy the needs. Hence the more the likelihood of adopting farm practice or technology that may satisfy the need. However, the study show that environmental/agricultural production constraints were negatively associated with adoption of alley farming. This is contrary to expectation. This could mean that the farmers were still able to carry out their farm production activities within their available environmental/agricultural resources.

(xxi) Community Structure

Adoption of farm innovations in rural communities has been found to be influenced by several village factors (Clark and Akinbode, op cit). Social interactions and interpersonal communications among community members can be expected to influence the acceptance and subsequent adoption of farm technologies.

Alao (op cit) resolved that community structure exerts contextual influence on all the other dimensions of explanatory variables in adoption study.

xxii) Level of Community infrastructural differentiation

Availability of infrastructural facilities has been closely related to adoption of innovations in rural areas. The amenities allow the farmers, their family members and agricultural extension agents to settle within rural communities. Clark and Akinbode (ibid) discovered that several village factors were found to have positive influences on the adoption of agricultural practices by farmers.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Summary

Alley farming is an agoforestry system in which arable crops are grown in the alleys between legumenous hedgerows which are pruned periodically to improve soil fertility and also provide fodder for livestock. It was anticipated that on-farm reseach would provide a basis for adoption and wider diffusion of the technology, but apparently that is not happenng at farm level. This study investigated factors associated with the level of acceptance and adoption of this technology by selected farmers in Osun state.

The study was conducted in the Humid-zone programme of International Livestock Research Institute. Data for the study was collected from randomly selected 115 adopters, and 75 non-adopters of alley farming technology whithin the programme. Personal interveiw method and participant obsevation technique were used for data collection. Data were analyzed with the u se of descriptive and inferential staistics.

5.1 Summary of Findings

The major findings of this study are summarized in the following sections.

5.1.1 The personal and socio-economic characteristics of farmers.

i. Age of farmers: The findings revealed that 86.95% adopters were above 50 years of age, while only 13.05% adopters were below 50 years. Also, 88.00% non-adopters were above 50 years, while the remaining 12.00% fell below 50 years of age. .

ii. Sex: The findings showed that 84.35% adopters were male, while only 15.65% were female. Also, among non-adopters, 66.67% were males while 33.33% were female. Thus, male farmers adopted alley farming technology than their female counterparts.

iii. Marital Status: It was revealed that 2.61% adopters were single while 97.39% adopters were married. Also, 4.00% non-adopters were single while 96.00% were married.

iv. Occupational Characteristics: The findings revealed that 53.04% adopters engaged in farming only, while 31.30% adopters engaged in farming and hunting, and 10.43% adopters also engaged in farming and food processing. Whereas, among non-adopters, 72.00% engaged in farming only, while 10.67% and 12.00% engaged in farming and carpentry; and farming and food processing respectively.

v. Marriage pattern: The findings revealed that 51.79% adopters practised monogamy, while 48.21% adopters practised polygyny in their family setting. Whereas 24.00% non-adopters practised monogamy while 76.00% non-adopters practised polygyny.

vi Family Structure: The study revealed that 50.44% adopters maintained a nuclear family structure while 49.56% adopters maintained an extended family system. It was also revealed that 44.44% non-adopters maintained nuclear family while 55.56% non-adopters maintained extended family structure.

vii. Level of education attained by farmers: It was revealed that 28.69% adopters and 48.00% non-adopters never attended school. Also, 10.44% adopters had secondary education, another 2.61% had participated in adult education programme, another 32.17% did not complete primary education while 26.09% completed their primary education among adopters' category. Only 20.00% non-adopters completed their primary education while 32.00% non-adopters did not complete theirs. Thus, a large proportion of the farmers in non-adopters's category were illiterates.

viii. Literacy Level: The findings showed that 39.13% adopters cannot read, or write Yoruba or English; another 45.22% adopters can read and write Yoruba only, while 15.65% adopters can read and write both Yoruba and English. Among non-adopters, 56.00% cannot read or write both Yoruba and English; 36.00% can read and write Yoruba only, while 8.00% can read and write both Yoruba and English. Thus, the literacy level might have influenced perception and adoption of alley farming by farmers.

ix Years of farming experience: The findings revealed that 89.56% adopters and 78.67% non-adopters had more than 11 years of farming

experience. Thus, a large proportion of the farmers had long been involved in farming.

x. Total farm size: It was revealed that 67.83% adopters and 58.67% non-adopters were cultivating less than 4 ha of farmland, while 26.08% adopters and 34.67% non-adopters were cultivating between 4.1-6.0 ha of farmland. Only 6.09% adopters and 6.6% non-adopters were cultivating between 6.1-7.0ha of land.

xi. Crop mixture: It was revealed that mixed and multiple croppings were more prevalent in the study area. Farmers were engaged in tree crops production like cocoa, cashew, oil palm and citrus, along side with cereals such as maize, sorghum, and tubers like yam, cocoyam and cassava production. 73.91% adopters engaged in Leucaena/maize/cowpea; 62.61% adopters also engaged in Bbricidia/maize/cowpea mixture, while 80.00% adopters and 86.67% non-adopters engaged in maize and cassava production.

xii. Family size: The study reveals that 96.52% adopters and 96.00% non-adopters had more than 5 members in their families. These include wives, children and relatives in some cases. The average family size for adopters was 6.5 while that of non-adopters was 6.7.

xiii. Number of children assisting in farm work: The findings revealed that 15.65% adopters and 30.67% non-adopters did not have children available for farm work. Also, 67.83% adopters and 48.00% non-adopters had either 1 or 2 children, while 16.52% adopters and 21.33% non-adopters

had either 3 or 4 children available for farm work. The average number of childen available for farm work was 1.6 for adopters and 1.4 for non-adopters.

xiv. Labour availability: It was revealed that family, hired and contractual constituted the major labour supplies to farmers in the study area.

xv. Source of farm labour: The findings revealed that most farmers depended on hired and family labour for their farm operations. 56.52% adopters and 70.66% non-adopters indicated family, and hired as major sources of farm labour.

xvi. Years of residence in the locality: The study revealed that 77.39% adopters and 88.00% non-adopters had spent more than 20 years in their respective localities. While 22.61% adopters and 12.00% non-adopters had spend less than 20 years in their localities. Thus, the majority of the farmers were well used to prevailing farming systems in their area of operations.

xvii. Farming system practice: The study revealed that 82.61% adopters engaged in annual and permanent crops, and livestock production, while 49.33% non-adopters also engaged in mixed farming. Thus, many adopters will be expected to provide feeds or fodders for their livestock.

xviii. Ownership of livestock: It was revealed that 80.00% adopters possessed livestock on their farms or homesteads, while 47.33% non-adopters also possessed livestock. However, 20.00% adopters and 50.67% non-adopters did not possess livestock. Sheeps and goats were the small

ruminents owned by the sampled farmers. Thus, livestock constituted an integral part of the farming system in the study area.

xix. Livestock feeding system: The findings revealed that the three major livestock feeding systems used by adopters were (1) wastefarm product, (2) cut and carry feeding, (3) and free-roaming. These were indicated by 53.04%; 49.57% and 40.00% adopters respectively. Also practised by adopters were household/background feeding (30.43%) and grozing system (10.43%). Also, the two major feeding systems practised by non-adopters were waste-farm product (42.67%) and free-roaming (28.00%). The practice of cut and carry system of feeding might have necessitated adoption of alley farmer by livestock farmers.

xx. Status-within family of orientation: It was revealed that majority of adopters of alley farming were either first-born (41.74%) or in-between (37.39%) in their families of orientation. While 41.33% and 20.00% of non-adopters were first-born and in-between respectively. Also, 5.22% adopters and 5.33% non-adopters were last-born of their families. Thus, majority of the farmers were either first-born or in-between in their families of orientation.

xxi. Land ownership status: The study shows that 72.17% adopters inherited their farm lands from parents/family, another 20.87% had personal access to land, while tenants and pledgees constituted 4.35% and 2.61% respectively among the adopters. However, 58.66% non-adopters inherited their farmlands from parents/family, another 16.0% non-adopters

and 10.67% non-adopters were pledgees and tenants respectively. Only 14.67% non-adopters had personal access to their farm lands. Thus, majority of adopters and non-adopters had access to their farm lands through inheritance.

xxii. Land acquisition pattern: This study revealed that 73.91% adopters and 73.33% non-adopters acquired their farm lands through inheritance. The field survey exercise also revealed that renting of land for farming was not a common system in the area of study.

xxiii. Land tenure and tree-tenure systems: The study revealed that inheritance and family holding were the two major land tenure systems in the area of study. 94.78% and 20.87% adopters indicated inheritance and family holding systems respectively, while 77.33% and 26.67% non-adopters shared the same view respectively. Other systems mentioned were lease or pledge, and individual holdings by purchase.

Also, the study revealed that majority of farmers believed that trees on farm lands are properties of the planters. 75.65% adopters and 77.33% non-adopters indicated that trees are properties of the planters. Also, 25.22% adopters and 33.33% non-adopters indicated that both men and women have equal access to trees, while 21.74% adopters and 13.33% non-adopters indicated that access can be secured by purchase of farm lands. Thus, farmers are likely to plant trees and shrubs on lands on which they have permanent ownership or access.

xxiv. Cosmopoliteness: The findings revealed that 67.83% adopters usually travelled out of their communities once per month, another 20.87% adopters usually travelled out once per week, another 3.47% adopters usually spent most of their times within the community, while only 7.83% adopters usually travelled out twice per week. Whereas, among the non-adopters, 60.00% usually travelled out once per month; another 22.67% usually travelled out once per week; another 13.33% usually stayed in their communities, while only 4.00% usually travelled twice per week. The possible external exposure and degree of outside contacts might have influenced the adoption of alley farming by the farmers in the area.

xxv. Social-participation/membership of social-groups: The findings revealed that 73.91% adopters were in at least 5 groups or more, another 23.48% adopters were in 3 or 4 groups, while only 2.61% adopters were in 1 or 2 groups. Also, it was revealed that 38.67% non-adopters were in 5 groups or more, another 56.00% non adopters were in 3 or 4 groups, while only 5.33% non-adopters were in 1 or 2 groups. Socio-groups mentioned by farmers include religious groups, cooperative societies, and farmers groups. Majority of adopters were found to be in more groups than non-adopters.

xxvi. The level of contacts between friends, neighbours and relatives: The findings revealed that 58.26% adopters had more than 10 times of contacts with friends, neighbours and relatives, while only 33.33% non-adopters had similar contacts. Also 41.74% adopters and 66.67% non-adopters had

between 5 to 9 times of contacts in the last three months to the time of study. Thus, majority of adopters had more contacts with friends, neighbours, and relatives than non-adopters.

xxvii. Contact with extension agents: The findings revealed that 60.87% adopters had above 11 times of contacts with extension agents, while 48.00% non-adopters had similar contacts In all, 86.09% adopters and 64.00% non-adopters had more than 6 times of contacts with extension agents in the last six months to the time of study. Only 6.09% adopters and 25.33% non-adopters claimed that they had never met with extension agents in the last six months. Thus, farmers still depend on extension personnel to get farm advice and information.

xxviii. Sources of knowledge on alley farming: The findings showed that 63.48% adopters and 90.67% non-adopters claimed that friends, and neighbours were their major sources of knowledge on alley farming. Other sources such as officials of International Livestock Research Institute (ILRI) and International Institute of Tropical Agriculture (I.I.T.A) were mentioned by 41.74% adopters and 30.67% non-adopters. The extension Department of Osun-State Agricultural Development Programme (OSSADEP) has just initiated agroforestry technology packages in the state; hence it was not recognised as major source of knowledge on alley farming in the area of study.

xxix. The number of sources of information used: The findings revealed that 94.78% adopters used 3 or 4 sources of information, while another

5.22% adopters used 5 sources or more. Among the non-adopters, 92.00% used 3 or 4 sources of information, while 8.00% used 5 sources or more. The sources of information used by farmers include, radio, extension agents, friends and neighbours, children and produce buyers.

xxx. Farmers attitude toward alley farming adoption: The findings revealed that 89.56% adopters were favourably predisposed toward alley farming adoption, another 7.83% adopters maintained unfavourable attitude while only 2.61% adopters maintained neutral position. Among the non-adopters, 58.6% maintained unfavourable attitude toward alley farming adoption, another 37.33% maintained favourable attitude while only 4.00% maintained neutral position. Attitude towards a farm technology usually influence its acceptance and adoption by farmers.

xxxi. Household decision making process: The findings revealed that husbands, wives and children were usually involved in taking decisions on farm related matters. 72.17% adopters and 69.00% non-adopters claimed that husbands, wives and children take decisions on farm related matters. Opinions of friends, neighbours and relatives were also utilised in taking decisions on farm matters. This was indicated by 47.83% adopters and 57.33% non-adopters.

5.1.2 Community Structures, and level of Social Infrastructural differentiation in the area of Study.

The findings revealed that above 50.00% adopters generally believed that the three communities included in the study possessed the following (i) system of

values and attitudes that are conducive to innovation adoption (ii) heterogenous neighbourhoods, ethnic and religious, (iii) lack of fractionalism and dispute, (iv) a diversity of religious traditions, (v) inadequate or poor storage facilities, (vi) absence of effective market for farm produce, and (vii) absence of good road network and transport facilities.

The findings also revealed that Ife-Odan possessed more basic social facilities than both Owu-Ile and Iwo-Ate-Isale in the area of study. This was reflected in terms of availability of electricity, post office, maternity/Health centre and recreation/relaxation centres. While education facilities such as primary and secondary schools were available, even though in varying number in the three communities.

5.1.3 Environmental and Agricultural Production Constraints

The findings revealed that above 50.00% of respondents in each community of study mentioned the following constraints (i) shortage of labour/high cost of wages; (ii) lack of farm inputs such as fertilizers; (iii) lack of finance or credit for farming, and (iv) high cost of farm inputs such as seeds and chemicals. The findings further revealed that above 40.00% of sample farmers mentioned (i) poor soil fertility; (ii) lack of fuelwood for domestic purpose, and (iii) lack of fencing materials for compound and livestock, in at least two communities in the area of study. However, scarcity of land and lack of lands for permanent cropping were not indicated as major problems in the area of study.

5.1.4 Farmers' reasons for the adoption, non-adoption and discontinuance of alley farming technology

The findings revealed that adopters were practising alley farming for the following reasons (i) provision of fodder for livestock (79.13%); (ii) increase in crop yields (63.48%); (iii) neighbours were practising it (63.48%); (iv) increase in soil fertility (49.57%); (v) preservation of soil structures (47.83%); and (vi) provision of staking and firewood materials (44.35%). Few farmers also mentioned (i) control of soil erosion (21.73%) (ii) provision of recognition in the community (12.17%) and (iii) labour available for managing the technology (10.43%) as reasons for practising it.

However, the non-adopters mentioned the following reasons for maintaining status-quo (i) It requires more labour (62.67%) (ii) it is very complex to adopt (58.67%); (iii) labour is not available (57.33%); (iv) Delayed gratification (57.33%); (v) Lack of technical guidiance (52.00%); (vi) lack of farm animals (50.67%); and (vii) risky to adopt because of future maintenance (42.67%). Few farmers also mentioned the following (i) lack of knowledge on alley farming practice (30.67%); (ii) lack of seed for planting (22.67%); (iii) lack of land for personal use (20.00%); (iv) lack of access to trees on the land (16.00%); (v) neighbours do not practice it (14.17%); and (vi) land is not suitable (10.76%) as reasons for maintaining status-quo.

The adopters that were on discontinuance stage mentioned the following reasons for discontinuing with alley farming (i) lack of adequate time for proper maintenance and management of alley farm (58.33%); (ii) Other farms require

more attention (52.78%); and (iii) seed dispersal causing weed problems (50.00%). Other reasons mentioned include (i) rooting system presents the use of tractor (44.44%); (ii) It hinders tuber crops production e.g. yam and cassava (38.89%); (iii) lack of labour for frequent pruning (36.11%); (iv) No monetary gains from hedgerow shrubs (33.33%); (v) Hedgerow is difficult to prune after sometimes (25.00%); (vi) seed dispersal is difficult to control (16.67%); and (vii) seed dispersal causes dispute with neighbours (11.11%).

5.1.5 The testing of the hypotheses.

The study determined the relationships between adoption of alley farming technology and some selected socio-economic factors; agricultural/environmental production constraints, land and tree-use related factors, community structures and community's level of infrastructure differentiation.

Correlation analysis showed a positive and significant correlation between adoption of alley farming and marital status (0.3491); age of farmer (0.4618); number of children assisting on farm (0.4461); family size (0.2236); Farming experience (0.2928); level of education (0.2208); literacy (0.3883); total farm size (0.2400); years of residence in the locality (0.3841); Occupational characteristics (0.2581); farming system practice (0.5038); soil fertility improvement methods used (0.3504); socio-status on land (0.2666); Ownership of livestock (0.3502); livestock feeding system (0.4422); sources of knowledge on alley farming technology (0.2746) land-use pattern (0.2039); tree-tenure system (0.2602); availability of farm labour (0.3876); and membership of social-groups (0.3181).

Also, it was established that cosmopoliteness (0.0056); number of sources of information used (0.0265); contact with extension agent (0.0367); knowledge of agricultural practices (0.1415); labour shortage experience (0.1637) and tree-planting activities (0.0533) have positive but non-significant relationship with adoption of alley farming technology.

However, the findings showed a negative and significant correlation between adoption of alley farming and marriage pattern (-0.2254); family structure (-0.2021); household decision making process (-0.2415); and environmental/agricultural production constraints (-0.4410). While there were negative but non-significant correlation between adoption of alley farming and sex of farmer (-0.0933); cropping system (-0.0484); status within household (-0.0171); farmer's attitude toward alley farming adoption (-0.1735); length of fallow period (-0.1194); and level of contact between friends, neighbours and relatives (-0.0542).

The findings further revealed that there was significant relationship between community structure and adoption of alley farming. Also, there was a significant relationship between adoption of alley farming by community members and level of social infrastructural differentiation.

The study further established the contributions of factors with positive and significant relationship to percentage variation in adoption of alley farming as follows: marital status (12.2%); age of farmers (21.32%); number or children assisting in farm work (19.9%); literacy (15.0%); years of residence in the locality (14.7%); soil fertility improvement methods used (12.2%); farming system practice (25.4%); membership of social-groups (10.1%); livestock feeding system

(19.5%); Ownership of livestock (12.3%); and availability of farm labour (14.9%).

The contributions of other factors with positive and significant relationship with adoption were as follows:- level of education attained (4.9%); family size (5.0%); farming experience (8.6%); total farm size (5.7%); occupational characteristics (6.6%); Socio-status on land (7.1%); sources of knowledge on alley farming (7.5%); land-use pattern (4.2%); and tree-use pattern (6.8%). Also, those with negative and significant relationship made the following contributions: marriage pattern (5.00%); family structure (4.00%); household decision making process (6.00%); and environmental/agricultural production constraints (19.45%).

The total percentage variations (98.58%) in the adoption of alley farming were attributed to the following variables that showed sigificant relationship with adoptions: (i) marriage pattern (-3.885); (ii) family structure (2.853); (iii) Literacy (-2.354); (iv) Cosmopoliteness (2.770); (v) number of sources of information used (-4.0591); (v) Years of residence in the locality (7.010); (vi) Contact with extension agent (9.565); (vii) Cropping system (-4.564); (viii) Occupational characteristics (3.165); (ix) farming system practice (8.871); (x) Knowledge of agricultural practice (7.348); (xi) Environmental/agricultural production constraints (-11.450); (xii) Ownership of livestock (-5.541); (xiii) Livestock feeding system (-7.040); (xiv) Land-use pattern (-8.045); (xv) Tree-tenure system (-6.717); (xvi) Length of fallow period (4.802); (xvii) Tree-planting activities (3.711) and labour shortage experience (4.440).

The findings further showed that the regression coefficient of the following independent variables were positive (i) sex of farmer (0.046874); (ii) marital status (0.118058); (iii) number of children assisting in farm work (0.051299); (iv) Family size (0.065186); (v) family structure (0.255442); (vi) level of education (0.030585); (vii) literacy (0.48817); (viii) Cosmopoliteness (0.0536581); (ix) years of residence in the locality (0.035161); (x) contact with extension agent (0.10492); (xi) status within household (0.041135); (xii) occupational characteristics (0.084025); (xiii) Farming system practice (1.566868); (xiv)ownership of livestock (0.576865); (xv) livestock feeding system (0.286294); (xvi) Soil fertility improvement methods used (0.066608); (xvii) sources of knowledge on alley farming (0.016741); (xviii) length of fallow period (0.548313); (xix) Tree-planting activities (0.355935); (xx) labour shortage experience (0.298415) and (xxi) level of contacts with friends, neighbours and relatives (0.036977).

5.2 Conclusions

While great caution must be exercised in generalising the claims and the findings of this study, the investigator was satisfied, however, in presenting on the basis of evidence reported in the major findings, the following conclusions.

1. Many of the farmers involved in the study were relatively old, married with children, but depended on external labour source because of their age and limited number of children available for farm work.
2. Young farmers were not much involved in the adoption of alley farming. Also, male farmers adopted alley farming technology than their female

counterparts. The female socio-status on land, their involvement in other off-farm activities and management of the technology might have accounted for this.

3. Land availability and acquisition were not problems for indigens of the communities in the study area. Therefore, they can still practice shifting cultivating system.

4. Multiple cropping was more prevalent than sole cropping in the area of study and majority of sample farmers were engaged in the production of both arable and tree crops.

5. Many of the alley farming adopters engaged in crops and livestock production. 82.61% adopters and 49.33% non-adopters engaged in mixed farming (crops and livestock) in the study. Tree crops produced include cocoa cashew, oil palm and citrus along side with cereals and tubers crops like maize, guinea corn, yam, cocoyam and cassava while sheeps and goats were their major livestock.

6. Cut-and-carry system of feeding livestock encouraged the adoption of alley farming as majority of adopters, and few non-adopters indicated this system of feeding for their livestock.

7. Inheritance constituted the major source of land acquisition by farmers as majority of both adopters and non-adopters inherited their farm lands from parents/family.

8. The potential adoption of alley farming by those who are not indigenes may be threatened as inheritance and family holding were the two major land

tenure systems in the area of study. This is because access to land must be permanent for the ownership of the trees to be permanent and be of long-term benefits to the planters.

9. Husband, wives and children were usually involved in taking decisions on farm related matters. Hence, farm technologies which benefit majority of household members may have high tendency for adoption than those which benefit only a few members.

10. The level of social infrastructure in the three communities was not the same. Ife-Odan had more basic social facilities than both Owu-ile and Iwo-Ate Isale.

11. The major reasons mentioned by majority of adopters for practising alley farming were (i) provision of fodder for livestock; (ii) increase in crop yields, (iii) neighbours were practising it; (iv) increase in soil fertility; (v) preservation of soil structure and (vi) provision of staking and firewood materials. Therefore, the farmers were practising alley farming to benefit their crops and livestock.

12. Lack of technical guidiance and perceived complex and risky nature of the technology were the main reasons for maintaining status quo by non-adopters of alley farming.

13. Some of the farmers who adopted alley farming were becoming dissatisfied with the technology. Such adopters complained of lack of adequate time for proper maintenance and management of alley farm; seed dispersal causing week problems; rooting system preventing the use of tractor, and

hindering tuber crops production, lack of labour for frequent pruning and lack of monetary gains from hedgerow shrubs.

14. There is lack of efficient extension service to assist the adopters on how best to manage their alley farms. This was evident by the dissatisfaction expressed by the adopters and discontinuance that has already set in.

15. The positive and significant correlation between adoption of alley farming and marital status, age of farmer, number of children assisting in farm work, level of education attained, literacy , family size, farming experience, total farm size, years of residence in the locality, occupational characteristics, farming system practice, soil fertility improvement methods used, socio-status on land, ownership of livestock, livestock feeding system, sources of knowledge on alley farming, land-use pattern, tree-tenure system, availability of farm labour, level of contacts with friends, neighbour and relative and membership of social-groups is a reflection of the direction and degree of relationship of these variables to adoption of alley farming. Out of the variables investigated in the study, adoption of alley farming was significantly influenced in a positive direction by these variables.

However, marriage pattern, family structure, household decision making process, and environmental/agricultural production constraints showed a negative and significant relationship with adoption of alley farming. That is these four variables influenced adoption of alley farming significantly but in a negative direction.

16. There was a significant relationship between adoption of alley farming by community members and level of social infrastructural differentiation on one hand and between community structure and adoption of alley farming on the other.

17. Alley farming is most likely to be adopted where majority of farmers within farming communities, have individual secured tenure of discrete plots of lands either through divided inheritance, purchase or gift and not restricted to family land, with widespread ownership and confinement of livestock. Where plots are cultivated by the extended family, or the land remains completely undivided and is allocated on a rotational basis, alley farming is less likely to be adopted.

5.3 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made:-

1. There is a need to strengthen extension service at farmers' level in the area of study. Also, the involvement of the farmers and their local groups in the dissemination of alley farming technology and collation of feedback information for research purpose has become imperative.

2. Arranging visitations to areas where alley farming has proved successful over many years, may be necessary for the adopters, in order to check discontinuance of the technology.

3. The need to look into possible areas of income generation from the

adoption of alley farming, by way of selling the staking materials and leguminous seeds becomes imminent as this can encourage and sustain adoption of alley farming by small-scale farmers.

4. Instituting effective extension advisory service that is fully equipped with technical details on alley farming, seeds for planting and adequate transport facilities can encourage and promote adoption of alley farming by the majority of small-scale farmers. This will provide technical guidance for the farmers.

5. Organising farmers' children, rural youths and rural women (housewives) into groups, and teaching them management techniques on alley farming will be of great help in promoting and sustaining adoption of alley farming by small-scale farmers as wives and children were usually involved in taking decisions on farm related matters in the area of study.

6. There is a need for the improvement of social facilities in the communities within area of study. This is to encourage more youth to settle in the area of and take farming as a career.

7. While a farm technology may be generally extended to farmer and adopted by them, alley farming should be extended and promoted in areas with land acquisition problems, declining soil fertility and where practising shifting cultivation system may be impossible.

8. Criteria for selection and inclusion of small-scale farmers in future developmental on-farm research projects on alley farming should be based on those factors that showed positive and significant relationship with

adoption of alley farming in the study. These include among others age, number of children assisting on farm, family size, farming experience, literacy level, total farm size, years of residence in the locality, socio-status on land, livestock feeding system, farming system practice, e.t.c.

9. There is a need to determine community and farmers' particular needs before introducing alley farming to them. This will determine suitability and appropriateness of the technology to the farming communities before its extension and promotion by concerned agencies.

11. Farmers have multiple criteria for assessing new technologies. These include, among others, economic profitability, risk, contribution to food security, crops and livestock production, time taken to see a return on investment and labour requirement. To be widely adopted, alley farming should perform better in meeting these criteria than existing technologies.

5.4 Areas for Further Research

This study concentrated efforts on investigating socio-economic factors that influenced adoption of alley farming by small-scale farmers in Osun-State. There is a need for a study on technical factors to assess what the farmers have learnt in acquiring the technology, their management of the technology, and their abilities to combine tree-crop - livestock in a systematic way. The technical competence of the farmers to manage alley farming technology needs to be probed.

Alley farming has been less widely and rapidly adopted by farmers than expected, hence there is still a need for a study to determine in detail those factors

relevant to farmers' decisions to adopt alley farming. Such study will also determine whether or not alley farming has actually addressed farmers' particular needs and problems.

This study revealed that more men adopted alley farming than women and showed that tenants are less likely to adopt the technology than land owners. A study may be initiated to identify those set of people that are most unlikely to adopts alley farming. Such study may seek reasons for the gender bias, how customary tenure influence the adoptability of alley farming, and the male orientation of extension programmes on alley farming technology.

A study may be initiated to investigate the impact of the shift in economic activities on the adoption of alley farming. This is recommended in view of the discontinuances of the technology by some of the adopters. Such study may consider why farmers's children prefer to engage in o ther vocations rather than farming and find out why there is lack of continuity of adoption of alley farming.

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APPENDIX 1

FARMERS' INTERVIEW SCHEDULE FOR SOCIO-ECONOMIC RESEARCH ON ALLEY FARMING TECHNOLOGY IN OSUN STATE.

NOTE: The data required is purely for research purpose

PERSONAL CHARACTERISTICS OF FARMERS

1. Area of farm location/village name:.....
2. Sex of farmer; Male..... or Female:.....
3. Marital Status; Married:..... Single:..... Widow: .....
4. Age of farmer; How old are you (specify)? .....

Household/Family size/Family Structure/Marriage Pattern

5. How many of your children are assisting you on farm (specify)?.....
6. How many of your relatives are assisting or working for you on farm (specify)?.....
7. How many of you are living together in your household (specify)?.....
8. What is your family structure?.....Nuclear..... or Extended .....
9. What is your marriage pattern? Monogamy..... or Polygamy.....

Level of Education attained

10. Did you ever attend classes in school? Yes..... No.....

    If yes, what level did you attain?

(i) Never attended school .....

(ii) Primary (uncompleted).....

(iii) Primary (completed) .....

(iv) Secondary Modern School .....

(v) Secondary Grammar School .....

(vi) Teacher Grade II/OND/NCE ....

(vii) Other formal education received (specify) .....

Literacy

11. Can you read and/or write, Yoruba, and/or English

(i) Cannot read or write .....

(ii) Can read and write Yoruba only .....

(iii) Can read English only .....

(iv) Can read and write English only ....

(v) Can read and write both Yoruba and English ....

Farming Experience

12. For how many years have you been farming (specify).....

Cosmopoliteness

13. How often do you travel out of this community?

(i) Not often .....

(ii) Once per month .....

(iii) Once per week .....

(iv) Twice per week .....

Total Farm size Cultivated

14. What is the size of your cultivated farms (specify)? .....

15. What is the size of your farm under bush fallow at the moment (specify)? .....

16. When you put all farms together, how large are they (specify) .....

Years of residence in the area

17. How long have you been residing in this area (specify)? .....

Sources of agricultural information

18. What are your major sources of agricultural information? (i)..... (ii) ..... (iii) ..... (iv) .....

Contact with Extension agent

19. Do you have personal contacts with Extension Agent in recent times? Yes ..... or No .....

20. If yes, for the past six months, how many times did you have contact with the agents? .....

Types of Crops grown

21. What crops do you grow on your farms?

(i) ..... (ii) ..... (iii) ..... (iv) ..... (v) ..... (vi).:.....

Crops Protection methods

25 Do you have crops protection methods to control weeds, diseases and pests? Yes ..... or No .....

If yes, what are the methods?

(i) ..... (ii) ..... (iii) ..... (iv) .....

Soil Fertility improvement methods

26. Do you make efforts to improve soil fertility of your farm? Yes.... or No .....

If yes, how do you improve the soil fertility?

(i) .....

(ii) .....

(iii) .....

Status within household

27. What is your status within your extended family?

(i) First born in the family .....

(ii) In-between, i.e. 2nd, 3rd etc. .....

(iii) Lost-born in the family .....

(iv) The head of family .....

(v) Housewife .....

Socio participation/Membership of socio-group

28. Are you a member of any social group?

Yes ..... or No .....

29. Are you participating in any recognised Project/Scheme/Programme, or Co-operative Society in this area or elsewhere? Yes ..... or No .....

30. Which one are you really involved in?

(i) Project ..... (ii) Scheme ..... (iii) Programme ..... (iv) Co-

operative Society ..... (v) Others (Specify) .....

31. In all, how many groups or societies do you belong to (specify) .....

Level of Contact between friends, neighbours and relatives

32. Do you normally contact friends, neighbours and relative on farm related matters? Yes ..... or No .....

33. In the past six months, can you remember the number of times, you have contacted or sought information on farm related matters from friends, neighbours and relatives (specify)? .....

34. Do people contact you to seek advice on farm matters. Yes ..... or No....

Occupational Characteristics

35. What is your major occupation? .....

36. Do you engage in other non-farm occupation?

Yes ..... or No .....

37. If yes, what is the off-farm economic activities you are engaged in.

(i) Fishing ..... (ii) Hunting ..... (iii) Trading .....

(iv) Drinking processing ..... (v) Food processing .....

(vi) Artisanry ..... (vii) Carpentry/Tailoring.....

(viii) Herbalist .....

Farming system practice

38. How will you describe your farm activities/enterprises?

(i) Vegetable crops and Annual Crops production .....

(ii) Annual crops production .....

(iii) Permanent and Annual Crops production .....

(iv) Crops and Livestock production .....

(v) Livestock production only .....

(vi) Permanent and Annual crops and Livestock production .....

Livestock Ownership

39. Do you posses livestock?

Yes..... or No .....

40. What types of animals do you keep?

(i) Sheep..... (ii) Goat ..... (iii) Cattle ..... (iv) Piggery .....

(v) Rabbitry ..... (vi) Others (specify) .....

Livestock feeding system

41. What do you use to feed your animals?

(i) Waste farm products ..... (ii) Formulated feed .....

(iii) Free-roaming ..... (iv) Household/Background feeding .....

(v) Cut and carry system ..... (vi) Grazing system .....

Availability of farm labour

42. What is/are your sources of farm labour?

(i) Family ..... (ii) Hired .....

(iii) Friend/Relative/Neighbours ..... (iv) Peer groups .....

(v) Contractual ..... (vi) Communal labour on reciprocal basis .....

Labour shortage experience

43. Which of the farm operations or activities do you usually experience labour shortage?

(i). ..... (ii) ..... (iii) ..... (iv) .....

44. How do you normally handle the labour shortage?

(i) .....

(ii) .....

(iii) .....

Household-Decision Making process

45. Who is/are responsible for taking decision on farm related matters?

(i) Family head takes decision alone .....

(ii) Husband and wife take decision on farm related matters .....

(iii) Husband, wife and children take decision on farm related matters

(iv) Friends, relatives and neighbours help make decision on farm matters. .....

(v) Village head or community leader helps make decision on farm matters .....

Land acquisition pattern

46. Do people from outside the village use land in this village? Yes.... or No....

47. If yes, how do they get the land?

(i) Gift ..... (ii) Loan ..... (iii) Rent ..... (iv) Pledge .....

(v) Purchase ..... (vi) Lease ..... (vii) Others (specify) .....

Land ownership status

48. What is your status on the land you are cultivating?

(i) Tenant ..... (ii) Pledgee ..... (iii) Inherited from parent .....

(iv) Landowner .....

49. What is the average cost of renting land per acre per year in this area?.....

Land tenure system

50. How is land in this village controlled?

(i) Leaseholding..... (ii) Outright purchase.....

(iii) Family holding/inheritance ..... (iv) Community holding .....

(v) Government/Public .....

Tree Tenure System

51. Who have access to economic trees such as oil palm, coconut, kolanut, cocoa etc?

(i) Only men have access to trees on farm land .....

(ii) Both men and women have equal access to trees .....

(iii) Only household heads have access to trees

(iv) Buyers of farm lands have access to economic trees .....

(v) Other household members have access to economic trees .....

(vi) Trees are properties of the planter .....

52. Who owns the trees on the cultivated farmlands in this area?

(i) Farmer..... (ii) Landlords..... (iii) Family .....

(iv) Community..... (v) Government .....

Fallow System

53. Do people in this village move their cultivated fields all together after some years of cropping?

Yes ..... or No .....

54. If yes, what is the usual length of time to rest a field after cropping?

(i) Years of cropping .....

(ii) Number of years for fallow .....

Tree Planting Activities

55. Do you deliberately plant any trees on your farmlands or leave some in fallow fields? Yes.... or No .....

56. If yes, mention the trees? .....

(i) ..... (ii) ..... (iii) .....

Community level of infrastructure differentiation

57. Which of the following basic social amenities are available in this community.

Social amenities	Availability	
	Yes	No
(i) Good drinking water		
(ii) Electricity		
(iii) Primary School		
(iv) Secondary School		
(v) Maternity/Health Centre		
(vi) Post office		

(vii) Bank

(viii) Local market

(ix) Supermarkets/Stores

(x) Recreation/Relaxation Centres.

Community Structure

58. Which of the following statement is true of the people and this community

		Yes	No
(i)	Society's culture is favourable to change		
(ii)	System of values and attitudes of people are conducive to innovation adoption		
(iii)	There are heterogeneous neighbourhoods, ethnic and religious in the community		
(iv)	Organisations in the community are being used for educational purposes.		
(v)	The social structure and culture of locality groups are the major factors influencing the adoption of new farm practices		
(vi)	The standard of living is relatively high		
(vii)	There is lack of disputes in the community		
(viii)	Presence of formal social organisations		
(ix)	A diversity of religious traditions in the community		
(x)	Presence of a number of political parties		
(xi)	The presence of a number of voluntary organisations		

(xii) Incentives are provided in form of subsidy to farmers in this area

(xiii) Inadequate or poor storage facilities

(xiv) Absence of effective market for farm produce

Knowledge of Agricultural practices

59. What are the new farm practices introduced to you or known by you?

(i) ..... (ii) ..... (iii) ..... (iv) .....

Source of knowledge on Alley Farming Technology

60. Do you know anything about alley farming technology?

Yes ..... or No .....

61. If yes, through who did you know about it?

(i) I don't know..... (ii) Extension agent .....

(iii) Friend and neighbour ..... (iv) Whiteman/official of ILRI/IITA

(v) Others (specify) .....

62. For how long have you heard about alley farming technology?

(i) Less than 2 years ..... (ii) 2-3 years ..... (iii) 4-5 years ....

(iv) More than 5 years .....

Stages of adoption

63. At what stage of adoption of alley farming are you at the present moment?

(i) Awareness ..... (ii) Trial acceptance ..... (iii) Conviction .....

(iv) Complete adoption ..... (v) Discontinuance .....

Farmers' attitude toward alley farming adoption

64. Have you tried the technology on your own farm? Yes.... or No ....

65. If No, what are the reasons for not trying it on your farm

	Reason	Yes	No
(i)	Lack of technical guidance		
(ii)	It requires more labour		
(iii)	Lack of knowledge on alley farming practice		
(iv)	Lack of seed for planting		
(v)	Lack of land for my personal use		
(vi)	Lack of access to trees on the land		
(vii)	Very complex to adopt		
(viii)	Neighbours do not practice it		
(ix)	Land is not suitable		
(x)	Labour is not available		
(xi)	It is risky to adopt		
(xii)	I do not have livestock/Animals		
(xiii)	It takes time to get benefits		

66. If yes, for how long have you been practising the technology on your farm?

(i) Less than 2 years..... (ii) 2-3 years..... (iii) 4-5 years.....

(vi) More than 5 years .....

Note: (Calculate the individual adoption period from Questions 62 and 66. Individual adoption period .....)

67. What are the reasons for practising alley farming on your farm?

	Reasons	Yes	No

(i) It increases crop yield

(ii) It preserves soil structure

(iii) It provides fodder for livestock

(iv) Neighbours are practising it

(v) There are labour for managing it

(vi) It increases soil fertility

(vii) Technical guidance available for it

(viii) It controls soil erosion

(ix) Provision of staking and fuelwood materials

(x) It provides recognition in the community

(xi) It provides additional income

Environmental/Agricultural Production Constraints

68. What are the farming problems confronting you in this area?

Farming problems	Yes	No
(i) Poor soil fertility		
(ii) Land topography/Hilly/Sloping land		
(iii) Soil erosion problem		
(iv) Lack of staking materials for crops		
(v) Shortage of labour		
(vi) Scarcity of land		
(vii) Lack of browse and fodder for livestock		

(viii) Lack of fuelwood for domestic purpose

(ix) Lack of land for permanent cropping

(x) Lack of farm inputs such as fertilizers

(xi) Lack of finance or credit for farming

(xii) Lack of fencing materials for compound and livestock

(xiii) Inability to control weed problems

(xiv) High cost of farm inputs, such as seeds and chemicals