



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 07, Issue, 08, pp.3305-3309, August, 2016

RESEARCH ARTICLE

FARMERS' PERCEPTION OF ALLEY CROPPING: A CASE STUDY OF IITA ALLEY CROPPING PROGRAMME PARTICIPANTS

*Akintunde, M. A. O. and Rantlo, A.M.

Department of Agricultural Economics & Extension, National University of Lesotho, Roma

ARTICLE INFO

Article History:

Received 13th May, 2016
Received in revised form
20th June, 2016
Accepted 17th July, 2016
Published online 30th August, 2016

Key words:

Perception,
Alley cropping,
IITA, Agroforestry.

Copyright©2016, Akintunde and Rantlo. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Alley cropping or hedgerow intercropping is one of the many sub-systems of agroforestry technology. It has been introduced to farmers in many countries of West Africa including Nigeria by International Institute of Tropical Agriculture (IITA), Ibadan. IITA established these alley farms and supervised its maintenance in order to achieve results. The farmers were also given incentives like tree seedlings, palm trees, cutlasses, to encourage them. This study is narrowed down to two villages- Alabata in Akinyele local government area of Oyo state and Ayepe in Ishokan local government area of Oshun state. All the fifty-five male farmers who are participating in the programme are purposively selected. They recognized that alley cropping helped to increase soil fertility, improved weed control and reduced pests. They also recognized certain constraints such as increased labour demand, competition among crops and weeding.

INTRODUCTION

Hedgerow intercropping is an agro forestry technology that is being explored as one of the land use options in the tropics. Research to develop the system began in the early 1970s at the International Institute of Tropical Agriculture (IITA), where the term "alley cropping" was coined (Ssekabembe, 1985). These two terms, (alley cropping and hedgerow intercropping), are now being used interchangeably. It is a land management practice in which crops are grown in alley, (or Interspaces), between rows of planted, fast growing, woody shrubs or tree species, usually legumes, and in which the woody species are periodically pruned during the cropping season. Alley cropping retains some of the main advantages of shifting cultivation like regenerating soil fertility, providing green manure, fire wood and stakes, and suppressing weeds (Kang and Juo, 1981; Balasubramanian, 1983). Getahun (1980) stated that the practice achieves ecological features of natural bush fallow system without requiring fallow periods between cropping cycles. Thus this system is an agro forestry technology with potentials for wide applicability and success (Steiner, 1982). *Leucaena leucocephala* can be alley cropped with maize, cassava and cowpeas. Kang and Daguma (1985) reported that yields of maize alley cropped with *Leucaena leucocephala* were higher on experimental plots compared with control plots with or without fertilizer.

Other suitable tree species for alley cropping trials are *Gliricidia sepium*, *Cassia siamea* and *Calliandra callathyrus*. After some years of practical demonstration of this technology and its subsequent introduction to some selected areas, it is pertinent to know what the participating farmers think about it. What is their perception concerning crop yield, farm labour input, weed control, tree planting and pruning, before and after adopting the technology. While it is important to introduce new technologies to farmers to solve their problems, it is equally important to get response (feedback) from them. This research work was carried out to study the perception of farmers towards IITA's alley cropping programme through attempts to attain the following objectives;

- Determine the difference in farmers' perception of crop yield before and after participation in alley cropping.
- Ascertain if there are changes in farmers' perception of farm labour demand before and after participation in alley cropping.
- Identify demographic characteristics of the farmers that affect their perception of alley cropping.

Hypothesis

The following hypotheses are stated as null hypothesis;

- There is no significant difference in farmers' perception of crop yield before and after participation in alley cropping.

*Corresponding author: Akintunde, M. A. O.
Department of Agricultural Economics & Extension, National University of Lesotho, Roma

- There is no significant difference in farmers' perception of farm labour demand before and after participation in alley cropping.

Litratue Review

Agro forestry is an approach of integrated land use that involves deliberate retention or admixture of trees and other woody perennials in crop animal production fields to benefit from the resultant ecological and economic interactions (Nair, 1985). According to Nair (1985), the agro forestry system must have three basic sets of components that are managed by man, namely. The tree (wood perennial), the herb (agricultural crops including pasture species) and the animal. This leads to a simple classification of agro forestry systems as given below:

Agrisilvicultural - crops and trees including shrubs/vines/trees
 Silvopastoral - pasture/animals and trees
 Agrosilvopastoral - crops, pasture/animals and trees
 Multipurpose trees - apiculture and aquaculture with trees.

Table 2.1. Categorization and System Based on the Structure and Function

Structure	Arrangement of components	Function
Agrisilvicultural (crops and trees including shrubs)	In space (spatial) mixed dense (e.g. homestead garden)	Productive function: food, fodder, fuel wood and others
Silvopastoral (pasture/animals and trees)	Mixed space(e.g. most systems of trees in pasture)	
Agrosilvopastoral (crops, pasture/animals and trees)	Strip (width of strip to be more than one tree)	
Others (Multipurpose tree lots, apiculture with trees, aquaculture with trees e.g.)	Boundary (trees on edges of plots/trees)	Protective function: wind break, shelter belt, soil conservation, soil improvement, shade.

Source: NAIR (1985): Classification of Agro forestry systems

The Need for Agro forestry

It is estimated that 11 million hectares of tropical forest are destroyed annually as a result of clearing land for fuel wood and for agricultural operations. An additional 4.5 million hectares or more are estimated to be cleared through commercial timber operations annually. An FAO study indicates that tropical trees are being cut much more rapidly than reforestation or natural process may replace them. Indeed the study suggested that for every 10 hectares cleared, only one was replaced. In many developing countries, including Nigeria, wood provides more than two thirds of the energy used for all purposes. An estimated 250 million people in developing countries live in areas of fuel wood shortage (Kersten *et al*, 1998).

Merits of Alley Cropping

Trees continuously contribute to soil organic matter through shedding of leaves and roots. Trees used in windbreaks can also increase water availability by reducing wind speed and thereby lowering evapotranspiration. Tree canopies provide shade that lowers soil temperature, reducing evaporation and slowing the decomposition of organic matter. The canopies lower the impact of heavy rainfall, reducing run off and increasing water infiltration into the soil, thereby controlling erosion .Tree pruning are used as mulch to suppress weeds, green manure, firewood as well as browse. Leguminous trees fixed nitrogen biologically to companion crops (United States Development Agency (USDA), 2012).

Demerits of Alley Cropping

The labour requirement for hedgerow pruning is often perceived as control weeds, then alley cropping could actually help to reduce the overall demand for labour. There may be competition between trees and crops when they are grown close together. This competition is more pronounced when prunings from the trees are removed for use as fodder and fuel wood, rather than applied to the crops as mulch. Competition for light appears to be the most widely observed form of competition in alley cropping. However, other aspects of competition such as for moisture and nutrients should be researched into. Alley cropping techniques are full of so many technicalities like spacing, seed treatments, pruning, mulching and so on. An illiterate farmer may find the system too complex to adopt (Graves *et al*, 2004, Okonkwo *et al*, 2009).

The Concept of Perception

According to Van Den Ban and Hawkins (1974), perception is the process by which a man receives information or stimuli

from his environment and transforms it into psychological awareness. Extension agents should appreciate why people interpret their surroundings differently, and how these different perceptions influence their communication behavior.

Characteristics of a typical Nigerian farmer

Ekong (1988) revealed the following characteristics of Nigerian famers;

Age of farmers

The average age of a Nigerian farmer is 45 -50 years. There is no relationship between age and participation/adoption of agricultural innovations.

Level of Education

Less than 40% of Nigerian farmers have formal education, that is schooling, but up to 40% of them are moderately literate in their languages and a lot of these farmers understand display of figures. There is positive association between literacy and adoption of innovations and not between adoption of innovations and formal schooling (Clark and Akinbode, 1968). Level of Social Participation. Nigerian farmers belong to a number of formal and informal organizations. It was also revealed that there is positive relationship between Nigerian farmers' level of participation in community life and adoption of agricultural innovations.

Level of Income

The Nigerian farmers' income varies depending on the type of crops, farm size, farming type (mixed or crop farming) and

whether full or part-time farming. It was also discovered that there is a positive relationship between level of income and participation in agricultural innovations.

Media Exposure

There is a positive relationship between mass media exposure and participation in agricultural innovations by Nigerian farmers. Mass media sources like radio, agricultural newsletters and television play prominent roles in creating awareness of innovations to farmers. Equally important are information provided by family members, friends, neighbours and local organizations. The agricultural extension agent is the most important source of information to farmers on agricultural innovations. In contrast to the American theory that relative importance of different sources of information varies with stages of adoption, Williams (1969) in an empirical survey on Western Nigeria, observed that with Nigerian farmers, the importance of extension agent cuts across various stages of adoption process. This is due to ineffective method of treating agricultural information by the available mass media and low level of education and literacy of the farmers.

MATERIALS AND METHODS

The Research Area

The research was conducted in two villages, namely: Alabata and Ayepe. Alabata is a village in Akinyele Local Government Area of Oyo state of Nigeria. The people's primary occupation is farming and alley cropping has been introduced to the farmers several years back. Ayepe is a village in Isokan Local Government Area of Oshun State, Nigeria. The village is situated in the 'cocoa belt' of the low land, semi deciduous humid forest (Mutsaers *et al*, 1986), about 60 km southeast of IITA headquarters in Ibadan. Average annual rainfall is between 1250 and 1500mm. Majority of the people are farmers planting cassava, maize, cocoyam, yam and vegetables.

The Population for the Study

The study involved all male farmers, they are the only farmers that have participated in alley cropping in both villages.

Sampling Size and Sampling Procedure

The two villages are purposively selected because they have been exposed to alley cropping by IITA some years back. All participating farmers (all males) in the two villages were interviewed because they fall short of the minimum number earlier envisaged, i.e. 120 respondents. There were 25 farmers in Alabata and 30 farmers in Ayepe, making a total of 55 farmers.

Types of Data and Instrument for Data collection

Primary data was used for the study. The primary data collection was carried out by the use of structured questionnaires, through personal interviews by the researcher.

Validity and Reliability of Research Instrument

The research instrument was validated by the researcher, (face validity). For reliability test, a test-retest method was used.

This was carried out in Badeku, a village in Akinyele Local Government Area. A sample of 20 farmers was involved at an interval of 2 weeks between the first and second administration. The instrument was accepted as reliable because r was 0.8, (above 0.5).

Measurement of Variables

The dependent variable is "farmers' perception of alley cropping". This was measured by giving a set of 20 questions to the respondents. Their responses were recorded using a 5-point Likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), Strongly Disagree (SD).

Data Analysis

Descriptive statistical tools like frequency distribution, mean, pie chart and histogram were used to analyze changes in the use of fertilizer, pesticides and herbicides: they were also used to analyze constraints, age of participants, proportion of alley farms to farm size, years of participation in alley cropping and decision to continue or not. The t-test was used to test the hypotheses 1 and 2, while hypothesis 3 was tested by Pearson Product Moment Correlation (PPMC) and chi-square.

RESULTS AND DISCUSSIONS

Demographic Characteristics of farmers

Majority of the farmers are aged between 50 – 59 years (32.7%), while a few of them are between 70 – 79 years (7.3%) (Table 4.1). The youngest and most energetic farmers constitute only 10.9%, meaning that most of the farmers are getting old, and this is not good for eventual adoption of this technology. The mean age of 54 years also corroborates the fact that most participating farmers are old and may not perform their best on the farm.

Table 4.1. Frequency distribution of age

Age (years)	Frequency	Percentage (%)
30 – 40	6	10.9
40 - 49	12	21.8
50 – 59	18	32.7
60 – 69	15	27.3
70 - 79	4	7.3
TOTAL	55	100

According to table 4.2 on educational level of alley cropping participants, almost half of the farmers (49.1%) have no formal education, i.e. they cannot read or write. The number of farmers decreases as educational level increases. There were slightly more educated farmers (50.1%) who can read and write mostly in local vernacular language.

Leadership Status

Only 27.3 percent of the farmers held leadership positions in their various groups. Out of the 72.7 percent who are not leaders, 34.5 percent are ordinary members of their various groups, while 38.2 percent are not members at all.

Use of fertilizer, pesticides and herbicides before participation in alley cropping

Before participation in alley cropping, 38 farmers believed that fertilizer application is necessary, 14 said fertilizer was not necessary while 3 of them were undecided. With pesticide 23 farmers said yes, 30 said no while 2 farmers were neutral. 48 farmers agreed to herbicide application, 4 said no and 3 were undecided (Figure 4.2a).

Table 4.2 Educational Level of Alley Cropping Participants

Educational level	Frequency	Percentage
No formal education	27	49.1
Adult/non formal education	11	20
Primary six	7	12.7
WASC/GCE	5	9.1
NCE/OND	3	5.5
HND/BSc	1	1.8
MSc/PhD	1	1.8
Others	0	0

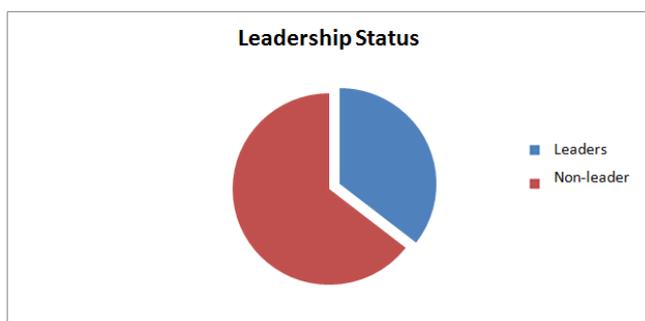


Figure 4.1. Leadership Status of farmers

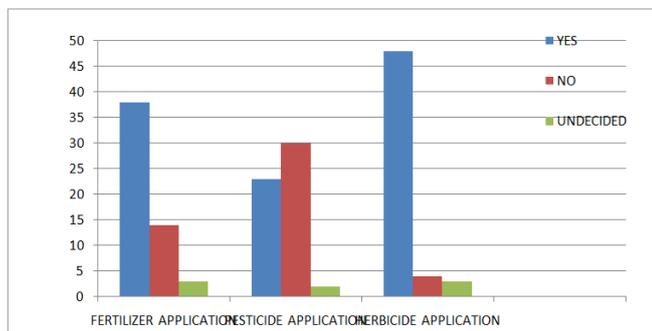


Figure 4.2a Responses on use of application of fertilizer, pesticides and herbicides

Use of fertilizer, pesticide and herbicide after participation in alley cropping

With alley cropping (fig; 4.2b), 8 farmers still believed that fertilizer is necessary, 45 of them disagreed while 2 were undecided. 15 farmers supported the use of pesticides, 37 disagreed while 3 were undecided. Only 16 farmers said yes to continued use of herbicides during alley cropping, 36 said no while 3 were undecided.

Overall, more farmers agreed that fertilizer, pesticide and herbicides are needed more before alley cropping than during participation in alley cropping. This corroborates the fact that alley cropping increases soil fertility, reduces pest and does not encourage weed growth.

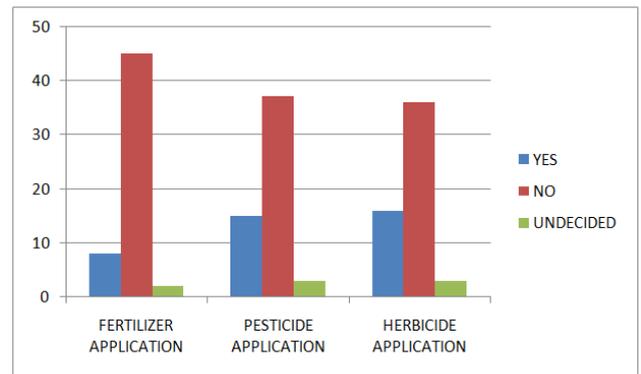


Figure 4.2b. Responses on Fertilizer, Pesticide and Herbicide necessity

Testing of hypotheses

Hypothesis One

Ho: There is no significant difference in farmers' perception of crop yield before and after participation in alley cropping. Wilcoxon's t-test was used because the data was at ordinal level.

$$t(\text{cal}) 8.09 > t(\text{tab}) 2.0 (P= 0.05)$$

Ho was rejected, i.e. there is a significant statistical difference in farmers' perception of crop yield before and after participation in alley cropping.

Hypothesis Two

Ho: There is no significant difference in farmers' perception of farm labour demand before and after participation in alley cropping. Wilcoxon's t-test was used.

$$t(\text{cal}) 6.5 > t(\text{tab}) 2.0 (P= 0.05)$$

Ho was rejected, i.e. there is a significant statistical difference in farmers' perception of farm labour demand before after participation in alley cropping.

Conclusion

Farmers will continue to participate and may even adopt alley cropping technology if the associated constraints are minimized. Technicalities of the technology should be explained to the participants to make adoption easier for them.

Acknowledgements

I am grateful to Messrs G. Kolawole, Isiaka and Jonas of IITA and Akinrinola of Agronomy department of the University of Ibadan. I also thankmy co-author Mr. M. Rantlo for his hard work and dedication especially during data analysis and editing of the manuscript to make it fit for publication. Many thanks to our families and children for their support during the research.

REFERENCES

Graves, A. R. and Matthews, R. B. 2004. Low external input technologies for livelihood improvement in subsistence agriculture. *AdvAgron* 82: 473-555.

- Kang B. T. and Juo A. S. R. 1981. Management of low acidity clay (LAC) soils in tropical Africa for food production; *paper presented at the fourth International soil classification workshop 2-12 June, 1981, Kigali, Rwanda.*
- Kang, B.T. and Danguma B. 1985. Nitrogen management in alley cropping systems, In Kang B.T. van der Heide J. (Ed), *Nitrogen in farming systems in the humid and sub-humid tropics. Institute of soil fertility, Haren, the Netherlands.*
- Kersten, I., Baumbach, G., Oluwole, A.F., Obioh, I. B and Ogunsola, O.J., 1998. Urban and rural fuelwood situation in the tropical rain-forest area of south-west Nigeria. *Energy, 23(10):887-897.*
- Nair, P. K. R. 1980. *Agroforestry species: A crop sheets manual*, International Council for Research in agroforestry (ICRAF) pp. 336.
- Okonkwo C. I., Mbagwu J. S. C. and Egwu S. O. 2009. Changes in soil properties under alley cropping system of three leguminous crops; *Journal of Tropical Agriculture, Food, Environment and Extension*, 8 (1) 60-65.
- Ssekabembe, C. K. 1985. Perspectives in on hedgerow Intercropping: *Agroforestry systems*, 3:4 (339-351).
- Steiner, K. G. 1982. *Intercropping in tropical smallholder agriculture with special reference to West Africa*. German Agency for Technical Cooperation (GTZ), Eschborn, FRG. p. 303. Schriftenreihe der GTZ No. 137.
- United States Development Agency, 2012. What is alley cropping? [Online] Available from: http://nac.edu/documents/workingtrees/infosheet/WT_info_alleycropping.pdf. Accessed on 22/12/2015.
- Van Den Ban H. W. and Hawkins H. S. 1974. Theoretical background to farmers' use of extension; *Agricultural Extension*. pp. 61-67. Boomlers 1974.
