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Research Article

Adoption and Discontinuance Utilization of Alley Farming by Farmers in Aguata Local Government Area, Anambra State, Nigeria

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Abstract This study analysed the adoption and discontinuance utilization of Alley farming by farmers in Aguata Local Government Area Anambra State Nigeria. Data were Collected with structured and Validated questionnaire from 120 randomly selected Alley farming technology farmers who adopted and discontinued the utilization of the technology. Data were analysed using descriptive statistics: mean scores, percentages and frequency distribution and z-test was used to established the hypothesized relationships. Results of the study show that majority of the farmers who adopted the technology initially later discontinued and major factors that led to the discontinuance among others included: financial implications, inadequate information sources as only farmers and neighbours were found to be major sources of information, environmental factors, inadequate extension contact etc. The discontinuance behaviour of farmers were found to take various forms but gradual form was more than other forms. The discontinuance behaviour in Aguata was not total. The study recommended among others that Extension Service should overhaul the mechanism and channels used in introducing the technology, with intensive follow-up and adequate extension contact between the farmers and extension service.

Keywords Adoption, Discontinuance utilization, Alley farming, Technology, Farmers, Aguata, Anambra State

Introduction

In the South east Nigeria generally and in Anambra State specifically, farmers for long relied solely on shifting cultivation and bush fallowing characterized by the traditional "Slash and burn" techniques for maintaining the fertility of their arable lands. This ensures a balance between their socio-economic and agro-ecological environment. Studies of these traditional cultivation fallow systems in the geographical zone showed that farmers typically clear a plot of land, cultivate the land for 1- 3 years and then abandon it to lie fallow for some years [1-5].

During this fallow period, there is regrowth of the forest or bush and the ground cover protects the soil from erosion and controls Obnoxious weeds. The gradual accumulation of nutrients supplied by the decay of organic matter from secondary growth of natural vegetation regenerates soil fertility [6-7]. Unlike what obtains today, in the past, farm lands were then relatively more abundant and the traditional land management system which rotates cultivation periods with long fallow periods, was able to stable ecosystems that are biologically efficient and sustainable [8-10].

As it is presently, increasing population pressures on land is particularly pronounced in Anambra State, where population densities are highest on land per capital on arable land, farmers ratios are the least compared with other parts of Rural Africa [2,4].

The rapidly increasing population growth rates and densities have created land scarcities leading to shortening fallow lengths and land use intensities in the state [2, 11]. In many communities in Anambra State, farmers have

reduced their fallow periods below level necessary to restore soil fertility and maintain the ecological balance under shifting cultivation while in some cases, the fallow system has been completely abandoned [1, 12]. The absence of sound soil management practices, the breakdown of the traditional fallow practices and the increasing land use intensification in Anambra State has resulted in accelerated leaching of soil nutrients, erosion, decreased moisture retention of the land, increased weed population and decline in soil fertility which adversely affect crop yield, labour productivity and returns to farming [1, 10, 13-14].

In order to help solve this problem of land fertility management through the activities of her Anambra State Agricultural Development Programme (ADP), Anambra State introduced Alley farming in 1996 as a technology to help the farmers boast their soil fertility. Alley farming is an agro-forestry technique involving the cultivation of crop between nitrogen fixing leguminous hedgerious species developed by IITA in the 1990s [15]. The leguminous species have deep roots for nutrient capture and recycling, produce substantial biomass which are applied to crops as mulch and contributes to nitrogen fixation. The technology has been shown to increase and sustain crop production compared to conventional bush fallow and the shifting cultivation. This technology has been introduced to farmers for adoption and utilization on continual bases in Anambra State, Nigeria by Anambra State Agricultural Development Programme and the State Ministry of Agriculture and Natural Resources with huge support from international center for research in Agro forestry and Alley farming Network for Tropical Africa (AFRNETA) since early 1990s [16]. The adoption of an innovation involves a transformation in orientation and behavour of the farmer from the time the farmer adopts new practices to that of gradual or rapid stoppage of the use of the practice. Adoption may be defined as a decision to make full use of a new idea or practice as the best course of action among alternatives. In Nigeria like in most developing and developed countries of the world, a lot of importance has been placed on farmers adoption of new agricultural technologies and this has generated a lot of interest to agricultural extension experts and other social scientists. However, an important component of the innovation adoption decision-making process which has received little research attention recently and which is the part of this study is the discontinuance utilization behavior of farmers over introduced farm technologies. Discontinuance of an innovation can be describe as the decision to stop or abandon continued use of an innovation as it has been adopted [17-20]). Rogers (2003) tried to differentiate between rejection and discontinuance when he explained that rejection can occur at any stage in the adoption process while discontinuance will only occur after adoption has taken place [19]. Anaeto (2010) noted that discontinuance like adoption occurs in stages and can thus take the forms of immediate, gradual or rapid disengagement. The paucity of empirical evidence of the factors that determine farmers adoption and discontinuance behaviours over introduced agricultural innovations in the farming systems of Africa generally and especially in Nigeria and specifically in Anambra State agro-forestry sector necessitates the investigations in this study [20].

Objectives of the Study

The specific objectives of the study include to:

- Determine the awareness of the farmers on alley farming technology in the study area,
- Identify the Alley farming technology information sources available to farmers
- Ascertain the effectiveness of the mechanism used by the Anambra State Extension Service to introduce and sustain alley farming technology
- Determine the extent of adoption attained by alley farming farmers before decision to discontinue the practice.
- Identify forms of discontinuance behaviours exhibited by farmers.
- Examine the discontinuance behavior level of alley farming farmers.
- Assess the factors that influence the adoption and discontinuance of alley farming technology in the study area.

Hypotheses of the Study

The following null hypotheses were tested

- There is no significant difference between the adoption behavior level of alley farming farmers and their discontinuance behavior level.
- There is no significant difference in the adoption level of alley farming between ADP contact and Non-ADP contact farmers.

Materials and Methods

The study was conducted in Aguata Local Government Area of Anambra State. Aguata Local Government Area is one of the 21 Local Government Areas of the state and is made up of 15 communities. The population of the local government area according to 2006 national population figure was 369,972. The temperature of this area is uniformly high accompanied by seasonal distribution of rainfall. Economically, the inhabitants of Aguata Local Government Area are generally farmers, traders, civil servants and industrialists.

The major ecological problem in this area is soil erosion and land slide menace which has affected agricultural activities in the area. Two main sources of data were used for this study namely primary data from field survey and secondary data from literature reviewed. All the farmers in the study area constituted the population of the study through representative estimation, a sample size of 120 farmers were selected and used for the study. Questionnaire and interview schedule properly pretested were used to collect the needed information for the study.

Sample selection was done in such a way as to cover the extension blocks in the local government area where Alley farming was pronounced before discontinuance based on information from the ADP zonal headquarter at Ekwuluobi. In this regards therefore two blocks were purposively selected. The number of circles in each selected block was collected from the block extension supervisor at the headquarters of each block. 5 circles were randomly selected from each of the clocks to give a total of 10 circles. 2 sub-circles were also randomly selected from the 10circles to give a total of 20 sub-circles from which 6 farmers were randomly selected from each sub-circle making a total of 120 farmers used as sample size for the study. Data were collected to help achieve the stated objectives of the study. Qualitative as well as quantitative analytical techniques were used for the analysis of the data. Simple descriptive statistics such as means, scores, percentages and frequency distribution were used to analyze objects 1 - 7. Other quantitative data were analysed using appropriate statistical techniques. For instance, z-test was used to establish the hypothesis.

The Z-test was represented by the formula

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where z = the value by which the statistical significance of the mean difference is to be judged

$\bar{X}_1 = mean\ adoption\ level/ADP\ contact\ farmers$

$\bar{X}_2 = mean\ discontinuance\ level/Non - ADP\ contact\ farmers$

$S_1^2 = standard\ deviation\ of\ X_1$

$S_2^2 = standard\ deviation\ of\ X_2$

$n_1 = The\ number\ of\ respondents$

$n_2 = The\ number\ of\ respondents$

Results and Discussion

Awareness of Alley farming

Table 1: Distribution of farmers according to their awareness of alley farming

Responses	Frequency	Percentage
Aware	102	85.00
Not Aware	18	15
Total	120	100

Source: Field survey data 2015

Table 1 shows that 85 percent of the farmers were aware of alley farming while 15 percent were not aware. This thus shows that alley farming technology was actually introduced in the study area and was well known.

Information Sources Availability

Table 2: Distribution of Alley farming farmers according to availability of sources of information

Information sources available to farmers	Frequency	Percentage
Extension Agents	92	76.67
Staff of research institute	13	10.83
Agric show/field day	2	1.67
Fellow farmers/friends/neighbours	110	91.67
Age grades	3	2.5
Cooperative society	46	38.33
Extension newsletter	15	12.5
Posters	2	1.67
Radio farmer	19	15.83
TV programme (Oru-Ubi)	4	3.33
Church Organizations	28	23.33

Multiple responses were recorded

Source: Field survey date: 2015

The distribution of farmers according to alley farming technology information sources available to them is presented in table 2. The result shows that majority of the farmers (91.67) reported that their available source of information on Alley farming was fellow farmers/friends while 76.67 percent indicated that their available source of information on alley farming was Extension agents followed by cooperative society and church organization. This result implies that farmers in Aguata Local Government Area were exposed to different sources of information on alley farming. However Radio farmer, TV programme (Oru-Ubi), Agric show/field day, Age grade, Extension news letter and posters were not always available sources of information to farmers on alley farming.

Mechanism Used to Introduce and Sustain Alley Farming Technology

Table 3: Distribution of Alley farming technology farmers according to the mechanism used by Extension service to introduce and sustain the Alley farming Technology

Mechanism used by Extension service	Most Frequently used (4)	Frequently used (3)	Undecided (2)	Not Frequently used (1)	Mean
Staff of Research Institute	6	13	69	32	1.9
Excursion/Tours	0	2	52	66	1.4
Demonstration	15	14	83	08	2.3
Training and visit	10	26	48	36	2.0
Group discussion	8	32	64	16	2.2
Use of cooperative society	4	59	42	19	2.8
Workshop/seminar and conferences	3	36	51	30	2.1
Home/farm visit	2	18	49	51	1.7
Field day/ Agric show	2	3	61	54	1.6
Radio/TV farmers	8	37	57	18	2.2
Print media (News Papers, circulars)	3	29	61	17	2.3
Extension bulletin	4	33	58	25	2.1
Extension agents visit/teaching	7	26	72	15	2.2
fellow farmers/neighbours	30	70	15	05	3.0
Church organizations	20	56	37	07	2.7

Source: field survey data 2015

$$\frac{4+3+2+1}{4} = 2.5 \quad Discrimenating\ index$$

Decision Rule

Mean score above 2.5 is taken as most frequently used while below 2.5 but higher than 2 is take as frequently used while below 2 is taken as not frequency used.

The frequently of use of the channels used by extension service to introduce and sustain the alley farming technology was determined and the results are presented in table 3.3

The results show that fellow farmers/neighbours (m = 3.0), church organizations (m = 2.7) and cooperative society (m = 2.8) were most frequently used. Demonstrations (m = 2.3), Training and visit (mean 2.0), Group discussion (m = 2.2), workshop/seminar and conferences (m = 2.1), Radio/TV farmer (m = 2.2), Print media (m = 2.3), Extension Bulletin (m = 2.1) and Extension agents visit/teaching (m = 2.2) were frequently used. Staff of research institute (m = 1.9), Excursion/Tours (m = 1.4), Home/farm visit (m = 1.7) and field day/agric show (m = 1.6) were not frequently used. It is not surprising that fellow farmers/neighbours and cooperative society appeared most frequently used because most farmers interact among themselves, sharing experiences and ideas together hence they are bound to get information from one another.

The less frequently used of these channels may have contributed to the high level of discontinuance behaviours recorded in alley farming technology in Aguata Local Government Area of Anambra State. The implication of this, therefore is that extension service must modify and re-adjust their teaching methods so as to make more impact on their clientele.

Extent of Adoption Attained by the Farmers before Discontinuance Behaviour

Table 4: Distribution of Alley Farming Technology Farmers According to the Extent of adoption they Attained before Discontinuance Behavior

Innovation-Decision Stages	Aware	Interest	Evaluation	Trail	Adopted
Alley Farming	40	15	10	20	35
Technology	(33.3)	(12.5)	(8.3)	(16.6)	(26.6)

Figures in parentheses are percentages of response

Source: Field survey data 2015

The extent of adoption attained by Alley farming technology farmers before their decision to discontinue the practice were determined and the results presented in table 3.4. The result shows that most of farmers (33.3 percent) were still in awareness stage, 12.5 percent just developing interest, 8.3 percent still considering it while 16.6 percent still giving it a trail. Only 26.6 percent actually adopted it in the innovation-decision making process/stages. It can therefore be said that the technology has not been highly and widely adopted before discontinuance by the farmers in Aguata Local Government Area Anambra State.

Forms of Discontinuance behavior shown by Alley Farming technology farmers

Table 5: Distribution of Alley farming technology farmers according to forms of their discontinuance behaviours

Classification of Discontinuance Behaviours	Frequency	Percentage
Gradual	48	40
Replacement	28	23.33
Rapid	15	12.5
Immediate	17	14.16
Disenchantment	12	10

Source: Field survey data 2015

The forms of discontinuance behaviour, the alley farming technology farmers exhibited were classified and presented in table 3.5. The result shows that most of the farmers had gradual form of discontinuance behaviour

(40 percent) while 23.33 percent had replacement, 12.5 had rapid, 14.16 had immediate and 10 percent had disenchantment discontinuance behavior. This therefore shows that the farmers discontinuance behavior took various forms in the state. However, very few farmers discontinued the technology because they wanted superior alternative.

Farmers' Discontinuance Behaviour levels over the Alley farming technology

Table 3.6: Distribution of alley farming technology farmers according to their discontinuance behaviour level over alley farming technology

Level of discontinuance behavior of Alley farming	**3 Very high**		**2 High**		**1 Low**		**Mean**
	F	**%**	**F**	**%**	**F**	**%**	
	48	40	69	57.5	03	2.5	2.4

Source: Field survey data 2015

Table 6 shows the distribution of Discontinuance behaviour level of Alley farming technology farmers over Alley farming technology. A 3 point likert type measuring scale of very high, high and low were used to measure the discontinuance level of the farmers. A discriminating index mean of 2 was established and on interval of 0.5 chosen thus giving rise to an upper limit of $2 + .5 \simeq 2.5$ and lower limit of $2 - .5 = 1.5$.

Then a decision rule of any mean score higher and equal to 2.5 was taken as very high while any equal and less than 1.5 was taken as low and mean score less than 2.5 but higher than 1.5 is taken as high. Based on this decision rule, the level of discontinuance behaviour of farmers on alley farming in Aguata Local Government Area was high (m=2.4) which shows that the farmers actually discontinued the technology.

Factors Influencing the Adoption/Discontinuance of Alley Farming Technology

Table 7: Distribution of Respondents According to Seriousness of Factors Influencing Adoption/Discontinuance of Alley Farming Technology

Influencing factors	**Very serious**	**%**	**Just serous**	**%**	**Not serious**	**%**	**X (mean)**	**Remark**
Inadequate information	2	40.00	2	40.00	1	20.00	2.2	Serious
Lack/limited resource availability	1	3.57	25	89.29	2	7.14	2.0	Serious
Time factor	1	3.57	25	89.29	2	7.14	2.0	Serious
Environmental factor	2	16.67	8	66.67	2	16.67	2.0	Serious
Financial factor	12	57.69	10	38.46	1	3.85	2.5	Very Serious
Socio-economic factor	4	44.44	4	44.44	1	11.11	2.3	Serious
Profitability of the tech.	3	10.71	3	10.71	22	78.57	1.3	Not Serious

Source: Field Survey Data 2015

Table 7 shows the seriousness of factors likely to influence adoption/discontinuance of alley farming technology. The factors were measured using 3 point likert type of very serious, serious and not serious. Financial factor posed to be the "very serious" factor affecting reactions of farmers towards alley farming while profitability of the technology is "Not a serious" factor. Other factors such as: socio-economic factor, environmental factor, time factor, limited resource and inadequate information were serious. This implies that finance is a very important factor of consideration of the respondents in reacting towards a given technology such as alley farming.

Establishing Hypothesized Relationships

Hypothesis I; There is no significant difference between the adoption behaviour of the farmers and their discontinuance behaviour in alley farming.

Table 8: Difference in Adoption and Discontinuance Behavior of Farmers in Alley Farming Technology

Variables	**No. of observers**	**Mean**	**Standard deviation**	**Z-tab**	**Z-cal**	**Decision**

Adoption behavior	75	1.29	0.38			
Discontinuance behaviour	26	1.07	0.25	1.96	2.06	Reject

Z-critical at 5% = 1.96

Z= calculated significant at 5% level.

The result of the z-test of the significant difference between the farmers' adoption behaviour and discontinuance behaviour is presented in the table 3.7. The result shows that the z-test comprises of 76 farmers (X1) and 26 (X2) with a mean of 1.29 and 1.07 and standard deviation of 0.25 and 0.38. The test of significant difference produced a Z-cal of 2.06 which was significant at 5% level when compared with the critical Z-tabulated of 1.96 for a two tail test.

Therefore hypothesis 1 which states that there is a significant difference between the adoption behaviour of the farmers and their discontinuance behaviour in alley farming is rejected since there is a significant difference in farmers adoption and discontinuance behaviour of Alley farming Technology.

Hypothesis II: There is no significant difference in the adoption level of alley farming between ADP contact and Non-ADP contact farmers.

Table 9: Result of Z-test on significant difference in the adoption of alley farming by ADP contact and non-ADP contact farmers

Variables	**No. of observers**	**Mean**	**Standard deviation**	**Z-tab**	**Z-cal**	**Decision**
ADP contact farmers.	20	1.67	0.71			
Non ADP contact farmers.	18	1.03	0.39	1.96	3.88	Reject

Z = critical at 5% = 1.96

Z = calculated significant at 5% level

The result of the significant difference in the adoption level of alley farming between ADP contact and non ADP contact farmers is presented in table 3.9. The result shows that the Z-test comprises of 20 ADP contact farmers, men of 1.67 with a standard deviation of 0.71 for X1. And 81 Non ADP contact farmers, 1.03 mean with standard deviation of 0.39 for X2. The test of significant difference produced a Z-cal of 3.88 which was significant at 5% when compared with the critical Z-tabulated of 1.96 for a two tail test. Therefore, the hypothesis II which states that: there is no significant difference in the adoption of Alley farming Technology by ADP contact farmers and Non-ADP contact farmers, is thereby rejected since there is significant difference in their adoption level. Those with more contact with ADP appear to react more favourable to Alley farming Technology than those not in contact with ADP.

Conclusion

No doubt the targeted aim of introducing Alley farming Technology was to help improve the soil fertility of the farmers soil and thus result to higher yields as well as maintain a healthy living among the people of Aguata Local Government Area. Farmers adopted the technology and some years after, most of them discontinued its practice.

Alley farming, from all indications is an indispensable profitable practice, since it uses resources more efficiently than mono-cropping system. Alley farming is needed for sustainable agricultural production. There is need for re-orientation of the farmers on the need for adoption/re-adoption of the technology by the farmers instead of relying on the traditional long fallow periods system.

Since rapid population growth and competing demand for land use for non-agricultural purpose have created land scarcities, Extension with other stakeholders in agriculture (Government and Non-Governmental Organizations) should join hands to empower in areas such as provision of reliable information sources, practical trainings, provision of loan and subsidies so as to encourage the farmers to adopt the technology.

The study therefore concludes that since the discontinuance behavior shown by the farmers over alley farming technology in Aguata was not total, there are chances that farmers in Aguata would appreciate the need for alley farming technology if extension service intensifies efforts, using delivery systems that are in consonance with the farmers socio-economic and agronomic circumstances.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. The Extension mechanism adopted in transferring the technology needs to be modified so that they would be able to make much impact on their clientele.
2. Combinations of various extension teaching methods would assist make the technology clearer and easy to appreciate.
3. There should be increased awareness creation by extension staff on the technology and associated benefits so that the farmers would become more motivated.
4. Need for follow-up and close monitoring of the technology to avoid loss of interest on the part of the farmers.
5. The study show that information needs on alley farming technology in the areas of its benefits and methods of carrying it out were still insufficient. The study therefore recommends that field/practical demonstrations should be encouraged the more the extension teaching methods.
6. Cooperative societies were popular in the study area. This study recommends that farmers should be encouraged to form more cooperative societies so that they can pull their resources together to be able to source for assistance from the authorities that matter. This will also help them to source the loan as a group.

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