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INTENSITY OF USE OF RICE PRODUCTION TECHNOLOGY: LESSON FROM AGRICULTURAL TRANSFORMATION AGENDA PARTICIPANTS IN NORTH WEST, NIGERIA

[*1]Balogun, O. S. and [2]Damisa, M. A.

[1]Department of Agricultural Extension and Management,
Federal College of Forestry Mechanisation Forestry Research Institute of Nigeria, Afaka, Mando Kaduna.
[2]Department of Agricultural Economics, Ahmadu Bello University ABU Zaria.

Corresponding Authors email: baaseg2006@yahoo.com

ABSTRACT
The study examined the Intensity of use of improved technology among rice farming households of Agricultural Transformation Agenda (ATA) in North-Western zone of Nigeria. 571 respondents were selected using a multi-stage sampling technique. Data were collected through structured questionnaires on socio-economic variables such as respondent's age, marital status, gender, household size and level of education. Descriptive statistics was used to describe the socio-economic variable. Cragg's model (Double hurdle) was used to examine the influence of some socio-economic and institutional variables on participation and intensity of use by the respondents. The study revealed that farm size and communication assets (radio/Television sets and phones) significantly influenced the farmer's decision to participate (P>0.01). Gender of household head, ownership of livestock (Oxen) and extension agent contacts influenced respondent's decision to participate (P<0.05), market distance had significant influence on participation decision (P<0.01). Also, intensity of use of package of practices was influenced significantly by farm size and households' size (P<0.01) while communication assets ownership significantly influenced package of practices use (P<0.05), respectively. There were complains of fluctuations of input/output prices insect pests and inadequate extension visits the study recommended that farmers' information and sensitization system should be considerably improved. Furthermore, attention should be given to well organized extension visits and formidable marketing system in agricultural projects for effective input output delivery.

Keywords: ATA, Participants, Cragg's model. Double hurdle

INTRODUCTION

Agriculture continues to be the most important sector of the Nigerian economy, in spite of the dominance of petroleum sector. It remains the largest contributor to the growth and development of Nigerian economy (Agbolahan, Onyekwere, Agbonkpolor and Umar , 2010; Abu, Odoemenem and Ocholi, 2010)accounting for over 38% of the non-oil foreign exchange earnings and employing about 70% of the active labour force of the population (Izuchukwu, 2011).

Nigeria's food imports are growing at an unsustainable rate of 11% per annum. Nigeria spends over $22 billion annually on importation of various food items. Relying on the import of expensive food on global markets fuels domestic inflation as excessive imports continues to put high pressure on the Naira and hurting the economy. Nigeria is importing what it can produce in abundance. Import dependency is affecting Nigerian farmers, displacing local production and creating rising unemployment. Therefore import dependency is neither acceptable, nor sustainable fiscally, economically or politically (Akinwumi, 2012) .The Federal Republic of Nigeria has instituted the National Economic Transformation Agenda whose aim is to diversify the economy from reliance on oil, assure food security and create jobs, especially for the youth. The expected impact of the Agricultural Transformation Agenda Support Program was to contribute to the private sector-led agricultural growth for food security, creation of jobs and shared wealth. Its specific objective is to increase, on a sustainable basis, the income of smallholder farmers and rural entrepreneurs that are engaged in the production, processing, storage and marketing of the priority commodity value chains. In a nut shell, agricultural transformation aims to improve agricultural production productivity and reduce poverty (Akinwumi, (2012)

Agricultural transformation had been implemented in four Staple Crops Processing Zones (SCPZs) of Adani-Omor, Bida-Badeggi, Kano-Jigawa, Kebbi-Sokoto and cover 21 LGAs in seven States: Anambra (Ogbaru and Orumba North LGAs), Enugu (UzoUwani LGA); Jigawa (Hadejia LGA); Kano (Bunkure, Kura and Rano LGAs); Kebbi (Argungu, Bagudo, BirninKebbi, Dandi, Ngaski, Shanga and Suru LGAs); Niger

(Agaie, Gbako, Lapai, Lavun, Katcha and Mokwa LGAs); and Sokoto (Kware LGA).

The country is currently preoccupied with the challenge of diversifying the structure of its economy. Like in many rich and poor countries, the issue of poverty and well-being has been of great concern. As a result, poverty reduction strategy processes (PRSP) have been at the centre-stage of development programs. Nigeria's government is more eager than ever to move its populace out of poverty while the rich nations are increasingly aware of the need to promote security through poverty reduction (NBS, 2004). Therefore, the major challenges confronting the Nigerian government is how to transform the current subsistence oriented agricultural production into a commercial one; and how to improve productivity and poverty of poor farming households.

The expected impact of the Agricultural Transformation Agenda Support Program is to contribute to the private sector-led agricultural growth for food security, creation of jobs and shared wealth. Its specific objective is to increase, on a sustainable basis, the income of smallholder farmers and rural entrepreneurs that are engaged in the production, processing, storage and marketing of the priority commodity value chains. Agricultural transformation aims to improve agricultural production and productivity. In view of these, this research is poised to answer the following research questions, describe are the factors that influenced beneficiaries' participation in the project, describe the determinants of the intensity of use of improved technologies,

Theoretical Framework.

Determinants of participation and input Use Intensity

Cragg'sDouble-Hurdle Model

Modeling farmers decision making about whether to participate or not to participate in a programme constitutes a discrete (whether or not to take up the technology) and continuous (the intensity of use of the technology) decision. Most adoption models are based on the assumption that farmers are faced with a choice between two alternatives and the choices they make depend on identifiable characteristics of the technologies or programme' expected benefits and the available incentives (Pindyck and Rubinfeld, 1997). Participation and use intensity of programme package (dependent variable) will be measured as the proportion of package of practice applied by the programme participants. A feature of many models of this nature, for example straightforward binary or censored models, is that the process which results in non-adoption is assumed to be the same as that which determines the intensity of participation. Thus, for example, if a given farmer's characteristic is known to have a positive effect on the extent of participation, then a very high value of this characteristic would inevitably lead to the prediction of participation for such farmer. While such assumptions may turn out to hold, there is no reason to expect this apriori. One reason why such an assumption might fail is that there may exist a proportion of the population of farmers who would, out of principle, never participate under any circumstances

Accordingly, the double-hurdle statistical model, originally formulated by Cragg (1971) in the context of household demand for products, was applied to estimate the probability of participation and the intensity of use. This method has many benefits in the context of this study. First, the sets of factors that affect the participation and intensity of input use can be dissimilar (Teklewold, et al., 2006). Second, this procedure allows the definition of different types of dependent variables for participation and intensity decisions. This is important since the participation decision will often be described by a binary variable or censored variable (one that has a lower limit, an upper limit, or both while the intensity decision is better described using continuous values.

The double-hurdle model is a parametric generalization of the Tobit model, in which two separate stochastic processes determine the decision to participate and the intensity of participation in the programme. In the model, both hurdles have equations associated with them, incorporating the effects of farmer's characteristics and circumstances. Such explanatory variables may appear in both equations or in one. Most importantly, a variable appearing in both equations may have opposite effects in the two equations. The double-hurdle model has an adoption (D) equation as specified below:

$$\begin{cases} D_i = 1\ if D_i^* > 0\ and\ 0\ if D_i^* \\ \qquad D_i = \alpha' Z_i + U_i \end{cases} \quad \text{(i)}$$

Where D is a latent variable which takes the value 1 if the farmer participates in the programme and zero otherwise. Z is a vector of household characteristics and α is a vector of parameters and an intensity equation defined by:

$$\begin{cases} Y_i = Y_i^* if Y_i^* > 0\ and D_i^* > 0 \\ \qquad Y_i = 0\ otherwise \\ \qquad Y_i^* = \beta' X_i + V_i \end{cases} \quad \text{(ii)}$$

Where $Y_i$the observed intensity of participation is given by:

$$Y_i = \sum(\frac{AT_i}{RT_i})/S_i \quad \text{(iii)}$$

whereY_i is participation index of ith farmer, AT_i is the level or quantity of input the farmer actually applied, , RT_i is the exposure or quantity of an input he ought to apply, and S_i is the proportion of score attributable to a particular input (as given by percentage for each innovation).

$X_i$is a vector of the individual's characteristics and β is a vector of parameters.

METHODOLOGY

Study Area.

The study was carried out in Kano State. Kano state is located in North Western Nigeria. It occupies an area approximately 20,131km^2. It is located on latitude 11^0 30^1N and longitude 8^0 30^1E with an average altitude of 484m above sea level, the State has a population of totaling 9,383,628 according to 2006 National Population Census (NPC, 2006). Kano State borders

Katsina State to the North-West and Jigawa State to the North-East. Farming is the main occupation of the people and it is characterized predominantly by mixed cropping. Kano State features savanna vegetation with a semi-arid climate. It witnesses an average precipitation of about 690mm per year, the bulk of which falls from June to September. The state is typically hot throughout the year, though noticeably cool from December February. The annual temperature ranges between 19.06^0c to 33.19^0c. It has a well-drained ferruginous soil.

Subsistence and commercial agriculture is mostly practiced in the State. Among the food crops cultivated are millet, cowpeas, sorghum, maize and rice for local consumption while groundnuts and cotton are produced for export and industrial purposes. Presently, rice is particularly important to the economic activities in the study area, both upland and low land rice is cropped in the study area because of the availability of tube wells and the Hedejia - Jama'a irrigation scheme lying on both sides of Zaria Kano-Rano roads. The scheme was originally started by Kano state government, it is one of the largest irrigation scheme in West Africa (Sangari,2006). During the colonial period and several years after the country's independence, the groundnuts produced in the state constituted one of the major sources of revenue for the country. Kano State is a major producer of hides and skins, it is also a major producer of sesame, soybean, cotton, garlic, gum Arabic and chili pepper

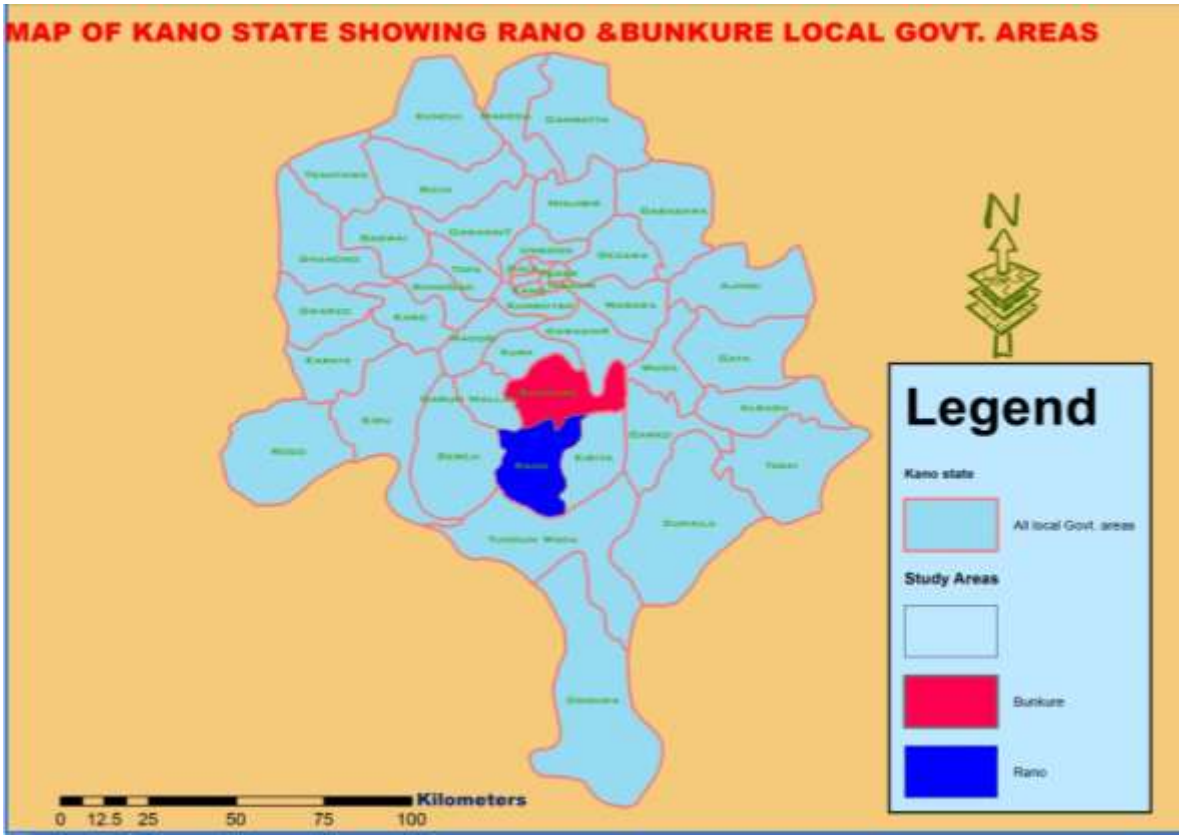

Fig. 1: Map of Kano State showing Bunkure and Rano Local Government Areas

Sampling Technique. Multi-stage sampling technique was employed to select the respondents for this study. The first stage involved purposive selection of the three local government areas that participated in ATA project. In the second stage, two Local Governments were randomly selected from the three Local Governments that participated in agricultural transformation programme in the state. This was followed by purposive selection of seven villages from the two local government areas. The selection of the villages was due to the implementation of agricultural transformation programmes and intensity of rice farming activities in the areas. The last stage involve the random selection of 201 participants and 370 non participants as presented in table 1 below

Table 1: Description of sampled farmers according to villages

L.G.A	Village	Participants	Non-Participants
Rano	Rano	32	57
	Rarun	30	43
	Kaurara	25	45
	Kazaurarawa	23	56
Bunkure	Bunkure	35	61
	Kuruma	35	48
	Shiye	21	60
Total		**201**	**370**

Source: Field survey, 2015.

Method of Data Collection and Analytical Techniques.
Primary data was used for the study. This was obtained by administering structured questionnaire to participants and non-participants rice farming households in the study area by trained enumerators. A total of 571 farmers were used for the study consisting of 201 and 370 participants and non-participants. Data were collected on socio-economic variables (age, educational level, farm size, farming experience, and non-farming activities of the respondents). Information's was also collected on the input-output level, income and expenditure of the respondents. Descriptive statistics (including frequencies and percentages) and inferential statistics (Z-test, t-stat) was used to describe the socio-economic attributes of the respondents. Craggs Model was used to examine participation determinants and the level of participation in the programm.

Determinants of Participation Decision and level of Participation.(The Cragg's model)
Model Specification
The double-hurdle model is a parametric generalization of the Tobit regression model, in which two separate stochastic processes determine the decision to participate and the intensity of participation in the project. In the model, both hurdles have equations associated with them, incorporating the effects of farmer's characteristics. Such explanatory variables may appear in both equations or in one. Most importantly, a variable appearing in both equations may have opposite effects in the two equations. The double-hurdle model has an adoption (D) equation as specified below:

$$\begin{cases} D_i = 1 \; if D_i^* > 0 \; and \; 0 \; if D_i^* \\ \quad D_i = \alpha' Z_i + U_i \end{cases} \quad ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, \text{(iv)}$$

Where D is a latent variable which takes the value 1 if the farmer participates in the programme and zero otherwise. Z is a vector of household characteristics and α is a vector of parameters, The use of intensity equation defined by:

$$\begin{cases} Y_i = Y_i^* if Y_i^* > 0 \; and D_i^* > 0 \\ \quad Y_i = 0 \; otherwise \\ \quad Y_i^* = \beta' X_i + V_i \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(v)}$$

Where $Y_i$the observed intensity of participation is given by:

$$Y_i = \sum \left(\frac{AT_i}{RT_i}\right)/S_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(vi)}$$

whereY_i is participation index of ith farmer, AT_i is the level or quantity of input the farmer actually applied, , RT_i is the exposure or quantity of an input he ought to apply, and S_i is the proportion of score attributable to a particular input (as given by percentage for each innovation).
$X_i =$ Vector of the individual's characteristics
β = vector of parameters.
X_1 = Farm size (ha).
X_2= Age of household head (years)
X_3= Gender (male=1 female =0)
X4= household size
X_5= Level of Education (years),
X_6 = Own radio or TV set or mobile phone (yes = 1),
X_7 = Own Oxen for transportation/ traction (yes =1)
X_8 = Number of improved varieties known in previous cropping year,
X_9 = Member of cooperative (yes =1, 0= otherwise)
X_{10} = Member of farmers association (yes= 1, 0= otherwise)
X_{11} = Contact with government extension agents
X_{12} = Access to credit (for access = 1, 0 otherwise)
X_{14} = Experience in farmer-farmer seed exchange (yes = 1, 0 = otherwise)
X_{15} = Farmers' perception of the varieties (ranked above average = 1),
X16= Access to fertilizer (yes =1, 0= otherwise),
X17= Market distance (Km),
The log-likelihood function for the double-hurdle model is given by

$$\log L = \sum_0 \ell_n \left[1 - \Phi(\alpha Z_i') \left(\frac{X_i'\beta}{\sigma}\right)\right] + \sum_0 \ell_n \left[\Phi(\alpha Z_i') \frac{1}{\sigma} \phi \left(\frac{Y_i - X_i'\beta}{\sigma}\right)\right] \ldots\ldots\ldots\ldots\ldots\ldots \text{(vii)}$$

RESULTS AND DISCUSSION
Socio-Economic Characteristics of the Farmers
Age of Household Head
Table 1 presents the age distribution of the respondents; the result revealed that the mean age of the sampled respondents was 41.2 year. About 8.75% of the participants were less than

30 years old however, most (46.77%) were aged between 30 – 40 years. Also the age distributions of the non-participants follow the same trend, an average farmer among the non-participant falls within the range of 31-50 years. Age is hypothesized to assume a quadratic function in farming activities, most times, very young famers are considered immature to be able to undertake largescale farming, on the other hand, very old farmers (who might have out grown their economically active age) will find it difficult to undertake rigorous farming activities. Nnadi and Akwiwu (2008), Mohammad-Lawal, Omotesho and Falola, (2009) in similar studies found age to influence participation in youth in agricultural on-farm or off-farm activities. Based on the age distribution obtained in this study, it can be asserted that the rice farming population is economically active and agriculturally viable.

However, the role of age in explaining participation in agricultural projects is somewhat controversial in the literature. Older people are sometimes thought to be less amenable to change and hence reluctant to change their old ways of doing things. In this case, age would have a negative effect on participation. On the other hand, older people may have higher accumulated capital, more contacts with extension, better prefer by credit institutions, larger family sizes, etc all of which would make them more prepare to participate in a technology than younger ones. Whatever the condition, age is an important factor that would help explain participation in the new project.

Sex of Household Head

As presented in Table 2, the data revealed that for both participants and non-participants, males constitute more than 70% of the respondents implying that women constitute about 30% of the rice farming population. Gender of farmers often affects their decision to participate in projects. In the past, in most parts of the developing world including Nigeria, most extension workers are men and are usually biased towards men in their extension activities. In recent times however as the relative benefits to be gained in redirecting extension efforts by gender is been realized this bias has been corrected and women are involved in extension activities. Women play a significant role in agriculture especially widows.

Status of Educational of the Household Head

Table 2 shows the structure of education of the households head educational status. The study shows that a good number of the participants 48 (23.88%) and 88 (28.71%) had no formal education. Although, about 46% of the participants had primary and secondary education, only about 2.5% and 11.08 of the participants and non-participants respectively had tertiary education. Education is believed to increase the adoption or participation in innovative projects and new programmes. It is also believed to improve household per capita income. (Akwiwumi, 2008). Aikaeli (2010) posits that investment in education is income improving. It is measured as the number of years spent in formal schooling/education (in years). This assertion conforms to similar studies by Nnadi and Akwiwu (2008), Muhammad-Lawal *et al.,* (2009).

Household Size

Table 2 shows that the respondents have an average household size of about 10 individuals, about 105 (52.23%) of the participants have household sizes ranging between 5-10 persons. Forty seven 47 (22%) of the respondents had 11-15 family members. Families with larger household sizes are likely to have greater responsibilities of meeting the family's income and social needs but large families to a rice farmer may be considered an incentive because of labour requirement. Those with a household size of five or more members were considered to be large, while households of less than five members were considered small. This implies that for both participants and non-participants in the study area, more than 90% of the farming households were made up of large families. This is consistent with similar studies by Muhammad-Lawal *et al.* (2009), Aikaeli (2010).

Farming Experience of the Household Head

The result presented in table 1 revealed that the sampled farmers had an average of 16 years of farming experience. That majority (24.88%) of the participants in the project had over 20 years of farming experience, also about (42.79 %) of the participants had between 6-20 years of farming experience while majority of the non-participants (64.18 %) had over 20 years of farming experience. Furthermore, about 37% of the participants had acquired less than 10years of farming experience.

While farming experience helps a farmer to gain enough knowledge and expertise in undertaking certain farming activities, it takes quite a long period of farming to be able to gather this experience. Changes in climatic and weather conditions such as rainfall and temperature patterns take several years (sometimes up to thirty years) to occur. In this regard, very experience farmers are assumed to be above thirty-five (35) years of age. Invariably, the effect of long years of experience in farming or main decision making is that with increased farming experience, farmers are generally better able to assess the relevance of new projects and programmes. This ultimately informs their decision to participate or not as they their interactions with their neighbors and the outside world. Also, experienced farmers, tend to be better placed in a position to accumulate skills needed for use in new innovation and project compared with the younger ones. Also farmers who have acquired some knowledge in school put this knowledge into practice when they go into farming. Hence the effect of farm experience will depend on the individual farmer and the kind of knowledge and experience he/she has acquired over the years.

Rice Farming Experience of Household Head

Table 2 presents the distributions of the sampled farmers according to their years of experience in farming. The data shows that the respondents have a mean of about 9.5 years of

rice farming experience. About (50.7 %) of the participants in the project had between 6-10 years of rice farming experience, this constitutes about 102 participants. About 42.97% of the non-participants had been into rice farming for about 6-10 years. The study also revealed that more than 60 % of the non-participants had more than 6 years of rice farming experience. This can be considered as advantage to the respondents in terms of having prerequisite knowledge in farming. It is important to note that long years of general farming experience is not the same as experience acquired through the years in rice farming. While farming experience helps a farmer to gain enough knowledge and expertise in undertaking certain farming activities, it takes quite a long period of farming to gather this experience'' However, when a respondent has been involved in cropping rice year in year out over a long period of time, this could add to his understanding ability when introduced to new programmes that has to do with rice farming.

Table 2: Distribution of Respondents According to Socio-economic Characteristics

Variables	Participants Frequency	Percentage (%)	Non-Participants Frequency	Percentage (%)
Age				
< 30	18	8.75	41	11.08
30-50	94	46.77	182	49.19
41-50	69	34.33	106	28.65
> 51	20	9.95	41	11.08
Mean	41.9		40.5	
Gender				
Male	155	77.11	289	78.10
Female	46	22.89	81	21.89
Level of Education				
No formal Education	48	23.88	88	28.71
Quranic	54	26	91	24.59
Primary	61	30.34	84	22.27
Secondary	28	13.93	66	17.85
Tatiary	10	2.48	41	11.08
Family Size				
< 5	20	9.95	84	22.70
5-10	105	52.23	188	50.81
11-15	46	22.88	56	15.13
> 16	30	14.93	42	11.35
Mean	10		9	
Farming Experience				
< 5	41	20.40	16	4.32
6-10	33	16.42	79	21.35
11-15	43	21.39	59	15.96
16-20	43	21.39	87	23.51
>21	50	24.88	129	34.86
Mean	15		17	
Rice Farmexperience				
< 5	37	18.41	95	25.67
6-10	102	50.7	159	42.97
11-15	32	15.9	52	14.05
16-20	22	10.95	44	11.89
>21	8	3.98	20	5.45
Mean	9.6		9.5	
Total	**201**	**100**	**370**	**100**

Source: Field Survey, 2015

Factors Affecting Farmers' Participation in Rice Farming transformation Project and the Intensity of Use of package of Practices.

The parameter estimates of the models employed to identify the factors influencing farmers' participation in decision for the project are presented in Table 4.2. The likelihood ratio test statistics suggest the statistical significance of the fitted regression. Results of the analyses also indicate that rate of participation and intensity of use of package of practices were influenced by different factors which includes farm size, gender, level of education, household size, ownership of assets such as radio/ television sets and phones. Other variables includes, ownership of Oxen/bull, extension contacts and market distance.

Farm size

Farm size influenced positively the probability of participation in the project at 5%probability also; it positively influenced the intensity of using of package of practices at 5% probability level. This implies that farm size is an indicator of wealth and a proxy for social status and influence within the study area. The result is similar with the finding of Teklewold *et al* (2006).

Age

Age of the farm household head was positively related to the probability of participating in Agricultural transformation project at 10 percent probability level. The justification for this is that older farmers might have gained knowledge. The result is consistent with the findings of Teklewold *et al* (2006) and Hassen (2013). The result indicates that as the age of the household increases head by one year, the probability of participation in agricultural transformation increases by 0.17%. Also the intensity of use of package of practice in the project increases by 2%.

Household Size.

Household size negatively influenced participation in agricultural transformation Aikaieli (2010) Determinants of rural income in Tanzania; An empirical approach research report project at 10 % probability level with a marginal effect of 1% implying that higher household size reduces participation by one percent. Furthermore, the intensity of participation is consequently reduced by 3% This finding may be explained by the fact that farmers with larger households may require more expenditure to keep their households hence little is probably left to try new programmes. The negatively and significant effect of household size on intensity of use might also be related more to the land allocated for other food crops to which the farmer is sure to keep food requirement of the household member than putting much resources into new programs.

Asset /Radio/Television/Phone

Ownership of asset such as radio, television, radio or phone positively influenced participation at 1% and the intensity of use of package of practice at 5% probability level with a marginal effect of about 12 and 16.1% t respectively. The probable reason for this finding is that, improved practices are information sensitive and hence the household with ready sources of information uses the technologies on their farm plots more than others. This result implies that an average respondents' decision to participate was greatly influenced by access to communication assets.

Own Livestock.

Livestock is considered as an asset that could be used either in the production process or in exchange. This variable was found to have impacted positively on the decision to participate in agricultural transformation program in the study area at 5% level of probability and with a marginal effect of 2%. This shows that ownership of Oxen/bulls in the study area increases the probability of participation by 2%. This is because these animals are not only used for traction purposes but also to transport the farm produce. Abay and Assefa (2004) found similar signs for other technologies in studies carried out in Ethiopia.

Agricultural Extension

Access to extension services had the expected positive (0.734) and significant at 5% level of probability participation decision in transformation programme probably due to access to information from the agents. Similar signs found for other technologies Teklewold *et al.,* (2006).Agricultural extension services are the major sources of information for farmers to be familiar with improved agricultural technologies. Farmers can get access to information about new technologies through contacting agricultural development project/programme agent (ADP).

Market Access

The coefficient (0.02) of distance to all weather roads and markets was significant at 1%, had the expected positive sign and was significant at 1% level for participation but not for intensity of use of package of practice. Access to market is one other important variable for the adoption of improved technologies. This is due to the fact that a relatively closer distance of farmers' home to the market enables and facilitates marketing of inputs and outputs. Proximity of farmers to all weather roads and markets are essential for timely input delivery and output disposal and results in less transport cost of inputs and outputs.

Table 3: Determinants of Farmers Participation decision and Intensity of Use.

	Decision to participate			Level of use of package of practices		
Variables	**Coeff**	**Robust std. Error**	**Marginal effect**	**Coeff**	**Robust Std. Error**	**Marginal effect.**
Constant	-0981	1.0132		3.43	6.34	
Farm size	0.71*	0.324	0.0668	4.70***	1.50	.76
Age	0.019	0.014	0.0017	0.03	0.065	0.02
Gender	0.386**	0.423	0.0440	0.03	0.07	0.01
Level of Education	0.018	0.039	0.0016	-0.15	0.76	-0.12
Household size	-0.166	0.219	-0.0169	-3.41***	0.86	-2.38
Communication Asset	0.127*	0.138	0.122	2.13**	0.68	1.61
Own oxen	0.19**	0.075	0.0203	-0.33	0.32	-0.42
Knowledge of improved variety	0.35	0.266	0.0336	0.61	2.56	4.02
Extension agent	0.734**	0.290	0.0772	3.22	2.52	2.29
Credit access	0.462	0.275	0.0617	-1.15	1.33	0.82
Seed recycle						
Experience seed exchange	-0.008	0.003	-0.0008	-0.01	0.02	0.003
Market distance	0.02***	0.012	.0.0662	-0.2	0.01	0.01
Fertilizer access	-0.011	0.005	-0.0012	-0.01	0.02	-0.008
Landowner	-0.001	0.05	-0.0001	.21	0.28	0.151
Chi square	53.56***					147.34***
Log-likelihood	-63					-52

*Source Field survey 2015. Significant *at 10%, probability level*

SUMMARY, CONCLUSION AND RECOMMENDATION.

The study assessed the Intensity of use of improved Technology among Rice Farming Participants of Agricultural Transformation Agenda (ATA) in Northern Nigeria. Primary data was obtained through the use of well-structured questionnaire administered to 571 rice based farming households. The data was analysed using descriptive statistics, inferential statistics, Craggs model, the socio-economic characteristics of the farmers revealed that, the average age of the sampled farmers was about 39.6years. The respondents (70%) were mostly males. About 48% of the respondents had no formal education. An average farmer in the study area has rice farm size of about (0.91ha) and (0.99ha) for participants and non-participants respectively. Over 50% participants have been cultivating rice for between 6-10 years respectively.

Furthermore, the study show that a number of socio-economic characteristics impacted positively on the farmer's decision to participate in the project. Farm size (0.71), asset ownership (0.127) impacted farmers decision positively at 10% level of significance. Sex (0.386), ownership of Oxen (0.19) and extension contact (0.734) influenced participation decision at 5% level. Also, level of education (0.018) and market distance (0.02) had positive effect on participation at 1% level. Furthermore, only farm size (4.70) and asset (2.13) jointly had positive significant effect on participation and level of use intensity. Although household size (2.13) has positive effect on participation, the effect on the use intensity was found to be negative at 5% level of probability. The study concludes that participant's decisions to participate and use intensities of the package of practices were influenced by socio-economic and institutional variables. Based on the empirical findings from this study, the following recommendations were made. Prompt information and farmers sensitization on developmental projects is very crucial to their participation and use of the package of practices; this was clearly shown by the statistical significance of the variables (assets such as radio, television and phones). It is therefore important to include proper information dissemination into agricultural projects.

Effort should also be made ensure that priorities be given to formidable marketing access and outlets for the produce of the participants. In other words, access to both the input and output markets are very important variables that facilitated the participants in the project. Incentives can also be given to the participants at the point of sales by buying up their products during gluts when prices are low as a measure to stabilize market prices so as to keep farmers in production. Such projects should give more attention to well organized extension visits for the participants.

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