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Adoption Of Modern Farming Technology And Poverty Reduction In Nigeria: A Case Of Cooperative Societies In Kano State, Nigeria

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Abstract: ***This study examines the effect of adoption of modern farming technology on poverty reduction among members of farmers' cooperative societies in Kano State Nigeria. A cross-sectional survey research design was adopted. Primary data collection method was used in which self-administered questionnaires were distributed to a total sample of 217 respondents selected from the target population of 498 members of farmers' multi-purpose cooperative societies. Pearson correlation and binary logistic regression model were used to determine the effect of adoption of modern farming technology on poverty reduction among the respondents. The mean per capita expenditure was used as a dependent variable, while adoption of modern farming technology as the independent variable.***

The findings indicated that female were more affected by poverty than their male counterparts. Gender was not a significant factor that determined poverty level in this research. Young and middle age were the majority of the respondents and these age groups were more affected by poverty. Age was found as a significant factor that determined poverty level in this research. Majority of the respondents had household size of 7 to above 12, and the respondents with large family size were more affected by poverty than those with small ones. The household size was found as a significant factor that determined poverty level in this research. Majority of the respondents had low educational qualifications, and the respondents with low educational qualifications were more affected by poverty than those with higher educational qualifications. The educational qualification was found as a significant factor that determined poverty level in this research.

The study found that majority of the members of farmers' cooperative societies in this research reported the technologies were not affordable to them, and they did not apply the technologies to their farming activities. Further analysis employing correlation and logistic regression showed that adoption of modern farming technology was not statistically significant factor in reducing poverty level among members of farmers' cooperative societies in this research. Hence, this study recommended that the modern farming technology should be affordable to many farmers so that their productivities increase in order to reduce their poverty level.

Keywords: adoption of modern farming technology, farmers' cooperative societies, poverty

I. INTRODUCTION

This study examines the effect of adoption of modern farming technology on poverty reduction among members of farmers' cooperative societies in Kano State Nigeria. The adoption of modern farming technology is one the objectives of Farmers Empowerment Programme (FEP) which was designed and implemented under National Poverty Eradication Programme (NAPEP) in 2007 with the sole purpose and mandate of fighting or alleviating poverty levels among

members of farmers' cooperative societies in Kano State, Nigeria.

Alleviating poverty among poor farmers and improving their welfare will require increased efforts to provide yield enhancing and natural resources conserving technologies. Modern agricultural technologies include the use of fertilizer, improved seeds, pesticides, crop rotation, small scale irrigation systems to decrease dependency on weather, and soil conservation practices to ease soil loss. These technologies, when completely implemented would lead to sustainable yield growth and are considered to have the potential to decrease long term poverty (Minten, and Barrett, 2008; Mendola, 2007).

Achieving agricultural productivity growth is one of the possible reasons for developing and disseminating yield-increasing technologies because it is no longer possible to meet the needs of increasing numbers of people by expanding areas under cultivation. Agricultural research and technological improvements are therefore crucial to increase agricultural productivity and thereby reduce poverty and meet demands for food without irreversible degradation of the natural resource base (Asfaw, 2010).

Therefore in the light of the above situation, it was necessary to carry out this study in order to examine the effect of adoption of modern farming technology on poverty reduction among members of farmers' cooperative societies in Kano State Nigeria.

II. LITERATURE REVIEW

Several researchers (e.g. Babu, 2011; Kassa, Kassa, and Aregawi, 2014; Kassie, Shiferaw, and Muricho, 2010; Asfaw, 2010; Mendola, 2007; Santosh and Sukanya, 2015) have shown interest in studying the relationship between adoption of modern farming technologies and poverty reduction. Mendola (2007) adopted a non-experimental evaluation strategy in order to assess the direct contribution of modern-seed technology adoption to rural poverty in Bangladesh. Using a cross-sectional household survey, he established the causal effect of adopting high yielding varieties (HYVs) of rice on poverty alleviation by using the Propensity Score Matching (PSM) method. He found that adoption of HYVs of rice had a positive impact on farm household wellbeing and thereby produced also positive impact on poverty reduction.

Babu (2011) studied the determining factors to adopt package of technology among poor rural goat farming communities in Rajasthan State of India. In his study, he used sustainable livelihood framework and innovation diffusion theory for primary data analysis; the data were collected using questionnaires, focused group discussion and interview methods. He found that technology adoption (i.e. Vaccine, De-wormer, Diary Cattle feed, and use of Castrator) was influenced by socio-economic characters, resources (assets) and perception of technology. In socio-economic characters age, social group, education are the important factors that determined technology adaptation. It was also observed that older people adopted technology more than younger ones who mostly sought employment elsewhere. Upper social class adopted technology more than lower social class and more educated people adopted technology more than less educated people. He also established that resources or assets determined the adaptation of technology, those with large goat flock size, land ownership and available family's member of labour for goat grazing adopted technology more than those with less of these assets. On perception of technology adoption, he found that easy to handle, economic advantage and availability of local extension workers encouraged technology adaptation. Finally, he established that use of technology in goat farming had significant effect on poverty reduction among goat farming communities. Therefore, this study shows that technology adoption can boast productivity, income which in turn leads to poverty reduction among poor farmers but despite the importance of the technology adoption in moving people out of poverty large number of poor farmers cannot afford it and applied it in their farming activities. Hence, this is where the government, private individuals, donor agencies need to intervene to provide the technology at subsidized rate or provide credit at low interest rate so that poor farmer can afford to adopt these technologies in order to escape poverty shackle. The researcher seems to use simple descriptive analysis in the form of percentages and the study lacks rigorous analysis in the form inferential statistics.

Kassie, et al (2010) studied the impact of adopting improved groundnut varieties on crop income and rural poverty in rural Uganda, using cross-sectional farm household data collected in 2006 in seven districts. In their study, they used linear regression model and established that adoption of improved groundnut technologies had a significant positive impact on crop income and negative impact on poverty reduction. In another study conducted by Asfaw (2010) found similar finding. He evaluated the potential impact of adoption of modern agricultural technologies on rural household welfare measured by crop income and consumption expenditure in rural Ethiopia and Tanzania, using cross-sectional farm household data collected in 2007 from randomly selected sample of 1,313 households (700 in Ethiopia and 613 in Tanzania). He used regression model and established that adoption of improved agricultural technologies had a significant impact on crop income but the impact on consumption expenditure was mixed. This confirmed that there is potential direct role between technology adoption and improved rural household welfare which leads to higher incomes from improved technology which also translated into lower income poverty. Therefore, these studies indicate that there is negative relationship between technology adoption and poverty reduction which means that the more the poor farmers use or adopt modern technologies the fewer tendencies they have to fall into poverty.

Kassa, et al (2014) identified the determinants of agricultural technology adoption decision and examined the impact of adoption on farm income in Ethiopia, using probit and Ordinary Least Square (OLS) regression models and found that agricultural adoption decision of farm households had been determined by irrigation use, land ownership, credit access, distance to the nearest market, plot distance from home, off-farm participation and tropical livestock unit. They also found that agricultural technology adoption had a positive and significant effect on farm income and negative effect on

poverty reduction by which adopters were better-off than non-adopters. While, Santosh and Sukanya (2015) examined the causal effect of adoption of agricultural related technologies on consumption expenditure and poverty, using cross-sectional household level data collected in 2014 from a sample of 270 households in rural India. They established that agricultural related technologies adoption had a positive and significant impact on consumption expenditure and positive impact on poverty reduction.

Minten and Berrett (2008) study in Madagascar also drew similar conclusion of adopting of intensifying improved technologies which was strongly associated with better agricultural yields and poverty reduction. Karanja, Renkow, and Crawford, (2003) showed that maize technology adoption in high agricultural potential regions of Kenya was likely to have substantially greater positive impact on aggregate real income, but may have a less-than-positive influence on income distributional outcomes, compared to technology adoption in low agricultural potential regions. Becerril and Abdulai (2010) also used Propensity Score Matching (PSM) to analyze the impact of the adoption of improved maize varieties on household income and poverty reduction, using cross-sectional data of 325 farmers in Mexico. Their findings revealed a robust positive and significant impact of improved maize variety adoption on farm household welfare measured by per capita expenditure and poverty reduction. The adoption of improved maize varieties helped in raising the household per capita expenditure thereby reducing their probability of falling below the poverty line.

III. RESEARCH METHODOLOGY

This study adopted a cross-sectional research design because necessary information about the effect of adoption of modern farming technology on poverty reduction among different members of farmers' multi-purpose cooperative societies was gathered through the use of self-administered questionnaire and interview at a go. This choice of the research design is supported by the statement of Sekaran (2003) that when a researcher is faced with a situation where he/she will gather data just once from a cross-section of different respondents for the purpose of answering research questions the appropriate research design for him/her is cross-sectional research design. On the other hand, Amin (2005) contended that a cross-sectional survey is the most commonly used research method in social science research. The cross-sectional research design required one to use a number of data collection methods and collect information from a cross-section of respondents (Sekaran, 2003). This study also employed a mixed methodology approach which involves using quantitative and qualitative approach.

STUDY POPULATION

The target population of this study consists of 498 members of 18 different farmers' multi-purpose cooperative societies. Sampling strategies used in this study was random sampling technique and specifically stratified random sampling technique was chosen because the cooperative societies were heterogeneous in their productive activities (Amin, 2005; Bogere and Gesa, 2015; Kothari and Garg, 2014; and Odiya, 2009).

SAMPLE SIZE DETERMINATION

217 sample size was selected from the target population of 498 using Krecie and Morgan (1967)'s formula as can be seen below;

$$s = \frac{x^2 Np(1-p)}{d^2(N-1)+x^2 p(1-p)}$$

$$= \frac{3.841 \times 498 \times 0.50(1-0.50)}{(0.05)^2(498-1)+3.841 \times 0.50(1-0.50)}$$

$$= 217$$

SAMPLE SIZE DISTRIBUTION

For proper distribution of these 217 sample size the proportional stratified random sampling technique was used under which the sizes of the samples from the different strata were kept proportional to the sizes of the strata (Kothari and Garg, 2014). This can be shown in table 1 below;

S/N	Stratified Cooperative Societies	Population	Sample Size
1	Crop Production Cooperative Societies	106	46
2	Agro-processing Cooperative Societies	173	75
3	Livestock Production Cooperative Societies	219	96
	TOTAL	**498**	**217**

Source: Researcher's calculation from NAPEP, 2007

Table 1: Allocation of 217 Sample Size to Three Different Strata

Table 1 shows how 217 sample sizes were distributed using proportional stratified random sampling formula to three different strata of farmers' multi-purpose cooperative societies.

DATA COLLECTION METHOD

This study used primary data collection method which involved survey/questionnaire and personal interview. The data collection instruments used in this study were questionnaire and interview guide.

VALIDITY OF THE RESEARCH INSTRUMENTS

It is observed that validity of the research instrument is concerned with the idea that research design fully addressed the research objectives. The validity of a research instrument is the degree to which the instrument actually measures or collects data on what it is really intended to measure (Kakinda-Mbaga, 1990). In this current study, the validity of the research instrument was established through a validity test using face validity, content validity and construct validity.

FACE VALIDITY

This is where the supervisors were provided with the draft of the research instrument (questionnaire) to check for its

validity. Face validity is important because it provides an idea about the validity of the instruments used (questionnaire). Therefore, the supervisors were provided with the draft of the questionnaire for their inputs. Hence their inputs were used to improve the instrument.

CONTENT VALIDITY

To ascertain the content validity, content validity index (CVI) was computed from the responses of 10 specialists or experts in the field of study in which they assessed the questionnaire items' suitability and relevance vis-à-vis to the objectives of the study. Therefore, these assessors or experts were asked to rate the validity of all the items on the questionnaire using the scale of: not relevant (NR) = 1; somewhat relevant (SR) = 2; quite relevant (QR) = 3; relevant (R) = 4; and very relevant (VR) = 5. The relevant and very relevant were summed up and divided by the sum of all items as can be seen using content validity index formula and the result was shown below;

$$CVI = \frac{Number\ of\ questions\ ticked\ relevant\ (R\ \&\ VR)}{Total\ number\ of\ questions}$$

= 0.9375

Therefore, comparing this result with the conventional research wisdom which requires that a credible research instrument should have validity score from 0.7 and above shows that the questionnaire items and the whole questionnaire is credible and valid for use in this research (Amin, 2005; Sekaran, 2003; Sullivan, 2001).

CONSTRUCT VALIDITY

The questionnaire was subjected to the factor analysis (Exploratory Factor Analysis, EFA) to determine its validity using construct validity (convergent) test. The convergent validity test was shown in table 2

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.687
Bartlett's Test of Sphericity	Approx. Chi-Square	545.868
	Df	6
	Sig.	.000

Source: primary data (2016)

Table 2: Convergent Validity Results of Adoption of Modern Farming Technology

The table 2 shows Exploratory Factor Analysis (EFA) results of the study variable (adoption of modern farming technology). The KMO value (0.687) shows that the variable was acceptable as it had a value greater than 0.5, the Bartlett's test of sphericity Sig. value was 0.000. The rule of thumb states that KMO should be greater or equal to 0.5 to show sample adequacy, while Bartlett's test of sphericity Sig. value should be less than 0.05 (Field, 2009). Based on this assumption it implies that the study sample was adequate enough to continue with factor analysis.

RELIABILITY OF THE RESEARCH INSTRUMENTS

The importance of research reliability calls for concern to ensure that the data collection instrument should be able to yield the same results when repeated tests are conducted on the same respondents under the same conditions (Koul, 2004). Therefore, the data obtained from the pilot study were subjected to reliability test through the use of the Cronbach's (1964) alpha ($\propto$) test so as to ascertain the internal consistency of the study variables or questionnaire items. Therefore, reliability tests using Cronbach alpha are shown on the table 3:

Cronbach Alpha	Number of items
0.886	8

Sources: Field Research, 2016

Table 3: Reliability Tests Results

The reliability test of the questionnaire items from the table 3 using Cronbach alpha test shows that adoption of modern farming technology scored 0.886; Classification on quality of Cronbach's Alpha value by George and Mallery (2003), state that value of 0.9 to 1 is excellent, between 0.8 and 0.899 is good, 0.7 to 0.799 is acceptable, 0.6 to 0.699 is questionable and 0.5 to 0.599 is poor, and below 0.5 as unacceptable. The result obtained from this analysis as depicted from table 3 shows that Cronbach's Alpha value was high, indicating a high reliability of the research instrument. Therefore, this implies that the questionnaire items and the whole questionnaire are reliable, credible and consistent for use in this research (Amin, 2005; Sekaran, 2003; Sullivan, 2001).

IV. FINDINGS PRESENTATION, INTERPRETATION AND DISCUSSION

In this section of the paper, findings, interpretation and discussion were all handled at the same time. First the cross-tabulation of demographic characteristics and poverty level of the respondents, the descriptive statistics and the factor structure (component metrics) of adoption of modern farming technology were presented and thereafter the correlation and regression of the study objective were presented.

A. CROSS TABULATION OF DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS AND POVERTY

The demographic characteristics of the respondents were cross-tabulated with poverty in order to examine their association with the poverty level among members of farmers' cooperative societies, and the results were as follows;

Gender	Count	Poverty Level		Total
		Non-poor	Poor	
Male	Count	60	118	**178**
	% within Gender	33.7%	66.3%	**100%**
Female	Count	9	26	**35**
	% within Gender	25.7%	74.3%	**100%**
Total	**Count**	**69**	**144**	**213**
	% within Gender	**32.4%**	**67.6%**	**100%**
	x^2 = 0.853, df = 1, Sig = 0.356			

Sources: Primary field data (2016)

Table 4: Cross-tabulation of Gender and poverty

Table 4 shows that majority of the female (74.3%) were affected by poverty compared to their male counterparts (66.3%). This study confirmed the feminization of poverty

among members of farmers' cooperative societies in this research. This finding is in agreement with authours like Dreze and Sen 1995; Buvinic and Gupta, 1997; Dunlop and Velkoff 1999; Senada and Sergio (2007); and Oyekale, Adepoju and Balogun (2012).

In many developing countries social and cultural motives restrict women's access to work and education, and hence women do not participate in labour market as freely as men do (Dreze and Sen 1995, Dunlop and Velkoff 1999) and thus, the female headed households regarded to be poor compared with male headed household. Several reasons are attributed to cause this situation. First, female headed households in general have more dependents and thus have higher non-workers to workers ratio compared to other households. Second, female heads typically work for lower wages and have less access to assets and productive resources compared to men owing to gender bias against women. Third, women typically bear the burden of household chores that result in time and mobility constraints compared to male-heads (Buvinic and Gupta, 1997).

However, the chi-square test showed that there was no significant relationship between gender and poverty (x^2 = 0.853, df = 1, Sig = 0.356). The implication is that gender is not a significant factor that contributed to the poverty level among members of farmers' cooperative societies in this research. This finding is in agreement with authours like Senada and Sergio (2007); Oyekale, Adepoju and Balogun (2012); and Makame and Mzee (2014) where they all found that gender was not a statistically significant factor in determining poverty level in their study areas.

Age Group	Count	Poverty Level Non-poor	Poor	Total
Young (20-39 Years)	Count	10	41	**51**
	% within Age Group	19.6%	80.4%	**100%**
Middle age (40-49 Years)	Count	38	79	**117**
	% within Age Group	32.5%	67.5%	**100%**
Old age (50 Years and above)	Count	21	24	**45**
	% within Age Group	46.7%	53.3%	**100%**
Total	**Count**	**69**	**144**	**213**
	% within Age Group	**32.4%**	**67.6%**	**100%**
x^2 = 7.993, df = 2, Sig = 0.018				

Sources: Primary field data (2016)

Table 5: Cross-tabulation of Age Group and poverty

Table 5 reveals that young (80.4%) and middle age (67.5%) respondents were more affected by poverty than the old (53.3%) respondents. However, the chi-square test showed that there was a significant relationship between age and poverty level (x^2 = 7.993, df = 2, Sig = 0.018) among members of farmers' cooperative societies in this study. This implies that the more members of farmers' cooperative societies increase age the less he/she is affected by poverty. This finding is also in relation to the findings of Achia, Wangombe, and Khadioli (2010).

Household Size	Count	Poverty Level Non-poor	Poor	Total
1-3	Count	11	14	**25**
	% within Household Size	44%	56%	**100%**
4-6	Count	14	21	**35**
	% within Household Size	40%	60%	**100%**
7-9	Count	16	31	**47**
	% within Household Size	34%	66%	**100%**
10-12	Count	14	36	**50**
	% within Household Size	28%	72%	**100%**
Above 12	Count	14	42	**56**
	% within Household Size	25%	75%	**100%**
Total	**Count**	**69**	**144**	**213**
	% within Household Size	**32.4%**	**67.6%**	**100%**
x^2 = 7.328, df = 4, Sig = 0.036				

Sources: Primary field data (2016)

Table 6: Cross-tabulation of Household Size and poverty

Table 6 shows that households with more members of 7 to above 12 were more affected by poverty than the households with small members 1 -3. This finding implies that the households with small members are less affected by poverty whereas the households with large members are more affected by poverty. This finding is in agreement with the findings of Achia, Wangombe, and Khadioli (2010); Abdul-Hakim, Ismail, and Abdul-Razak, (2010); and Makame and Mzee (2014).

The large family size which characterized with larger number of dependents against few bread earners, and also the increase of family size which is not in line with the increase of income that resulting in increasing the chance of the family entering into poverty status (Abdul-Hakim, et.al. 2010; and Makame and Mzee,2014).

However, the chi-square test showed that there was a significant relationship between household size and poverty level (x^2 = 7.328, df = 4, Sig = 0.036) among members of farmers' cooperative societies in this study. The implication of this is that the larger the number of the household size of members of farmers' cooperative societies the more likely they will be affected by poverty and vice versa. This finding is also in relation to the findings of Abdul-Hakim, et.al. 2010; and Makame and Mzee, 2014, where they found that household size had a positive effect on household being poor. For every one member increase in the household the probability of household being poor will increase,

Highest Educational Qualification	Count	Poverty Level Non-poor	Poor	Total
Informal Education	Count	11	42	**53**
	% within Highest Educational Qualification	20.8%	79.2%	**100%**
Primary Education	Count	7	20	**27**
	% within Highest Educational Qualification	25.9%	74.1%	**100%**

Secondary Education	Count	13	30	**43**
	% within Highest Educational Qualification	30.2%	69.8%	**100%**
OND/NCE	Count	20	38	**58**
	% within Highest Educational Qualification	34.5%	65.5%	**100%**
Degree/HND	Count	10	10	**20**
	% within Highest Educational Qualification	50%	50%	**100%**
Postgraduate	Count	8	4	**12**
	% within Highest Educational Qualification	66.7%	33.3%	**100%**
Total	**Count**	**69**	**144**	**213**
	% within Highest Educational Qualification	**32.4%**	**67.6%**	**100%**

x^2 = 13.268, df = 5, Sig = 0.021

Sources: Primary field data (2016)

Table 7: Cross-tabulation of Educational Qualification and poverty

Table 7 reveals that majority of the respondents with lower educational qualifications (informal 79.2%, primary 74.1%, etc) were more affected by poverty than those with higher educational qualifications (Degree 50%, Postgraduate 33.3%). This finding implies that the higher the educational qualification of the members of farmers' cooperative societies the less their chances of being affected by poverty. This finding concurs with Achia, Wangombe, and Khadioli, 2010; Geda et al., 2005; Maitra, 2002; Makame and Mzee 2014 where they all found that the likelihood of being poor is decreased when house head attained higher education. This implies that, education is the important factors in reducing the impact of poverty among members of farmers' cooperative societies in this study.

However, the chi-square test showed that there was a significant relationship between educational qualification and poverty level (x^2 = 13.268, df = 5, Sig = 0.021) among members of farmers' cooperative societies in this study. The implication of this is that higher the educational qualification significantly reduces poverty level among the members of farmers' cooperative societies in this research and vice versa. This finding is also in relation to the findings of Achia, Wangombe, and Khadioli, 2010; Geda et al., 2005; Maitra, 2002; Makame and Mzee 2014 where they all established that education was statistically related to the poverty reduction. For example, Geda et al., (2005) established that poverty was strongly associated with the level of education; Maitra (2002) also found that that the education attainment of the household head had a significant impact in poverty status and standard of living of the household; and Achia, Wangombe, and Khadioli, (2010) further showed that increases in educational attainment had an important impact on reducing the probability that a household would be poor.

DESCRIPTIVE STATISTICS OF THE ADOPTION OF MODERN FARMING TECHNOLOGY

Descriptive statistics describe the characteristics of the study variables and the relationship that exist between adoption of modern farming technology and poverty reduction.

	Mean	S.D	Analysis N
We have received modern farming technology from Farmers Empowerment Programme.	3.1315	1.41808	213
The modern farming technologies are compatible with my farming activities.	3.1831	1.40729	213
We were involved in the design, development or purchase of the technology.	3.1362	1.45539	213
The technologies we have received are also available to many farmers to put into use.	3.0986	1.45195	213
I can afford the modern farming technology provided by the Farmers Empowerment Programme.	2.3186	0.53888	213
The application of modern farming technology i have received has improved my farming productivity.	2.5469	0.84975	213
The application of modern farming technology i have received has increased my income.	2.4099	0.63145	213
The modern farming technology i have received has impacted on/influenced my livelihood.	2.4862	0.86837	213

Source: primary field data (2016)

Table 8: Descriptive Statistics of the Adoption of Modern Farming Technology

Table 8 shows that members of farmers' cooperative societies in this study reported that on average (mean = 3.1315) they had received modern farming technology from Farmers Empowerment Programme. This implies that modern farming technology was made available to the members of farmers' cooperative societies in this study. The Table 8 further depicts that members of farmers' cooperative societies in this study agreed that on average (mean = 3.1831) the modern farming technologies were compatible with their farming activities. This means that most of the modern farming technologies that were available to the members of farmers' cooperative societies in this study were also compatible with their farming activities.

Additionally table 8 reveals that members of farmers' cooperative societies in this study reported that on average (mean = 3.1362) they were involved in the design, development or purchase of the technology. This clearly indicated that the opinion and interest of members of farmers' cooperative societies with regard to the type of modern farming technologies, design, or development of the technology were sought in this study. The table 8 also indicates that the members of farmers' cooperative societies in this study agreed that on average (mean = 3.0986) the

technologies they had received were also available to many farmers to put into use. Finally, table 8 reveals that members of farmers' cooperative societies in this study reported that their ability to purchase the technologies was low (mean = 2.3186) because the technologies were very expensive, the respondents reported that the improvement of their farming productivities as a result of applying the technologies was low (mean = 2.5469), the respondents also reported that the increment of their income as a result of applying the technologies was low (mean = 2.4099), and the respondents further reported that the influenced of the technologies on their livelihoods was low (mean = 2.4862).

COMPONENT MATRIX AND VARIANCE EXPLAINED OF THE ADOPTION OF MODERN FARMING TECHNOLOGY

An analysis of component matrix and variance explained were carried out in order to determine what constitute the items of adoption of modern farming technology. Therefore, the data was factor analysed using the principal component method with varimax rotation to determine whether the items created to measure the variable were representative of the variable. According to Steven (2009), a factor loading level of 0.5 is regarded as significant and also according to the Keiser criterion items with Eigen values larger than one should be selected (Field, 2009). The results are depicted in table 9:

	Component(Modern Farming Technology)
The modern farming technologies are compatible with my farming activities.	.900
We were involved in the design, development or purchase of the technology.	.887
We have received modern farming technology from Farmers Empowerment Programme.	.846
The technologies we have received are also available to many farmers to put into use.	.725
Eigenvalues	**2.838**
% of Variance	**70.953**
Cumulative %	**70.953**

Extraction Method: Principal Component Analysis; a. 1 components extracted,
Source: primary field data (2016)

Table 9: Component Matrix and Variance Explained of Adoption of Modern Farming Technology

The results of table 9 shows that adoption modern farming technologies being compatible with poor farmers' activities, involvement of cooperative societies in the design, development or purchase of the technology, receiving modern farming technology, and availability of the technologies to other farmers accounted for 70.95% variation in adoption of modern farming technologies. Furthermore, the results indicate that all the items had Eigen values of greater than one, implying that they should be accepted. The results also reveal that all the items were significant as they all had a factor loading values of more than 0.5 ranging; 0.900, 0.887, 0.846, and 0.725. This signified that the validity was by convergent.

RELATIONSHIP BETWEEN ADOPTION OF MODERN FARMING TECHNOLOGY AND POVERTY REDUCTION

In this section, the analysis of relationship between adoption of modern farming technology and poverty reduction was undertaken in order to establish how the adoption of modern farming technology affect poverty level among the respondents. Pearson correlation was first executed to determine their relationship and thereafter the binary logistic regression was also performed to find out by what percentage the adoption of modern farming technology has contributed to the alleviation of poverty level among members of farmers cooperative societies in this research. This was intended to provide support or otherwise of the null hypothesis which states that "adoption of modern farming technology does not have significant relationship to poverty level among members of farmers' multi-purpose cooperative societies in Kano State, Nigeria".

As indicated, the hypothesis was first tested using bivariate correlation which yielded the results that proved the existence of negative insignificant relationship between adoption of modern farming technology and poverty reduction among members of farmers' cooperative societies in the study [r(213) = -0.038, p = 0.577] it is easy to understand that adoption of modern farming technology is a factor that did not influence poverty reduction among members of farmers' cooperative societies in this study. The relationship implies that adoption of modern farming technology was very insignificant in reducing or alleviating poverty level among members of farmers' cooperative societies in Kano State, Nigeria.

Furthermore, to get more details or general picture on the overall influence of adoption of adoption modern farming technology on poverty reduction among members of farmers' cooperative societies in this research the binary logistic regression was performed.

		B	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**95.0% C.I. for EXP(B)**	
								Lower	**Upper**
Step 1[a]	**Modern Farming Technology**	-.103	.183	.315	1	.575	.902	.630	1.292
	Constant	1.045	.572	3.339	1	.068	2.842		

a. Variable(s) entered on step 1: Modern Farming Technology.

Source: primary field data (2016)

Table 10: Logistic Regression Results for Adoption of Modern Farming Technology and Poverty

The results of logistic regression on table 10 further reveals that adoption of modern farming technology was statistically insignificant (beta = -0.103, p = 0.575) in reducing poverty level among members of farmers' cooperative societies in this research. The results also showed that increasing adoption of modern farming technology by 1 unit, the probability or likelihood of members of farmers' cooperative societies falling into poverty or being affected by poverty decreased by only 0.103. The results further shows that increasing adoption of modern farming technology by 1

unit the odd ratio or probability of the poverty levels among members of farmers' cooperative societies will be reduced by 0.902 time.

It is therefore, clearly shown that based on this finding the null hypothesis (H^1_O) which states that; "adoption of modern farming technology does not have significant relationship to poverty level among members of farmers' multi-purpose cooperative societies in Kano State, Nigeria" was accepted and the alternate hypothesis (H^2_O) which states that; "adoption of modern farming technology have significant relationship to poverty level among members of farmers' multi-purpose cooperative societies in Kano State, Nigeria", was rejected.

Therefore, this finding is in relation to Santosh and Sukanya, (2015) who evidenced that quantifying the causal effect of technology adoption could be quite complex. Technology adoption was constrained by lack of development of market infrastructure, information asymmetry and lack of funds and it had insignificant impart on poverty reduction. On the other hands, the finding is in disagreement with Babu, 2011; Kassa, Kassa, and Aregawi, 2014; Kassie, Shiferaw, and Muricho, 2010; Asfaw, 2010; and Mendola, 2007. Kassie, et al (2010) established that adoption of improved groundnut technologies had a significant and negative impact on poverty reduction. Becerril and Abdulai (2010) established that agricultural related technologies adoption had a positive and significant impact on consumption expenditure and negative impact on poverty reduction. The adoption of modern farming technology in this research was found to be insignificant factor towards poverty reduction among members of farmers' cooperative societies because majority of the members of farmers' cooperative societies stated that the technology was not affordable to them, and they not apply the technologies to their farming activities.

V. CONCLUSION

This chapter aimed at examining the effect of adoption of modern farming technology on poverty level among members of farmers' multi-purpose cooperative societies in Kano State, Nigeria. The study found that majority of the members of farmers' cooperative societies in this research reported the technologies were not affordable to them, and they did not apply the technologies to their farming activities. Further analysis employing correlation and logistic regression showed that adoption of modern farming technology was not statistically significant factor in reducing poverty level among members of farmers' cooperative societies in this research.

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