
EFFECTS OF INNOVATIVE FARMING TECHNIQUES ON FARMERS' LIVELIHOODS IN RURAL COMMUNITIES IN JIGAWA STATE, NIGERIA

Adamu BULAMA

ABSTRACT

Agriculture plays a crucial role in the socio-economic development of many nations and it remains a major source of rural livelihoods. About 80% of the rural population in Jigawa State engage in subsistent farming using traditional mode of production. Innovative farming techniques were then introduced to the farmers in the State through agricultural development programmes for increased crop production and livelihood improvement of farmers. The study was designed to analyze the effect of the innovative farming techniques on livelihood improvement of farmers in Jigawa State, Nigeria. The specific objectives were to: characterize the major sources of farmers' livelihoods; examine the sources of innovative farming techniques; describe the innovative farming techniques; examine the factors influencing the adoption of the innovative farming techniques among farmers; assess the effect of the innovative farming techniques on farmers' livelihoods and describe the major constraints of adopting innovative farming techniques among farmers in the study area. Spatially, the study covered four Local Government Areas (LGAs) of Buji, Taura, Gwiwa and Auyo in two communities from each LGA. Multi-stage sampling procedure involving purposive and systematic random sampling techniques, were employed in selecting 405 farmers for questionnaire administration and 40 for interviews. Descriptive and inferential analytical tools were used to analyzed data from questionnaire while responses from interviews were analyzed using thematic analytical approach. Logistic regression was used to determine the influence of socio-economic characteristics of farmers and adoption of innovative farming techniques while Pearson's Product Moment Correlation Coefficient was performed to correlate innovative farming with improved livelihood of farmers in the study area. About 74% of the respondents were males and 26% females. The findings of the study confirmed that about 73% of the respondents relied on farming as a major source of livelihood; 13 sources of information on innovative farming techniques identified, radio ranked 1st with about 75% of the respondents relying on for information on innovative farming; 41 innovative farming techniques grouped into 9 categories namely crop planting, land preparation, storage, Soil and water conservation, weeds control, fertilizer application, soil fertility improvement, crop management and harvesting techniques. 12 factors identified influencing farmers decision of innovative farming viz Sex, age, marital status level of education, household size, years of farming experience, membership of farmers' unions, level of income, affordability, simplicity and compatibility of the techniques as well as frequency of farmers' contact with agricultural extension agents. 14 key constraints were identified hindering farmers adoption of innovative farming techniques. Lack of adequate rain-fall and excessive cost of inputs seed and fertilizers were identified as the major constraints. The study recommended that adequate number of agricultural extension workers should be recruited and assigned to work with rural farmers with proper monitoring; relevant radio programmes should be sponsored to include call-in where farmers would be interacting with agricultural experts live.

Also, Jigawa State Government should create encourage active participation of private investors in agriculture to support farmers with agricultural loans.

Key Words: Socio-economic development, Innovative farming techniques, livelihood improvement

INTRODUCTION

Agriculture plays a crucial role in the socio-economic development of many nations and it remains a major source of rural livelihoods. Affirming this position, Shitu, Kamara, Mbavai and Ndaghu (2014), pointed out that agriculture is an important livelihood of rural communities in the Sudan-Savannah of West Africa. Apart from being the source of food for the people, agriculture has in the past been an important provider of resources for investments in other sectors of the economy.

Bakare (2013) and Anyanwuocha (2006) stated that agriculture employs 80% of rural labour in Nigeria with a significant proportion of the farmers using traditional mode of farming which according to Ajeigbe, Mohammed, Adeosun, and Ihedioha (2010), results low yields. To achieve greater productivity among farmers, several innovative farming strategies were introduced to farmers through Agricultural Development Projects (ADPs) across the nation. Following these efforts, Nigeria has witnessed Agricultural improvements in the recent years. According to the National Agricultural Extension and Liaison Services (NAERLS) (2013) there was a remarkable improvement in the annual production of rice, maize, yam, cowpea, millet, soybean, benniseed/sesame, ginger, cocoyam and cotton in 2014, compared to what was produced in 2013. Therefore, innovative farming techniques are vital to promoting agricultural productivity.

To increase farmers' productivity across the State, Jigawa State Government has through its ministries, departments and agencies (MDAs) implemented Agricultural development interventions. Notably among them were the Fadama I, II, III and III (Additional Funding, the Community-based Agriculture and Rural Development Programme (CBARDP) and Climate Adaptation and Agri-business Project (CAAP). Innovative farming techniques right from land preparation, crops planting and management to harvesting and storage were introduced to the farmers through the ADPs (JARDA, 2015).

Agricultural Development Programmes (ADPs) in Jigawa State were coordinated by the Jigawa State Agriculture and Rural Development Agency (JARDA). With its headquarters at Dutse, JARDA has four zonal offices in Birnin-Kudu, Hadejia, Kazaure and Ringim. According to NAERLS (2013), the JARDA worked with 20 Subject Matter Specialists (SMSs), 47 Block Extension Supervisors (BESs) and 376 Village Extension Agents (VEAs). The VEAs worked with an estimated number of 628,010 farm families (FF) and 3200 cooperative societies to ensure that the Agricultural development programmes are properly implemented (NAERLS, 2013 and JARDA, 2015)

Statement of the Problem

In 2000, the Jigawa State Government commissioned a fact-finding mission which involved experts from the Tennessee Valley Authority (TVA) to recommend a development framework for the State. The commission came up with a development roadmap comprising of short and long-term development plans. Following this development, two major agricultural development

interventions namely Community Based Agriculture and Rural Development Project (CBARDP) and Fadama projects (I, II and III) were implemented in in Jigawa State from 2014 to 2016 and 2003 to 2016 respectively. Fadama III-AF (Additional Funding) is ongoing building on the successes and lessons of Fadama II. The programmes coordinated by the JARDA were aimed at improving food security and rural livelihood in Jigawa State through the promotion of best farming practices among farmers (Fadama Development Project, 2003; Adegbite, Adubi, Oyekunle and Sobanke 2008).

The projects targeted to improve rural livelihoods through a planned Agricultural extension delivery to farmers (Illo, Usman, Ango and Aliyu, 2015). Farmers receive both inputs and skills support in which they interact with experts to acquire best farming practices. It is therefore pertinent to understand the level of farmers' adoption of the farming skills introduced to them through the agricultural development projects (ADPs) and establish the effect of the adoption on crop production and farmers' livelihood.

Given the fact that many farmers' in Jigawa State have participated in Community-based Agricultural development Programme and Fadama Projects, much about effect of rural farmers' participation in agricultural development programmes is not fully explored. Thus, creating a gap in knowledge which this study intends to fill. To achieve these, the study seeks to answer the following research questions:

1. What are the major sources of farmers' livelihoods?
2. What are the sources of innovative farming techniques in the study area?
3. What are the innovative farming techniques adopted by farmers in the study area?
4. What are the factors influencing adoption of innovative farming techniques among farmers in the study area?
5. What is the effect of the innovative farming techniques on farmers' livelihoods in the study area?
6. What are the major constraints of adopting innovative farming techniques among farmers in the study area

Aim and Objectives of the Study

The aim of this study is to analyze effect of innovative farming techniques adoption among farmers on crop production and the livelihoods of rural communities in Jigawa state. The objectives of the study are to:

- i. characterize the major sources of farmers' livelihoods; in the study area
- ii. examine the sources of innovative farming techniques in the study area;
- iii. describe the innovative farming techniques adopted by farmers in the study area;
- iv. examine the factors influencing the adoption of the innovative farming techniques among farmers in the study area;
- v. assess the effect of the innovative farming techniques on farmers' livelihoods in the study area;
- vi. describe the major constraints of adopting innovative farming techniques among farmers in the study area.

Scope of the Study

The study covered four Local Government Areas (LGAs) in Jigawa State which were Buji, Taura, Gwiwa and Auyo. Eight communities were covered in the four LGAs which were Chakwama and Jaji-koli in Buji LGA; Bardo and Nahuce in Taura LGA; Buntusu and Guntai in

Gwiwa LGA and Auyakayi and Gamafoiin Auyo LGA. The selection of the four LGAs and the eight communities was guided by their active involvement in the ADPs in which innovative farming techniques were introduced to farmers (JARDA, 2015).

The content scope covers the information regarding the farmers' socio-economic characteristics, major sources from which they make livelihoods, major types of innovative farming techniques farmers are aware of and adopted, key factors influencing farmers' adoption decision of innovative farming techniques, benefits of adopting innovative farming technique in terms of increased crop productivity and their livelihoods. Temporally, the study covers 2013 and 2016 farming seasons. The selection of this period was guided by the completion of the first phase of the IFAD-CBARDP and Fadama III, commencement of Fadama-Additional Funding (AF) Project. Other activities include the commencement of fadama-Additional Funding (AF) Project and implementation of Climate Adaptation and Agri-busines Project (CAAP). Three years after the implementation of the programmes is enough to assess their effect of crop production and livelihood improvement of farmers in the study area.

LITERATURE EVIEW

Overview of agricultural development programmes in Jigawa State

Jigawa State is one of the states in Nigeria endowed with Agricultural potential (Kaugama and Ahmed, 2014). According to the Jigawa State Ministry of Agriculture (2013), out of the total land area of 2.24 million hectares of the State, about 1.6 million hectares are used for farming during wet seasons while about 308,000 hectares of the land mass used for irrigated farming. Kaugama and Ahmed (2014) further asserted that Jigawa State has high potentials for Agricultural production for household consumption, commerce and industrial use. Majority of the people in rural areas depend heavily on agro-related activities such as crops production, processing and marketing for their livelihood (Bulama, 2013). Jigawa State is agrarian as more than 90% of the working adults engage in small scale Agriculture and agro related activities as a means of livelihood (Usman 2009).

Rural livelihood of Jigawa State

The major rural livelihood activities in Jigawa State are crop production and animal husbandry. Majority of the famers in the State depend on rain-fed farming while a few engage in irrigation farming during dry season. In 2013, an estimated annual output of 635,800 metric tons of millet, maize, sorghum and rice was achieved in Jigawa State. Livestock farming of cattle and small ruminants is also found across rural areas of the State, and poultry farming is rapidly increasing. Popular livestock species in the state include goats, sheep, poultry and cattle with estimated populations of 2.3 million, 1.8 million, 4.2 million and 1.1 million respectively (Jigawa State Government, 2009). Traditional crops production and animal breeding are still practiced in the Jigawa State, despite the numerous Agricultural interventions implemented (NAERLS, 2012).

Agricultural development programmes and policies

In 2000, the Jigawa State Government commissioned a fact-finding mission of Tennessee Valley Authority (TVA) which prescribed a holistic approach to the State development, with emphasis on rural livelihood improvement. Following the recommendations of the TVA, a number of long-term development plans, strategies and projects were introduced and implemented in Jigawa State. These included the Jigawa State Economic Empowerment Development Strategy (JISEEDS) lunched in 2001; The Community Based Agriculture and Rural Development Project

(CBARDP) implemented with support from the International Fund for Agricultural Development (IFAD) implemented from 2003 to 2016; the Fadama projects (I, II and III) of the World Bank, 2014-2016 Medium Term Sector Strategy (MTSS) developed in 2013 and the recently introduced Climate Adaptation and Agri-business Project. The interventions coordinated by the JARDA, were all aimed at improving food security and rural livelihood in Jigawa State through the promotion of best farming practices among farmers and access to inputs (Fadama Development Project, (2003) and Adegbite, Adubi, Oyekunle and Sobanke 2008).

Implementation of Community-based agriculture and rural development (BBARDP) and Fadama projects in Jigawa State

The Community-based Agricultural and Rural Development Project was implemented in many states in Nigeria with funding support from the International Fund for Agricultural Development (IFAD). The project was implemented in Borno, Jigawa, Katsina, Kebbi, Yobe, Sokoto and Zamfara, 69 local government area councils within the seven states covering 207 villages (Galadima, 2014). Agricultural extension services were the main tool used in the implementation of the project focusing mainly on improving agricultural production, improving living standard of the rural people and enhancing livelihood and rural development. The major stakeholders of CBARDP were farmers, rural economic operators such as processors, marketers, rural agro-industrialists, farm managers and farm labour force. The project was implemented using participatory approach involving all the key stakeholders addressing major farmers' needs in terms of inputs and services (Farinde, 1995). with the aim of mobilizing resources to improve their social economic and cultural conditions (Yahaya, 2005).

Fadama projects on the other hand were implemented in phases viz Fadama I, II and Fadama III Additional Funding (AF). Fadama project was first implemented in the 1990s with funding support from the World bank which targeted to to promote simple and low-cost improved irrigation technology. After the evaluation of Fadama I, it was found that the success of the project was hampered by some issues in both design and implementation. Despite all the challenges, the Federal Government of Nigeria and some State Governments were impressed by the achievements of Fadama I and therefore sought for the continuity of the project in which the African development Bank agreed to extend a loan for the implementation of Fadama II and the subsequent extension to Fadama III which built on the gains and lessons of Fadama II.

Innovative farming techniques and farmers' livelihoods improvement

According to Chambers and Conway (1991), livelihood comprises people, their capabilities and their means of living which include their food, their sources of income and assets both tangible and non-tangible. The tangible assets include claims and access. A livelihood is considered environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend. A livelihood is socially sustainable if it copes with stress and shocks and provides for future generations. Livelihood refers to all means of making a living which include the various activities and resources that allow people to live.. Individuals perform various activities to gain and maintain their livelihoods. Akinwale (2010) noted that the nature of these livelihood activities depends on the availability of assets, resources labour, skills, education, social capital, seasonality and agro-climate or agro-ecology.

According to Kambewa (2010), over 29 technologies, including new varieties, management practices, and processing methods were made ready for transfer and 2910 farmers and 100 processors adopted them. Altogether, 4614 males and 2920 females were trained in aspects of

cassava production and processing. In total, 10,843 rural households, 8743 vulnerable households, 21 Agriculture- related firms, and 36 producer organizations, business associations, and community-based organizations (CBOs) directly benefited from the project’s interventions. On the impact of the intervention on the rural farmers’ livelihood improvement, it was revealed that most households owned farming tools, with about 99% and 55% of the farmers owned bicycles, 26% possessed additional farmland, 60% has enough food for the family.

METHODOLOGY

The study adopted a mixed approach comprising field survey, field observation and analysis of data from interviews. This is based on the pragmatists’ philosophical assumption/world view which according to Creswell (2012) cited in Sheheli (2013), arises out of actions, situations and consequences. The pragmatists’ philosophical assumption underpins mixed method researches using pluralistic approach to derive knowledge about a problem. The assumption implies that researchers can draw information both quantitatively and qualitatively when engaged in their researches.

In line with this assumption, the study was carried out using Convergent Parallel Mixed Method (CPMM) combining quantitative and qualitative data concurrently. According to Creswell (2012) cited in Sheheli (2013), the CPMM is a type of mixed methods design in which the researcher combines quantitative and qualitative data to provide a comprehensive analysis of the research problem. CPMM is therefore a method that focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. The method of data analysis used was mixed method involving both quantitative and qualitative data through descriptive and inferential analytical tools. The quantitative data from the questionnaire was analyzed using a combination of descriptive and inferential statistics while the qualitative data collected through interviews was analyzed using thematic analytical approach. Objectives 1,2 and 3 were descriptively analyzed using frequency counting and percentages while objectives 4, 5 and 6 were inferentially analyzed using Logistic regression (LR) model, t-test and Pearson Product Moment Correlation Co-efficient (PPMCC).

RESULTS AND DISCUSSION

Major sources of farmers’ livelihoods in the study area

Table 4.2 presents respondents’ sources of livelihoods by their ages, size of household and by LGAs. Five sources of livelihoods were identified among the respondents viz farming (73%), trading (10.7%), civil service (4.3%), craftsmanship (9.7%) and a few unclassified activities categorized as others representing 2.3%. The unclassified activities included among others groundnut oil extraction and driving commercial vehicles and motorcycles.

Table 4.2: Major sources of respondents’ livelihoods

Selected Variables	Major Livelihood Sources	Frequency (%)	Ranking
Major sources of livelihoods	Farming	287(73.0)	1 st
	Trading	42(10.7)	2 nd
	Civil service	17(4.3)	3 rd

	Artisans		38(9.7)		4 th	
	Others		9(2.3)		5 th	
Livelihoods by age	15-24 Years	25-34 Years	35-44 Years	45-54 Years	55-64 Years	65 and Above Years
Farming	24 (61.5)	29 (61.7)	79 (56.8)	31 (47.7)	31(50.8)	23 (54.8)
Trading	9 (23.1)	8 (17.0)	32 (23.0)	19 (29.2)	15(24.6)	9 (21.4)
Civil service	2 (5.1)	4 (8.5)	9 (6.5)	2 (3.1)	3 (4.9)	3 (7.1)
Artisans	4 (10.3)	6 (12.8)	19 (13.7)	13 (20.0)	12(19.7)	7 (16.7)
Livelihood by household size	1-2 Persons	3-5 Persons	6-10 Persons	11 and above Persons		
Farming	43(52.4)	148 (55.6)	19 (51.4)	6 (75)		
Trading	9(11)	56 (21.4)	6 (16.2)	1 (12.5)		
Civil service	5(6.1)	14 (5.3)	4 (10.8)	0 (0.0)		
Artisans	18(22)	37 (13.9)	6 (16.2)	0 (0.0)		
Others	7(8.5)	11(4.1)	2(5.4)	1(12.5)		
Types of farming activities by LGAs	Buji	Taura	Auyo	Gwiwa		
Farming	64(68.1)	71(53.8)	83(62.4)	23(67.6)		
Trading	12(12.8)	16(12)	14(10.5)	2(5.9)		
Civil service	6(6.4)	11(8.3)	11(8.5)	1(2.9)		
Artisans	5(5.3)	6(4.5)	5(3.5)	3(8.8)		
Others	7(7.4)	28(21)	20(15)	5(14.7)		

Source: Author’s Field Survey, 2017 * Percentage in Parenthesis

Table 4.3: Source of Information on Innovative Farming Techniques by the Respondents

Source	Frequency	Ranking
Radio	294	1 st
Cooperative Societies	266	2 nd
Government agricultural extension agent	246	3 th
Friends and relatives	185	4 th
Agro-inputs dealers	156	5 th
Social media	165	6 th
School	150	7 th
Television	120	8 th
Lead farmers	99	9 th
Community Leaders	90	10 th
Newspaper (print media)	54	11 th
Private Investors	48	12 th
Bill Board	32	13 th

Source: Author’s Field Survey, 2017 *Multiple Responses

The study found out 13 major sources of information regarding innovative farming to farmers viz radio, newspaper, television, social media, schools, government agricultural extension agents,

lead farmers, friends and relatives, cooperative societies, private investors, agricultural chemicals and inputs dealers. A farmer remarked during interview that;

“I frequently listen to agricultural radio programmes such as – mu komagona and nomakarkara of Radio Kaduna. It is easier for me than to buy newspaper because I am not a good reader also, I do not have television to watch television”. – Alhaji Sani Mai-GarmaBuntusu.

4.5 Adoption of innovative farming techniques among farmers

Table 4.4 Adoption of innovative farming techniques

Innovative farming Techniques	Frequency	Ranking
Crop planting techniques	353	1 st
Land Preparation techniques	314	2 nd
Storage	311	3 th
Soil and Water conservation techniques	292	4 th
Weeds control techniques	287	5 th
Fertilizer application	267	6 th
Soil fertility improvement techniques	247	7 th
Crop management	229	8 th
Harvesting	211	9 th

Source: Author’s Field Survey, 2017 *Multiple responses

The study reveals seven major innovative farming techniques introduced to farmers in Jigawa State. These included mulching, use of organic waste, crop rotation, plant residue, pesticides usage, use of farm-yard manure and application agrochemicals application. According to the Table, crop planting techniques have the highest adoption frequency and therefore ranked as 1st followed by land preparation innovative technique as 2nd then storage techniques as 3rd techniques adopted among the farmers. Soil and water conservation techniques ranked 4th, weeds control techniques ranked 5th, fertilizer application techniques ranked 6th, soil fertility improvement techniques ranked 7th, crop management techniques ranked 8th while harvesting ranked 9th.

4.6 Factors Influencing the Adoption of the Innovative Farming Techniques among Farmers

Tables 4.1a and 4.1b indicate variations in the adoption of innovative farming techniques among respondents based on some key socio-economic characteristics of the respondents which included sex, age, level of education, household size and years of farming experience.

Table 4.5: Factors Influencing the Adoption of the Innovative Farming Techniques among Farmers

Variables	LP	CP	WSC	SFI	WC	CM	FA	Hv	Str	RC
Sex	0.894	0.347	0.497	0.265	0.369	0.321	0.524	0.589	0.023*	0.423
Age	0.019	0.003	0.005	0.007	0.002	0.01	0.0.20	0.005	0.008*	-0.006

Marital status	0.003	0.004	0.001	0.002	0.002	0.019*	0.005	0.006	0.058	-0.009
Level of education	0.709	0.199	0.945	0.709	0.199	0.32	0.902	0.175	0.316	0.400
Household size	0.005	0.004	0.021	0.019*	0.006	0.002*	0.001*	0.004	0.016	-0.006
Years of farming experience	0.346	0.395	0.509	0.517	0.23	0.527	0.274	0.095	0.085	0.331
Membership of organizations	0.821	0.672	0.565	0.081	0.363	0.284	0.624	0.281	0.81	0.508
Level of income	0.564	0.002*	0.001*	0.132	0.265	0.244	0.058	0.258	0.170*	0.169
Affordability of techniques	0.894	0.536	0.545	0.144	0.206	0.134	0.398	0.17	0.321	0.372
Compatibility of techniques ³	0.424	0.589	0.023*	0.321	0.132	0.424	0.175	0.416	0.010*	0.276
Simplicity of techniques	0.833	0.995	0.077	0.482	0.010*	0.733	0.895	0.526	0.409	0.550
Contact with extension agents	0.667	0.684	0.975	0.503	0.121*	0.633	0.101*	0.002	0.057	0.391

Source: Author’s Field Survey, 2017 *Significance Level - 0.05

LP=Land Preparation, CP= Crop Planting, SWC=Soil and Water Conservation, SFI=Soil Fertility Improvement, WC=Weeds Control, CM=Crop Management, FA=Fertilizer Application, Hv= and ST=Storage RC=Regression Coefficient

The findings in Table 4.5 were discussed though with an adjustment, in the light of the Theory of Change (ToC) which is based on ‘if’ and ‘then’ referring to action(s) and outcome. In the context of the study, the ‘if’ and ‘then’ are linked with the adoption of innovative farming techniques by farmers (the ‘if’) and the increased crop production and livelihood improvement (the ‘then’). The study went further to explain ‘why’ the ‘if’ which categorically refers to factors influencing farmers’ decision to adopt innovative farming techniques. ‘Why the if’ in the context of this study refer to internal and external factors or variables that influenced the respondents’ decisions to adopt innovative farming techniques. In this regard, the internal and external factors (Why the ifs) were sex, age, marital status, level of education, household size, years of farming experience, membership of farmers’ organizations/unions, level of income, affordability of techniques, compatibility of techniques, simplicity of techniques and farmers’ contact with extension agents.

Effects of Innovative Farming Techniques on Improved Farmers’ Livelihoods

Table 4.7: Correlation of the adoption of innovative farming techniques with farmers’ livelihood improvement

Farmers’ Livelihood Improvement Indicators (LIs)	Correlation Coefficient	Mean	SD	p
Provision of nutritious food for the household members	0.311	21.19	3.76	0.278

Payment of school fees for the children	0.378	23.38	3.68
Payment of bride price for marriage	0.282	28.21	4.92
Payment of medical bills for household members			
	0.386	38.60	6.22
Construction/rehabilitation of houses	-0.023 ^{NS}	37.04	6.51
Payment for vocational skills	0.331	33.48	5.15
Purchase of new cars	-0.206 ^{NS}	36.30	6.42
Purchase of new motorcycles	0.825	37.20	5.32
Purchase of work bull(s)	0.398	38.40	6.61
Purchase of additional farm implements	0.491	25.75	5.57
Purchase of livestock	0.452	21.02	4.31
Purchase of food processing machines	0.209	26.89	5.22
Purchase of radio/television and cellular phones			
	0.200	22.78	6.01
Purchase of clothing for self and household members	0.255	21.87	5.20
Purchase of additional farmland	0.331	27.98	5.04

Source: Author's Field Survey, 2017df = 5 percent (0.005) NS = correlation not significant

Table 4.6 shows an aggregated correlation coefficient of 0.278 which was greater than the degree of freedom of 0.005 indicating positive relationship of the adoption of innovative farming techniques and livelihood improvement of the respondents. Purchase of motorcycles had the highest coefficient correlation of 0.825 many respondents had purchased motorcycles from the profits they made in farming. This finding agreed with Omolehin (2012) and Agbiokoro (2010) cited in Galadima (2014) in which agricultural development projects were found impacting positively on the lives of rural farmers in Kaduna and kano State respectively.

Constraints/Challenges of Innovative Farming Technique Adoption among Farmers

Table 4.9 presents data on the major constraints indicating the degree at which the constraints affected respondents' adoption decisions in terms of high, medium or low.

Table 4.9: Constraints/Challenges of Techniques Adoption

Constraints	Constraints Level - Frequency and (%)			
	High	Medium	Low	Not at All
Lack of information about the innovation	18(4.6)	3(0.8)	4(1.0)	1(0.3)
Non-availability of fertilizer	22(5.6)	12(3.1)	3(0.8)	0(0.0)
Excessive cost of inputs	1(0.3)	21(5.3)	0(0.0)	6(1.5)
Inadequate farmland	2(0.5)	0(0.0)	13(3.3)	3(0.8)
Excessive cost of improved seeds	36(9.2)	20(5.1)	0(0.0)	2(0.5)
Pests and diseases	12(3.1)	6(1.5)	13(3.3)	5(1.3)
Excessive cost of labour	4(1.0)	22(5.6)	27(6.9)	1(0.3)
Insufficient rainfall	38(9.7)	0(0.0)	0(0.0)	4(1.0)
No access to credit/loans	22(5.6)	0(0.0)	0(0.0)	1(0.3)
Low market price,	0(0.0)	0(0.0)	0(0.0)	7(1.8)
No or low profit?	7(1.8)	24(6.1)	0(0.0)	8(2.0)

Lack of frequent contact with agricultural extension agents	15(3.8)	0(0.0)	3(0.8)	1(0.3)
Cultural practices/values	0(0.0)	1(0.3)	0(0.0)	5(1.3)
Total	45.0%	27.8%	16.1%	11.1%

Source: Researcher’s Field Work 2017

The Table reveals excessive cost of improved seeds, insufficient rainfall and non-availability of fertilizer to the reach of farmers. Other constraints identify are lack of information about the innovation, inadequate farmland, pests and diseases, excessive cost of labour, no access to credit/loans, low market price, and lack of frequent contact with agricultural extension agents. Also, lack of frequent or no contact with extension workers affects farmers’ access to information on innovative farming. In the Table, the respondents indicated the degree at which the constraints affected their farming activities e.g. highly challenging, moderately challenging, low challenging and not challenging affected. The table shows that 45% of the respondents were highly affected, about 28% moderately affected, low effect to 16% while 11% have not been affected at all by the constraints. The constraints with high effect on farmers adoption of innovative farming were insufficient rainfall (10%), excessive cost of inputs (9%), non-availability of fertilizer and lack of access to loans/credits with 6% each. Insufficient rainfall, excessive cost of inputs and lack of finances were highlighted as the major constraints. Respondents explained that rains establish lately and stop early in less than three months. Many farmers when interviewed on the cost of the fertilizer, they stated that a bag was sold between N8000 to N9,000 which was not easy for them to buy. access loans from banks. A key informant interviewed remarked that;

“The major problem we the farmers in Taura LGA face is shortage of rainfall. The rain establishes in June/July and stops in August/September before most of our crop get ready for harvest as a result of which many of farm at loss”. ----- AlhajiGarba, Bardo.

CONCLUSION AND RECOMMENDATIONS

Based on the positive association of innovative farming techniques with increased crop production and livelihood improvement of farmers found, the study concludes that adoption of new farming skills and technologies had significantly contributed to the increase of crop production and livelihood improvement of farmers in the study area. About 75% of the respondents received information on innovative farming via radio, this highlights significance of radio in diffusing information on innovative farming among farmers in the study area. Simplicity of innovative farming and farmers’ participation in cooperative activities were rated high in influencing farmers adoption decision of innovative farming in the study area. This therefore concludes that farmers are most likely to adopt simpler farming techniques than difficult ones irrespective of what benefits are derived. Also, farmers’ participation in cooperative activities makes adoption of innovative farming faster and easier among farmers.

Recommendations

The following actions are recommended to achieve effective delivery of innovative farming techniques to farmers and adoption for increased crop production and improved livelihood.

i. Farming is identified as the major source of livelihood for most of the rural people in the study area but experimentation through extension programme is low. Government should ensure frequent contact of farmers with the Agriculture Extension Workers (AEWs) to provide adequate farming guidance and support to farmers in the study area for greater harvests. More extension agents should be recruited and assigned to work with rural farmers with proper monitoring.

ii. Since radio is the major source of farmers' information on innovative farming techniques, more agricultural related radio programmes should be introduced and broadcast through both government owned and private radio stations in the study area. This will include call-in live programmes where farmers can interact with experts through phone calls when programmes are aired. JARDA and other stakeholders can use these for diffusing innovative farming techniques to farmers

iii. Affordability of innovative farming techniques is identified as one of the major factors affecting farmers' adoption decision, it is recommended that the Jigawa State Government and the Local Government Councils to support rural farmers with inputs (improved seeds and fertilizer) either free or on a subsidized rate.

iv. The findings of the study indicated an increase in crop production among farmers in especially food crops viz sorghum, rice and maize, it is appropriate to recommend that farmers be encouraged to equally focus on cash crop production such as sesame and groundnut. This will not only help in increasing production rate in the study area but also would help to increase farmers' income and eventually improve their livelihood.

V The data revealed lack of adequate capital and inputs among farmers to scale up their farming activities. It is therefore recommended that the government should create enabling environment for active participation of private investors in agriculture to support farmers with agricultural loans.

REFERENCES

Adegbite, D., A., Adubi, K., O., Oyekunle, O. & Sobanke, S., B. (2008). Impact of National Fadama Development Project II on Small- Scale Farmers' Income in Ogun State: Implications for Agricultural Financing in Nigeria. *Journal of Sustainable Development in Africa* 10(3): 103-128.

Ajeigbe, H., A. Mohammed, S., G. Adeosun, J., O. and Ihedioha, D. (2010). Farmers' guide to increased productivity of improved legume-cereal cropping systems in the savannas of Nigeria. Ibadan International Institute of Tropical Agriculture.

Akinwale, A.A. 2010. Livelihood and environmental challenges in coastal communities of Nigeria. *Journal of Sustainable Development in Africa*, 12(8): 79-88

Anyanwuocha, R., A., (2006). *Fundamentals of Economics Onitsha-Nigeria*. African First Publisher Ltd.

Bakare, A., S. (2013). An econometric analysis of sustainable Agriculture and rural development in Nigeria: A Vector Autoregressive Approach (VAR). *Journal of Agricultural Economics and Development* Vol. 2 (5), 184-193. Accessed from online at <http://academeresearchjournals.org/journal/jaед> on June 2014.

Bulama, A. (2013). Effectiveness of cooperative societies in the socio-economic development in rural areas of Jigawa State. Unpublished M. Ed Thesis. Department of Adult Education and Community Development Bayero University, Kano

Chambers, R. & Conway, G. R. (1991). Sustainable Rural Livelihoods: Practical Concept for the 21st Century. IDS Discussion Paper. Accessed from <https://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/775/Dp296.pdf> on June 2, 2017

Fadama development project (2003): Project Appraisal Report. Accessed from <https://www.afdb.org/fileadmin/uploads/afdb/documents/project-and-operations/ng-2003-156-en-adf-bd-wp-nigeria-ar-fadama-development-project.pdf>,

Farinde, A.J. (1995). Effectiveness of the Training and Visit Extension System of the Lagos State Agricultural Development Programme, Nigeria. Unpublished Ph.D. Thesis Obafemi Awolowo University, Ile-Ife, Nigeria.

Galadima, M. (2014). Impact of IFAD community-based Agricultural and rural development programme on rural livelihoods in Yobe State, Nigeria. A published MSc Thesis, Department of Agricultural Economics Ahmadu Bello University, Zaria. 76-82 Jigawa State Ministry of Agriculture (2013), Medium Term Sector Strategy (2014-2016). Unpublished Report

Kambewa, E. 2010. Improving rural livelihoods in Southern Africa. The SARNET cassava component. An impact assessment report. Ibadan, Nigeria: International Institute for Tropical Agriculture. 2(2): 32-34

Kaugama, H., H. and Ahmed, A., B. (2014). Prospect and Challenges of Farming along the Hadejia- Nguru Wetland in Jigawa State Nigeria. *International Journal of Academic Research in Economics and Management Sciences*. 3(6): 43-52 National Agricultural Extension and Research Liaison Services (2013). Agricultural Performance Survey of 2013 Wet Season in Nigeria

Sheheli, S. (2013). Improving Livelihood of Rural Women through Income Generating Activities in Bangladesh. A published PhD Dissertation, Humboldt University Berlin. Accessed from <https://edoc.hu-berlin.de/handle/18452/17240> on March 14, 2016

Shitu, M., B., Kamara, A., Y., Mbavai, J., J. & Ndaghu, N. (2014). Group Dynamics and Improvement of Rural Livelihoods under the Sudan Savanna Taskforce Project. Ibadan, Nigeria. A published Report

Usman, S. (2009). Analysis of farm plan and resource -use efficiency of sesame production in Jigawa State, Nigeria. An unpublished M.Sc. Thesis. Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria

Yahaya, O. (2005). Impact of Community Based Organizations on Rural Development in Kano State. Unpublished M.Sc. Thesis, Ahmadu Bello University, Zaria, Nigeria.