Awareness and Adoption of Good Agricultural Practices among Smallholder Farmers in relation to the Adopted Villages programme: The Case Study of Northern Nigeria

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Abstract:
This study assesses smallholder level of awareness and uptake of good agricultural practices (GAPs) that were initiated by the National Agricultural Extension and Research Liaison Services (NAERLS) in Nigeria; a programme to enhance the agricultural productivity and income of participants. This study engaged with 120 smallholder farmers and their extension officer and data were collected via structured face-to-face and livelihood questionnaires and then analyzed using descriptive and inferential statistics. The findings show that 82% of participants were aware of the specific GAPs covered by the NAERLS programme. Despite this, the majority of respondents were not practicing these. Participants identified numerous challenges to GAPs implementation, including; unreliable and inadequate rainfall; lack of farm inputs; high cost of farm inputs; lack of technical know-how; lack of irrigation facilities and high illiteracy. The study also shows that the level of awareness of GAPs among farmers in the study areas has a statistically significant impact on the productivity and livelihoods of smallholders. These initial results strongly suggest that the Nigerian government should provide funds to support NAERLS in order to intensify its intervention efforts. In the same vein, NGOs, rural developers, policy makers and government at all levels should be encouraged to provide farm inputs and credit facilities to farming communities to offset the high costs of inputs.
Keywords: Good Agricultural Practices, Awareness.

1. Introduction

Agriculture serves as a valuable source of income, contributing to poverty reduction and represents the main source of livelihood for 1.4 billion smallholder farmers and their families who produce nearly 70% of all food consumed worldwide (World Bank 2008; FAO 2010; Gahukar 2011; Lowder *et al.* 2014; Onyekwelu *et al.* 2015). Globally, there are approximately 2.5 billion people involved in full-or part-time smallholder agriculture, managing an estimated 500 million small farms (IFAD 2013). The agriculture sector is also the mainstay of the economies of most of the developing world. Furthermore in Sub-Saharan Africa an estimated 75% of resource-poor people rely on agriculture for their livelihoods, the sectoremploys about 60% of the workforce and contributes an average of 30% to Gross Domestic Product (GDP) (FAO 2010; Kalungu *et al.* 2013; Chowa *et al.* 2013).   It is estimated that nearly 70% of the people in developing countries live in rural areas where agriculture is the main source of livelihood, and there are some 36million smallholder farmers across the continent of Africa (Vermeulen *et al.* 2012; Kalungu *et al.* 2013; Wright *et al.* 2014).

By definition smallholder farmers cultivate small areasof land, often less than two hectares (ha), using family labour and simple technologies (e.g. mainly hand-held hoes, minimal use of animal traction and no tractors). Indeed, they are faced with several challenges including: lack of fertilizers; inadequate and unreliable rainfall; high cost of farm inputs;extremepoverty;inadequate finance; chronic illiteracy; poor storage and market prices and high rate of pest and disease attacks. Land scarcity, increasing population pressure, poorly targeted agricultural policies and agricultural management strategies exacerbate the problem (Nkala *et al.* 2011) while the rural population often depend on their agricultural production as their main source of both food security and income generation (Nagayets 2005; Umar *et al.* 2012).

In Nigeria, agriculture contributes about 42% to the GDP, employs70% of the active population (Arokoyo 2005; Sennuga 2012; Osebeyo and Aye 2014) and produces 80% of food needed to feed the growing population (Nwafor 2008; Yila and Thapa 2008). Smallholder farmers are the backbone of agricultural production in

Nigeria with over 90% of the agricultural output is derived from resource-poor farming, carried out by smallholder farmers (< 3hectres) who have been the principal source of the national food supply for many decades (Adedipe *et al.* 2004).

Agriculture was a very important sector in the Nigerian economy in the 1960s; and the country was generally self-sufficient in food production, employment and exchange earnings. The situation is effectively the same three decades later with the exception that it is no longer the most important foreign exchange earner, a role now being played by oil industry.

However, the agricultural sector has significantly underperformed and experienced a serious decline over the last 40 years due to high revenue from the oil boom deflecting government attention with revenues underpinning other developments; as a result agriculture has fallen from about 75% of total export earnings in the 1960s to less than 5% (FGN 2008). Despite this sharp drop, agriculture is still the principal source of raw materials for the nation's agro-based industries and accounts for almost 88% of non-oil export earnings (Oji-Okoro 2011; Osebeyo and Aye 2014). This reality has become clearly manifested in the high cost of food nationwide and food insecurity, both at the household and national level along with increasing malnutrition among children (Ansuya *et al.* 2018).

Overcoming the increasing incidence of chronic disease and the widespread problem of food security and rural poverty in Nigeria is one of the fundamental challenges confronting the Nigerian government and international agencies. The problem is mainly caused by the inaccessibility of resource-poor farmers to improved technologies emanating from the National Agricultural Research Institutes (NARIs) (World Bank 2012; Akinola *et al.* 2013). This is because improved technologies can only be beneficial to the end-users when judiciously put to use. However, many technologies developed by the research institutions in Nigeria have remained under-utilized because the extension services, which are supposed to facilitate the dissemination of research-based information, have remained redundant and ineffective (Aker 2012). Further, the ratio of extension agent to farming families is now 1:3000 in Nigeria (FMARD 2005). Consequently, in an attempt to address this the "Adopted Village Concept" pilot project was introduced in 1996, under the World Bank, Assisted Programme of National Agricultural Research Project (NARP). However, following the collapse of the NARP in 1999 (Mustapha *et al.* 2012), the Agricultural Research Council of Nigeria (ARCN) issued a directive to the NARIs in 2008 to revisit and revive the earlier introduced concept of 'Adopted Villages' with a renewed vigour, culminating in the take-off of the 'Adopted villages' in 2009 (Akinola *et al.* 2013).

1.1   The Adopted Village Concept

According to Mustapha *et al.* (2012), the ARCN issued directive stated that each research institute, university, and college of agriculture was expected to identify two communities/high schools within its jurisdiction and mandate areas within which to promote best farming practices and government policies. In accordance with the directive, each institute is expected to identify farmers and engage them in a participatory rural approach using their farmland or field as a 'showroom' for the other community members to demonstrate a particular technology. The National Agricultural Extension and Research Liaison Services (NAERLS) of the Ahmadu Bello University, ABU Zaria has been working is 5 geographical zones of the country but with a particular emphasis on villages in the North West zone of Nigeria, in Kaduna and Katsina States.

The 'Adopted Village' concept is an extension approach aimed at enhancing the agricultural productivity and general livelihood of the rural dwellers in an integrated manner, focusing on health, education drinking water supply and so on. Demonstrations are conducted in each Adopted Village to encourage adoption of new technologies/practices among farmers. The principal aims of the 'Adopted Village' concept is to empower resource-poor farmers,enhance the economic and livelihood status of the beneficiaries' households, increase food security and market competitiveness, create job opportunities for youths and develop agriculture as a business and vacation.

The main objective of the 'Adopted Village' concept is to encourage large-scale adoption of improved technologies, economic empowerment of resource-poor farmers, create job opportunities for youths and ensure food security. Specifically, the 'Adopted Villages' concept is to:
- Create awareness in the rural areas and improve farmer's organizations development via communities' activities
- Empowerment of the communities through the initial provision of some facilities and infrastructural development in the village.
- Facilitate the transfer and adoption of improved agricultural technologies in the adopted villages.

- Accelerate union and integration of differs programs of state/local government and other development agencies in the villages.
- Improve the economic status of the villagers through capacity building of the rural dwellers and communities.
- Enhance socio-economic status and livelihoods of the farmers with the provision of credit facilities for all farming families in the adopted villages.
- Operate an agricultural research outreach center including research-based information flow.
- Ensure adequate monitoring of the progress of the implementation of the project in the villages.
- Build vibrant rural communities that are productive, self-sustaining and create new markets.

The Adopted Village concept was initiated to speed up and upscale technologies adoption under the farmers' environmental condition in a participatory rural approach. The involvement of farmers in the concept is additional advantages which in turn facilitates the rate of adoption and boost the agricultural productivity of the participants. One of the villages in this case study is an adopted village (Sakadadi) while the other (Nasarawan Buhari) is not.

1.2   Good Agricultural Practices (GAPs)
GAPs are a collection of practices for on-farm production and post-production processes, resulting in safe and healthy food and non-food agricultural products while taking into account economic, social and environmental sustainability (FAO 2010; Lefebvre *et al.* 2015). GAPs cover a range of areas including maintaining soil fertility, water resource and irrigation management, cropland management, degraded land restoration, animal production and welfare, integrated pest management, integrated fertilizer management and conservation agriculture (Montagn *et al.* 2007; FAO 2010). GAPs explicitly aim to increase the supply of safe and high-quality food by promoting more sustainable crop production (Ali 2014) while also helping to improve market access and farmers' livelihoods (Poole and Lynch 2003; FAO 2010). Although GAPs have the potential to play a significant role in improving agricultural practices, there is currently limited empirical evidence on the level of awareness and implementation of GAPs. Therefore, this study aims to assess the effect of interventions on the livelihood and productivity of resource-poor farmers. The specific objectives of this study are to:
(i) examine the level of awareness of GAPs among smallholder farmers in the selected villages, one under adopt a village and one that is not;
(ii) explore the sources of information for the selected GAPs; and,
(iii) examine the extent of the implementation of GAPs technologies.

2. Materials and methods
2.1.   The study area and data description
The study area comprises two Local Government Areas of Giwa and Sabon Gari in Kaduna State which are located in the Northern Guinea Savannah ecological zone of Nigeria (see Figure 1). These LGA were purposively selected based on the location of adopted villages concept initiated by NAERLS.

Giwa Local Government Area is located in the plain of the Northern part of Kaduna State. Giwa has eleven districts and twelve political wards. It lies between latitude 12.20^0 N to 12.52^0N and longitude 7.0^0E to 7.5^0E (Oyakhilomen 2012). Giwa Local Government has an estimated population of 32,255 and is made up of Hausa/Fulani tribe with a population growth rate of 3.2% per annum, occupying 2145.79sq km of land (National Population Commission-NPC 2006; Akinola *et al.* 2013). The vegetation of the area is mostly grasses and shrubs. The major crops grown in the area are maize, cowpea, tomatoes, sorghum, groundnut, pepper, onions, wheat and sugarcane.

Sabon Gari Local Government Area has six districts and eleven wards with a population of 734, 391. The population of the area is more diverse as it is predominantly made of settlers and non-indigenes that came to settle in Zaria for diverse reasons and due to numerous government institutions and amenities in the area. The local government is the home of several tertiary institutions and research institutes including; Ahmadu Bello University, Zaria, School of Aviation, Leather Research Institute, military college, and barracks (Akinola *et al.* 2013). Sabon Gari occupies a total of 273,779sq km of land (NPC, 2006) laying at the border of Kaduna State. The major crops grown in the area are sorghum, cowpea, millet, soybean, rice, groundnut, amaranthus, cotton and carrot.

2.2   Sampling procedure of the study area
A multi-stage purposive and stratified random sampling procedure was followed for the selection of the study area. The study was confined to Kaduna State, Northern Nigeria (see Figure 1). A separate list of the LGA and

Adopted Villages from Kaduna State was collected from NAERLS, Ahmadu Bello University, Zaria for the selection of the villages for the study (Table 1).   Thus, two villages which participated in the Adopted Village Concept and sufficiently close to municipal, state or federal roads to enable a series of visits by the researcher were selected using a simple random sampling technique.

Both villages are situated in the Northern Guinea Savannah ecological zone. The rainy season lasts for about five months and the dry season for seven months. Agriculture is the principal economic activity and livelihood of about 90% of the population in both communities, and the bulk of agriculture is undertaken by men as cultural traditions do not permit women to actively engage in farming activities or own land. The women shell and extract groundnut oil using local methods for sale the while Fulani tribe extract milk from cows. Prominent traditional male activities include; blacksmithing, pottery, hunting and leather work. The major religions in the study area are Islam and Christianity, with about 90% of the population actively practicing Islam, yet living in a traditional polygamous family setting.
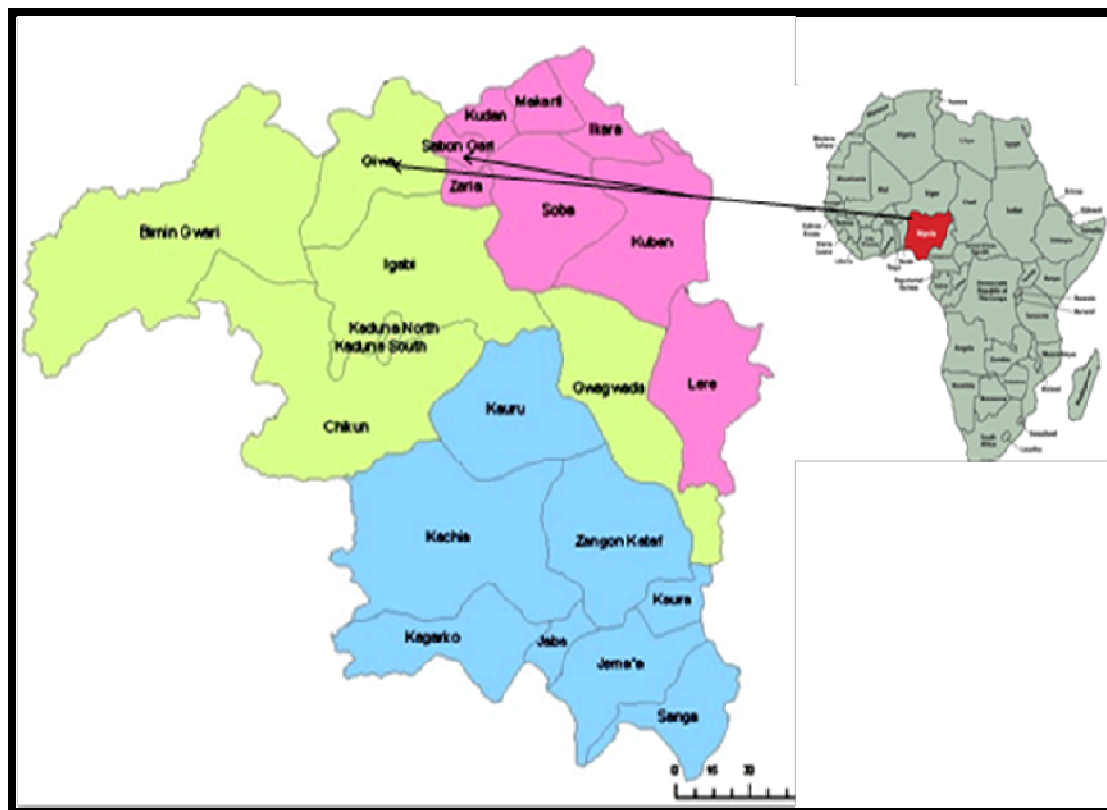

Fig. 1: Map of the Study Area showing Giwa and Sabon Gari Local Government, Kaduna State, Nigeria.

Table 1: Villages in Kaduna and Katsina, North West Zone, Nigeria. Note: Those in bold are adopted villages while Nasarawan Buhari and Sakadadi are the case study villages for this research.

S/N	State	LGA	Village	Number
1	**Kaduna State**	Zaria	Kufena	150
2		Giwa	***Nasarawan Buhari***	250
3		Giwa	Yansarki	150
4		Giwa	Maigamo	200
5		Giwa	Hayingada	75
6		SabonGari	Hayindogo	75
7		SabonGari	***Sakadadi***	250
8		SabonGari	Hayin Sambo	75
9		SabonGari	Basawa	75
10		SabonGari	Maiwasa	50
11	**Katsina State**	Danja	Kokami	200
12		Funtua	Tudun-Iya	800

2.3   Selection of respondents

From each village, a total of 60 arable farmers were selected using a stratified sampling procedure where the main rationale and criterion for choice of the participants were based on their participation and non-participation in the Adopted Village Concept, their age, gender, and farming experience. Thus, the total number of respondents interviewed for the study was 120 farming households. The participants were for Kaduna and Kastina States from Northern Nigeria.

2.4 Data Collection and Analysis

Data for this study were collected through household livelihood survey tool via face-to-face interviews conducted by the researcher. Prior to data collection, village group meetings were conducted in the LGA primary school in Giwa and Sabon Gari to introduce the project and its benefits to the villagers. The villagers were encourage to attend the meeting by the village head, and two buses were provided to convey the villagers to the meeting venue, 118 villagers attended from Nasarawan Buhari while 114 villagers present from Sakadadi village respectively. The farmers were contacted in their homes.

Household livelihood data were collected along with questions based on the study objectives as follows:
- The first section sought information on demographic characteristics of the smallholder farmers. Respondents were asked to indicate their age, the level of education attained, household education, the number of years in farming, the size of landholding (number of hectares owned and hectares rented).
- The second section considered the level of awareness of certain GAPs, with a specific focus on crop land management; soil fertility managements; water management; degraded land restoration; integrated pest management; crop selection and seedling. The rationale for the choice of GAPs was based on the modern farming practice being promoted by the adopted village concept and relevant to the agro-climatic conditions in the region. Respondents were asked to indicate their awareness using a 4-point Likert scale of "highly aware" (3), "Aware" (2) "Remotely aware" (1) and "not aware" (0).
- The third section addressed the farmers' sources of information for the specified GAPs. The respondents were asked to indicate their sources of information, choosing from extension agents, radio, mobile phones, television, newspaper, field day, agro-dealer, brochure and other farmers, among others.
- The level of implementation of the specified GAPs on the respondents' farmland was the focus of the fourth section. Respondents were asked to state level of implementation, using 5-point Likert scale of

"very high" (4), "high" (3), "moderate" (2), "low" (1) and not at all (0). Respondent were also asked about the regularity to extension visit to their area, using a 6-point Likert scale of "yearly" (5), "three times a year" (4), "twice a year" (3), once a month (2), "during raining season" (1) and "no extension visit" (0).

- The fifth section addressed prevailing problems confronting respondent in implementing the GAPs. The respondents were asked about factors such as lack of fertilizers, inadequate finance/capital, poverty, inadequate and unreliable rainfall, among others.

- The primary data collected using the survey were first edited by sorting through the questionnaire papers visually and discarding those with obvious anomalies such as non-response, multiple errors, and numerous missing data. The statistical package SPSS version 24 was employed for the analysis of the data. This paper mainly reports the descriptive analysis of the baseline conditions of the two communities

3. Results and Discussion

3.1   Respondents characteristics

All the respondents were males; this is because the cultural traditions of the study area do not allow females to be actively involved in farming activities; furthermore, analysis of the two villages did not reveal any significant differences between the communities other than whether they were an adopted village or not (see section – where you discuss extension) As a result the two communities will be described as one larger community in terms of household profiles.

Almost one-third (31%) of the respondents were between 31-40 years old followed by 27% who were between 41-50 years old; in terms of new entrants to smallholding, just under 20% were between 20 and 30 years old (Table 2). An overwhelming majority (97%) of the respondents was married with half of these households having 10 or fewer members, the remainder had larger families of 21 plus members reflecting polygamy within the communities.

In terms of education of household heads some two thirds had no education or only primary education, about one quarter had secondary education and only some 8% had tertiary education (Table 2). When family education is considered there is evidence of investment in the next generation with less than 4% having no education (probably babies and infants), 55% having primary education and 36% going on to secondary education (Table 2).

In relation to family income, 40% were in the income range of ₦301, 000 - ₦400, 999 (equivalent to $860 - $1,145) followed by 24% who were in the range of ₦121, 000 - ₦300, 999 (i.e. $347 - $859). This is less than $1.5 per day poverty line i.e. income divided by number of adults. In the same vein, the family labour hired was 10%.

Table 2: Demographic representation of the socio-economic
Characteristics of the smallholder farmers (n= 120)

Variables	*Percentage*
Age (years)	
20-30	15.8
31-40	31.7
41-50	27.5
51-60	17.5
61-70	6.7
> 70	.8
Gender (Sex)	
Male	100
Female	0
Marital status	
Single	3.3
Married	96.7
Household size	
≤10	50.8
11-20	36.4
21-30	12.1
>31	.7
Level of education	
No education	25.8
Primary	40.0
Secondary	26.7
Tertiary	7.5
Family education	
No education	3.3
Primary	55.0
Secondary	35.8
Tertiary	2.5
No Children yet	3.3

3.2   Awareness of GAPs among Smallholder Farmers

This section will examine the results of the survey relating to the awareness and implementation as part of the Adopted Village project, more specifically: cropland management; water management; degraded land restoration; integrated pest management; crop and seed selection and crop and soil fertility management.

3.3   Awareness of GAPs

The data presented in Figure 2 indicates that 46% of the farmers are not aware of water management practices while 57% of the respondent indicated that they were aware of the use of irrigation and 23% stated that they were highly aware. 44% indicated that they were not aware of terracing and only 7% of respondents indicated they were highly aware. By implication, this shows that farmers in the adopted villages are aware of water management practices.

The data shown in table 2 reveal that majority of the respondents (95%) were highly aware of fertilizer application while no respondents state that they were unaware. Similarly, the results show that a reasonable amount of the respondents (58%) were aware of the use of manure while about 7% were unaware. A little above half of the respondents (52%) indicated they were aware of cover cropping while 11% were unaware. Also, the level of respondents' awareness of intercropping was relative high with only 6.4% of respondents stating that they were not aware of the practice.

Table 2: Distribution of respondents according to their level of awareness of GAPs

Agricultural Production Components	Current Practices	Highly Aware %	Aware %	Remotely Aware %	Not Aware %
Crop land	Crop types	23.6	61.4	7.1	7.9
Management	Cropping Systems	21.4	63.0	6.4	9.2
	Tillage Systems	22.9	60.0	10.0	7.1
Water	Use of Irrigation	13.6	57.1	18.6	10.7
Management	Bunds	7.8	20.2	26.0	46.1
	Mulch	5.7	23.3	30.0	41.0
	Terracing	7.2	21.2	27.4	44.3
Restoration	Re-vegetation	14.0	20.2	42.2	23.6
	Crop Rotation	18.6	57.1	19.0	5.3
Integrated	Use of Pesticides 20.0	56.0	15.0	8.3	
Pest	Tilling	16.4	52.3	20.4	10.7
Management	Resistant Varieties	14.3	55.0	17.9	13.1
	Plot Selection and Layout	15.9	57.1	14.3	12.9
	Planting Date	19.3	57.1	20.0	3.6
Seeds, Crop	Sowing facility	10.7	24.3	50.8	14.3
Selection	Sowing Depths	12.9	45.7	26.4	15.0
and	Seed Dressing	10.3	12.3	25.3	52.1
Seedling	Seed Requirement Re-planting	13.6	50.0	25.0	11.4
	Local seeds	11.4	50.7	25.0	12.9
	Use of manure	22.9	58.0	12.1	7.1
	Mulching	21.4	19.3	47.1	12.1
Soil Fertility	Fertilizer application	95.1	13.0	2.1	0
Management	Cover cropping	29.3	52.2	7.2	11.4
	Intercropping	27.1	54.1	12.4	6.4

3.4   Sources of information for Good Agricultural Practices

The sources and availability information have been argued to be critical factors affecting adoption rates of technologies (Oladele 2010). Additionally, Roger (2003) reported that extension officers play a positive and fundamental role in diffusing agricultural innovations from research to farmers. Moreover, dissemination of adequate and relevant information to smallholder farmers has been shown to enhance productivity and make more farm produce available all year round (Okunade 2006).

In order to gain a better understanding of whether these factors may influence respondents' level of awareness of the stated GAPs, the survey asked where respondents source information from. Overall, the majority of the participants considered extension officers' from NAERLS, as their main source of information on a range of GAPs. Although to a lesser extent, the radio was also noted as an important source of information, followed by mobile phones (Figure 3). Far fewer participants reflected other sources of information such as television, other farmers, and newspapers to be important information. The findings revealed that the majority of participants consider agricultural extension agents to be their most reliable and dependable source of accurate information.

However, the study showed that the non-participants considered farmer-to-farmers extremely useful in the farming business (see figure 4).   In addition they also find revealed that radio is making significant contribution. From the survey we can conclude that farmer-to-farmer extension model is making remarkable different among the smallholder farmers.

On the other hand, a study conducted among maize farmers in Nigeria, Fadiji *et al.* (2005) found extension agents to be a major source of agricultural technologies and research based information dissemination to farmers.   Findings show that the Adopted Village project was relatively effective and impacted the respondents, because the government extension agents are not consistent with the delivery of their work

perhaps because of the extension ratio in Nigeria, 1:3000; not only in creating awareness but also in demonstrating the technologies on the village farms. This corroborates the findings of Akinola *et al* (2013), who found that the adopted village project improved the extension-rural household linkages, enhanced participants' capacity and improved their income and livelihoods within the community. The majority of the respondents who actively participated in the project were enlightened about better farming practices and other agricultural technologies.

The positive outcomes above could have potentially been possible without the Adopted Village Concept. However, it is important to note that the project was not without its own challenges such as lack of definite extension system, lack of reliable data, absence of reliable mobility, limited funds, unreliable internet connectivity for website and difficulty in identifying friendly and willing media houses and other available dissemination channel outfits (NAERLS 2011). These challenges had an effect on the survey, in that respondents had difficulty in recalling information as small scale farmers do not keep records of their expenditure and costs. Similarly, some respondents with large farms failed to keep interview appointments with the research team, after all, the arrangement had been made. Moreover, inaccessible roads to the remote farms and villages also presented difficulties, as many of the roads were extremely bad.

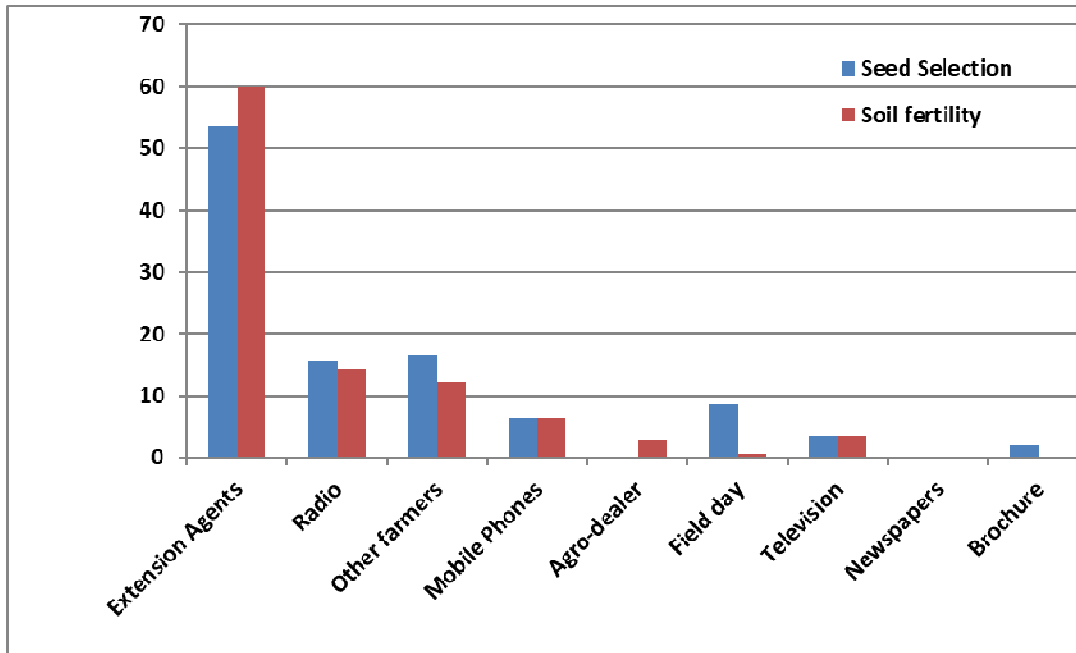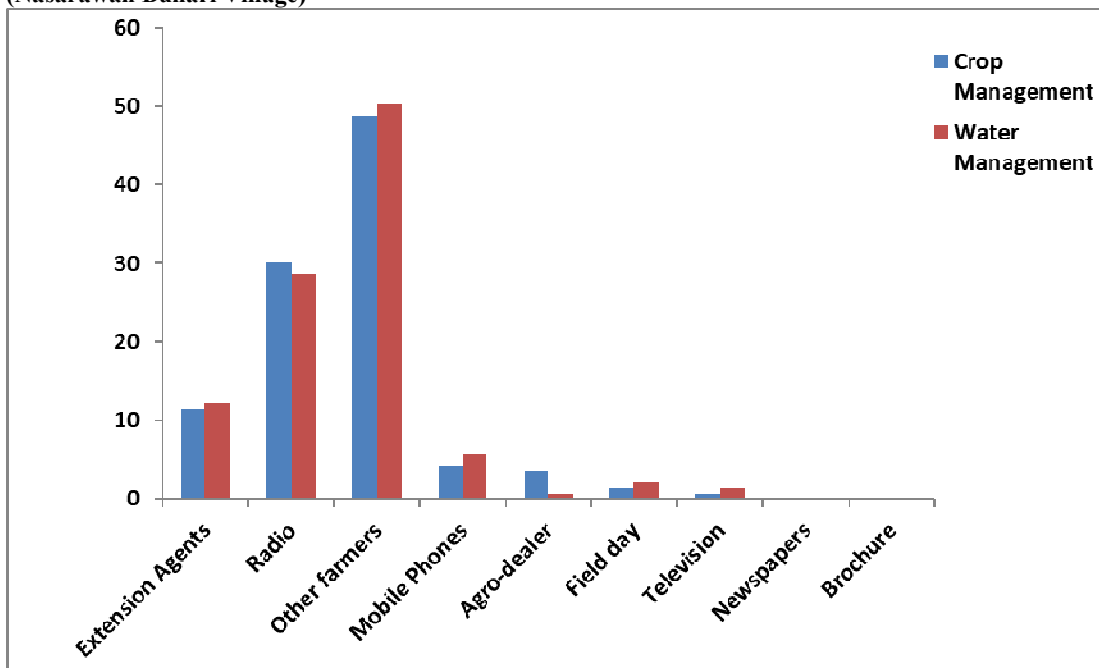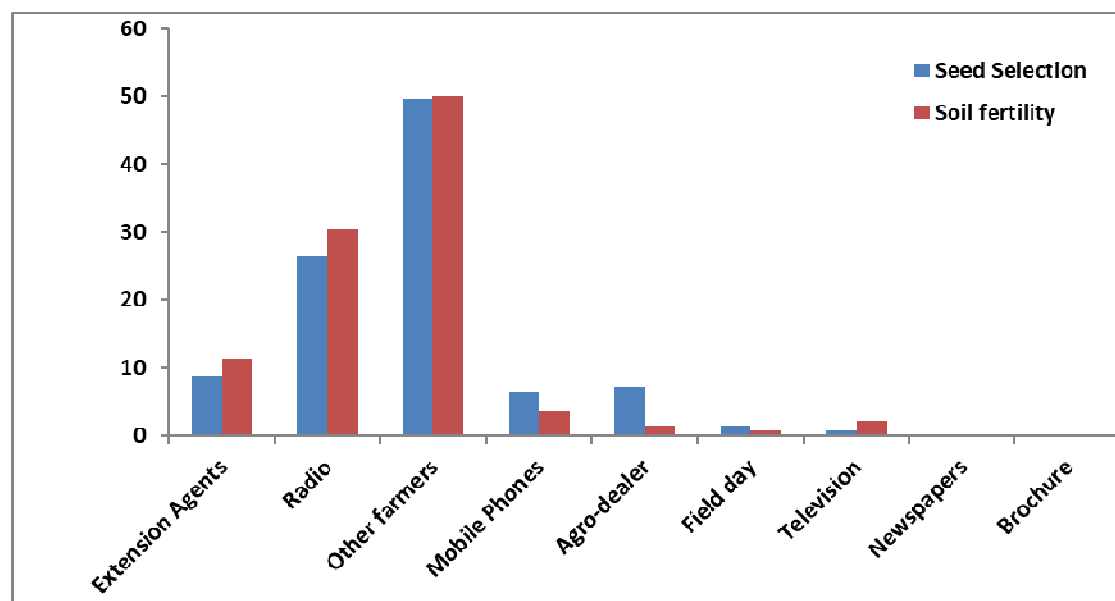**Figure 3: Distribution of Participants according to the sources of information on GAPs (Sakadadi Village)**
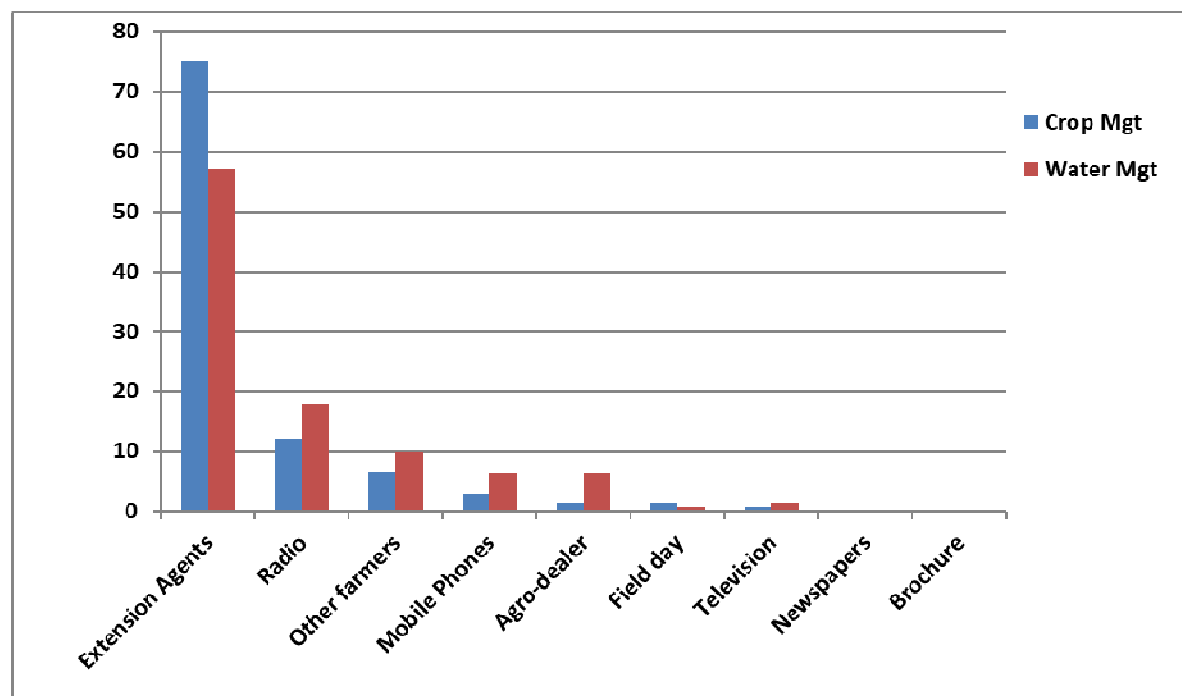
Figure 4: Distribution of Non-Participants according to the sources of information on GAPs (Nasarawan Buhari Village)

3.4   Practice of Good Agricultural Practices among Smallholder farmers

Respondents were asked to state their level of uptake of the stated GAPs. As shown in Table 3; the majority of the respondent indicated low levels of implementation of cropland management. Similarly, a significant proportion of respondents (39%) specified low levels of appropriate water management on their farmland, while the result in Table 4 confirms that the practice of integrated pest management is extremely low among the respondents with 40% indicating low and 32% moderate implementation of the GAPs. The findings in table 4 also reveal that farmers indicated low levels of practice of integrated pest management; seed, crop selection and seeding production and soil fertility management at 40, 40 and 35% respectively. This might be attributed to non-availability of smallholder farmers to procure essential inputs needed to sustainably increase their productivity which subsequently results in reductions in productivity and livelihoods among smallholder farmers in the adopted villages (Flenchtmann and Knihinicki 2002).

Table 4: Distribution of respondents according to practice of GAPs

Agricultural Production Components	Very High	Moderate High		Low	Not at all
Crop Land Management	16.1	21.4	24.2	34.0	4.3
Water Management	9.3	16.4	31.1	39.7	3.5
Degraded lands Restoration	9.3	12.1	32.2	40.0	6.4
Integrated Pest Management					
Seed, Crop Selection	10.7	12.9	31.4	40.0	5.0
and Seedlings Production	12.1	26.2	17.3	40.1	4.3
Soil fertility Management	19.3	9.3	28.5	35.0	7.9

3.5   Level of Extension Contact

The mission of extension services is to provide research based information, educational programs and technologies on farmers needs which invariably provides an opportunity for transfer of skills, knowledge and accurate information which enables farmers to make an informed decision and facilitate adoption (Long and Sworzel 2007; Oladele 2010; Adesope *et al.* 2010). The distribution of respondents according to the number of extension visits to the Adopted Villages is presented in Figure x. Contact with extension agents provides channels by which farmers' problems are identified for research and play a significant role in the adoption of technologies (Adesiji *et al.* 2010; Ajani and Onwubuya 2013; Ainembabazi and Mugisha 2014). Table 4 reveals

that just over one-third (34%) of farmers in the adopted villages received extension visits once a month while 29% had extension contact during the raining season and 17% indicated that they do not receive extension visits. Furthermore, finding shows that the respondents who had more extensions visits have a higher level of GAPs implementation compare to their counterparts. This implies that role of extension services and accurate dissemination of information to the adoption of improved technologies cannot be underrated.

Figure 5: Distribution of respondents by extension contact (Nasarawan Buhari and Sakadadi Villages)
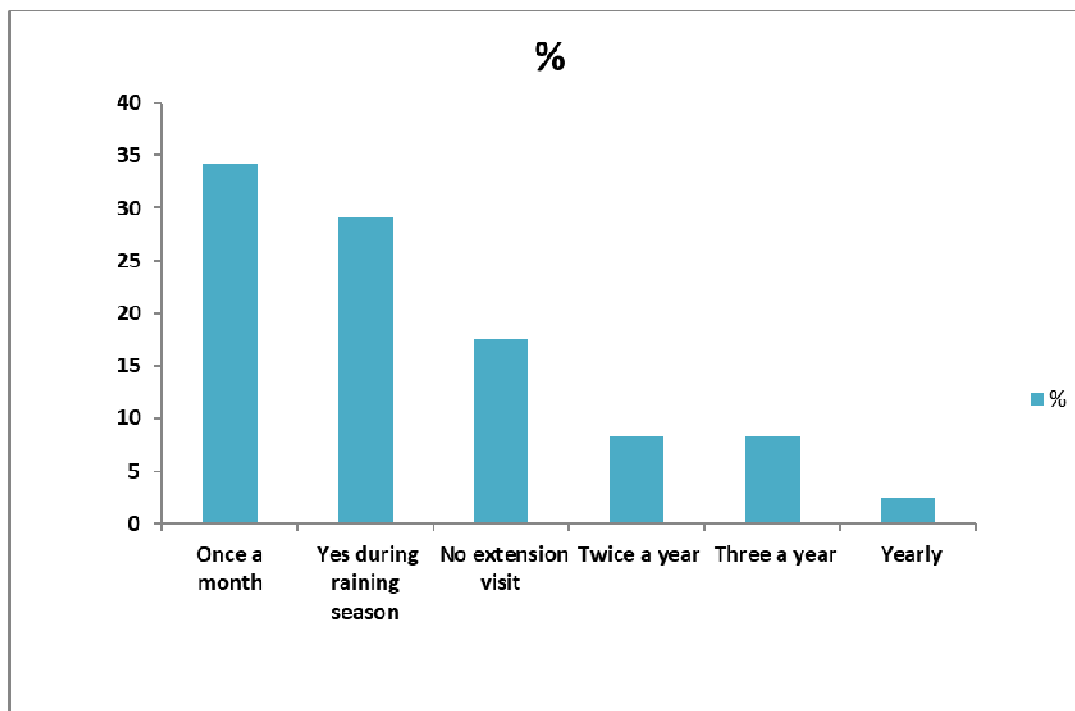

Table 5 shows that 26% of the respondents indicated a lack of fertilizers as the principal challenge they are facing, followed by inadequate capital (20%) and poverty (15%). Similarly, 10% of the respondents noted inadequate and unreliable rainfall as another prevailing problem confronting them in practicing GAPs.

Table 5: Factors influencing implementation of GAPs

Problems	Frequency (n=120) Percentage
Lack of fertilizers	85.8
Inadequate finance/capital	82.5
Poverty	80.8
Inadequate and unreliable rainfall	77.5
High cost of farm inputs	71.7
Poor market prices	61.6
Lack of irrigation facilities	53.3
High rate of pest and disease attack	52.5
Low production hence little returns	50.8
Illiteracy/lack of education	48.3
Lack of technical know-how	43.3
Inadequate labour	40.8
Lack of portable water	39.2
Infrastructural problem /land tenure	35.0
Poor storage facilities	25.8

*Multiple Responses

3.6   Conclusion

This study, have revealed that 61% of the respondents in the study area were aware of the GAPs as conveyed to them by the extension officers from NAERLS, ABU, Zaria. The study also shows that the level of awareness of GAPs was very high. Similarly, out of nine sources of extension information for the accredited GAPs, four were most prominent among the respondents, namely, extension agents, radio, fellow farmers and mobile phones. This is in agreement with the study conducted by Fadiji *et al* (2005) who found out that, extension agents, radio, fellow farmers, and television were veritable media and sources of extension information in the rural areas. Also, Ayoade (2010) stated that rural farmers should be encouraged to seek extension information on recommendations and technologies through various extension sources at their disposal. Moreover, findings show that majority of the respondents (72%) indicated low in the uptake and implementation of GAPs in the study area. The study also revealed that the respondents were facing with numerous prevailing challenges which inhibit them from implementing the identified GAPs, namely; lack of fertilizers, inadequate finance, extreme poverty, unreliable rainfall and cost of production among others. This is in agreement with the findings of Pongvinyoo *et al* (2014) among coffee farmers in Thailand, which stated that farmers still lacked farm input, knowledge and experience of GAPs and their conventional farming activities are often conflicting with the GAPs system. Also, FAO (2010) asserts that financial cost and specialized knowledge make implementation of GAPs such as water purification equipment or record-keeping technology more difficult for smallholder farmers and producers in developing countries. In the same vein, in a study conducted by Akkaya *et al* (2006) on GAPs and its implementation in Turkey, identified limitations over the fragmented structure of production area, lack of keeping records, lack of establishment of growers' organization in term of number and scale to expand widely GAP system. By and large, this study concluded that the main challenge to GAPs among smallholder farmers is to put the system into practice more widely.

3.7   Recommendations

The study recommends that the Federal Ministry of Agriculture should provide more funds for NAERLS in order to intensify its efforts in the pilot communities' development projects and expanded its Adopted Village concepts to other parts of the country which invariably will create more awareness of the GAP system among rural communities. It also recommends collaboration between government and private sectors, such that the implementation of GAP becomes part of the private sector standard. If successful, this collaboration might encourage smallholder farmers to be more aware and make better informed decisions which encourages comprehensive implementation of the system. Furthermore, effort should be made by all tiers of Government towards encouraging smallholder farmers to practice the GAP system by providing farm inputs and irrigation system for the rural community. Extension services should embark on massive public enlightenment campaigns and mass information mobilization in the rural communities across the nation.

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