



## **SPATIAL TECHNOLOGY ADOPTION AMONGST AFRICAN DEVELOPMENT BANK COMMUNITY BASED AGRICULTURE AND RURAL DEVELOPMENT PROGRAMME BENEFICIARIES IN NIGERIA**

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### **ABSTRACT**

Improved technology adoption for agricultural transformation and poverty reduction is critical in modern day agriculture. The study examined spatial distribution of technology adoption among African Development Bank-Community Based Agriculture and Rural Development Programme (AfDB-CBARDP) beneficiaries in Nigeria. Multi stage sampling procedure was employed where a total of 1020 farmers/Project beneficiaries across the 5 project implementing units (PIU) were selected. The data was estimated using descriptive statistics. The result obtained indicated that the mean value across the states for improved seed, post-harvest, dry season and fertilizer application technologies adoption stood at 83.7%, 81.9%, 75.8% and 51.8%. Similarly, the mean adoption rates for improved livestock, and fisheries technologies were reported to be 68.7%, and 50.6%, respectively. On a state-by-state basis, the weighted mean rates of adoption for all the agricultural technologies indicated that Adamawa, Bauchi, Gombe, Kaduna and Kwara have 58.0%, 70.2%, 66.9%, 67.7 and 50.0% respectively. The findings of the study revealed that the mean adoption rate among females Project beneficiaries for post-harvest technologies like multi-purpose threshers, rice dehaulers, rice milling, groundnut extractors, hammer milling machines and grinding machines were appreciably higher having percentage values of 66.3%, 56.2%, 70.1%, 60.1%, 59.1% and 54.9% respectively. In the same vein, distribution of technology adoption reveals that adoption of seed, fertilizer and post-harvest technologies ranked highest than fishery technologies across the Project implementing units. Technology adoption on gender basis further revealed that Groundnut, cowpea, and soybean technologies were highly adopted among participating male than female farmers. Concurrently, the study indicated an appreciable level of agricultural technology adoption across the Project implementing units. However, the mean adoption rate of Artificial Insemination technologies was low (25.5%) having fell short of the 40% before a farmer is considered to be an adopter. The study recommended among others that where the overall adoption rate is lower, further research is required to identify the key constraints to adoption so that corrective measures can be found which can be used to improve adoption of future AfDB-CBARDP supported technologies.

**Keywords:** Project implementing units, Rural village areas, African Development Bank Community Based Agriculture and Rural Development Programme.

### **INTRODUCTION**

Nigeria has a diverse and rich vegetation capable of supporting a heavy population of livestock, 68 million ha of arable land, 267.7 billion m<sup>3</sup> of surface water, 57.9 billion m<sup>3</sup> of underground water and 3.14 million ha of irrigable land and technical change in the form of adoption of improved agricultural production technologies has been reported to have positive impacts on agricultural productivity growth in the developing world (National Food Security Programme [NPFS], 2008). The country is also blessed with reasonably abundant rainfall of between 300 mm to about 4000 mm per annum, as well as an extensive coastal region that is



very rich in fish and other marine products. Despite Nigeria's rich agricultural resource endowment, the agricultural sector has been growing at a relatively low rate. Average yields of major staple crops are below that of other developing countries. This means that Nigeria is yet, to fully utilize its natural resource base, particularly land for agricultural production. The country's ability to fully utilize its agricultural production potential depends on the innovativeness of actors in the agricultural sector, particularly farmers. Promotion of technical change through the generation of agricultural technologies by research and their dissemination to end users plays a critical role in boosting agricultural productivity in developing countries. Many studies have indicated that agricultural productivity growth has been driven by improved farm technologies, including improved seeds, fertilizer, and water control (Johnston and Kilby, 1975; 1976; Gabre-Madhin and Johnston, 2002).

The availability of modern agricultural production technologies to end users, and the capacities of end users to adopt and utilize these technologies are also critical. Unfortunately, the Nigerian agricultural sector is characterized by low level of technology adoption which in turn contributes to the low agricultural productivity in the country. Yet agricultural innovations have always been adopted slowly and some aspects of the adoption process are still poorly understood. While the finding of low levels of technology adoption is well accepted, few studies in the past attempted to explained the slow rate of adoption of modern agricultural technology (Bandiera and Rasul (2006; Langyintuo and Mekuria, 2005; and Zavale *et al.*, 2005). The Project has introduced a range of agricultural technologies to increase productivity that was expected to increase income and leaving conditions of beneficiaries.

This study attempted to examines the spatial distribution of technology adoption by African Development Bank Community Based Agriculture and Rural Development Programme (AfDB-CBARDP) beneficiaries. In specific terms, the objectives of the study were to:

- i) To determine rate of adoption of improved agricultural technologies among the Project beneficiaries.
- ii) To assess the distribution of improved farming technology adoption by gender among the Project beneficiaries.

## **MATERIALS AND METHODS**

### **The Study Area**

The study areas were made up of Project participating States of Adamawa, Bauchi, Gombe, Kaduna and Kwara. The Project is been implemented in Nine (9) Local Government Areas (LGA) in each selected State and Three (3) Rural Village Area (RVA) per LGA, giving a total of 45 LGAs and 135 RVAs, respectively, representing 49.0% of the local Government areas.

### **Sampling Technique**

Multi stage sampling technique was employed for the study. The first stage involved purposive selection of LGAs and RVAs where there is contiguous Project activities in order to ensure all technologies introduced by the Project are reasonably captured. The fact that adoption of certain technologies is highly localize and weather dependent in some instances predisposes the selection criteria. In each State, 3 LGAs were selected and in each LGA, 2 RVAs were in turn purposively selected, making a total of 6 RVAs/LGA. In the second stage, 34 farmers/Project beneficiaries were selected randomly from each RVA to give a total of 204 respondents per State Altogether, 1,020 farmers/Project beneficiaries were selected for the study.

### Method of Data Collection

The study instrument was designed based on the existing agricultural technology adoption literatures and technologies introduced by the Project. The survey instrument deals specifically with technology adoption variables. Both primary and secondary data were used to collect information using a combination of structured questionnaires and focus group discussions.

### Validity and Reliability

In order to ensure internal validity and control measurement error, the survey instrument was reviewed by the Project researcher's committee for content and face validity. Some adjustments were made in the structure, chronology, and wording based on their recommendations. The instrument was pilot-tested by a randomly selected group of farmers in 3 RVAs comprising Tulai, Jangu and Guda of Bauchi State.

### The Analytical Framework

Descriptive statistics was employed in analyzing the data using means and percentages.

## RESULTS AND DISCUSSION

### Rate of Adoption of Improved Agricultural Technologies

According to the result obtained in Table 1, mean adoption across the states for improved seed, post-harvest, dry season and fertilizer application technologies stood at 83.7%, 81.9%, 75.8% and 51.8%, respectively. Similarly, the mean adoption rates for improved livestock, and fisheries technologies were reported to be 68.7%, and 50.6% respectively. This result indicated an appreciable level of agricultural technology adoption across the Project implementing units. However, the mean adoption rate of AI technologies was low (25.5%) having fell short of the 40% point as canvassed by (Ojiako, 2009; and Idrisa *et al.*, 2012) before a farmer is considered to be an adopter.

**Table 1:** Distribution of Technology Adoption Rates (%)

State	Adamawa	Bauchi	Gombe	Kaduna	Kwara	Mean
Technology						
Improved Seed	87.6	76.2	82.5	85.5	87.0	83.7
Fertilizer Application	76.6	87.0	81.0	78.0	86.8	81.9
Post-Harvest	69.2	76.4	64.4	81.0	83.0	75.8
Dry Season	56.3	61.6	59.1	61.2	21.0	51.8
Improved Livestock	78.1	81.0	79.0	74.0	31.6	68.7
Improved Fishery	15.1	78.0	71.0	69.5	19.3	50.6
Artificial Insemination	23.2	31.5	26.0	25.0	21.7	25.5
<b>Mean</b>	<b>58.0</b>	<b>70.2</b>	<b>66.9</b>	<b>67.7</b>	<b>50.0</b>	

Source: Field data, 2013

On a state-by-state basis, the weighted mean rates of adoption of all the agricultural technologies indicates that Adamawa, Bauchi, Gombe, Kaduna and Kwara have 58.0%, 70.2%, 66.9%, 67.7 and 50.0%, respectively (Table 1). It could be safely averred that Bauchi Project implementing unit has the highest percentage of adoption of the agricultural technologies promoted. On type of agricultural technology wise, adoption of seed, fertilizer and post-harvest technologies ranked highest than fishery and livestock technologies across the Project implementing units. Likewise, it could be avouched that the low rate of dry season technology adoption in Kwara Project implementing unit is perhaps not isolated with its vintage geographical position located at epicenter of guinea savanna ecological zone of Nigeria which has a relatively longer period of rainy season (7- 8 month).



### **Adoption of Improved Seeds Technology by Gender**

Different improved varieties of seeds were promoted by the Project for adoption across the five Project implementing states of Adamawa, Bauchi, Gombe, Kaduna and Kwara. Table 2 presents the description of the technologies and the distribution of the adopters according to gender across the five participating states. The mean adoption for early maize variety was 49.9% and 28.2% for male and female farmers, respectively. On the other hand, the adoption levels for *striga* resistant variety, Sorghum ICSV, Nerica/Faro rice, Groundnut Ex-Dakar and Soybean were reported to be 51.3%, /29.0%; 38.8%/, 21.9%; 44.1%/, 24.9%; 28.3%/, 16.0% and 25.3%, /14.3% for male/female Project beneficiaries, respectively. In the same vein, adoption of other seed technologies like cowpea variety, Sosat millet variety, Ex-Sudan Beniseed, Cassava, Yam miniset and crop mixture were shown to have mean adoption rates of 28.9%, /16.3%; 9.5%/, 5.4%; 6.0%/, 3.4%; 22.1%, 12.4%; 9.0%, 5.1% and 10.5%, 5.9% for male and female farmers, respectively. The result indicates that there are more male adopters of the improved seeds technology than their female counterparts. The result further reveals that the overall adoption of the newly introduced crop mixtures; Maize/Cowpea and Maize/Soya bean was low; 10.5%/5.9% for male and female farmers, respectively.

Technology adoption on state basis revealed that Groundnut, cowpea, and soybean were highly adopted among participating male farmers. These crops are usually cultivated as cash crops, hence their likely dominance adoption by male-headed households in these areas. No single adoption (Table 2) was recorded for some of the improved seed technologies like beniseed, cassava and yam mini set in Adamawa, Bauchi and Gombe states. While cassava and beniseed were not considered staples in these areas, non-adoption of yam mini set on the other hand could be linked to its environmental requirements which these areas did not possess.

**Table 2:** Adoption of Improved Seeds Technology by Gender

Type of improved seed adopted	Adamawa (n = 198)		Bauchi (n = 201)		Gombe (n = 202)		Kaduna (n = 201)		Kwara (n = 200)		Total (n = 1,002)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Early maize variety	43.1%	20.3%	53.2%	25.0%	65.0%	30.6%	71.0%	33.4%	67.1%	31.5%	49.9%	28.2%
Striga Resistant variety	31.6%	14.9%	56.1%	26.4%	76.0%	35.7%	81.2%	38.2%	63.1%	29.7%	51.3%	29.0%
Sorghum ICSV	93.5%	43.9%	21.3%	10.0%	41.2%	19.4%	32.0%	15.0%	45.0%	21.2%	38.8%	21.9%
Nerica and Faro Rice	43.3%	20.4%	61.2%	28.8%	65.0%	30.6%	64.0%	30.1%	31.2%	14.7%	44.1%	24.9%
Groundnut-Ex-dakar	78.2%	36.8%	42.1%	19.8%	23.0%	10.8%	26.5%	12.5%	0.0%	0.0%	28.3%	16.0%
Soybean variety	68.0%	32.0%	26.1%	12.3%	12.0%	5.6%	19.0%	8.9%	26.7%	12.5%	25.3%	14.3%
Cowpea variety	63.2%	29.7%	13.1%	6.2%	37.1%	17.4%	41.0%	19.3%	19.0%	8.9%	28.9%	16.3%
Millet Variety (Sosat)	0.0%	0.0%	12.0%	5.6%	34.0%	16.0%	11.0%	5.2%	0.0%	0.0%	9.5%	5.4%
Beniseed (Ex Sudan)	0.0%	0.0%	2.0%	0.9%	19.0%	8.9%	15.0%	7.1%	0.0%	0.0%	6.0%	3.4%
Cassava	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	45.1%	21.2%	87.2%	41.0%	22.1%	12.4%
Yam Miniset	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	54.1%	25.4%	9.0%	5.1%
Crop mixtures (Maize/cowpea; Maize/soybean)	17.20%	8.10%	12.00%	5.60%	10.00%	4.70%	0.00%	0.00%	24.00%	11.30%	10.5%	5.9%

Source: Field data, 2013



### **Adoption of Fertilizer Technologies by Gender**

Four different types of fertilizer technologies were promoted in the AfDB-CBARDP participating states of Adamawa, Bauchi, Gombe, Kaduna and Kwara. The improved technologies were categorized viz; organic/inorganic fertilizer application, Best Management Practice (BMP) using combination of organic and inorganic fertilizer and fertilizer application using ring method. The level of adoption of these technologies by gender groups as indicated in Table 3 shown that organic fertilizer technology application has a mean adoption rate of 64.4% among male beneficiaries while inorganic fertilizer recorded 94.0% mean adoption rate for the same sex across the five states. The high adoption rate of inorganic fertilizer could be explained by its long existence in the farming history of Nigeria and farmers have since appreciated its importance as yield enhancement input. In the same vein, Kohli and Singh (1997) found that inputs played a large role in the rapid adoption of maize High Yielding Varieties in Punjab, India.

On the other hand, the mean rates of adoption of BMP and ring method of fertilizer application were reported to be 43.5% and 12.1%, respectively. Obviously, there is low level of adoption of these technologies among the Project beneficiaries. Notwithstanding, the ring method of fertilizer application ensures effective fertilizer usage both in terms of quantity and plant up take. However, the amount drudgery and time required to apply it may partly explain the reason for its low adoption rate. Comparatively, there were more male adopters than female adopters. Perhaps, this could be due to high proportion of ownership of factors of production, especially land by male farmers than their female counterparts due to cultural practices.

**Table 3:** Gender Distribution of Fertilizer Technology Adoption

Improved fertilizer application adopted	Adamawa (n = 198)		Bauchi (n = 201)		Gombe (n = 202)		Kaduna (n = 201)		Kwara (n = 200)		Total (n = 1,002)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Organic fertilizer	56.3%	19.7%	76.0%	26.6%	65.4%	22.9%	59.3%	20.8%	65.2%	22.8%	64.4%	22.6%
Inorganic fertilizer	97.4%	0.2%	94.0%	0.2%	91.2%	4.0%	89.3%	9.0%	98.0%	4.3%	94.0%	3.5%
BMP-using Organic & Inorganic	56.2%	19.7%	36.0%	12.6%	54.2%	19.0%	27.8%	9.7%	43.2%	15.1%	43.5%	15.2%
Fertilizer application using ring method	21.5%	7.5%	43.0%	15.1%	43.0%	15.1%	35.2%	12.3%	29.8%	10.4%	34.5%	12.1%

Source: Field data, 2013





### **Adoption of Post-Harvest Technologies by Gender**

The gender distribution of post-harvest technology adoption is presented in Table 4. The mean adoption rates were generally higher among females than males project beneficiaries. The findings of the study revealed that the mean adoption rate among females' project beneficiaries with regard to multi-purpose threshers, rice dehaulers, rice milling, groundnut extractors, hammer milling machines and grinding machines were appreciably higher having percentage values of 66.3%, 56.2%, 70.1%, 60.1%, 59.1% and 54.9%, respectively. The high rates of adoption by women beneficiaries could be explained by their traditional role as custodians of food processing activities in the family.

Results analysis based on technology adoption by state revealed that adoption of groundnut thresher/melon sheller was high in Adamawa and Kwara representing 54.3% and 63.2% respectively among female Project beneficiaries. It could be cited that adoption of improved groundnut technology seed was equally higher in Adamawa State, hence the tendency of adopting technologies that are related to groundnut processing. The high proportion for adoption of melon sheller in Kwara may also be connected to the culture of the dominant ethnic group in the state which has melon seed as a major ingredient in the preparation of their traditional *egusi* soup delicacy. Adoption of cassava technologies was virtually none existent except in Kaduna and Kwara States. This too has strong implication on feeding habits of people domiciled in the two states. While Kwara could be said to be predominantly Yorubas, Kaduna is a cosmopolitan city which harbors sizeable number of different ethnic groups in Nigeria including Yorubas and Igbos whose principal staple food is *Garri* (a cassava product).



**Table 4:** Gender Distribution of Post-Harvest Technology Adoption

Type of improved Post-Harvest Adopted	Adamawa (n = 198)		Bauchi (n = 201)		Gombe (n = 202)		Kaduna (n = 201)		Kwara (n = 200)		Total (n = 1,002)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Multi-purpose crop thresher	0.0%	0.0%	8.0%	91.0%	10.4%	84.3%	1.7%	84.3%	11.2%	72.1%	6.3%	66.3%
Groundnut and melon thresher	12.5%	54.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.5%	63.2%	5.4%	23.5%
Rice Dehaulers	17.1%	74.3%	15.0%	65.2%	15.5%	67.3%	0.0%	0.0%	17.1%	74.3%	12.9%	56.2%
Rice milling	17.5%	76.2%	19.9%	86.5%	12.5%	54.3%	15.0%	65.4%	15.7%	68.3%	16.1%	70.1%
Groundnut oil extraction	20.0%	87.0%	16.8%	73.2%	20.5%	69.3%	16.4%	71.2%	0.0%	0.0%	14.7%	60.1%
Cassava processing	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	54.3%	21.5%	78.0%	6.8%	26.5%
Storage bins	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	34.0%	7.8%	0.0%	0.0%	6.8%	1.6%
Chorkor smoking kiln	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.1%	61.2%	2.8%	12.2%
Hammer mill machine	21.4%	93.0%	0.0%	0.0%	14.3%	62.1%	15.0%	65.0%	17.3%	75.3%	13.6%	59.1%
Grinding machine	15.0%	65.0%	15.9%	69.2%	0.0%	0.0%	20.5%	69.3%	18.7%	71.2%	14.0%	54.9%

Source: Field data, 2013



### **Adoption of Improved Fishery Technology**

The project has disseminated two distinct technologies under its fishery programme. These are fish production using plastic technology and fish feed formulation production. The distribution of the respondents based on the adoption pattern as shown in Table 5 has revealed that 23.9%, 4.95 and 34.1%, 6.95% total male and female beneficiaries have adopted the two technologies respectively. On State basis, Kaduna has the highest percentage of male plastic tank technology adopters (39.4%), while Adamawa has the least (21.3%). Kwara State did not adopt the technology altogether. This may not be unconnected with the presence of large bodies of perennial rivers which traverse the State and where artisanal fishing is very popular. Meanwhile, mean adoption rate for fish feed formulation is reported to be 34.15 % and 6.95 % for male and female Project beneficiaries, respectively. Relatively, there is low rate of adoption for fishery technology bundle in some of the States especially Adamawa, which might be attributable to the late Project take off in the State.



**Table 5:** Adoption of Improved Fishery Technology

Type of improved Fishery adopted	Adamawa (n = 198)		Bauchi (n = 201)		Gombe (n = 202)		Kaduna (n = 201)		Kwara (n = 200)		Total (n = 1,002)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Fish production using plastic tank	21.3%	4.5%	23.4%	7.0%	35.4%	2.0%	39.4%	11.0%	0.0%	0.0%	23.9%	4.9%
Fish feed formulation and production	17.2%	3.6%	46.0%	8.0%	49.0%	9.0%	26.0%	7.0%	32.3%	6.8%	34.1%	6.9%

Source: Field data, 2013



### **Adoption of Artificial Insemination Technology**

According to the data obtained in Table 6 the mean adoption rate for artificial insemination technology on gender basis for livestock feed and feeding is 16.5% male and 0.4% female. Relatively, the mean adoption rate for herd health management is also shown to be 6.2% male and 0.3% female. For both Artificial Insemination services and training of community inseminators, the mean adoption rate is reported to be 24.2% and 2.0% for the male gender only. Apart from its low performance, the adoption of artificial insemination technology is overtly tilted in favor of men, perhaps this could be due to their vintage position as owners of productive assets and head of the household decision making.

**Table 6:** Adoption of Artificial Insemination Technology

Artificial insemination adopted	Adamawa (n = 198)		Bauchi (n = 201)		Gombe (n = 202)		Kaduna (n = 201)		Kwara (n = 200)		Total (n = 1,002)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Livestock feed and feeding	19.2%	0.0%	12.3%	0.0%	11.1%	0.0%	13.2%	0.0%	26.7%	2.0%	16.5%	0.4%
Herd health management	5.0%	0.0%	7.0%	0.8%	1.2%	0.1%	6.0%	0.7%	12.0%	0.0%	6.2%	0.3%
A.I services	32.0%	0.0%	21.0%	0.0%	17.0%	0.0%	23.0%	0.0%	28.0%	0.0%	24.2%	0.0%
Community Inseminators	2.0%	0.0%	2.0%	0.0%	2.0%	0.0%	2.0%	0.0%	2.0%	0.0%	2.0%	0.0%

Source: Field data, 2013

## CONCLUSION AND RECOMMENDATIONS

The mean result across the States for improved seed, post-harvest, dry season and fertilizer application technologies adoption stood at 83.7%, 81.9%, 75.8% and 51.8%. Similarly, the mean adoption rates for improved livestock, and fisheries technologies were reported to be 68.7%, and 50.6%, respectively. On a state-by-state basis, the weighted mean rates of adoption for all the agricultural technologies indicated that Adamawa, Bauchi, Gombe, Kaduna and Kwara have 58.0%, 70.2%, 66.9%, 67.7 and 50.0%, respectively.

Furthermore, adoption of improved seed technology by gender reveals that, the mean adoption for early maize variety was 49.9% and 28.2% for male and female farmers respectively. On the other hand, the adoption levels for *striga* resistant variety, Sorghum ICSV, Nerica/Faro rice, Groundnut Ex-Dakar and Soybean were reported to be 51.3%/29.0%; 38.8%/21.9%; 44.1%/24.9%; 28.3%/16.0% and 25.3%/14.3% for male/female farmers, respectively. The result further shown that organic fertilizer technology application has a mean adoption rate of 64.4% among male beneficiaries while inorganic fertilizer recorded 94.0% mean adoption rate for the same sex across the five states.

The high adoption rate of inorganic fertilizer could be explained by its long existence in the farming history of Nigeria and farmers have since recognized its importance as yield enhancement input. The adoption of improved fishery production technology revealed that 23.9%, 4.95% and 34.1%, 6.95% male and female beneficiaries have adopted the two technologies, respectively. On State basis, Kaduna has the highest percentage of male plastic tank technology adopters (39.4%), while Adamawa has the least (21.3%). Kwara State did not adopt the technology altogether. This may not be unconnected with the presence of large bodies of perennial rivers which traverse the State and where artisanal fishing is very popular. Meanwhile, mean adoption rate for fish feed formulation is reported to be 34.15 % and 6.95 % for male and female among the Project beneficiaries, respectively.

Technology adoption on gender basis further revealed that Groundnut, cowpea, and soybean technologies were highly adopted among participating male farmers. These crops are usually cultivated as cash crops, hence, their likely dominance adoption by male-headed households in these areas. The result indicates that there are more male adopters of the improved seeds technology than their female counterparts. Similarly, apart from its low performance, the adoption of artificial insemination technology is overtly tilted in favor of men, perhaps this could be due to their vintage position as owners of productive assets and head of the household decision making. The study recommended that:

4. Technologies with low adoption levels should receive special attention in extension in terms of educating the farmers on the benefits of adopting such practices.
5. More innovative extension strategies are required in order to improve access to extension services for farmers with low education levels.
6. Where the overall adoption rate is lower, further research is required to identify the key constraints to adoption so that corrective measures can be found which can be used to improve adoption of future AfDB-CBARDP supported technologies.

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