Journal of Arid Agriculture

J. Arid Agric. 2025, Vol. 26 (3): 8 - 17

https://jaaunimaid.ng/index.php/home

0189-7551
https://doi.org/10.63659/jaa.v26i3.99

ADOPTION LEVEL OF IMPROVED RICE PRODUCTION TECHNOLOGIES AMONG IFAD-VCDP RICE FARMERS BENEFICIARIES AND NON-BENEFICIARIES IN NASARAWA STATE, NIGERIA

*Dio Philip, E.S. Salau and E.G. Luka

Department of Agricultural Economics and Extension, Faculty of Agriculture, Nasarawa State University, Keffi.

Corresponding e-mail: philipdio220029@nsuk.edu.ng Phone: 08062191136

ABSTRACT: The study assessed the Adoption level of Improved Rice Production Technologies among IFAD-VCDP Rice Farmers Beneficiaries and Non-beneficiaries in Nasarawa State, Nigeria. Multistage sampling technique was used to select 260 rice farmer beneficiaries of IFAD-VCDP and 260 non-beneficiaries, using a structured questionnaire across the three participating Local Government Areas of Nasarawa State. Descriptive and inferential statistics were used for data analysis. The study identified the socioeconomic characteristics of the beneficiaries and non-beneficiaries. The result further shows very high level of adoption of improved rice production technologies introduced by IFAD-VCDP among the beneficiaries. The benefits derived from adoption of improved rice production technologies were increase in yield, increase in farm income and expansion of farmland. Farm size, farming experience, extension contact, household labour, annual income and yield/ha were significant factors influencing adoption of improved rice production technologies. The study concluded that the IFAD-VCDP Improved Rice Production Technologies have been well-received by rice farmers in Nasarawa State, with a high level of adoption recorded. However, high cost of the technology remains a significant constraint to effective adoption. It is essential to scale up extension services, strengthen farmer organizations, and promote public-private partnerships to make the technologies more affordable and accessible to farmers.

Keywords: Adoption, Beneficiaries, IFAD-VCDP, Improved Technologies, Non-beneficiaries

INTRODUCTION

Farmers in Nigeria have been described as being very poor with low income, especially in rural areas where the farmers are facing low agricultural production. The low productivity of staple crops in developing countries such as Nigeria is as a result of the use of inefficient traditional farming techniques, inadequate irrigation infrastructure, land fragmentation, the effect of climate change, improper application of modern agricultural technologies and lack of credit are responsible for the widening supply-demand gab. For instance, the bulk of rice production in the country remains in the hands of small-scale farmers who are limited by capital, poor commodity market infrastructures and farm management skills to give higher yield.

Improved rice productivity can be attained through the adoption of improved agricultural technological innovation by the farmers, which includes high-yield variety, genetically modified crops, facilitating access to credit and insurance markets, irrigation facilities, along with good extension services. All these may lead not only to better yield, income, labour-saving, efficiency, but also to improved production environment (e.g. mitigating effects on climate change) and health benefits (Amali *et al*., 2021). Thus, for Nigerian agriculture to improve, farmers have to learn and adopt recommended scientific farming techniques in place of the traditional practices. Studies have shown that several improved rice production technologies abound (Okonji, 2020). These include seed selection techniques, planting depth, plant spacing, pesticide application, high-yielding seed varieties, improved land preparation, herbicide application, fertilizer application, the use of combined harvester, high-table well, modern storage system,

How to cite this Article: Dio Philip, E.S. Salau and E.G. Luka (2025). Adoption Level of Improved Rice Production T¬echnologies Among IFAD-VCDP Rice Farmers Beneficiaries and Non-Beneficiaries in Nasarawa State, Nigeria. *Journal of Arid Agriculture, 26*(3), 8 - 17. https://doi.org/10.63659/jaa.v26i3.99 Retrieved from https://jaaunimaid.ng/index.php/home/article/view/99

water management and irrigation system in addition to government intervention programmes like IFAD-VCDP, Anchor Borrowers' Programme (CBN, 2021; CBN, 2022).

The rice production technologies provided to rice farmers by IFAD-VCDP include: Improved variety of rice seeds, Seedling management (raising seedlings in raised seedbed and uprooting seedlings carefully), Use of optimum aged seedling, Row transplanting maintaining 20cm row to row and 20cm plant to plant spacing, recommended seedling density, Insect pest management by birds perch as alternate to apply insecticide and use of recommended quantity of fertilizer at recommended time of application (Nasarawa IFAD-VCDP, (2024).

IFAD-VCDP started it activities in Nasarawa State in 2020, with so many rice farmers from the selected LGAs of Lafia, Doma, Karu, Nasarawa and Wamba participating in the programme, but there are no empirical studies focusing on the level of adoption of the improved rice production technologies by the beneficiaries of the VCDP programme and the factors limiting the uptake of the introduced technologies. The dearth of these vital data poses serious research gaps that need to be filled. This study is therefore designed to fill these identified research gaps.

The study will provide answers to the following research questions:

i. describe the socioeconomic characteristics of IFAD-VCDP rice farmer's beneficiaries and non-beneficiaries in Nasarawa State;
ii. determine the level of adoption of IFAD-VCDP improved rice production technologies by the respondents;
iii. determine the benefits derived from adoption of IFAD-VCDP improved rice production technologies;
iv. examine the socioeconomic factors influencing adoption level of IFAD-VCDP improved rice production technologies by the respondents; and
v. Constraints to effective adoption of improved rice production technologies by the respondents.

Statement of the Hypothesis

The hypothesis for this study stated in the null form:
Ho: There is no significant relationship between the socioeconomic characteristics of the respondents and their adoption level of IFAD-VCDP improved rice production technologies.

METHODOLOGY

The study was conducted in Nasarawa State, Nigeria. The area is centrally located in the middle-belt region of Nigeria. The state lies between latitudes $7^0 45^1$ and $9^0 25^1$North of the equator and longitudes 7^0 and $9^0 37^1$ East of the Greenwich meridian. It lies within the Guinea Savanna region and has tropical climate. The State shares boundary with Kaduna State to the North, Plateau State to the East, Taraba and Benue State in the South and Kogi and Federal Capital Territory to the West. The State has a climate typical of the tropical zone. It has an average temperature of 28.4^0C. Rainfall varies from place to place with annual average of between 1100mm to about 2000mm. Agriculture is the dominant source of livelihood.

A multistage sampling technique was used to select the respondents for this study. A comprehensive list of IFAD-VCDP participating farmers from the selected communities was obtained during a preliminary survey. It shows that there were a total of 750 registered IFAD-VCDP farmers in the selected communities in Nasarawa State. (Nasarawa State IFAD-VCDP Office, 2024). The Taro Yamane formula was applied to calculate the representative sample size from the total population of 750 beneficiaries of IFAD VCDP in the three selected LGA of Nasarawa state. Through this formula, sample size of 260 rice farmers' beneficiaries of IFAD-VCDP and 260 non-beneficiaries were selected for the study. Bourley's proportional distribution was used to determine the number of participating rice farmers in each of the community. Primary data were used for the study. The data were collected using questionnaire which was administered to the sampled respondents. The data were analyzed using descriptive statistics and multiple linear regression analysis.

Table 1: Sampling Frame and Sample size of IFAD-VCDP Rice Farmers Beneficiaries and Non-beneficiaries in the Study Area.

LGA	Community	Number of Beneficiaries	Sample Selected (34.6%)	Non-beneficiaries Selected
Doma	Rutu	75	26	26
	Doma	82	28	28
	Iwashi	77	27	27
	Yelwa	52	18	18
	Total	**286**	**99**	**99**
Karu	Karu	71	24	24
	Panda	68	24	24
	Karshi	63	22	22
	Gitata	46	16	16
	Total	**248**	**86**	**86**
Wamba	Wamba	61	21	21
	Sisimbaki	55	19	19
	Gbude	53	18	18
	Mararaba	47	16	16
	Total	**216**	**75**	**75**
Total	**12**	**750**	**260**	**260**

Source: Nasarawa State IFAD-VCDP, 2024

RESULT AND DISCUSSION

Socioeconomic Characteristics of IFAD-VCDP Beneficiaries and Non-beneficiaries

The result from Table 1 shows that the mean age was 42 years and 45 year for beneficiaries and non-beneficiaries respectively. Result on educational level revealed that IFAD-VCDP beneficiaries had average educational level of 12 years and 6 years for non-beneficiaries. On household labour, beneficiaries had average household number of 3 persons and 5 persons for non-beneficiaries. Faming experience had mean years of 14 years and 18 years for beneficiaries and non-beneficiaries respectively. Result on mean number of extension contact was 14 times in a year for beneficiaries and 1 time in a year for non-beneficiaries. Furthermore, the result shows all (100%) of the IFAD-VCDP rice farmers beneficiaries were members of cooperative societies who have 5-10 years (68.08%), more than 10 years (14.62%) years of membership and 17.31% have less than 5 years of membership. The study also shows that 52.69% of the rice farmers' non-beneficiaries of IFAD-VCDP intervention do not belong to any farming associations, 23.85% have less 5 years of membership while 23.46% have more than 5 years of membership. The average years of membership of cooperative association is 7 and 2 for beneficiaries and non-beneficiaries respectively. This shows that IFAD-VCDP have the highest number of years of membership of association. This is because to be beneficiaries of IFAD-VCDP, one must be a member of cooperative societies. It implies, as rice producers get involved in cooperative societies/association, it increases the chances of participating in IFAD value chain development programme.

Level of Adoption of Improved Rice Production Technologies

Table 2 shows improved rice production technologies identified by the respondents in the study area. Among the IFAD-VCDP beneficiaries, it was revealed that 100.0% of the respondents identified improved seed varieties, 91.92% identified optimum seed rate, 88.85% identified mechanized farming, 86.15% identified timely transplanting, 83.85% identified standard planting depth, 73.85 identified method of fertilizer application, 70.00% identified used of agrochemical. Other technologies with high identification are improved nursery techniques, storage methods and used of line spacing. For the non-beneficiaries, 71.92% identified mechanized farming, 68.08% identified used of agrochemicals, 61.92% identified optimum seed rate while 50.00% identified improved seed varieties. From the result, it can be deduced that IFAD-VCDP rice farmers have high knowledge of improved rice production technologies while non-beneficiaries farmers in the study area had poor knowledge of rice production technologies. This could be due to lack of awareness and exposure of the farmers on the practices of improved

technologies in rice production. This is in line with Oladeebo *et al*. (2019), who found that IFAD-VCDP beneficiaries in Nigeria had a higher level of knowledge and adoption of improved rice production technologies.

Table 1: Socioeconomic Characteristics of IFAD-VCDP rice Beneficiaries and Non-Beneficiaries

Characteristics	Freq. Beneficiaries	Percent	Mean	Freq. non-beneficiaries	Percent	Mean
Age						
Less than 20	11	4.23	**42years**	13	5.00	**45years**
20-39	97	37.31		51	19.61	
40-59	125	48.08		167	64.23	
61 above	27	10.38		29	11.15	
Sex						
Male	138	53.08		155	59.62	
Female	122	46.92		105	40.38	
Education level						
No formal education	27	10.38	**10years**	89	34.23	**6years**
Primary	58	22.31		88	33.84	
Secondary	97	37.31		64	24.62	
Tertiary	78	30.00		19	7.31	
Number of household involve in rice production						
1-5	222	85.38	**3persons**	106	40.77	**5persons**
6-10	38	14.62		153	58.85	
11 and above	0	0.00		1	0.38	
Farm size						
<1	0	0.00	**2.7ha**	15	5.77	**1.9ha**
1-4	228	87.69		245	94.23	
5 and above	32	12.31		0	0.00	
Farming experience (Years of rice farming)						
Less than 10	35	13.46	**14years**	22	8.46	**18years**
10-19	194	74.62		109	41.92	
20-29	19	7.31		128	49.23	
30-39	9	3.46		1	0.38	
40 and above	3	1.15		0	0.00	
Access to credit						
Yes	126	48.08		27	10.38	
No	134	51.12		233	89.62	
Number of extension visits						
1-10	32	12.31	**14times**	104	40.00	**1time**
10-19	178	68.46			0	0.00
20 and above	50	19.23			0	0.00
Cooperative Membership						
Member	260	100.0		123	47.31	
Not member	0	0.00		137	52.69	

Source: Field Survey, 2025

Adoption marks the final step in the adoption process, where the innovation becomes a standard part of one's practices. This is a stage where an individual makes a mental and practical evaluation to make the final decision as whether to use or reject an innovation Van den Ban and Hawkins (1996). It was analyzed using frequency and percentage. Adoption level is the relative number of innovation/technologies that is put to use. It is the Number of technologies adopted by an individual farmer divided by the total number of improved technologies available in the area and multiplying by 100. Result in Table 3 shows that among the IFAD-VCDP beneficiaries, majority (37.31%) have very high adoption level , 32.69% adopted high scale level, 12.31% adopted medium scale level, while 6.53% have low adoption level and 11.15% have very low adoption level. This implies there is high level of adoption of improved rice production technologies among the IFAD-VCDP rice farmers' beneficiaries.

Table 2: Improved Rice Production Technologies Adopted by IFAD-VCDP Rice Farmers Beneficiaries and Non-Beneficiaries

Improved technologies	Freq Beneficiaries	Percentage Beneficiaries	Freq Non-beneficiaries	Percentage Non-beneficiaries
Improved rice varieties	260	100.00	130	50.00
Use of line spacing	97	37.31	6	2.31
Use of standard planting depth	218	83.85	102	39.23
Use of agrochemicals	182	70.00	177	68.08
Method Fertilizer application	192	73.85	87	33.46
Mechanized farming	231	88.85	187	71.92
Improved nursery techniques	178	68.46	48	18.46
Irrigation method	72	27.69	73	28.08
Timely transplanting	224	86.15	32	12.31
Optimum seed rate	239	91.92	161	61.92
Zero tillage	0	0.00	71	27.31
Pest and disease control	206	79.23	76	29.23
Water management	214	82.31	62	23.85
Storage methods	153	58.85	20	7.00

Source: Field Survey, 2025. Multiple responses allowed

On the other hand, the result among the non-beneficiaries of IFAD-VCDP intervention shows 2.31% adopted high scale level, 36.54% have medium adoption level, 56.15% have low level adoption and 5.0% have very low level of adoption of improved rice production technologies. This finding shows very low level of adoption of improved rice production technologies among the non-beneficiaries of IFAD-VCDP intervention. This could be due to inadequate information and exposure of the farmers to the practices of the improved technologies. The high level of adoption of improved rice production technologies among the beneficiaries came as a result of adequate support and extension services, training and capacity building which enhance their skills and access to improved inputs such as seeds, fertilizers, and other inputs which can increase their adoption of improved technologies. This result agreed with the findings of Abdullahi *et al.* (2024) who found higher adoption level of improved agricultural practices among the IFAD-VCDP beneficiaries.

Table 3: Level of Adoption of Improved Rice Production Technologies by IFAD-VCDP Beneficiaries and Non-beneficiaries

Range %	Freq	Percent Beneficiaries	Adoption Level	Freq	Percent Non-beneficiaries	Adoption Level
1-20	29	11.15	Very low	13	5.00	Very low
21-40	17	6.53	Low	146	56.15	Low
41-60	32	12.31	Medium	95	36.54	Medium
61-80	85	32.69	High	6	2.31	High
81-100	97	37.31	Very high	0	0.00	Very high
Total	**260**	**100**		**260**	**100**	

Source: Field Survey, 2025

The Benefits Derived from Adoption of IFAD-VCDP Improved Rice Production Technologies

Table 4 shows the distribution of the respondents by the benefits/achievement derived from the adoption of the improved technologies disseminated. Results from the table shows that the majority (98.07%) of the IFAD-VCDP beneficiaries had increase in their rice output as a result of their adoption of the technologies disseminated. This in line with Mustapha et al., (2012) who recorded that rice yield could increase due to growers using improved rice varieties which have potentials to improve nutrition, boost food security, foster rural development and support sustainable land care. This is expected because of the yielding potentials of the improved varieties. Furthermore, the majority (72.31%) of the respondents expanded their farm land, that is, area of land under rice cultivation. The expansion of area of land under rice cultivation could be the reason for the increase in rice output. Also, the majority

(85.77%) of the respondents had increased in their farm income. When other things are held constant, there is obviously a positive relationship between level of income and adoption of innovations.

The majority (81.54%) of the respondents acquired more skills for rice production. About 31.15% of the respondents adopted more farm technologies. The success of any diffusion of innovations depends not only on its rate and level of adoption among the potential users but also on the benefits derived from adoption of such innovations.

Other benefits specified by the respondents were ease of labour, proper control of pests and diseases, and good maintenance of farmland. For the IFAD-VCDP non-beneficiaries, Results from the table shows that the majority (86.15%) of the IFAD-VCDP non-beneficiaries had increase in their rice output as a result of their adoption of improved rice production technologies, majority (76.15%) of the respondents had increased in their farm income. Other benefits derived from adoption of improved rice production technologies by non-beneficiaries were ease of labour, proper pests and diseases, more skills acquisition, expansion of farmland, good maintenance and adoption of more farm technologies.

Table 4: Benefits Derived from Adoption of Improved Rice Production Technologies by IFAD-VCDP Rice Farmers Beneficiaries and Non-Beneficiaries

Improved technologies	Freq Beneficiaries	Percent	Freq Non-Beneficiaries	Percent
High yield	255	98.07	224	86.15
Good maintenance	69	26.54	40	15.38
Ease of labour	148	56.92	121	46.54
Increase in farm income	223	85.77	198	76.15
Proper control of pest and diseases	48	45.38	95	36.54
Expansion of farm land	188	72.31	68	26.15
Acquired more skills	212	81.54	87	33.46
Adoption of more farm tech.	81	31.15	27	10.38

Source: Field Survey, 2025. Multiple responses allowed

Socioeconomic Characteristics Influencing Level of Adoption of Improved Rice Production Technologies

Multiple linear regression analysis was used to determine the socioeconomic factors influencing level of Adoption of rice improved production technologies among the IFAD-VCDP beneficiaries and non-beneficiaries in Nasarawa State. The result of multiple regression analysis of IFAD-VCDP rice farmers' beneficiaries indicates an R-squared of 0.8290 or 82.90%. This shows that about 82.90% of the variation in level of adoption of improved rice production technologies among IFAD-VCDP beneficiaries was influenced by the socio-economic characteristics of the rural farmers. The result of multiple regression analysis for non-beneficiaries indicates an R-squared of 0.8409 or 84.09%. This shows that about 84.09% of the variation in level of adoption of improved rice production technologies among non-beneficiaries of IFAD-VCDP intervention was influenced by the socio-economic characteristics of the rice farmers. The close relation of R-squared to adjusted R-squared 0.8207 for beneficiaries and 0.8332 for non-beneficiaries is an indication that the explanatory power of the independent variables cannot be exaggerated. The overall effect of the independent variables on the dependent variable was indicated by F-statistics which was significant at 1% level. The low value of standard error of the estimates indicates that the result is statistically reliable.

From the result in Table 5, a significant relationship was observed between farm size and adoption of improved rice production technologies among IFAD-VCDP rice beneficiaries. Farm size is significant at 10% and negatively related to adoption of improved rice production technologies, which implies as farm size increases, adoption of improved rice production technologies decreases. This could be that adopting improved rice production technologies increases for farmers with large farms than those with smaller farms. This could be attributed to the facts that if a farm size increases there is high tendency of increase in yield of rice even if respondents do not adopt any improved rice production technologies. The result is similar with the finding of Muhammad *et al.* (2017).

The results in Table 5 revealed that farming experience had negative significant influence on adoption of improved rice production technologies at 1% for both beneficiaries and non-beneficiaries. This implies as farming experience increases, the adoption level of improved rice production technologies decreases. This negative relationship could be

due to experienced farmers may have developed their own effective farming practices and see no need to adopt new technologies. In other words, farmers with long experience in farming are more inclined to adopt improved rice technologies. This agreed with the findings of Sani and Bagna (2007) that experience in farming had significant influence on the adoption of improved rice varieties.

Number of extension contact was statistically significant at 1% with negative coefficient for both IFAD-VCDP beneficiaries and non-beneficiaries. This implies that as number of extension contact increases, the adoption level of improved rice production technologies decreases. This negative relationship can be attributed to several factors. These include lack of trust or credibility in extension agents, insufficient or poor quality extension services, farmers' dissatisfaction, reliance on alternative information sources and complexity of the technology being promoted. These factors may collectively contribute to the observed negative relationship, suggesting that simply increasing extension contacts may not be enough to drive adoption of improved rice production. This is contrary with Abubakar *et al.* (2019) and Umar *et al.* (2019)

The result further shows that household labour is statistically significant factor influencing the adoption level of improved rice production technologies at 5% significance level with negative relationship among beneficiaries and non beneficiaries. This implies as household labour increases, the adoption of improved rice production technologies decreases. This could probably be due to the fact that large family size may have more labour available, making them less likely to adopt labour saving technologies. This is contrary with Anne *et al.* (2012) who found a positive relationship between household labour and adoption of improved agricultural production technologies.

Years of membership of cooperative had significant at 5% with negative relationship to adoption for non-beneficiaries of IFAD-VCDP intervention. This implies as years of membership of cooperative increases, the adoption level of improved rice production technologies decreases. Membership of associations is a negative variable which is contrary to the apriori expectation on the membership of agricultural associations that should be positive. This might be due to non-participation of most of the farmers in associations implying decrease access to acceptance of some improved rice production technologies. The result is similar with the finding of Muhammad *et al.* (2017)

Further analysis shows that the annual income of the respondents was statistically significant at 10% with a positive coefficient for IFAD-VCDP beneficiaries. This implies that positive relationship exist between the farmers' annual income and their level of adoption of improved rice production technologies. As income increases, the adoption level of improved rice production technologies increases. Farmers with higher incomes may be more aware of the benefits of new technologies and have the financial security to take risks and try new approaches more than those with lower annual income. The result is similar with Onyeneke, (2017) and Adeyemi *et al.,* (2020) reported farm income among other factors as significant, and had positive influence on adoption of improved rice varieties' adoption in South-West Nigeria.

Land ownership had a positive and significantly related to adoption of improved rice production technologies at 1% significance level for both beneficiaries and non-beneficiaries. This means that as land ownership increases, the adoption level of improved rice production technologies also increases. Land ownership provides farmers with security and incentive to invest in their land and adopt improved farming technologies. It can be an advantage to innovation adoption. They can easily test the technologies on their farm when there is enough land for them to practice the technology.

Yields is a statistically significant factor influencing the adoption level of improved rice production technologies at 10% significance level with negative coefficient among the beneficiaries of IFAD-VCDP. This means as yield of farmers increases, the adoption level of improved rice production technologies decreases. Farmers who have higher yields are less likely to adopt improved production technologies. This could be that farmers who already have high yields might feel that they do not need to adopt new technologies to improve their yields.

Journal of Arid Agriculture. 2025, Vol. 26 (3): 8 – 17

Table 5: Socioeconomic Characteristics Influencing Adoption Level of IFAD-VCDP Improved Rice Production Technologies among Beneficiaries and Non-beneficiaries.

Variables	Coefficient	Standard Error	Z-values	P>/z/
		Beneficiaries		
Age	0.0877316	0.0540885	1.62	0.106NS
Sex	-.396787	1.50204	-0.26	0.792NS
Educational level	0.1747889	0.1622077	1.08	0.282NS
Farm size	-1.246115	0.7122199	-1.75	0.081*
Farming experience	-0.5395207	0.1414199	-3.82	0.000***
Extension contact	-0.5030743	0.1581298	-3.18	0.002***
Household labour	-1.516194	0.6927543	-2.19	0.030**
Access to credit	9.45e-07	1.80e-06	0.52	0.601NS
Cooperative membership	0.1641009	0.3086488	0.53	0.595NS
Annual total income/ha	0.0000317	0.0000165	1.93	0.055*
Land ownership	50.78393	2.004271	25.34	0.000***
Yield/ha	-2.627853	1.400664	-1.88	0.062*
Constant	45.06484	6.553781	6.88	0.000
		Non-beneficiaries.		
Age	0.0589291	0.0650634	0.91	0.366
Sex	-0.0952686	1.464265	-0.07	0.948
Educational level	0.1457689	0.141546	1.03	0.304
Farm size	-0.9236235	0.6757315	-1.37	0.173
Farming experience	-0.4851065	0.138168	-3.51	0.001***
Extension contact	-2.52257	0.4814593	-5.24	0.000***
Household labour	-1.334017	0.6727588	-1.98	0.048**
Access to credit	-4.06e-06	0.0000103	-0.39	0.694
Cooperative membership	-0.6281649	0.318492	-1.97	0.050**
Income	-9.66e-07	1.89e-06	-0.51	0.609
Yield/ha	0.0298732	0.1811412	0.16	0.869
Land ownership	50.88933	1.91981	26.51	0.000***
Constant	46.89173	5.166139	9.08	0.000

Source: Field Survey, (2025)

R^2 for beneficiaries = 0.8290 R^2 for non-beneficiaries = 0.8409

Adj R^2 for beneficiaries = 0.8207 Adj R^2 non-beneficiaries= 0.8332

***= Significant at 1%, ** = Significant at 5%, *= Significant at 10%.

Test of Hypothesis

Ho: The Null hypothesis there is no significant relationship between socioeconomic characteristics and the level of adoption of improved rice production technologies for both beneficiaries and non-beneficiaries. For beneficiaries, 7 socioeconomic characteristics significantly influence the level of adoption of improved rice production technologies. For non-beneficiaries, 5 socioeconomic characteristics significantly influence the level of adoption of improved rice production technologies. Based on the results, the null hypothesis (Ho) can be rejected for both beneficiaries and non-beneficiaries, as there are significant relationships between socioeconomic characteristics and the level of adoption of improved rice production technologies. Therefore, the alternative hypothesis (H1) is accepted. There is a significant relationship between socioeconomic characteristics and the level of adoption of improved rice production technologies for both beneficiaries and non-beneficiaries.

Constraints to Effective Adoption of Improved Rice Production Technologies by Rice Farmers' Beneficiaries of IFAD-VCDP and Non-beneficiaries

The result in Table 6 shows the constraints faced by rice farmers' beneficiaries of the VCDP in adoption of improved rice production technologies as identified by the farmers include: high cost of the technologies (Mean=2.43) which rank first 1st in the order of seriousness on the perceptions of the rice farmers, insecurities (farmers and herders clashes) (Mean=2.19) which was rank 2nd in the order of seriousness on the perceptions of the rice farmers. Insufficient land for cultivation (Mean=2.18) was ranked 3rd in the order of seriousness on the

perceptions of the rice farmers, inadequate irrigation system (Mean=2.16) was ranked 4th in the order of seriousness on the perceptions of the rice farmers and tedious nature of some technologies (Mean=2.15) was ranked 5th in the order of seriousness on the perceptions of the rice farmers. The findings that high cost of technologies, insecurities, insufficient land for cultivation, inadequate irrigation system, and tedious nature of some technologies are constraints to effective adoption of improved rice production technologies among beneficiaries are consistent with existing literature. Research has shown that these constraints can hinder the adoption of improved technologies, particularly among smallholder farmers. For instance, studies by Awotide *et al.* (2016) on irrigation systems and agricultural productivity in Nigeria, have found that high cost of technologies, such as irrigation systems and improved seeds, can be a significant barrier to adoption. Insecurities, such as conflict and violence, can also hinder agricultural production and technology adoption (Fasona *et al.,* 2017). Furthermore, insufficient land for cultivation, inadequate irrigation systems, and tedious nature of some technologies can also constrain technology adoption (Oladeebo *et al.*, 2019; Adeoti *et al.,* 2018; Ogunniyi *et al.,* 2018).

Table 6: Constraints to Effective Adoption of Improved Rice Production Technologies Face by Rice Farmer IFAD-VCDP Beneficiaries

VARIABLES	Very Serious F*3	Serious F*2	Not serious F*12	WM	Remark	Rank
High cost of the technologies	151(58.08)	70(26.92)	39(15.00)	2.43	Serious	1
Insecurity (Farmers/Herders clashes)	109(41.92)	92(35.38)	59(22.69)	2.19	Serious	2
Insufficient land for cultivation	94(36.15)	119(45.77)	47(18.08)	2.18	Serious	3
Inadequate irrigation system	102(39.23	95(36.92)	62(23.85)	2.16	Serious	4
Tedious nature of some technologies	96(36.92)	107(41.15)	57(21.92)	2.15	Serious	5
Limited access to credit	61(23.46)	113(43.46)	86(33.08)	1.90	Not serious	6
Low education and awareness on the technologies	58(22.31)	111(42.69)	91(35.00)	1.87	Not serious	7
Labour scarcity and supply	76(29.23)	69(26.54)	115(44.23)	1.85	Not serious	8
Inadequate quantity of improved seed	65(25.00)	81(31.15)	114(43.85)	1.81	Not serious	9
Low technical know how	64(24.62)	77(29.62)	119(45.77)	1.79	Not serious	10
Cultural influence on access and used of some technologies	44(16.92)	92(35.38)	124(47.69)	1.69	Not serious	11
Poor road network	49(18.85)	71(27.31)	140(53.85)	1.65	Not serious	12
Inadequate access to improved seed	38(14.62)	91(35.00)	131(50.38)	1.64	Not serious	13
Poor access to market information	48(18.46)	69(26.54)	140(53.85)	1.63	Not serious	14
Limited access to information	47(18.08)	66(25.38)	147(56.54)	1.61	Not serious	15
Inadequate training and extension	94(33.9)	111(40.1)	72(26.0)	2.08	Not serious	16
Non-beneficiaries.						
Insecurity (Farmers/Herders clashes)	125(48.08)	102(39.23)	33(12.69)	2.35	Serious	1
High cost of technologies	104(40.00)	105(40.38)	15(19.62)	2.20	Serious	2
Limited access to credit	95(36.54)	112(43.08)	53(20.38)	2.16	Serious	3
Insufficient land for cultivation	96(36.92)	98(37.69)	66(25.38)	2.12	Serious	4
Low education and awareness on the technologies	103(39.62)	83(31.92)	74(28.46)	2.11	Serious	5
Labour scarcity and supply	81(31.15)	124(47.69)	55(21.15)	2.10	Serious	6
Tedious nature of some technologies	83(31.92)	119(45.77)	58(22.31)	2.09	Serious	7
Poor access to market information	90(34.64)	100(38.46)	70(26.92)	2.08	Serious	8
Inadequate access to improved seed	93(35.77)	89(34.23)	78(30.00)	2.06	Serious	9
Inadequate quantity of improved seed	08(30.77)	114(43.85)	66(25.38)	2.05	Serious	10
Limited access to information	60(23.08)	108(41.54)	92(35.38)	1.88	Not serious	11
Low technical know how	42(16.15)	143(55.00)	75(28.83)	1.87	Not serious	12
Inadequate irrigation system	54(20.77)	112(43.08)	94(36.15)	1.84	Not serious	13
Cultural influence on accessing and use of some technologies	34(13.08)	139(53.46)	87(33.46)	1.79	Not serious	14
Poor road network	56(21.54)	75(28.85)	129(49.62)	1.72	Not serious	15

Source: Field Survey, 2025. *Values in Parenthesis are percentage

The constraints facing rice farmers' non-beneficiaries of VCDP were presented in Table 6. The result shows the constraints faced by rice farmers' non-beneficiaries of the VCDP as identified by the farmers include: insecurities (herdsmen and farmers-clashes) (Mean=2.35), high cost of the technologies (Mean=2.20), limited access to credit

(Mean=2.16), insufficient land for cultivation (Mean=2.12), low education and awareness on the technologies (Mean=2.11), labour scarcity and supply (Mean=2.10), tedious nature of some technologies (Mean= 2.09), poor access to market information (mean 2.08), inadequate access to improved seeds (Mean=2.06) and inadequate quantity of improved seeds (Mean=2.05) which were rank in the order of seriousness as perceived by the rice farmers. Rilwan *et al.* (2024) also revealed that the major constraints faced by the respondents in adopting rice production technologies were high cost of farm input, inadequate recommended rice varieties, low level of awareness, inadequate extension agents' access, low access to credit, climatic change and high cost of input.

CONCLUSION

The results demonstrated that IFAD-VCDP programme has been highly effective in promoting the adoption of improved rice production technologies among the beneficiaries. The significantly higher adoption levels among beneficiaries and non beneficiaries underscore the programme success in achieving its objective. The programme interventions including training, extension services and input support, have significantly contributed to the increased adoption levels, improved productivity and enhanced livelihoods of farmers.

Recommendations

Based on the findings of the study, it was recommended that;

i. Similar programmes can be replicated in other areas to achieve sustainable agricultural development and food security.
ii. There should be collaboration between government and local communities to device means of improving the security of life and properties of farmers' thereby bringing lasting solutions to this farmers/pastoral conflict in the study Area.
iii. Provide targeted subsidies or support programme for essential inputs such as seeds, fertilizers and irrigation equipment, to reduce the financial burden on farmers and make improved technologies more accessible in the study area.
iv. Insufficient land for rice cultivation was also a serious constraint to effective adoption of IFAD-VCDP improved rice production technologies. It is recommended that land leasing arrangement should be promoted, allowing farmers to access land for rice cultivation without having to purchase it outright.

REFERENCE

Abubakar B., Aliyu A. and Bukar G. (2019) Problem analysis of rice production in Wurno Irrigation Scheme using Participatory Approaches. Scientific journal of agriculture 1(15): 112-116

Anne G. T., Mulawa R. T., Okello J. and Kamau M. (2012) The role of varietal attributes on adoption of improved seed varieties. The Growth in Africa, ISSER/Cornell University/ World Bank/DFID/USAID.

Awotide, B.A., Diagne, A., Awoyemi, T.T, Ebiohomon, V., and Ojehomon, T. (2016). Household Endowment and Poverty Reduction in Rural Nigeria: Evidence from Rice Farming Households. *Agricultural Journal* 6(5):274-285

Ekong, E. E. (2003). Rural Sociology: An Introduction and Analysis of Rural Nigeria. 2 nd edition published by Dove Educational Publishers, Uyopp 279-282

Muhammad M.B, Abubakar B. Z., Umar B. F. and Yakubu D. H. (2017) Factors Influencing Adoption of Improved Rice Production Technologies by Rice Farmers in Sokoto State, Nigeria. *Journal of Agriculture and Environment Vol.* 13 No. 1, 2017: 77-86 ISSN 1595-465X

Okonji, C. J. and Awolu, O. T., 2020. Factors influencing adoption of improved technology among maize farmers in Ekiti State, Nigeria. Agrosearch, 20(2), 102-112. https://dx.doi.org/10.4314/agrosh.v20i2.7

Rilwanu, S. M., Sulaiman, A. and Bose, A. A. (2024) Factors Influencing Adoption of Improved Rice Production Technologies in Western Agricultural Zone of Bauchi State, Nigeria. *Nigerian Journal of Agriculture and Agricultural Technology*. Vol 4(2): 2811-1885.

Sani, R.M. and A. Bagana (2007). Adoption of improved seeds of millet and cowpea by farmers in Madarounfa District, Niger Republic. *Continental Journal of Agricultural Economics*, 1: 1-6.

Umar, S.I., Ndanitsa, M.A. and Olaleye, S.R. (2019) Adoption of Improved Rice Production Technologies Among Youth Farmers in Gbako Local Government Area, Niger State. *Journal of Agricultural Extension* 13(1):1-8.

Van den Ban & Hawkins, H. S. (1996). Agricultural Extension. 2 nd edition, Blackwell Science Ltd, London. pp 96-119.