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A comparative analysis of the economics of cassava production and processing by IFAD VCDP participants and non-participants in Benue and Kogi States, Nigeria

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Abstract

This study analyzed the Economics of Cassava production and processing by IFAD VCDP participants and Non-participants in Benue and Kogi States, Nigeria. The objectives of the study were to: describe the socio-economic characteristics of the participants and non-participants along the value chain; estimate the cost and returns on production and processing of cassava by participants and non-participant respondents in the study area, and to identify the constraints to cassava production and processing in the study area. Two hypotheses were formulated and tested. There is no difference between the income of participants and non-participants The study employed the survey research design of descriptive type. Simple random sampling technique and Proportionate sampling (using Taro Yamane) were used to scientifically select 333 participants and 333 non – participants from the two states making 666 respondents. However only 664 questionnaires were found useful. Data collected were analyzed using frequencies, percentages, mean scores, and gross margin. Findings from the study revealed that majority of the respondents were males (52.71%), in the active age range of 31 – 50 years, married (89.31 %,), educated (84%) and had over five years' experience (74.25%). Gross margin analysis showed that the participants had a gross margin of ₦792, 952 and Benefit-cost ratio of 6.64 as against ₦646, 961.76 and 5.83 by non-participant farmers respectively and ₦820, 374.10 and Benefit-cost ratio of 3.23 for participant processors and ₦452, 917.85 and 2.03 for non-participant processors respectively. Lack of funds (2.61), poor rural infrastructure (2.29), high transportation (2.42) and poor access to stem cuttings (2.44) constitute constraints to cassava production while lack of funds (2.90), poor rural infrastructure (2.44) and high transportation cost (2.15) constitute constraints to cassava processing. The z-test statistical analysis result revealed income differential of ₦264, 081 in favour of participants with a t-value of 12.0842 significant at 1% level (Pr. = 0.000). Conclusively, the study provides valuable insights into the dynamics of participants and non-participants in the IFAD VCDP programme, shedding light on their socioeconomic characteristics, and constraints. Notably, the participants in the programme demonstrated a higher mean income compared to non-participants, indicating the positive impact of IFAD project participation on income generation. The study among others recommends that policymakers explore options for providing financial assistance such as microcredit facilities, or grants to the participants, ensuring that financial literacy training accompany these initiatives to ensure responsible use of funds and investment in cassava-related activities.

Keywords: Economics; Cassava; IFAD; Production; Processing; Participants; Non-participants

1. Introduction

Agricultural sector over the years remain the highest source of employment especially in the rural areas. Farmers' involvement in the sector is very important for food availability and supply (Obianefo, Okafor, Bola-Audu & Umebali,

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2019). Agriculture has also been considered to be the major occupation and the main source of livelihood for over 2.5 billion people globally (Ogidi, 2016). The importance of agricultural sector to the economy can be vividly seen as it substantially contributed to the bailing out of the country from the most recent economic recession occasioned by the COVID -19 Pandemic in the fourth quarter of 2020.

To fast track agricultural development towards value addition and self- reliance that will stand the test of time, the Federal Government had an agreement with International Fund for Agricultural Development (IFAD) in 2014/2015 to support two major crops- Cassava and Rice. IFAD earmarked US$7.5 million to boost rice and cassava value chain development. The International Fund for Agricultural Development (IFAD) was expected to assist rice and cassava small holder farmers in Nigeria in the area of crop processing through the introduction of farm processing machines that can effectively and efficiently process rice and cassava produce with minimum training.

Training was to focus on how to add value to rice and cassava production so as to enhance income, create wealth and jobs for the youth in the country. This new project was also expected to provide finance for fertilizers, agro chemicals as well as improved cuttings and certified rice seeds. While focusing on production, this new project was particularly expected to support and encourage processors to produce polished and stone-free rice so as to promote local rice consumption and discourage Nigerians from going for imported rice (IFAD, 2015).

Thus the International Fund for Agricultural Development (IFAD) has a value chain development programme designed to support the government of Nigeria in tackling two major challenges: (i) meet domestic food requirements and (ii) address the issue of low productivity by modernizing an input system and farming model that is largely inefficient. The main objective of Value Chain Development Project is to enhance the income and food security of poor rural households engaged in the production, processing and marketing of rice and cassava in targeted states on a sustainable basis. The IFAD-funded Value Chain Development Programme in Nigeria was established to assist cassava and rice smallholder farmers through a value chain approach to enhance productivity, promote agro-processing and increased access to markets. The programme aims to transform the agricultural sector of rural Nigeria by achieving food security, increasing incomes and creating new employment opportunities.

Seven years after the commencement of the programme, this paper attempts to assess the effect of the programme on the livelihood and economies of the smallholder cassava farmers as the target beneficiaries of the program. The objectives of the study therefore include to describe the socio-economic characteristics of the participants and non-participants along the value chain, estimate the cost and returns on production and processing of cassava by participants and non-participant respondents in the study area, and to identify the constraints to cassava production and processing in the study area.

2. Methodology

The population for the study comprised the entire ADP registered cassava farmers and processors in the two states of Benue and Kogi associated with IFAD project. Benue State is divided into three senatorial zones but three agricultural zones namely Benue South, Benue North East and Benue North West and Zone A, Zone B, and Zone C respectively. Zone A comprises seven local government areas namely Katsina-Ala, Konshisha, Kwande, Logo, Ukum, Ushongo and Vandekya. Zone B consist of seven local government areas namely Buruku, Gboko, Guma, Gwer East, Gwer West, Makurdi, and Tarka. Zone C however comprises nine local government areas namely Apa, Ado, Agatu, Obi, Ogbadibo, Ohimini, Oju, Okpoku, and Oturkpo. Kogi State is divided into three senatorial districts namely: Kogi East, Kogi Central and Kogi West. . The state is agriculturally divided into four zones namely: Zone A comprising five local Government Areas which includes Ijumu, Kaba/Bunu, Mopa-Muro, Yagba East and Yagba West (with Ayetorogbede as its headquarter); Zone B comprising four local Government Areas which include Ankpa, Bassa, Dekina and Omala (with Anyigba as its headquater); Zone C comprising seven Local Government Areas which include Adavi, Ajaokuta, Lokoja, Ogori/Magongo, Okehi, Okene and Koton Karfe (with Koton-Karfe as its headquarter) and Zone D comprising five local Government Areas which include Ibaji, Idah, Igalamela-Odolu, Ofu and Olamaboro (with Aloma as its headquarter).

Registered IFAD cassava value chain Development Programme farmers constitute a subset of ADP registered farmers in Benue and Kogi states, Nigeria. IFAD programme has 1102 beneficiaries in Benue State and 817 beneficiaries in Kogi State making a total of 1,919 participants. This comprises 458 farmers and 644 processors found in the three agricultural zones (A, B, and C) covering the 8 local government areas of Agatu, Guma, Logo, Okpokwu, Gwer East, Gwer West, Ogbadibo, and Kwande in Benue State and 555 farmers (producers), and 262 processors found in (three out of the four Agricultural Zones A, C, and D) and covering the five local Government Areas of Ajaokuta, Ibaji, Kaba, Lokoja and Olamaboro local Government Areas of Kogi state. Thus the population of study comprises IFAD cassava beneficiary farmers and processors in both states (1,919).

A multi-stage sampling procedure was employed for the study using purposive and simple random sampling technique. Stage one involved the purposive selection of the 3 each out of the ADP administrative zones in Benue and Kogi States respectively. This is because IFAD presence is in all the agricultural zones of Benue state and in three out of the four agricultural zones of Kogi State. The three zones of Benue State are Zone A with headquarter at Adikpo, Zone B with headquarter at Gboko and Zone C with headquarter at Otukpa. The four zones of Kogi State are Zone A with headquarter at Aiyetoro-Gbede, Zone B with headquarter at Anyigba, Zone C with headquarter at Kotonkarfi and Zone D with headquarter at Aloma. Zone B in Kogi State was left out because IFAD presence is not found there. This gave a total of 6 zones out of 7 zones in the two states. The second stage involved the random selection of three blocks from Benue state and three blocks from Kogi state giving a total of six blocks from six zones of the two states (Proportionate sampling). This was followed by the selection of 24 out of the 53 farmers'/processor groups in both states. The total number of participants in the IFAD programme in the two states stands at one thousand nine hundred and nineteen (1,919). Taro Yamane formular for sample size determination was used to calculate the appropriate sample size that would be representative of the population.

$$n = n = \frac{N}{1+N\,(e)2}$$

$$= \frac{1919}{1+1919\,(0.05)2}$$

$$= 332$$

Benue has a total of one thousand, one hundred and two (1,102) IFAD registered farmers and processors while Kogi has eight hundred and seventeen (817) IFAD registered farmers and processors. The third stage involved the proportional selection of respondents (farmers and processors) as 191 and 141 from Benue and Kogi States respectively. Thus a total of three hundred and thirty-two (332) respondents was selected from a population of 1,919 participants. Similar number of farmers and processors (non-participants) were also selected from Benue and Kogi States (191 and 141 respectively). In all therefore, six hundred and sixty-four (664) respondents were interviewed or assessed for the study. Primary data was used for the study. Thus data were collected through the administration of well-structured questionnaire and interview schedule. Data collected for the study were analyzed using both descriptive and inferential statistical tools. The descriptive statistics used include frequency distribution tables, percentages and means. The inferential statistics used include gross margin analysis and Z test.

3. Results and discussion

The result of the socioeconomic characteristics of both participant and non- participant cassava farmers and processors in IFAD Cassava Value Chain Development Programme in the study area analyzed using frequency and percentage is shown on table 1. These are age, sex, marital status, educational qualification, household size, farm size, experience, membership of association and extension contact.

Table 1 Socioeconomic Characteristic of Respondents

Socioeconomic Variables	**Participants n = 331**			**Non-Participants n=333**			**Pooled n = 664**		
	Freq.	**%**	**Mean**	**Freq.**	**%**	**Mean**	**Freq.**	**%**	**Mean**
Age									
≤ 20 years	2	0.60	43.70	0	0.00	43.67	2	0.30	43.67
21 – 30	32	9.67		34	10.21		66	9.94	
31 – 40	104	31.42		95	28.53		200	30.12	
41 – 50	123	37.16		134	40.24		256	38.55	
51 – 60	57	17.22		57	17.12		114	17.7	
> 60	13	3.93		13	3.90		26	3.92	
Total	331	100		333	100		664	100	

Sex									
Female	140	42.30		175	52.55		314	47.29	
Male	191	57.70		158	47.45		350	52.71	
Total	331	100		333	100		664	100	
Marital Status									
Single	24	7.25		23	6.91		47	7.08	
Married	291	87.92		302	90.69		593	89.31	
Divorced/Widow	16	4.83		8	2.40		24	3.61	
Total	331	100		333	100		664	100	
Educational Qual.									
No Formal Education	47	14.20		54	16.22		101	15.21	
Primary Education	110	33.23		92	27.63		203	30.57	
Secondary Education	135	40.79		143	42.94		277	41.72	
Tertiary Education	39	11.78		44	13.21		83	12.50	
Total	331	100		333	100		664	100	
Household Size									
1 – 5	155	46.83	7.40	192	57.66	6.57	348	52.41	7.0
6 – 10	145	43.81		126	37.84		270	40.66	
11 – 15	24	7.25		12	3.60		36	5.42	
> 15	7	2.11		3	0.90		10	1.51	
Total	331	100		333	100		664	100	
Farm/Bus. Size									
1 – 2	219	66.16	2.33	45	13.51	2.21	435	65.51	2.27
3- 4	93	28.10		171	51.35		210	31.63	
> 4	19	5.73		117	35.14		19	2.86	
Total	331	100		333	100		664	100	
Years of Experience									
1 – 5	90	27.19	18.61	81	24.32	17.75	171	25.75	18.17
6 – 10	130	39.27		148	44.44		279	42.02	
11 – 15	86	25.98		87	26.13		172	25.90	
16 – 20	22	6.65		14	4.20		36	5.42	
> 20	3	0.91		3	0.90		6	0.90	
Total	331	100		333	100		664	100	
Membership of Association									
No, do not belong	180	54.38		122	36.64		302	45.58	
Yes, Belong	151	45.62		211	63.66		362	54.52	
Total	331	100		333	100		664	100	

Extension Contact									
No, did not have	156	47.13		109	32.73		265	39.91	
Yes, had contact	175	52.87		224	67.27		399	60.09	
Total	331	100		333	100		664	100	

Source: Field Survey Data, 2022

The distribution of respondents according to age as shown on table 1 indicates that participants and non-participant farmers and processors have a mean age of 44 years. The implication of this is that IFAD cassava development intervention programme involves more of farmers and processors in the active age bracket of 30 – 50 years. Thus these farmers and processors are found to be energetic and with the capacity to provide the needed man power for farming and processing activities. While the finding is in agreement with Abdullahi *et al* (2015) who reported the mean age of farmers participating in IFAD programme in Kaduna State to be 48 years, and Uzochukwu et al (2021), Omolehin et al (2020) who reported average age of 46 years among cassava farmers under the Nigerian Agricultural Transformation Agenda, findings of Yusuf, Lategan and Ayinde (2013) reveals that age plays a significant role in farming and processing activities as it is a determinant of the ability of the of the farmer/processor to carryout tedious and rigorous work. The distribution of respondents according to gender as shown on table 1 indicates that in the participants group 57.7% were males while 42.3% were females. On the contrary, in the non-participant group, 49.45 were males while 52.55 were females. This shows that the participants had more males than females while the non-participants had more females than the males. However, the pooled data comprising both participants and non-participants shows that the males dominate with 52.71% over the females with 47.29%. This is an indication of the fact that more males participate in the IFAD value chain development programme than females. Men often have access to agricultural development programmes and credit packages than women in Nigeria and sub-Saharan Africa, an indication of advantage conferred on them by their physical strength and freedom to search for such opportunities. This finding is in tandem with Ajieh (2014) who reported male dominance of 65% among cassava farmers and processors in Oshimili, Delta State, Nigeria. Akangbe *et al.* (2012) also reported that 71.7% of Fadama II farmers in Oyo State were males. Table 1 reveals that most of the respondents (89.31) were married. This implies that the farmers and processors have helping hands in carrying out their farming, processing and marketing activities. Result further shows that 7.08 and 3.61 of the respondents were single and divorced respectively. This result is in agreement with Kuye *et al* (2014) who reported that majority of respondents they studied were married and that the large percentage of married male and female arable crop farmers indicated that most of the farmers in the study area had families of their own, who could supply them labour. Similar finding was also reported by Bature *et al.* (2013) among Fadama III farmers studied in the Federal Capital Territory of Nigeria. The household size of the majority (52.41%) of the respondents ranged from 1 – 5 while 40.66% of the respondents had a household size ranging from 6 to 10. In developing countries where small-scale agricultural enterprises are largely labor-intensive, large household size confers labour availability required to efficiently manage enterprises. The findings of this study agree with Mohammed *et al.* (2011) when they reported a modal household size of 6 – 15 members among Fadama II farmers in Niger State, Nigeria. The mean household size was 7. Dominant farming/enterprise management experience as shown on table 1 also ranged from 6 - 15 years for both participants (65.25%) and non-participants (70.57%) as indicated in Table 1. The combined or pooled also shows 67.92% as the dominant for the range of 6 – 15 years. This result is in consonance with Jean *et al* (2019) who reported that 66.8% of cassava farmers in Kabare Territory, Eastern Democratic Republic of Congo had an experience ranging from 11 to 20 years and it implies that the respondents could have firm grip of the behaviour of the variables that generate greater results from the farming and processing enterprises. The table 1 reveals that most of the respondents (participants and non-participants) had one form of education or the other. This is because only 14.2%, 16.22% and 15.21% of the participants, non-participants and the pooled respectively had no formal education. 40.79%, 42.94% and 41.72% of the participants, non-participants and the pooled respectively had secondary education representing the highest. This finding on education is in agreement with the work of Obaniyi *et al* (2019) who reported that majority of the respondents had obtained secondary qualification, followed by primary education and then tertiary education. It equally agrees with the findings of Uzochukwu *et al* (2021) who found out that most of the cassava farmers in Anambra State, Nigeria attained at least, secondary educational qualification. The implication of this finding is that majority of the respondents in the study area were educated enough to understand how to use their inputs efficiently and effectively, make wise decision on their participation in IFAD Cassava Value Chain Development Programme and determine appropriate innovations to be adopted. Table 1 also reveals that the over 66% of participant farmers/processors had small farm size of 1 – 2ha with an average farm size of 2.33ha while above 51% of the non-participants had a large farm size of 3 – 4 ha with an average size of 2.21. The pooled however indicates that over 65% of the respondents had small farm size of 0.1 – 2 hectares. This result shows that the respondents were operating on small scale bases. This result is in agreement with Ebewore and Okedo – Okojie (2016) who found that farm sizes among cassava farmers' in Delta state

were rather small; majority of the farmers had farm sizes of between 0 – 5 hectares and reported that fragmentation due to land tenure systems, nearness to farms and resource endowment of farmers were responsible.

3.1. Cost and Return to Cassava Production (Farming)

Table 2 shows the cost and return to cassava production by both IFAD VCDP participant farmers and the non-participant farmers.

Table 2 Estimate of the cost and returns to cassava production by participant and Non participant cassava farmers

Participant Cassava Farmers			**Non-Participant Cassava Farmers**	
Revenue and Cost Items	**Value (₦)**	**% Total Cost**	**Value (₦)**	**% Total Cost**
Cassava Consumed	129,585.50		129,328.90	
Cassava tubers sold	779,822.40		625,144.70	
Gross Return	909,407.90		754,473.60	
Variable costs				
Stem Cuttings bought	8,946.71	6.53	8,553.29	6.60
Land Clearing	15,694.08	11.46	13,050.00	10.08
Ploughing/Ridging	29,302.63	21.40	28,940.79	22.36
Planting	8,835.53	6.45	7,157.90	5.53
Weeding/Chemicals	9,925.66	7.25	8,938.82	6.90
Harvesting	9,805.26	7.16	9,739.47	7.52
Transportation	22,507.89	16.44	22,507.89	17.39
Others	11,438.16	8.36	8,623.68	6.66
Total Variable Cost	116,455.92	85.07	107,511.84	83.05
Fixed Cost				
Rent	20,434.21	14.93	21,940.79	16.95
Total Fixed Cost	20,434.21	14.93	21,940.79	16.95
Gross Margin (TR - TVC)	792,952.00		646,961.76	
Benefit cost ratio (BCR)	₦6.64k		₦ 5.83k	

Source: Field Survey Data, 2022

The table shows that both participant and non-participant cassava farmers have similar expenses for cassava consumption, with participants spending slightly more. Participants generated higher revenue from selling cassava tubers compared to non-participants, indicating that participation in the IFAD project might have positively impacted their cassava sales. The gross return is the total revenue generated from cassava sales. Participants again outperformed non-participants in terms of gross return, suggesting that the IFAD project may have helped increase their overall income.

From the gross margin analysis carried out in Table 2, the gross margin of ₦792, 952.00K was obtained by participant cassava farmers while the non-participant cassava farmers obtained a gross margin of N646, 961.00K. Participants had a higher gross margin compared to non-participants, indicating that their profitability was greater even after considering variable costs. The results suggest that cassava farmers who participated in the IFAD project had higher revenue and better profitability (gross margin) compared to non-participants. The benefit-cost ratio of 6.64 and 5.83 for participants and non-participant farmers respectively implies that for every ₦1.00 invested, the participants got ₦6.64K while the non-participants got ₦5.83K. This result is in agreement with that of Sanusi *et al* However, participants also incurred higher variable costs, which may be attributed to increased investments in their cassava production activities, possibly facilitated by the project's support and resources. This finding is in tandem with similar cost and

return analysis among Fadama III cassava farmers carried out by Ali (2018) who noted that significant difference in income change between beneficiaries and non-beneficiaries before and after Fadama III. Hence, beneficiaries had significantly higher income difference than non-beneficiaries within the period under review. The Benefit cost ratio of 6.64 for participant cassava farmers implies that for every ₦1.00 invested in cassava farming business, an additional ₦ 6.64kobo profit was realized as opposed to the non-participant farmers who's every ₦ 1.00 invested yields additional profit of ₦5.83kobo. This result is in agreement with Jato *et al* (2020) who noted that for every N1.00 invested by cassava farmers in Akinyele, Oyo State, an additional profit of 85kobo was realized.

3.2. Cost and Return to Cassava Processing

Table 3 shows the cost and return to cassava processing by both IFAD VCDP participant processors and the non-participant processors.

Table 3 Estimate of the cost and returns to cassava processing by participant and Non participant cassava processors

Participant Cassava Processors			**Non-Participant Cassava Processors**	
Revenue and Cost Items	**Value (₦)**	**% Total Cost**	**Value (₦)**	**% Total Cost**
Cassava Product Consumed	128,413.40		128,413.40	
Cassava Product sold	1,058,226.80		764,022.30	
Gross Return	1,186,640.20		892,435.70	
Variable costs				
Cassava tubers bought	209,468.90	57.19	285,279.30	64.90
Transportation	25,192.09	6.87	24,430.17	5.56
Water/Energy/Others	27,429.40	7.48	26,639.11	6.06
Peeling	11,383.62	3.10	10,665.36	2.42
Grating	27,987.57	7.64	27,771.51	6.32
Pressing	22,634.46	6.18	22,483.80	5.11
Frying	31,783.05	8.68	31,918.99	7.26
Marketing Charges	5,451.98	1.49	5,385.48	1.22
Other Costs	4,935.03	1.35	4,944.13	1.12
Total Variable Cost	366,266.10		439,517.85	
Gross Margin (TR - TVC)	820,374.10		452,917.85	
Benefit cost ratio (BCR)	3.23		2.03	

Source: Field Survey Data, 2022

The table shows that participants in the IFAD project who are cassava processors generated substantially higher revenue from selling cassava products compared to non-participants. Specifically, participants generated 1,058,226.80 Naira in revenue, while non-participants earned 764,022.30 Naira. This remarkable difference in revenue is reflected in the gross return, which accounts for total revenue. The lower variable costs incurred by participants (366,266.10 Naira) compared to non-participants (439,517.85 Naira) suggest that participants have adopted more efficient processing practices. These efficiency gains contribute to higher profitability. Participants achieved a gross return of 1,186,640.20 Naira, whereas non-participants had a gross return of 892,435.70 Naira. The benefit-cost ratio of 3.23 and 2.03 for participants and non-participant processors respectively indicates that for every ₦1.00 invested into cassava processing, the participants earned additional profit of ₦3.23k while non-participant processors earned ₦2.03k. These figures indicate that project participation had a substantial positive impact on the sales and income of cassava processors. Also, the gross margin, which represents the profitability after deducting variable costs, was notably higher for participants. Participants achieved a gross margin of ₦820, 374.10K, while non-participants had a gross margin of ₦452, 917.85K. These figures underscore that participation in the IFAD project has not only increased revenue but has also significantly improved the profitability of cassava processing activities. This finding among cassava processors agrees with Ali (2018) who noted that significant difference in income change between beneficiaries and non-

beneficiaries before and after Fadama III. Hence, beneficiaries had significantly higher income difference than non-beneficiaries within the period under review. The Benefit cost ratio of 3.23 for participant processors implies that for every ₦ 1.00 invested in the business, an additional ₦3.23kobo profit was realized as opposed to the non-participants who's every ₦1.00 invested yields additional profit of only ₦2.03kobo. This result is in agreement with Jato *et al* (2020) who noted that for every N1.00 invested by cassava farmers in Akinyele, Oyo State, an additional profit of ₦1.85kobo was realized. The result also implies that participant cassava processors make more money from their investments than non-participant cassava processors.

4. Constraints to Cassava Production and Processing by Farmers and Processors

The constraints experienced by participating farmers and processors in IFAD VCDP are presented in Table 7.1 and Table 7.2, respectively.

4.1. Production Constraints Experienced by Participant Cassava Farmers

Table 4 shows production constraints experienced by participant cassava farmers

Table 4 Production Constraints Experienced by Participant Farmers in IFAD VCDP

S/N	Constraint by participants	Very Severe Constraint (3)	Severe Constraint (2)	Low Constraint (1)	Total Sum of Score	Mean Score
1	Funds	128	29	18	460	2.62*
2	Land Acquisition	46	56	73	323	1.84
3	Fertilizer	24	68	83	291	1.66
4	Herbicides/Pesticides	24	39	112	262	1.50
5	Access to Information	38	103	34	354	2.02*
6	Rural Infrastructure	79	70	26	403	2.30*
7	Labour Cost	53	75	47	356	2.03*
8	Transportation Cost	93	64	18	425	2.42*
9	Access to Stem Cuttings	87	80	8	429	2.45*

Source: Field Survey Data, 2022. n = 175

The severity of the constraint related to access to stem cuttings (mean score = 2.45) is a significant concern. Stem cuttings are a critical resource for cassava cultivation, and limited access can hinder the expansion of cassava farming and crop diversification. Cassava is a staple crop in many regions, and its accessibility depends on the availability of quality stem cuttings. A shortage of stem cuttings can disrupt food security and income generation for participants. Addressing this constraint is essential. Initiatives to improve access to quality stem cuttings, including disease-resistant varieties, should be a priority. This may involve establishing community nurseries, collaborating with agricultural research institutions, or promoting farmer-to-farmer stem cutting exchange programs. Improving access to a variety of cassava stem cuttings can encourage participants to diversify their cassava crops, considering factors such as yield potential, pest resistance, and market demand. This finding is in line with Aisueni and Azaiki (2017) who observed that access to healthy and disease resistant cassava stem cutting such as TMS 419 would boost the yield and income of cassava farmers in Nigeria

The severity of poor rural infrastructure (mean score = 2.30) is a major concern. Inadequate roads, lack of storage facilities, and limited access to markets can significantly hinder agricultural activities and economic development in rural areas. The absence of reliable transportation infrastructure can lead to higher post-harvest losses, increased marketing costs, and reduced competitiveness for participants in local and regional markets. Addressing this constraint may require coordinated efforts from government agencies, development organizations, and the private sector. Investments in road construction, storage facilities, and market linkages are crucial for rural development and economic growth. This finding is in line with Edeme *et al* (2020) who noted that investment in infrastructural development with a view to improving agricultural productivity potentially contributes to employment generation.

High transportation costs (mean score = 2.42) pose a severe constraint, affecting the overall profitability and competitiveness of agricultural products. It indicates that participants may face challenges in accessing distant markets and obtaining fair prices for their produce. High transportation costs act as an economic disincentive, potentially discouraging participants from engaging in agricultural activities or expanding their market reach. Strategies to mitigate this constraint should focus on improving transportation infrastructure, reducing logistics costs, and promoting market access through better road networks and transportation options. This finding is in line with Edeme *et al* (2020) who asserted that transportation problem significantly affects production and processing of agricultural products. To him, it is not just enough to produce and process but timely conveyance of produce and products to the market is key to the sustenance of farming and processing business.

High labour costs (mean score = 2.03) can negatively impact the cost-effectiveness of farming operations. Participants may face challenges in hiring and retaining labor at affordable rates. To mitigate this constraint, promoting mechanization and efficient farming practices can be valuable. This includes the use of labor-saving technologies and practices to reduce reliance on expensive labour. Understanding the dynamics of the local labour market, including seasonal fluctuations and wage rates, is crucial for addressing this constraint effectively.

The low constraint related to the lack of fertilizer (mean score = 1.66) suggests that participants may have relatively better access to fertilizers or perceive this as a less critical issue. While not a severe constraint, promoting sustainable nutrient management and soil health remains important for long-term agricultural productivity and environmental sustainability. Encouraging participants to adopt practices such as soil testing and balanced nutrient use can further improve crop yields. This finding is in line with Aisueni and Azaiki (2017) who noted that cassava yields much even in the absence of the usage of fertilizer.

The low constraint regarding the lack of chemicals (mean score = 1.50) implies that participants may not perceive this as a significant issue. Adequate access to agricultural chemicals may be in place. To maintain this advantage, promoting integrated pest management (IPM) practices can help reduce the reliance on chemicals and support environmentally friendly agriculture. Encouraging sustainable pest and disease control practices can contribute to agricultural sustainability and reduce chemical dependency. This finding is in line with Aisueni and Azaiki (2017) who noted that in cassava production, chemical usage to control weeds and pests was not too important as cassava can on its own as a crop withstand weeds and pest infestation and still yield substantially.

The z-test statistical analysis showing income differential among participants and non-participant farmers and processors in IFAD cassava VCDP is presented in Table 5. The difference in means (income differential) between participants and non-participants is approximately $264,081. This indicates that, on average, participants earn ₦264,081 more than non-participants.

Table 5 Z-tests statistical analysis

Variable	Obs	Mean	Std. Error	Std. Deviation
Participants	331	796482.2	17918.3	325995
Non-Participants	333	532400.9	12510.18	228289.3
Combined	664	664043.8	12052.48	310570.6
Difference		264081	21853.38	
T-value = 12.0842. Pr =0.000				

Source: Field Survey Data, 2022

The t-value of 12.0842 is quite large and significant at 1% level of significance (Pr. = 0.000), indicating a significant difference in means between the participants and non-participants. This means that the income difference observed is unlikely to have occurred by chance. The extremely low p-value suggests strong evidence against the null hypothesis (i.e., the hypothesis that there is no difference in income between participants and non-participants). In other words, the income difference observed is statistically significant. The result is in agreement with Ali (2018) who noted that beneficiaries (participants) earned higher average agricultural enterprise income (₦165, 227.80) than non-beneficiaries (non-participants) who earned ₦121, 752.60.

The finding (Table 5) indicates that participants in the IFAD project have a significantly higher income, on average, compared to non-participants. This finding suggests that the IFAD project has had a positive impact on the income levels

of its participants, and this impact is statistically significant. The higher income among participants could be attributed to various factors, such as improved agricultural practices, access to resources, or training provided by the project. This outcome supports the hypothesis that participation in the IFAD project is associated with increased income differentials, which can have important implications for rural development and poverty reduction. The result is in consonance with Sanusi *et al* (2021) who noted that participants in innovation agriculture earned higher revenue than non-participants in Ogun State, Nigeria.

4.2. Processing Constraints Experienced by Participant Cassava Processors

Table 6 shows the constraints experienced by processors in IFAD VCDP.

Table 6 Processing Constraints Experienced by Participant Processors in IFAD VCDP

S/N	Constraints by Processors	Very Severe Constraint (3)	Severe Constraint (2)	Low Constraint (1)	Total	Mean
1	Funds	140	15	1	451	2.89*
2	Access to Information	21	97	38	295	1.89
3	Rural Infrastructure	100	25	31	381	2.44*
4	Labour Cost	10	120	26	296	1.90
5	Transportation Cost	39	102	15	336	2.15*
6	Extension Service	18	60	78	252	1.62
7	Poor Knowledge of Machines	28	81	47	293	1.88
8	Cost of processing	30	50	76	266	1.70
9	Marketing problems	21	40	95	238	1.52
10	Distant Processing Centres	33	50	73	272	1.74
11	Power/Electricity	31	60	65	278	1.78

Source: Field Survey Data, 2022. n = 156

The severe constraint of a lack of funds (mean score. =2.89) highlights a critical financial challenge faced by cassava processors. It indicates that many processors struggle with limited capital to sustain and expand their operations. The severity of this constraint can threaten the sustainability of processing enterprises. Processors may face difficulties in procuring equipment, raw materials, and maintaining consistent production. Addressing this constraint requires targeted financial interventions, such as microfinance programs, access to credit, and grants to support processors in overcoming financial barriers. These interventions can stimulate business growth and economic development in the cassava value chain. This finding is in line with Simonyan and Omolehin (2012) who noted that unavailability of credit and funds to Fadama II participant farmers in Kaduna State constituted major challenge to processing of agricultural produce by processors.

The severe constraint of poor rural infrastructure (mean score = 2.44) has significant ramifications for cassava processors. It reflects challenges in transportation, market access, and overall business development due to inadequate infrastructure. Processors may experience increased operational costs, particularly for transportation, which can affect their competitiveness. Additionally, limited infrastructure can hinder market access and growth potential. Addressing this constraint necessitates substantial investments in rural infrastructure, including road networks, storage facilities, and market access points. Infrastructure improvement can unlock new market opportunities and enhance the overall competitiveness of cassava processing enterprises. This finding is in line with Awoyemi *et al* (2020) who asserts that constraints to adoption of processing technologies include cost of machines and maintenance, low level awareness and training, inadequate finance, and poor infrastructure. They further noted that once infrastructure problems are addressed, production and processing of agricultural products becomes easy.

The mid-level severity of high transportation costs (mean score = 2.15) indicates that processors face notable challenges in moving raw materials and finished products cost-effectively. These costs can strain the financial resources of processors and potentially lead to higher product prices, affecting their competitiveness in the market. Strategies to mitigate this constraint should focus on optimizing logistics, exploring cost-effective transportation solutions, and

considering collaborative transportation initiatives to reduce the financial burden on processors. This finding is in line with Edeme *et al* (2020)) who noted that of all infrastructure problems of farmers and processors, transportation was highly implicated for 80% of post-harvest losses in ECOWAS countries.

The constraint of poor access to information (mean score = 1.89), though not extremely severe, highlights the need for improved information dissemination among processors. Enhancing access to information can contribute to market efficiency. Processors can make informed decisions regarding sourcing, pricing, and product targeting, potentially leading to increased profitability. While the constraint is moderate, strengthening extension services and information-sharing mechanisms remains important. Extension providers should prioritize addressing the specific information needs of cassava processors, including market trends, food safety, and technology updates. This finding is in line with Ajayi et al (2017) who noted that access to information by farmers and processors was key in boosting production and productivity.

The low constraint related to poor access to extension services (mean score = 1.62) suggests that processors have some access to advisory support. While not a major constraint, improving access to quality extension services can enhance processors' knowledge and skills in cassava processing, food safety, and business management. Extension providers can tailor their services to meet the specific needs of processors, offering guidance on technology adoption, quality control, and marketing strategies. This finding is in line with Asrat and Simane (2018) who noted that extension visit increases the likelihood of innovation adoption and helps to improve on technical knowhow (Beshir et al., 2012).

The low constraint regarding marketing problems (mean score = 1.52) indicates that processors may not perceive marketing challenges as highly significant. While not a major concern, improving market awareness and strategies can enhance the positioning of cassava products and expand market reach for processors. Processors may benefit from exploring diversified marketing channels and target markets to increase product sales and revenue. This finding is in line with Aneke (2017) who noted that marketing of products by Fadama I farmers was not a constraint rather production and processing were more of constraints

5. Conclusion

This study provides valuable insights into the dynamics of participants and non-participants in the IFAD VCDP programme, shedding light on their socioeconomic characteristics, needs, and constraints. Notably, the participants in the programme demonstrated a higher mean income compared to non-participants, indicating the positive impact of IFAD project participation on income generation.

Recommendations

Following findings from this study, the following policy recommendations are relevant:

- To address the financial constraints faced by participants, policymakers should explore options for providing financial assistance, microcredit facilities, or grants. Financial literacy training should accompany these initiatives to ensure responsible use of funds and investment in cassava-related activities.
- To mitigate challenges related to poor access roads and transportation costs, policymakers should prioritize infrastructure development in rural areas where cassava farming and processing are prevalent. This includes road maintenance and the provision of transportation subsidies or cooperative arrangements to reduce costs.
- Policymakers should invest in strengthening extension services as practiced by IFAD to provide timely and relevant information and support to participants. Extension agents should be trained and deployed to work closely with participants, fostering knowledge exchange and addressing constraints related to technology adoption.
- Regular monitoring and evaluation of the IFAD VCDP program should be conducted to assess its impact on income differentials and technology adoption rates. Policymakers should actively seek feedback from participants and use this information to make necessary program adjustments and improvements

Compliance with ethical standards

Disclosure of Conflict of Interest

The author has no conflict of interest in this research.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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