Original Research Article

"Is Agriculture still the Mainstay of Rural Economies?" Insights from Ultra-Poor Households in North-central Nigeria

ABSTRACT

Aims: Nigeria may be facing aging and decline in the population engaged at food production nodes, posing huge challenge to agri-food systems with poverty at risk of deepening. Current trend in rural-urban migration and occupational mobility raises the open question of: "Is agriculture still a mainstay of rural economy, playing reliant roles in income and employment generation for the ultra-poor in Nigeria rurality?". Understanding this is important because structural changes to agricultural workforce in Nigeria have far-reaching implications on food security, welfare, and poverty. We sought to unfold the dynamics of agriculture as a business among ultra-poor rural households in North-Central Nigeria. First, we investigated engagements of ultra-poor rural households in agriculture. Secondly, we examined their level of commercialization. Lastly, we investigated determinants of ultra-poor's market participation and its intensity.

Study design: This study used quantitative primary data collected in surveys and qualitative data generated from focus group discussions.

Place and Duration of Study: The study was carried out in three states in North-central Nigeria viz: Kwara, Kogi, and Niger with data collected and analyzed between 2020-2022.

Methodology: We randomly selected 1588 households (out of 60,427 households) from the "Single Register of the Ultra-poor" operationalized on a World-Bank-Assisted Conditional Cash Transfer (CCT) programme. We analysed data using descriptive statistics, Household Agricultural Commercialization Index, and Double-Hurdle Model.

Results: Only about 18.7% of the ultra-poor households were primarily engaged in agriculture with the focus groups highlighting conflicts issues from indiscriminate grazing activities as reason for the abandonment. Determinants of market participation and intensification include: (-) household dependency ratio, distance to markets, (+) linkage to market agents, access to mechanization and input market, CCT-beneficiary status, and farm size ($p<0.05$).

Conclusion: Involvement in primary agricultural production is declining in Nigeria. We recommend a boost to infrastructural development of the rurality to support agricultural transformation and attractiveness to the next wave of youths.

Keywords: agriculture, agricultural commercialization, double-hurdle, single register, ultra-poor

1. INTRODUCTION

Agriculture is established in literature as a mainstay of the rural economy and considered subsistence in practice. Its role as an income and employment source for the poorest and vulnerable remains notable. With the recent trend of rural-urban migration and occupational mobility, the acclaimed role of agriculture in rural economies has become a subject of doubt, needing scrutiny especially among the very poor. Structural changes to agriculture and its workforce in Nigeria have far-reaching implications on food security, employment, and poverty with such changes having potentials to disproportionately affect rurality given their underlining low-income levels.

Nigeria has the highest number of extremely poor people in the world [1] [2] with a growing poverty rate and widening income inequalities. Recent statistics [3] puts rural population in Nigeria at 47.25% and this rural economy is characteristically different from the formal economy. The rural individual is potentially more vulnerable to natural hazards and involved in riskier ventures.

The International Labour Organization [4] estimates that in developing and emerging countries, over 80 per cent of the poor live in rural areas. Poverty in Nigeria is pervasive although the country is rich in human and material resources that should translate into better living standards [5]. The International Monetary Fund [6] holds that poverty remains high in Nigeria, severe in rural areas, where up to 80 per cent of the population live below the poverty line, with limited social services and infrastructure and more often, financially excluded. About 90 per cent of Nigeria's food is produced by small-scale farmers who cultivate small plots of land and depend on rainfall rather than irrigation systems and dwelling mostly in rural areas [7]. Given their poor and vulnerable state, many in the rural communities are unable to improve their productivity on the farm, handle shocks such as flooding, drought or any inclement weather element, all resulting in reduced output. Nigeria population is increasing [8] and this becomes particularly concerning because the agricultural labour force that has been known to be concentrated in the rural areas is on the decline.

For instance, a study carried out by [9] in Southwestern Nigeria revealed that youth from poorer households are becoming less engaged in agriculture, leaving agriculture for non-agricultural jobs (occupational migration), and migrating from rural to urban areas. This suggest that Nigeria may be facing the precarious situation of aging as well as decline in the population engaged at the food production nodes, both of which poses huge challenge to the agri-food systems and economic development with poverty at risk of deepening in the rurality.

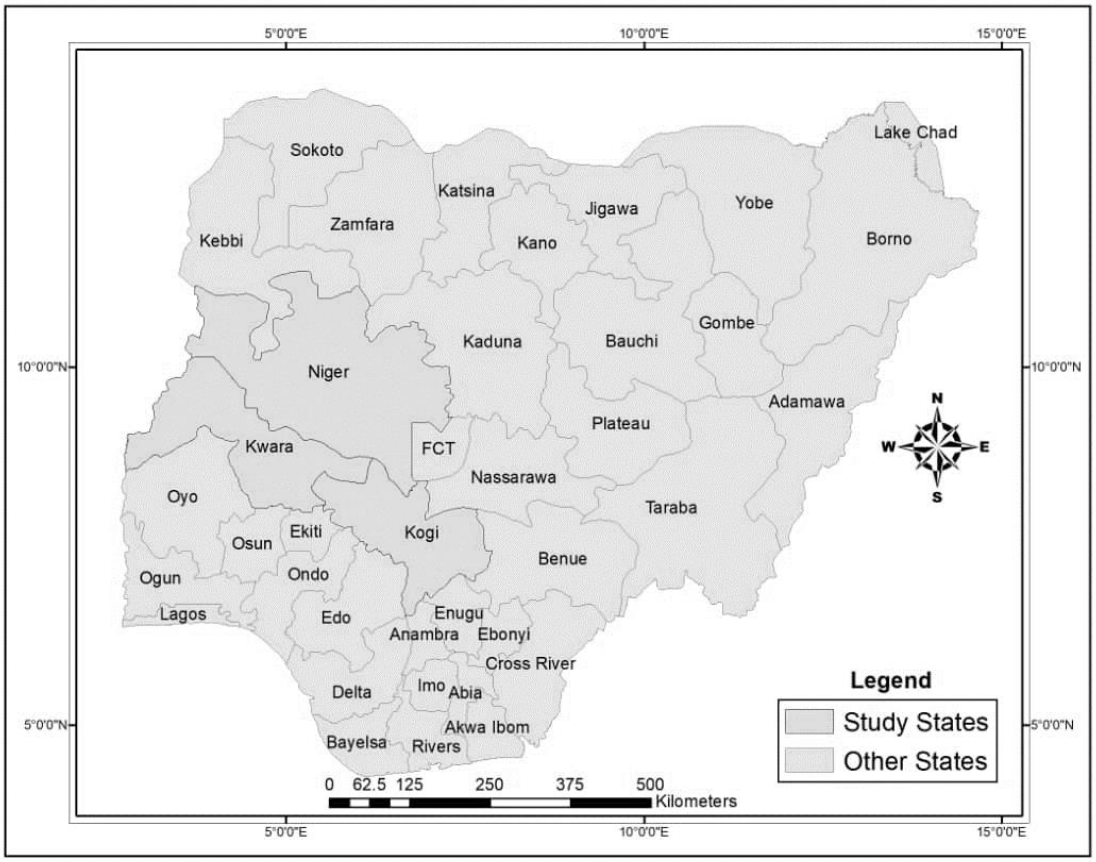
We carried out this research to unfold the dynamics of agriculture as a business among the ultra-poor rural households in North-Central Nigeria. First, we investigated the engagements of ultra-poor rural households in agricultural activities in a foundational step towards validating or updating the age-long belief of agriculture being the mainstay of rural economies in Nigeria. Secondly, we examined the level of agricultural commercialization among these ultra-poor rural farming households in the study area. Thirdly, we examined the determinants of market participation and its intensity among the ultra-poor rural farming households. Lastly, we investigated the marginal effect that individual determinants may have on the intensity of crop commercialization irrespective of the farm household's marketing decision.

This research is premised on the von Thunen's location theory [10] which states that if environmental variables are held constant, then the farm product that achieves the highest profit will outbid all other products in the competition for location. This theory suggests two

basic models which are that: the intensity of production of a particular crop decline with the distance from the market whereas the type of land use will also vary with the distance from the market. This research is justified by the need to have empirically driven policy discourse that are targeted to building resilience in agri-food systems in the face of myriads of problems that agriculture face ranging from changing climate to declining agricultural workforce.

2. METHODOLOGY

This study was carried out in the three (3) states in North-Central Nigeria where, according to the Youth Empowerment and Social Support Operations (YESSO)World Bank report [11], Conditional Cash Transfers (CCT) initiative has been embraced and fully operational. These include Kwara, Kogi, and Niger States (presented in Figure 1). This piece of information is important in that the beneficiaries of this cash transfer initiatives are the ***"ultra poor"*** as driven by their selection process described hereafter.



Author's design

Figure 1: Map of Nigeria showing the study area

YESSO piloted the creation of a Single Register for the poor and vulnerable households in the country – across various states [11]. The Single Register is a list methodologically compiled by the Youth Employment and Social Support Operation (YESSO). It is the

database of the Youth Empowerment and Social Support Operations (YESSO), designed as a Social Safety Nets initiative by the World Bank and the Presidency.
As part of the efforts towards poverty alleviation in the country, the YESSO approach was birthed having clear dictates of creating a Single Register that is based on location specific definition of poverty. This approach uses a Community-Based Targeting method for identification of the poor and vulnerable within the locality. The outcome provides a database of community-identified and community-ranked poorest households containing relevant socioeconomic information on individuals in the households as well as the asset base of the households.

The States used the Single Register in selecting the eligible beneficiaries for various social safety nets interventions. As at the time of primary data collection in 2020, the total number of beneficiaries selected the Single Register in Kwara, Niger, and Kogi States was 60,427 out of which 58,289 were found to belong to the rural stratum. We utilized the Taro Yamane's sample size determination technique (highlighted in *Eqn.1*) to calculate the sample size required from the population:

$$n = \frac{N}{1 + N(e^2)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn.1)$$

Where N is the population size of CCT beneficiaries in the single register and $\boldsymbol{e}$ is the level of precision (set at 0.05). The total sample size arrived at was approximately 397 individuals whom were beneficiaries of CCTs. Essentially, our interest was in both ultra-poor rural households that were benefiting from CCTs social safety net programmes and those that were non-beneficiaries. We therefore selected a multiple of three of non-CCT beneficiaries as the number of beneficiaries which gave 1191 in addition to 397 CCT-beneficiary to give a total sample size of 1588 households - the determining criterion basically being their enlistment in the Single Register as Ultra poor households in the communities. Our selection of beneficiaries and non-beneficiaries of CCT avails us more robust analysis that adds insight to the research.

Following the determination of the appropriate sample size, random sampling technique was employed to select respondents through a computer-generated pool draw. The selected households were thereafter communicated in a tracing exercise through the support of the YESSO coordinators within-localities. We used a mixed research approach in combing and scooping the generation of primary data through qualitative and quantitative surveys. The data analysed were hence collected qualitatively and quantitatively. We gathered primary data with semi-structured questionnaire administered through Computer-Assisted Personal Interview on the SurveyCTO Collect App and engaged in Focus Group discussions (FGDs) to elicit qualitative data.

We analysed the data collected for this research using Descriptive and inferential statistics. To examine the level and intensity of agricultural commercialization among the ultra-poor rural farming households in the study area, the Household Agricultural Commercialization Index was employed. This tool is widely used in measuring the intensity of household

participation in agricultural output markets [12] [13] [14] [15]. The Agricultural Commercialization Index is denoted as $HHCI_i$ as shown in *Eqn 2.* Basically, this refers to the proportion of value of crops sold with respect to the value of crops harvested.

The Household Commercialization Index can be stated as:

$$HHCI_i = \left(\frac{\sum_{k=1}^{K} P_k S_{ki}}{\sum_{k=1}^{K} P_k Q_{ki}}\right) * 100 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn\ 2)$$

Where P_k denotes market price of crop k. S_{ki} and Q_{ki} represent respectively quantity sold and harvested of crop k by household i. This index attempts to measure the degree of households' market participation in a scale neutral manner independently of households' wealth and productivity. The advantage of using these approaches is also that it avoids the crude distinctions between subsistence and commercial farm households. Thus, the commercialization index can take any value from zero which means total subsistence-oriented production (no crop sold) to hundred (all crops produced are sold).

Our study focused on rain-fed and non-rainfed production activities of the households being investigated. The reason for this is because cursory observation of the households in the study area revealed that both categories are major components of the rural livelihoods which sometimes contribute to their market participation. Our study's searchlight is, however, only on the major food crops produced in the study area under the rain-fed category.

In examining the determinants of agricultural commercialization among the ultra-poor rural farming households in the study area, the Double Hurdle Model was employed following the works of [12] and [16]. This model was originally proposed by [17] and it considers that each household must overcome two hurdles in market decision making process and specifies for each step of decision the corresponding equation. The first hurdle, depicted in *Eqn 3,* specifies the decision to participate or not in the agricultural markets while the second hurdle (*Eqn. 5*) refers to the equation of the intensity of sale. Thus, a household decision to participate in crop market and quantity traded can be presented in the decision equation that follows:

$$d_i^* = z_i\delta + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn.3)$$

Where $di*$ is a latent variable indicator of household market participation and μi~(0,1)

$$d_i = \begin{cases} 1\ if\ d_i^* > 0 \\ 0\ if\ d_i^* \leq 0 \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn.4)$$

d_i=1 if the household i effectively participates in the market of crops as sellers (i.e. $d_i^* > 0$) and d_i=0 if household i does not sell in the market ($d_i^* \leq 0$). Conditional to market participation decision (*Eqn. 5*), the intensity of sale by a given household can be expressed as follows:

$$S.Int_i^* = x_i\beta + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn.5)$$

With $\varepsilon_i \sim \mathrm{N}(0, \sigma^2)$, where z_i and x_i are vectors of observed variables that explain respectively households' decision to participate in the market and the intensity of sale. δ and β are vectors of parameters to be estimated; μi and εi are the error terms.

In this model, the positive quantity sold is observed only if the household participates in crop market and zero if otherwise. Hence, the observed quantity sold ($S.Int_i$) related to latent sale $S.Int_i^*$ is:

$$S.Int_i = \begin{cases} S.Int_i^* \; if \; d = 1 \; and \; y_i^* > 0 \\ 0 \qquad\qquad if \; otherwise \end{cases} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn. 6)$$

According to [12], the original specification of the model of [17] assumed independence between the error terms of the two hurdles. If the error terms μi and εi are normally, independently, and identically distributed, that is,

$$\begin{pmatrix} \mu_i \\ \varepsilon_i \end{pmatrix} \sim \mathrm{N}\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (Eqn. 7)$$

It therefore follows that as such, the maximum likelihood estimator can be obtained by Probit regression for the first step of the model (i.e. *Eqn. 3 and 4*) and then truncated normal regression can be used for the second step (i.e. *Eqn. 5*).

To determine the factors affecting market participation decision of the selected farming households and intensity of agricultural commercialization, we modeled variables as informed by literature [12] [18] [19] [20] [21] [22] [23] [24] [25] [26].

3. RESULTS AND DISCUSSION

3.1 Socio-Demographics Characteristics of Respondents

We found that majority (82%) of the ultra-poor households that benefitted from CCTs were female-headed with the majority (80%) of them being married. Along the states, Kogi state ranked first, having the highest percentage (88.7%) of female beneficiaries. Kwara State ranked second with 82.9% of the beneficiaries being female while the percentage for Niger State was 73.64%. Females were found to benefit more from the CCT programme than their male counterparts probably because of the higher levels of vulnerabilities that women are prone to.

Similar findings on gender roles have also been made in other countries, for instance, in a study by [27] on cash transfer programming, using eight rigorous evaluations conducted on large-scale government cash transfers in sub-Saharan Africa under the Transfer Project, it was recorded that majority of beneficiary households within these programmes comprise mostly elderly women with limited employment. Although the scheme investigated is for unconditional CCTs, the observation remains relevant, indicating that women stand good chances in benefitting from cash transfers, conditional or otherwise. The intervention scheme under investigation in this study appears to prioritize women based on the conjecture that women are more likely to spend on goods or services that will benefit the household including the male head thereby improving welfare.

The average household size of the CCT beneficiaries was 8individuals while that of non-beneficiaries was 7 individuals. With about 7-8 individuals per household, the average household size in the study area is larger than the national average of 5.9persons. Most (36.4%) of the CCT beneficiaries were not formally educated whereas 21.1% and 31.3% had up to primary and secondary education respectively. The mean year of schooling among the CCT beneficiaries is 4.45years which suggests a low literacy level. A similar finding was made on the non-CCT beneficiary respondents as drawn from the Single register where the mean years of schooling was 4.62years. The findings from these respondents are observed to be lower than the national average of 5.2 reported on UNDP's Human Development Reports and UNESCO Institute of statistics as 2013 estimates.

This may be linked to the fact that the Single Register basically comprises of vulnerable poor from the rural areas who are the poorest of the poor. The fact that they belong to that economic stratum is a strong factor that may have precluded the majority of these people from securing formal education. This may suggest the need to revamp access to free education in the rural areas to be able to develop human capital among the poor given the criticality of this in breaking the vicious cycle of poverty in concerned households.

Among the CCT beneficiaries and non-beneficiaries as drawn from the Single register, upto 4.5% of the beneficiaries had at least one form of physical disability which impairs them from being able to function at par with able people in their daily routine. The non-CCT beneficiaries on the other hand have up to 3.75% of people living with disability. According to [28], there are an estimated 3.3million people living with disabilities in Nigeria with the country having a prevalence rate of 2.3%.

The finding that the Single Register has a higher percentage of people living with disabilities on it than the national average is an indication of inclusivity. This suggests that people living with disabilities are purposedly captured in the registry in such a way that allows them to benefit from programmes that may be targeted towards the vulnerable on an ongoing basis. This is very crucial since people living with disabilities are often disproportionately affected by poverty.

According to [29], 9 out of 10 people with disabilities live below the poverty line. This accentuates the importance of inclusivity of people living with disability in national programmes targeted at addressing poverty and vulnerabilities in the country. The finding that a higher percentage of this sect of the population are enrolled to benefit from the CCT programme being investigated in this study, as drawn from the Single Register suggest that special attention is being accorded to them as is required.

We found that the CCT beneficiary and non-beneficiary households had similar patterns of additional sources of income that accrued to the households from activities engaged in by other members of the home. Farming remains the most popular alternative income source of most households, accounting for 37.3% and 39.63% in CCT beneficiary and non-beneficiary households. Given the commendable contribution of agricultural related activities to total household’s income, it becomes necessary to ensure the maintenance of a safe space for people to carry on their farming related activities by clamping down on banditry and insurgency which are currently challenging many rural households across Nigeria.

Based on the guidelines for the CCTs programme understudied, beneficiaries are mandated to keep a specified percentage of their monthly incomes (basically from transfers) in some form of savings. It was found in this study that up to 16.03% of the CCT beneficiaries currently violate this term. It is surprising that violators are still able to access their monthly benefits as demonstrable saving in the previous month is a pre-condition for drawdown in the subsequent month. This is an indication that there are some lapses in the process of funds administration to the CCT beneficiaries in some of the locations. There is a very low patronage of commercial banks as a saving medium among the CCT beneficiaries as only about 2.39% engage this medium.

This is consistent with *apriori* expectation because commercial banks are often distant from the rural areas which hence prevent dwellers in remote locations from being included in this financial space. The patronage of 18.18% found with microfinance banks is commendable as it suggests that microfinance banks are, by their proximity to the grassroot, able to cater to the needs at that level. Informal savings groups and cooperatives societies ranked as the most popular savings medium with the CCT beneficiaries, accounting for 31.34% and 21.29% respectively. This is expected because they are more readily available in the rural areas, are easy to institute and operate among the rural dwellers, and not demanding of any formal structure in day-to-day running.

Cooperatives and savings groups have a proven track record in improving access to finance for micro entities as commonly found in the study area. Up to 10.77% of the CCT beneficiary respondents saved on their own within the households with the use of traditional piggy banks. This may be a successful approach to saving as much as it may be unsuccessful, especially when individuals have not been able to cultivate stringent discipline that allows them to still hold on to such savings even when unforeseen household demands arise. It is also worrisome how personnel with the CCT program will be able to track real savings by such beneficiaries since all track records regarding these savings can only be backed up by the submission of the beneficiary without any available cross-verification process as may be found in the other savings medium.

Among the selected non-beneficiaries of CCT, it was found that close to half of the respondents (46.41%) did not engage in any form of savings with any of the indicated options. This suggests that the CCT scheme has indeed proven useful in imbibing savings culture in many beneficiaries. Informal savings group (20.26%) and cooperatives societies (11.32%) were also found to be popular among the non-beneficiaries as was the case with beneficiaries. This is largely because these groups are common in the rural areas and generally open to all, most especially for folks in the same line of occupation.

3.2. Agricultural Involvement of the Ultra-poor Rural Households in North Central Nigeria

The involvement of ultra-poor households in agricultural activities is the first objective of interest in this study. The findings from the profiling carried out on the respondent CCT beneficiaries and non-beneficiaries' primary occupation is as presented in Figure 2.

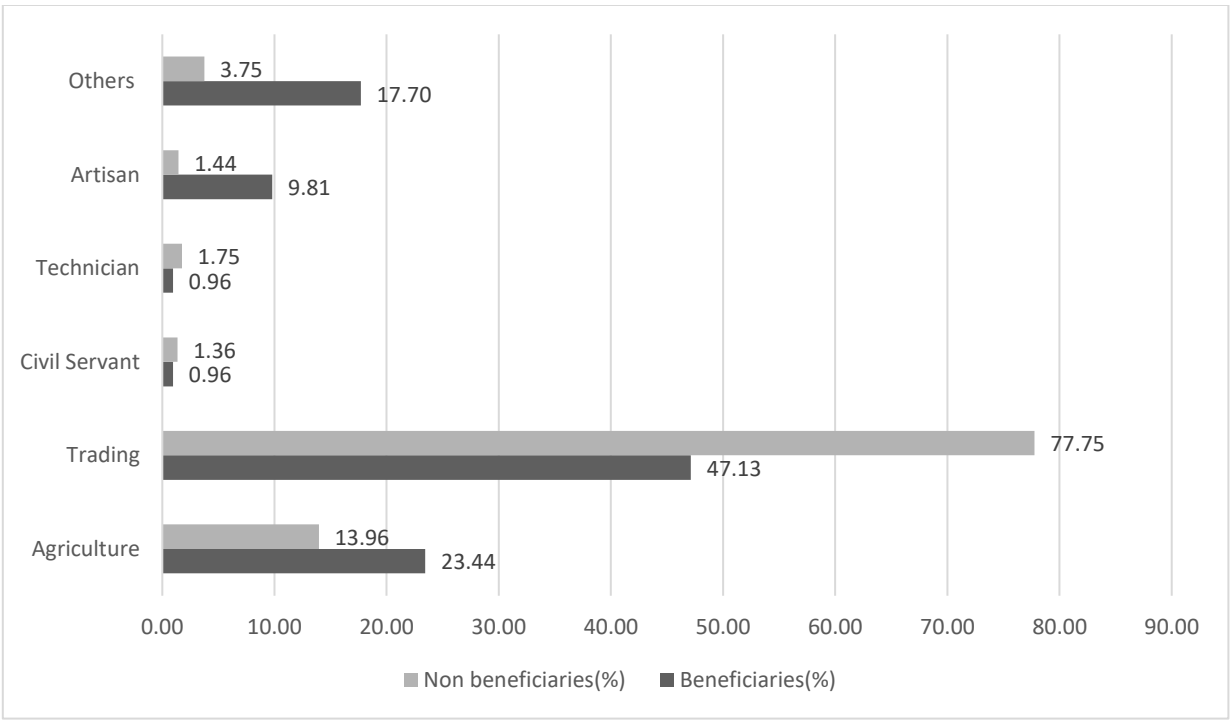


Figure 2: Occupational Characterization of Ultra-poor Household Heads in the Study Area

As shown in Figure 2, only about 14% and 23% of the beneficiary and non-beneficiary ultra-poor households in the study area are engaged in agricultural related activities. Most of the respondent ultra-poor households are rather engaged in trading activities. Overall, only 18.7% of the respondents were engaged in agrarian occupations and this may influence household food security in the study area. Particularly, the findings from this study indicate a deviation to apriori notion that agriculture is the mainstay of rural economies. This has strong policy implications, suggesting that other future interventions for poverty alleviation within the rural economies may need to take approaches other than agrarian to have wider reach.

Findings from the focus group discussion gave more insight into the state of agricultural involvement by ultra-poor households in the study area. One unanimous observation that emanated from focus group discussions held in the communities across the three states was that engagement in agricultural activities has continued to decline given conflicts issues arising from indiscriminate grazing activities.

One of the focus group discussion participants stated as follows:

> *"Here in Isare Opin, we cannot do commercial agricultural activities because of cattle herders. Those of us that still farm have to stay in our farms till late in the night to ensure cattles don't eat our crops. Yet, we will walk for about 2hrs before getting back to the village. Those of us without 'Okada' (i.e. motor bikes) find this tiresome because we are only able to work a little in farm before being*

tired and we still need to walk back home at night and this reduces our energy for farm activities. The nearby farmland that we would have preferred are no longer attractive because those ones are closer to Fulani settlements".

This finding may have strong implications on food security and on livelihoods considering that the activities of many are being hampered by the state of insecurities in the study area. However, to some extent, this is compensated for by the relegation of farming activities to secondary occupation.

While neither crop farming nor other forms of farming constitute the major occupation of respondents sampled in the study area, it did take a major percentage of secondary occupation, thus representing approximately 40% of respondents' secondary occupation. This finding is in tandem with what was found by Handa *et al.* (2018) in the Transfer Project across Sub Saharan Africa, which suggested that a defining characteristic of most beneficiary households is that they are not wage workers, but rather depend on their own efforts in smallholder agriculture or family-run businesses to assure enough income and food for survival. According to [27], most beneficiary households live and work in a context of poorly functioning or non-existent input/output, labor, insurance, and/or credit markets.

3.3 Agricultural Commercialization among the Selected Farming Households

In examining the level of agricultural commercialization among the ultra-poor rural farming households in the study area, the Crop Commercialization Index analysis revealed the results in Table 1. Further analysis was carried out to unfold commercialization along individual key crops in the study area and the results are presented in Table 2.

Table 1: Agricultural Commercialization among the Ultra-poor Farming Households

Crop Commercialization Index	Frequency	Percentage
No quantity sold (0%)	371	43.85
< 25% Sold	232	27.42
25% - 50%	125	14.78
> 50%	118	13.95
Total	846	100

Source: Data Analysis, 2022

From the results earlier presented on respondent ultra-poor households' involvement in agriculture, it could be seen that out of the 1588 respondents selected from the CCT beneficiary and non-beneficiary categories, only 846 had farming either as their main or secondary occupation and they therefore form the basis of the analyses carried out in this section. As shown in Table 1, 43.85% of the respondents recorded zero agricultural commercialization. This suggests that they were mostly into subsistence farming, basically in agricultural activities for the sole purpose of feeding their families. It can be seen from Table 2 that up to 27.42% of the respondents sold less than 25% of their outputs. Only 13.95% of the farming households reported commercialization index above 50%.

This result is consistent with what has been found in various studies in Sub-Saharan Africa. For instance, [12] Ouedraogo *et al*., 2018 in a study carried out in Burkina Faso found that

only about 17% of total farm output produced were sold with up to about 45% of smallholder farmers not participating in markets. More studies carried out in other African countries have also found similar situation in Agricultural commercialization. For instance, Ethiopian farm households were reported to have crop commercialization index of about 25.0% [30], Malawian farm households 17.6%, Tanzanian households 27.5%, and Ugandan farming households 26.3% [31]. This has strong implications on the farming households in the sub-region as it suggests that most African farming households have not been able to successfully scale up their agricultural capacity in a way that can increase what they may have on offer for sale. Breaking the vicious cycle of poverty among rural farming households in the region will require boosting the productive capacity of households.

Commercialization Index along Key Crops in the Study Area

Results of the commercialization index for individual commonly produced crops that were considered in this study are as presented in Table 2. From Table 1, only 475 of the 846 farming households that were sampled participated in the crop output market. The analysis in this section is hence premised on the commercialization activities of these market participants.

Table 2: Commercialization Index along Commonly Produced Crops by the Selected Farming Households

	Producers		Sellers (i.e. Market Participants)		
Crops	Frequency	Percentages	Frequency	Percentages	Mean of Crop Comm. Index
Cassava	443	52.36	260	30.75	58.50
Cowpea	236	27.90	117	13.83	40.20
Sorghum	212	25.06	122	14.42	16.44
Maize	412	48.70	228	26.95	4.25
Millet	118	13.95	79	9.34	16.80
Rice	204	24.11	161	19.03	67.48
Soyabeans	336	39.72	276	32.62	72.55
Sweet potato	147	17.38	63	7.45	8.34
Yams	234	27.66	114	13.48	16.45
Total number					33.45
846 Farming Households			*475 Farming/Market Participating*		

Source: data analysis, 2022 Multiple responses captured for investigated crops

As shown in Table 2, cassava was one of the most commonly produced staple in the study area with up to 52.36% of the farming households in its production. However, only 30.75% of the cassava producing households participated in the markets, presenting a crop commercialization index of 58.50%. Cassava is indeed an important crop in the study area given its plurality of use at the household level and industrially. As such, one would have expected a higher level of market participation than what was observed. This may be attributable to the subsistence level at which agriculture is being practiced in the area under investigation.

The limited infrastructure such as in transportation, storage, processing, and marketing may also be fingered as affecting commercialization of this key crop. Maize (48.70%) and Soya beans (39.72%) were the next ranked crops produced among the households. The result shown that 26.95% of the maize producers and 32.62% of the soyabeans producers participated in the crop output markets. However, the crop commercialization index of soyabeans was significantly higher (72.55%) than what was observed for maize (4.25%). This suggests that maize is mostly produced by households as a food security crop whereas many are into soya beans production as a cash crop given its high commercial value and industrial uses.

About 28% of the farming households were into the production of cowpea, with less than half of them (<14%) participating in the market. However, the mean crop commercialization index of 40.2% was reported suggesting that those who participated in the market did so at higher thresholds. Up to 25% of the farming households were into the production of sorghum and only about 14% of these households were participating in the market. Similar low production and market participation findings were also made for millet where about 14% of the farming households were millet producers and 9% were market participants.

This finding is in tandem with what has been reported by [32] in a study on millet and sorghum where low production and market participation characterized the value chains in Nigeria. One would expect that more households would be in the production of sorghum and millets as these are food security crops well adapted to drier regions, having potential especially with the changing climate. However, the limited industrial uses for these crops have continued to be a barrier in the markets and infact the value chains, in general.

About 24% of the farming households were found to produce rice whereas 19% of the households participated in the market. The ratio (19:24) of rice market participant to producer is significantly high at about 80%. It is interesting as well to note a commercialization index of 67.5% for rice. This is an indication that rice is prominent in income generation for rice farming households. The recent ban in rice importation and the push for local production may be one of the reasons for the high commercialization level found among the rice farming households that participated in the market. With the existing demand-supply gap in the rice subsector, it becomes important to encourage rice production among the farming households in the study area, who do not currently produce rice, most especially because there are vast opportunities to delve into upland and lowland rice farming.

Sweet potatoes and yams were found to be produced by about 17% and 28% of the farming households, respectively. The level of market participation was around 7% and 13% and the commercialization index stood at 8% and 16% respectively. It can be observed that both tuber crops have low production, low market participation, as well as low commercialization level in the study area. This may likely be because of the limited industrial use coupled with their bulkiness and perishability which have implications on their storability, marketing and invariably, commercial value. This finding on low commercialization is in tandem with that of [33] in a study carried out in Imo State where it was found that close to sixty percent of the

444 respondents who were yam producers had commercialization index that was less than 25%
445 which was quite low.
446
447 Past research investigating yam marketing by [34] highlighted insufficient knowledge on
448 efficiency of the yam marketing system in Nigeria. The research noted some of the
449 challenges in yam marketing to include high cost of transportation given the bulkiness, and
450 low level of storage technology given the perishability. [35] had earlier noted that many
451 farmers grow yam for household food security without much consideration to its commercial
452 potential.
453 More recent studies [36] [37] have also reported the high importance yet low
454 commercialization level in yam with households selling less than 23% of the output as ware
455 yam. It is of interest to note that despite Nigeria's ranking as a top world producer of yam
456 contributing up to 71% to world output of yam the country does not feature among the top
457 ten exporting countries in the global yam market [38] [39] [40]. Addressing the gap in yam
458 commercialization becomes very important toward developing the value chain considering
459 the huge potential and advantage that Nigeria has in yam production.
460
461 **3.4. Determinants of Ultra-poor Households' Agricultural Commercialization**
462 **Decision & Extent**
463
464 Results of the Double Hurdle Model analysis used in identifying the determinants of market
465 participation decision among the ultra-poor farming households and the intensity of their
466 agricultural commercialization is presented in Table 3. The model is of good fit and is
467 statistically significant (*Prob > Chi^2 - 0.000*) in explaining the market participation decision
468 and commercialization intensity.
469
470 As revealed from the Probit regression in the first stage of the model (Hurdle 1), at 5%
471 significance level, the likelihood of farm households' participating in crop markets is
472 positively influenced by farm size, with a coefficient of 0.425. This finding is consistent with
473 what has been reported in several studies in other African countries. For instance, [12]
474 reported that farm size plays cogent role on the probability of farm households' participating
475 in the crop market in Burkina Faso. In fact, [22] had argued that production growth (and
476 invariably market participation) is highly driven by increase in farm size. [41] had also
477 reported that the probability of becoming a crop seller increases when land holding
478 increases. In the same vein, [26] and [18] had reported a positive and significant effect of
479 farm size on households' market supply in Mozambique and Kenya, respectively.
480
481 **Table 3: Determinants of Households Agricultural Commercialization**

	HURDLE 1			HURDLE 2		
	Probit Estimator of Participation in Output Market			Truncated Normal Estimator of Intensity of Sales Activities when participating in Output Market		
Variables	Coefficient	Std. error	Pvalue	Coefficient	Std. error	Pvalue
Age	-0.055	0.032	0.061	-2.427**	1.024	0.044

Gender	-0.377	0.194	0.075	-3.014	1.926	0.521
Educ_stat	0.744	0.365	0.683	1.632	0.959	0.335
Hh_dependency_Ratio	-0.148**	0.059	0.004	-0.951**	0.468	0.032
Participation_non_farm_activities	-0.354**	0.098	0.046	-1.206**	0.795	0.048
Extension_contact	0.326	0.085	0.566	1.708	0.964	0.211
Farm_size	0.425**	0.080	0.032	2.494**	1.423	0.029
Access_to_mechanization	0.352**	0.104	0.001	1.923**	1.107	0.007
Access_to_finance	0.275**	0.094	0.000	1.636**	0.963	0.002
Fertilizer_usage_per_hectare	0.004**	0.001	0.002	0.915**	0.625	0.045
CCT_programme_participation	0.135**	0.056	0.029	2.557	1.492	0.105
Linkage_to_mkt_agents	0.424**	0.097	0.037	4.102**	2.238	0.046
Access_to_storage_facilities	0.094	0.077	0.548	2.184	1.759	0.628
Transport_asset_ownership	0.524	0.098	0.235	2.437	1.876	0.451
Quality_access_road	0.245**	0.106	0.001	1.469	1.104	0.088
Distance_to_market	-0.762**	0.349	0.000	-2.424**	1.735	0.003
Communication_equipment_ownership	0.029**	0.037	0.042	0.925	0.577	0.605
Constant	-1.497**	0.595	0.000	-9.714**	5.560	0.042
Log likelihood	*-1346.94*			*-2401.63*		
Wald Chi^2(17)	*112.53*			*124.66*		
Prob > Chi^2	*0.000*			*0.000*		
Observations	*846*			*846*		
Sigma	*14.392***			*16.287***		
	(1.634)			*(1.025)*		

*** Significant at 5% Source: data analysis, 2022*

Table 3 further revealed that at 5% level of significance, farm households' participation in crop markets is also positively influenced by the access to mechanization, access to finance, and rate of fertilizer usage per hectare with coefficients of 0.352, 0.274, and 0.004. These findings are consistent with apriori expectation because the access to such resources as finance, mechanization, and inputs will boost farmers' productive capacity which will in turn lead to an increase in the marketable surplus. The availability of this surplus may be regarded as a necessary, although not sufficient, condition for households to participate as sellers in crop markets. These findings are in tandem with past studies which have also underscored the cogent roles that access to productive resources play on smallholders' crop supply in African countries [12] [23] [24] [18].

As shown in Table 3, participation in CCTs programme positively influenced market participation by the agricultural households with a coefficient of 0.135, at 5% level of significance. This may be because their CCT beneficiary status has resulted in an increase in their financial capabilities which has implications on their productive capacity as earlier submitted. With coefficients of 0.424 and 0.029 respectively, linkage to market agents and ownership of communication equipment were found to positively affect market participation among the households at 0.05% level of significance. The linkage to market agents has some inter-relationship with ownership of communication equipment in some way because the means of communication available to individuals will determine the strength of their linkage to available market agents in the area.

The finding that communication equipment ownership positively affect the likelihood of market participation is in tandem with that of [42] [43] [19] and [21] in various studies carried out in Ethiopia, Ghana, and Niger republic where they all come to the convergence that the use of radio or phone may reduce information asymmetry, reduce price dispersion and then stimulate market participation among farming households in Sub-Saharan Africa. [12] in a study carried out in Burkina Faso had also reported similar finding to what was found in this research, albeit their result was only positively significant in consideration of food and cash crops whereas it was insignificant when only food crops were considered.

Evidence also exists [25] [20] that effect of access to information on agricultural commercialization is more important for perishable crops than for traditional staple crops. From Table 3, it can be seen that the quality of access road also positively influenced the likelihood of market participation among the agricultural households at five percent significance level. According to [12], the existence of all-weather roads significantly raises the probability of households' participation in agricultural markets.

The distance to market, with a coefficient 0.762, was found to negatively influence the farming household market participation at 5% level of significance. This finding is consistent with those of [44], [45], [46] which have suggested that rural isolation increases transaction costs and negatively affects households' market participation. Furthermore, transportation costs which increase in absence of good quality of roads may affect households' cropping pattern toward subsistence farming and reduce their ability to produce marketable surplus.

From table 3, the likelihood that a farming household will participate in crop market as seller is significantly reduced by 35.4% where the household head was mainly engaged in non-farm economic activities. This may be because such households may not have the luxury of time that will allow them to operate their farm at a level that can permit production of marketable surplus. The fact that farming households are involved in non-farm activities may also mean that they have other sources of income that can be relied on which hence does not motivate them to scale up their farming activities. Similar finding was made by [12] in a study in Burkina Faso which submitted that if the head of the household is engaged in non-farm activities, the likelihood of the household selling food crop falls. The authors explained this observation by the fact that access to non-farm activities, which represents an opportunity for income earning, modifies the livelihood strategy of the farm households by reducing their reliance on food crop sale. According to the authors, this results in a reduction of their reliance on farm income and lowers their incentive to engage in commercial farming, particularly as far as food crops are concerned.

From the results presented in Table 3, the household dependency ratio played significant roles in determining market participation. Based on the probit regression, the likelihood that a household will participate in market reduced significantly as the number of individuals dependent on the head increased by a factor of 0.148. This is consistent with *apriori* expectation because where the number of mouths to feed is large, the household will have limited marketable surplus from their farm output. Although one may argue that the larger the household size is, the higher the labour supply that would be available for agricultural

production, this will be dependent on the demography of the individuals within the households.

As presented under Hurdle 2 in Table 3, the results of the second stage of the model describing the determinants of conditional market participation shown that, at 5% level of significance, the age of household head, household dependency ratio, participation in non-farm activities, and distance to market negatively influenced the intensity of crop commercialization by the household with coefficients of -2.427, -0.951, -1.206, and -2.424 respectively. On the other hand, the farm size, access to mechanization, access to finance, fertilizer usage per hectare, and linkage to market agents had positive relationship with the intensity of commercialization among the farming households investigated, having coefficients of 2.494, 1.923, 1.636, 0.915, and 4.102 respectively.

The age of the household head was not significant in the first Hurdle which was the market participation among the farming households. However, this became significant at 5% level in the second Hurdle which implies that if for other factors, the household decide to participate in the market, their intensity of commercialization will decline with an increase in the age of the household head. This is expected because the drive and energy of an individual to intensify efforts towards crop sales is likely to lower with their age. As shown in Hurdle 2, once a farm household has taken the decision to participate in the market, the intensity of their commercialization of crops falls as the household dependency ratio increased. So also does the intensity of participation decline when the household head is engaged in non-farm activities, and as the distance to market increased.

Conditional upon market participation, farm size, access to mechanization, access to finance, fertilizer usage per hectare, and linkage to market agent positively and significantly influence the intensity of crop commercialization among the farming households at 5% significance level. These findings are consistent with what was reported by [12]. As found in Hurdle 1 for decision on market participation, these variables also play significant roles in determining the intensity of crop commercialization among the selected farming households. Although, the quality of access road and the ownership of communication equipment by the household head increases the probability of participation in the crop market as shown in Hurdle 1, once this participation decision has been made, these factors become inconsequential towards determining their intensity of crop commercialization.

Further analysis was carried out to unfold the marginal effect that the modelled regressors have on the intensity of crop commercialization irrespective of the farm household's marketing decision, the Average Partial Effects (or unconditional marginal effect) were measured, and the result is as presented in Table 4.

Table 4: Average Partial Effects Unconditional to Market Participation Decision

Variables	Coefficients	Std. Error	*P* value
Age	-1.354**	0.659	.046
Gender	-1.846**	0.171	.033
Educ_stat	0.925	0.047	.704
Hh_dependency_Ratio	-0.820**	0.068	.000

Participation_non_farm_activities	-1.112**	0.274	.009
Extension_contact	1.134	0.713	.152
Farm_size	2.047**	1.902	.000
Access_to_mechanization	0.965**	0.038	.005
Access_to_finance	0.124**	0.004	.027
Fertilizer_usage_per_hectare	0.681**	0.224	.001
CCT_programme_participation	1.635**	1.051	.042
Linkage_to_mkt_agents	3.496**	1.268	.019
Access_to_storage_facilities	1.827	0.963	.524
Transport_asset_ownership	1.034	0.824	.638
Quality_access_road	1.229**	0.950	.016
Distance_to_market	-0.443**	0.067	.022
Communication_equipment_ownership	0.701**	0.362	.034

** Significant at 5% Source: data analysis, 2022

Std errors generated from bootstrapping with 100 replications

The findings as presented in Table 4 underscore the importance of productive resources such as farm size, access to agricultural mechanization, access to finance, quantity of fertilizer available for use per hectare, and benefits from CCTs programmes on the unconditional level of crop commercialization. Linkage to market agent, quality of link road, and ownership of communication equipment can also be seen to be of importance towards unconditional level of crop commercialization at 5% significance level.

As reported in Table 4, an increase in farm size by one-hectare results in 2.05 units increase in the intensity of commercialization of food crops. Access to mechanization raises the intensity of crop commercialization by a factor of 0.965 whereas access to finance raised this by a factor of 0.124. With an increase in fertilizer use per hectare by 10 kilograms, the intensity of food crop sale increased by 0.681 units. Participation in CCT programmes increased the intensity of crop commercialization by a factor of 4.35 as compared to their non-beneficiary counterparts. As presented, households that had access to market agents were about 3.496 units more commercial than those who did not have access to market agents.

The result for average partial effect of ownership of communication equipment suggests that the ownership of communication equipment raised the crop commercialization intensity of the household by a factor of 0.701 as compared to households that do not own communication equipment. The quality of link road has positive and significant effect on the level of crop commercialization by a factor of 1.229 units suggesting that households located in areas with better quality link roads are more commercial than their counterparts located in areas with bad roads.

4. CONCLUSION

We conclude that involvement in primary agricultural production is on the decline in rural Nigeria and CCTs programme with a clause of agricultural involvement might be a workable tool to explore to encourage participation in the sector in the rurality. The declining market participation without a commensurate rise in commercial agriculture in the country can

jeopardize food security, if left unaddressed. Since the capacity of farming households to produce at the level that can spur them into commercialization is hinged on their financial holding assets, efforts should be geared towards better inclusivity of the ultra-poor in social safety nets programmes like CCTs. We recommend a boost to infrastructural development in the rural economies to support agricultural transformation and endear teeming youths into the sector. Given that access to agricultural mechanization, finance, and inputs play critical roles in household agricultural productive capabilities, it becomes important to develop schemes that can facilitate these for rural households since it will impact on their marketable surplus, and invariably market participation. Private sector should take on opportunities that will facilitate the linkage of farming households with the markets through the provision of platforms that connect farmers and buyers, that facilitate agricultural produce storage, and provide logistic support between producers and the buyers.

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