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Assessing the Extent of Commercialization of Smallholding Farming Households in Cross River State, Nigeria

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Abstract: *This study was designed to determine the household commercialization index (HCI); identify the variation in the level of commercialization among households in the three agricultural zones, as well as identify the micro-level factors determining the level of commercialization in Cross River State.Descriptive, statistical and econometric methods were employed to analyze the data collected from a sample of 120 households using structured questionnaires. Findingsshowed that the degree of commercialization in the study area is moderately high (about 60.40%). On average, households sold about 56.10%, 66.60% and 58.50% of their total production (in grain equivalent terms) for the Southern, Central and Northern zones respectively.Tobitregression analysis showed thattotal quantity of food crops produced, farming experience, access to agricultural extension service, size of land used for cultivation, membership in cooperatives and household family size are important factors determining the level ofcommercialization of smallholder farms. The study recommends the formulation of policies to enhance food crop production and aimed at creating enabling environment forincome generation; policies to encourage the formation of cooperatives to provide a strong mitigation strategy and advance participation in the output market; strengtheningof extension delivery.*

Key words*: Commercialization,Cross River State, Smallholder, Subsistence farming, Tobit regression,*

I. Introduction

Smallholder farming is key to livelihoods of many rural households in developing economies. Recognition of the potential of market to unlock economic growth and development gave rise to market led rural development paradigm during the 1980s [1].Rural areas are the home of the majority in Africa and small scale agriculture is the mainstay of the rural economy serving mainly as a source of food income [2]. Small holder farming, which is the predominant source of livelihoods in Africa, has proven to be as efficient as larger farms when farmers have received similar support services and inputs (seed, fertilizer, and credit) [3].Many countries and international development agencies give due concern to intensification and commercialization of smallholder farming as a means of achieving poverty reduction and thus have reflected it in their official policies[4].

In Nigeria, the government has promoted the increasing commercialization of agricultural production through its different schemes, policies and programmes. Cross River State government has been promoting the increasing commercialization of agriculture particularly through its Cross River Agricultural and Rural Empowerment

Scheme (CARES) and Commercial Agriculture Development Project.Commercialization in this study is taken to be a deliberate action on the part of the agricultural producers of their own free will or by means of coercion to use the land, labour, implements and other inputs in such a way that a greater or smaller part of the crops and/or animals produced is for exchange or sale[5].

According to the Cross River State Economic Empowerment and Development Strategy [6], the Cross River State economy is mainly characterized by subsistence-oriented agriculture. Inspite of the increasing trend in food crop production, commercialization of small holder farming is not yet high enough to enable farmers benefit from increased incomeand stimulate rural growth.The potential of markets as an engine of agricultural growth and pathway to exit poverty for the majority of the smallholder farmers in Cross River State remains not fully exploited. These smallholder farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and extension services. Thus, it is not possible for farmers to integrate with the market and enjoy the benefits of commercialization unless the already existing hurdles are removed and better environmentis created [7]. Smallholder commercialization typically leads to an increased diversity of marketed commodities at the national level and increased specialization at regional and farm levels. Markets allow households to increase their incomes by producing that which provides the highest returns to land and labour and then use the cash to buy household consumption items rather than be constrained to produce all the goods that the household needs to consume. In the long run, subsistence agriculture may not be a viable activity to ensure sustainable household food security and welfare

[8],[9],[1],[10].Commercializing smallholder agriculture is an indispensable pathway towards economic growth and development for most developing countries relying on the agricultural sector [11],[8],[1].

Therefore there is need to identify the level and driving forces of commercialization of smallholder farming and possible areas of intervention.

Such analysis will help to design appropriate instruments, institutions and other interventions for sustainable economic development of small-holder farmers [12].

II. Theoretical Issues

A large literature exists on commercialisation, broadly defined as having greater engagement with markets, either for inputs, outputs, or both of small family farms. [2] defined agricultural commercialization as "the proportion of agricultural production that is marketed". Agricultural commercialization aims to bring about a shift from production for solely domestic consumption to production dominantly market oriented. In line with the above definitions, [13] defined commercialization of smallholder production as "a process involving the transformation from production for household subsistence to production for the market". [14]found out that most definitions refer to agricultural commercialization as "the degree of participation in the output markets with the focus very much on cash incomes".

Though there have been different definitions of commercialization, we will follow [15] and calculate it as percentage of the total produce sold from a household. The study of commercialization in this study starts with the question whether a farm or household sells any of its farm output and goes a step further to consider the degree of commercialization as measured by the quantity of crops sold in relation to the quantity of crops produced.[16]and[4] define the household commercialization index(HCI)as:

HCI = [gross value of all crop sales $_{\text{hh I, year j}}$ /gross value of all crop production $_{\text{hh I, year j}}$] * 100,

HCI could also be defined as:

HCI =[total quantityof all crop sales $_{\text{hh I, year j}}$ / total quantityof all crop production $_{\text{hh I, year j}}$] * 100.

This index measures the extent to which household crop production is oriented toward the market.

The existing literature in commercialization use both the participation in the output market as well as participation in the input market to measure the commercialization of agriculture [15].

[8]classified farming system as subsistence, semi-commercial and commercial based on market orientation. The main purpose of subsistence system is to produce to maintain household food self sufficiency. The semi-commercial system is focused towards generation of marketable surplus and maintaining household food-security. In commercial system, profit maximization is the main motive of the entrepreneur. Production of cash crops in addition to staples or even exclusively is another form of commercialization. Similarly, commercialization also involves the widening and deepening of the household's market transactions relating to inputs and outputs.

III. Methodology

3.1 Study area and data collection

This study was conducted in Cross River State of Nigeria. Cross River State lies between latitude 5.25^0N and longitude 8.25^0E. The state has an area of 22, 3442 square kilometers. Annual rainfall varies from 2942mmto 3424mm.

Average temperature is 29^0C.Major crops grown in the state are yam, cassava, melon, maize, cocoyam, plantain, pepper, cocoa and rice. Cross River State has a total of 18 LGAs. The state is divided into three agricultural zones namely: northern zone (Ogoja zone), Central Zone (Ikom zone), and Southern Zone (Calabar zone).

A multi-stage sampling technique was used to select 120 household heads in 24 communities of six Local Government Areas (LGA) of Cross River State. Stage one of the multi-stage sampling technique was the selection of the Local Government Areas (LGA). Two LGAs were randomly selected from each of the zones, making a total of 6 LGAs (Akpabuyo, Odukpani, Boki, Yakurr, Ogoja and Yala were selected). Stage two is the selection of villages or farming communities. From each of these LGAs, a sampling frame of villages was used to select randomly 4 farming communities of close proximity to the main output market (approximately 1 to 5 Km). Stage three is the selection of 120 household-head respondents from the 24 communities using the random sampling method.

The research design used in this study is the cross-sectional (or survey) design. Accordingly, data relating to the commercialization of food crops (maize, rice, yam, cassava and cocoyam) for the production and harvest year of 2011 to 2012 were collected and analyzed. Crops were selected based on the prevalent food crops in Cross River State. Collection of primary data was with the aid of a well structured household survey questionnaire to collect among others data on the socioeconomic characteristics of smallholders. Descriptive, statistical and econometric methods were used to analyze the primary data.

3.2 Model Specification

The general model is a binary choice model involving estimation of the probability of participation of households in the market (Y) as a function of a vector of explanatory variables (X). Most studies have modeled agricultural commercialization as a two-step analytical approach involving the unobservable decision to commercialize and the observed degree or extent of commercialization [17]; [18]. The Tobit regression model, a hybrid of the discrete and continuous model was used to draw inferences on the causal factors for commercialization of households, the probability of participating in the market and the extent or intensity of participation in the context of household characteristics captured by the X_is. The model is expressed as:

$Y_i = \beta X_i + U_i$

$Y_i > 0$ if household participate in the market, otherwise

$Y_i = 0$ if household do not participate in the market

Where:

irepresents the number of respondents i.e. (1, 2 ...120)

Y_i represents the dependent variable "degree of commercialization"

Xrepresents vector of explanatory variables as specified in Table 1

Bare estimable parameters of the respective variables

U is an independently distributed error term

TABLE 1 Specification of explanatory variables for theTobit regression

Variable	Specification	Expected sign
Sex	1 if male and 0 if female	+
Age	Age at time of interview in years	-
Level of Education	1=Primary, 2=Secondary and 3= Tertiary	+
Farming experience	Number of years of farming experience	+
Household family size	Number of household members who participated in farming	+
*Total food crops produced	The total crops sold in the year (in grain equivalent)	+
Total Land size (in hectares)	Total land size cultivated in the year including rented-in land	+
Gross non-farm income	Total income earned from non-farm activities in the year	-
Extension service	1 if benefitted and 0 if not benefitted	+
Membership in Cooperative	1 if member and 0 if not member	+

*A conversion factor of 1Kg = 15432.3584 Grain was used

Source: [12], [19]

TABLE 2 Socio-economic characteristics of Household Heads

Household Attributes	Southern Zone				Central Zone				Northern Zone			
	Min	Max	Mean	Std. Deviation	Min	Max	Mean	Std. Deviation	Min	Max	Mean	Std. Deviation
Sex (1=male 0=female)	0	1	0.77	0.423	0	1	0.90	0.304	0	1	0.75	0.439
Age (in years)	32	70	45.80	8.156	30	63	46.08	7.367	28	71	44.50	8.904
Farming Experience (in years)	7	50	22.10	10.330	5	40	18.88	8.751	4	51	19.33	10.269
Education (1=literate 0=illiterate)	1	1	1.00	0.000	1	1	1.00	0.000	1	1	1.00	0.000
Level of Education (1=primary 2=secondary 3=tertiary)	1	3	2.13	0.648	1	3	1.88	0.723	1	3	1.97	0.733
Land Ownership (1=Yes 0=No)	0	1	0.67	0.474	0	1	0.83	0.385	0	1	0.73	0.452
Land holding size (in hectares)	0	4	2.14	0.898	1	4	1.95	0.799	0.3	4	1.69	0.950
Family size	1	13	7.10	3.011	3	17	6.90	2.687	1	10	6.15	2.237
Household Labour composition (Man equivalent)	2.9	20.4	9.52	4.138	3.1	15	8.05	3.484	3.6	16.4	7.65	2.723
Marital Status	1	4	1.23	0.698	1	4	1.23	0.733	1	4	1.33	0.917

SOURCE: FIELD STUDY 2011/2

IV. Empirical Results And Discussion

4.1 Socioeconomic Characteristics:

Table 2 shows the socio-economic characteristics of respondents that affect commercialization. The proportion of male-headed households is higher than that of female-headed households (77%, 90% and 75% in the Southern, Central and Northern zones respectively). Females become household heads in the absence of an adult male considered capable of being the household head [20]. This explains the large representation of male heads in the sample.Gender of household head captures the differences in market orientation between males and females with males expected to have a higher propensity to participate in markets than females [19]. The mean age of a typical household is 45-46 years, with the youngest being 28 and the oldest 71 years old.The age of the household head is a proxy measure of experience and availability of resources. It is possible that older and more experienced heads are able to take better production decisions and have greater contacts which allow trading opportunities to be discovered at lower cost than younger ones [19].

On the average a household head is married and has between 19 to 22 years of farming experience, and has had at least a primary school education, which indicates that they can at least read and write, an important factor in the commercialization of farming.

A typical household has a mean family size of 6-7, and labour composition of 8-10 (Manequivalent)which is indicative of the amount of labour available for crop production throughout the year.

Majority of the households own less than two hectares of land, agreeing with the findings of [21].The per capita land holding size is 1.7 – 2.0 hectares, though there are those who own as small as 0.3 hectares and those who own as large as 4.0 hectares. The mean land holding size is a good indicator of the dominance of smallholder farmers in Cross River State [22].

4.2 Determinants Of The Degree Of Commercialization

The variables that affect commercialization of smallholder farming were determined using the Tobit Regression Analysis. The results for the three Agricultural Zones in Cross River State and the aggregate result for the whole state is presented in TABLES 3, 4, 5 and 6.

TABLE 3 shows the Tobit regression result for the southern Agricultural zone.

TABLE 3 Tobit regression results for determinants of degree of commercialization in the southern zone

Variable	Coefficient	Std. Err.	z- Statistic	Prob.
Total crop produced	4.08E-07	5.72E-07	0.714333	0.4750
Extension service (1=yes, 0=no)	9.376337	8.410090	1.114891	0.2649
Member of cooperative (1=yes, 0=no)	14.30851	8.329428	1.717826	0.0858*
Family size	-3.292653	1.256093	-2.621344	0.0088***
Sex (1=male, 0= female)	12.96731	8.559222	1.515011	0.1298
Farming experience (in years)	-0.298661	0.368549	-0.810369	0.4177
Level of education	-5.266644	5.477906	-0.961434	0.3363
Gross non-farm income	4.027457	7.565248	0.532363	0.5945
Constant	66.53923	19.59234	3.396185	0.0007

Note: *** 1% significance level, **5% significance level, *10% significance level
Prob. 0.000006 Avg. Log Likelihood -4.245775

The Tobit regression estimation for the Southern zone indicates that only two of the variables were significant. Membership of cooperatives was significant at 10% while family size was significant at 1% level of significance. These two variables had the expected apriori signs. Membership of cooperatives had a positive sign indicating that as membership of cooperatives is increased and encouraged commercialization of households will also increase. This is in line with [23] where increasein membership of cooperatives increased fish production in the freshwater fishery subsector of the Cross River Basin. Household family size has a negative sign indicating that as family size increases commercialization will reduce. This might be as a result of households consuming their output instead of taking it to the markets. Total crop produced, extension service, gross non-farm income all had the expected positive sign although they were not significant. Both farming experience and level of education did not have the expected signs and were not significant. Level of education has a negative sign. The justification for this is that though it is argued that education enables an individual to make independent choices and to act on the basis of the decisions as well as increase the tendency to cooperate with other people and participate in group activities, it is also possible that education could increase the chances of the household head earning non-farm income. This would reduce the households' dependence on agriculture and thus commercialization [19].

The Tobit regression result for the Central Agricultural Zone is presented in TABLE 4

TABLE 4 Tobit regression results for determinants of degree of commercialization in the central zone

Variable	Coefficient	Std. Err.	z- Statistic	Prob.
Total crop produced	4.56E-05	7.73E-05	0.589698	0.5554
Total land size (in hectares)	9.89589	0.17942	0.610117	0.1047*
Extension service (1=yes, 0=no)	6.2964	0.73219	0.824757	0.0047***
Member of cooperative (1=yes, 0=no)	25.05281	95.42001	0.262553	0.7929
Family size	18.64748	14.76477	1.262972	0.2066
Sex (1=male, 0= female)	-45.70099	101.2473	-0.451380	0.6517
Age (years)	3.718653	4.303721	0.864055	0.3876
Farming experience (in years)	-0.247809	4.076704	-0.060787	0.9515
Level of education	54.49861	41.24543	1.321325	0.1864
Gross non-farm income	0.000116	0.000172	0.674624	0.4999
Constant	94.52108	212.5648	0.444669	0.6566

Note: *** 1% significance level, **5% significance level, *10% significance level
Prob. 0.000 Avg. Log Likelihood -6.261909

Tobit regression estimation for the Central zone indicates that only two variables were significant. These were total farm size and extension services. Both were significant at 10% and 1% respectively. Both farm size and extension services had the expected positive sign indicating that increase in these variables would increase the degree of commercialization of the households. Other variables that were not significant but had the expected positive sign were total crop produced, membership of cooperatives, family size, level of education, age of household head and gross non farm income. Farming experience was not significant and did not have the expected sign. Total land size used for cropping has a positive sign which is in line with the findings by [24] who established an increase in the degree of food crops commercialization with farm size.

TABLE 5 shows the result of the Tobit regression result for the determinants of commercialization of smallholder farms in the Northern Agricultural Zone.

TABLE 5 Tobit regression results for determinants of degree of commercialization in the northern zone

Variable	Coefficient	Std. Err.	z- Statistic	Prob.
Total crop produced	0.001101	0.000437	2.519451	0.0117***
Total land size (in hectares)	0.174541	2.139005	0.081599	0.9350
Extension service (1=yes, 0=no)	34.80905	23.72885	1.466951	0.1424
Member of cooperative (1=yes, 0=no)	2.616453	11.06800	0.236398	0.8131
Family size	6.094160	5.229296	1.165388	0.2439
Sex (1=male, 0= female)	-20.72370	28.11402	-0.737131	0.4610
Farming experience (in years)	40.81205	19.00130	2.147855	0.0317**
Level of education	-0.909113	2.416770	-0.376169	0.7068
Gross non-farm income	-2.5559384	27.10748	-0.094416	0.9248
Constant	-5.716028	82.48271	-0.069300	0.9448

Note: *** 1% significance level, **5% significance level, *10% significance level
Prob. 0.000 Avg. Log Likelihood -4.996339

TheTobit regression for the Northern zone shows that total quantity of crops produced and farming experience have a significant and positive relationship with the degree of commercialization. They were significant at 1% and 5% respectively. The positive sign indicates that an increase in both variables will result in an increase in commercialization. Other variables such as farm size, extension services, membership of cooperatives, family size have the expected positive signs but were not significant.
TABLE 6 shows Tobit regression for the whole Cross River state.

TABLE 6 Tobit regression results for determinants of degree of commercialization in Cross River State

Variable	Coefficient	Std. Err.	z- Statistic	Prob.
Total crop produced	1.42E-07	3.12E-06	0.045356	0.9638
Total land size (in hectares)	-4.766543	14.64143	-0.325552	0.7448
Extension service (1=yes, 0=no)	0.48734	2.10292	2.765611	0.0057***
Member of cooperative (1=yes, 0=no)	4.40374	2.76118	1.846097	0.0649*
Family size	1.609882	4.853827	0.331673	0.7401
Sex (1=male, 0= female)	16.50654	30.73056	0.537137	0.5912
Farming experience (in years)	-2.781366	1.603520	-1.734538	0.0828*
Level of education	3.045562	17.13705	0.177718	0.8589
Age (years)	1.840783	1.948962	0.944494	0.3449
Gross non-farm income	5.57E-05	7.86E-05	0.709038	0.4783
Constant	121.6713	86.33610	1.409275	0.1588

Note: *** 1% significance level, **5% significance level, *10% significance level
Prob. 0.000 Avg. Log Likelihood -5.836216

Tobit regression result for the whole Cross River State showsthat three variables membership of cooperatives, extension service, and farming service were significant at 1%, 10% and 10% level of significance respectively. Extension services and membership of cooperatives had a positiverelationship with the degree of commercialization. This indicates that an increase in these two variables will also increase the degree of commercialization. However, farming experience has a negative sign as against the expected positive sign. Variables such as total crop produced, farm size, family size, level of education, gross non farm income had the expected positive sign but were not significant.

A One-way ANOVA tests revealed that there was no significant variation in the level of commercialization among households in the three agricultural zones in Cross River State. All of them are engaged in mixed farming, and produce exclusively food crops (cassava, maize, yam, cocoyam and rice) for both own consumption and for the market.

TABLE 7 Summary of crop produced and sold (in grain equivalent)

Variable	Southern Zone	Central Zone	Northern Zone
Mean crop produced per capita	2018997.50	5976170.50	5103060.25
Mean crop sold per capita	1290155.87	5333300.00	3800080.63
Degree of Commercia-lization	56.10	66.60	58.50

SOURCE: Estimated from field data

TABLE 7 shows that household heads in the Central agricultural zone are more market oriented than those in the Northern and southern zone. This could be due to the existence of swampy areas which makes it possible for food crops to be planted during the dry season. Another possible reason could be the cocoa and plantain farms/plantation in Ikom, Etung and Boki which attract high returns from the output market.

V. Recommendations

The findings discussed above provide the following recommendations and policy implications:

1. Given the significance of membership of cooperatives as a determinant factor affecting the degree of commercialization of households in the southern zone, and in the aggregated data for the state policy makers and stakeholders in the agricultural sector in Cross River State should encourage the formation of cooperatives, farmer groups and associations. This will provide a strong mitigation strategy and advance participation in the output market.
2. A lot needs to be done to strengthen the Federal Governments' nationwide, unified and all-inclusive extension delivery system under the Agricultural Development Programs (ADPs) particularly in the Central agricultural zone such as;periodic up-grading of the skills of extension agents, strengthening the business orientation of farm households, as well asencompassingtechnical advice, capacity building of farmers, better credit services, provision of high-yield seed varieties and other inputs in the extension package.
3. The Government should formulate policies that create incentives for increased food crop production in the Northern zone. The empirical result indicating the importance of food crop production level (in quantity terms) as a determinant factor for degree of commercialization justifies such an intervention.
4. Government policy should also aim at creating enabling environment for income generation; such as provision of cassava processing mill. This will serve as an incentive to increase production level as well as the intensity of cassava commercialization in line with the Federal Governments' Agricultural Transformation Action Plan (ATAP).

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