COMPARATIVE ANALYSIS OF RESOURCE USE EFFICIENCY IN CASSAVA-BASED CROPPING SYSTEM IN OGUN AND OYO STATES, NIGERIA

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PRESENTATION LAYOUT

- What?
- How?
- Findings
- Conclusion
- Recommendations

INTRODUCTION

- **“Resource" is a human-centered concept perceived to have value by humans.**
- **We can therefore talk about availability, affordability and changes in the use and distribution of resources in agriculture**
- **Resource use efficiency implies how efficiently the farmer can use his resources in production process.**

OBJECTIVES OF THE STUDY

- **Distribution of labour and land used by cassava farmers*;***
- **Estimate the existing scales of operation of cassava producers ;**
- **Analyze cropping practices adopted by cassava farmers and the major reasons;**
- **investigate the availability and affordability of production resources by cassava farmers**
- **Estimate *returns-to-scale of farmer's production;***
- **Evaluate the resource-use efficiency of cassava-based farmers.**

METHODOLOGY

- ***The study was a cross-sectional survey of cassava farmers in Ogun and Oyo States, Nigeria in 2011.***
- ***The main survey instruments were: questionnaire and personal interview .***
- ***A multistage sampling procedure was adopted for this study***

STAGES IN THE SELECTION PROCESS

- ***1st stage:*** ***purposive selection of Oyo and Ogun States.***
- ***2nd stage:*** **stratification of the each state into 4 Agricultural zones in line with the Agricultural Development Project (ADP) zoning system.**
- ***3rd stage:*** Purposive selection of a **LGA per zone based on the intensity of cassava production.**
- ***4th stage:*** **Purposive selection of 2 communities from list of communities/LGA based also on the intensity of cassava.**
- **5th stage: Random selection of 19 cassava farmers /selected communities with 150 in Ogun and 115 in Oyo eventually used.**

METHODS OF DATA ANALYSIS

- ***Descriptive statistics***

- ***Marginal analysis of resource utilisation:*** ***to determine resource use efficiency of some essential inputs used by the farmers***

ESTIMATE RETURNS-TO-SCALE OF FARMER'S PRODUCTION.

$$\text{Log}\,\pi^{*} = b_0 + b_1 \log X_1 + b_i \log X_i^{*}\,(i = 2 - - - 5) + biDi(i = - - -2) + U$$

- *Π* = Normalized profit X_1 = land area cultivated in hectares*
- *X_1 = land area cultivated in hectares*
- *X_2^* = labour cost in naira per day divided by Po*
- *X_3^* = planting material in naira divided by Po*
- *X_4^* = agrochemical (fertilizer) costs in naira divided by Po*
- *X_5^* = cost of herbicide divided by Po*
- *D_i = dummy variable to capture the scale of operation*

PERCENTAGE CHANGE TO ATTAIN ALLOCATIVE EFFICIENCY

$$D_{ij} = (1 - r) \times 100 \text{ ---------}$$

- D_{ij} *is the required percentage change to attain allocative efficiency*
- *r is allocative resource use efficiency*
- *A negative value implies that an increase in the use of that input is needed, while*
- *a positive value implies need for a reduction of that input.*
- *A zero percentage indicated that maximum or absolute efficiency was achieved.*

Various scales of cassava farmers were equally efficient in resource allocation.

$$Z_{cal} = \frac{K_i - K_j}{\sqrt{(S_i^2 + S^2{}_j / n_i + n_j)}} - - - - - -$$

Where:

- Z_{cal} = Z - score
- K_i and k_j = Mean efficiency ratios for each category
- S_i^2 and S_j^2 = Variance of efficiency ratios in resource use by the corresponding category
- n_i and n_j = Sample size of the respective categories

DISTRIBUTION OF BY NUMBER OF LABOUR USED ON CASSAVA FARM (FAMILY)

Family Labour	Ogun	Oyo	Pooled (Ogun & Oyo)
1	0 (0.0)	34 (29.6)	34 (12.8)
2	94 (62.7)	25 (21.7)	119 (44.9)
3	56 (37.3)	18 (15.7)	74 (27.9)
4	0 (0.0)	16 (13.9)	16 (6.0)
5	0 (0.0)	15 (13.0)	15 (5.7)
6	0 (0.0)	6 (5.2)	6 (2.3)
7	0 (0.0)	1 (0.9)	1 (0.4)
Total	150 (100.0)	115 (100.0)	265 (100.0)
Mean	2.37	2.78	2.55
Standard Deviation	0.49	1.63	1.55
t-statistics	-2.61***		

DISTRIBUTION OF BY NUMBER OF LABOUR USED ON CASSAVA FARM (HIRED)

Hired Labour	Distribution of Respondents by Number of Hired Labour Used		
None	37(24.17)	33 (28.7)	70(26.4)
1	9(6.0)	12(10.4)	21(7.9)
2	16(10.7)	12(10.4)	28(10.6)
3	5(3.3)	12(10.4)	17(6.4)
4	7(4.7)	15(13.0)	22(8.3)
5	8(5.3)	12(10.4)	20(7.5)
6	9(6.0)	8(7.0)	17(6.4)
7	25(16.7)	6(5.2)	3(11.7)
>8	34(22.67)	5(4.4)	39(14.72)
Total	150(100)	115(100)	265
Mean	7.61	3.94	6.07
Standard Deviation	5.93	2.09	5.05
t-statistics	16.79***		

DISTRIBUTION OF CASSAVA-BASED FARMERS BY FARM SIZE OWNED AND CULTIVATED (HA)

Farm Size	Definition	Ogun	Oyo	Pooled (Ogun and Oyo)
0.01-1.0	Small farm	43(28.67)	43(37.39)	86(32.45)
1.1-2.0	Medium farm	56(37.33)	23(20.00)	79(29.81)
> 2.0	Large farm	51(34.00)	49(42.61)	100(37.74)
	Total	150(100.00)	115(100.00)	265(100.00)
	Mean	2.355	3.396	2.806
	Standard deviation	1.846	4.252	3.162
	t-stat	14.449***		
		Size of Farm Land Cultivated		
0.01-1.0	Small farm	45(71.43)	63(54.78)	108(40.75)
1.1-2.0	Medium farm	61(40.67)	32(27.83)	93(35.09)
> 2.0	Large farm	44 (29.33)	20(17.39)	64(24.15)
	Total	150 (100.00)	115(100.00)	265(100.00)
	Mean	2.2427	1.588	1.9587
	Standard deviation	1.8148	1.4428	SD =1.6922
	t-stat	18.843***		

CROPPING PRACTICES ADOPTED BY FARMERS WITH MAJOR REASONS

Cropping Practices	Ogun	Oyo	Pooled (Ogun & Oyo)
Sole Cassava	8 (5.33)	20 (17.39)	28 (10.57)
Cassava + Maize/Guinea corn	139 (92.67)	89 (77.39)	213 (80.38)
Cassava + Melon	18 (12.00)	3 (2.61)	18 (6.79)
Cassava + Yam	22 (14.67)	3 (2.61)	25 (9.43)
Cassava + Cocoyam	8 (5.33)	0 (0.00)	8 (3.02)
Cassava + Cowpea	2 (1.33)	4 (3.48)	6 (2.26)
Cassava + vegetable	13 (8.67)	0 (0.00)	13 (4.91)
Cassava + Pepper	16 (10.67)	2 (1.74)	16 (6.04)
Main reasons for intercropping			
Improve income	133 (88.67)	105(91.31)	238 (89.81)
Increase fertility	2(1.33)	3(2.61)	5(1.89)
Prevention against crop failure	5(3.33)	5(4.35)	10(3.77)
Maximum use of land	10(6.67)	2(1.74)	12(4.53)

FARM RESOURCE AVAILABILITY AND AFFORDABILITY

Resources	Very available and affordable	Very available but not affordable	Just available and affordable	Just available but not affordable	Not available but affordable	Neither available nor affordable
	Ogun State					
Land	**60(40.0)**	**27(18.0)**	**41(27.3)**	**8(5.3)**	**1(0.7)**	**5(3.3)**
Labour (family)	**33(22.0)**	**4(2.7)**	**60(40.0)**	**5(3.3)**	**13(8.7)**	**16(10.7)**
Labour (hired)	**29(19.3)**	**19(12.7)**	**30(20.0)**	**47(31.3)**	**6(4.0)**	**10(6.7)**
herbicide	**10(6.7)**	**19(12.7)**	**25(16.7)**	**49(32.7)**	**5(3.3)**	**31(20.7)**
Pesticide	**10(6.7)**	**18(12.0)**	**16(10.7)**	**59(39.3)**	**59(3.3)**	**30(20.0)**
Fertilizer	**15(10.0)**	**18(12.00)**	**15(10)**	**60(40.00)**	**6(4.0)**	**28(18.7)**
Cassava stem	**92(61.3)**	**3(2.0)**	**43(28.7)**	**2(1.3)**	**1(0.7)**	**0(0.00)**
Loan	**1(0.7)**	**0(0.00)**	**2(1.3)**	**3(2.0)**	**17(11.3)**	**120(80.0)**
Machinery	**10(6.7)**	**2(1.3)**	**3(2.00)**	**29(19.3)**	**39(26.0)**	**58(38.7)**

FARM RESOURCE AVAILABILITY AND AFFORDABILITY

Resources	Very available and affordable	Very available but not affordable	Just available and affordable	Just available but not affordable	Not available but affordable	Neither available nor affordable
			OYO STATE			
Land	**24(20.9)**	**16(13.9)**	**45(39.1)**	**4(3.5)**	**1(0.9)**	**4(3.5)**
Labour (family)	**11(9.6)**	**1(0.9)**	**37(32.2)**	**15(13)**	**3(2.6)**	**25(21.7)**
Labour (hired)	**1(0.9)**	**9(7.8)**	**36(31.3)**	**39(33.9)**	**5(4.3)**	**4(3.5)**
herbicide	**2(1.7)**	**4(3.5)**	**40(34.8)**	**27(23.5)**	**4(3.5)**	**3(2.6)**
Pesticide	**0(0.0)**	**5(4.3)**	**37(32.2)**	**21(18.3)**	**3(2.6)**	**7(6.1)**
Fertilizer	**1(0.9)**	**2(1.7)**	**39(33.9)**	**25(21.7)**	**3(2.6)**	**21(18.3)**
Cassava stem	**58(50.4)**	**5(4.3)**	**22(19.1)**	**5(4.3)**	**0(0.00)**	**6(5.2)**
Loan	**1(0.9)**	**1(0.9)**	**14(12.2)**	**17(14.8)**	**10(8.7)**	**53(46.1)**
Machinery	**1(0.9)**	**0(0.0)**	**19(16.5)**	**9(7.8)**	**13(11.3)**	**52(45.2)**

RESOURCE USE EFFICIENCY OF CASSAVA-BASED FARMERS

Inputs	Ogun State					Oyo State				
	EP	MPP	MVP	MFC	r	EP	MPP	MFC	MVP	r
Land cultivated (ha)	-0.069	-0.023	-0.909	5,328.2	-0.0002	-0.142	0.021	12,189.9	0.191	1.566
Labour(N/manday)	0.209	-0.219	-8.653	1,438.6	-0.0060	0.087	-0.830	1,308.2	-7.733	-0.006
Herbicide (N/litre)	0.112	12.657	500.08	1,194.1	0.4188	0.370	-5.033	913.5	-46.87	-0.051
Agrochemical (fertilizer N/kg)	0.420	3.935	155.47	99.47	1.5630	0.128	-33.897	87.9	-315.68	-3.590
Planting material (N/bundle*)	0 .518	1.455	57.487	252.37	0.2278	0 .305	-15.721	229.5	-146.41	-0.638
Return to Scale (RTS),	0.672			MAE	0.441	0.443			Mean allocative efficiency	-0.544

RESOURCE USE EFFICIENCY OF CASSAVA-BASED FARMERS (POOLED)

Inputs	Pooled (Ogun and Oyo)				
	EP	MPP	MFC	MVP	r
Land cultivated (ha)	**-0.0869**	**0.080**	**9,802.21**	**2.147**	**0.000219**
Labour(N/manday)	**0.1319**	**-1.030**	**1,388.93**	**-27.645**	**-0.0199**
Herbicide (N/litre)	**0.3013**	**-4.010**	**1,071.32**	**-107.628**	**-0.1004**
Agrochemical (fertilizer N/kg)	**0.3932**	**-21.187**	**94.03**	**-568.659**	**-6.0477**
Planting material (N/bundle*)	**0.3082**	**-2.107**	**243.64**	**-56.551**	**-0.232**
Return to Scale (RTS),	**1.0477**	Mean allocative efficiency			**-1.2800**

RESULTS OF THE Z-TEST FOR RESOURCE USE EFFICIENCY OF VARIOUS SCALES OPERATORS

Pair of scale operators	Computed Z-score	Critical Z-value at 1% level of significance	Decision
		Ogun State	
Small scale versus medium scale	-1.89	0.059	Accept
Small scale versus large scale	-0.80	0.425	Reject
Medium scale versus large scale	0.81	0.417	Reject
		Oyo State	
Small scale versus medium scale	1.79	0.073	Accept
Small scale versus large scale	1.74	0.082	Accept
Medium scale versus large scale	0.05	0.963	Reject

Z-TEST FOR RESOURCE USE EFFICIENCY OF VARIOUS SCALES OPERATORS (POOLED)

Pair of scale operators	Computed Z-score	Critical Z-value at 1% level of significance	Decision
Pooled (Ogun and Oyo)			
Small scale versus medium scale	**-0.25**	**0.805**	**Reject**
Small scale versus large scale	**0.88**	**0.379**	**Reject**
Medium scale versus large scale	**1.33**	**0.260**	**Reject**

PERCENTAGE CHANGE TO ATTAIN ALLOCATIVE EFFICIENCY

Inputs	Ogun State	Oyo State	Pooled (Ogun and Oyo)
Land	100.02	-56.60	99.98
Labour	100.60	100.59	101.99
Herbicide	58.12	105.13	110.04
Agrochemical (fertilizer)	-56.30	459.01	704.77
Planting Materials (cassava sticks or cuttings)	77.22	163.80	123.20

CONCLUSIONS

- some degree of inefficiencies exist among cassava farmers in the study areas
- The level of inefficiency was least among producers in Oyo compared to those in Ogun State.
- Cassava production has a decreasing return-to-scale in both States (0.672 in Ogun and 0.443 in Oyo State)

CONCLUSIONS (CONT'D)

- **In Ogun State, inputs such as land, labour, herbicides and planting material (cassava sticks or cuttings) are over-utilized**
- **Fertilizer was under-utilized.**
- **All the inputs were over-utilized in Oyo State with the exception of land, which was under-utilized,**
- **That is opportunities still exists to increase output by increasing the level of *these inputs.***

SUGGESTIONS

- Farmers should make some necessary adjustments in the use of production resources to attain allocative efficiency.

- In Ogun State, Cassava farmers should increase the use of fertilizer by 56.30% and

- reduce the use of other inputs:
- land area cultivated by 100.02%,
- labour by 100.62%,
- herbicide by 58.12%,
- Cassava cuttings or sticks by 77.22%

SUGGESTIONS (CONT'D)

- In Oyo State, farmers can attain allocative efficiency
- by increasing land area cultivated by 56.60%
- reduce labour by 199.59%,
- herbicides by 105.13%,
- fertilizer by 459.01% and
- Cassava cuttings by 163.80%.

THE END OF PRESENTATION

THANKS FOR LISTENING