

# Performance of Cocoyam Market Chain in South East Nigeria

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## Abstract

The study examined the performance of cocoyam marketing chain in South east Nigeria. A total of 260 questionnaires were administered from September 2012 to August 2013 to producers, wholesalers and retailers selected through stratified multi-staged random sampling techniques. Data collected were analyzed using marketing margin, price spread, return on investment ratios, marketing efficiency, net income and net profit. There is seasonal variation in price from early to mid season and to late season. However, the average price spread from producers to wholesalers and retailers were ₦27,000, ₦15000, and ₦3,000 while their shares in consumers' dollars were 60%, 33% and 7%. Their average operating marketing costs were ₦16193 (\$80), ₦7700 (\$38.50), and ₦896 (\$4.48) while the average net income of producers, wholesalers and retailers per year were ₦204,246 (\$1021.21), ₦3,650,000 (\$18,250) and ₦474,000 (\$2370) each respectively (at an exchange rate of 1\$ = ₦200). Their average return on investment from producers to wholesalers to retailers were 0.70, 1.09 and 2.41 for every 1\$ invested on the business while their average marketing efficiency were 70%, 109% and 241%. The results also provide insights into the socio-economic and institutional characteristics. There was statistically significant different ( $P < 0.001$ ) in net income of farmers, wholesalers and retailers. Producers, wholesalers and retailers lack capacity building, capital from formal financial institution. There is high transaction and search costs. Policy recommendations to these effects were suggested including strengthening marketing institutions through capacity building for stakeholders.

**Key ward:** Marketing chain, performance, price efficiency, cocoyam, Nigeria

## 1. Introduction

According to FAOSTAT (2013) the total world production of cocoyam in 2011 was 10 million tones. Africa as a continent is the major producer of cocoyam, followed by Asia, with about half of the African production and Oceania with just a tenth of the total African production. Nigeria is the world largest producer of cocoyam accounting for 34% of the world production. She is followed by China, Cameroon and Ghana with 17%, 16% and 14% respectively (FAOSTAT, 2013). Cocoyam is an important crop grown consume mostly in eastern part of Nigeria. Economic and socio-cultural factors play a major role in its consumption values. Cocoyam production has increased over the years from 5.6 million metric tonnes in 1990 to 9.624 million metric tonnes in 2011 (FAOSTAT, 2013). The total area harvested around the world in 2011 was 1.269Million hectares. It is regarded as a cash crop and foreign exchange earner, as well as critical component in the rural economic development. Cocoyam production is mostly used for human consumption and an important food security crop in times of failure or shortage of other crops (Acheamgong et al. 2015).

Cocoyam thrives well in warm, humid forest areas where high annual rainfall and long wet season are conducive for its optimum yield. Considering that this climate makes up about 80% of land mass in South-east Nigeria, there is need for exploitation of potentials of cocoyam marketing chain. Smallholder market participation in the chain contributes significantly to rural economic growth and poverty reduction in developing nations (Dorward et al. 2008; Greig 2009; Kostov & Davidova 2013; Zanello 2012). Yet there is no research found on performance of cocoyam market chain. Cocoyam market chain comprises two major phases which are production and marketing (processing and storage) before it reaches the consumers (Pietrobelli & Saliola 2008). The two phases involves activities such as design, production, marketing, distribution and support to the final consumer (Pietrobelli & Saliola 2008). Several studies associated participation constraints to technical development, supportive institution as well as operational and marketing efficiency (Baltenweck & Stall, 2007; Barret, 2008; Gabre-Madhin, 2006). Market operate efficiently when the consumer price is equal to the producer price plus marketing costs and motivate market players to continue in production and marketing. The operational efficiency of marketing system is enhanced when the marketing costs are reduced at the same level of output (Babatunde & Oyatoye 2009; Oguntade & Mafimisebi 2010). However, unless the middlemen earn profit in excess of what they require to pay for the interest on borrowed capital and cater for the risk they take, their interest in arbitraging across time, space and form will not be sustainable. This orientation suggests that critical intervention assistance aimed to ensure broad-based, low cost access to competitive, well functioning markets including getting prices right requires significant investment by public sector (Barret 2008).

Despite the growing interests on how agricultural commodities are produced by large numbers of farmers and consumed by large numbers of households, much less attention has been paid to understanding the performance of market chain in cocoyam industry (FAOSTAT 2005; Onu & Iliyasu 2008; Afolabi 2009; Mari 2009; Giroh et al. 2010). The researchers are of the opinion that with the exception of foodstuffs consumed on-

farm or sold locally, they are bought and sold a number of times between the farm gate and the final consumer. While moving between these two points, the commodity is loaded, off-loaded, transported, stored, cleaned, graded and processed. The conduit that runs from a farmer down to a final user, through which the commodity passes and which embodies these transactions and activities is conventionally referred to as a “marketing and processing chain”, a “supply chain”, or a “value chain” depending on the complexity of the links. However none of these studies examined the question of the value chain performance in the cocoyam industry. Thus there is need to address this under-researched area given the peculiarity of market environments in shaping the food security and income in developing countries. Here we draw insight from cocoyam marketing and ask: what contextual factors (socio-economic and institutional conditions) describe market participants? Whether the performance of value chain in cocoyam marketing system in Nigeria is profitable and thereby improving rural livelihoods? What gross margin, net profit margins and net income are earned by producers, wholesalers and retailers? What is the nature of price spread, return on investment ratios, and marketing efficiency of producers, wholesalers and retailers? In providing answer to the above questions, the broad objective of the paper will be based on evaluation of the cocoyam marketing chain performance in South east Nigeria. Specifically, the objectives of the study were to:

- i. Describe the socio-economic characteristics of cocoyam marketers;
- ii. assess gross margin, net profit margins and net income of producers, wholesalers and retailers;
- iii. examine price spread, return on investment ratios, marketing efficiency among producers, wholesalers and retailers.

## 2. Null hypothesis

The mean net income of farmers, wholesalers and retailers do not significantly differs

## 3. Methodology

The study area is South-east geopolitical zone of Nigeria. Five states constitute this zone: Abia, Anambra, Ebonyi, Enugu, and Imo, covering latitude  $4^{\circ} 50' N$  to  $7^{\circ} 10' N$  and longitudes  $6^{\circ} 40' E$  to  $8^{\circ} 30' E$ . the zone spreads over a total area of 78,618 km<sup>2</sup>, representing 8.5% of the nation’s total land area. The area has a total population of 16,381,729 (National Population Commission 2007).

Three-stage sampling technique was employed for the study. In stage one, we stratified each state within the zone based on whether it is within a cocoyam supply/surplus or a demand/deficit zone. In this sense, stratum 1 (cocoyam supply zone) includes Enugu, Ebonyi and Imo states, while stratum 2 (cocoyam deficit region) include Abia and Anambra states. We select a state from each stratum using a simple random sampling approach. This gave a total of two states – Enugu and Anambra – from where cocoyam markets and respondents were selected. To select markets (stage two), we use a purposive sampling approach. Here, six markets (three urban and three rural cocoyam markets) were selected. The urban markets are Timber shed/Nsukka main, Enugu main and Onitsha main while the rural markets are Nkwo Ibagwa market, Orié/Nkwo Opanda, and Nkwo Adazi Nnukwu. The stage three, we sampled respondents (stratified into producers, wholesalers and retailers) using a predetermined sampling frame drawn from the selected markets. Applying a random sampling approach, we selected 100 producers from a frame of 5000 households; 60 wholesalers from 2600; and 100 retailers from 5300. Overall, we sampled 260 respondents whose responses formed the data used in the study.

Data collection was undertaken during 2012 and 2013, and primarily involved administration of three sets of different structured questionnaires to each category of respondents, including using open ended questionnaires for focus group discussions (one per market location). Secondary data were collected from journals, periodicals from Food and Agricultural Organization, International Food Policy Research Institutes, United Nations, World Bank, National Root Crop Research Institute, Umudike, conference proceedings, thesis, books and other the opinions of experts in the field of produce marketing as way to triangulate our findings. We combined descriptive statistics and perspective along the analytical framework presented in the next section to analyze our data

## 4. Analytical framework

### 4.1 Market margin

$$MM = \frac{(PS \times 100)}{SP} \dots\dots\dots(1)$$

Where,

MM indicates the marketing margin earned by a specific agency (wholesaler, retailer etc),

PS stands for price spread availed by that agency and

SP represents sale price of the same agency for cocoyam.

$$NM = PS - MC \dots\dots\dots(2)$$

Where,

NM stands for net margin,  
 PS indicates the price spread availed by the specific agency and  
 MC represents marketing costs incurred by the same agency.  
 $RRPI = TRMA/TCMA \dots\dots\dots(3)$

Where,

- RRPI = Rate of return per naira on investment
- TRMA = Total revenue from marketing activities
- TCMA = Total cost incurred in marketing activities (depreciation fixed cost + variable cost)

**4.2 Calculation of the marketing costs**

These costs are computed on per 100kg/bag. Each marketing agency (producers, wholesalers and retailers) is inquired about the amount it spent on marketing and the costs of each agency are calculated by using the following formula:

$$MC = \frac{AS}{GH} \dots\dots\dots(4)$$

Where MC stands for marketing cost of 100kg of cocoyam, AS for actual operating costs on the bags marketed and GH represents number of 100kg bags handled. All marketing costs for producers, wholesalers and retailers in this study would be calculated in this way.

**4.3 Calculation of price spread**

The following formula is used to compute the price spread of each market intermediary in the marketing of cocoyam.

$$\text{Price spread of producers, wholesalers and retailers (PS)} = (SP - CP) \dots\dots\dots(5)$$

Where, PS indicates price spread of a specific agency (wholesaler, retailer etc), SP represents sale price of the same agency for cocoyam and Cp cost price of that agency.

$$\text{Thus the spread for Producers} = \text{Producers price} - \text{cost of production} \dots (6)$$

$$\text{Wholesale spread} = \text{Wholesale price} - \text{costs of purchase} \dots\dots\dots(7)$$

$$\text{Retailer spread} = \text{retailers price} - \text{cost of purchase} \dots\dots\dots (8)$$

**4.4 Breakdown of consumer's naira or share in consumer's naira .**

This is calculated by expressing the net margin of a specific agency (producers, wholesalers and retailers) as a proportion of the retail price. The following formula is used to determine the breakdown of consumer's Naira.

$$BDCN = \frac{PS}{RP} \dots\dots\dots (9)$$

Where BDCN stands for breakdown of consumers' Naira spent on cocoyam, PS indicates price spread and RP represents retail price.

**4.5 Marketing Efficiency of producers, wholesalers and retailers**

Marketing efficiency was obtained by dividing the net profit margin of producer, wholesalers or retailers by each agency's marketing costs and multiplied by 100.

Thus the marketing efficiency of producers is the net profit margin of producers divided by cost of production.

$$\text{Producers efficiency} = \frac{\text{Producers price} - \text{cost of production}}{\text{production costs}} \times 100 \dots\dots (10)$$

$$\text{Wholesalers' efficiency} = \frac{\text{Wholesale price} - \text{marketing cost}}{\text{marketing costs}} \times 100 \dots\dots\dots(11)$$

$$\text{Retailers' efficiency} = \frac{\text{retailers price} - \text{marketing costs}}{\text{marketing costs}} \times 100 \dots\dots\dots (12)$$

**5. Results**

Here we focus on personal characteristics that shape market-participation (Table 1) age, educational level, gender, household size, marital status.

Table 1. Socio-economic characteristics of market participants that affect market systems

Characteristics	Producers (n = 100)	Wholesalers (n= 60)	Retailers (n = 100)	Total (n = 260)
<b>Age of Players</b>				
21- 30 years	7 (7)	0(0)	2(2)	9(3.46)
31- 40 years	4(4)	5(8.3)	22(22)	31(11.93)
41- 50 years	48(48)	47(78.4)	55(55)	150(57.69)
51- 60 years	36(36)	8(13.3)	19(19)	63(24.23)
>60 years	(5)	0(0)	2(2)	7(2.69)
<b>Educational Level</b>				
No formal Education	28(28)	10(16.7)	25(25)	63(24.23)
Primary education	24(24)	23(38.3)	46(46)	93(35.76)
Secondary Education	38(38)	24(40)	24(24)	86(33.07)
Tertiary Education	10(10)	3(5)	5(5)	18(6.92)
<b>Gender</b>				
Male	88(88)	5(8.3)	4(4)	97(37.3)
Female	12(12)	55(91.7)	96(96)	163(62.7)
<b>Household size</b>				
1-3	14(14)	2(3.3)	4(4)	20(7.69)
4-6	59(59)	18(30)	30(30)	107(41.16)
7-9	24(24)	37(61.7)	63(63)	124(47.69)
>9	3(3)	3(5)	3(3)	9(3.46)

Source: Field survey 2012/13

**Age:** The age distribution of the sample was skewed towards the upper age group of 40 and above indicating that there were relatively high proportions of middle age respondents participating in the cocoyam markets. Less than 16% of respondents were below 40 years. The cultivator/producers below 40 years were 11%; that of wholesalers were 5% and retailers 24%.

**Education:** Levels of education affect the level of participation in cocoyam markets. From Table 1, 24% of respondents had no formal education starting from 10% of wholesalers to 28% of producers. On the other hand 33, 35 and 6 percent of the respondents attended primary, secondary and tertiary education, respectively.

**Gender:** With respect to gender Table 1 shows that 37% of the interviewed participants were male while 63% were female.

**Household size:** Household sizes are generally larger among the retailers where 63% have between 7 and 9 people in their family. The percentage of wholesalers with household size of between 7 and 9 people were 37% while that of farmers were 24%. The majority of the marketers among the producers, wholesalers, retailers were married (87%) while 13% were single.

We present in table 2 the institutional variables that could influence the decision to participate in the sampled markets.

**Extension services:** Only about 67% of farmers, 3.3% of wholesalers and 15% of retailers have access to extension agents (Table 2). This results shows that in south east Nigeria, the majority of marketers, especially wholesalers and retailers, have no proper linkages with the extension services. This results in lack of market information on prices, credits and grades and standards

**Credit access:** Credit is one of the business support services, especially for participating in marketing cultivars with more commercial orientation. Table 2 shows the major players among formal and informal financial institutions. Governments' Microfinance institution is weak in south east Nigeria and that is why their role in lending to the respondents (7%) is smaller relative to Non Governmental Organization that lent to 26% of marketers, as shown in Table 2.

**Export and industrial use:** The uses of cocoyam were much restricted to its domestic consumption purposes. Its conversion into flour for export and use as gum and for breeding for snails was not yet known and implemented by the industrial and export sector in Nigeria.

Table 2. Institutional conditions that influences marketing participation

Socio-economic variables	Producers (n=100)	Wholesalers (n=60)	Retailers (n=100)	Total (n=260)
<b>Extension service</b>				
Access to extension services	67(67)	2(3.3)	15(15)	84(32.3)
No access to extension services	33(33)	58(96.7)	85(85)	176(67.7)
<b>Need for credit</b>				
Need for credit	78(78)	49(81.7)	69(69)	196(75.38)
No need for credit	22(22)	11(18.3)	31(31)	64(24.62)
<b>Sources of finance</b>		17(28.3)	80(80)	158(60.77)
Personal savings	61(61)	33(55)	7(7)	68(26.16)
NGO	28(28)	4(6.7)	4(4)	15(5.77)
Friends and relatives	7(7)	6(10)	9(9)	19(7.30)
Microfinance institution	4(4)			
<b>Membership of co-operatives</b>				
Member	62(62)	56(93.3)	6(6) 94(94)	124(47.70)
Not a member	38(38)	4(6.7)	00(00)	136(52.30)
Export and industrial use	00(00)	00(00)	00(00)	00(00)

Source: Field survey, 2012/2013. Figure in parentheses are percentages.

### 5.1 Marketing performance

To analyze the performance of cocoyam markets, costs within the chains and price information at different stages in the marketing chain were used to test if the existing marketing channels offer the expected services. The measures used were marketing margin, price spread, net profit, return on investment ratios, marketing efficiency and net income. Marketing margins are the differences between producer and consumer prices of an equivalent quantity and quality of a commodity. Price spread of cocoyam is the difference between the wholesale price or retail price and the cost price of cocoyam. It represents the payments for all of the value adding costs after the products have left the farm gate (Iiyasu et al. 2011).

### 5.2 Marketing margins

The marketing margin is the difference between the retail price and farm price. A wide margin means usually high prices to consumers and low prices to producers. There are a lot of variations in prices received by producers, wholesalers and retailers. These included day to day variations of price, grade differences, price variation over season, and price differences in consumption and production areas. The price of cocoyam was collected on per bag (per 100kg) basis. Cocoyam prices were collected on monthly basis throughout the harvest season from farmers, wholesalers and retailers. The average price of cocoyam from November to February when the cocoyam was harvested is called early season price while the price from March to June is called mid season prices and July to October is late season prices.

Table 3 shows that cocoyam producers in South East Nigeria received maximum price of ₦40,000 (100kg) during the late season between July and October and a minimum price of ₦16,000 at the early season between November and February. The wholesale price was ₦42,000 while the retail price was ₦45,000 per 100kilogram of cocoyam throughout the whole season. There is a similar pattern for farmers, wholesalers and retailers, and it can be concluded that all agencies received highest price at the late season.

Table 3. Sale price of cocoyam at different market intermediaries ₦/100kg (one bag)

Market agencies	Early season	Mid season	Late season	Average
Producers	16,000	25,000	40,000	27,000
Wholesalers	24,000	38,000	64,000	42,000
Retailers	27,000	40,000	68,000	45,000

Early, Nov. to Feb; Mid-March to June; Late-July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200

### 5.3 Price Spread

The price spread for each agency is the selling price minus costs price for a specific agency. For instance the price spread for producers, wholesalers and retailers was calculated from the difference between sale price and costs price of cocoyam per 100kgs bag marketed by producers, wholesalers and retailers. The result presented in Table 4 below reveals that price spread from producers to wholesalers and retailers was ₦27,000, ₦15000, and ₦3,000. The retail prices for cocoyam were reported to be ₦27,000, ₦40,000, and ₦68,000 per 100 kilogram bag of cocoyam in early, mid and late seasons respectively. The highest retail price of ₦68,000 per bag was recorded during the late season between July and October. Generally the price of cocoyam was very high in all seasons due to the incidence of leaf blight and highest during the late season as a result of storage losses, storage costs, transportation and accommodation. The average price was calculated as ₦45,000 per bag of 100kg of cocoyam.

Table 4. Price spread from producers to wholesalers and retailers ₦/100kg (one bag)

Market agencies	Early season	Mid season	Late season	Average
Producers	16,000	25,000	40,000	27000
Wholesalers	8000	13,000	24000	15000
Retailers	3000	2000	4000	3000
Retail price	27000	40,000	68000	45000

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200

### 5.4 Share in consumer's Naira

The share of producers and other market agencies in the consumers' naira was calculated by expressing the price spread for each agency as the proportion of the retail price that goes to farmers, wholesalers and retailers. The producer's share in the consumer's naira (on final retail price) was calculated on a per bag (100kg) basis.

Table 5 below shows that the producer's share in consumer's naira was 60% in South East Nigeria. This was obtained from Table 4 by dividing 27,000 (producer's price) with 45,000 (final retail price) and multiplying by 100 to give 60%. Other intermediaries obtained 33% and 7% as wholesalers' and retailers' shares respectively using the same formula. From this analysis it is seen that the cocoyam farmers have a fair share of the consumers spending for all seasons (60%).

Table 5. Price Spread from producers to wholesalers and retailers in % (one bag)

Market agencies	Early season	Mid season	Late season	Average
Producers	59	63	58	60
Wholesalers	29	32	35	33
Retailers	12	05	07	07
Retail price	100	100	100	100

Early, Nov. to Feb; Mid-March to June; Late-July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200

### 5.5 Marketing Costs

Table 6. Average operating costs of producers per 100kg bag in Naira (₦)

Producers operating costs	Early season	Mid season	Late season	Average
Cocoyam Seedlings	1500	1500	1500	1500
Herbicides/mounding/weeding	2000	2000	2000	2000
Planting/herbicides/mounding	1000	1000	1000	1000
Fertilizer/manure/application	100	100	100	100
Harvesting	1000	1000	1000	1000
Transportation	1000	1000	1000	1000
Bagging	200	200	200	200
Loading	100	100	100	100
Unloading	100	100	100	100
Rent	100	100	100	100
Others	300	300	300	300
Capital costs	2960	2960	2960	2960
Construction of storage house	-	500	500	500
Losses of cocoyam during storage/removal of rotten one before June	-	1000	1000	1000
Losses of cocoyam during storage/removal of rotten one before October	-	-	13300	4333
Total	10,360	12,460	25,760	16,193

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200

The most important marketing channel is the channel through the farmer to the wholesalers to retailers as this accounted for about 80% of the total channel (see table 3). The operating costs of producers, wholesalers and retailers are presented in table 6, 7 and 8.

The operating costs of producing cocoyam were presented in Table 6. The results showed that on average the total operating costs of cocoyam producers was ₦10,360 per bag (100kg) in South-east Nigeria. These are herbicides/application, mounding/weeding, planting, harvesting, transportation, bagging, loading/unloading, rents.

If the producer decides to store cocoyam for some months before selling, then additional costs of construction of storage house, removal of rotten cocoyam and losses of cocoyam due to physiological changes will amount to ₦12,460 by the end of June and ₦25,760 by the end of October. Subsistence farmers used mounding, manual weeding and apply fertilizer/manure to cocoyam while the commercial farmers used herbicides only and planted directly on the soil but they incurred more transportation costs.

The marketing costs of cocoyam wholesalers are summarized in Table 7. On average, the total operating costs of cocoyam wholesalers are ₦4060 during the early season, ₦5040 during the mid season and ₦14,000 during the late season per 100kg bag of cocoyam. The costs of purchase were 16,000, 25,000 and 40,000 during the early, mid and late seasons.

### 5.6 Operating costs of wholesalers

The operating costs of wholesalers are transportation, food/lodging in the source and vending points, bags/re-bagging, loading/offloading. Wholesalers had to travel from various places to Kaduna and also rented accommodation in those areas for acquiring cocoyam during the late season. Thus they incurred ₦14,000 per bag for those activities before cocoyam reached the deficit regions.

Table 7. Average operating costs of wholesalers per 100kg in Naira (₦) (1\$ = ₦200)

Wholesalers costs	Early season	Mid season	Late season	Average
Transport to zone of purchase	100	200	1,000	433.3
Costs of capital	2,300	2,900	8,000	4400
Food and lodging	100	300	2,600	1000
Purchase of 100kg of cocoyam	16,000	25,000	40,000	27000
Costs of loading in the source market	100	100	100	100
Transport per 100kg to storage	200	200	900	433.3
Costs of offloading in storage	100	100	100	100
Transport to vending point	500	500	500	500
Bags/ re-bagging	100	100	100	100
Costs of loading from the store	100	100	100	100
Costs of offloading at vending point	100	100	100	100
Food and lodging at vending point	300	380	440	373.3
Storage costs at vending point	60	60	60	60
Total	4,060	5,040	14,000	7,160

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013.

### 5.7 Average operating costs of retailer

The marketing costs of cocoyam retailers were summarized in Table 8. On average, retailing 100kg of cocoyam costs about 980, 896 and 812 during the early, mid and late seasons respectively. These costs are transportation fees to the market, costs of feeding, capital, transportation to the vending point and shop rents.

Table 8. Average operating costs of retailers per 100kg in Naira (₦) (1\$ = ₦200)

Retailers costs	Early season	Mid season	Late season	Average
Costs of capital	200	200	100	300
Food and lodging	500	200	100	160
Purchase of 100kg of cocoyam	24,000	38,000	64,000	42,000
Transport to vending point	300	100	100	100
Storage costs at vending point	100	100	100	100
Shop rents	180	296	412	296
Total	980	896	812	896

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013.

Table 9. Summary of marketing costs of farmers, wholesalers and retailers in naira (₦)

Market agencies	Early season	Mid season	Late season	Average
Producers	10,360	12,460	25,760	16,193
Wholesalers	4060	5040	14,000	7700
Retailers	980	896	812	896

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013. 1\$ = ₦200

### 5.8 Net Profit Margin

The net profit margin of market intermediaries was the net earning gained after paying all marketing costs as well as the costs of capital as shown in Table 10. It is obtained from the difference between sale price of cocoyam per bag in Table 1 and the costs in Table 6. The result indicated that cocoyam producers benefited from seasonal price variation. Cocoyam producers obtained an average net profit of ₦10,807 per bag in the whole season, while the net profit of cocoyam producers in the early season was ₦5640 per bag and ₦14,240 per bag during the late season.

Table 10. Net profit margins of cocoyam producers, wholesalers and retailers (1 bag).

Market agencies	Early season	Mid season	Late season	Average
Producers	5640	12540	14240	10807
Wholesalers	3940	7960	10,000	7300
Retailers	2020	1104	3188	2104
Total	11,600	21,604	27,428	20,211

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200

The net profit of ₦14,240 received by producers during the late season was due to the scarcity of cocoyam from July to October. During that period most farmers (95%) had already sold their cocoyam and were in the farm for producing new cocoyam. Wholesalers had to travel to far places to source for late season cocoyam between July and October. Thus wholesalers received a maximum net return of ₦10,000 per bag in the late season. The wholesalers also received ₦7,960 per bag in the mid season and ₦3940 per bag in the early season. Similarly, the net margins of retailers were also higher at ₦3188 during the late season when cocoyam was very scarce. During the early season from November to February the price of cocoyam declined as compared to mid and late seasons.

### 5.9 Percentage Profit margin

Percentage profit margin is the proportion of profit that was obtained by each of the agencies. It is obtained by dividing profit margin of farmers, wholesalers and retailers by the total profit margin of each season and multiplying the result by 100 from Table 11. The price spread has already been calculated in Table 7 by subtracting the costs per bag of cocoyam incurred by a specific agency from the price received by the same agency, while the net margins have been worked out by subtracting marketing costs from price spread for each



agency separately. The distribution of percentage profit margin of each market intermediary is presented in Table 11.

Table 11. Percentage profit margin of producers, wholesalers and retailers in per kg 1\$ = ₦200

Market agencies	Early season	Mid season	Late season	Average
Producers	49	58	52	53
Wholesalers	34	37	36	36
Retailers	17	05	12	11

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013.

It is evident in Table 11 that the highest percentage (53%) profit margin is received by the producers followed by 36% received by the wholesalers. The result further indicates that retailers obtained a relatively low margin per bag but some located at Enugu and Onitsha market were transacting many bags than producers, over the whole season. The main risks for wholesalers and retailers were price variations and failure to sell perishable produce in time.

### 5.10 Return on Investment (ROI)

The profits of firms and businesses are always related with costs and output in net profit terms. Return on Investment (ROI) relates net profit of producers, wholesalers and retailers to the costs incurred in the producing or other marketing services in cocoyam. Thus net profit of farmers, wholesalers and retailers during the early season, mid season and late season respectively in Table 10 was divided by total costs incurred in Table 9. Analysis of ROI presented in Table 12 revealed that producers realized \$0.54 from every \$1 invested in production of cocoyam in the early season. Wholesalers realized \$0.97 in every \$1 invested in marketing cocoyam in the early season. Retailers realized a higher ROI of \$2.06 on every ₦\$ invested in marketing cocoyam than other intermediaries. Retailers also realized the highest Return on Investment (ROI) of \$2.41 in every \$1 invested for the whole season. Return on naira invested for other functionaries were lower as shown in Table 12 because retailers incurred very little costs in marketing compared to other functionaries. However it can be concluded that the competitive forces within the market is operational.

Table 12. Returns to investment by cocoyam supply chain in south east Nigeria (1 bag)

Market agencies	Early season	Mid season	Late season	Average
Producers	0.54	1.01	0.55	0.70
Wholesalers	0.97	1.58	0.71	1.09
Retailers	2.06	1.23	3.93	2.41

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013.

### 5.11 Marketing Efficiency

Marketing efficiency was calculated using the formula given by (Olukosi & Isitor 1990) which is net profit divided by marketing cost and multiplied by 100%. Thus net profit of farmers, wholesalers and retailers during the early season, mid season and late seasons in Table 8 was divided by total costs incurred in Table 9. Analysis of marketing efficiency (ME) revealed that the average marketing efficiency of producers in South-East Nigeria was 54% in the early season. Wholesalers had 97% in the early season while retailers had 206% at the same time. Looking at the whole seasons it was observed that retailers had the highest efficiency of 241% while wholesalers had 109% and farmers 70%.

Table 13. Marketing efficiency in cocoyam marketing in south-east Nigeria (per 100kg bag)

Market agencies	Early season	Mid season	Late season	Average
Producers	54	101	55	70
Wholesalers	97	158	71	109
Retailers	206	123	393	241

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013.

### 5.12 Net Income of Farmers, Wholesalers and Retailers

Thus the net income of average farmers who sold all his cocoyam during the early season was ₦106,596 as shown in Table 14. An average farmer during the mid season sold at ₦12,540 per bag. Thus a net income of ₦237,006 accrued to an average farmer who sold all his cocoyam at mid season. Only less than 10% who sold all their cocoyam during the late season (between July and October) had ₦269,136 as net income. Since the

majority of farmers 90% sold before July the average income of 90% of farmers per year is about ₦118,556. However those 10% of producers who participated in business during the whole season had ₦204,246.

Most of the bags of cocoyam were sold during the early season and mid season since about 40% of the wholesalers got out of business during the late season. The net income of average wholesalers thus ranges from ₦1,970,000 during the early season to ₦3,980,000 during the mid season to ₦5,000,000 accrued at the late season and average of ₦3,650,000 for those who were in business throughout the whole year. About 60% of wholesalers also lost part of their money to retailers and 20% lost to farmers who failed to fulfill their contracts. Some of the retailers were also out of the business during the late season. The net income of an average retailer per year who sold all their purchased cocoyam either during the early season or mid season or late season was either ₦454,500 or ₦248,400 or ₦717,300 respectively and the average net income was ₦474,400 as shown in Table 14.

This showed that wholesalers had the highest net income per year while farmers earned the least income per year. Farmers' income could be improved by adding value to cocoyam through improved storage or by getting in contact with urban wholesalers, retailers and hoteliers to get more income from their products.

Table 14. Net Income per 100kg (one bag) of average farmers, wholesalers and retailer during the early, mid and late seasons in ₦

Market agencies	Early season	Mid season	Late season	Whole season
Producers	106,596	237,006	269,136	204,246
Wholesalers	1,970,000	3,980,000	5,000,000	3,650,000
Retailers	454,500	248,400	717,300	474,400

Early, Nov. to Feb; Mid, March to June; Late, July to Oct. Source: Field survey, 2012/2013. Exchange rate at 1\$ = ₦200.

## 6. Test for hypothesis

Hypothesis was tested using Analysis of Variance (ANOVA). The result in table 15 indicated that there was statistically significant difference in the mean income of farmers, wholesalers and retailers (F-calculated = 244.1, P < 0.001). Therefore the null hypothesis is not accepted. Further mean separation using Duncan's Multiple Range Tests (DMRT) showed that wholesalers had the highest mean income, followed by retailers and then the farmers. This is in line with the *apriori* expectation since wholesalers handled more volume than the retailers and farmers handled the least volume compared to other functionaries.

Table 15. Duncan test for the mean income of farmers, wholesalers and retailers

Treatments	N	Mean	1	2	3		
Farmers	100	1.0558E5	1.0558E5				
Retailers	100	5.1530E5		5.1530E5			
Wholesalers	60	1.9674E6			1.9674E6		
Sig			1.000	1.000	1.000		
Total	260	6.9281E6	Sum of square	Df	Mean square	F	Sig
Between groups						244.1	.000
Within groups			1.351E14	2	6.755E13		
Total			7.112E13	257	2.76E11		
			2.062E14	259			

Source: Field survey, 2012/2013. Subset for alpha = 0.05 (5%)

Hence, we reject the null hypothesis and accept the alternative that the mean net income of farmers, wholesalers and retailers significantly differs.

## 7. Discussion

Price spread, share in consumers dollars (on final retail price), return on investment ratios, marketing efficiency, net profit margin and net income were employed to identifying the imperfections and issues confronted in production system and marketing mechanics. The result showed that price spread from producers to wholesalers and retailers were ₦27,000, ₦15000, and ₦3,000 while their share in consumers' dollars were 60%, 33% and 7%. Their average operating marketing costs were ₦16193 (\$80), ₦7700 (\$38.50), and ₦896 (\$4.48) while the average net income of producers, wholesalers and retailers per year were ₦204,246 (\$1021.21), ₦3,650,000 (\$18,250) and ₦474,000 (\$2370) each respectively (at an exchange rate of 1\$ = ₦200). Their average return on investment from producers to wholesalers to retailers were 0.70, 1.09 and 2.41 for every 1\$ invested on the

business while their average marketing efficiency were 70%, 109% and 241%. The results also provide insights into the socio-economic and institutional characteristics of producers, wholesalers and retailers. The results are meaningful in many aspects.

Producers and retailers obtained a relatively low margin per unit volume of cocoyam although they are transacting lower volumes over the season. The main risks for wholesalers and retailers are price variation and the failure to sell perishable produce in time. Also wholesalers generally do not grade and re-pack their stock therefore; they do not extend assurance to retailers. On the other hand, retailers did not have enough time to ascertain the quality of cocoyam at the lower layers of bags. Thus market for cocoyam is thin, fragmented, disorderly, and unreliable and these entail a lot of transaction costs since they had to personally inspect the commodity to ensure that they are buying cocoyam that is standard in quality, grades, weight. There is indication of collusive oligopoly for wholesalers as their profit margins and returns to investment were significantly higher when compared with other actors in cocoyam supply chain. Table 2 shows lack of extension service that could enables traders to have information on grades and standards as well as information on price and weight. Therefore the need for government agencies, firms and civil society organization to design, transform and maintain different institution such as agricultural-support services and production technology as well as infrastructures such as roads that play necessary roles for market participation.

## 8. Conclusion

The study made a valuable addition to the knowledge required for efficient production and marketing of cocoyam in South east Nigeria. The results have revealed that the yield for cocoyam was low when compared to the yields of experimental stations in the country. The lacking agricultural-support services and production technology that will provide disease resistance and high yielding varieties were perhaps the responsible factors for inefficient cocoyam production in South east Nigeria. Thus the return to investment was lowest for producers at 0.70 for \$1 invested compared to 1.09 and 2.41 for wholesalers and retailers.

The results further reveal that there is high degree of competition among producers and retailers, which suggest that their market margins are not excessive except wholesalers where indications of collusive oligopoly could be said as the profit margins. However returns to investment of retailers were higher when compared with other actors since they incur the least operating costs.

The descriptive results show that their access to various factors of production are clear indications of their poor resource situation which constrained their ability to maximize market efficiency.

Our results are similar to past studies on marketing constraints in developing countries (eg Gabre-Madhin 2006; Barret 2008; Dorward et al. 2008), particularly on the need to get institutional capacities right in order to enhance marketing chain. Our study empirically identifying the imperfections and issues confronted in production system and marketing mechanics and how they contributed to transaction costs associated with marketing in West Africa. However, to clarify pin down the identified price spread, share in consumers dollars (on final retail price), return on investment ratios, marketing efficiency, net profit margin and net income beyond our study location, particularly in terms of broader concerns for food commercialization in Africa, suggest an opportunity for further research. Similarly further research can investigate the implication of transaction and search costs to direct market orientation across the subsistence-to-commercial marketing spectrum in West Africa.

Overall, we recommend that agricultural extension, support services, credit and technology transfer may be improved to increase output and generate exportable surpluses. It was also suggested that agrarian reforms be introduced including asset redistribution on selective basis to maximize the benefits of growth across households and reduce poverty through high value cocoyam crop. Further inter-state trade may be promoted by developing road and other infrastructure in order to reduce transport and other transaction costs. It is further suggested that the Government may formulate an appropriate policy to invest in research and development for enhancing the yield of cocoyam. Major investments shall be made to improve marketing systems and in supportive infrastructure was recommended to facilitate marketing and trade of cocoyam. There is strong need to establish for collaboration between private and public research and development programs to improve management practices, particularly, the efficient use of available technology for timely and efficient production. The results of this study indicated that the cocoyam production system is partially efficient, while the marketing system is moderately efficient. There was a frequent flow of price information while the differences in price at different locations were due to transportation and transaction costs. High marketing margins of different actors in supply chain of the cocoyam and different prices at different times were due to imperfections in marketing system. An important role may, therefore, be envisioned for government as facilitator and promoter of an efficient production and marketing system. Government has also a role to play for stabilizing prices of perishable commodities to protect producers in the short run, and establish market infrastructures including cool chains as a long-term solution. Government should also give incentives for growth and promotion of input industry required cocoyam production and to industries like packaging, processing, transportation and storage to promote trade

along with employment. Profits of middlemen may also be rationalized through regulation and selective control. It is further suggested that the concepts of cooperative and community marketing be also promoted for addressing the vertical issues of cocoyam marketing. Public and private partnership and NGOs as well as CBOs should play an important role of catalyst for an efficient and improved marketing system which benefits producers and satisfies consumer. The strategy can be identification of new markets with diversification of existing portfolio. The efforts for value addition in tomato and chilies need to be done for enhancing returns. Government role needs to be invoked, wherever necessary, to remove market imperfections in the interest of producer and consumer.

## 9. References

- Acheampong, P. et al., 2015. Cocoyam Value Chain and Benchmark study in Ghana. *ResearchGate*, 2(1), pp.4295–6326.
- Afolabi, J.A., 2009. An Assessment of Gari Marketing in South-Western Nigeria. *Journal of Social Science*, Vol. 21(1), pp.33–38.
- Babatunde, R. & Oyatoye, E. o., 2009. Food security and marketing problems in Nigeria: the case of maize marketing in Kwara State. In I. H. Eric Tielkes, Christian Hülsebusch & K. B. Andreas Deininger, eds. *Global food and Product Chain Dynamics Innovation conflicts Strategies*. Honenheim, p. 15.
- Baltenweck, I. & Stall, S., 2007. Beyond one size-fits-All. Measures for commodity system in Kenyan Highlands. *Journal of Agricultural Economics*, Vol 58 pp(3), pp.536 – 548.
- Barret, C., 2008. Smallholder market participation: concept and evidence from Eastern and Southern Africa. *food policy*, vol 33, pp.pp. 299–317.
- Dorward, A., Kydd, J. & C., P., 2008. *Traditional domestic markets and marketing systems for agricultural products*, FAOSTAT, 2005. *Food and Agricultural Organization: Agricultural Statistics*, Rome, Italy.
- Gabre-Madhin, E.Z., 2006. *Building institutions for markets – the challenge in the age of globalization*, Addis Ababa, Ethiopia.: Ethiopia strategy support program, International food policy research institute.
- Giroh, D.Y., Umar, H.Y. & Yakubu, W., 2010. Structure, conduct and performance of farm gate marketing of natural rubber in Edo and Delta States, Nigeria African. *Journal of Agricultural Research*, 5(14), pp.1780–1783.
- Greig, L., 2009. An analysis of the key factors influencing farmer’s choice of crop, Kibamba ward, Tanzania. *Journal of Agricultural Economics*, 60(3), pp.699 – 715.
- Iliyasu, A.H. et al., 2011. Economics of Smoked and Dried Fish Marketing in Yola North and South Local Government Areas of Adamawa State, Nigeria. *Journal of agriculture and social sciences*, 7(2), pp.13–16.
- Kostov, P. & Davidova, S., 2013. A quantile regression analysis of the effect of farmers’ attitude and perceptions on market participation. *Journal of Agricultural Economics*, 64(1), pp.112–132.
- Mari, F.M., 2009. *Structure and efficiency analysis of vegetable production and marketing in sindh, Pakistan*. Sindh agriculture university Tando jam.
- National Population Commission, 2007. *Nigerian population, state by state analysis*, Nigeria.
- Oguntade, A.E. & Mafimisebi, T.E., 2010. Pricing and operational efficiencies in the livestock feed market in Ondo state, Nigeria. *Revista de Economia e Agronegócio (REA)*, 8(2), p.24.
- Olukosi, J.O. & Isitor, S.U., 1990. *Introduction to agricultural Market and Price: principal and applications*, Abuja: Published by Living Book Series.
- Onu, J. & Iliyasu, H.A., 2008. An Economic Analysis of the Food Grain Market in Adamawa State, Nigeria. *World Journal of Agricultural Sciences*, 4(5), pp.617–622.
- Pietrobelli, C. & Saliola, F., 2008. Power Relationships along the Value Chain: Multinational Firms, Global Buyers, and Local Suppliers’ Performance. *Cambridge Journal of Economics*, 32(6), pp.947–962.
- Zanello, G., 2012. Mobile phone and radios: effects on transactions costs and market participation for households in Northern Ghana. *Journal of Agricultural Economics*, 63(3), pp.694–714.

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