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MARKETING EFFICIENCY ANALYSIS OF YAM VALUE CHAIN IN THE NORTHERN REGION OF GHANA

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Abstract

For smallholder households, yam production constitutes an important source of food and income and also plays a vital role in their socio-cultural lives. This paper sought to evaluate the marketing efficiency of key players of the value chain as well as investigate their challenges. The study used cross-sectional data of 400 key players sampled through a multi-stage technique. Gross margin and marketing efficiency analyses were employed for the computation, while the Kendall Coefficient of Concordance was used for constraint analysis. The study revealed that an average yam value chain player makes relatively good margins with an average net margin of GH¢93.05, GH¢167.63, GH¢73.80 per 100 tubers for farmers, wholesalers and retailers respectively. The marketing efficiency of the farmers, retailers, and wholesalers was estimated to be 251%, 213% and 44%, respectively. Also, the players ranked erratic rainfall pattern, poor transportation system, high deterioration rate of yam, price fluctuation, among others as the most pressing problems hindering the smooth operation of the yam value chain. The yam value chain can be stepped-up by the provision of affordable storage facilities, development of the road network as well as organizing business and financial management training for actors.

Keywords: Constraints, Gross Margin, Market Efficiency, Yam, Northern Ghana

Introduction

Developing countries, and for that matter Ghana, still battle with food insecurity and high levels of poverty. These problems are more pronounced in rural areas and paradoxically, among smallholder farmers. This stems from the fact that policy interventions have been mostly skewed towards increasing productivity rather than ensuring efficiency in production and distribution. The FAO (2003) noted that efficiency in agricultural markets has the tendency of strengthening farmers' bargaining power with intermediate traders, which will likely increase their incomes and reduce wastage of produce.

Yam (*Dioscorea* spp.) is a very important food crop in many African societies. This is evident in the role it plays in serving a variety of food needs as well as its economic and cultural significance to people on the continent, especially West Africa. In an economic sense, yam tubers are a ready source of income in rural areas. Rural yam farmers enjoy fiscal reinforcement as soon as their yam tubers are ripe for harvest. The fresh tubers are sold in the rural and urban markets, and some are exported. For instance, Ghana stands as the leading exporter of yam, though not the highest producer. According to Okwor et al. (1998), yam festivals are celebrated to venerate yam before commencing the eating of the new yam. In some part of Ghana, yam is presented as gifts in marriages as part of bridal handouts, it is also offered to honoured guests or used for traditional sacrifices. Yam peels are also used as feed for livestock. FAO (2003) reported that yam is the third most essential energy giving food in the diet of Ghanaians, and on the average, supply 300 kcal to the daily per capita consumption in the country and thus accounts for 20% of calorie intake.

In Ghana, yam contributes about 16% to the country's agricultural GDP (MoFA, 2011; Anaadumba, 2013), meanwhile Anaadumba (2013) indicates that arable lands used for yam cultivation is just 6.3%. Yam is produced in Ghana across the various agro-ecological zones in varying proportions. For instance, the Brong-Ahafo Region located within the transitional zone is the leading yam producing area in the country, with 39% production rate. The Northern Region produces 25% of the yam output in the country. Other significant yam-producing regions include the Eastern, Upper West, Ashanti, and the Volta Regions. Ghana accounts for a significant proportion (over 94%) of total yam exports in West Africa. This is due to the country's ability to produce above domestic consumption level (FAOSTAT, 2012). MEDA (2011) found out that yam exports to Europe and North America accounted for 21000mt per year; while growing at 7.7% annually. However, high population growth and over-lapping food demand by West Africans abroad pose the danger of "closing the gap". Essentially, there is rising opportunity in yam marketing, which needs to be tapped. Yet, the long run increase in output and improved marketing will highly depend on efficiency in marketing.

Moreover, pre-production issues have taken a central attention in yam research, while issues of post-harvest, marketing, storage and consumer demand are rather neglected. As postulated by Aidoo et al. (2012), who observed that even though marketing plays a crucial role in linking the producer to the consumer, its associated glitches in the areas of transportation, wholesaling and retailing activities, have however been largely overlooked by researchers, especially in Ghana. This often puts yam producers and marketers in difficult situations in dealing with market surpluses. Even though there have been many schemes of research work done in Ghana (Aidoo et al, 2012; IITA, 2012) on the yam value chain, very little is known about the social organization of yam farmers at the farm level and the marketing efficiency of actors within the yam value chain. This study aims to add to knowledge by examining the marketing efficiency along the yam value chain in the Northern Region of Ghana, such that disturbing issues to the development of the yam industry may be unraveled to expand the export base as well as increase export revenue.

The Concept of Value Chain

There are different definitions and several distinct approaches to value chain research. Nonetheless, Ivarsson & Alvstam (2005) defined value chain as a vehicle by which new forms of production, technologies, logistics, labour processes and organizational relations and networks are introduced. However, a definition of the term as it is understood in this study is given below.

A value chain consists of all stages of a technical production process as well as of the interaction between these stages. The production process starts at the stage of input supply, then covers production, processing, marketing and ends with the consumption of a certain product. The technical production process can generally be separated into five stages: input supply, primary production, processing, marketing and consumption. At every stage, one or several different actors can be found. The first step of the production process is the input supply. This considers everything from the seeds to the technical equipment that is needed for the production of the concerned product. Actors in this stage can be small, medium or big sized enterprises. For the yam production process, the major inputs required for the production of yam are seed yam, land, labour, equipment for preparing the land, staking materials and agrochemicals. Inferring from Adam et al. (2014), most yam producers in Ghana currently obtain inputs from local markets but are constrained by high costs of materials particularly seed yam and difficulty in accessing credit. Most farmers use traditional methods of generating planting materials, which results in lower quality yams. The minisett technique is used on a small scale and often farmers will keep the seeds that they have produced rather than sell to others, therefore creating a market opportunity for a commercial seed yam supplier. Primary production (sowing, fertilizing, harvesting, etc.) follows input supply. Yam cultivation takes place from the season of January to September, depending on the rain pattern. Actors at this stage can also be individual, small, middle or big sized smallholders as well as big enterprises with their own out-grower schemes or

production plants. If the product is not marketed in its raw condition, processing is the next step. Raw materials get transformed into processed products such as powdered yam, bread, apple pie, etc. Transformation becomes more and more important as consumers, especially in urban centers ask for a high variety of products and prefer more and more processed foods for easy cooking. In the study area, food vendors mostly do yam processing. Activities like classifying or packing also fall under the category of transformation.

The next stage in the process is trade and marketing. The processed products have to be transferred to the places of demand and sold. It should be noted that like many food items in Ghana, not much processing is done with yam. However, yam is transported from production centers where the tuber is in abundance to urban centers like Kumasi and Accra for higher prices. Thus, even though there would not have been any physical value addition, in terms of the price, one can say that there is a value addition. The marketers consist mainly of wholesalers and retailers. The last stage is consumption of the good. Even though the consumers participate neither in the production process nor add value to the product, they are part of the chain, as in most cases the consumer is the driving power of the whole process. Therefore, consumer demand is the determining factor for the kind, amount, and quality of a product. For quite a wide range of products, which are not substantial for a living, the consumer's value of a certain product determines the possible price it attracts and therefore the potential value addition to the net product within a chain.

Yam Marketing Channels in Ghana

Marketing involves the process(es) of business organization, which makes available products or services of value to the consumer from the point of production. The American Marketing Association (AMA) (2013) describes marketing as the activity, set of institutions and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large. Marketing of agricultural products commence at the farm, through to the wholesalers, retailers/processors and finally to the consumer.

The value chain of yam, for instance, is less industrialized relative to other commodities, particularly in Ghana. According to Bancroft (2000), yam is largely traded in its raw form in Ghana, thus there is limited or relatively no processing of the commodity into secondary products. The common form of processing is typically boiling and frying by chop-bar owners and directly selling it to consumers. Mostly, yam produced in the Northern Region is transported to the other parts of the country, particularly Kumasi and Accra at central yam marketing points or transit markets for sale and exported to other destination countries. Evans School of Policy Analysis and Research (EPAR) (2012) postulated that a chunk of Ghana's yam is exported to the United Kingdom (48%), Netherlands (24%), United States of America (18%) and the remaining ten percent to other countries. It was also stipulated that on the average export quantity and value of Ghana's yam has increased over the years. As identified and mapped out by Aidoo et al. (2012), the product pathway for yam in a typical yam-producing district is depicted in figure 1. It shows the line of interactions of various different players within the yam marketing structure that balances demand and supply between producers and consumers. Thus, there exist three main pathways through which yam travels from the producer to the consumer; in the first route, yam moves from the producer direct to the consumer. The second route is from the producer through the wholesaler to the retailer, then to the consumer. While the third route moves yam from the producer to the cross-border trader, through to the wholesalers and retailers in destination countries, then to the consumer.

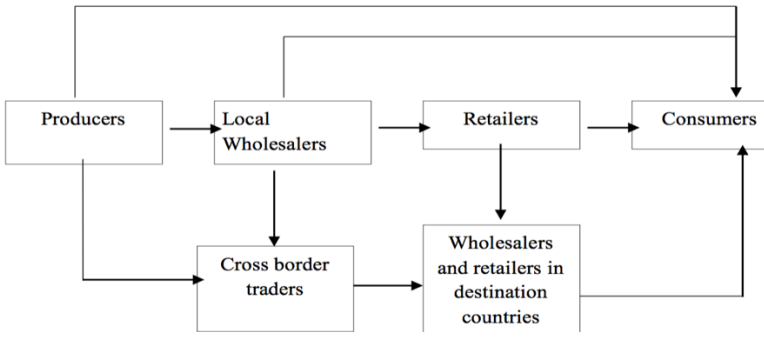

Figure 1*: A Yam Pathway in a Typical Yam-Producing District *Source: Aidoo et al. (2012)*

Figure 2 presents the study's yam value chain adapted from Aidoo et al. (2012). The sketch reveals both the physical and virtual chains. The main actors form the physical chain, whereas the virtual chain starts with input supply to production, processing and consumption. Transportation, however, helps with the distribution of the produce, which is also done by wholesalers and marketers until it gets to the final consumer. Note that trading activities do not only take place between the stages of processing and consumption but also between production and processing or input supply and production.

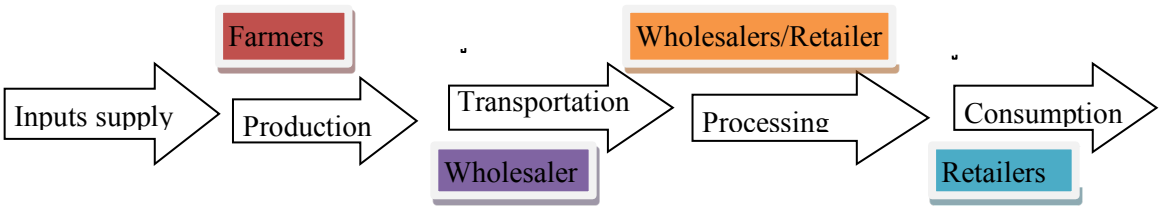

Figure 2: Extracted yam value chain
Source: Author's sketch (2016)

Methodology

Study Area and Sampling Method

The study was undertaken in the Northern Region of Ghana. The region is bordered to the North by the Upper East and the Upper West Regions; it shares boundaries with the Brong-Ahafo and the Volta Regions to the South, Togo to the East, and Côte d'Ivoire to the West. The land is mostly low lying except in the North-Eastern corner with the Gambaga Escarpment and along the Western corridor. The Black and White Volta rivers and their tributaries such as the Nasia and Daka rivers drain the region.

Sample Size Determination

Study limitations make it necessary for the selection of samples. It is deemed important by Saunders et al (1997) to make key decisions on some determinants of sample size in selecting a sample; thus the desired precision level and the acceptable level of confidence or the limit of allowable error. The Statistical formula employed for the determination of the sample size is that proposed by Cochran (1963), which is stated as follows;

$$n = \frac{z^2(1-\pi)\pi}{e^2}$$

where n is the sample size, z is the z-score from the standard normal distribution table at a given level of confidence, π is the population proportion, e is the level of precision or margin of error.

Owing to the fact that there is no established data on the population of yam value chain players, the population proportion was set at a conventional rate of 50%, which is expected to be a good representation of the population. A 5% margin of error was allowed with a confidence interval of 95%, at the 95%, z-score was read from the standard normal distribution table as 1.96. Therefore, the sample size was computed as below;

$$\frac{1.96^2(1-0.5)(0.5)}{0.05^2} = 384.16$$

Hence the determined sample size was 384 yam value chain players, however, for sampling convenience the study considered a sample of 400 players in the yam industry; selected through a multi-stage sampling technique across the five selected districts in the region.

Based on the premise that yam is the major crop cultivated along the eastern flank of the region, the five districts of the Northern Region namely; Yendi, Nanumba North, Nanumba South, Zabzugu and Tatale-Sanguli were purposively sampled at the first stage. In the second stage, two communities were randomly selected (through the lottery method) from each of the districts. After the identification of the major yam growing communities in the various

districts, the study proceeded to use stratified and simple random (lottery) sampling method to select 200 yam farmers, 50 wholesalers, and 150 retailers/processors. For each district, a sample of 80 respondents was selected as follows: Yam producers/farmers (40); wholesalers (10); retailers/processors (30). At the community level, the sample size was as follows: Yam producers/farmers (20); wholesalers (5) and retailers/processors (15). Generally, wholesalers are composed of resident/sedentary, assemblers/wholesalers and distant (itinerant) wholesalers. As such stratified sampling technique was used to select the 50 wholesalers; 25 from each stratum resident/sedentary and distant (itinerant).

Conceptual Framework

Gross Margin Analysis

As noted by Barnard & Nix (1979), gross margin for an enterprise is its financial output minus its variable costs. Based on this, gross marketing margins for the various players of the yam value chain were calculated using the formula below:

$$GMM = TR - TVC \qquad (1)$$

where *GMM*, *TR* and *TVC* is the gross marketing margin, total revenue and total variable cost respectively. The net margin accruing to the wholesaler or the retailer is the difference between the gross marketing margin and the marketing costs. Marketing cost is the sum of transport cost, storage cost, labour cost and other costs associated with moving the commodity from the point of purchase to the customer or final consumer.

$$NMM = GMM - MC \qquad (2)$$

where *NMM* is the Net Marketing Margin for a given actor (farmer, retailer or wholesaler), *GMM* is the gross marketing margin and *MC* is the trader's marketing costs.

Marketing Efficiency

Marketing efficiency measures the competitiveness of a market with regards to pricing and market performance of both market infrastructure and services. An efficient marketing system ensures the efficient allocation of agricultural resources and increased production since effective price transmission reflects consumer preferences to producers. Marketing efficiency comprises pricing efficiency, technical (operational) efficiency and innovative efficiency (Okereke, 1988). In this study, the concept of marketing efficiency refers to pricing efficiency, which demonstrates the effectiveness of yam movement between the source and destination of yam markets, as well as the existence and nature of price linkage between the same. Though several methods for evaluating marketing efficiency exist, the study uses marketing margins. In an efficient marketing system, the marketing margins of all actors in the system are identical and inter-market prices are correlated, suggesting an integrated marketing system. Marketing efficiency (*ME*) is computed using the formula proposed by Olukosi & Isitor (1990), which is specified as:

$$ME = \frac{NMM}{MC} \times 100\% \qquad (3)$$

where *NNM* and *MC* as defined above.

Analysis of Yam Farmers' and Traders' Constraints

Kendall's Coefficient of Concordance

The Kendall's coefficient of concordance measures the degree of association assuming there are *K* raters rating *k* problems in rank order from 1 to *k*. The Kendall's statistic *(W)* defines the ratio of variability and determines the measure of commonality in rating. It is examined on a scale of zero to one. Thus, the closer the value is to one the greater the level of agreement. The Kendall's statistics *(W)* can be specified as;

$$W = \frac{12\sum T_j^2 - 3K^2N(N+1)^2}{K^2N(N^2-1)} \qquad (4)$$

where T_j = Column totals, N = Number of variables ranked and K = Number of judges/farmers doing the

ranking. To test for the statistical significance of the W, the Friedman's chi-square statistic was used. This is obtained by the formula:

$$\chi^2 = K(N-1)W \qquad (5)$$

This statistic is asymptotically distributed as chi-square with *N-1* degrees of freedom (Legendre, 2005).

Results and Discussions

Volume of Yam Handled by the major Players in the Yam Value Chain

Quantities of yam per hundred tubers (locally called *nyu' gmani*) handled by the players in the yam value chain are presented in Table 1. The table indicates that an average yam farmer is able to produce in a season almost 900 tubers of yam at an average cost of GH¢ 179.43 per hundred tubers. Out of this, about 620 tubers, representing 69% are eventually sold out at an average price of GH¢ 298.93; the remaining 31% is for consumption or gifts or may get spoilt/lost. At an average cost of GH¢ 299.24 per 100 tubers, wholesalers are able to assemble about 7500 tubers of yam from farm gates and other points, out of which 7477 tubers are transported per trip to destination markets in Accra or Kumasi (Details of post-harvest loss treated in 3.4 below). These tubers are valued at GH¢ 582.80 per 100 tubers in the destination markets. Retailers, on the other hand, purchase an average of 654 tubers of yam at an average price of GH¢ 285.12 per 100 tubers and sell out 645 tubers to the final consumer at a price of GH¢ 382.48 per 100.

Table 1: ***Volume of Yam Handled by major Players in the Yam Value Chain***

Player	Qty produced/100	Qty sold/100	Cost/100	Selling price/100
Farmers	8.89	6.22	179.43	298.93
Wholesalers	75.06	74.77	299.24	582.80
Retailers	6.54	6.45	285.12	382.48

Source: Field Survey (2016)

Gross Margin and Marketing Efficiency of major Players in the Yam Value Chain

Marketing margins of the various players were computed using the mean purchasing and selling prices across the various categories of players in the yam marketing chain. The average selling price per 100 tubers, (that is gross revenue for yam farmers) was GH¢ 298.93; that of wholesalers averaged GH¢ 582.80 and GH¢ 382.48 for retailers. In estimating the gross margin for farmers, the average cost of producing 100 tubers was subtracted from the gross revenue to give a gross margin of GH¢ 119.51. In the case of the wholesalers and retailers, the cost of purchasing was deducted which yielded average gross margins of GH¢ 283.56 and GH¢ 97.35 respectively.

From the computations, wholesalers have the highest gross margin. This could partly be attributed to the relatively high selling price they get. The retailers, on the other hand, have the lowest gross margin relative to the other key players. To obtain the net margins, which is the gross margin less marketing cost per 100 tubers, the marketing costs of the various players which include transport cost, levies, loading and off-loading charges and others are computed and deducted from the gross margins. As presented in Table 2, it was revealed that due to high transportation cost on the part of the wholesalers, they have the highest marketing cost (GH¢115.93), which reduces the gross margin (GH¢283.56) by 40.88% to a net of GH¢ 167.63. The percentage reductions for the farmers and retailers are 22.14% and 24.19% with associated marketing costs of GH¢ 26.46 and GH¢ 23.55 respectively. Despite the high percentage reduction, the wholesalers still control the largest share of the market value of yam, as their net margin stood at GH¢ 167.61 as against GH¢ 93.05 for the farmer and GH¢ 73.80 for the retailer. This finding is in line with the conclusion of Adinya &

Awoke (2007) that yam marketing is a profitable business, especially for the wholesalers in Obubra Local Government area in Cross River State, Nigeria. With regard to the marketing efficiency (defined as the ratio of net margin to marketing cost), the estimated results in Table 3 indicate that the yam business is profitable, with mean marketing efficiency of 169% in excess of 100%, thus, yam value chain players make super-normal profits.

Table 2: Gross and Net Margins of Key Players

Item	Farmers	Wholesalers	Retailers
a. Gross Revenue	298.93	582.80	382.48
b. Cost of production / product	179.43	299.24	285.12
c. Gross Margin (a-b)	**119.51**	**283.56**	**97.35**
Marketing Costs:			
Transport cost	8.52	84.67	17.37
Loading	5.55	9.28	1.22
Offloading	3.44	8.30	1.22
Tax/duty	0.22	0.27	0.22
Other costs	8.73	13.40	3.50
d. Total Marketing cost	26.46	115.93	23.55
e. Net margin c-d	**93.05**	**167.63**	**73.80**

Source: Field survey (2016)

This is consistent with a study from Abia State, Nigeria by Ehirim et al. (2007), in their economic assessment of yam marketing in which they found an efficiency of 125%. With respect to individual players in our study, yam farmers are seen as the most efficient players with a margin of 251% above the break-even point. This can be attributed to their limited participation in marketing activities, which limits their marketing costs. Retailers are the next efficient players in the chain with 213% in excess of 100% compared to the wholesaler with 44% surplus.

Table 3: Marketing Efficiency of Key Players

Item	*Average*	*Farmers*	*Wholesalers*	*Retailers*
Gross Margin	166.81	119.51	283.56	97.35
Marketing Cost	55.31	26.46	115.93	23.55
Net Margin	111.49	93.05	167.63	73.80
Marketing Efficiency (e/d)	2.6988	3.5170	1.4459	3.1336
Marketing Efficiency (%)	**269.88**	**351.70**	**144.59**	**313.36**

Source: Field survey, 2016

This suggests that there is a glut in the yam business and as such, farmers pay off their marketing cost by one-fifth of their net margin. The retailers, on the other hand, enjoy margins three times more than the value added in their marketing activities, whereas the wholesalers are a little above the break-even point, thus they get about 44% more on their value-addition on yam.

Estimation of the Magnitude of Post-Harvest Losses

Like any other agricultural commodity, yam is a perishable product and physically deteriorates which exposes players within the chain to some amount of losses. To determine the magnitude of these losses along the chain, information was sought from actors on the magnitude of post-harvest losses during harvest, transportation, and storage until the tubers get to the consumer. These losses were summed to obtain the total loss, which was then taken as a percentage of the marketable surplus (after deducting yam consumed and gifts), which accounts for breakages and deteriorations. The gain was then computed by the following formula;

$$MS = TH - (YC + Gift) \quad (5)$$

$$Yam\ sold = MS - Yam\ lost \quad (6)$$

Where *MS* is marketable surplus, *TH* is total harvest and *YC* is yam consumed.

With regard to the wholesaler and retailer, the losses were equally summed at all market levels to get the total losses. However, since the wholesaler and the retailer do not harvest yam but purchase from farmers, to measure the gain, the loss was deducted from the purchased quantity in 100 tubers. This was then averaged to the number of wholesalers or retailers in the chain. From the computation, the average loss experienced by the actors was 4.1%, with greatest loss of 10.5% experienced by the farmers or at the production level. Retailers on the other hand experience minimal losses (1.3%) relative to the farmers. The wholesalers record the least percentage loss (0.4%). Generally, as presented in figure 1, there are minimal yam losses across the various stages of the value chain.

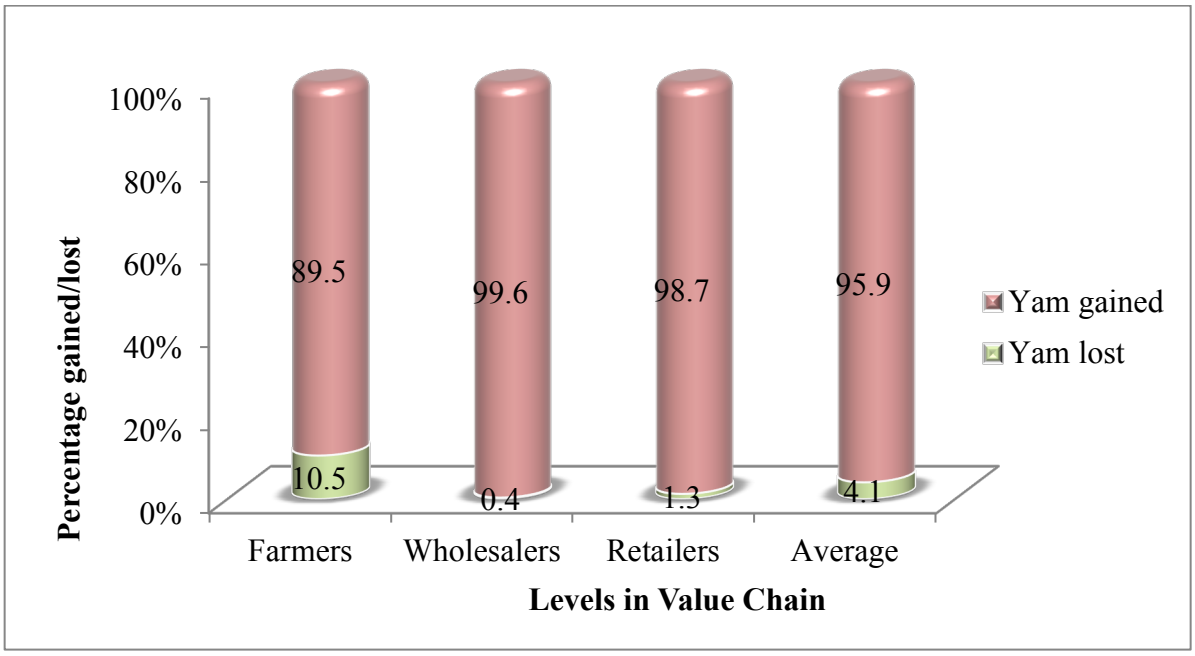

Figure 3: Magnitude of losses in the value chain
Source: Field survey, 2016

Constraint Analysis of the Yam Value Chain

Evaluation of the efficiency of the yam value chain indicated some level of efficiency, especially with respect to the yam marketers. However, efficiency results show there is still room for improvement, which then calls for the analysis of impediments to the growth and development of the yam industry. Players in the yam industry were asked to rank these problems according to the level of gravity. The Kendall Coefficient of Concordance is used to indicate the level of agreement among the raters on the constraints. The results are shown in Tables 4, 5, and 6.

Farmers' Constraint Analysis: In all, 165 (83%) from the sampled 200 farmers gave rankings to the identified challenges. The Kendall Coefficient generated 0.562 denoting that 56% of the farmers agreed with the constraints ranked. The results show that unreliable rainfall pattern is the most pressing challenge to the farmers, with a mean rank of 2.77. Erratic rainfall patterns negatively affect crop yields because farmers are unable to predict the rains for suitable planting time and for that matter, gamble with their farming activities. Following erratic rainfall patterns is poor transportation system with a mean rank of 4.10. Poor transportation system embodies difficulty in accessing vehicles, poor road network, which reflects in high cost of transportation of yam from the farm gate to the market centers.

Table 4: Yam farmers' constraints

Constraint	*Mean Rank*	*Rank*
Unreliable rainfall pattern	2.77	1st
Poor transportation system	4.11	2nd
Poor access to extension services	4.18	3rd
Soil infertility	4.86	4th
Inadequate access to credit	5.16	5th
High labour cost	5.59	6th
Unfavourable temperatures	7.15	7th
Pests and diseases	7.95	8th
Inadequate storage facilities	8.07	9th
Inaccessibility to farm inputs	8.51	10th
Soil erosion	9.82	11th
Insecure land tenure system	11.35	12th
Seasonal floods	11.46	13th

Kendall's coefficient (W) = 0.562

Test statistic () = 1112.199

Pr (value) = 0.000

Number of observation = 165

Source: Field survey, 2016

Farmers also ranked poor access to extension services as the third most challenging issue. MoFA, (2012) indicated an extension officer-farmer ratio of 1:700, which poses a serious problem to farmers in learning and adopting new and modern technologies. In instances where farmers are lucky to have access to extension services, the services are not regular, which negatively affects the development of the agricultural sector. Other problems deemed severe are poor soil fertility and access to credit. However, seasonal floods, insecure land tenure system, and soil erosion were the least ranked problems. As a result of the relatively flexible land tenure system in the north, most farmers do not encounter problems with respect to land acquisition. Thus, while only six percent rent or squat, the rest are either operating on their own lands (24%) or family-owned lands (70%). Seasonal flood and soil erosion is also not much of a problem because of the land terrain and also coping strategies adopted by farmers to check erosion.

Wholesalers' Constraint Analysis: At the wholesalers' level, 92% (46) of the sampled 50 wholesalers ranked poor road network as the most pressing problem hindering their yam trade (Table 5). According to them, the bad nature of the road affects the entire transport system; from the availability of vehicles to the risk of physical losses due to accidents. Fluctuation of yam prices is also regarded as another serious issue to the development of the yam business and as such was ranked second among the list of problems. The wholesalers explained that the seasonal nature of yam supply affects price stability, which mostly affects their business capital. High transportation cost was ranked third, reflecting the direct effect of the poor road network and ultimately fuel price hikes. This was viewed as a serious setback because it affects the margins and consequently the marketing efficiency of the wholesalers. The wholesalers also ranked high rate of yam deterioration as the third most severe problem. They attributed this to the excessive use of chemicals by farmers on yam in the production activities, which affects the storage length of the yam, especially the "*Pona*", which is the most preferred variety among the *Dioscorea rotundata* species in the market. However, inadequate storage

facilities were not seen so much as a worrying issue and for that matter was ranked the lowest, with a mean rank of 5.32. The Kendall's coefficient value of 0.537 implies that about 54% of the wholesalers agreed to the order of ranking.

Table 5: Wholesalers Constraints

Constraint	*Mean rank*	*Rank*
Poor road network	1.87	1st
Yam price fluctuation	2.60	2nd
High rate of deterioration	3.41	3rd
High cost of transportation	3.76	4th
Inadequate access to credit	4.04	5th
Inadequate storage facilities	5.32	6th
Kendall's coefficient (W) = 0.537		
Test statistic () = 123.403		
Pr (value) = 0.000		
Number of observation = 46		

Source: Field survey, 2016

Retailers' Constraint Analysis: With respect to the retailers' constraints, 136 respondents, constituting 91% of the 150 retailers sampled also saw poor road network as the most serious factor to the progress of their yam business, with a mean rank of 1.64 (Table 6). The second most pressing issue to the retailers was limited access to credit. However, during the data collection, most retailers were ignorant of the availability of credit unions and facilities and others who had knowledge of it lacked the needed collateral to access the credit. Deterioration of yam was ranked as the third most difficult problem facing their yam business. This is of grave concern especially to those into yam processing. Meanwhile, some of the problems are not deemed relatively challenging. These were the unavailability of consumers' preferred varieties, market access and inadequate storage facilities. There was a high degree of agreement among the retailers on the ranking of the constraints with a Kendall coefficient of 0.634, which suggests that 63% of the retailers agreed to this ranking.

Table 6: Retailers' Constraints

Constraint	*Mean Rank*	*Rank*
Poor road network	1.64	1st
Limited access to credit	3.24	2nd
High cost of yam and other inputs	3.64	3rd
High deterioration rate	4.36	4th
High transportation cost	4.54	5th
High labour cost	5.75	6th
Inadequate storage facilities	6.57	7th
Ready market for yam/yam product	7.55	8th
Non availability of consumer preferred variety	7.71	9th
Kendall's coefficient (W) = 0.634		
Test statistic () = 690.149		
Pr (value) = 0.000		
Number of observation = 136		

Source: Field survey, 2016

Conclusions and Policy Recommendations

The study established that there is efficiency in yam business or marketing, as value added in marketing activities yields more returns. Also, the post-harvest losses in the yam value chain are quite minimal with an average loss of 4.1% on every 100 tubers of yam. However, with over 50% agreement on ratings, it is confirmed that the yam value chain faces a myriad of problems. The serious problems among these included; erratic rains, poor transportation system, price fluctuation and yam deterioration. The subject of post-harvest losses in the yam value chain is more pronounced with farmers, hence, should be tackled at the production level more. Farmers must be given proper education on the best chemical application and also be encouraged to prepare compost or apply organic fertilizer to avert the deterioration effect of

chemicals on yam. Farmers should also be supported to construct storage facilities to mitigate against storage level losses. Based on the constraint analysis, the transportation system, especially rural roads, must be enhanced to help ameliorate the difficulty in transporting yam to urban centers. This would result in the reduction in marketing cost and consequently increase actors' margins. Infrastructural development will also create the conducive environment that would encourage the participation and thriving of the private sector in yam business; in the area of transport, processing and marketing, thus boosting the yam industry and virtually the economy at large.

Finally, since the yam market is booming, research and development (R&D) must be encouraged and private investment must be pumped in to investigate and come out with recommended technologies for enhanced yam processing and value addition to exploit more export opportunities in the yam industry.

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References

Adam, H., Zakaria, H. & Abujaja, M.A. (2014). Sociocultural implications on innovation adoption: the case of adoption of yam minisett technology among farmers in Northern Region, Ghana. ***Journal of Agricultural Economics, Extension and Rural Development,*** 1(7): 105-113.

Adinya, I. B. & Awoke, M. U. (2007). Economic Analysis of Yam Marketing in Obubra Local Government Area of Cross River State, Nigeria, ***Journal of Agriculture, Forestry and the Social Sciences,*** 5(1): 41-50.

Aidoo, R., Nimoh, F., Andivi, B. J-E., Ohene-Yankyera, K., Fialor, S.C., Mensah, O.J. & Abaidoo, C.R. (2012). Estimation of Margins and Efficiency in the Ghanaian Yam Marketing Chain. ***Asian Journal of Agriculture and Rural Development,*** 2(2): 226-234.

American Marketing Association (AMA), (2013). ***Approved Definition of Marketing by Board of Directors***, July 2013. https://www.ama.org/AboutAMA/Pages/Definition-of-Marketing.aspx

Anaadumba, P. (2013). Analysis of Incentives and Disincentives for Yam in Ghana: ***Technical notes series***, MAFAP, FAO, Rome.

Bancroft, R.D. (2000). Relieving post-harvest constraints and identifying opportunities for improving the marketing of fresh yam in Ghana, Crop Post Harvest Programme. ***Final Technical Report,*** No: R6505; ZB No: ZB0016.

Bernard, C.S. & Nix, J.S. (1979). ***Farm planning and control***. (2nd ed). Cambridge University Press, 600.

Cochran, W.G. (*1963*). *Sampling Techniques*. New York: Wiley and Sons.

Cooke, E., Hague, S. & Mckay, A. (2016). The Ghana Poverty and Inequality Report: Using the 6th Ghana Living Standards Survey 2016 Sussex: UNICEF

Ehirim, N. C., Onyemauwa, C. S., Ikheloa, E. & Umezurumba, I. E. (2007). Economics of yam marketing in Umuahia, Abia state, Nigeria, ***International Journal of Tropical Agriculture and Food Systems,*** 1(1): 51- 56.

Evans School of Policy Analysis and Research (EPAR), (2012). Yam Value Chain: ***Ghana EPAR Brief No. 206*** Prepared for the Agricultural Policy Team of the Bill & Melinda Gates Foundation December 12, 2012 by Kathryn Bergh, Claire Kpaka, Patricia Orozco, Mary Kay Gugerty, & C. Leigh Anderson.

FAO (Food and Agriculture Organization), (2003). Trade liberalization and food security in developing countries: Trade Reforms and Food Security-Conceptualizing the linkages. Commodities and Trades Division, FAO, Rome, Italy

FAO (Food and Agriculture Organization), (2003). ***Promoting CARICOM/CARIFORUM Food Security (Phase II) (GTFS/RLA/141/ITA): Evaluation Report***. FAO, Rome, Italy.

FAOSTAT (Statistics of the Food and Agricultural Organization), (2012). Retrieved on 4th August, 2015. http://faostat.fao.org/site/291/default.aspx

IITA (International Institute of Tropical Agriculture), (2012). ***Afrimedia: US$12M project to boost yam productivity in Ghana and Nigeria, 2012***. Available on http://www.iita.org/yam (accessed on 5th April, 2015)

Ivarsson, I. & Alvstam, C.G. (2005). Technology transfer from TNCs to local suppliers in developing countries: A study of AB Volvo's truck and bus plants in Brazil, China, India, and Mexico**.** ***World Development,*** 33(8): 1325-1344.

Legendre, P. (2005). Species Association: Kendall's Coefficient of Concordance Revised, ***Journal of Agriculture, Biological and Environmental Statistics*****,** 10(2): 226 – 245.

MEDA (Mennonite Economic Development Associates), (2011). Ghana Yam Market, Subsector and Value Chain Assessment: Final study report prepared for the Bill and Melinda Gates Foundation. http://meda.org/fr/market-systems-publications/51-ghana-yam-market-subsector-and-value-chain-assessment/file. Accessed 15th June, 2015.

MoFA (Ministry of Food and Agriculture), (2011). ***Agriculture in Ghana: Facts and figures (2010***) Statistics, Research and Information Directorate (SRID), Accra, Ghana.

MoFA (Ministry of Food and Agriculture), (2012). ***Pilot Program Based Budget (PBB) for 2013-2015***; MoFA, Accra-Ghana.

Okereke, O. (1988). Inter-Regional Trade in Food in the Economic Community of West African States (ECOWAS), In-***Readings in Agricultural Markets.*** *T. O.* Adekanye (ed) *1988*: Longman, Nigeria, pp. 35-41,

Okwor, G.C., Asiedu R. & Ekanayeke I.J. (1998). ***Food yams. Advances in Research***: International Institute of Tropical Agriculture (IITA), Ibadan and National Root Crop Research Institute (NRCRI), Umudike, 187-215.

Olukosi, J. O. & Isitor, S.V. (1990.) ***Introduction to Agricultural Market and Price; Principles and Applications***, Zaria: Agitab Publishers.

Saunders, M., Lewis, P. & Thornhill, A. (1997). ***Research methods for business students.*** London: Pitman