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Structure, Conduct and Performance of Tomato Marketing in Ghana

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Abstract
Marketing of agricultural products especially tomato has been a vocation for most women in Ghana, but little attention has been given to the marketing efficiency of tomato. The study analysed the efficiency of marketing system of tomatoes in Pwalugu in the Upper East Region of Ghana. The study depended mainly on primary data collected through a semi-structured interview with sixty-four respondents involved in the tomato marketing chain. Deconstructed Marketing Margins, Gini Coefficient, Returns on Capital Employed and the marketing efficiency criterion were used in assessing the efficiency of the marketing system of tomatoes. An average profit margin of Gh₵21,888.68, Gh₵110,060.70 and Gh₵1,169.03 for farmers, wholesalers and retailers per year respectively was realized. Also, farmers realized a return on capital employed of 1,127.6%, 237.6% for wholesalers and 66.0% for retailers. Our finding of a highly profitable tomato marketing industry in Pwalugu is contradictory to the views portrayed in the Ghanaian media. We advocate for a module to be developed for tomato marketing and processing under the National Youth Employment Programme (NYEP).
Keywords: Efficiency, deconstructed market margins, tomato, marketing system, return on assets

1. Introduction

Tomato cultivation is a significant economic activity in Ghana. Before the 1960s, tomato production was a subsistence activity. However, in the early 1960s the commercialisation of tomato farming begun. As a result of this commercialization, Ghana had moved into tomato processing as early as 1968 with the establishment of three tomato canneries for processing tomato paste in Pwalugu, Wenchi and Nsawam. The canneries operated on partial contract farming agreement, providing either equipment to tomato farmers or guaranteeing market access for pre-agreed quantities produced by smallholders. Marketing of tomatoes in Ghana has been a problem in recent times due to inadequate storage facilities, the perishable nature of tomatoes, inadequate funds, high cost of inputs and high level of importation from other countries (Robinson and Kolavalli, 2010). The problems have heightened fears of subsequent loss of market and livelihood as liberalization is deepening within the Economic Community of West Africa States regional market. According to the Ghana News Agency report on 11th March 2009, in the Upper East Region, Pwalugu inclusive, there is no tomato season that passes without some farmers committing suicide as a result of frustration. Farmers reportedly get frustrated as a result of low prices for their produce or lack of access to market opportunities and as a result are unable to pay back loans owed financial institutions. This report is consistent with a research report entitled "Free-trade, small scale production and poverty" undertaken in 2008 and facilitated by Social Enterprise Foundation of West Africa which found that the inability of farmers to raise funds to repay loans resulted from both price volatility and competition which was a characteristic of the increasing market share of imported tomato paste. These reports raise questions about the efficiency of the tomato marketing system especially as it relates to farmers. It appears from these reports that farmers are short-changed by the system and are not making any meaningful profit from tomato production and marketing. In order to provide answers to these nagging concerns, this paper set out to evaluate the performance of not only farmers in the tomato marketing chain but also wholesalers and retailers. We present evidence in this paper to the effect that contrary to the much touted unprofitableness of tomato marketing to farmers, farmers earn much higher profit margins than expected.

Some other studies have been carried out related to the analysis of the efficiency of the marketing system of tomatoes, including those of Robinson and Kolavalli (2010) in Ghana, and Alcos et al. (2001) in the Philippines, but the studies do not address the specific issues relating to the efficiency of marketing system in a relatively deprived area like Pwalugu. Previous studies have focused on specific segments of the market such as farm gate, or wholesale stage or retail stage or a combination of the previous two. This approach obscures the fact that marketing is a system and must be analysed holistically. This study is unique in the sense that it examines the efficiency of tomato marketing from the farm gate to wholesale stage and to the retail stage. In addition, it explores not only the conduct of the marketing system at each stage, it also evaluates the structure as well as the performance of the marketing system.

According to Businessdictionary.com (2012) market conduct entails the firms' pattern of behaviour in executing its pricing and promotion strategy and its response to the realities of the market it serves. Market conduct is different from market performance. Market conduct refers to the price and other market policies

pursued by sellers, in terms of both their aims and of the way in which they coordinate their decisions and make them mutually compatible (Encyclopaedia Britannica, 2012). Market performance, on the other hand, refers to the end results of these policies. Market structures explain some characteristics of the market, which are believed to influence its nature of competition and the process of price formation. There are four theoretical models used in analysing market structures. These four models are; pure competition, pure monopoly, monopolistic competition and oligopoly. These models differ in several respects; the number of firms in the industry, whether those firms produce a standardized product or try to differentiate their products from those of other firms and how easy or difficult it is for firms to enter the industry (McConnell and Brue, 2005). The structure of a market will necessarily have an effect on the level of concentration. The higher the number of market participants, the lower the concentration, and vice versa.

Market and marketing has long been the focus of investigation by the experts who have qualitatively studied it where in general the producers have been the focus of attention. In other words, they have solely attempted to scrutinize and estimate the supply and demand functions individually based upon which the price elasticity of factors and the responsiveness of producers and consumers to changes in price of factors and products have been determined. However, the most important section of market lying between the producers and consumers, referred to as 'the marketing margin,' has been totally ignored (Abassian, 2010). Marketing margin is seen as the difference between price paid to the first seller and that paid by the final buyer. Margins depend considerably on the degree of processing. Margins tend to be higher for perishables like fruits and vegetables (Zulfiqar et al., 2005). The analysis of marketing costs and margins would reveal how efficient pricing in domestic markets is, and give an indication of the importance of transaction costs facing traders, farmers and intermediaries (middlemen) and help in identifying and solving bottlenecks and thus assist in reducing marketing costs (Sudan Integrated Food Security Information for Action (SIFSIA), 2011). To investigate the marketing margin thoroughly, it is better to divide it into two smaller portions of the Retailer Margin and Wholesaler Margin. The Wholesale Margin is the difference of the price at which wholesalers sell their product and the price which they pay to the farmers as they buy the product from them, and the Retailer Margin refers to the difference of the price at which the retailers sell the acquired products to the consumer and the price they pay to the wholesalers (Abassian, 2010).

It is in the light of this therefore that the study seeks to analyse the efficiency of marketing system of tomato in Pwalugu in the Upper East Region of Ghana. The study intends to generally do so by examining the margins that accrue to various players in the market as well as the structure of the market. This study contributes profoundly to knowledge by analysing the efficiency of marketing system of tomatoes in a relatively deprived locality like Pwalugu. It reveals the efficiency of the marketing system in the industry which will be useful to intermediaries and government in formulating policies that will provide ready market for tomatoes and reduce poverty and also policies that will strengthen the capacity of the tomato factory in Pwalugu. More importantly, since the study used farm level data rather than aggregate data, it provides important insights into the micro nature of production and marketing, which are usually not captured by aggregate data that largely ignore the behaviour of individual farmers as argued by Mkhabela (2005).

2. Research Methodology

2.1 Site selection and sampling procedure

Pwalugu is a community under the Talensi-Nabdam District in the Upper East Region of Ghana. The district shares boundaries with Bolgatanga Municipality to the north, to the south by the West and East Mamprusi Districts (both in the Northern Region), Bawku West District to the east and Kassena-Nankana District to the west. The climate of Pwalugu is classified as tropical and has two (2) distinct seasons; the rainy season which run from May-October, and the long dry season that stretches from October-April (Talensi-Nabdam District Assembly (MTDPR), 2007). Pwalugu is a rural community with majority of the people engaged in agriculture (small-scale farming, livestock and poultry production). Agriculture is mainly rain fed (May to October) followed by a prolonged dry season. Other commercial activities such as shea butter extraction, charcoal production, tomato processing, sand winning, fishing and 'pito' brewing exist in the community.

The research was carried out in Pwalugu due to the dominance of tomato cultivation in the area, and also due to the presence of a tomato processing factory in the community. A sample size of sixty-four market participants was selected. This comprised thirty (30) farmers, twenty-four (24) retailers and ten (10) wholesalers. The stratified random sampling was used by structuring the population into various strata. This ensured fair representation in a sample as heterogeneous as ours. The stratification involved three homogeneous groups of farmers, wholesalers and retailers. The simple random sampling method was used to select a specific number of respondents from each group based on their proportion in the market place. A semi-structured questionnaire was then administered to the sample to obtain primary data for analysis.

2.2 Data Analysis Techniques

The budgetary approach was used for the analysis. Specifically, Deconstructed Marketing Margins, Gini-Coefficient, Returns on Capital Employed and other marketing efficiency techniques were employed in assessing the efficiency of marketing system of tomatoes.

Marketing Margins: Following Abankwah et al. (2010), the Deconstructed Marketing Margin and the Return on Capital Employed (RoCE) were used for analysing the data. The Deconstructed Marketing Margin allows for the estimation of marketing margins and profit margins. The marketing margin (M_m) was computed as the difference between costs of purchasing tomatoes per year (C_t) and revenue derived from sale of tomatoes per year (R_t), given as:

$$M_m = \frac{\sum_{i=1}^{n}(R_t - C_t)}{N} \quad (1)$$

To at least break even, the revenue from the sale of tomatoes should encompass the cost of purchasing tomatoes, marketing cost (M_c) and traders' profit margin (P_m) as:

$$R_c = \frac{\sum_{i=1}^{n}(C_t + M_c + P_m)}{N} \quad (2)$$

Equations (1) and (2) give equation (3), as a model for deconstructed marketing margins along the market chain as:

$$M_m = \frac{\sum_{i=1}^{n}(M_c + P_m)}{N} \quad (3)$$

N is the number of market participants at each stage (say farmers, retailers or wholesalers). The marketing margin must cover costs involved in transferring produce (tomatoes) from one stage to the next and provide a reasonable return to those doing the marketing (Abbott and Makeham, 1990). Costs of marketing tomatoes are the transaction cost ($\mathrm{T_c}$), cost of working capital ($\mathrm{W_c}$), depreciation of fixed assets ($\mathrm{A_c}$), opportunity cost of trader's time ($\mathrm{O_c}$) and trader's profit margin ($\mathrm{P_m}$). Substituting these components in equation (3) yields a new equation stated as:

$$M_m = \frac{\sum_{i=1}^{n}(T_c + W_c + A_c + O_c + P_m)}{N} \quad (4)$$

Following from equation (2), profit margin is obtained as:

$$P_m = \frac{\sum_{i=1}^{n}[R_t - (C_t + T_c + W_c + A_c + O_c)]}{N} \quad (5)$$

The five equations allowed for the estimation of the marketing and profit margins, the various components of the marketing cost and their proportions of the marketing margins. The components of transaction cost are transportation cost, market tolls, packaging cost, taxes, and bribes.

Return on Capital Employed ($RoCE$) is given as the ratio of profit margin (P_m) to capital invested (C_i) expressed as a percentage:

$$RoCE = \frac{\sum_{i=1}^{n}((P_m/C_i)}{N} \times 100 \quad (6)$$

Capital invested is the combination of working capital and value of fixed assets. Returns to traders were compared to interest that they would have earned had they invested their capital in a fixed deposit savings at the bank. If the return on capital employed is lower than the returns on fixed deposit saving, it indicates that operations are at sub-optimal level which is not viable and vice versa (Abankwah et al., 2010).

Measure of Market Concentration: To assess the level of market concentration, the Gini Coefficient (GC) approach was used. Mathematically the Gini Coefficient is expressed as:

$$GC = 1 - \sum XY \quad (7)$$

where *X* = proportion of sellers, *Y* = cumulative proportion of sellers. The value of the Gini Coefficient ranges between zero and one. The higher the coefficient, the higher the level of concentration and an indication of high inefficiency in the market structure (Giroh et al., 2010).

Marketing Efficiency (M_e) Techniques: The marketing efficiency criterion is used to analyse how efficient the marketing system is in the tomato industry in Pwalugu. Mathematically, the marketing efficiency criterion is stated as:

$$M_e = 100 - \left(\frac{\text{marketing cost}}{\text{marketing margin}} \times 100\right) \quad (8)$$

The marketing efficiency estimates the financial marketing feasibility of executing any additional marketing services and a positive signed estimate would justify application of such services and a negative estimate will indicate otherwise (Abdou, 2004).

3. Results and Discussion

3.1 Distribution Channel of Tomatoes

The distribution channel of tomatoes consists of various players who handle tomato as it moves through the marketing system. The actors in the distribution chain of tomatoes in Pwalugu are farmers, wholesalers and retailers as represented in table 1.

Table 1: The Flow of Tomato Supply

Source of tomatoes	**Retailers**		**Wholesalers**		**NSTC**	
	Frequency	Percent	Frequency	Percent	Percent	%
Farmers	16	66.7	10	100	1	100
Wholesalers	8	33.3	0	0	0	0
Total	24	100	10	100	1	100

Field survey, 2011

From table 1, majority of retailers (66.7%) get their supply of tomatoes from farmers and the remaining 33.3% obtain theirs from wholesalers. All the wholesalers interviewed, like the Northern Star Tomato Company (NSTC), obtained their tomato supplies from farmers. This implied that farmers' profit margin is likely to be higher as the chain is shorter.

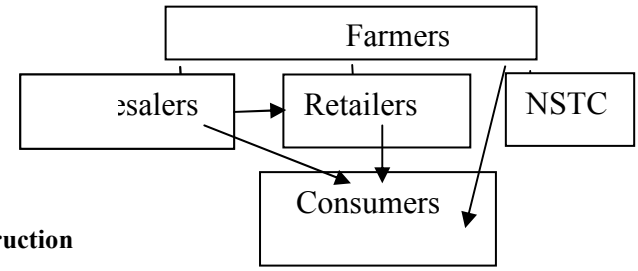
Table 2: Flow of Supply from Farmers to Various Actors

Actors	**Frequency**	**Percent**
Retailers	9	30.0
Wholesalers	8	26.7
NSTC	11	36.7
Consumers	2	6.7
Total	**30**	**100.0**

Field survey, 2011

From table 2, majority of the farmers (36.7%) sell their produce to the NSTC, with 30% selling to retailers, 26.7% to wholesalers and 6.7% supplying directly to consumers. The major forms of transportation in the tomato industry are trucks and donkey carts. Figure 1 shows the distribution channel of fresh tomato in the study area..

Figure 1 Channel of Distribution of Fresh Tomato



Source: authors' construction

3.2 The Efficiency of the Marketing System of Tomato Industry

The efficiency of the marketing system of the tomato industry was analysed using the Deconstructed Marketing Margins, Returns on Capital Employed, Gini Coefficient and the Marketing Efficiency Criterion.

Deconstructed Marketing Margins in the Various Channels

The marketing margins of farmers per annum as indicated in table 3 below was Gh₵ 24,293.0[2] with a profit margin of Gh₵ 21,888.7 representing 90.1% of farmers returns on labour per annum of the marketing margin.

[2] The yearly average interbank exchange rate for 2011 stood at USD 1 = Gh₵ 1.5606 (accessed from www.oanda.com on

Transaction cost, working capital, opportunity cost and depreciation constituted the marketing cost of farmers representing 9.9% of the marketing margin. Wholesalers on the other hand had a marketing margin of Gh₵ 249,284.0 and a profit margin of Gh₵ 110,060.7 representing 44.2% of marketing margin and marketing cost comprising transaction cost, working capital, opportunity cost and depreciation making 55.8% of marketing margin. Finally, retailers realized a marketing margin of Gh₵ 4,161.5 with a profit margin of Gh₵ 1,169.0 and a marketing cost of Gh₵ 2,992.5 representing 28.1% and 79.9% respectively. The results show that profit margins were relatively high in marketing tomatoes. The wholesalers and farmers recorded a high profit margin of 44.2% and 90.1% of marketing margins respectively with retailers recording the least profit margin of 28.1% of marketing margin. The profit margin for retailers is lower than the 40.0% found in a similar study in the Philippines by Alcos et al. (2001). The implication of the results is that from farmers to wholesalers through to retailers, tomato marketing is highly profitable. It is an effective means of getting the poor out of poverty since the annual profit margins are all above both local and international poverty lines. Consumers can also benefit more from the process if processing of tomatoes can be enhanced to stabilise prices during the off-season.

Table 3: Annual Revenue, Marketing Cost, Marketing and Profit Margins in Gh₵

Measures of marketing margin	Statistics				Percent
	Mean	Minimum	Maximum	Std. Dev.	
Farmers					
C_t	1,553.3	277.0	4,172.0	990.8	
R_t	25,846.3	2,040.0	54,000.0	13,460.1	
T_c	1,217.1	12.0	6,300.0	1,255.5	
W_c	403.9	100.0	900.0	227.5	
A_c	283.4	48.8	961.84	250.6	
O_c	500.0				
P_m	21,888.7				90.1
M_c	2,404.3				9.9
M_m	24,293.0				
Wholesalers					
C_t	302,756.0	86,400.0	576,000.0	174,630.6	
R_t	513,940.0	115,200.0	880,000.0	288,478.7	
T_c	7,374.9	3,744.0	352,100.0	97,458.5	
A_c	2,748.4	125.0	8,400.0	2,758.0	
O_c	1,000.0				
P_m	110,060.7				44.2
M_c	139,223.3				55.8
M_m	249,284.0				
Retailers					
C_t	10,491.7	1,680.0	32,400.0	8,097.1	
R_t	14,653.2	2,040.0	42,500.0	11,603.8	
T_c	1,075.3	128.0	5,472.0	1,256.6	
W_c	1,691.7	120.0	4,000.0	1,096.5	
A_c	25.5	4.3	53.0	14.0	
O_c	200.0				

23/08/12).

P_m	1,169.0	28.1
M_c	2,992.5	79.9
M_m	4,161.5	

R_t= revenue from tomatoes, C_t= cost of tomatoes, T_c=transaction cost, W_c= working capital, A_c= depreciation, O_c= opportunity cost, P_m= profit margin, M_m= marketing margin, M_c= marketing cost

Computed from Survey data, 2011

Economic Viability of the Marketing System

The economic viability of the marketing system was assessed using the returns on capital employed. The farmers had the highest returns on capital employed whereas retailers recorded the least. The capital invested by retailers was low with a mean value of Gh₵ 1,759.96 whereas the capital invested by farmers and wholesalers were Gh₵ 1,941.3 and Gh₵ 46,324.1 respectively (see table 4). The RoCE for farmers was 1,127.6% implying that farmers had 1,127.6% returns on their capital invested. Also, wholesalers recorded a RoCE of 237.59% representing 237.59% returns on their capital invested whiles retailers had 66.0% returns on capital invested. The RoCE for retailers in this study is higher than the RoCE of 40.0% found by Alcos et al. (2001) in the Philipines. Thus, contrary to the popularly held view that tomato production and marketing is risky, unproductive and invariably a 'suicide mission', this study reveals that the entire tomato marketing system is highly profitable. In fact, very few enterprises can yield comparable returns. The evidence on the ground regarding the high profitability of the tomato marketing system is reflected by many farmers and wholesalers who have built houses and bought commercial vehicles out of the tomato business.

Table 4: Returns on Capital Employed in Gh₵

Parameter	**Statistics**			
	Mean	**Minimum**	**Maximum**	**SD**
Farmers				
Capital invested	1,941.30	308.30	5,602.50	2,145.89
Profit margin	21,888.70			
RoCE	**1,127.6%**			
Wholesalers				
Capital invested	46,324.10	31,073.00	84,290.00	15,502.09
Profit margin	110,060.70			
RoCE	**237.6%**			
Retailers				
Capital invested	1,759.96	146.00	4,060.00	1,084.33
Profit margin	1,169.03			
RoCE	**66.0%**			

Computed from field data, 2011

Market Structure of the Tomato Industry

The Gini coefficient was used to determine the market structure of the tomato industry. The market structure analysis for farmers, wholesalers and retailers reveals a Gini coefficient of 0.68, 0.58 and 0.64 as computed in table 5. Since the coefficients are closer to one, the concentration of the market is relatively high indicating the existence of inefficiency in the market structure. The research further revealed that access to information was limited as wholesalers and retailers had inadequate information about the availability of tomatoes while farmers had little information regarding pricing. Also, price discrimination prevailed in the market as tomatoes were sold at different prices to different consumers at various parts of the market due to inadequate information by consumers, even though there exist free entry and exit in the market.

Table 5: Market Structure Analysis for Farmers, Wholesalers and Retailers

Annual sales GH₵	Number	Proportion (X)	Cumulative proportion	Annual sales GH₵	Prop. of cum. Total sales (Y)	XY
Farmers						
<20,000	11	0.37	0.37	123,982	0.14	0.05
20,000-40,000	10	0.33	0.70	272,040	0.32	0.11
>40,000	9	0.30	1.00	464,100	0.54	0.16
Total	**30**	–	–	**860,122**	–	**∑XY 0.32**
GC=1–∑xy,	**1– 0.32=0.68**					
Wholesalers						
<200,000	1	0.10	0.10	187,200	0.02	0.002
200,000–800,000	5	0.5	0.6	2,813,000	0.32	0.16
>800,000	4	0.40	1.00	5,764,000	0.66	0.26
Total	**10**	–	–	**8,764,200**	–	**∑xy=0.422**
GC=1–∑xy,	**1–0.422=0.58**					
Retailers						
<8,000	9	0.37	0.37	43,536	0.12	0.04
8,000–30,000	12	0.5	0.87	185,840	0.53	0.27
>30,000	13	0.13	1.00	122,300	0.35	0.05
Total	**24**	–	–	**351,676**	–	**∑XY=0.36**
GC=1–∑XY,	**1–0.36=0.64**					

Computed from field data, 2011

Analysis of the Financial Marketing Feasibility

The marketing efficiency criterion was used to analyse the financial marketing feasibility of executing any additional marketing services. A positive sign value indicates the application of additional marketing services and a negative value indicates otherwise. Since the results from the analysis show values of 28.09, 90.10 and 44.15 for retailers, farmers and wholesalers respectively (as can be deduced from table 3), it justifies the application of additional marketing services at all levels of the marketing chain. This corroborates the viability of the tomato marketing system as indicated by the RoCE, market margin and profit margin.

5. Conclusion

The study analysed the efficiency of tomato marketing system in Pwalugu in terms of structure, conduct and performance. Various measures of performance such as marketing margin, profit margin and return on assets all showed that the tomato marketing system is performing well. Profit margins in the marketing system of tomatoes for farmers, retailers and wholesalers were relatively high with wholesalers making the highest profits. Players in the tomato industry received higher returns from their capital invested. Our finding of a highly profitable tomato marketing industry in Pwalugu is contradictory to the views portrayed in the Ghanaian media. The results further revealed high market concentration and inefficiency in the market structure. With more investments by farmers, retailers and wholesalers in the industry, earnings will be boosted. Other entrepreneurs can also take advantage of the viability of the marketing system to create more jobs for the teeming unemployed youth. We also advocate for a module to be developed for tomato marketing and processing under the National Youth Employment Programme (NYEP).

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