

Farmers Profits: Can the Standard Weights and Measures Help?

Adwoa Oforiwa Antwi¹, Kenichi Matsui²

¹Graduate School of Life and Environmental Sciences, University of Tsukuba

²Faculty of Life and Environmental Sciences University of Tsukuba Ibaraki, Japan

Abstract—In Ghana, rural people, mostly farmers, experience food insecurity. In bargaining with marketers, farmers tend to lose profits. The use of traditional weights and measures led to inefficient transactions. These difficulties have negatively affected farmers' productivity, calories intake, and international competitiveness. This research investigates how standard weights and measures can secure farmers' profits at local markets. Using a random selection of 312 farmers for the questionnaire survey at two markets, we examine the impact of current pricing methods on farmers' profits and advantages of standard weights and measures for farmers. The results show that price decision-making was based on three primary methods: (1) traditional weights and measures, (2) negotiation with individual marketers, and (3) negotiation with market queens. Markets queens and traditional measures negatively influenced farmers' profits. Farmers' perceptions showed that standard weights and measures would not only increase their profits at local markets but also enhance their international competitiveness.

Keywords— Ghana, food security, local market, weights and measures.

I. INTRODUCTION

The number of people who suffer from food insecurity in Ghana has increased from 1.2 million in 2009 to 2.1 million in 2016 (FAO, 2017). Rural communities suffer the most. According to a World Food Programme report (WFPR, 2016), about 15.5% of people in Ghana's Brong Ahafo Region, which is mainly rural, are food insecure. Of what Brong Ahafo residents eat 36% comes from their own farms and 58% from local markets (WFPR, 2016). This means that local markets play important roles in ensuring rural farmer's food security.

Farmers in the Brong Ahafo Region face many difficulties to optimize their sales benefits at the market. Our earlier study (Antwi and Matsui, 2018) found that traders' ad hoc bargaining exploited the majority of farmers in this Region. Crop and vegetable prices were often determined by traditional weights and measures that traders preferred. Adejobi (2011) similarly found that traditional weights and measures at local markets created price inefficiencies. As a result, farmers who come to sell their products at market tend to distrust the market's pricing system (Pool et al., 2003).

This paper examines the extent to which standard weights and measures rather than traditional ones can secure profits for farmers in Ghana so that the country can reduce the number of its food insecure people in the future. In order to achieve the objective, we try to identify (1) current pricing practices at minor and major local markets, (2) effects of these practices on farmers' profits, (3) determinants of farmers' profits, and (4) farmers' perceptions about using standard weights and measures. In the following discussion, we first describe the significance of our study area. We then explain our methodology and discuss the results of our filed study and questionnaire surveys.

II. LITERATURE REVIEW

USAID (2013), noted that local markets in Africa are known for lower quality products due to lack of grading and packaging standards. Standardisation system helps farmers to identify quality levels by grade and package. In so doing, consumers are better informed about products at the local markets. Researchers showed that a standardized pricing at market ensures the efficient distribution of food to consumers, create employment opportunities for more farmers, provide competitive advantage in regional exports and increase farmer's profit margins (Adejobi et al., 2011; International Labour Organization, 2014).

The dominance of marketers at market over price determination has discouraged the participation of women and youths in agriculture (Feed the Future, 2017). Instead many tend to choose other trade options in developed countries despite the availability of government incentives that promote farming. Farmers in African countries, mostly smallholders, cover their production cost from the sales profit they obtain from selling their products. Therefore, securing optimal profits is critical for them to sustainably commercialize farming (Dolan and Humphrey, 2000).

In Ghana, local markets lack transparency (Lyon, 2003; Ortiz et al., 2010 and Yiridoe, 2005). Antwi and Matsui (2018) found that food prices at local markets were determined by the interplay of bargaining power and ad hoc weights/measures between farmers and marketers. The valuation of a fair return for farmers has resulted partly in price fluctuations and low profits. Other researchers found that price fluctuation at local markets posed challenges in the supply chain (Saurav and Neeraj, 2015). To solve such problems, trade associations headed by so-called “market queens” or market leaders were established in the 1970s to introduce some form of standards in price-fixing. However, these market queens upheld ad hoc traditional market transactions in a way that benefited their interests (Lyon, 2003; Ortiz et al., 2010). More recently, however, the Ghanaian government introduced the standard weights and measures partly to override the power of market queens and their intermediate partners. However, the effectiveness of this new policy is not yet observed at daily transaction practices at Ghana’s local markets (Antwi and Matsui, 2018; Yiridoe, 2005). So, the fundamental question is whether or not smallholder farmers in food insecure areas of Ghana and elsewhere can increase their profits from adopting standardized weights and measures. We found very little study on this question in our literature review.

III. METHODOLOGY

3.1 Study area

The survey was conducted in the Brong Ahafo Region. This region is known as the “food basket” of Ghana because most residents are farmers who raise important cash crops like cocoa, cashew, fruit trees, maize, rice, yam, and other vegetables (SADA, 2016). Using purposive sampling, two markets were selected from two municipalities: Berekum Market and Techiman Market.

Berekum Municipality is located in the north-western part of the Region. According to the Ghana population census of 2010, the municipality had a population of 129,628. The Ghana Statistical Service projected that the municipality population would reach 156,349 by the end of 2019, a 17% increase. More than half of the populations (129,628) were economically active and involved in agriculture, mostly growing tomato, plantain, maize, eggplant, pepper, okra, cassava, rice, and yam. Most farmers (83.5%) were literate (Ghana Statistical Service, 2012). Berekum Market operates on Thursdays when marketers and farmers within the boundary of Berekum Municipality and outside meet. Also, as this market is close to Cote D'Ivoire, Cote D'Ivoire buyers often come for acquiring tomato, garden-egg, pepper, plantain, cassava, maize, and many other farm products.

Techiman Municipality is situated in the central part of the Brong Ahafo Region with a population of 147,788, of which about 74.2% were economically active. About 46.2% was involved in agriculture, mostly cultivating tomato, eggplant, pepper, cabbage, okra, maize, and yam. About 74.2% of the residents in this municipality were literate (Ghana Statistical Service, 2012). Techiman Market is one of the largest markets in Ghana and operates three days a week (Monday to Wednesday). Monday and Tuesday are for wholesale crops, while Wednesday is for both wholesale and retail transactions. This market attracts people from other West African countries like Mali, Burkina Faso, Nigeria, and Niger as well as Ghana’s big cities like Accra and Kumasi.

These two municipality markets are important to rural farmers. Berekum Municipality Market is operated by those who live in Berekum and neighboring towns, while Techiman Municipality Market, an urban market, brings different tribes to trade. Traditionally Techiman Market is located on one of the major trading routes between the northern and southern boundaries of Ghana. It was the primary center for trading bulk foodstuffs such as yams, grains, and vegetables from north Ghana to urban markets in Accra, Kumasi, Takoradi, and CapeCoast.

3.2 Data collection and Analysis

The data collection for this research was primarily based on a semi-structured questionnaire to gather responses from farmers at the two markets. Our survey attempted to understand farmers’ perceptions about the benefits of traditional pricing and the prospects of having standard weights and measures (Lyon, 2000). It was conducted in the period between August and October 2018. In total, we collected valid responses from 312 farmers (165 from Berekum and 147 from Techiman). The response rate was 98%. Before conducting this survey, eight skilled enumerators were briefed to administer the questionnaire. The study was supervised with the collaboration of municipal information officers (MIS) in Berekum and Techiman. In the same period, we conducted in-person interviews with ten farmers, each from the two municipalities to seek their understanding of the questionnaire and personal experiences on the current pricing methods. We also undertook pre-survey observations at the two markets to familiarize ourselves with the area and observe how they transacted businesses.

The survey focused on three sets of questions: (1) socio-demographic characteristics of the respondents, (2) farmers’ current pricing practices and their profits, (3) farmers’ perceptions about standard weights and measures, including their motivating factors.

We assessed the performance of six current price-setting methods on farmers’ profits at market and factors influencing the use of standard weights and measures by using multiple regression analyses. The coefficient was identified to measure the strength of the relationship between variables. P-value (typically ≤ 0.05 and > 0.05) was used to determine the significance of the results and whether to accept or reject the null hypothesis.

IV. RESULTS AND DISCUSSION

4.1 Socio-demographic characteristics of the respondents

The first part of our survey asked the respondents about their age, education, gender, work experience, family size and farm size. These are important to identify relevant factors for our multiple regression analyses. The result shows that about 67% of our respondents were men (Table 1). Here it is important to note that in general men in Ghana dominate commercial farming activities. Regarding education, 63% of the respondents had formal training up to tertiary level, and 37% had no formal education. The majority (84%) were married with an average family size of six persons. Regarding age, the average age of the respondents was 42 years old with a minimum age at 22 years old and a maximum at 71 years old. This indicates an aging issue among local farmers. This tendency is similar in other parts of the country (Feed the Future, 2017; Okoffo et al, 2016). Our respondents had an average farm size of nine acres, and 14 years of trading experience at local market.

TABLE 1
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF FARMERS AT BEREKUM AND TECHIMAN MARKETS

Characteristics	% Response			
	Sex	Male	Female	
	67.1	32.1		
Education	None	Primary/JSS	Senior/Form 4	Tertiary
	36.5	45.2	16.6	1.6
Marital Status	Married	Single	Divorced	Widow
	84.9	7.4	4.8	2.9
	Descriptive Statistics			
	Min	Max	Mean	Standard Deviation
Age	22	71	42	8.9
Work Experience	1	50	14	8.3
Family size	1	15	6	3.1
Farm Size (acre)	0.5	40	9	13.6

4.2 Current pricing practices at Berekum and Techiman markets

To better understand current pricing practices among farmers at the two markets, we asked the respondents to select the methods they had used to set prices with multiple choices. Based on information we collected from local market authorities and our own field observation at these two markets, we listed six choices (Table 2). One of the options, which is unique in Ghana, is to negotiate with a market queen. According to Aguda (2009), market queens no longer influenced pricing at Ghana’s markets, but our earlier study found otherwise (Antwi and Matsui, 2018). So, we wanted to know how this traditional practice persisted. Other options we listed included negotiation with individual buyers, the use of ad hoc traditional measures (e.g., *olonka* as a unit that uses different sizes of empty cans as containers for vegetables like tomatoes), the use of standardized weights and measures, and negotiation with market and farmers’ associations.

The result shows about 96% of our respondents arbitrarily used varying sizes of traditional weights and measures. In our fieldwork, we observed that farmers in Berekum mainly used black buckets and baskets with different sizes for bulk trade or wholesale. For retail sales, they used calibrated tins or *olonkas*. At Techiman Market, people from northern Ghana used calabash and “koko bowls” in trading grains while those from south used buckets and baskets for vegetables and fish. About 62% of the respondents at Techiman Market negotiated with market queens and leaders of market associations while 68% dealt with individual marketers. These are the practices farmers complained about marketer’s unfair pricing practices.

In response to our question about the past use of standard weights and measures at the markets, about 81% of the respondents were negative. However, the respondents generally believed that standards would make pricing practices fairer. Additionally,

we interviewed farmers who traded cashew and cocoa at Techiman Market. They said they used standard weights and measures to keep track of their production and benefits at the end of the harvesting season. From the results we found that some farmers (39%) benefited from farmers' associations, especially at Techiman. These associations negotiate with market queens for member farmers. They also help the farmer's loan from banks and other financial institutions.

TABLE 2
FARMERS PRICING PRACTICES AT LOCAL MARKET

Pricing Method	Yes		No	
Negotiated with market queens	194	62%	118	38%
Negotiated with individual marketers	211	68%	101	32%
Used traditional weights and measures	299	96%	13	4%
Used standard weights and measures	58	19%	254	81%
Market associations	78	25%	234	75%
Farmers' association	122	39%	190	61%

4.3 The effects of traditional price setting on farmers

We then asked the respondents to indicate their level of agreement and disagreement with five provided statements about pricing practices. The results show that 67% of the respondents did not think that they would obtain a fair price for their products at local markets (Table 3). Similarly, 68% felt cheated at markets in the process of pricing their products. The respondents attributed this problem to the influence of marketers, market queens and a lack of standard weights and measures. Although negotiations allow farmers and marketers to decide on prices, farmers are sometimes forced to accept marketers' offers. Regarding unfairness at the market for farmers, 68% of our respondents said their profits did not increase by using traditional weights and measures.

TABLE 3
FARMER'S PERCEPTIONS ABOUT CURRENT PRICING

	Percentage of the respondents				
	Strongly Agree	Agree	Not sure	Disagree	Strongly disagree
Do you receive a fair price?	26	3	4	0	67
Do traditional weights optimize profits?	3	16	9	3	68
Has profit margin increased in last 5-10 years?	11	29	33	23	4
Is price negotiation beneficial?	20	20	7	18	36
Do price cheating occur?	68	0	0	0	32

4.4 Significance of current pricing on farmers' profits at local market

To understand the extent to which the current ad hoc pricing practices affected farmer's profits, we tried to find the relationship between farmer's profits and pricing practices through regression analyses (Table 4). Among the six methods of pricing we asked the respondents to identify, negotiations with market queens had the most significant P-value of 1.1E-11 and a coefficient of 0.298. This reiterates our earlier finding that market queens still have a strong influence on pricing activities at Berekum and Techiman markets despite the national policy to abolish their roles in the 1980s.

The multiple regression analysis result for the other pricing methods (negotiation with individual traders, traditional measures and markets associations) were significant at a P-value of 4.05E-8, 0.50 and 1.9E-5 respectively (Table 4). However, coefficient values for traditional measures and market associations were -0.128 and -0.048, a sign of negative relationship. These results indicate that the minimal usage of traditional measures and market associations' support can

increase farmer’s profits and help them make better price-decisions. Replacing ad hoc measures with standardized ones can minimize the influence of market queens. Institutional support rather than individual efforts ends to promote transparency and trust at local market.

TABLE 4
REGRESSION RESULT OF PROFIT DETERMINANTS

Factors	Profit	Negot. Queen	Negot. Individual	Traditional Measure	Standard Measure	Market Ass.	Farmer Ass.
Profit	.	.000	.000	.050	.000	.000	.000
Negotiate Queens	1.16E-11	.	.000	.270	.000	.000	.000
Negotiate Individuals	4.05E-8	.000	.	.011	.000	.000	.000
Traditional weights	.050	.270	.011	.	.031	.007	.036
Standard weights	4.1E-5	.000	.000	.031	.	.000	.000
Markets Associations	1.9E-5	.000	.000	.007	.000	.	.000
Farmer Association	2.6E-10	.000	.000	.036	.000	.000	.

4.5 Farmers’ perceptions about standard weights and measures

Having these results, we tried to understand farmers’ perceptions about the use of standard weights and measures. We asked farmers to answer the extent to which they agreed or disagreed with four possible results from the use of these standards (Table 5). We found that about 89% of the respondents strongly agreed that the use of standards could improve their profits. More than half (60%) of the respondents perceived that standard weights and measures would motivate them to increase their production. Also, almost all the respondents strongly agreed or agreed that standard weights and measures would better inform marketers and consumers about their products (Table 5). Lastly, about 69% of our respondents strongly agreed or agreed that the use of standard weights measures would help compete with the supermarket and international trade.

TABLE 5
FARMERS’ PERCEPTIONS ABOUT THE BENEFITS FROM USING STANDARDS

	Percentage of respondents				
	Strongly Agree	Agree	Not sure	Disagree	Strongly disagree
Standards would improve my profit	89	0	0	0	11
They better inform about products	50	31	16	3	0
They help compete with supermarkets	46	23	20	7	4
They encourage to increase production	60	0	0	0	40

4.6 Factors influencing the use of standard weights and measures

Ghana has formulated a policy that imposes the use of standard weights and measures at all local markets. As this policy is not yet fully implemented, we tried to identify factors that can influence the implementation. In particular, we tried to find out how our respondent’s age, education, farm size, and experience can influence the level of policy implementation. The multiple regression analysis results showed that farm size, age, education, and farming experience were significant at a P-value of 5% (p<0.05). However, the coefficient values for education and experience showed negative. This indicates that inadequate training and information on the use of standard weights and measures may affect farmer’s usage and price decision-making (Table 6).

TABLE 6
REGRESSION ANALYSIS OF FACTORS INFLUENCING STANDARD WEIGHT AND MEASURE

Factors	Standard weight	Age	Education	Experience	Farm size
Standard weight	.	.021	.183	.361	.000
Age	.021	.	.423	.043	.000
Education	.183	.423	.	0.05E-3	.050
Experience	.361	.043	0.05E-3	.	.001
Farm size	1.67E-17	0.04E-4	.050	.001	.

V. CONCLUSION

Inefficient and opaque transaction practices at Ghana's local markets directly or indirectly affect the current rise in food secure people in rural Ghana. Market queens continue to influence the pricing system. This led to the loss of farmers' profits and limited farmers' purchasing ability. Also, traditional market price negotiations led to the loss of farmers' profits. Farmers were well-aware of these conditions as about 67% of our respondents found that they did not receive a fair price for their products, and 68% felt cheated in negotiation. They did emphasize the importance of having standard weights and measures to decide on prices. These farmers appear to be ready to adopt standard weights and measures as they believed that these standards would better inform marketers and consumers about products, allowing them to better compete with supermarkets and international markets. The respondents also believed that these standards would incentivize further production, potentially revitalizing aging agricultural sector. For the Ghanaian government to successfully implement its market standardization policy it needs to better inform farmers and marketers about benefits standard weights and measures can bring.

REFERENCES

- [1] Adejobi, A.O., Babatunde, R.O., and Idowu, E.O. (2011). Weight and measurement issues in retail marketing of fresh tomatoes: Evidence from Osun State, Nigeria. *Journal of Agricultural and Biological Science*, 6 (4): 1990-6145.
- [2] Antwi, A.O. and Matsui, K. (2018). Price Perception on weights and measures at the local markets of Ghana. *Kasetsart Journal of Social Sciences* <https://doi.org/10.1016/j.kjss.2018.01.011>.
- [3] BMA (2013). Berekum Municipal Assembly Medium –Term Development Plan. BrongAhafo Region.
- [4] Dennis, C., and Peprah, E. (1995). Coping with transition through organization Techiman Market, Ghana. *Gender & Development*, 3(3), 43-48.<https://doi.org/10.1080/741921862>
- [5] Dolan, C., & Humphrey, J. (2000). Governance and trade in fresh vegetables: the impact of UK supermarkets on the African horticulture industry. *Journal of development studies*, 37(2), 147-176.
- [6] FAO (2017). Regional Overview of Food Security and Nutrition in Africa 2017. The food security and nutrition–conflict nexus: building resilience for food security, nutrition, and peace. Accra.
- [7] Feed the Future (2017, October 30). *Making Agriculture Cool Again for Youth in Africa*. The U.S Government's Global Hunger & Food Security Initiative. Retrieved January 17, from <https://www.feedthefuture.gov/article/making-agriculture-cool-again-for-youth-in-africa/>.
- [8] Ghana Statistical Service (GSS). (2012). 2010 population and housing census: A summary report of results. Retrieved from http://www.statsghana.gov.gh/pop_stats.html.
- [9] Lyon, F. (2003). Trader associations and urban food systems in Ghana: Institution list approaches to understanding urban collective action. *International Journal of Urban and Regional Research*, 27, 11–23.<https://doi.org/10.1111/1468-2427.00428>
- [10] Lyon, Fergus (2000) Trust and power in farmer-trader relations: a study of small scale vegetable production and marketing systems in Ghana, Durham theses, Durham University. Available at Durham E-Theses Online: <http://etheses.dur.ac.uk/1474/>.
- [11] Negi, S., & Anand, N. (2015). Issues and challenges in the supply chain of fruits & vegetables sector in India: a review. *International Journal of Managing Value and Supply Chains*, 6(2), 47-62.
- [12] Ortiz, N. C. M., Campbell, C., & Hyman, B. (2010). Analyzing Market Reforms and Food Distribution Systems in Accra, Ghana: Lessons and Implications for Reforming the Bazarito Market of Cartagena, Colombia, Massachusetts Institute of Technology, Department of Urban Studies and Planning Case Study. *Massachusetts Institute of Technology Department of Urban Studies and Planning*.
- [13] Poole, N., Seini, W.A., and Heh, V. (2003). Improving Agri-Food Marketing in Developing Economies: Contractual Vegetable Markets in Ghana. *Development in Practice*, 13(5), 551-557. <https://www.jstor.org/stable/4029943>.
- [14] USAID (2013). The Fresh Fruit and Vegetable Markets of East Africa. http://d3n8a8pro7vhmx.cloudfront.net/eatradehub/pages/83/attachments/original/1378732967/FFV_Markets_of_East_Africa_final_approved_and_compressed_July_17_2013.pdf?1378732967. Retrieved 30 July, 2019.
- [15] World Food Programme (WFP) (2016). Emergency Food Security and Market Assessment in Ghana. <https://documents.wfp.org/stellent/groups/public/documents/ena/wfp287333.pdf>.
- [16] Yiridoe, E. K. (2005). A problem ignored: The role of a weights and measures system in food security in Africa. *Outlook on Agriculture*,34(4), 233e241.<https://doi.org/10.5367/000000005775454715>.