Choice of marketing outlets among smallholder cowpea farmers in Ghana

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Abstract

Purpose – To help address the problem of imperfections in the performance of cowpea markets in Ghana, the study sought to understand the costs and benefits associated with different market outlets and factors influencing farmers' choice of these outlets.

Design/methodology/approach – A two-stage sampling technique was adopted to collect data from 300 cowpea farmers through purposive sampling of communities and simple random selection at the farmer level in Ejura Sekyedumasi municipality of Ghana. Analytical methods including profitability measures such as gross margin, net margin, return on investment and multinomial logistic (MNL) regression model were used to analyze the data.

Findings – The results showed that production and marketing of cowpea is profitable with farmers who trade in wholesale markets recording the highest gross margin (Gh₵1245.85 (US$227.76)), net margin (Gh₵1029.37 (US$188.18)) and return on investment (ROI) of 63%. Important nonfarm-related factors including household size, farming experience, membership of farmer-based organization and extension contact were found to significantly influence the choice of marketing outlets in the study area. In addition, market attributes such as produce selling price, volume of cowpea sold and post-harvest value addition were also key determinants of cowpea market outlet choices.

Practical implications – The results of the study are vital to agricultural administrators in devising efficient cowpea market systems for smallholder farmers in Ghana. Likewise, the study provides important information to smallholder farmers in the choice of market outlets that maximizes their returns.

Originality/value – Previous studies on marketing of cowpea in Ghana emphasized on direct retail or consumer marketing to maximize farmers' returns. Meanwhile, there are claims to suggest that the sale of cowpea grains in the country are carried out through varied market outlets which come with differing costs and benefits implications for smallholder farmers. Therefore, the present study comprehensively compared associated costs and benefits in all available cowpea market outlets so as to settle the confusion surrounding most profitable and efficient marketing channel for smallholder farmers toward poverty reduction.

Keywords Profitability, Poverty reduction, Cowpea, Smallholder farmer, Market outlets

Paper type Research paper

Introduction

Cowpea (*vigna unguiculata*) is one of the oldest leguminous crops domesticated in human history (Egbadzor *et al.*, 2013). The crop contributes significantly to food security and overall

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economic well-being of rural economies in sub-Saharan Africa (Langyintuo *et al.*, 2003). Besides serving as an important source of protein and micro-nutrients, production of cowpea is also a major source of income for vulnerable households in sub-Saharan Africa (Adeola *et al.*, 2011). In Ghana, cowpea is predominantly cultivated in the five regions of the North (Wahaga, 2019). However, the savannah zones of Brong Ahafo, Eastern, Volta and Ashanti regions are also important producing zones. The total area under cowpea cultivation was 162,000 ha in 2013 which declined to 159,345 ha in 2018. However, the total output increased from 200,000T to 215,350T, respectively (FAOstat, 2020).

The economic impact [1] of cowpea production in Ghana is low (Wahaga, 2019), which is partly attributed to marketing inefficiencies (Srinivas *et al.*, 2014). The cowpea system is characterized by smallholder farmers who cultivate less than 2 ha of farmland but are responsible for more than 80% of domestic supply (Awunyo-Vitor *et al.*, 2013). The farmers produce in smaller quantities; they have no formal relationship with traders and are also disorganized (Antenneh *et al.*, 2011). As a result, the Ghanaian cowpea market is imperfect with high transaction costs from searching costs, risk and uncertainties and information asymmetry (Adams *et al.*, 2020). Farmers are also unable to exploit economies of scale due to the smaller nature of farm holdings, all things being equal (Djalalou-Dine *et al.*, 2015). Further, in spite of the existence of a national food buffer stock company (NAFCO) for information flow and provision of storage facilities to farmers, Armah *et al.* (2019) observed significant imperfect environment in the marketing of cereals and other crops in Ghana. To partly address this problem of imperfections in the performance of cowpea markets, the study sought to understand the costs and benefits associated with market outlets and factors influencing farmers' choice of market outlets in Ghana. Thorough understanding of these issues is relevant to guide policy design for improved cowpea market performance in the country.

Smallholder farmers' participation in efficient market systems is a fundamental component of an enhanced agricultural-based economy for food security among rural households (Food and Agriculture Organization (FAO), 2011). However, an important agricultural market segment that is frequently mentioned but has attracted less attention in practice and literature is market outlet choices (Kassaw *et al.*, 2019). Market outlets represent the first exit points through which value chain actors dispose their products in the supply chain. Therefore, the concept of agricultural market outlet choices relates to the process in which farmers decide to sell their agricultural products in different market outlets (Djalalou-Dine *et al.*, 2015). An efficient and profitable market outlet provides motivation for smallholder farmers to increase output and expand subsistence farming into commercial production, thereby helping to reduce poverty (FAO, 2015). Further, an appropriate market outlet has the tendency to positively influence farmers' decisions to adopt agricultural technology for higher income (Nyarko, 2016).

In Ghana, the agricultural market system for cowpea is open with numerous market outlets including wholesalers, commission agents, cooperative societies and retailers (Nyarko, 2016). These outlets, besides direct trading with retailers, are controlled by agricultural middlemen who act as intermediaries between farmers and consumers to purposefully convey cowpea grains and ensure value creation in a form desired by consumers. However, the activities of these value chain actors have been criticized to include unnecessarily stretching the supply chain, inhibiting the development of an effective system while depriving farmers of fair earnings. Therefore, direct marketing, which shortens the producer's marketing chain are highly prioritized and recommended for higher producers' marketing margin (Hardesty and Leff, 2010). For instance, previous studies (Aidoo *et al.*, 2012; Frimpong *et al.*, 2015) in an assessment of the legume marketing system in Ghana advocated for the use of direct retail marketing. The authors argued that direct trading with retailers will eliminate intermediary actors whose activities only elongate the value chain and disadvantage farmers in terms of income earnings. Though direct marketing may offer higher prices, farmers could also be faced with higher marketing and transaction costs such as packaging, transportation and grading

costs. Searching costs could also be high in direct marketing which may prolong sales periods. In such situations, crop deterioration could be high leading to loss in value and reduction in farmers' income as cowpea grains are susceptible to pest and insect attack (MoFA, 2012).

The various cowpea market outlets in Ghana have different costs and benefits' implications for smallholder farmers. However, the emphasis on direct retail marketing to maximize farmers' returns without comprehensively understanding the associated costs and benefits in other alternative market outlets raises a fundamental research question: *Does direct retail marketing offer the highest profit margin to cowpea farmers*? The primary objective of this study therefore was to estimate and compare associated costs and benefits in direct market outlets with alternative outlets in the Ejura-Sekyedumase municipality of Ghana. In addition, factors that influence cowpea farmers' decision to participate in a particular outlet are also investigated. The results of the study are vital to agricultural administrators in devising efficient cowpea market systems in Ghana and elsewhere in sub-Saharan Africa. Second, the result makes an important contribution to the limited cowpea literature in Ghana which is restricted to agronomic issues and abstracts on the marketing segment of the crop. The remainder of the paper is organized as follows. First, the research methods and analytical methods are presented in section two. Section three is devoted to result and discussions. Appropriate conclusions and recommendations are presented in section four.

Methodology

The study was carried out in the Ejura-Sekyedumase municipality of Ashanti region in Ghana. The municipality has a vegetation that mirrors the topographic and climatic conditions of savannah grasslands in the north and the sparse deciduous forest to the south. Rainfall is bi-modal which varies between 1,200 and 1,500 mm. The dominant occupation is agriculture which employs more than 60.2% of the labor workforce in the area. Nearly 97.4% of the agricultural households engage in crop farming with maize and cowpea [2] being the major cultivated staple food crops. In terms of cowpea production, the district is ranked among the top 10 producing districts in the Ghana (Ghana Statistical Service (GSS), 2013).

The study uses both qualitative and quantitative research designs. The adoption of the mix method helps to improve data reliability and validity through data triangulation. Qualitative methods such as focus group discussion and key informant interviews were used to assess respondents' perceptions on challenges in cowpea marketing. In each community, six farmers were randomly selected for focus group discussions, while key informants including agricultural officials, chairpersons of farmer-based organizations (FBOs), and selected traders were interviewed using an interview guide. Meanwhile, a structured questionnaire was developed to solicit for quantitative data on costs, prices, farm-related and non-related data. Prior to actual data collection, the questionnaire was pretested on 10 cowpea farmers in one community. The resulting data were analyzed and used to refine the main questionnaire before actual administration.

A two-stage sampling technique was adopted to select 300 cowpea farmers in the municipality. In stage one, five communities were purposively selected based on significant contribution to cowpea production in the area (Awunyo-Vitor *et al.*, 2013). Stage 2 comprises a simple random selection of the 300 cowpea farmers based on a sample frame obtained from the Department of Agriculture of the municipality. Equal number of respondents representing 60 [3] farmers from each community were selected for the study.

Analytical approach

Descriptive statistics, multinomial logistic regression, gross margin (GM), net margin (NM) and return on investment (ROI) were used to analyze the data.

GM is the difference between total revenue (TR) and the total variable cost (TVC), while in NM, fixed costs (FC) are considered in the cost determination.

Mathematically, the GM and NM are specified as:

$$\text{GM} = \text{TR}–\text{TVC}$$

$$\text{TR} = P \times Q$$

$$NM = TR–(\text{TVC} + \text{TFC})$$

where, TR = total revenue/hectare (Gh¢), P = unit price (Gh¢), Q = volume/quantity of cowpea (kg).

ROI which is the ratio of returns to costs is also expressed as;

$$\text{ROI} = \frac{\text{Net Income}}{\text{Investment cost}} \times 100\%$$

Model specification

The theoretical basis to investigate choice behavior of cowpea producers is consistent with the random utility (RU) theory (Greene, 2003). The theory states that when an economic agent is confronted with a choice, the agent chooses an option that maximizes his/her utilities (Greene, 2003). The likelihood that the decision-maker (i.e. cowpea producer) chooses an alternative (e.g. retail outlet) can be investigated as a function of his personal characteristics and other exogenous factors. The likelihood that individual n chooses alternative i, P_{ni}, is expressed as:

$$P_{ni} = \text{Prob}\,(\text{individual } n \text{ chooses alternative } i) = G(x_{ni}, x_{nj}\gamma_j \neq i,\ s_{n,}, \beta) \tag{1}$$

where x_{ni} is a vector of attributes of alternative i faced by individual n, $\gamma_j \neq i$ is a vector of variables associated with alternatives (other than i) faced by individual n, s_n is a vector of characteristics of individual n, and β is a set of estimated parameters.

Although the utility of individuals is not directly observed, their actions are observed by the choices they make. Assuming Y_j and Y_k signify a household's utility for two alternatives, denoted by U_j and U_k, respectively. The corresponding random linear utility model may be specified as:

$$U_j = \beta_j^{'} X_i + \varepsilon_j \quad \text{and} \quad U_k = \beta_k^{'} X_i + \varepsilon_k \tag{2}$$

where U_j and U_k denote perceived utilities associated with participation in alternative (j) and alternative (k), respectively; X_i represents the vector of independent variables that influences the desirability of the alternative; β_j and β_k are regression parameters to be estimated and ε_j and ε_k are disturbance terms (or unobserved effects) assumed to be independently and identically distributed (Maddala, 2001).

Various econometric models [4] are used to analyse individuals' choice behavior depending on the measurement of the response variable and distribution of residuals (Maddala, 2001). The MNL model is adopted for this study because it does not pose any challenge in computing multivariate normal probabilities as compared to other choice models. In this study, the choice of the market outlets is categorized to be mutually exclusive such that no one producer has the tendency to belong to two or more groups. The assumption of independence of irrelevant alternatives (IIA) that states that the odds in each outcome are mutually exclusive is tested to ensure that coefficients are consistent and efficient.

The empirical MNL used is of the form;

$$\log \frac{\Pr(Y=j)}{\Pr(Y=j^*)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \mu \tag{3}$$

where j represents a given category (i.e. wholesalers, retailers, commission agents or a combination of market (ACM) of outlets), and j^* is the reference category. Retailer outlet is considered as the reference category. In addition, β_0 is the intercept, and $\beta_1 - \beta_{11}$ are parameters to be estimated and μ is the error term. The predictor variables x_1 to x_{11} are defined in Table 1.

Result and discussions

Descriptive analysis

The data in Table 2 show a majority of the respondents are males, which concurs with the finding of the 65% observed by Awunyo-Vitor *et al.* (2013) in the same study area. Likewise, 73% of the respondents are married which denotes extra labor for cowpea farming activities. This result is similar to the 87.1% reported by Nimoh and Asuming-Brempong (2012) for cowpea farmers in the Akatsi district of Ghana. The low FBO [5] membership of 26% among the respondents has negative implications for accessing production and marketing information. However, the high rate of 50% of respondents engaged in nonfarm income activities may imply an extra source of income that could be used to supplement household livelihood needs and also purchase production inputs for cowpea production. It is, therefore not surprising that the majority (54%) of the respondents are within the annual income bracket of Gh₵1,001 [6] to Gh₵5,000. The respondents are highly experienced, as shown by the mean farming experience of 11 years with farmers in the wholesaler and commission agent outlets being the dominant. The respondents' age of 42 years denotes youthful exuberance in the cowpea business and an opportunity to improve productivity since studies have established a strong correlation between young people and adoption of technologies. The average household size of eight persons is the same as observed by Aidoo *et al.* (2014) for tomato farmers in the Offinso district of Ghana. The relatively larger household size may imply additional labor availability for cowpea production. The low literacy rate of 3.65 years of formal education is consistent with the national figure of five years as reported by Awunyo-Vitor *et al.* (2013) for cowpea farmers in Ghana. This finding has negative implications for the adoption of improved technologies for higher productivity (Bongiwe and Micah, 2013). Similarly, the average annual extension contact of three times per annum is low

Variable	Description	Measurement	*A-priori* expectation
AGE	Age of household head	Years	+
EDU	Years of schooling of household head	Years	+
GEN	Gender of the household head	1 = male, 0 = female	–
FSIZE	Farm size	Hectares	+
EXPE	Experience of the household head	Number of years in cowpea production	+
EXT	Extension contact	Frequency of contact	+
HSIZE	Household size	Number of active labor	–
QTY	Quantity of cowpea sold	Kilograms	+
PRICE	Selling price	Ghc	–
VALUE	Extent of post-harvest value addition	1 = High, 2 = moderate, 3 = low	–
ACCR	Access to credit	Ghc	+
ACMKT	Access to market information	1 = High, 2 = moderate, 3 = low	–
FBO	Access to farmer-based organization	Frequency of attending	+

Table 1.
Definition of variables and hypothesis

Variable	Pooled sample (300)	Wholesaler outlet (81)	Retail outlet (129)	Comm. Agent outlet (60)	ACM (30)	KW- H value
(a) Discrete variables (percentages)						
Gender						
1 = Male	70	76.5	58.9	55	80	6.315*
0 = Female	30	23.5	41.1	35	20	
Marital Status						
Single	12	10	14	12	13	1.721^{ns}
Married	73	78	72	78	57	
Widowed	4	1	5	0	10	
Divorced	11	11	9	10	20	
0 = No	31	28	35	25	30	
Non-farm income						
Private own non-farm business	41	26	50	43	40	10.619**
Salaried/Paid worker	9	9	9	8	13	
None	50	65	41	48	47	
Member of FBOs						
1 = Yes	26	26	22	43	7	9.444**
0 = No	91	74	78	57	93	
Household income size						
Less than Gh₵1,000	8	4	13	3	3	28.312***
Gh₵1,001–5,000	54	41	64	60	33	
Gh₵5,001–10,000	30	43	19	32	43	
Gh₵10,001–15,000	7	11	2	3	20	
Above Gh₵ 15,001	1	1	2	2	0	
(b) Continuous variables						*F-value*
Age in years	42	41	38	50	42	20.50***
Household size in numbers	8	9	8	8	8	0.02^{ns}
Years of formal education	3.65	3.96	3.43	3.08	4.9	1.73^{ns}
Years of farming experience	11	14	9	11	12	10.03***
Amount of credit granted in Gh₵/ha	48	94	16	53	50	1.72^{ns}
Frequency of extension contact	3	3	2	4	1	2.87**

Note(s): *** Indicates significance at the 1% level, ** at the 5% level and * at the 10% level. KW indicates Kruskal-Wallis

Table 2.
Summary statistics of demographic characteristics

given the recommended extension contact of 5–10 times per annum across sub-Saharan Africa (Bonye *et al.*, 2012). This result may also negatively affect technology adoption since extension officers are responsible for the dissemination and promotion of improve technologies in developing economies. Likewise, the small amount of credit accessed (Gh₵48.00) may also have negative impact on technology adoption because majority of the farmers are poor who may be unable to purchase improved inputs to expand cowpea farming business.

Cost components	Market outlets				
Variable costs	Wholesaler	Retailers	Commission agents	ACM	Pool data
Inputs					
Seeds	147.75	148.39	145.1	151.53	148.193
Pesticides	48.43	49.39	37.14	51.4	46.59
Weedicides	26.2	28.39	28.77	31.97	28.8325
Ploughing	213.22	211.17	202.06	213.17	209.905
Total input cost (A)	*435.60*	*437.34*	*413.07*	*448.07*	*433.52*
Labor					
Planting	88.2	91.17	91.37	95.63	91.5925
Weeding	46.34	50.07	47.85	47.35	47.9025
Harvesting	213.78	211.07	221.39	213.36	214.9
Land clearing	213.22	48.67	202.06	213.17	169.28
Chemical application	45.36	48.68	49.06	48.93	48.0075
Threshing	209	214.05	214.58	213.17	212.7
Total labor costs (B)	*815.9*	*663.71*	*826.31*	*831.61*	*784.383*
Total variable cost ($A + B = C$)	1251.5^{1}	1101.05^{1}	1239.38^{1}	1279.68^{1}	1217.903
Marketing costs					
Transportation	40.05^{1}	46.13^{2}	0.00^{3}	49.5^{4}	44.67**
Storage	3.56^{1}	1.94^{2}	0.00^{3}	1.71^{4}	2.805***
Sacks	30.09	35.74	28.72	28.57	30.78
Packaging cost	38.94^{1}	39.71^{2}	30.52^{3}	35.43^{4}	36.15*
Marketing toll/tax	40.11^{1}	30.56^{2}	0.00^{3}	36.23^{4}	36.40**
Postharvest losses	3.76	4.88	3.24	3.88	3.94
Total marketing cost (D)	*156.51^{1}*	*158.96^{2}*	*62.48^{3}*	*155.32^{4}*	*154.753**
Total variable and marketing costs ($C + D = E$)	1408.01^{1}	1260.01^{1}	1301.86^{1}	1435^{1}	1372.66
Fixed costs					
Rent on land	128.17	125.23	123.12	120.17	124.17
Depreciated items					
Hoe	12.15	9.77	9.45	10.85	10.55
Cutlasses	14.08	12.7	12.63	12.55	13.04
Knapsack sprayer	62.07	58.11	57.84	56.43	58.62
Total fixed costs (F)	216.48^{1}	205.90^{1}	203.06^{1}	200.00^{1}	206.36
Total production and marketing cost ($E + F = G$)	1624.49^{1}	1465.91^{2}	1504.86^{3}	1635^{4}	1579.02

Note(s): **Means across the rows with different superscripts (1, 2, 3 and 4) are significantly different at $p < 0.05$ level on one-way ANOVA test of means. Exchange rate: US$1 = Gh¢4.7

Table 3. Production costs (Gh¢) per hectare of cowpea among marketing outlets

Cost of cowpea production

The total cost of producing a hectare of cowpea is decomposed into variable, marketing and fixed costs (Table 3). The variable costs (VC) are based on recurrent inputs such as seeds, pesticides, weedicides, ploughing and labor costs. Cowpea farmers employ either hired or family labor to carry out important agronomic practices, including planting, chemical application, harvesting, land clearing and threshing of grains. The data show an average VC of Gh¢1,217.93 which does not vary across the market outlets. However, the marketing costs incurred across the outlets were different and statistically significant at 5% level. The differences are attributed to lower marketing costs of Gh¢62.48 incurred for farmers in the commission agents' outlets. An in-depth focus group discussion revealed that all marketing activities except packaging and sack costs are liabilities of the commission agents in this outlet. Overall, it can be inferred that farmers in the

retail outlets incurred the highest marketing costs (Gh₵158.96) which is indicative of high transaction costs with negative implication on profitability.

The total fixed costs were calculated from rent on land, depreciated fixed assets including hoes, cutlass and knapsack sprayer. The data show no significant difference in the cost of fixed items incurred by all farmers across the market outlets. Perhaps, the land tenure system practiced in the study area may have influenced this finding. The land tenure system in the Ejura-Skyedumase municipality is quiet developed with standardized renting rates for all farmers with little variations. As a result, the choice of a market outlet is not likely to be influenced by fixed costs incurred in cowpea farming.

Overall, the total production and marketing costs of a hectare of cowpea farm is Gh₵1,579.02 of which 50% is attributed to labor costs. The finding provides credence to the fact that cowpea production is a labor-intensive venture for smallholder farmers in Ghana. Such a high manual dependency may negatively affect profitability and the scale of farm operation, thereby limiting farmers' ability to transform peasant farming systems into a commercialized agricultural system. Thus, strategies to mechanize the production process would be appropriate to raise farmers' income and reduce poverty in the study area (Hardesty and Leff, 2010). Across market outlets, farmers who have no market outlet preferences (Gh₵1635) have the highest production and marketing costs followed by wholesaler outlets (Gh₵1624.49), commission agent outlets (Gh₵1504.86) and lastly, retailer outlets (Gh₵1465.91).

Revenue and profit analysis

The total revenue from producing a hectare of cowpea was determined as the product of selling price and the quantity sold (Table 4). The significant difference in the total revenue across the market outlets is as a result of higher quantity of cowpea sold in the wholesale outlets. This finding appears to support previous studies (Kassaw *et al.*, 2019) which suggest that wholesale traders often buy in large quantities and as a result they engage farmers who have the capacity to produce in such capacities for marketing. Even though the data show a higher selling price for retail outlets, farmers in the wholesale outlets recorded the highest total revenue (Gh₵2653.86) mainly due to the larger quantity of cowpea grains produced per hectare. The highest price paid in the retail outlets agrees well with Aidoo *et al.* (2012) who observed that legume farmers who patronized retail outlets receive higher prices compared with alternative outlets. However, it appears, during in-depth focus group discussions that the low selling prices received by farmers in the commission agents and wholesaler outlets compensates for production and financial assistances provided by the traders. The respondents indicate that

Component	Wholesaler	Retailer	Commission agents	ACM	Pool data
Revenue					
Quantity of cowpea sold (kg/ha)	1206.3[1]	892[2]	1015.9[3]	891.4[4]	1009.7**
Price/Kg	2.2[1]	2.42[2]	2.06[3]	2.4[4]	2.27**
Total revenue (*H*)	2653.86[1]	2158.64[2]	2092.75[3]	2139.36[4]	2292.02**
Less total variable and marketing cost (E)	1408.01[1]	1260.01[1]	1301.86[1]	1435[1]	1372.66
Gross margin (*H–E = I*)	1245.85[1]	898.63[2]	790.89[3]	704.36[4]	919.36**
Less fixed cost (F)	*216.48*	*205.9*	*203.06*	*200.00*	*206.36*
Net margin (*I–F = J*)	1029.37[1]	692.73[2]	587.83[3]	504.36[4]	713.007**
ROI ((*J*/*G*)*100)	63%	47%	39%	31%	45%

Note(s): **Means across the rows with different superscripts (1, 2, 3 and 4) are significantly different at $p < 0.05$ level on one-way ANOVA test of means. Exchange rate: US$1 = Gh₵5.47

Table 4.
Revenue and profit (Gh₵) per hectare of cowpea among marketing outlets

"*in many instances, prices are set during pre-harvest, which may not reflect current prices on the market*" because of an established informal working relationship between the traders and the farmers. In return, farmers under such informal agreement enjoy financial and managerial assistances so as to increase crop production and productivity. It was, therefore, unsurprising to see farmers who trade in the wholesale outlets (1206.3kg/ha) and commission agent outlets (1015.9kg/ha) having the highest cowpea productivity per hectare.

According to Table 4, farmers who opted for the wholesale outlet had the highest GM of Gh₵1,245. 85 with the pooled sample recording Gh₵919. 36. The significant variation of the GM across the outlets is attributed to the higher revenue in the wholesale outlets. Similarly, farmers who trade in the wholesale outlets had the highest NM (Gh₵1,029.37), closely followed by retail outlets (Gh₵692.73). Farmers with ACM outlets (Gh₵504.36) had the last NM after commission agent outlets (Gh₵587.83). The highest GM for the wholesale outlets compared with alternative outlets disagrees with Antenneh *et al.* (2011) who reported higher GM for coffee farmers in a combination of outlets in Ethiopia. Likewise, Frimpong *et al.* (2015) observed higher profitability for soybean farmers who patronized retail outlets against counterpart outlets in Ghana. Perhaps the difference between the findings of this current and the previous studies may be partly linked to the emerging collaboration (informal contracts) that seems to be gaining grounds between smallholder farmers and traders in the wholesaler and commission agent outlets in the study area. Farmers in such working relations enjoy economies of scale; are efficient; have guaranteed ready markets and have higher propensity to reduce risks and postharvest losses.

The profitability analysis shows a ROI of 45% which implies that cowpea production is a lucrative venture in the study area. The ROI is greater than the opportunity cost of capital of commercial lending rate by 14.4% points. Across outlets, wholesale outlets (63%) recorded the highest ROI, before retail outlets (47%), commission agents (39%) and lastly ACM outlets (31%). The finding is consistent with Adeola *et al.* (2011) who reported higher returns in cowpea investment in rural Nigeria. The authors recommended for a policy action that creates an enabling environment to transform the subsistence cowpea system into a commercialized system for poverty reduction and food security.

Econometric analysis

The applicability of the MNL regression model was assessed in terms of the IIA test (Cheng and Long, 2007). Basically, the IIA implies that a farmer's choice between two alternative choices, such as retailer and wholesaler outlets is unaffected by the availability of a third outlet, such as commission agents. Thus, the IIA requires that if the commission agent outlet becomes available, the probabilities for the choice of either retail or wholesale outlets must adjust in precisely the same amount necessary to maintain their original odds. The Hausman–McFadden test was performed to test the IIA inherent in the MNL model. The result shows a chi-square value of 2.57 with p-value of 1. This implies that the study fails to reject the null hypothesis which denotes that the difference in coefficients is not systematic. Therefore, the IIA assumption was not violated; hence the application of the MNL model to the data is justified. Similarly, the pairwise correlation matrix was used to test for potential multi-collinearity among the predictor variables. The result indicates a highest pair wise correlation matrix of less than 0.5 which denotes the absence of multi-collinearity among the predictor variables (Gujarati, 2004). In view of this, the significant effects of the explanatory variables on the choice of market outlets are shown in Table 5. The model shows that the effects of four factors (household size, experience, quantity sold and selling price) influence the choice of wholesale outlets when compared with base category of retail outlets. On the other hand, all predictor variables except gender, experience, access to market information and credit access influenced the choice of commission agent outlets. Meanwhile, only four

Table 5.
Multinomial logit regression results on producers' market outlet choice decision-making

Variables	Wholesalers			Commission agents			Combination of outlets		
	Coeff	Std. Err.	dy/dx	Coeff	Std. Err.	dy/dx	Coeff	Std. Err.	dy/dx
Farmer characteristics									
Gender	−0.306	0.401	−0.031	0.190	0.459	0.042	−0.704	0.585	−0.046
Age	0.004	0.021	−0.005	0.119	0.023	0.012***	0.017	0.026	−0.0002
Household size	−0.157	0.057	−0.014***	−0.151	0.069	−0.008**	−0.062	0.073	0.002
Formal education in years	0.013	0.048	0.004	−0.106	0.058	−0.013*	0.099	0.061	0.008
Experience	0.071	0.032	0.012**	−0.013	0.036	−0.004	−0.013	0.046	−0.003
Farm and market factors									
Quantity sold	0.059	0.014	0.005***	0.031	0.017	−0.0002*	0.075	0.016	0.003***
Selling price	−0.038	0.006	−0.0032***	−0.042	0.008	−0.0025***	−0.016	0.008	0.0004**
Value addition	−0.109	0.268	0.029	−0.844	0.331	−0.083**	−0.181	0.341	−0.001
Institutional factors									
Frequency of extension contact	0.167	0.104	0.016	0.206	0.119	0.014*	−0.013	0.159	−0.009
Access to market information	−0.070	0.148	−0.004	−0.146	0.162	−0.012	0.002	0.188	0.004
Farmer based organization	0.257	0.449	0.036	−0.993	0.490	−0.134**	1.440	0.819	0.112*
Credit granted	0.002	0.001	0.000	0.001	0.001	−1.92	0.002	0.001	0.0001*
Constant	11.84	2.775		12.84	3.153		0.630	3.809	
Goodness of fit and model performance statistics									
Number of observations	300								
Likelihood ratio χ^2 (36)	227.03								
Prob > χ^2	0.0000								
Log likelihood	−267.058								
Pseudo R^2	0.2983								

Note(s): (***) Indicates significance at the 1% level. (**) Indicates significance at the 5% level. (*) indicates significance at the 10% level. Retailer outlet choice is the base category

explanatory variables (quantity sold, selling price, FBO and access to credit) influence the choice of a combination of market outlets.

Farmer's age has a positive relationship with the likelihood of choosing commission agent outlets at 1% significance level. The result implies that as farmer's age increases by a year, the probability of trading with commission agents compared with a retail outlet increases by 1.2%. The reason for this finding may be linked to the immobility of older farmers during marketing. This finding concurs with Boogard *et al.* (2011) who reported a significant positive relationship between farmer's age and the choice of commission agent's outlets.

Family size negatively influences the likelihood of choosing wholesaler outlets and commission agent outlets at 5 and 1% significance level, respectively. The result is in line with the finding of Boogard *et al.* (2011) who argued that farm households with larger family sizes may have the capacity to transport their agricultural products to urban marketing centers for sale with retailers for higher prices. Likewise, formal education is negatively associated with the likelihood of choosing commission agent outlets compared with retailer outlets at 10%, significance level. The finding reveals that as the number of years in formal education increases, the propensity to trade in the retail market increases by 1.3%. The result supports the study of Xaba and Masuku (2013) who observe significant relations between educated farmers and the choice of retail outlets for agricultural products. However, the data depict a significant positive relationship between farming experience and the likelihood of choosing wholesaler market outlets at 5% level of significance. The data suggest that as farmers' experience increases by a year, the probability of trading in the wholesale markets increases by 1.2%. This is so because experienced cowpea producers may have a deep understanding of the cowpea business which may influence technology adoption to increase production and productivity. Hence, they are likely to trade with outlets such as wholesalers or commission agents who have the capacity to buy in bulk and in large quantities. The findings concur with Ogunleye and Oladeji (2007) in the choice of marketing outlets among cocoa farmers in Nigeria.

In terms of quantity of cowpea sold, the data show a significant positive association with the likelihood of choosing wholesale market outlet at 1% significance level. The finding supports the fact that wholesalers have the capacity to buy large quantities, and in turn, farmers with the ability to produce such quantities are more likely to trade with them. In relation, a study Kassaw *et al.* (2019) concludes that the volume of agricultural produce available for sale influence farmers' decision to trade in wholesaler markets in Ethiopia. Similarly, the volume of cowpea sold is positively related to the probability of choosing ACM outlets at the 1 % significance level. On the contrary, the data show a significant negative relationship between the volume of cowpea sold and the likelihood of choosing commission agent outlets. This finding deviates from our *a priori* expectation, perhaps the reason might reflect from the low selling prices offered in the commission agent outlets in the study area.

Post-harvest value addition has a significant negative relationship with the likelihood of choosing commission agent outlet at 5% significance level. It appears to suggest that because the retail market deals with cowpea grains ready for consumption, any farmer who undertakes value addition such as sorting and grading is more likely to trade in such markets for higher price premium. The study of Emana *et al.* (2015) appears to support this finding of positive relationship between value addition and the choice of retail outlets. While selling price is negatively related to the probability of choosing wholesaler and commission agent outlets, its effect on the choice of ACM outlets (ACM) is positive at 1 % significance level. The result demonstrates that as selling price increases by a dollar (Ghana cedi), the likelihood of trading in wholesaler and commission agent markets will decrease by 0.32 and 0.25%, respectively. On the other hand, the prospect of trading in ACM outlets would increase by 0.04%, all things being equal. The finding is consistent with the observation made by

Zivenge and Karavina (2012) who establish a positive relationship between selling price and the choice of retail market outlets.

Likewise, extension contact has a positive association with the likelihood of choosing commission agent markets against retail markets at 10% significance level. In support Melese *et al.* (2018) argued that access to extension information improves farmers' knowledge and increases their odds of adopting technologies for higher productivity and production. Consequently, these farmers are more likely to trade with markets that have the ability to buy in bulk such as commission agents. In line with this result, Kuma *et al.* (2013) in Ethiopia also reported similar findings. Similarly, access to credit also has positive relations with the likelihood of choosing ACM outlets against retail markets. Access to credit facilities does not only contribute to higher production but farmers are also able to afford storage facilities for better produce prices in the future without preference for a specific outlet for sale. Likewise, the data show that the membership of farmer-based organization is positively related to the likelihood of choosing ACM outlets, but it is negatively associated with the probability of choosing commission agent outlets at 5 and 10% significance level, respectively. Farmer groups improve farmers' bargaining power and enable their accessibility to high value markets. Such farmers become better off in accessing markets that offer higher producer prices such as retailers and ACM outlets.

Conclusions

The primary objective of the study was to understand the cowpea marketing system by estimating the costs and returns associated with each market outlet, their profitability and the factors that inform farmers' decision to choose a particular outlet. Based on the profitability analysis, the ROI of 45% implies that cowpea production is a viable venture with the wholesaler outlet being the most viable buyer for farmers. It can also be concluded that any form of partnership between the farmer and traders that seeks to enhance the level of resource endowment of the former prior to production and also provide an assured market to the produce has the tendency to improve farm productivity and profitability. Since membership of FBOs improves farmers' bargaining power and enables their accessibility to high-value markets, the study recommends that existing FBOs should be strengthened through periodic capacity-building programs for both leadership and members. Furtherance of this, special concessionary credit facilities should be made available to smallholder farmers. It is also recommended that access to agricultural extension agents should be enhanced to enable smallholder farmers' access new and improved technologies and market information.

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Notes

1. Economic impact refers to the financial gains from the sale of cowpea beans; improvement in soil nitrogen through biological nitrogen fixation of cowpea nodules, use of cowpea residue as livestock feeds and use of cowpea leaves as vegetables for the preparation of soap.
2. Production of cowpea has enormous potential for poverty reduction and food security in the municipality. Of the estimated 19,000 farm households in the municipality, 80% subsist on cowpea farming for livelihood and sustenance (Awunyo-Vitor *et al.*, 2013). However, the actual cowpea yield for Ejura Sekyedumase is 1.02 mt/ha which is far below the national achievable yield of 1.96 mt/ha (Ansah *et al.*, 2014). In view of this, conducting the study in the municipality is worthwhile because

the empirical evidence generated has implication for policy design to increase cowpea production and productivity in the area.

3. Equal proportional sampling was adopted because the population of farmers in all the communities are almost the same.
4. The probit and logit models are used for dichotomous dependent variables, while multinomial logit (MNL) and probit (MNP) and multivariate probit (MVP) are used for polychotomous dependent variables.
5. FBOs are conduits for sharing ideas and knowledge, linking farmers to markets and crucial service providers. They also help to create awareness among farmers on modern technologies and as a channel to access extension education.
6. Exchange rate: US$1 = Gh₵5.47

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