**FOOD SCIENCE & TECHNOLOGY | SHORT COMMUNICATION**

**Effect of rural farmers’ access to information on price and profits in Cameroon**

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**Abstract:** In rural land-locked areas of Africa, access to information about market prices can have a fundamental effect on the prices and profits of farmers. However, it is not clear how farmers organise to have better access to market and what role telephones can play in reducing access to information. A semi-structured questionnaire which served as a tool for data collection was administered to 225 farmers in Pinyin Clan of the North-West region. Descriptive statistics and the Analysis of variance (ANOVA) were used to evaluate price and profit gap between farmers with access to information, farmers who sell through middlemen, farmers who sell through group sales and farmers who did not use any of the above options. The results revealed that there was a significant price and profit gap between farmers who have access to information through mobile phones, who organised and sell through group sales. There was equally a significant price and profit gap between vegetable farmers who sell directly to the market and those who sell through middlemen. Access to information in rural areas can significantly increase farmers’ incomes and livelihoods, thus the use of mobile phones and group sales can facilitate farmers bargaining power.

**Subjects:** Agricultural Development; Agricultural Economics; Economics; Environmental Economics; Business, Management and Accounting

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**PUBLIC INTEREST STATEMENT**

Rural areas in Sub-Saharan Africa and Cameroon are characterized by smallholder farmer population. These farmers depend on farming for their livelihood; however these farmers hardly have maximum revenue from their products. Access to information has been highlighted as one of the most important elements that affects farmers price and profitability, this paper evaluates how farmers access to information affect the price and profit of Irish potatoes and vegetables in Pinyin Clan-Cameroon. Results show that there is a significant price and profit gap between farmgate prices and prices at which middlemen resell in major cities for vegetables, however there was no difference for Irish potatoes. This means that due to the non-perishable nature of Irish potatoes, price variability is low, and middlemen cannot really exploit farmers. The paper equally shows that there is a high price and profit gap between farmers who sell at farm gates and those who sell through group sales.
Keywords: farm gate; market information; middlemen; group sales; profit; price

1. Introduction
Globally, about 1.5 billion people depend on smallholder agriculture for income and livelihood (Ferris et al., 2014). These farmers often fail to benefit fully from the full value of their products because they lack market information and when they bargain for better prices they often end up with unfavourable terms (Hussain, 2003). This is true in rural areas because imperfections in market information can significantly increase cost for reliable information which leads to inefficiencies and welfare loss to farmers (Department for International Development (DFID), 2005). This situation is precarious in Sub-Saharan Africa where farmers have the choice of selling their products to middlemen or taking their products to the nearest markets (Fafchamps & Vargas, 2005). Most often due to significant transport cost, farmers prefer middlemen pick up notwithstanding the fact that middlemen can exploit them and reap better rents (Fafchamps & Hill, 2005; Merel et al., 2009).

Currently, farmers are faced with several options when selling their products. They can sell through middlemen or transport their products themselves to the market or group themselves and one member takes the product to the market. The decision to choose one of the above options depends on several factors that condition the farmer’s choice. Some farmers decide to sell through middlemen due to lack of market information and the relatively small quantities, others carry to the market because they have large quantities to sell. Group sales is common amongst farmers who understand themselves and decide to group their small quantities to reduce transport cost per unit by collectively renting a truck to transport their produce to a city market with the hope of having better prices.

Many studies have investigated how farmers decide to participate in the market (Bellemare & Barrett 2006), and how they choose between middlemen pick-up and sales directly to neighbouring markets (Fafchamps & Hill, 2005). Many of these studies focused on transport cost as a principal determinant due to the high transport cost in Sub-Saharan Africa that makes it difficult for farmers to sell directly to markets and equally to have market information. These farmers often have the choice of bearing the high transaction cost and selling at a higher price in neighbouring town markets or sell at low farmgate prices through middlemen (Fafchamps and Hill 2005). However, making this market decision depends on farmers’ knowledge of the market price in the neighbouring town market. Unfortunately, this market information is often difficult to have and at times unreliable. With technological innovation, mobile phones have now penetrated most rural areas in Africa with increasing network coverage. These phones have been used by rural farmers as a tool in reducing the information gap by calling families and other traders in neighbouring cities to enquire about market prices.

The relative effect of farmers choice on their price and profits has not been extensively investigated in the literature. Significant research has dwelled on factors that drive farmers decisions (Goetz, 1992; Key, Sadoulet & Janvry 2000). However, the relative effect of this information on their bargaining power to have better prices and profits when they sell at farmgate, through middlemen or through group sales has not been extensively studied. In Cameroon, Minkoua Nzie et al. (2018) investigated the effect of mobile phone use on farmers transaction cost, their results however show a positive impact of mobile phone use on transaction cost. This means that the use of mobile phones does not reduce farmers transaction cost, thus there is no change in farmers profits as a result. Empirical investigations on the interplay between access to information, market actors (farmers, middlemen and cooperatives) are not well enshrined in literature. Research on the role of access to information on farmers prices and profits shows mixed results, Svensson and Yanagizawa (2009) and Goyal (2010) reported positive impact while Aker and Fafchamps (2011), Fafchamps & Minten (2012) and Mitra, Mookherjee, Torrero and Visaria (2013) did not find any relationship.
This study seeks to fill this research gap by (i) investigating how farmers' decisions to sell at farmgate, through middlemen and through group sales affect their price and profits. This paper equally seeks to (ii) investigate how these decisions affect highly perishable crops such as Solanum scabrum (commonly called “njama njama” in Cameroon) and less perishable crops such as Solanum tuberosum (commonly called irish potatoes). An extensive investigation of (iii) market information system, middlemen activity and use of group sales to sell by smallholder is absent in Cameroon. This study extends literature by using ANOVA analysis to outline the price and profit gap between farmers with access to information, those who sell through middlemen and those who sell through group sales. This paper will highlight the role of middlemen in farmers’ access to market and profitability.

2. Materials and methods

2.1. Area description
Our study site is in the North West region of Cameroon. Pinyin is situated in the South West of Bamenda in the Santa subdivision, Mezam Division. Pinyin is a clan composed of five villages; Mesoh, Meshi, Mentin, Buchi, and Menka which is our area of study. The area where the Paramount Fon (chief) has his palace is called Pinyin but it is not a village itself. The villages are situated very close together mainly along one road. The map below shows Pinyin our study site with its neighbouring villages. Figure 1 below shows the location of the study site.

The map above shows the Pinyin clan and other neighbouring villages in the North West region, with the arrow pointing the Pinyin clan on the map.

Pinyin has an estimated population of 39,000 inhabitants (Josua project, 2019). More than 80% of the population depends on farming for livelihood. The main crops cultivated in this village include; carrots, beans, Irish potatoes, corn and vegetables. Our study will be based in the Menka village of the Pinyin clan. All the quarters of the Menka village will make up our sample. The Menka village is made up of six (6) quarters, Nkon’toh, Maborh, Nkon’tuit, acokikhaneo,
`Nkon’tumme and Nkon’school. From this study, the researchers observed that some of the farmers cultivate for home consumption, while the majority do farming as a profession and cultivate to sell. This majority that cultivate for commercial purposes sell about 80% of their produce and keep 20% for family consumption. In this study, emphasis will be laid on farmers who cultivate to sell as primary objective.

2.2. Sampling procedure
Data was collected from farmers in the Pinyin Clan of the North-west region of Cameroon over a period of 04 weeks from March 25th -April 26th, 2017. A semi-structured questionnaire was administered to a total of 250 farmers, with a total of 225 farmers responding to the questionnaires giving a response rate of 90%. Table 1 shows the sampled population for farmers engaged in the cultivation and sales of Solanum scabrum (commonly called “njama njama” in Cameroon) and less perishable crops such as Solanum tuberosum (commonly called irish potatoes).

2.3. Questionnaire
The questionnaire used in this research; is constituted of four sections, the first section captures the demographic profile of the respondents such as: age, gender, type of product cultivated, occupation average monthly income. The organization of the questionnaire is given below:

2.3.1. Part I of the questionnaire
This part is dedicated to capture the major problems faced by rural farmers as far as market access is concerned. The response from farmers who sell through middlemen and those who sell directly to the major markets will be assessed. This will permit us to know how divergent market access is. Market access also depends on the access to information by the different actors. The higher or the easier the access to information the easier farmers can have access to the market and create greater value for their produce.

2.3.2. Part II of the questionnaire
This section seeks to verify the cost of production of farmers, distinction will be made between farmers who buy their inputs individually and those who buy collectively through a cooperative. The questionnaire was inspired from the works of Silva et al. (2014) who developed a tool with necessary data points on cost and revenue to help farmers in decision making. This will permit us to know if there is any difference in cost of production between farmers who work individually or collectively.

| Table 1. Sample size |
|----------------------|
| Category of respondents | Njama Njama farmers | Irish potatoe Farmers | Sampling technic |
| Nkon’toh             | 25                  | 25                    | Stratified random sampling |
| Maborh               | 23                  | 22                    | Stratified random sampling |
| Nkon’tuit            | 20                  | 19                    | Stratified random sampling |
| Acohkikanee          | 22                  | 10                    | Stratified random sampling |
| Nkon’school          | 21                  | 10                    | Stratified random sampling |
| Nkon’tumme           | 20                  | 8                     | Stratified random sampling |
| Total                | 131                 | 94                    | |

Source: computed by author
2.3.3. Part III of the questionnaire
It permits us to capture the prices at which the farmers sell their produce. With inspiration from the works of Timsina and Shivakoti (2018), questions were developed. This research seeks to verify if selling through cooperatives will increase the bargaining power of farmers, thus making them price makers and not price takers anymore, thus distinction will be made between farmers who sell their produce individually and those who sell through cooperatives or collectively.

2.3.4. Part IV of the questionnaire
This section will concentrate on the evaluation of the level of market access, it seeks to get the perception of farmers who buy and sell through cooperatives, those who buy inputs through cooperatives and sell individually.

2.4. Data analysis
Building from Pokhrel et al. (2007), price and profit margin were used as the basis to determine whether farmers decision to sell at farmgates, through middlemen or using group sales had a significant effect on farmers price and profits. The data was coded and entered using the Statistical Package for Social Science (SPSS version 20), graphs were produced using excel spreadsheet version 2016. Profit was determined by applying the difference between the total revenue and total cost (Profit = Total revenue-total cost). Two-way Analysis of variance (ANOVA) without replication was employed, ANOVA was preferred because it permits to capture within and between group variations. Two-way analysis permits to analyse the interaction between two variables by verifying if a change in any of the variables affects the measured result (Burke, 1998). The ANOVA test used in this paper allows an effective understanding of differences between farmers with access to information and those without access to information, those selling through middlemen and those selling directly to the markets and finally those selling through group sales and those selling on individual basis.

3. Results

3.1. Access to information and prices
The bargaining power of farmers depends on their source of information about market price, the farm gate price for “njama njama” farmers that get information from buyers around or “price takers” is 245.5FCFA while the average price for “njama njama” farmers who get information by calling relatives and friends in town is 617.5 FCFA. There is a significant difference in prices between those who receive or accept prices from buyers and those who call and get the real prices. To get a better appraisal of this gap ANOVA was applied on the prices of farmers with access to information and those without access to information to verify if there is a significant gap. This gives a gap of 363.1FCFA which is quite significant. The ANOVA test highlights the significant difference by the significant variation of prices of farmers who are “price taker” with those who enquire about market prices from major markets. This implies that there is a significant difference in prices between those who ask for information about prices from buyers or accept prices from buyers and those who call the major cities to enquire about the prices. This result underscores the importance of access to information on the market price of rural smallholder farmers. It gives the farmer the perception of the real market price and thus gives them an upper hand when bargaining.

Table 2 shows that on average, when farmers get information about market price by calling friends and family members in major cities, they turn to have 1785fcfa as profit per bundle of vegetable sold over a farming year. When farmers get information from buyers who come to the village, they turn to record an average yearly profit of 626fcfa. This gives a gap or difference of 1158fcfa, this is highlighted by the significant variation from ANOVA test above. This highlights the fact that having the right information is a very important indicator of market access. Farmers who have access to information about prices turn to record higher farm gate prices than those who receive prices from middlemen. This is equally true for their profits.
4. Price and profit gap between farm gate sales and middlemen

4.1. Farm gate and middlemen price gap
The average price at which middle men sell a bundle of “njama njama” is 1750fcfa while the average price farmers sell at farm gate is 475fcfa. This is almost 3 times less the price at which middlemen sell. This ANOVA test below shows (Table 3) that there is a significant variation in prices at which middlemen sell and farmgate prices. Thus, suggesting that farmers are exploited in the process.

The average price at which middlemen sell a bucket of Irish potatoes in Bamenda and Santa is 4167 fcfa while the average price at which farmers sell at farm gates is 2336Fcfa. This gives us a difference (price gap) of 1936Fcfa. This difference statistically significant at 1% level. This shows that middlemen make a lot of profits by buying from neighbouring villages like Menka. To confirm this, it is important to verify if there is any gap in profits. It is important to note that farmers and middlemen incur production cost and transport cost, respectively.

4.2. Farm gate and middlemen profit gap
It is important to note here that the production cost is borne by the farmer while the transportation cost and any other costs are borne by the middleman. Table 4 shows a significant difference in profits between middlemen and “njama njama” farmers, middlemen make an average profit of 7250fcfa per sack (50kg) of “njama njama” while farmers register an average of 1992fcfa per sack (50kg). This gives a profit gap of 5258fcfa between middlemen and farmers. This difference is significantly different from zero at 5%, thus there is a significant difference in profit. This shows that the profit made by middlemen dealing in the buying and sell of njama njama is higher than that made by farmers. These middlemen often take advantage of the high variation of the prices of “njama njama” to make profits.

Table 2. ANOVA test for effect of access to information on price and profit of farmers

| Source of Variation                  | Access to information and farm gate prices | Access to information and profits |
|--------------------------------------|-------------------------------------------|----------------------------------|
|                                      | ANOVA                                     | F      | P-value | F crit | ANOVA                                     | F      | P-value | F crit |
| prices and profits                   |                                           | 0.31205| 0.96708 | 2.81793|                                           | 0.31205| 0.96708 | 2.81793|
| Call and get information from major markets; Ask from buyers or receive price from buyers |                                            | 34.36944| 0.00011 | 4.84434|                                           | 34.36944| 0.00011 | 4.84434|

Table 3. Price gap between farmers and middlemen for “njama njama” and Irish Potatoes

| Source of Variation                  | Price gap between farm gate sales and middlemen sales for njama njama | Price gap for Irish potatoes between farm gate sales and middlemen |
|--------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------|
|                                      | ANOVA                                                    | F      | P-value | F crit | ANOVA                                                    | F      | P-value | F crit |
| Prices                               |                                           | 0.92793| 0.53803 | 3.78704|                                           | 1.00000| 0.50000 | 2.27189|
| Sales at farmgate and through middlemen |                                            | 283.09009| 0.00000 | 5.59145|                                           | 46.28045| 0.00000 | 4.45132|
**Table 4. Profit gap between farmers and middlemen for “njama njama” and Irish Potatoes**

| ANOVA          | Profit gap of farmers and middlemen per bundle of njama njama | Profit gap between farmers and middlemen per bucket of Irish Potatoes |
|----------------|---------------------------------------------------------------|---------------------------------------------------------------------|
| **Source of Variation** | **F** | **P-value** | **F crit** | **F** | **P-value** | **F crit** |
| Profits        | 1.40013 | 0.31209 | 3.17889 | 0.90738 | 0.53090 | 9.27663 |
| Sales at farmgate and through middlemen | 20.18150 | 0.00151 | 5.11736 | 1.15543 | 0.36117 | 10.12796 |

Table 4 shows no significant variation in profits between middlemen and Irish Potatoes farmers, the profit per bucket of Irish potatoes for middlemen is 17067fcfa while that of Irish potatoes farmers stands at 12545fcfa. This gives us a difference of 4521fcfa. This difference is not significant at 5% or at 10% level and the hypothesis that the difference is greater than zero is not equally significant. This means that farmers are not exploited, the middlemen only increase prices with respect to the extra transport cost and losses incurred during transportation. These results confirm the fact that middlemen facilitate market access by covering the extra transport cost and creating a market for the village farmers. Generally, their role is usually exploitative because they propose very low prices to these farmers and resell in nearby towns at very high prices this accounts for the significant difference in profits between farmers and middlemen who deal in “njama njama”. Some farmers decided to overcome this by bringing their produce together, incur the transport cost and sell in major cities like Douala and Yaoundé. The next section will verify if joint sales or selling as a cooperative is more profitable.

5. Price and profit gap between group sales and farmgate

5.1. Farm gate and group sales price gap

The average price at which farmers sell Irish potatoes through group sales in major cities is 4375fcfa per bucket while the average price at which farmers sell Irish potatoes at farm gates is 2258fcfa per bucket. This gives a difference of 2117fcfa, the variation is significant at 1% level (see Table 5). This shows that farmers who sell through group sales sell at significantly higher prices than those who sell at farm gates. To access if there is really any added advantage by selling through cooperatives, we are going to proceed by verifying the profit gap between farmers who sell at farm gates and those who sell through cooperatives.

On average the price at which farmers sell “njama njama” through group sales is 1733fcfa per bundle while the price at which farmers sell at farm gates is 464fcfa per bundle. This gives a difference of 1270 fcfa, thus variation is statistically significant at 1% level. This means that farmers who prefer to sell through group sales sell at significantly higher prices than those who sell at farm gates.

**Table 5. ANOVA Farm gate and group sales price gap**

| ANOVA          | Price gap between farm gate and group or cooperative sales of njama njama | Price gap between farm gate and group or cooperative sales for Irish Potatoes |
|----------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|
| **Source of Variation** | **F** | **P-value** | **F crit** | **F** | **P-value** | **F crit** |
| Rows           | 0.63737439 | 0.68341157 | 5.050329058 | 0.67605634 | 0.00011353 | 3.78704354 |
| Columns        | 118.54°7146 | 0.00011353 | 6.607890974 | 11.9295775 | 0.01063469 | 5.39144785 |
5.2. Farm gate and group sales profit gap
Farmers who sell through group sales make an average profit of 4740fcfa per bundle of “njama njama” while those who sell through farm gates make an average of 1792fcfa per bundle. There is a difference of 3124 FCFA in the profits made by the two sales, this variation is significant at 1% level of confidence. This implies that the extra price and profit are not only due to extra cost but better market information and market access. We therefore see here that it is far better off to sell through group sales or cooperatives than selling individually at farm gate prices.

The test results above show that 80,748.57fcfa is the amount a farmer who sells Irish potatoes through group sales or cooperatives get on average per farming year while 12545fcfa is the amount registered by farmers who sell individually at farm gates. There exists a difference of 68203fcfa, which is significant at 1% level. This significant difference is due to higher market access and access to information. Since the farmers combine their produce, they have a better bargaining power, all this account for the higher price and higher profits, thus leading to the conclusion that it is preferable to sell through group sales than individually at farm gate prices.

6. Discussion
The results indicate that farmers with access to information sell their produce at higher prices and make higher profits than those who get information from buyers around or simply accept prices from middlemen. This study equally shows that middlemen have a pivotal role to play as far as market access, prices and profits of farmers are concerned. Our results indicate that there is a significant price gap between prices at which middlemen sell and farm gate prices while there is equally a significant profit gap between middlemen and farmers. As far as Irish potato is concerned, there is a significant price gap but not a significant profit gap. This means that the extra price gap is simply due to the extra transport cost and other transaction cost. Our study reveals that group sales or cooperatives lead to higher prices and profits, it equally leads to better market access. This is shown by the significant price and profit gap between farmers who sell at farm gates and those who bring their produce together (marketing cooperatives) and sell in major cities like Yaoundé and Douala.

These results corroborate with that of Pokhrel and Thapa (2007) who underscored the exploitative nature of middlemen dealing in vegetables. Researchers who say middlemen are non-exploitative in nature will match with middlemen who deal in the buying and selling Irish potatoes where no significant difference was found between the profits of middlemen and farmers dealing in Irish potatoes. Pokhrel and Thapa (2007) share this point of view when they did not find any support for middlemen exploiting producers. Several authors concluded to this thesis in different geographic regions and products (Enete, 2009; Hayami et al., 1999). However, Jones (1984) reported a positive effect of middlemen on producer’s margins and propose their role should be considered in rural policy reforms. Middlemen serve as catalyst when all other options have failed, they link farmers to markets by taking up the transport cost and go through the bad roads, facilitate market access (Fachamps & Vargas, 2005).

Like in this paper, the exploitative nature of middlemen trading in vegetables has been documented in literature (Osborne, 2005; Pokhrel & Thapa, 2007). These middlemen exploit gaps in the flow of information between the market and the farmer to make significant profits (Pokhrel & Thapa, 2007). In some cases, a middleman is the only buyer from a village, thus decides the price, this is a classic case of monopsony, this is very true for land-locked areas with significant transport cost and difficult access. Access to credit and information equally explain the significant profit gap between middlemen and wholesalers (Scott, 1985). However, when there is competition among the middlemen, it reduces their market power because producers will have many options and will prefer to sell to the highest buyer (Pokhrel & Thapa, 2007).

These results equally corroborate with that of Agbola et al. (2010) who ascertain the influence of cooperatives on the farmers sales. The significant price and profit gap between farmers with access to information and those without access to information are in line with the work of
Courtois and Subervie (2014) who highlighted the positive influence of mobile phones on access to information. The positive effect of cooperative sales also corroborates with the positive effects of farmers’ cooperative actions in other studies such as Taiwo et al. (2015) who evaluated the effects of cooperative societies on members’ output. This is because when farmers come together, they benefit from economies of scale, transport to major markets become cheaper and it’s easier to rent a truck. To effective enhance the positive effect of group sales on market access and profitability, it is important to develop their skills sets (Ashby et al., 2011).

For farmers to have access to pertinent market information and benefit from higher profits, it is important that the government should extend network coverage to rural areas in all parts of the nation. This will facilitate access to information using mobile phones, farmers can equally have better access to markets by organising in groups and transport their products to markets to benefit from scale economics.

7. Conclusion

The results of this study show that there are a significant price and profit gap between farmers that have access to information and those without access to information. The study equally shows a significant price and profit gap between farmgate prices and prices at which middlemen resell in major cities for njama njama, however there was no significant difference for Irish potatoes. This means that due to the non-perishable nature of Irish potatoes, price variability is low, and middlemen cannot really exploit farmers significantly. The paper equally shows that there is a significant price and profit gap between farmers who sell at farm gates and those who sell through group sales. Marketing of their farm produce remains a major problem, they step from having information about prices and negotiation with buyers and middlemen. The results from this study highlight significant price and profit gap for farmers who have access to information through use of mobile phones and relatives in major cities, significant price and profit gap was also highlighted for farmers who sell to middle-men and those who sell through joint sales. This means that for farmers to have maximum return on their products, access to proper market information is fundamental, community members equally must improve on their negotiation skills. The significant price and profit gap received by farmers who sell through cooperatives suggests that farmers should organize themselves into cooperatives, not only marketing cooperatives but production and sales cooperatives. This will permit them to buy farm inputs as a group thereby would benefit from economies of large-scale purchase, it will also permit the farmers to lobby for extra support from the government and non-governmental organizations. Cooperatives should take a pro-active role in the marketplace as it can place them in new arenas of competition which may require significant changes in the usual view of cooperatives.

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Authors’ contributions

SMP wrote the draft version, HBY reviewed and enriched the discussion, JTP reviewed the language and enriched the introduction, YVN, entered the data and reviewed the paper, TRM proofread and added discussion.

Conflicts of interest
The authors declare no conflict of interest.
Significance statements
This study shows that rural farmers access to information can significantly increase their prices and profits, thus their livelihoods can be improved significantly. The results of this paper can be used as guidelines for developing rural development strategies especially those aimed at improving farmers livelihoods. It gives guiding information on the importance of putting in place basic infrastructure that facilitates farmers access to information and provides recommendations on how to do so.

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