ECONOMIC POTENTIALS OF GINGER VALUE CHAIN IN KADUNA STATE, NIGERIA

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Abstract

Without a doubt, ginger is an important commercial crop which significantly contribute nutritionally, pharmaceutically and medically. Unfortunately, the producers, processors, and marketers have been given little attention, especially regarding the empirical profitability associated with each activity.

This study, therefore, sought to estimate the net margins of the actors and compare their profitability. A total of 380 ginger producers, processors, and marketers were randomly selected from Jaba local government area in Kaduna state. Data were collected using pretested semi-structured questionnaires. Partial budgeting techniques and the one-way analysis of variance were used.

The study revealed a net margin of about 140,000 NGN/ha/annum for the producers, while the net marketing margin/bag for the ginger processors and marketers was 3,300 NGN and 3,470 NGN, respectively. Furthermore, the profitability indices showed that the producers, processors, and marketers earned about 37%, 70%, and 41% profit of invested funds in the ginger value chain.

Comparative analysis revealed that the profitability of the processors, which was the highest, was statistically different from the other actors. It is concluded that there exist tremendous economic potentials in the ginger value chain. It is, therefore, recommend that policies that will encourage ginger production, processing, and marketing should be implemented with particular emphasis on the processing aspect.

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Introduction

Ginger is a popular root crop that has been used as a spice and a medicinal herb since antiquity. It is one among the world's most well-known and commonly used spices. Ginger is a condiment that is used to flavour meals such as sauces, gravies, desserts, cookies, and drinks. Ginger's extracted rhizome contains roughly 2% essential oils (NBF, 2011). These oils are extracted for usage in confectionary, cosmetics, food processing, and medicines, among other things (Sambo, 2017). The volatile oils zingerone, shogaols, and gingerols, which make up roughly 1-3% of the weight of fresh ginger, give it its distinctive odor and flavor. Gingerols have antibacterial, analgesic, sedative, and antipyretic properties (Agize, van der Zouwen, 2016). Ginger can aid with avariety of conditions including degenerative disorders (arthritis and rheumatism), digestive disorders (indigestion, constipation, and ulcer), cardiovascular disorders (atherosclerosis and hypertension), vomiting, diabetes mellitus, and cancer (Mashhadi et al., 2013). According to a recent study, a pungent chemical found in ginger (6-shogaol) is up to 10,000 times more powerful than traditional chemotherapy at targeting cancer stem cells, which are at the base of cancer malignancy (Desaulniers, 2017). Because of its capacity to reduce blood clotting, ginger can help avoid strokes and heart attacks. It's also a multipurpose herb that can help with colds, flu, headaches, and sore throats (Mallam, 2015). All of these characteristics make ginger a highly sought-after crop.

The Nigerian agricultural industry has shown to be a persistent mainstay of the economy and the Nigerian people in terms of food supply, employment, and national income generating. At both the local and macro levels, agriculture is ideally positioned to have a major multiplier effect on any country's quest for socioeconomic and industrial development (Oluwaseyi, 2017). Nigeria boasts the world's second-largest ginger-growing area and it is a key supplier of dried split ginger to the international market. Nigeria, behind China, India, Nepal, and Thailand, is the worlds's fifth producer of ginger accounting for 7.8% of global production. Nigeria is the third largest exporter of ginger after China and India. It is responsible for supplying 9.6% of the total world export (Mamman, 2017). Despite all of this, the full potential of this crop's production and exportation has yet to be realized which has threaten Nigeria's ability to produce ginger (AgroNews, 2017). Ginger is Nigeria's third most important non-oil export. This indicates that the ginger value chain has a lot of potential and

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opportunities. Agricultural value chains have a lot of potential for alleviating poverty and encouraging long-term economic growth, as well as providing income and jobs. One of the options for enhancing efficiency in the agricultural industry is to organize agriculture along a value-chain structure. Design, sourcing of raw materials and intermediate inputs, marketing, and distribution are all part of the value chain network, which takes a product from idea to end customer (Kumar, 2011). Value chains are viewed as a route for the introduction of new manufacturing methods, technology, logistics, labor processors, and organizational networks (Trienekens, 2011). In modern integrated value chains,actors profit from more knowledge, better quality, and food safety, as well as losses, larger sales, and more value-added in manufacturing (Kumar, 2011).

There have been few studies that look at all elements of ginger production, processing, and marketing, including the economic potentials that exist in each of the value chain activities. Some studies have evaluated ginger production efficiency (Nmadu, Marcus, 2013), or ginger agricultural methods (Ahmed, 2018), ginger value-chain and SWOT analysis, as well as the socio-economic analysis of the ginger value chain (Abah et al., 2018; Nwaekpe et al., 2019; Parajuli et al., 2021). Nonetheless, quantitative information on economic prospects in many sections of its value chain is difficult to come by. The producers, processors, and marketers of ginger have received little attention in terms of how they might increase profitability and ensure that Nigerian ginger is not only highly sought after internationally, but also has a high monetary worth. As a result, the purpose of this research is to close this gap by calculating actors' net margins and assessing their profitability along the ginger value chain. The information gained from this study's conclusions will empirically demonstrate the economic potentials embedded in each of the value chain's examined operations. Furthermore, by comparing the profitability of the players, relevant stakeholders in the ginger value chain may easily understand where their attention should be concentrated in order to maximize the crop's enormous economic potential.

Methodology

Study Area

The study took place in Kaduna, Nigeria. The study site was chosen since it is Nigeria's largest research ginger producer. Kaduna is located in the North-West of Nigeria, with coordinates of 10° 20′ 0″ N and 7° 45′ 0″ E. Tropical grassland (Guinea savannah) in the south and sudan savannah in the north make up the state's biological range. The prairie is a huge expanse that spans the state's southern half. The soil is generally loamy to sandy. The dry (November - mid-April) and wet (late April - October) seasons are the two different seasons in the state. The annual rainfall

averages 1,016 mm. The state's economy is mostly based on agriculture. Agriculture employs roughly four million people and generates around 56% of the state's GDP. About 606,007 farmer families make up the state's population (KADP, 2007).

Yam, rice, maize, cowpea, millet, guinea corn, tomatoes, peppers, and melon are among the commercially grown food crops. Ginger, cotton, sugarcane, and groundnuts are the main income crops. The southern part of Kaduna is where ginger is grown. The highest ginger value chain operations are found in the Jaba local government area (LGA), (KADP, 2007; Folorunso, Adenuga, 2013). The LGA's soil is sandy loam, well-drained, and sloped gently. The rainy season is characterizes by a unimodal rainfall pattern of around 1,000-1,500 mm per year. It has a temperature range of 28-36°C. Ginger harvesting begins in late October to November, with production beginning in May/June. As soon as the product is harvested, processing and marketing activities begin.

Sample size and sampling procedure

The ginger producers, processors, and marketers in Kaduna state's principal ginger-producing local government area (Jaba) are the study's target demographic. The producers were surveyed using a three-stage random sample process. The first stage entiled picking five districts at random from a total of fifteen in the Jaba local government region. To produce a total of fifteen villages, three villages were chosen at random in each district. In the last stage, proportionate sampling was used to randomly choose 180 ginger growers from the list of producers in each selected village, which was obtained from the leaders of the ginger growers association in each of the villages. For the processors, a snowball sampling technique was used to generate a sampling frame of processors in the selected villages. Proportionate sampling was then used to select 80 processors for the study randomly. A purposive sampling technique was employed to select two major ginger markets (Tsakiya and Kwoi markets) in the local government. From these two markets, 120 marketers were randomly selected and interviewed. Three different sets of semi-structured questionnaires were designed to collect data from ginger producers, processors, and marketers, respectively. The questionnaires were used to harness the relevant data on input quantities and costs, output quantities, and prices, as well as the challenges encountered in the ginger value chain. Focus group discussions (FGDs) were also conducted with relevant stakeholders in the villages selected to substantiate the data collected from the respondents. The survey was done between January and March 2018, and data was collected for the 2016/2017 processing and marketing seasons, and the 2017 production season. Researchers in the fields of Agricultural Economics and Agricultural Extension tested the survey instrument for validity. Reliability was done using the pilot testing and the Cronbach alpha analysis.

Empirical strategy

Following the study of Olaghere (2017), to calculate the profitability of the producers in the value chain, the study used partial budgeting approaches. According to Dalsted and Gutierezz (2000), the technique assesses the changes in production costs and returns, as well as the dangers that come with a certain shift in production methods. The study of gross margin (GM) and net farm income (NFI) analysis were employed particularly, an it was given as:

GM (NGN/ha) = Total value of output (TVO) - Total variable costs (TVC) (1)

NFI (NGN/ha) = Total value of output (TVO) - Total costs (TC) (2)

Where,

TVO = Quantity of ginger in kg(Q) x Price/kg (P);

TVC = For the production season, the cost of labour and purchased materials (inputs);

TC = Total fixed costs + TVC;

Total fixed costs = Fixed cost items knapsack sprayers and simple farm implements have deteriorated in value.

Depreciation was calculated using the straight-line approach, as follows:

$$\frac{Cost\ of\ item - salvage\ value}{Useful\ life} \quad (3)$$

Salvage value for the study was assumed to be zero since the ginger producers did not sell off any of their used implements.

Gross margin was calculated on per hectare basis for ginger producers.

The return to capital invested (RCI) index was used to calculate profitability, which is reported as:

$$RCI = \frac{Net\ farm\ income}{Total\ cost} \quad (4)$$

Gross and net marketing margins were calculated for ginger processors and marketers. They are given as:

Gross marketing margin (in NGN) = Selling price - Producer price (5), (Rao, Chaudhry, 1988).

Net marketing margin (in NGN) = Gross marketing margin - Total processing/ marketing cost (6)

The return on capital invested as specified for the producers was also used to measure profitability, where the net farm income was replaced with the net marketing margin. For comparison, a one-way analysis of variance (ANOVA) was utilized. The tool was chosen because it is a parametric test for used for comparing variables which are normally distributed for more than two groups, and only the differences in result are of interest (Marusteri, Bacarea, 2010). The one-way ANOVA when there is only one independent variable, which is the return to capital invested. The purpose of the ANOVA is to compare the mean square within (MSW) and the mean square between (MSB), which are the two sources of variability that create the F-statistics.

This is expressed as:

$$F_{obs} = \frac{variance\ between\ groups}{variance\ within\ groups} \quad (7)$$

To compare the group means, Tukey's honestly significant difference (HSD) test was employed as the post hoc test. Although the test was created for scenarios in which the group's sample sizes are equal, it can also be used with different sample sizes. In this situation, the harmonic mean of n-sizes is used as n* in the adaptation. It is expressed as:

$$HSD = q\frac{\sqrt{MSE}}{n*} \quad (8)$$

Where, q = the relevant critical value of the studentized range statistics;

MSE = mean square within groups;

n* = number of scores used in calculating the group means of interest.

Results

Profitability Analysis

The results of the estimation of the gross and net margins, gross and net marketing margins, marketing efficiency, and the return to capital invested are presented in next table (Table 1).

Table 1. Analysis of the Profitability of ginger producers

Variables	Values (NGN/ha)
Total value of output	517,271.18
Cost of inputs	219,356.48
Cost of labour	141,158.51

Variables	Values (NGN/ha)
Total variable costs	360,514.99
Total fixed costs	16,726.25
Total costs	377,241.24
Gross margin	156,736.19
Net farm income	140,009.94

Source: Olaghere et al., 2019.

Note: 1 USD = 362 NGN

The gross value of output data show that the average physical amount for each hectare of land used for ginger cultivation in the research area was approximately 6,650.18 kg (147.78 bags). At the same period, the production season's price was 77.78 NGN/ kg. The farmers' average farm size for ginger cultivation was 2.17 ha. Labor costs accounted for more than a third of the total costs, according to the cost study. This could indicate that ginger is a labor-intensive product. The planting materials (ginger rhizome) cost 157,166.67 NGN per hectare, while fertilizer cost 53,646.73 NGN per hectare. According to the FGDs, the relatively high fertilizer cost is due to the fact that fertilizer application is a critical predictor of ginger output. The difference in input costs was accounted for by the cost of insecticides. Herbicides accounted for roughly 90% of pesticide costs, while insecticides accounted for the remaining 10%. This is due to the fact that the majority of farmers utilized selective herbicides for their first weeding, which is normally done after the ginger seedlings have fully germinated. The depreciated farm equipment, land rent, and interest paid on loans obtained make up the total fixed costs. Some of the farmers received loans from the cooperatives to which they belonged, and they were paying interest of around 3,005 USD. Generally, Table 1. reveals that the producers spend around 70% of their gross receipts from product sales on operating expenses. After all costs are deducted, the net farm income suggests that the farmers are left with around 140,000 NGN which is similar to the finding of (Chidiebere Mark, Ibe, 2018) which shows that there are a lot of prospects in the ginger industry.

Marketing margin and efficiency analysis of ginger processors

The subsection presents the analyses of the gross and net marketing margin of the ginger processors (Table 2.)

Table 2. Marketing margin and efficiency of ginger processors

Variables	Values (NGN/bag)
Producer price	3,500.00
Total processing cost	1,200.00
Total cost	4,700.00
Selling price	8,000.00
Gross marketing margin	4,500.00
Net marketing margin	3,300.00

Source: Olaghere et al., 2019.

Note: 1 USD = 362 NGN

Farmers sold their ginger to processors and marketers in bags. On average, a bag weighed 45 kg. There were no processing enterprises in the research region at the time of the field survey. Sorting, washing, peeling, splitting, and drying were among the tasks performed by the processors, who were mostly men (72.5%), (sun-drying). Some of the processors in the study region went so far as to grind the ginger into powder and extract ginger oil and oleoresin for consumers who explicitly requested it. The scope of this investigation, however, was confined to only the processors that processed and marketed dried split ginger. The cost of labor for processing activities, the cost of transportation of fresh ginger to processing locations, the cost of storage, and the cost of purchasing packaging materials were all included in the processing expenses for this study. These expenses amounted for 25% of the overall bill. The difference between the selling price and the producer price is gross marketing margin, which is the, reveals that the processors received an average of 4,500 NGN for their value added. It's worth mentioning that the highest selling price observed in the study region was 15,000 NGN. The price of dried ginger in the research area was determined by physical parameters such as the product's dryness and cleanliness.

Processing costs, however, are included in the value of the gross marketing margin. As is shown in Table 2., the net marketing margin accounts for 73% of the gross marketing margin, with processing costs accounting for the balance. This suggests that ginger processing is economical in the area under investigation.

Marketing margin and efficiency analysis of ginger marketers

The subsection presents the analyses of the marketing margin and efficiency analysis of ginger marketers.

Table 3. Marketing margin and efficiency of ginger marketers

Variables	Values (NGN/bag)
Cost price	8,000.00
Marketing cost	530.00
Total cost	8,530.00
Selling price	12,000.00
Gross marketing margin	4,000.00
Net marketing margin	3,470.00

Source: Olaghere et al., 2019.

Note: 1 USD = 362 NGN

The scope of this study's marketers was limited to marketers of dried split ginger and powdered dried ginger, which were largely done by stores. Transportation, sorting/grading, and crushing the ginger (in some circumstances), packaging, and storage were all covered by the marketing expenditures. The net marketing margin for ginger marketers is 3,470 NGN, which means that for every bag of ginger sold, the marketers profit 3,470 NGN (Table 3.). It's worth noting that the study found that when marketers sold dried ginger in smaller quantities rather than in bags, they made up to 50% more money. Nonetheless, some marketers who sold powdered ginger saw a 100% rise in their net profit for the trial. A quick analysis of the farmers' share reveals that the selling price of the producers is only about 29% of the selling price of the marketers and 44% of the selling price of the processors. The assumption is that as the value of the product grows along the value chain, profit rises as well. Ginger marketing is profitable in the researched location which agrees with (Kadurumba et al., 2021).

Return to capital invested of the actors in the value chain

Table 4. Profitability of margins among value chain actors (NGN/bag)

Margins	Producers	Processors	Marketers
Net margin	947.36	3,300.00	3,470.00
Total costs	2552.55	4,700.00	8,530.00
Return to capital	*37.1[a]	*70.2[b]	*40.7[a]

Source: Olaghere et al., 2019.

Note: 1 USD = 362 NGN

*At the 0.05 level, the mean difference is stastically significant; a = subset 1(indicates that the means in this subset are not statistically different from each other but different from those in b); b = subset 2 (indicates that the means in this subset are not statistically different from each other but different from those in a).

The gross and net margins of the producers were changed from hectare to bag for convenience of estimation and comparison with those of the processors and marketers. Results presented in Table 4., revealing that the producers had the lowest net margin and total costs. Similarly, marketers had the highest net margins and marketing costs. Comparison analysis revealed that the net margin of the producers was significantly different from those of the processors and marketers. However, there was no difference between that of the processors and marketers. On the other hand, the cost incurred by the marketers was significantly different from those of the other actors. The value of the return to capital invested of the actors in the value chain implies that the ginger producers, processors, and marketers will yield about 37%, 70%, and 41%, respectively, of invested capital as profit. However, profitability indices show that the producers had the lowest return to capital invested compared with their counterparts in the value chain. This is because there is a large difference between the net margin and the cost of producing ginger for the producers, as the net margin was much lower than the expenses incurred. Marketers have experienced a similar situation.

The processors, on the other hand, had a smaller variation between net margin and processing expenses, as a result, when comparing to the other two actors, they have a significant variation in the means of their return on capital invested. Although the marketers' return on capital invested was higher than the producers', the difference was not significant enough to conclude they were statistically distinct. In Table 4. Is shown that ginger processing was the most profitable activity among the value chain operators.

Conclusion and Recommendations

After conducting this research, there is possibility of weak measurement of some data collected caused by memory recall which may be inaccurate. However, it is clear that the ginger value chain is not only lucrative but also profitable, making it a good investment opportunity. The most profitable activity in the value chain is ginger processing, according to a comparison of the profitability of the three players in the value chain. As a result, the study suggests that policies be developed to encourage actors in the value chain to expand their operations. Also, the production, processing, and marketing methods (value-added processes) should be closely monitored, as well as the construction of a relevant grading system, to ensure that the ginger that enters the market is of standard quality both locally and internationally. As a result, ginger will command higher pricing and be in more demand. This can be by way of organising periodic training for the actors on best practices primarily in the processing so that they can compete favourably in the international market.

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