Efficiency Measurement of Modern Groundnut Oil Processing of RMP-12 and Ex-dakar Varieties in Gombe Metropolis Gombe State, Nigeria

Saleh A.[1,*], Ochi J. E.[2], Sani M. H.[2]

[1]Agricultural Economics and Extension Department, Federal University Kashere Gombe State
[2]Agricultural Economics and Extension Department, Abubakar Tafawa Balewa University Bauchi
*Corresponding author: abdussalihi@gmail.com

Abstract The study examined the marketing efficiency of modern groundnut oil processing of RMP-12 and Ex-dakar varieties in Gombe Metropolis. The focus was on the profitability of the business, market structures and efficiencies of the products. The study area was delineated into six market districts where two markets each, were selected for their popularity in groundnut oil processing. A multi-stage sampling technique was used to select 90 groundnut oil processors. Data were collected using structured questionnaires and were analysed using, farm budget, sherphered-futrel, gini-coefficient and t-test models. The results revealed that, cost of shelled groundnut constituted the major (92.3% and 91.6%) components of processing costs for RMP-12 and Ex-dakar respectively. The gross ratios, fixed ratios and operating ratios of the two groundnut varieties were < 1, meaning that the business was profitable. Also, the returns per naira invested of the respective groundnut varieties was ₦ 0.17 and ₦ 0.25, significant (P<0.01). The marketing coefficients for Ex-dakar products (69.97%) of Jekadafari markets revealed to be most efficient. The results also revealed the Gini-coefficients for RMP-12 and Ex-dakar oil and cake marketing was 0.835 and 0.839 respectively, indicating great variation in the revenue generated with high level of market concentration. Major impediments of modern groundut oil processing were security challenges, costs of inputs, inadequate capital, and erratic power supply. The study concluded that the business was profitable, that Ex-dakar variety gave higher net income of ₦ 7,428.80 than RMP-12 variety per tonne per week. The study recommends that security situation in the groundnut producing areas should be restored, electricity should be provided adequately, the traders should also have access to formal credits so as to improve productivity and efficiency.

Keywords: market, efficiency, profitability, groundnut, processing

1. Introduction

Groundnut, which is a highly valuable legume in Nigeria, is processed in many ways: roasting, boiling, homogenising, and toasting. However, toasting of groundnut, which commenced about a decade ago produces defects that may make the product unacceptable: broken or grinded nuts, nuts with peeled-off sugar coating, burnt nut, soft nuts, uncooked nuts, and two nuts stuck together. Since some processing norms are observed before obtaining the final product, an investigation of these norms may provide useful guidance on how to minimise these defects [1].

According to [2], modern edible oil extraction can be grouped into two: mechanical pressing and solvent extraction. Sometimes the latter compliments the former. For oilseeds with high oil content such as ground nut, first mechanical pressing will be applied and over 85% of the oil will be extracted. The remaining oil in the expeller cake will then be extracted with solvent. For some other oilseed with low oil content, solvent extraction is generally considered as the best alternative. However, the initial investment cost of solvent extraction is much higher than mechanical pressing. In addition, solvent extraction is more appropriate for large scale than small-scale enterprise. Therefore, for the purpose of this study the mechanical pressing technology has been focused.

There are many varieties of groundnut grown in Nigeria [3]. Some of these were considered 'traditional' but others have been introduced in the last few decades; the *Yardakar* (Ex-Dakar) *and Maiborgo* (RMP-12) which are known for their high content of edible oil [4]. Under normal circumstances, groundnuts being the major raw materials of oil extraction and cake production flow from the farms and/or rural markets to the processing plants in the urban centres where the demand is relatively high. The produce are assembled in big lots and move to bigger isolated urban regional markets. Standard units of

measurement and pricing were established in groundnut oil and groundnut cake marketing; edible oils are poured into gallons, jerry cans, bottles etc of different shapes and sizes, the cakes are bagged and weighted in tonnes. Despite groundnuts are seasoned crops, the modern oil millers partake in the business all year round [5].

According to [6], groundnut processing vis-à-vis oil extraction is a common socioeconomic activity found in Gombe State; as increase in production leads to a derived demand of the outputs, necessitated the establishment of small, medium and large-scale processing plants so as to add value to the crop. But, the oil processing enterprise in the State is mainly dominated by small-scale operators, based in urban areas. Small-scale groundnut mills are commercially viable, returning an annual average of 51% on typical investments of between ₦ 0.5 million - ₦ 2.5 million, with profits of 21% on sales. The socioeconomic benefits of groundnut oil mills include:

i) A typical small-scale groundnut oil mill employs at least 10 people on a permanent basis and 3 – 5 temporary workers with an average monthly income that is 2.5 – 3 times the rural average incomes.

ii) The mills offer a ready cash market for groundnut. A typical mill buys several thousands of Naira worth of groundnut per year from many different markets across the country.

iii) Other beneficiaries are that, school children who collect bottles for recycling, fuel wood suppliers, roasting and separation of seeds and (local) maintenance workshops that repair the mills. This amount to a further twenty five beneficiaries, earning hundreds of Naira per year from a mill.

iv) Benefits accrue to the community through cheaper oil of good quality; typically the groundnut oil is relatively cheaper than the refined blended oils produced by the larger companies.

The marketing efficiency measurement of groundnut oil processing depends on reducing the capital and operating costs as much as possible, and at the same time maximising the income from the sales of oil and other by-products. A careful study of all costs is therefore necessary before setting up a processing plant. In particular the cost of the main pieces of equipment, salaries for the expected number of workers, and the prices for raw materials, fuel and power should be assessed. The price that can be charged for oil and by-products depends on a number of factors including quality, packaging, and the number, type and quality of competing products. These should each be assessed in order to predict the likely income at the planned scale of production over the year.

The processing costs can then be compared with the expected income to calculate the likely profitability. In most cases it is necessary to make full use of the by-products to make the enterprise financially successful [7]. It is worth while study to groundnut value chain to identify its processing and marketing efficiencies, to provide information that looks into the possible ways and means of increasing the traders' income through accumulating capital and enhancing productivity and marketing. To this effect, the research is therefore made to provide answers to the following questions: (i) is small-scale groundnut oil processing a profitable venture? (ii) what type of market is marketing efficiency of groundnut oil processing achieved? (iii) what are the marketing channels of groundnut products? Thus; the specific objectives of the study were to: (i) ascertain the profitability of groundnut oil processing in the study area; (ii) determine the marketing efficiency of groundnut oil and groundnut cake in the study area; (iii) identify the possible marketing channels of groundnut oil and groundnut cake in the study area.

2. Methodology

2.1. The Study Area

Gombe metropolis is the principal urban centre of Gombe State which serves as the State capital as well the headquarters of Gombe Local Government Council. Situated on longitude 11°10´E and latitude 10°17´N, with an altitude of 435.13 meters above sea level, covering an area of 5,200 km^2 and had human population of 268,536, with males constituting 68.3% with a projection of 280,000 people in 2012. About 80% of the population engaged in agriculture and agro-allied investments. It's a multi-ethnic town constituting mainly of Fulani, Hausa, Tera, Bolewa, Tangale, Kanuri and etc. The weather is characterised by a warm climate, having a mean diurnal temperatures of 35°C – 40°C in the months of March – May and less than 30°C during harmattan and had mean annual rainfall of 850mm [8].

2.2. Sampling Procedure

A multi-stage sampling technique was used to select 90 small-scale groundnut oil processors. In stage I, Gombe metropolis was purposively selected. The choice was made by the fact that it's the commercial centre of the State and constituted about 85% of the target population for this study. In stage II, six market districts namely; Tudunwada, Jekadafari, Pantami, Herwagana, Bolari and Nassarawo were purposively selected because they were notable and predominant areas for modern groundnut oil processing. In stage III, two markets were selected each from the market districts. In stage IV, a total of 90 groundnut oil processors were selected using simple random sampling proportionate to the number of processors in each market.

2.3. Sample Size

In determining the sample size appropriate for this study, the Barlett *et al.* (2001) model as modified by [9] was used, where 20% of the population was sampled. The study sought to define sample size such that at least 95% level of confidence was obtained as probable error of using a sample did not exceed 5%. According to this model, the appropriate sample size for a population of 451 processors was ninety (90). A proportional allocation technique was then used to determine the number of sample from each market.

2.4. Data Collection

Data for this study were collected using structured questionnaires; this was supported with personal interview

in situations where the respondents did not understand the questions.

2.5. Data Analysis

Data were analysed using farm budget, profitability index, gini-coefficient, t-test and shephered-futrel. To determine the costs, returns and gross incomes, the farm budget model was employed. The gross margin analysis as a popular model was used, which also measured profitability of the enterprise. According to [10], the Gross Margin (GM) equation is specified as;

$$GM = TR - TVC \qquad (1)$$

where:
GM = Gross Margin (₦)
TVC = Total variable costs (₦)
TR = Total Revenue (₦).

To determine the income distribution and market concencentration, the gini-coefficient model was used. It is a measure of statistical dispersion most prominently used as a measure of inequality in income distribution. The model is most easily calculated from unordered size data as the "relative mean difference," that is the mean of the difference between every possible pair of individuals, divided by the mean size. The Gini-coefficient ranges from zero to one. A perfect equality in concentration (low) of sellers is expected if Gini-coefficient tends towards zero, while perfect inequality in concentration (high) of sellers is expected if gini-coefficient tends towards one. If Gini-coefficient equals to one then the market is imperfect and if Gini-coefficient is equals to zero the market is perfect and competitive [11]. However, analysis of the market structures (objective four of the study) for groundnut oil and cake of RMP-12 and Ex-dakar varieties was done using Gini-coefficient. According to [12] Gini-coefficient also, called the Gini index is expressed as:

$$GC = 1 - \sum XY \qquad (2)$$

where; GC = Gini-Coefficient
X = Proportion of groundnut oil and cake processors
Y = Cumulative proportion of processors earnings
$\sum$ = Summation sign.

Also, The Shephered-futrel model was used to determine marketing efficiency of groundnut oil processing in the study area. Efficiency in agro-processing firms is the most frequently used measure of market performance. Improved market performance is the common goal of agri-business firms. The model is simplified as;

$$M.E = \frac{\text{marketing costs}}{\text{Total value of marketing of the products}} \times 100\%. \quad (3)$$

Also this model considers marketing efficiency as;
where;
M.E = Marketing efficiency (coefficient)
TR = Total revenue
TC = Total costs

The coefficient shows what percentage of the total revenue is taken by the total costs. Therefore the lower the coefficient the better the marketing margin, hence the more efficient market is [13]. However, to test for significance, the Paired t-test analysis was used to assess statistical differences in costs, returns, profit level, marketing margin and marketing efficiencies between the two respective groundnut varieties. The model is assumed appropriate to compare the means of the two sample groundnut groundnut varieties [14]. Generally the model is specified as;

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\dfrac{s_1^2}{x_1} + \dfrac{s_2^2}{x_2}}} \qquad (4)$$

where;
t = t- value
$\bar{x}_1$ and $\bar{x}_2$ X_2 = Arithmetic means for the two sample groups
S_1 and S_2 = Variances of the two sample groups
n_1 and n_2 = Sample sizes of the two group

To take decision on whether or not the difference between the two groundnut varieties is significant, the confidence limit is set at 0.05. This means that five times out of a hundred, one would find a statistically significant difference between the mean outputs from the two varieties [14].

3. Results and Discussion

3.1. Costs and Returns of Groundnut oil Processing

Costs are the actual expenses incurred in the process of marketing agricultural products. "Reference [15]" reported that, marketing costs comprises of the actual expenses incurred in the performance of the marketing activities as the commodity moves from the farm to the ultimate consumer. Costs in processing and marketing of groundnut products were grouped basically into two; the fixed costs and the variable costs, while returns were obtained from the sales of the products (oil and cake). Also, profits and/or lost were determined from the differences between the total revenue and the total costs incurred in marketing.

The average total costs and returns from processing of average 3.12 tonnes of shelled groundnut per trader per processing cycle of at least two days per week were determined and presented in Table 1. The results revealed, the average total costs of processing 3.12 tonnes of shelled groundnut per week, was ₦ 417,959.13 and ₦ 386,596.21 for RMP-12 and Ex-dakar respectively. The average total costs of processing differed because raw RMP-12 incurred higher cost than Ex-dakar. Also the results depicted that, fixed cost components were merely 0.42% and 0.47% of the average total costs of processing RMP-12 and Ex-dakar respectively. The cost of raw RMP-12 variety accounted for 92.25% while that for Ex-dakar variety constituted 91.62% of the average total costs. In terms of returns, the average gross margin (GM) of ₦ 73,786.77 and ₦ 96,964.69 were realised from the sales of 1,606 litres (oil) and 1.53 tonnes (cake) obtained from RMP-12; and 1,512.7 liters (oil) and 1.63 tonnes (cake) obtained from Ex-dakar respectively. This also reveals that groundnut oil accounted for 67.54% of gross income from

RMP-12 and 64.67% from Ex-dakar, with the remaining proportion (32.46% and 35.33%) of the gross incomes from the respective groundnut varieties, accounted for revenues realised from the sales of groundnut cake. This implies that both the products must be sold jointly so as to cover the total variable costs and make profit.

Moreover, the revenues from edible oil accounted for 78.84% and 80.95% of the total costs of processing RMP-12 and Ex-dakar respectively. This implies that, for processors to make sufficient profit they have to sell both the cake and the oil. Similar findings were made by [16]; [17]; [18]; who reported that, to cover up the variable costs and make reasonable profit both groundnut oil and cake must be sold jointly. The result further showed the respective average net returns of ₦ 72,458.65 and ₦ 95,636.57 were made, and the difference was significant (P<0.01). This implies that net revenue of about ₦ 23,223.93

and ₦ 30,652.75 per tonne were realised from RMP-12 and Ex-dakar respectively. This is in line with [19], who reported ₦ 20,000.00 – ₦ 30,000.00 profit was realised from processing one tonne raw groundnut in South East Nigeria. This translates that the business was profitable, as further confirmed by the rate of return to investment of 17.34% and 24.74% meaning that for every ₦ 1 invested, ₦ 0.17 and ₦ 0.25 were realised as net returns from the respective groundnut varieties. This agrees with [20]; and [21] that groundnut oil processing and marketing was a profitable venture in Bauchi State. Although, the level of profit was low, which was attributed to low price paid for the products and coupled with high cost of groundnuts [18]. The high cost of groundnuts which is a cash crop may be attributed to the decline in its production due to negligence by the government since the discovery of petroleum in 1960s [22]; and [23].

Table 1. Costs and returns of small-scale groundnut oil processing per week of RMP-12 and Ex-dakar varieties

Elements			Amount (₦)		Relative % of TC	
Variable Costs	Quantity	Unit	RMP-12	Ex-dakar	RMP-12	Ex-dakar
Cost of shelled groundnut	3.12	tonnes	385,576.52	354,213.60	92.25	91.62
Salt	25.2	grams	98.83	98.83	0.023	0.026
Onion	0.95	kg	184.67	184.67	0.044	0.048
Water	300	litres	154.22	154.22	0.037	0.04
Firewood fuel	250	kg	269.69	269.69	0.064	0.07
Advertisement	.	.	134.66	134.66	0.032	0.035
Transportation	.	.	5,368.56	5,368.56	1.28	1.39
Labour	4	Man day	7,805.56	7,805.56	1.858	2.017
Security	1	night	330.3	330.3	0.079	0.085
Plastic oil containers	65	.	15,676.66	15,676.66	3.731	4.051
Poly-sacks	22	.	1,031.34	1,031.34	0.245	0.266
Total Variable Costs			**416,631.01**	**385,268.09**	**99.69**	**99.66**
Total Fixed Costs			**1,328.12**	**1,328.12**	**0.31**	**0.34**
Total Costs			**417,959.13**	**386,596.21**	**100**	**100**
Returns					**Relative % of TR**	
Oil			331,215.56	311,875.00	67.54	64.67
Cake			159,202.22	170,357.78	32.46	35.33
Total Returns			**490,417.78**	**482,232.78**	**100**	**100**
Gross Margin			73,786.77	96,964.69		
Net Profit			72,458.65	95,636.57		
Returns on Naira invested			0.17	0.25		

Source: Field survey data (2014).

Table 2. Profitability analysis of processing RMP-12 and Ex-dakar groundnut varieties

	Gross ratio (TC:TR)		Operating ratio (VC:TR)		Fixed ratio (FC:TR)		Returns per naira (NI:TC)	
Markets	RMP-12	Ex-dakar	RMP-12	Ex-dakar	RMP-12	Ex-dakar	RMP-12	Ex-dakar
Tudunwada	0.8381	0.8007	0.8307	0.7693	0.0029	0.0033	0.1552	0.2208
Jekadafari	0.8732	0.8069	0.8798	0.8896	0.0021	0.0019	0.2012	0.2886
Pantami	0.8591	0.8014	0.8678	0.8466	0.0023	0.0021	0.1906	0.2701
Herwagana	0.8316	0.7987	0.8193	0.6997	0.0035	0.0037	0.1401	0.2097
Bolari	0.8591	0.8012	0.8597	0.7995	0.0026	0.0026	0.1902	0.2575
Nassarawo	0.8528	0.8011	0.8395	0.7886	0.0028	0.0032	0.1631	0.2377
Total	**5.1139**	**4.810**	**5.0968**	**4.7932**	**0.0162**	**0.0168**	**1.0404**	**1.4844**
Minimum	0.8316	0.7987	0.8193	0.6997	0.0021	0.0019	0.1401	0.2097
Maximum	0.8732	0.8069	0.8798	0.8896	0.0035	0.0037	0.2021	0.2886
Means	**0.8523**	**0.8017**	**0.8495**	**0.7989**	**0.0027**	**0.0028**	**0.1734**	**0.2474**
Paired t-test								
Means	0.5065		0.5060		- 0.00010		- 0.07400	
S. E	0.00529		0.1778		0.00011		0.00339	
D. F	5		5		5		5	
t - values	9.578 ***		2.846 **		- 0.889 NS		- 21.822 ***	
P – values	0.000		0.036		0.415		0.000	

*** P<0.01; ** P<0.05; NS = Non significant; S.E. = Standard error; D.F. = Degree of freedom; TC = Total costs; VC = variable costs; FC = Fixed costs; TR= Total returns; NI = Net income.
Source: Field survey data (2014).

3.2. Profitability of Groundnut Oil Processing

Profitability analysis is a component of enterprise resource planning that allows producers and marketers to forecast the profitability of a proposal or optimize the profitability of an existing business. It can anticipate sales and profit potential specific to aspects of the market, such as customers' socioeconomic status or product types [24]. The profitability ratios used to measure financial success of groundnut processing include: gross ratio (GR), operating ratio (OR), fixed ratio (FR), and rate of return to investment (ROR), which were presented in Table 2.

Gross ratio shows the relationship between the total revenue and the average total costs. The GR evaluates the performance of the business, such that lower ratio of < 1 is considered desirable [16]. This entails higher returns per Naira invested. From the results, the gross ratio for RMP-12 (0.8523) and Ex-dakar (0.8017) were recorded. This implies 85.23% 80.17% of the total revenue gives to pay for the total costs of processing the respective groundnut varieties. This suggests the reason Ex-dakar variety gave higher average net return (profit) than the RMP-12 variety, because 14.77% and 19.83% of the total returns of the respective groundnut varieties were retained as profit, and the difference was highly significant (P<0.01).

Operating ratio is a ratio of a firm's variable costs to its total revenue. A positive and lower ratio of < 1 is desirable as this indicates that in the event of decline in sales or revenue, the firm will maintain its profitability status. A lower ratio is an indicator of operational efficiency of a business especially when compared to same ratio for competitors. The OR does not guaranty debt repayment or expansion of the firm's venture. Table 2 shows operating ratio of 0.8495 and 0.7989 for RMP-12 and Ex-dakar varieties, respectively. Meaning that, 84.95% and 79.89% of the total revenues were used to pay for the variable costs of the respective groundnut varietal processing with the remaining 15.05% and 20.11% constituted their gross margins. However, the difference was significant (P<0.05).

Fixed ratio measures firm's ability to pay for all its fixed charges with its income. The FR also viewed as a solvency ratio (SR) as it shows how easily a firm can pay its bills when they are due. The higher the ratio the better and firms are less at risk to invest. Lower FR shows firm's inability to meet its durable liabilities from the total revenue. The result showed the FR of 0.0027 and 0.0028 were recorded from processing of RMP-12 and Ex-dakar respectively. Implying that, only 0.27% and 0.28% of the total revenues went to pay for the fixed costs of the respective groundnut varietal processing. This implied that the processing firms had the ability to meet their long term debt obligations by 99.73% and 99.72% of the respective groundnut varieties, which entails non-significant (NS) difference in solvency ratios of the two groundnut varieties.

The rate of return to investment was 0.1734 (RMP-12) and 0.2474 (Ex-dakar), which further confirmed the relative profitability of the two enterprises; meaning that for every one naira invested in small-scale groundnut processing of RMP-12 and Ex-dakar varieties; ₦ 0.17 and ₦ 0.25 were realised, with the later (Ex-dakar) had more profit and the difference was significant (P<0.01). This

was because the RMP-12 variety incurred higher average total variable costs of ₦ 31,362.92 than the Ex-dakar variety. The average cost of shelled RMP-12 variety was ₦ 123,582.22 per tonne while that of Ex-dakar was ₦ 113,530.00 (Table 1). "Refernece [25], reported similar findings that ₦ 0.22 was realised as return per naira invested in groundnut marketing in, Cross River State. Also, [18] found the return on investment in groundnut processing in Maiduguri metropolis Nigeria was 40% of the total investment, which means for every one naira invested, ₦ 0.40 was realised. Since the prevailing interest rate on savings is 20%, therefore, it is better to invest in groundnut oil processing than to save money in a bank.

3.3. Market Structure Analysis

Market structure analysis emphasises the nature of market competition and attempt to relate the variables of market performance to types of market structure and conduct. Market structure is a description of the number and nature of participants in a market. Market performance is a reflection of the impact of structure and conduct on product prices, costs, the volume and quality of output in a marketing system [26]. If the structure of a market is that of monopoly rather than pure competition, then one could expect poor market performance. However, in this study the Gini-coefficient was used to examine the levels of market concentration for groundnut oil and cake sellers of the two varieties, so as to determine the degree of competition or monopoly in the market.

However, Table 3 shows the variation in total revenues generated among the RMP-12 processors (₦ 44,137,600.00) and Ex-dakar processors (₦ 43,400,950.00). Twelve (12) of the processors had income range; ₦ 1.50 million - ₦ 1.99 million, that contributed ₦ 4,458,100.00 and ₦ 4,345,800.00 to the total revenues generated, which indicates a proportion of only 10.1% and 10.0% of the respective groundnut varieties. On the other hand, 2 of the processors had income range of ₦ 6.0 million and above, and contributed ₦ 1,522,200.00 and ₦ 1,513,800.00 to the total revenues generated (constituting only 3.45% of the respective groundnut varieties). The Gini-coefficients calculated for RMP-12 (0.835) and Ex-dakar (0.839) oil and cake sales were close to unity (1).

Mathematically, it implies that there was very low variation of sales and revenue generated among the processors, as the Gini index (0.835 and 0.839) were close to 1 (value of equal distribution). But technically, there was great variation in the revenue generated, as out of the 56 RMP-12 variety processors in the study area 32.1% contributed ₦ 11,363,200.00; while 25.6% of the Ex-dakar processors contributed ₦ 11,108,950.00, which represents 25.7% and 25.6% of the total revenues generated of the respective groundnut varieties. While the remaining 67.9% of RMP-12 processors and 74.4% of Ex-dakar processors, contributed ₦ 32,774,400.00 and ₦ 32,292,000.00 respectively. This accounted for 74.3% and 74.4% proportion of the total revenues of the respective groundnut varieties. The implication here is that, groundnut oil and cake marketing of the two varieties in the study area was principally played by only 32.1% and 25.6% of the total respondents of the two groundnut varieties.

According to [27], many factors could have been responsible for this; the inability of most of the marketers to adequately provide fund for the business could be the strongest reason, as capital is the most essential factor in marketing. This implies that there was monopoly of the business by the richer respondents as majority did not play actively in the business. Also, [28] reported that entry and exit into the market, or moving to another status in the market is influenced by size of capital.

The Gini-coefficient index, greater than 0.35 is high, indicating inequitable distribution of income or sales [29]; and [30]. Therefore, the values of Gini- coefficients for groundnut oil and cake marketers of the two groundnut varieties in the study area indicated high level of concentration and consequently high inefficiency in the market structures [31]. Also, [32] advocated that the high concentration is therefore an indication that may lead to market imperfection and poor marketing performance. Since the number of firms are many and all of them selling homogenous products, it implies that there might not be restrictions of new firms in to and out of the markets thereby resulting in the existence of pure competition and this may have the tendency at bringing about inequality in earnings among the various markets with some few individuals controlling the operations of the markets. There is also more scope for middlemen to exploit either the consumers by charging them higher price or the processors by paying them low prices for their salable products. The results agreed with [33], who in their findings reported that, the Gini coefficient analysis showed a high level concentration of 0.862. This concentration ratio indicated that there was a high level of inequality in the sales revenue of the marketers; the market was imperfectly competitive with a structure that suggests a monopolistic market, existence of some barriers to entry, product differentiation, greater market power and choice of technology in the marketing enterprise. "Reference [34] made a similar observation in their study on the Market structure, conduct, channels and margins of dry season processed Okra vegetable in South-Eastern Nigeria.

But, [35] had a Gini coefficient of 0.077 among the rural buyers of Shea butter oil, which showed the lowest degree of equality in distribution. This signifies that, there was more equality of Shea butter distribution among the market participants. This was because the low concentration portrayed fair competition. "Reference [36] "reported that The Gini coefficient posted by rice processors and marketers (0.17), implied 17% varying degree of income inequality among the marketers. Hence; the market structure is said to have low concentration, perfect competition, with little or no barrier to entry or exit to the market, and the marketers had fair equitable distribution of sales and income. Also, such low coefficients imply low level of inequality and consequently high efficiency in the market structure [37]; and [38]. A perfectly competitive market that is efficient does not only bring sellers and buyers together, but also enables entrepreneurs to take advantage of opportunities to innovate and improve in response to demand and price changes [39].

3.4. Marketing Efficiency of Groundnut Products

Marketing efficiency is viewed as the maximisation of the ratio of output to input in marketing, expressed as percentage [40]. To determine the marketing efficiency of groundnut oil and cake, the Shephered – Futrel model was employed. This model was considered accurate for measuring marketing efficiency of most agro-processed products [41]. Table 4 shows that RMP-12 variety's oil and cake in Herwagana markets had the least marketing margin of 8.59%, this implies that 100% retail price paid by the final consumer, result in farm-to-retail price spread of only 8.56%. In other words, an average RMP-12 processor in Herwagana markets earns market margin of 0.086 ₦ for every 1 Naira retail price paid by the final consumer in the marketing process. This represents payments for all assembling, processing, transporting, and retailing charges added to farm products. The low level of marketing margin of the processors is attributed to exploitative activities of the middlemen. The finding contradicts [42], that farmer's margin was as high as 96.81%; that only 3.19% went to middlemen involved in grains marketing in Adamawa central zone.

Table 3. Gini-coefficients for RMP-12 and Ex-dakar's oil and cake sales in Gombe metropolis

Table	3:	Gini-coefficients	for	RMP-12	and	Ex-dakar's	oil	and	cake
1.5 – 1.99	12	12	0.13	4,458,100	4,345,800	0.101	0.1	0.013	0.013
2.0 – 2.49	10	22	0.11	3,282,700	3,269,000	0.074	0.075	0.008	0.008
2.5 – 2.99	27	49	0.3	11,363,200	11,108,950	0.257	0.256	0.077	0.077
3.0 – 3.49	16	65	0.18	8,451,800	8,465,000	0.191	0.195	0.034	0.035
3.5 – 3.99	11	76	0.12	6,854,800	6,679,200	0.155	0.154	0.019	0.018
4.0 – 4.49	3	79	0.03	1,909,700	1,868,100	0.043	0.043	0.001	0.001
4.5 – 4.49	6	85	0.07	4,030,500	3,945,300	0.091	0.091	0.006	0.006
5.0 – 5.49	2	87	0.02	1,489,600	1,430,200	0.034	0.033	0.001	0.001
5.5 – 5.59	1	88	0.01	775,000	775,600	0.018	0.018	0.0002	0.0002
6.0 – 6.49	2	90	0.02	1,522,200	1,513,800	0.0345	0.0345	0.001	0.001
TOTAL	90		1	44,137,600	43,400,950	1	1	0.1602	0.1602
			Mean	4,413,760	4,340,095	GC		0.8398	0.8398

N.B. Income distribution is in million (₦); F = Frequency distribution; FC = Cumulative frequency; X = Proportion of frequency; TS_1 = Total sales for RMP-12 products; TS_2 = Total sales for Ex-dakar; Y_1 = Proportion of total sales of RMP-12; Y_2 = Proportion of total sales of Ex-dakar. GC = Gini-coefficient

Source: Field survey data (2014).

Table 4. Marketing efficiency of groundnut products in Gombe metropolis

Markets	Varieties	SC (₦)	MC (₦)	TC (₦)	SP (₦)	VA (₦)	MM	ME
Tudunwada	RMP-12	379,439.99	22,003.38	401,443.37	448,838.46	69,398.47	0.1546	89.44
	Ex-dakar	348,720.00	22,003.38	370,723.38	440,453.85	92,733.85	0.2583	84.17
Jekadafari	RMP-12	384,072.00	27,395.41	411,467.41	549,300.00	165,228.00	0.1369	79.91
	Ex-dakar	350,064.00	27,395.41	377,459.41	539,450.00	189,386.00	0.3550	69.97
Pantami	RMP-12	389,479.99	25,360.30	414,840.29	524,904.17	135,424.18	0.2579	79.03
	Ex-dakar	343,408.01	25,360.30	368,768.31	510,400.00	166,991.99	0.3271	72.25
Herwagana	RMP-12	409,864.56	24,152.08	434,016.64	448,381.82	38,517.26	0.0859	96.80
	Ex-dakar	381,490.92	24,152.08	405,643.00	444,563.64	63,072.72	0.1419	91.25
Bolari	RMP-12	381,296.85	23,343.98	404,640.83	489,210.53	107,913.68	0.2206	82.71
	Ex-dakar	356,829.47	23,343.98	380,173.45	486,176.32	129,346.85	0.2660	78.20
Nassarawo	RMP-12	380,065.92	24,072.03	404,137.95	491,346.00	111,280.08	0.2265	82.25
	Ex-dakar	349,926.72	24,072.03	373,998.75	481,128.00	131,201.80	0.2727	77.73
Mean		371,221.54	24,387.86	395,609.40	487,846.07	116,707.91	0.2253	81.98

NB: SC = Supply costs; MC = Marketing costs; TC = Total costs; SP = Selling price; VA = Value added; MM = Marketing margin; ME = Marketing efficiency;
Source: Field survey data (2014).

Moreover, the Herwagana markets were regarded less efficient base on market coefficient (96.80%), implying that only 3.20% of the total revenues that were received by the processors. This may be due to monopolistic behaviour in the markets, imperfect competition, price variation of the raw materials and transportation costs. However, the results further revealed that, Ex-dakar variety's oil and cake in Jekadafari markets had the most marketing margin of 35.50%, this implies that, 100% retail price paid by the final consumer result in farm-to-retail price spread of only 35.50%. In other words, an average Ex-dakar processor in these markets earns a market margin of ₦ 0.36 for every 1 Naira retail price paid by the final consumer in the marketing process. Jekadafari markets having 69.97% market coefficient for Ex-dakar's oil and cake, were most efficient. Meaning that out of the total revenues, 30.03% went to the processors while the remaining proportion went to other middlemen.

The results also showed the marketing efficiencies of Nassarawo as (82.25% and 77.73%), Bolari as (82.71% and 78.20%), Pantami as (79.03% and 72.25%) and Tudunwada as (89.44% and 84.17%) for respective RMP-12 and Ex-dakar varieties. In comparison, Ex-dakar's products revealed to have lower coefficients than that of RMP-12 in all the markets; thus, concluded that those markets were most efficient. This was attributed to the fact that the Ex-dakar variety had lower processing costs and higher marketing margin than the RMP-12 variety. To improve the market efficiency and marketing margin, the processors should either increase the firm's gate price or to possibly by-pass the market middlemen to get higher return from the sales [43]. This agrees with [5], who in their findings reported Santhe market was the most efficient (53.70%) as compared to other markets in Mzimba & Kasungu districts of Northern and Central Malawi respectively. This was attributed to the fact that most of groundnut processors sold their products direct to the consumers. Also, [44] revealed the marketing efficiency of 32.67% was obtained in dried processed products in Maiduguri metropolis Borno State, Nigeria. This reveals that dried processed products marketers received about 67.33% per 50kg cartoon as net profit. "Reference [45] reported similar findings that groundnut marketing was found to perform better when compared to other oil producing crops in Northern Ghana. While the groundnuts' products traders realised 93.36% as marketing margin, the Soybeans' products traders obtained 57.22% marketing margin. But, [46] argued that efficiency of agricultural markets cannot be judged solely by the structure-conduct-performance framework or by the marketing margin analysis only, it needs to be backed up with some additional evidences of competitive conditions like low inter-market price differentials, possibility of inter-market trade, etc.

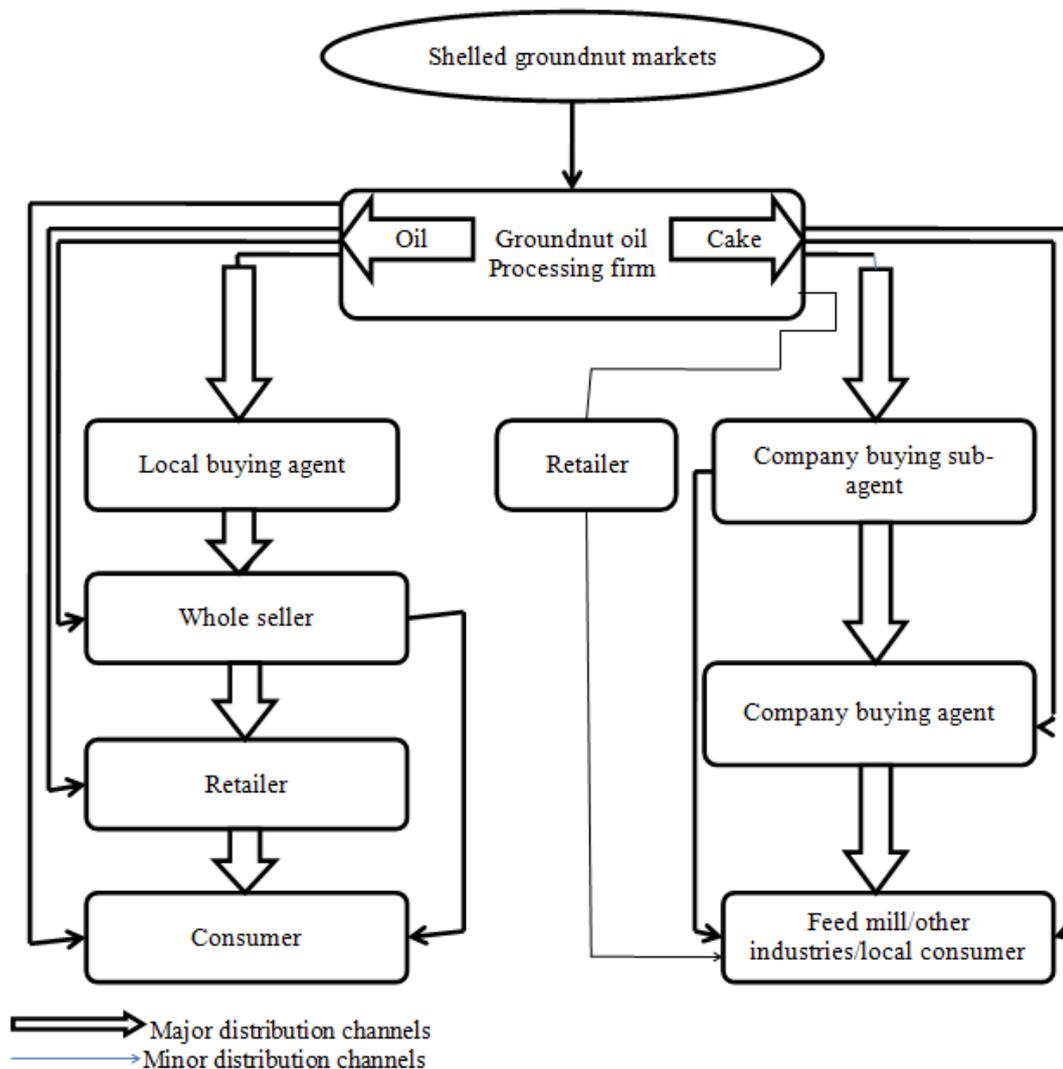## 3.5. Marketing Channels for Groundnut Oil and Cake in Gombe Metropolis

Marketing channel is the path of commodity from its raw form to its finished form or a path of product as it moves from the producers to the final consumers [26]. In this study, five distribution channels were identified each for groundnut oil and groundnut cake. Figure 1 depicts the various channels through which groundnut oil (GNO) and or groundnut cake (GNC) move from the processing firm to the final consumer. Wholesalers were found to be very important players in the value chain, helping the distribution within and outside the study area. In the same vein, while some channels were considered major, others were regarded as minor channels based on the volume of the products handled and the number of traders involved. This is in line with the findings of [47], who reported five marketing channels as; the very important channel, the important channel, the less important channel, the very less important channel and the insignificant channel.

Channel 1, was regarded the very important channel consists of five participants; the processors who sold the groundnut oil to the local buying agents at the firm gates, then sold to the wholesalers, retailers and finally to the ultimate consumer. Channel 2, regarded the important channel had four participants; the processors, by-passed the local buying agents, the wholesalers sold the oil to the retailers and finally to the consumer. In these channels (1 and 2), the gap between processors and consumers is widened on account of the presence of 3 or 2 intermediaries. Channel 3, the less important channel. This

comprises of only three participants; the processors, retailers and consumers. In this channel (processor-retailer-consumer) there is gap between the two extreme ends which is preferable in a situation where the buyers are large and also suitable for perishable goods which need speedy distribution. Channel 4, the very less important channel, also comprises of three participants; the processors, wholesalers and ultimate consumer. Channel 5, is the shortest and simplest pathway as the commodities move from the processors to the ultimate consumer. Regarded as the insignificant channel, comprising of only two participants where the processors sold the oil directly to the consumers.

On the aspect of marketing of groundnut cake, channel 1 was regarded as the very important channel which consists of four participants; the processors, the company sub-buying agents, the buying agents and the feed mills/other manufacturing industries, this long marketing channel indicates that the processors loosed so much gain for the middlemen. Channel 2, the important channel consist of three participants; the processors, the company buying agent and the feed mills/other manufacturing industries. Channel 3, regarded as the less important channel, also comprises of three participants; the processors, company buying sub-agents and feed

mills/other manufacturing industries. Channel 4, was the very less important channel that consist of three participants; the processors, retailers and feed mills/local consumers. Channel 5, regarded as the insignificant channel, consists of only two participants. The processors sold their products directly to the feed mills. According to [48], the 'processor-consumer' channel was most inefficient and left the processors with weak bargaining position. Most of the producers had no enough working capital and as, a result; they sell part of their groundnut product in advance at low prices to the middlemen. Even those who were able to avoid the firm gate selling and by-pass the middlemen, the marketing system compels them to be weak sellers, because there was no adequate market information to assist them sell their products. This is in line with [5], who reported that groundnut products changed hands many at times before reaching the ultimate consumer. In addition, Channels 1, 2, 3 and 4 were identified as channels where major marketing functions hold, whereas in channel 5 the products were sold directly to the consumers, the question of marketing costs did not even arise [49]. The marketing channel having only two participants (producer-consumer channel) was the most cost effective channel in the marketing of groundnut in Rafia zone of Niger State [50].

Source: Field survey (2014)
Figure 1. Marketing channel of groundnut oil and cake in the study area

4. Conclusion

Based on the results obtained from this study, it may be concluded that the enterprise is profitable, Ex-dakar variety gave higher gross income. The shelled groundnut was the most important resource input for oil and cake production, that increase in groundnut seed would give additional income. The results revealed that costs of shelled groundnut constituted the major components of processing costs. The financial ratios and as well as the return per naira invested further revealed the profitability of the enterprise, that Ex-dakar was more profitable. The gini-coefficients for the respective groundnut oil and cake marketing , reveals that there was great variation in the revenue generated among the processors, and also indicated high level of concentration and consequently high inefficiency in the market structures The coefficient of marketing revealed Jekadafari markets to be most efficients.

5. Recommendations

In order to achieve sufficient profit and efficient market in groundnut products, the following recommendations were made:

1) Government and the communities should do all possible to restore peace in the groundnut producing areas through dialogues among the conflicting groups, and as well as helping to fight against the Boko Haram insurgency.

2) Scarcity of groundnut seeds for processing means that unsustainability of the value chain in groundnut production, therefore production of the crop must be encouraged beyond the present subsistence level. Introduction of improved seeds and methods, need to be encouraged as part of extension service programmes.

3) Government and other lending agencies should make agricultural loan facilities accessible to the processors, so as to ensure timely and adequate utilization of inputs for improvement and efficiency. The processors should form cooperative societies, so as to have access to loans, to pull their resources together and help themselves in purchasing of inputs for their operations, and also to create other market linkages with a view of maximising advantages of distant markets.

4) Research institutes and tertiary schools need to develop appropriate and affordable processing technologies to small-scale modern processors. This is necessary given the fact that many of these small-scale processing technologies can be fabricated locally hence can easily be accessible and affordable.

5) Government should adequately provide the needed infrastructure to the processors, such as; electricity, good roads, storage facilities, market facilities etc.

6) In order to achieve higher profit, the processor should be encouraged to utilise Ex-dakar variety as their main resource input for oil and cake processing based on its high gross margin.

7) Marketing operations should be improved for enhanced efficiency in all the markets in the study area.

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