

Socio-economic analysis of small-scale groundnut-oil and cake processing in Birnin Kudu Agricultural Zone of Jigawa State, Nigeria

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ABSTRACT: This study analysed the socio-economic factors influencing groundnut oil and cake processing among small-scale processors in Birnin Kudu Agricultural Zone, Jigawa State, Nigeria. Specifically, it examined the socio-demographic profiles of processors, their impact on value addition, and the challenges faced in the processing chain. Data were collected from 286 respondents using structured questionnaires and analysed using descriptive statistics and multiple regression models. The findings revealed that processors were predominantly economically active, with an average age of 37, a household size of 8, and 9 years of processing experience. Regression results showed that age (0.179), processing experience (0.467), and cooperative membership (0.2.086) significantly influenced value addition at 5%, 1%, and 10% levels, respectively. Major challenges included the high cost of groundnut seeds and inadequate capital. The study recommends promoting cooperative memberships and moderate household sizes to enhance credit access and subsidised inputs, thereby improving productivity and value addition in the groundnut oil and cake processing value chain.

Keywords: Groundnut value chain, Jigawa State, small-scale processors, Socio-economic analysis, value addition.

INTRODUCTION

Groundnut, also known as peanuts, has a high nutritional and economic importance. In Nigeria, groundnut is one of the primary cultivated crops, with states like Niger, Kano, Jigawa, Zamfara, Kebbi, Sokoto, Katsina, Kaduna, and other Northern States being the main producers (Samuel and Ocholi, 2017). The groundnut pyramids of northern Nigeria had been a tourist attraction as well as evidence of wealth. This rosy picture about groundnut had long changed, occasioned by scarce resource availability and neglect of the agriculture sector in preference to crude oil (Samuel and Ocholi, 2017). Apart of its use as an industrial product, Abdullahi *et al.* (2017) observed that all parts of the groundnut plant, including the roots, pods, stems, leaves, shells, and kernels, are valuable, containing significant proportions of protein (25%-34%), oil (48%-50%), carbohydrates (11%-27%), crude fiber as well as

minerals and vitamins.

Despite the observed importance, an important postharvest handling of groundnut is the improvement of value. As per the United Nations Development Programme (UNDP, 2023), artisanal extraction stands out as a crucial economic activity, particularly for rural women. Once the oil extraction process is complete, the residual groundnut meal becomes a vital ingredient in animal feed for both poultry and livestock. Additionally, groundnuts can be processed into human food such as groundnut cake, known as *Kulikuli*, which serves both household consumption and commercial purposes (Shuaibu, 2021). The focus of this study was specifically on groundnut oil and groundnut cake processing carried out by small-scale women processors in the chosen study area. These processors either grow groundnuts on their farms or

purchase raw groundnuts from the market for subsequent processing into groundnut oil and cake, which are complementary products. The final products are then sold to consumers, thereby adding value to the process.

The Jigawa Agricultural and Rural Development Authority (JARDA) Zone 1 (commonly referred to as Birnin Kudu Agricultural Zone), stands out as one of the primary hubs for groundnut cultivation in Jigawa State (JARDA, 2021). The demand for groundnut and groundnut by-products has increased as a result of increased demand from other states of the country. Consequently, there's a bustling scene of groundnut oil and cake processing carried out by small-scale women processors to meet demand. Nonetheless, the challenge of limited value addition to these products persists in the area.

Extensive efforts have been carried out by governmental as well as non-governmental bodies to boost value addition in groundnut enterprise, however, its processing remains largely limited and less profitable. This could be occasioned by low value being added to the crop, possibly due to socio-economic and input cost-related factors. While many studies, such as that of Aliyu (2015) and Aliyu and Gona (2023), have emphasised the importance of value addition along the value chain, there is a paucity of documented information on groundnut value addition, particularly in the Birnin Kudu Agricultural Zone of Jigawa State, Nigeria. Previous research has mainly focused on groundnut production and marketing, leaving a gap that this study aims to fill. It seeks to investigate the socio-economic characteristics and their influence on the value addition of raw groundnuts into groundnut oil and cake by small-scale artisanal women processors in the area.

METHODOLOGY

Birnin Kudu Agricultural Zone (also referred to as Zone I) is situated in the southern part of Jigawa State, spanning from latitudes 9°15'N to 10°15'N and longitudes 10°30'E to 12°00'E. It comprises seven Local Government Areas (LGAs): Birnin Kudu, Dutse, Kiyawa, Gwaram, Buji, Miga, and Jahun (Figure 1). The zone shares borders with Gumel Agricultural Zone (Zone II) to the north, Ningi and Jamare Local Government Areas (LGAs) of Bauchi State to the south and east respectively, and Takai LGA of Kano State to the west. As reported by the National Population Commission (NPC, 2006), the population of this zone was 1,459,900, with a projected population of 2,493,894 by 2023, based on a 3.2% annual growth rate.

Birnin Kudu Agricultural Zone is situated within the Sudan savannah and experiences a moderate average rainfall of 550mm. Its soil composition is sandy and sandy-loamy, well-suited for groundnut cultivation. The zone has two distinct seasons: the rainy season, lasting from early May to October, and the dry season, from November to April. Daily temperatures range from 27 to 44°C, with April

being the hottest month. Agriculture is the primary economic activity, with most of the population engaged in crop farming and animal husbandry. Major crops grown include sorghum, rice, millet, groundnut, cowpea, sesame, and maize, as well as cash crops like date palm, sesame, and hibiscus. Livestock rearing involves cattle, sheep, goats, and various domesticated bird species (JARDA 2021).

According to JARDA (2021), Birnin Kudu Agricultural Zone emerges as the leading producer of groundnut crops, groundnut oil, and groundnut cake in Jigawa State, contributing about 75 to 80% of the state's groundnut output. Almost all LGAs within the zone are actively involved in groundnut production and processing.

Typically, groundnut oil and cake processing in the study area is carried out on a small scale by most processors. Using traditional methods, anywhere from 20 to 50 kg of raw groundnuts can be processed daily, depending on the manual labor available. At the cottage level, processing can handle 1 to 2 bags (around 80 to 160 kg) of raw groundnuts each day, using machines to produce groundnut oil and cake. However, in Kangire village, located in Birninkudu LGA, production occurs in relatively larger quantities, with groups processing 4 to 5 bags per day, facilitated by the utilization of machinery.

Sampling technique and sample size

A multi-stage sampling approach was used to determine a sample size of 296 smallholder groundnut oil and groundnut cake processors. In the initial stage, four LGAs within the zone were purposively selected based on intensive production and processing of groundnuts. These included Dutse, Birninkudu, Gwaram, and Kiyawa LGAs. In the second stage, three communities were purposively chosen from each of the four selected LGAs, to give a total of twelve communities out of seventy-five. This selection was based on their predominant involvement in groundnut production and processing, as well as the ease of access to these communities. Lastly, in the third stage, the Yamane (1967) formula was adapted to calculate the sample size. This calculation was based on a comprehensive list of an estimated population of 1140 groundnut oil and groundnut cake processors in the study area, obtained from the Agri-business Department of JARDA.

Assuming a 95% confidence level and a 5% sampling error, the formula is expressed as;

$$n = \frac{N}{1+N(e)^2} \dots \dots \dots (1)$$

Where: n = sample size, N = the population size, and e = the level of precision.

$$n = \frac{1140}{1 + 1140(0.05)^2}$$

$$n = 296$$

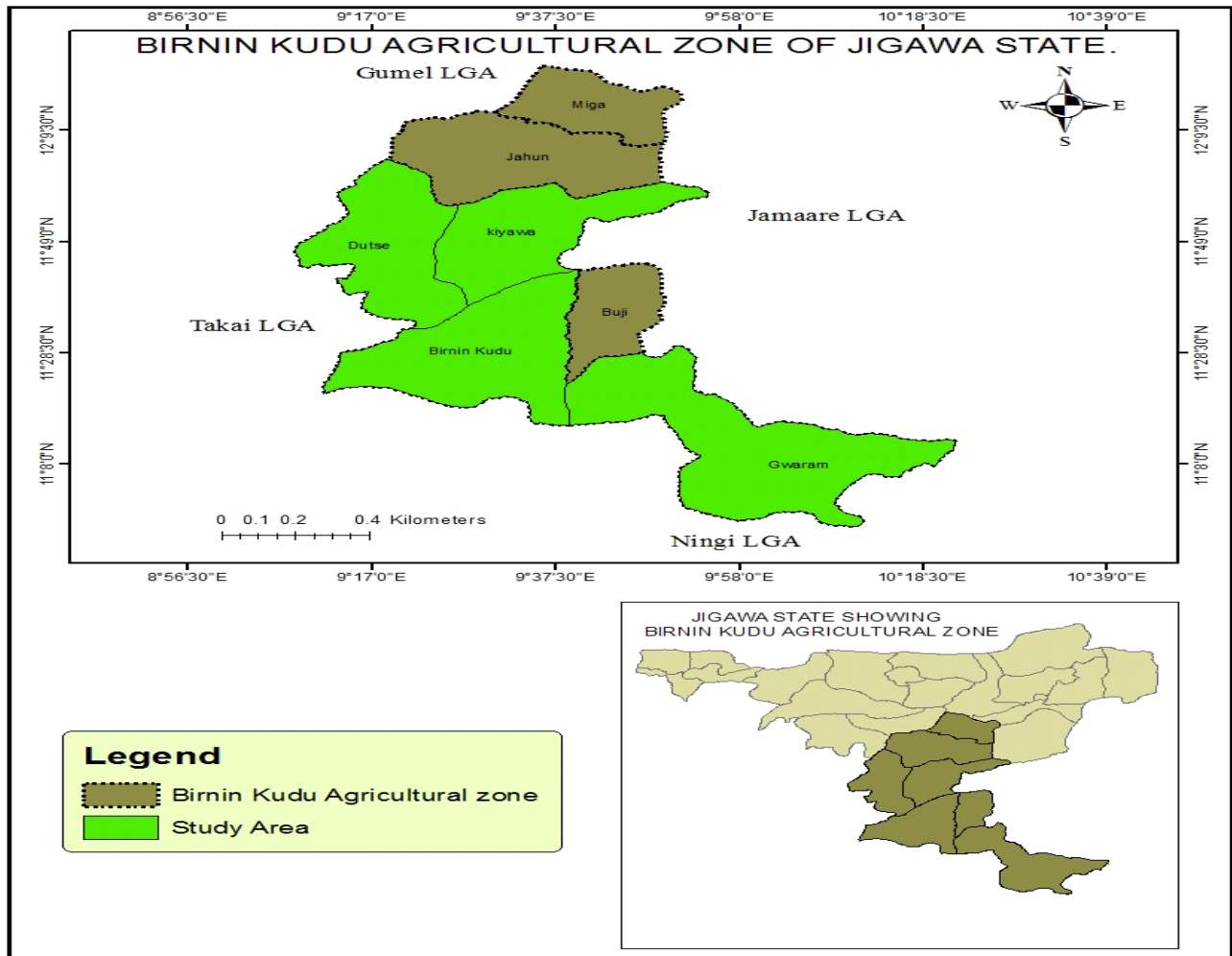


Figure 1. Map of BirninKudu Agricultural Zone of Jigawa State (Source: GIS Lab EMT Dept, FUD).

The Bowley’s proportion allocation formula was used to establish the sample size at each stratum or community. This is expressed as:

$$n = \frac{nN_i}{N} \dots\dots\dots (2)$$

Bowley’s proportion formula is easy to use, and it is more scientific in selecting sample size across the entire zone without bias.

Where: n_i = Sample size for the i^{th} Stratum, n = Total sample size, N_i = Population for the i^{th} stratum, and N = Total population.

The study relied on primary data as its main information source, gathered through well-structured questionnaires and interviews conducted face-to-face with respondents, facilitated by trained enumerators and extension officers

from JARDA in the study area. Additionally, on-site observations were conducted at the processing points for groundnut oil and groundnut cake production. Data collection took place between January and April 2022, focusing on the socio-economic characteristics of groundnut oil processors, including age, gender, marital status, education level, household size, years of processing experience, access to credit, and cooperative membership. Additionally, information on the costs and returns involved in processing groundnuts into oil and cake was gathered, covering fixed and variable costs, as well as revenue generated. Constraints faced by small-scale groundnut oil processors were also documented. The field data underwent analysis after coding and cleaning. Out of 296 questionnaires distributed, 286 (96.6% of the total sample) were suitable for analysis (Table 1). Some questionnaires were incomplete or not returned. Descriptive (mean and frequency), inferential (regression) statistics and budgeting techniques were employed to analyze the data.

Table 1. Sampling frame and sample size of groundnut oil and cake processors.

JARDA Agricultural zone one	Local Government Areas	Communities	Estimated population (sample frame)	Sample size selected	
Birnin kudu Agricultural zone	Dutse	Madobi	85	22	
		Sakwaya	100	26	
		Kudai	120	31	
	Birnin kudu	Birnin kudu	Kangere	100	26
			Kantoga	75	19
			Birnin kudu	150	39
	Gwaram	Gwaram	Sara	78	20
			Kila	100	26
			ZandamNagogo	52	14
	Kiyawa	Kiyawa	Shuwarin	60	16
			Andaza	100	26
			Kiyawa	120	31
Total	4	12	1140	296	

Source: JARDA 2022.

Ordinary Least Squares Multiple Regression Model

Multiple regressions are statistical tool that measures the relationship between the independent variables and the dependent variable. Y in this study is the dependent variable, which represents the total value addition in processing groundnut to groundnut oil and groundnut cake in the study area, which was calculated in Naira. This value was obtained by deducting the costs incurred in processing the groundnut oil and groundnut cake from the revenue generated from both products. Xson the other hand, are the independent variables representing the socio-economic factors influencing groundnut processing to groundnut oil and groundnut cake. They are the factors that determine the total value added to groundnut oil and groundnut cake in the study area. The exponential functional form in explicit form is presented below:

$$\text{Log } Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + u \dots \dots \dots (3)$$

Where: Y= Total value addition (₦), X₁ = Age of processors in years, X₂ =Education level of processors (years), X₃= Marital status (Married =1, Otherwise =0), X₄ = Household size (numbers), X₅ =Secondary occupation (Farming =1, Otherwise =0), X₆ = Processing Experience (years), X₇ = Co-operative Membership (Member =1, Non-member=0), X₈= Credit Accessibility (Access =1, Non, Access= 0), U = Error term or disturbance term, B₁ to B₆ are coefficients, B₀ = Intercept and Log = Logarithm function.

RESULTS AND DISCUSSION

Socio-economic characteristics of groundnut oil and cake processors

The results in Table 2 show the socio-economic characteristics

of small-scale groundnut processors in the study area, such as age, marital status, household size, educational level, occupation, years of processing experience, co-operative membership, and credit accessibility. The result from the table indicates that the average age of small-scale groundnut processors in the area is 37 years. Most of these processors fall within the 21-50 age range, making up 96.5% of the group. This suggests that the women are in their prime, being both energetic and capable of handling the demanding work involved in groundnut processing. Their age and vitality could facilitate the adoption of modern processing techniques, potentially boosting the amount of groundnut oil and cake produced. These findings align with Ishaya *et al* (2018), who noted that most women groundnut processors in Zuru Emirate, Kebbi State, were also within this active age range. Similarly, Aboki (2015) found the average age of traditional groundnut processors in North Central Nigeria to be 38 years, while Samuel and Ocholi (2017) reported a mean age of 38 years for processors in Taraba State.

The results in the table further show that a significant majority of women involved in small-scale groundnut processing are married, accounting for 81.8%. These women engage in processing to support their families and boost their income. The next largest groups are widows at 9.1% and divorced women at 6.3%, with singles making up the smallest percentage at 2.8%. This trend aligns with the findings of Hajara *et al.* (2023), who observed that most groundnut farmers in Maiduguri Metropolis, Borno State, Nigeria, were married. Similar results were reported by Shuaibu *et al.* (2018) in Kano State and by Ishaya *et al.* (2018) in Zuru Emirate, Kebbi State, where the majority of groundnut processors were also married and worked to enhance their family income. Abdulazeez *et al.* (2012) noted that most women groundnut processors in Kwara State were married, suggesting that the responsibilities of

Table 2. Socio-economic characteristics of groundnut oil and cake processors.

Characteristics	Frequency	Percentage	Mean Value
Age (years)			
21-30	79	27.6	
31-40	122	42.7	
41-50	75	26.2	37
51-60	10	3.5	
Total	286	100	
Marital Status			
Single	8	2.8	
Married	234	81.8	
Widow	26	9.1	
Divorced	18	6.3	
Total	286	100	
Household Size			
1-3	18	6.3	
4-6	92	32.2	
≥7	176	61.5	8
Total	286	100	
Educational level			
Tertiary	9	3.1	
Secondary	78	27.3	
Primary	107	37.4	
Quaranic	92	32.2	
Total	286	100	
Major Occupation			
Farming	6	2.1	
Groundnut Processing	265	92.7	
Trading	12	4.2	
Civil Servants	3	1	
Total	286	100	
Processing Experience			
1-3	11	3.9	
4-6	93	32.5	
≥7	182	63.6	9
Total	286	100	
Cooperative Membership			
Members	132	46.2	
Non-member	154	53.8	
Total	286	100	
Credit Accessibility			
Access to credit	22	7.7	
Non-Access	264	92.3	
Total	286	100	

Source: Field Survey, 2022.

family life drive them to work harder to address both household and business needs. Furthermore, Table 2 reveals that small-scale groundnut processors in the study area have an average household size of 8 people. A substantial 61.5% of these processors have large households, with 7 or more members. The larger household size likely means more family members are involved in groundnut processing, leading to increased availability of labour and lower labour costs in the area.

The findings are consistent with Samuel and Ocholi (2017), who found that large households in Taraba State provided women with additional family labour for processing groundnut oil and cake. Similarly, Aboki (2015) reported an average household size of 8 among traditional and small-scale processors in the North Central States. However, 32.2% of respondents had medium-sized households with 4 to 6 members, and 6.3% had small households with 1 to 3 members. The prevalence of large households is likely to positively influence both productivity and profitability in groundnut processing by increasing the market demand for processed products, which encourages larger-scale production.

With respect to the level of education, Table 2 indicates that 67.8% of groundnut processors received formal education. Specifically, 37% completed primary school, 27.3% finished secondary school, and 3.1% hold a tertiary education certificate. The remaining 32.2% attended Qur'anic schools. These levels of attainment in education suggest that the processors were literate and capable of making informed decisions that could enhance groundnut oil and cake production. This aligns with Ishaya *et al.* (2017), who found that women groundnut processors in Kebbi State, Nigeria, had significant formal education and were more open to adopting improved processing technologies. However, the results contrast with Samuel and Ocholi (2017), who reported that many groundnut processors in Taraba State had informal education and predominantly used traditional methods and tools, which led to lower profitability.

Table 2 shows that a significant majority of respondents (92.7%) consider groundnut processing their primary occupation, while trading accounts for 4.2%, farming for 2.1%, and civil service for just 1%. This indicates that for most women in the area, groundnut processing, particularly producing oil and cake, is their main source of income. This differs from the findings of Owusu-Adjei *et al.* (2017), who reported that women in Ghana primarily engaged in crop production.

Regarding processing experience, Table 2 reveals that the average experience among respondents is 9 years. A substantial 63.6% have been processing groundnuts for 7 years or more, suggesting that they are well-experienced and capable of handling processing tasks efficiently, which likely results in consistently high-quality products. This aligns with Saleh (2016), who found that groundnut oil processors in Gombe State, Nigeria, had between 6 to 10

years of experience. Similarly, Ishaya (2018) reported 6 to 10 years of processing experience among processors in Zuru Emirate, Kebbi State. Additionally, 32.5% of respondents have moderate experience (4 to 6 years), while 3.9% had less experience (1 to 3 years).

Additionally, Table 2 shows that 46.2% of respondents are members of cooperative groups focused on processing groundnuts into oil and cake. However, the majority, 53.8%, are not part of any cooperative. This suggests that many groundnut processors might be missing out on the advantages of cooperative membership, such as easier access to credit, information, labour, and market opportunities. This is consistent with Baba (2022), who found that only 35% of groundnut producers in a specific Local Government Area in Niger State, Nigeria, were involved in cooperatives. Similarly, Ogwuche (2017) reported that most women groundnut processors in Dutse, Jigawa State, were not cooperative members.

In terms of credit accessibility, Table 2 reveals that only 7.7% of respondents have access to credit for financing their groundnut processing activities, while a significant 92.3% do not. This lack of credit access likely limits their ability to buy necessary equipment and bulk quantities of raw materials, impacting their production capacity. Ahmed *et al.* (2022) noted that most groundnut processors in Adamawa State rely on family and friends for credit rather than formal financial institutions. Saleh (2016) highlighted that the lengthy procedures for securing loans from financial institutions contribute to this issue. Similarly, Shuaibu (2018) reported that 89.6% of women groundnut processors in Kano State also lacked access to credit.

Socio-economic factors influencing groundnut processing

Table 3 shows the results of the socio-economic characteristics that influenced value addition. The R^2 value was 0.318, which implied that 31.8% of the variation in the dependent variable (Y), which in value addition was explained by the model. The F-statistic was significant at 1%, and this indicates that the variables included in the model are jointly and statistically significant. As a result, the exponential functional form was chosen as the best fit.

The result revealed that age, years of processing experience, and cooperative membership were the significant socio-economic factors influencing total value addition. The coefficient of age was positive and significant at 5%. This implies that an increase in the age of groundnut processors will result in a 17.9% increase in value addition. It, however, means that aged people played a key role in increasing value addition. This could be as a result of more concentration on the enterprise than the young ones, whose interest is more in white collar jobs. This is in agreement with the findings of Shuaibu *et al.*

Table 3. Influence of socio-economic factors on total value addition.

Variable	Coefficient	Standard error	T-value	Probability
Constant		0.098	78.583	0.000***
Age	0.179	0.002	2.830	0.005**
Marital status	-0.042	0.038	-0.795	0.427
Household size	-0.065	0.004	-1.193	0.234
Education	-0.035	0.017	-0.700	0.485
Secondary occupation	-0.046	0.031	-0.915	0.361
Processing Experience	0.467	0.004	7.707	0.000***
Cooperative membership	0.086	0.048	1.659	.098*
Credit accessibility	0.078	0.030	1.449	.148
R ²	0.318			
Adj. R ²	0.298			
F Statistic	16.144			
Probability of F statistics	0.000			

***1%, **5%, *10% (Source: Field Survey 2022).

(2018), who reported that age had a positive and significant influence on the profit of groundnut processors in Kano State of Nigeria. This is also in agreement with the findings of Ugbajah and Isibor (2014), which revealed that age had a positive influence on the processing capacity of traditional groundnut oil processors in Adamawa State, Nigeria.

Years of processing experience also showed a positive coefficient and statistical significance at 1%. This implies that as the years of experience of the groundnut processors increase by a unit, it will result in a 46.7% increase in value addition. This could be due to the fact that groundnut processors over the years must have acquired processing techniques and innovative technologies, which will increase the processing capability of oil and cake, thereby causing good performance, which increases output and the value addition of groundnut oil and groundnut cake.

This is in agreement with the findings of Ogwuche (2017), who revealed that processing experience had a positive and significant influence on groundnut processors' ability to adopt improved groundnut processing technologies in Dutse, Jigawa State of Nigeria. Similar findings were reported by Ugbaja and Isibor (2014) that processing experience had a positive coefficient and was statistically significant at a 5% probability level in Adamawa State, Nigeria.

Cooperative membership also showed a positive coefficient, which was statistically significant at 10%. This implied that an increase in participation in cooperative membership by the groundnut processors will result in an 8.6% increase in value addition. It means that in the study area, groundnut processors being members of a cooperative association play a key role in increasing value addition. The implication is that cooperative membership

enables groundnut processors to be beneficiaries of certain inputs and finances, which will increase the value addition of groundnut oil and groundnut cake. This is in agreement with the findings of Shuaibu *et al.* (2018), which revealed that the participation of women processors in cooperative membership positive and significant influence on the profit of groundnut processors in Kano State of Nigeria. This also agreed with the findings of Ugbaja and Isibor (2014), which revealed that membership of traditional groundnut oil processors in Adamawa State, Nigeria, also has a positive influence on the processors. It increased the processor's opportunity to access modern inputs and obtain credit.

Constraints faced by processing groundnut

The result in Table 4 further reveals that the high cost of seeds, which is the main raw material for the processing of groundnut into oil and cake, affects the majority of the respondents (16.6%). However, *Samnut 24* is the most common variety of groundnut that is more preferred by small-scale groundnut processors due to its high oil content. It is expensive and sells for ₦740 per kg, hence making it difficult for the groundnut oil processors to buy large quantities for oil and cake processing. This agrees with the findings of Aliyu (2015) and Abdullahi *et al.* (2017), who reported that the high cost of shelled groundnut seeds and inadequate capital are major factors that hinder profit and market efficiency in groundnut processing. Additionally, the results agree with the findings of Shuaibu (2021), who revealed that major constraints faced by women groundnut processors were the high cost of seeds, which is the major raw material for groundnut processing.

Inadequate capital for business was second in the rank

Table 5. Constraints of small-scale groundnut oil and cake processors.

Constraints	Frequency	Percentage
High cost of groundnut seeds	280	16.6
Inadequate capital	271	16.0
High cost of processing machines	250	14.8
High cost of packaging items	235	13.9
Inadequate processing equipment	210	12.4
Unavailability of high oil yielding variety	143	8.5
Inadequate storage facilities	94	5.6
Low volume of product	77	4.6
High transport cost	60	3.6
Inconsistent power supply	36	2.1
Insecurity challenges	33	1.9
Total	1689	100

*Multiple responses (Source: Field survey, 2022).

with 16.0% of the respondents. This was one of the most serious problems complained about by most groundnut oil processors since most of them lack adequate capital to carry out processing activities. This could result from not being a member of any cooperative that could help them access credit from the government and other financial institutions. Hence, the capital used for groundnut oil and cake processing activities was inadequate, as it was mainly financed through personal savings. This agrees with the findings of Ahmed *et al.* (2022), who reported that the majority of the groundnut processors in Hong LGA of Adamawa State in Nigeria had a problem of inadequate capital as a major constraint. This is also in line with the findings of Bello (2016), who revealed that a lack of capital was a major challenge to women groundnut processors in Jigawa State.

Third on constraints is the high cost of processing machines (14.8%). Processing machines are an important tool for groundnut oil and cake processing, but most of the processors cannot afford to have their own processing machine because of the high cost, hence, they pay commercial grinders to grind their raw groundnut seeds in an effort to extract the oil. This is in agreement with the findings of Aliyu and Gona (2023), who revealed the high cost of processing equipment as a major constraint among groundnut processors in Kebbi State, Nigeria. High cost of packaging items was reported as a constraint by 13.9% of the respondents, which was ranked fourth. These items include jerry cans, bottles, bags, and nylons, which are costly. The high cost of these packaging items was a result of transportation costs incurred by the small-scale groundnut oil processors in traveling to urban areas to purchase the packaging items.

However, 12.4% of the respondents complained of not having adequate processing equipment, like a drum, frying pan, mortar, and pestle, for the groundnut processing

activities. They also complained that most of their processing equipment was old and worn out and needed replacement. This corroborates the findings of Bello (2016), who reported that inadequate processing equipment was one of the major constraints faced by women groundnut processors in Jigawa State, Nigeria. This was contrary to the findings of Samuel and Ocholi (2017), who reported that processing equipment was adequate for the groundnut processors in Taraba State of Nigeria.

Unavailability of high oil-yielding groundnut variety (8.5%), faced by the respondents, could be as a result of hoarding activities of marketers in the study area, which led to scarcity and high price of the high oil-yielding variety. Another reason could be as a result of not belonging to any cooperative association where easy access to inputs like high oil-yielding varieties of groundnut seeds could be obtained. This has led to a low volume of the products. This agrees with the findings of Samuel and Ocholi (2017), who reported similar problems among groundnut processors in Taraba State of Nigeria.

Inadequate storage facility (5.6%) is a minor problem faced by groundnut processors. The raw groundnuts purchased from the market are usually stored in bags, while the groundnut oil and cake produced are packaged in jerry cans, bottles, and bags. These are later kept in a store within the house before marketing. However, this problem is usually faced by groundnut processors who process fairly large quantities and are consistent in weekly production of groundnut oil and cake. This is in agreement with the findings of Ahmed *et al.* (2022), who reported that few groundnut processors in Hong LGA of Adamawa State in Nigeria had the problem of inadequate storage facilities. However, this is contrary to the findings of Shuaibu (2018). Furthermore, other constraints include low volume of products (4.6%). This arises in situations where the

groundnut processors do not have access to improved groundnut varieties with high oil content.

High transport cost (3.6%), though a minor problem, is usually encountered by groundnut processors in the effort of going to grind the raw groundnuts, especially when the location is far from the processing site. Transport cost is also incurred in the effort of acquiring packaging items like jerry cans, which are not usually common in remote communities and will require travelling far at times to buy the packaging items and in the course of marketing the groundnut oil and cake processed in nearby communities.

Inconsistent power supply (2.1%) is usually faced by groundnut millers who grind the raw groundnut and extract the oil for the groundnut processor. However, an unsteady power supply causes grinding of groundnut for processing, difficult for the processors.

Insecurity challenge (1.9%) was the least, implying that the study area is relatively peaceful and secure for groundnut oil and groundnut cake production. This was contrary to the findings of Shuaibu (2021), who reported that the insecure situation experienced by some major groundnut-consuming States in the Northern part of Nigeria poses a great problem to processors in Kano State, thereby reducing the scale of production. This is not in line with the findings of Saleh (2016), that 98.8% of the modern and small-scale groundnut processors in Gombe State complained of security problems due to communal conflicts and *Boko haram* insurgency within and around the state.

Conclusion

The study concludes that groundnut oil and cake processing at the small-scale level are mainly carried out by women in the study area. Processing activities are limited to manual and semi-motorized machines, resulting in a low quantity of oil realized (14 litres) which is comparatively lower than what is obtained in the mechanical press and solvent extraction industries (25 litres) (though still dependent on the same seed variety). Despite the various challenges faced by the groundnut processors in the study area, it was discovered that groundnut oil and cake processing is positively influenced by age, years of processing experience, and membership in a cooperative association.

Recommendations

The following recommendations are put forward from the findings. The groundnut oil and cake processors should be encouraged to join cooperative associations for the provision of interest-free and or subsidized credit facilities to acquire equipment and finance their businesses. This enables the processing of more oil and cake regularly and

profitably. Research should be geared towards the provision of high oil-yielding varieties of groundnut seed, other simple prototype machines and equipment for groundnut value addition, packaging materials with good quality and affordability to ensure high market demand and profitability.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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