



ANALYSIS OF WOMEN PARTICIPATION IN *GUNA* MELON (*Citrullus Vulgaris*) OIL EXTRACTION IN KATAGUM ZONE OF BAUCHI STATE, NIGERIA

¹Muhammad, M., ²Hamidu, B., ²Yakubu, S. and ¹Dabo, N. M.

¹Department of Agricultural Extension and Rural Development,
Abubakar Tafawa Balewa University, Bauchi.

²Department of Agricultural Economics, Abubakar Tafawa Balewa University, Bauchi.

Corresponding Author's Email: Muhammadgamawa1199@gmail.com, **GSM:** 08160435714

ABSTRACT

The study analysed women's participation in *Guna* melon (*Citrullus vulgaris*) oil extraction in Katagum Zone of Bauchi State, Nigeria. A multi-stage sampling technique was used to select 216 women processors, and data were collected through a structured questionnaire. Descriptive statistics and logit regression were employed to analyse socioeconomic characteristics, participation levels, and determinants of participation. Findings showed that most (97%, 52.3%, 53.2% and 56%) of the respondents were young (20–39 years), married, literate, and engaged in both farming and processing. Participation levels were high, with 66.7% producing *Guna* and 76.9% relying on manual processing methods. Logit regression revealed that marital status, educational level, years of processing experience, quantity of oil processed, access to raw materials, and market access were positive and significant determinants of participation ($P < 0.01$). Conversely, age, occupation, type of processing, annual income, time devoted to processing, and access to extension services negative and significant ($P < 0.01$) influenced participation. The study concludes that women play a central role in *Guna* oil extraction but face constraints related to technology access, labor intensity, and support services. It recommends improved access to modern processing technologies, targeted extension services, market linkage strengthening, and women-focused capacity-building initiatives to enhance productivity and economic empowerment.

Keywords: Analysis, Women, Participation *Guna* and Oil

INTRODUCTION

The Nigerian economy is still predominantly agrarian and women are key players in the business of agriculture, especially within rural communities. Women contribute between 40% and 65% of all hours spent in agricultural production, processing and also undertake 60% to 90% of rural agricultural product marketing, thus constituting more than two-thirds of the workforce in Agriculture (FAO, 2007). The fast demographic growth, coupled with the low economic resources in developing countries create the necessity to look for protein sources that can substitute animal protein, compliment the nutritional value of cereal-based foods and prevent malnutrition (Gonzalez-Quijada *et al.*, 2021). Many plant proteins usually in the form of protein extracts or seed flour are being investigated and tested for new products which are nutritionally viable and acceptable to consumers just like conventional protein sources from plants and animals, via soy beans, meat, fish and dairy products (Ojeh *et al.*, 2018).

Citrullus vulgaris (*Guna*) plant belongs to the family of the *Cucumbitaceae* or *Cucurbit*. This family is a major family with various economically important species particularly those with edible fruits e.g. watermelon. This family has both medicinal as well as nutritional uses (Gurcharan-Singh, 2004). *C. vulgaris* is a variety of water melon, unlike other common watermelon whose flesh is sweet and red in colour, this variety of melon has a pale yellow or light green juicy flesh and tastes bitter (Ojeh *et al.*, 2018). The 'Guna' seed resembles the popular 'egusi' seed, but this seed is smaller than the 'Egusi' melon seed. The seed is called 'Guna' in Hausa, 'egusiito' in Yoruba, 'ugbogoro' in Igbo. The 'Guna' seed is used for soup, in breakfast cereals and as snacks among certain tribes such as the "Mbula, Bwatiye, Kilba, and Bura" in Adamawa State among others tribes in Nigeria (Penuel *et al.*, 2017). The *Guna* melon is of immense importance to the economy of the farm family in a number of ways. The leaves and stems after harvest are used in feeding livestock. This is critical because during



this season, animal feed are rare. The seed is used in the production of vegetable oil for human consumption. The oil is considered a delicacy and used in preparation of meals especially during important functions. The residue after extracting the oil from the seed is used to thicken soups and also to lead livestock. The crop yields revenue to farmers because of the patronage from industrial vegetable oil processors as well as local consumers and there are potentialities for export, (Amaza, 2016).

There is a large and growing literature concerned with gender-based agricultural productivity issues and the economic activities of women. A great deal of substantive work has been done concerning, for example, the relative effects of increases in men's and women's incomes on the health, nutrition, and education of children Strauss, and Thomas, (2021); the access of women to credit markets Morris, and Meyer, (2018); the various roles played by women and men in a variety of farming systems Fabiyi, *et al.*, (2017); determinants of women participation in livestock production Gwary, *et al.*, (2017); women in household decision-making Baba *et al.*, (2017).

The study on women's participation in Guna melon oil extraction in Katagum Zone of Bauchi State, Nigeria, is crucial for several reasons. Firstly, it will contribute to the understanding of gender dynamics in agriculture, highlighting the often-overlooked role of women in the sector. By examining women's participation in a specific aspect of agriculture, such as oil extraction, the study sheds light on the economic and social contributions of women in rural communities. This understanding is essential for designing policies and interventions that promote gender equality and empower women in the agricultural sector.

The broad objective of the study is to analyse women participation in Guna melon oil extraction in Katagum Zone of Bauchi State, Nigeria. The specific objectives were to;

- i. describe the socio-economic characteristics of the respondents in the study area;
- ii. examine the respondent's level of participation in Guna melon oil extraction in the study area;
- iii. determine the factors influencing women participation in Guna melon oil extraction in the study area;

METHODOLOGY

The Study Area

The study was conducted in Katagum Zone of Bauchi State, Nigeria. The State has a population of about 9,280,000 in 2026 as projected based on the growth rate 3.4 NPC, (2006) and it has 20 local government area (LGAs). Bauchi is the capital of the State and is located on the northern edge of the Jos-Plateau with a total land area of 49, 119 km² (18,965 Sqm) representing about 5.3% of Nigeria's total land mass. Bauchi State is located between Latitude 9° 3' and 12° 3' North and Longitude 8° 50' and 11° East with an elevation of 616m with an altitude of 6,920m above sea level (National Bureau of Statistics [NBS], 2017). The annual rainfall ranges between 1,300 millimeters in the Southern part and 700 millimeters in the Northern part. The maximum and minimum temperature was 40.56°C and 22°C, respectively, the relative humidity is highest in August by (66.55) and lowest in February by (10.5%) (BSADP 2016). The state is bordered by seven States, Kano and Jigawa to the North, Taraba and Plateau to the South, Gombe and Yobe to the East and Kaduna to the West. Majority of the people are involved in farming (crop and livestock), fishing, food processing and marketing of agricultural produce.

Sampling Technique and Sample Size

A multi-stage sampling technique was used in selecting the respondents for the study. In the first stage, 5 LGAs were purposively selected based on their intensity of Guna processing and oil extraction. The selected LGAs are Katagum, Gamawa, Jama'are, Itas-Gadau and Zaki. In the second stage, 2 communities were randomly selected out of the selected LGAs making a total of 14 communities. The selected communities are; Madangala, Madara, Gamawa, Gololo, Hanafari, Jama'are, Mashema, Kashuri, Sandi Galau, and Sakwa respectively. In the final Stage, 216 women involved in Guna oil extraction were randomly and proportionately selected as the sample size for the study.



Table 1: Sampling Size Selection Plan

Zone	LGAs	Villages	Sampling frame	Sample size (40%)	
Katagum Zone	Katagum	Madangala	61	24	
		Madara	72	28	
	Gamawa	Gamawa	26	10	
		Udubo	51	20	
	Jama'are	Hanafari	42	17	
		Jama'are	85	34	
	Itas-Gadau	Mashema	31	12	
		Kashuri	27	11	
	Zaki	Sandi Galau	71	28	
		Sakwa	80	32	
	Total			546	216

Source: Author's computation, (2023)

Method of Data Collection

The study used primary data and collected using structured questionnaire which were administered with the aid of trained enumerators to the selected respondents in the study area. The questionnaire was segmented into sections; A, B, C and D based on the objectives of the study.

Methods of Data Analysis

Data collected were analyzed using descriptive and inferential statistics. Each analytical tools were selected to suit a particular objective.

Descriptive statistics

The descriptive statistics used include; percentages, mean and frequency distribution. They will be used to describe the socio-economic parameters such as; age, sex, household size, farm, level of education, income and the level of participation among others of the respondents.

Logit regression model

Logit regression was used to achieve objective iii which is to examine the factors influencing women participation in Guna oil extraction in the study area. According to Kmenta, (2017), the logistic distribution for the probability estimation of these factors follows a binary choice model and as such, the general logit regression model is mathematically expressed as:

The explicit form of the model is written as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \epsilon$$

where;

Y= Participation of women in Guna oil extraction (years of participation in Guna oil extraction)

a = constant

b₁-b₈ = Regression coefficients

X₁ = Age (years)

X₂ = Sex (Male = 1, Female = 0)

X₃ = Household size (number)

X₄ = Marital status (1= single, 2= married, 3= divorced, 4= widowed)

X₅ = Membership of association (Yes = 1, No = 0)

X₆ = Occupation (1= student, 2= student-employee, 3= Student-self-employed, 4= others)

X₇ = Source of information (number of sources)

X₈ = Income (Naira)

X₉ = Access to credit (Yes = 1, No = 0)

X₁₀ = Access to extension (Yes = 1, No = 0)

X₁₁ = Access to raw material (Guna seed) (Yes = 1, No = 0)

X₁₂ = Market (Yes = 1, No = 0)

e = error term



RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The results in Table 2 reveal key socioeconomic characteristics of respondents involved in guna oil processing. The age distribution indicates that 29.2% and 28.2% of respondents were between 20–24 and 35–39 years, respectively, while 22.2% fell between 30–34 years. This pattern demonstrates that guna oil processing is dominated by young women within their economically active years. Similar observations were reported by Eze and Okoro (2021), who noted that youth dominance in agro-processing enterprises enhances productivity due to higher energy levels and innovation propensity. Research also shows that young processors tend to adopt improved processing techniques more readily than older counterparts (Ibrahim *et al.*, 2022). This youthful demographic points to a promising labor force capable of driving growth in the local guna processing sector.

Marital status distribution shows that more than half (52.3%) of the respondents were married, while 39.4% were single. This suggests that most respondents carry family responsibilities, which often motivates increased participation in income-generating ventures such as guna oil processing. Recent studies indicate that married women are more likely to engage in agro-processing activities due to household financial obligations and the availability of family labor (Olanrewaju & Ahmed, 2023). This may help reduce labor costs and improve operational efficiency in manual processing systems.

Table 2: Socioeconomic Characteristics of the Respondents (216)

Variables	Frequency	Percentage	Mean
Age			
20-24	63	29.2	
25-29	16	7.4	
30-34	48	22.2	31
35-39	61	28.2	
40 and Above	28	13.0	
Marital status			
Single	85	39.4	
Married	113	52.3	
Widowed	18	8.3	
Educational level			
Qur'an	28	13.0	
Primary	21	9.7	
Secondary	52	24.1	
Tertiary	115	53.2	
Household size			
1-2	70	32.4	
3-4	107	49.5	4
5-6	5	2.3	
7-8	11	5.1	
9 and Above	23	10.6	
Occupation			
Civil servant	34	15.7	
Trader	17	7.9	
Farmer	121	56.0	
Processor	44	20.4	
Years of processing experience			
2.00	76	35.2	
3.00	51	23.6	
4.00	41	19.0	4
5.00	33	15.3	
10.00	15	6.9	
Type of processing			
Small scale	96	44.4	
Commercial scale	71	32.9	
Both	49	22.7	
Quantity of oil processed (litre)			
35-185	149	69.0	193
186-336	37	17.1	
337 and Above	30	13.9	

Field Survey, 2024

Education is an important factor influencing adoption of processing technologies. The findings show that 53.2% of the respondents had tertiary education, indicating a highly literate population. Higher literacy levels among agro-processors have been linked to improved capacity to adopt and operate processing technologies and adhere to safety standards (Yusuf & Abdullahi, 2021). The presence of well-educated processors also suggests potential for increased efficiency, faster learning, and improved responsiveness to extension information (Ogbonna *et al.*, 2023).

Household size distribution indicates that nearly half (49.5%) of respondents had 3–4 household members, while 32.4% had 1–2. Smaller household sizes are typical of young families and may reduce access to unpaid labor, consequently increasing reliance on hired workers (Suleiman *et al.*, 2020). This can influence production costs, especially in labor-intensive activities like manual gona oil extraction. Occupationally, a majority (56%) identified as farmers, while 20.4% were processors.



This indicates that most respondents combine farming with processing, a trend consistent with rural livelihood diversification strategies observed across Nigeria (Nwaobiala & Umeh, 2022).

Findings further reveal that 35.2% of respondents had only two years of processing experience, reflecting recent entry into the enterprise. This aligns with reports that rising unemployment and increasing market demand for edible oils have encouraged more women to venture into small-scale processing (Adebayo *et al.*, 2023). Additionally, 44.4% were small-scale processors, suggesting that the sector remains dominated by micro-enterprise structures characterized by limited capital and simple technologies, a trend also noted by Obi & Sule (2021). Majority (69%) of respondents processed 35–185 liters of gona oil, demonstrating moderate production capacity with potential for expansion when adequately supported through improved technologies, training, and credit.

Participation Level of Respondents in Gona Processing

shows that 66.7% of respondents were actively producing gona, while 20.4% and 13% served as marketers and processors. High producer participation suggests that most processors rely on self-produced raw materials, reducing dependence on market purchases and ensuring stable supply. This trend is supported by findings from Isa *et al.* (2022), who reported that self-production enhances processors' resilience to market fluctuations and raw material scarcity.

Majority (69.4%) of respondents sold their products in village markets, indicating that gona oil marketing is predominantly rural-based. According to Adamu and Usman (2021), rural markets remain primary outlets for local agro-processed goods due to proximity and reduced transportation costs. However, reliance on rural markets may limit access to premium urban markets with higher purchasing power. The findings further show that 76.9% of respondents processed gona oil manually. The dominance of manual techniques mirrors the situation in many rural processing industries where machinery adoption remains low due to cost, inadequate technical capacity, and unstable electricity (Ogunyemi & Bello, 2023).

Table 3: Participation Level of Respondents in Guna Processing

Variables	Frequency	Percentage
Role in guna		
Producer	144	66.7
Marketer	44	20.4
Processor	28	13.0
Product selling point		
Village markets	150	69.4
Urban city markets	33	15.3
Middlemen traders	33	15.3
Method of guna processing		
Manual	166	76.9
Mechanical	50	23.1
Major source of guna		
Personal farming	181	83.8
Purchase	35	16.2
Farm size		
None	38	17.6
2.00	48	22.2
3.00	104	48.1
4.00	26	12.0
Yield (bags)		
None	38	17.6
4-12	154	71.3
13-21	11	5.1
22 and Above	13	6.0
Experience in guna production		
None	38	17.6
1-2	85	39.4
3-4	66	30.6
5-6	27	12.5
Technology application in guna processing		
Yes	28	13.0
No	188	87.0

Field Survey, 2024

Similarly, 83.8% of respondents obtained guna from personal farming, demonstrating strong backward integration in the value chain. This supports studies indicating that integrated production–processing systems enhance profitability and ensure steady input supply (Okojie *et al.*, 2021). Moreover, about (48.1%) of respondents had farm sizes of about 3 hectares, which is consistent with smallholder farming systems prevalent in Northern Nigeria. Respondents also reported yields of 4–12 bags, reflecting moderate productivity levels typical of smallholder farms (Ibrahim & Yusuf, 2022). Only 13% reported use of modern technologies in processing, further highlighting the technological gap within the sector.

Factors Influencing Participation in Guna Oil Extraction

The result in Table 4 reveals the factors influencing participation of respondents in guna oil extraction in the study area. The finding shows marital status significantly ($P < 0.01$) increased the likelihood of participating in guna oil extraction. Married women may be more financially motivated to diversify household income, supporting similar observations by Bakari *et al.* (2020). Educational level was also positive and significant ($P < 0.01$), indicating that higher education enhances participation. Educated processors are more likely to evaluate business opportunities, adopt innovations, and manage small enterprises effectively (Okeke & Ibrahim, 2023). Years of processing experience positively and significantly ($P < 0.01$) influenced participation, suggesting that experience improves skills, efficiency, and commitment within the enterprise. Quantity of oil processed also showed a positive and significant ($P < 0.01$) relationship with participation, indicating that processors



increase engagement as they scale up operations. Access to raw materials and markets were equally positive and significant ($P < 0.01$), highlighting the importance of stable input supply and market availability in sustaining participation (Garba *et al.*, 2022).

Table 4: Factors Influencing Participation in Guna Oil Extraction

Variables	B	Std. Error	Beta	t	Sig
(Constant)	6.497	.447		14.539	.000
Age	-.065	.006	-1.047	-10.981	.000***
Marital status	.556	.074	1.084	7.519	.000***
Educational level	.493	.053	1.234	9.367	.000***
Household size	-.013	.015	-.087	-.825	.411 ^{NS}
Occupation	-.191	.044	-.425	-4.341	.000***
Years of processing experience	.141	.026	.682	5.421	.000***
Type of processing	-.436	.064	-.817	-6.812	.000***
Quantity of oil processed	.000	.000	.251	2.812	.005***
Annual income	-7.163E-6	.000	-2.233	-10.438	.000***
Time devoted to guna oil processing	-1.193	.155	-1.280	-7.720	.000***
Access to extension	-1.673	.177	-1.312	-9.431	.000***
Access to raw materials	.369	.061	.435	6.006	.000***
Access to market	1.248	.218	.486	5.738	.000***
R ²	.633				
Adj. R	.609				

Field Survey, 2024 ***Significant at 1% ($P < 0.01$)

Conversely, age had a negative and significant ($P < 0.01$) effect, implying that older women participate less in guna oil extraction. This is consistent with the natural decline in physical strength required for labor-intensive manual processing (Sadiq *et al.*, 2021). Occupation also negative and significantly ($P < 0.01$) affected participation, suggesting that women engaged in alternative jobs devote less time to processing. Type of processing was negative and significant ($P < 0.01$); increased mechanization may reduce labor requirements, explaining lower participation. Annual income and time devoted to processing were also negative and significant ($P < 0.01$), indicating that higher income earners may shift to more profitable ventures, while limited time investment reduces engagement. Access to extension services negatively and significantly ($P < 0.01$) influenced participation, suggesting inadequate or ineffective extension support. This finding aligns with reports that limited extension contact in rural processing industries hinders access to technical knowledge and modern practices (Lawal & Ahmed, 2022). Household size was not significant, implying that family size does not independently influence participation.

CONCLUSION AND RECOMMENDATIONS

The study concludes that women are key actors in *Guna* melon oil extraction in Katagum Zone, driven largely by household needs, income diversification, and increasing market demand for vegetable oil. In addition, despite their vital roles, most processors rely on manual processing methods due to limited access to mechanization, high cost of equipment, and inadequate extension support. educational attainment, experience, access to raw materials, and functional markets significantly improve women's participation in the value chain.

Based the findings the following recommendations were made;

- i. Government and NGOs should subsidize or facilitate the acquisition of small-scale mechanical extractors to reduce drudgery and enhance productivity among women processors.
- ii. Extension agents should be trained on *Guna* processing techniques and deployed to rural communities to provide regular support, especially on quality control, hygiene, and mechanization.
- iii. Policies that support women's access to farmland, improved *Guna* seeds, and input credit should be prioritized to stabilize raw material supply.



- iv. Establishing rural–urban marketing channels, cooperatives, and market information systems will enable women processors to sell products at better prices.

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