



EFFECTS OF TRADITIONAL METHOD OF FRYING GARRI ON THE ANTHROPOMETRIC PARAMETERS OF PROCESSORS IN NIGERIA

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ABSTRACT

The study highlights specific risk postures linked to musculoskeletal disorders in garri frying process. Garri processors selected from six (6) Local Government areas across the 3 Agricultural Zones of Osun state. Two Garri frying workstations were purposively selected based on the availability and popularity being the major Garri workstations, given 12 workstations. Six (6) processors were selected randomly at each workstation given 24 processors from each zone and a total of 72 respondents. Interview and observation methods were adopted for a sound understanding of activities and challenges of garri processors. Descriptive statistic tool was used to analyze data collected. Tape rule, weighing scale, vernier caliper were tools used to measure body height, hand length, thickness, and sit posture. The results shown that 66.7% processors were between age brackets 26 - 45 years. Most processors were primarily female (77.8%) while 22.2% were male, stressing the dominance of female in garri frying venture. Most (88.9%) of the processors had opportunity of attending various levels of educational program while 11.1% benefited from none - formal education system. More so, 43.7% of processors had body weight lower than 50kg while 33.3% and 53% had hand length shorter than 100cm and sit posture lower than 100cm respectively leading to overexertion of body ad this make them susceptible to musculoskeletal pains that threaten health conditions. Over 40% always experienced musculoskeletal pain both at during and after operational tasks. To address inefficiency and health risks, the nature of discomforts must be identified to assist the fabricator of garri fryer or Robotic assistance for maximum performance.

Keywords: AI, Ergonomic, Musculoskeletal, Robotic

INTRODUCTION

In garri frying processing, traditional method becomes a significant challenges for researchers who are exploring both indigenous and modern innovations towards improving efficiency, enhancing safety, and quality in the production process. However, modernization integrates the various segments of operation of cassava processing with automated machine or Robotic assistance as it is acclaimed by Bechar and Vigneau (2016) to have provide solution to labour shortage, efficiency demand and sustainability changes in food processing. In the synergy, simple mechanized stirrer and automated systems that regulate temperature and motion for an improved efficiency is possible with Garri processing (Akusu and Amuche, 2024). Thus the garri frying processing that involved the use of Robotic and Artificial Intelligent (Ai) departures from the traditional method largely depended on fire woods and manual labour is inevitable. Artificial intelligent (Ai) has potential to solve all the problems faced by farmers and can be applicable to processing in many ways (Talaviya *et al.*, 2025 and Pandya *et al.*, 2020). Ghodki (2022) has designed a self - sufficient system (Robotic System) that run on its own for a cycle period of round 20 minutes at 90⁰ operation of intermittent 360⁰ clockwise and anti - clockwise rotation. According to Samuel and Adetifa (2013), the nature of traditional processing activities becomes a major source of work - related musculoskeletal disorders which attributed to overexertion of body during operation tasks. Chapman and Mayer, (2001); Surabhi and Renu, (2010), and Adegbite *et al.*, (2019) identified three general tasks as endemic (lifting and carrying heavy loads),



sustained full - body bending, and highly repetitive motion of hands at work. Though the demand for cassava continues to grow not only because of the increased consumption but for its industrial demand by companies (Anning - Dorson, 2023). A growing body of evidence has demonstrated at several airports where Robotic assistance (Ai - powered smart bin) are used for picking waste or trash like Pittsburgh, Heathrow, Frankfurt International Airports. These Robots have cleaned over 1.6 million m² without disrupting passenger operation (Part News, 2025). If this Robotic assistance is efficiently delivered services in cleaning such could as well be successfully applicable in garri frying industry.

Nigeria is the largest producer of cassava tuber crop in the world, accounting for over 20% of global production with an annual over 30 million households depended on it both as a dietary staple food and processed into the secondary products such as chips, pellets, flour, adhesive, fermented alcohol and starch (Henan Jinrui Co. Ltd., 2025 and FIIRO, 2006). Olomola (2007) described Nigeria as a nation with highly diversified agro - ecological conditions, which make the substantial production of a wider range of crops possible. Nigeria's agriculture needs to keep evolving to embrace innovations that boost sustainable production both for feeding its growing population and tapping into export market. Thus, Agricultural Extension System remains a service expected to enhance the ability of farm families in order to respond to old problems and overcome the new challenges. Modernizing garri frying process significantly impacts processors and improves working conditions, enhancing production capacity and reducing socio - economic challenges in cassava value addition chain. Overall integration of Robotic System or Computer - Controlled Machine to perform tasks commonly associated with intelligent beings in manual frying operations such as exposure to nuisance smoke and heat, repetitive motion of hand wrists, arms and sweating will increase capacity and rate of frying process production. The study highlights specific risk postures linked to musculoskeletal disorders in garri frying. Switching to Robotic or Ai - powered machines would boost both efficiency and safety for processors. So, could using these technologies change the garri frying process? Our observations to prevent most wide spread health and safety challenges, ergonomic intervention is required for a holistic Robotic System or Artificial Intelligent (Ai) in place of human involvement in some critical operational stages of garri frying production process such as:

- Loading for washing the peeled cassava tuber
- Sitting posture at various angular degrees
- Oscillating sieving by hands to remove large lumps of grit mash
- Sustained bending of head, neck, waist, and back at sitting posture
- Packing, bagging, and loading

MATERIALS AND METHODS

The study was carried out in the six (6) selected local government areas representing the three Agricultural Zones of Osun state, Nigeria. This include Ilesa East, Ife Central (Ife/Ijesa zone), Orolu, Osogbo (Osun Central), and Ede North, Egbedore (Osun West). Two (2) Garri frying workstations were purposively selected from the representing local government areas based on the availability, popularity, and considered to be the major Garri workstations, given twelve (12) workstations (*Oke Opo & Kayafada, Aba Isoba & Alakowe, Isale Aro & Gbanmi, Dagbolu & Oloba, and Araromi & Orisunbare, Ofatedo & Iragberi*). About Six (6) processors were selected randomly at each workstation given a proportion of twenty-four (24) processors from each zone, making a total sample size of seventy-two (72) respondents. Structured questionnaire through interviews and observations methods adopted for a deeper understanding of activities and challenges faced by Garri processors. Descriptive statistic tool (table, frequency distribution, percentage) was used for the possibility of improving construction and assemblage of modern machine that can collaborate Robotic System and Artificial Intelligent (Ai) to reduce nuisance of smoke, sweat by operators, and ameliorate musculoskeletal pains. While on the field, tools like tape rule, weighing machine, vernier caliper were used to take records.

RESULTS AND DISCUSSION

The findings in the Table1 revealed that 66.7% of the respondents were between the age brackets of 26 - 45 years, which described as economically productive age Aderinola *et al.* (2006) and Ife/Ijesa agricultural zone has younger processors than the other two in Osun state. The processors were primarily female (77.8%) while 22.2% were male, stressing the dominance of female processors in garri frying. This finding is in line with Surabhin and Renu (2010); Odebode and Adetunji (2015); Adegbite *et al* (2019), and Anning - Dorson (2023). Most (88.9%) of the respondents had opportunity of attending various levels of educational system in the study areas while 11.1% accessed non - formal educational system, and actually turned to be intelligent. This is an evidence that the processors have acquired level of knowledge that make utilization of Robotic System or Artificial Intelligent (Ai) model in garri processing for a better production quality (Gombe *at al.*, 2016).

The anthropometric results in Table 1 show that body weight lower than 50g measured among 43.7% processors while 33.3% were with hand length lower than 100cm, and 53.0% having sit posture less than 100cm. these anthropometric features are key factors in manual processing activities which does not only prune to musculoskeletal pains derived from overexertion of body but highly susceptible to health risk (Samuel and Adetifa, 2013).

Table 1: Socio - economic and Anthropometric Parameters of Garri Processors

	Ilesa East LGA	Ife Central LGA	Orolu LGA	Osogbo LGA	Ede North LGA	Egbedore LGA
Age (yr)						
≤ 25	12 (16.7)	12 (16.7)	6 (8.3)	6 (8.3)	15 (20.8)	24 (33.3)
26 - 35	16 (22.2)	22 (30.6)	10 (13.9)	10 (13.9)	31 (43.1)	7 (9.7)
36 – 45	13 (18.1)	19 (26.4)	31 (43.1)	30 (41.7)	13 (18.1)	19 (26.4)
> 45	31 (43.1)	19 (26.4)	25 (34.7)	26 (36.1)	13 (18.1)	22 (30.6)
Sex						
Male	10 (13.9)	6 (8.3)	12 (16.7)	4 (5.6)	13 (18.1)	16 (22.2)
Female	62 (86.1)	66 (91.7)	60 (83.3)	68(94.4)	59 (81.9)	56 (77.8)
Educational Attainment						
None formal Education	2 (2.8)	10 (13.9)	13 (18.1)	18 (25.0)	1 (1.4)	4 (5.6)
Primary School	8(11.1)	10 (13.9)	15 (20.8)	20 (27.8)	6 (8.3)	23(31.9)
Junior Secondary	10 (13.9)	13 (18.1)	24 (33.3)	15 (20.8)	22 (30.6)	30 (41.7)
Senior Secondary	37 (51.4)	29 (40.3)	15 (20.8)	11 (15.3)	26 (36.1)	8 (11.1)
Tertiary Institution	15 (20.8)	10 (13.9)	5 (6.9)	8 (11.1)	17(23.6)	7 (9.7)
Body Weight (kg)						
≤ 50	33 (45.8)	21 (29.2)	48 (66.7)	32 (44.4)	23 (31.9)	32 (44.4)
> 50	39 (54.8)	51 (70.8)	24 (33.3)	40 (55.6)	49 (68.1)	40 (55.6)
Hand Length(cm)						
≤ 100	24 (33.3)	15 (20.8)	36 (50.0)	18 (25.0)	27 (37.5)	24 (33.3)
> 100	48 (66.7)	57 (79.2)	36 (50.0)	54 (75.0)	45 (62.5)	48 (66.7)
Arm Thickness (cm)						
≤ 40	21 (29.2)	15 (20.8)	24 (33.3)	54 (75.0)	21 (29.2)	30 (41.7)
> 40	51 (70.8)	57 (79.2)	48 (66.7)	18 (25.0)	51 (70.8)	42 (58.3)
Sitting Length(cm)						
≤ 100	38 (52.8)	60 (83.3)	45 (62.5)	30 (41.7)	25(34.7)	31 (43.1)
> 100	34 (47.2)	12 (16.7)	27 (37.5)	42 (58.3)	47 (65.3)	41 (56.9)

Source: Field Survey, 2025. Figures in Parenthesis are percentage (%)



Also, the results in the Table 2 shown that about 48.6% of the respondents always complaint of pain in some specific parts of their body most especially at the body joints during performing tasks while 45.8% always complaint after day frying tasks. Some specific working postures like neck and shoulder posture, back and waist posture, wrist and elbow posture, sit and stand posture are suspected to be hazardous and cause severe musculoskeletal disorders around upper and lower back regions (Surabhi and Renu, 2010; Odebode and Adetunji, 2015). Body pains associated with upper and lower back regions as well as neck region do not only reduce the processors’ efficiency but also affect the health that brings about low output in production (Jekayinfa, 2008; Samuel and Adetifa, 2013). It is a known fact, that manual tasks that are being carried out mostly by women are very labourious and wide spread health and safety problem to them. However, these women play a crucial role in cassava value addition chain therefore, their health challenges require a premium attention.

Integration of Robotic assistance or Artificial Intelligent (Ai-powered) model using appropriate hardware and temperature controlled automated devices in frying operation improves efficiency and sustainability challenges (Bechar and Vigneau, 2016). Though the adoption of agricultural Ai-powered Robotic does not only depends on technical performance but rely on how it is perceived by the ultimate users (Eastwood *et al.*, 2019). Tashiwa *et al.* (2023) reckons that, domestic automated machines when properly designed and assembled will perfectly handle heating and stirring garri mash for improvement and quality production.

Table 2: Discomforts Experienced during and after Garri Frying Tasks

LGAs	During			After		
	Never	Seldom	Always	Never	Seldom	Always
Ilesa East	6 (50.0)	2 (16.7)	4 (33.3)	4 (33.3)	5 (41.7)	3 (25.0)
Ife Central	1 (8.3)	3 (25.0)	8 (66.7)	2 (16.7)	5 (41.7)	5 (41.7)
Orolu	2(16.7)	4 (33.3)	6 (50.0)	1 (8.3)	4 (33.3)	7 (58.3)
Osogbo	4 (33.3)	2 (16.7)	6 (50.0)	3 (25.0)	4 (33.3)	5 (41.7)
Ede North	3 (25.0)	4 (33.3)	5 (41.7)	2 (16.7)	4 (33.3)	6 (50.0)
Egbedore	2 (16.7)	4 (33.3)	6 (50.0)	1 (8.3)	4 (33.3)	7 (58.3)
Cum %	24	26	48.6	18	36.1	45.8

CONCLUSION AND RECOMMENDATION

It is concluded in the study area that, the inefficiency production process and health risks faced by garri processors are traceable to discomforts derived from lifting heavy loads, persistent bending of body, and sustained motion of limbs. However, with Robotic assistance or Ai - powered machines in garri frying business, the garri process is poised for a revolutionary leap towards improved efficiency, health safety, and quality garri processing production.

REFERENCES

- Adegbite, S. A, Asiru, W. B, Salami, M. O, Nwaeche, C. F, Egun, K. K and Ogunbiyi, A. A (2019) Design and development of power driver garri fryer. *Journal of Engineering Research and Reports*, **4**(2): 1 – 15. doi.org/10.9734/JERR/2019/v4i216898
- Aderinola, E. O, Oladebo, J. O and Ojo, S. O (2006) Comparative technical efficiency of rice production Osun and Oyo states, Nigeria. Proceedings of the 2nd Annual Conference of the School of Agriculture and Agricultural Technology, Federal University of Technology, Akure. 216 - 221
- Akusu, M. O, and Amuche, K. I (2021) Application of PID based temperature controlled automated robotic based garri fryer. *International Journey of Novel Research and Development*, **9**(4): 237 - 239
- Anning - Dorson, T (2023) Cassava - garri value chain participation and rural women’s wellbeing: an exploratory study. *African Journal of Food, Agriculture, Nutrition and Development. Afr. J. Food Agric. Nutr. Dev.* **23**(11): 22121
- Bechar, A and Vigneau, C (2016) Agricultural robots for field operations: Concept and components. *Bio-system Engineering*. **149**: 94 - 111 doi.org/10.1016/J.BIOSYSTEMENG/2016/06.014



- Chapman, L and Meyer, J (2001) Ergonomics and musculoskeletal injuries in agriculture: recognizing and preventing the industry's most wide spread health and safety problem. *Agricultural Safety and Health Conference Proceedings*
- Eastwood, C, Klerkx, L, Ayre, M and Dela- Rue, b (2019) Managing socio - ethical challenges in the development of smart farming: from a fragmented to a comprehensive approach for responsible research and innovation. *Journal of Agricultural and Environmental Ethics* **32**(5): 741 - 768 doi.org/10.1007/s10806-917-9704-5
- FIRO (2006) Cassava production, processing, and utilization in Nigeria. Federal Institute of Industrial Research, Oshodi Nigeria. 138 - 189
- Ghodki, M. K (2022) A new solar powered robotic arm guided master-slave electric motors of biomass conveyor. *Journal of Engineering, Design and Technology* **22**(3): 739 -745 doi.org/10.1108/JEDT/09/2021-`496
- Gombe, S. Y, Suandi, T. B, Ismail, I. A and Omar, Z (2016) Extension education's role towards community empowerment in Nigeria: Issues, challenges and prospects. *Journal of Education and Social Policy* **3**(2): 135 - 137
- Henan Jinrui Co. Ltd. (2025) Top 5 cassava producers in the world. Henan Jinrui Food Engineering Company Limited
- Jekayinfa, S. O (2008) Ergonomic evaluation and energy requirements of bread baking operation in Southwestern Nigeria. *Nutrition and Food Science* **38**: 239 - 248
- Odebode, S. O and Adetunji, T. A (2015) Differentials of cassava processing activities among cassava processors in Ogun state, Nigeria. *Nigeria Journal of Rural Extension and Development* **9**(1): 1 - 4
- Olomola, A. S (2007) Strategies for managing the opportunities and challenges of a current agricultural commodity booms in Sub - Sahara Africa. AERC Seminar Policy Seminar IX Africa Economic Research Consortium (AERC) Nairobi, Kenya
- Pandya, R, Nadiadwala, S, Shah, R and Shah, M (2020) Buildout of methodology for meticulous diagnosis of k - complex in EEG for aiding the detection of Alzheimer's by artificial intelligence. *Augment Human Research* **5**(1): 3 doi.org/10.1007/s41133-019-0021-6
- Part News (2025) How Ai - powered robots are keeping Frankfurt airport clean. Monday 5th October. *travelmole.com*
- Samuel, T. M and Adetifa, B. O (2013) Assessing musculoskeletal risks in garri frying workers. *Leonard Journal of Sciences* **23**: 61 - 76 <http://Ijs.academicdirect.org/>
- Surabhi, S. and Renu, A (2010) Ergonomic intervention for preventing musculoskeletal disorders among farm women. *Journal of Agric Science* **1**(2): 61 - 71
- Talaviya, T, Shah, D, Patel, N, Yaganik, H and Shah, M (2020) Implementation of artificial intelligence in agriculture for optimization of irrigation and application of pesticides and herbicides. *Artificial Intelligent in Agriculture* **4**: 58 - 73
- Tashiwa, Y. I, Abubakar, A. J, Genesis, I and Kadafa, M. K (2023) Development of automated garri frying machine for domestic use. *Nigerian Journal of Engineering Science and Technology Research* **9**(1): 187 – 193