

**IDENTIFICATION OF END-USERS' PREFERENCES OF A CASSAVA
PRODUCT ("GARI") IN BENUE AND OSUN STATES, NIGERIA**

OSUNBADE Oluwaseun Adebawale

(AAA1500099)

B.Tech. Food Science (LAUTECH), M.Sc Food Technology (UI)

MARCH, 2020

**IDENTIFICATION OF END-USERS' PREFERENCES OF A CASSAVA
PRODUCT ("GARI") IN BENUE AND OSUN STATE, NIGERIA**

OSUNBADE Oluwaseun Adebawale

(AAA1500099)

B.Tech. Food Science (LAUTECH), M.Sc. Food Technology (UI)

A DISSERTATION SUBMITTED TO

DEPARTMENT OF FOOD SCIENCE,

FACULTY OF ENGINEERING AND TECHNOLOGY,

**LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY OGBOMOSO, NIGERIA, IN
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF
MASTERS OF PHILOSOPHY (M.PHIL) IN FOOD SCIENCE.**

MARCH, 2020.

CERTIFICATION

This Project with the title **Identification of End-Users Preferences of a Cassava Product (“Gari”) in Benue and Osun State** submitted by Osunbade Oluwaseun Adebawale (**AAA1500099**) was carried out under our supervision at Food Science Department, Ladoke Akintola University of Technology, Ogbomoso.

Supervisor

(Dr J.A. Adejuyitan)

B.Tech (Ogbomoso), M.Sc (Ibadan), Ph.D (Ogbomoso)

Senior Lecturer

Department of Food Science

Ladoke Akintola University of Technology

Ogbomoso, Nigeria

Date

Co-Supervisor

(Prof (Mrs) B.A Akinwande)

B.Sc (Ife), M.Sc (Ibadan), Ph.D (Ogbomoso)

Professor of Food Science

Department of Food Science

Ladoke Akintola University of Technology

Ogbomoso, Nigeria

Date

Co-Supervisor

(Dr Busie Maziya-Dixon)

Senior Scientist

Food and Nutrition Science Laboratory

International Institute of Tropical Agriculture (IITA)

Ibadan, Nigeria

Date

ATTESTATION

I hereby attest that this research work was carried out in the Department of Food Science, Faculty of Engineering and Technology, Ladoke Akintola University of Technology, Ogbomosho, Nigeria.

Ag. Head of Department
(Dr (Mrs) VF Abioye), B.Sc, M.Sc, Ph.D (Ogbomosho)
Senior Lecturer
Department of Food Science
Ladoke Akintola University of Technology
Ogbomosho, Nigeria

Date

DEDICATION

This project is dedicated to Almighty God and to my Mother Mrs A.A Osunbade for her encouragement and moral and financial support.

ACKNOWLEDGMENTS

My sincere gratitude goes first to God, our Help in ages past, our Hope for years to come, our Shelter from the stormy blast and our Eternal Home, I give my highest praise and thanks to Him for seeing me through in the course of this study. To my supervisors, Prof. B.A Akinwande and Dr J.A Adejuyitan, I want to express my sincere appreciation and express my heartfelt gratitude. I pray that God should bless them. I also want to appreciate Dr Maziya-Dixon (Senior Scientist at International Institute of Tropical Agriculture (IITA), Ibadan) for her support and scholarly contributions towards the success of this research work.

I express my sincere appreciation to Dr Bela Teeken, Dr Wasiu Awoyale, Abolore Bello, Olaosebikan Olamide, Oyedele Hakeem and Owoade Durodola of IITA for their contributions towards the success of my research. My profound gratitude also goes to all staff of International Institute of Tropical Agriculture (IITA) in food and nutrition science laboratory for their assistance. I will forever be grateful and I pray that God will reward them greatly. I sincerely appreciate Prof E.A Akande, Dr B.F Olanipekun, Dr V.F Abioye and Dr G.O Ogunlakin for their brilliant ideas which were source of encouragement.

I really appreciate my brother Prof Niyi Osunbade and my mother for their encouragement, financial and moral support. To every single member of my family, particularly my beloved wife and my son (Ademide Osunbade), I really appreciate their moral support and I am most grateful.

TABLE OF CONTENTS

CONTENT	PAGE
Title page	ii
Certification	iii
Attestation	iv
Dedication	v
Acknowledgments	vi
Table of Contents	vii
List of Table	x
List of Figure	ix
Abstract	xii
CHAPTER ONE	
1. INTRODUCTION	1
1.1 Background Information	1
1.2 Problem Statement	3
1.3 Aim and Objectives	4
1.4 Justification to the Study	4

1.4	Scope of the Study	4
CHAPTER TWO		
2.	LITERATURE REVIEW	5
2.1	Origin and History of cassava	5
2.1.1	Cassava Origin	5
2.1.2	Global Production of Cassava	5
2.1.3	Cassava World Exports and Trade	8
2.1.4	Cassava Varieties in Nigeria	9
2.1.5	Gender roles in “gari” processing	13
2.1.5.1	Peeling and grating	14
2.1.5.2	Fermentation	14
2.1.5.3	Pressing or dewatering	15
2.1.5.4	Roasting and frying of cassava mash	15
2.1.6	Global Cassava Utilization	16
2.1.7	Some Cassava Products	16
2.1.7.1	“Gari”	16
2.1.7.2	Fufu	16

2.1.7.3 Cassava flour	18
2.1.7.4 Cassava starch	18
2.1.7.5 Cassava paste	19
2.1.7.6 Dried cassava chips	19
2.1.7.7 Production of fermented and baked meal	19
2.1.7.8 Tapioca	20
2.1.7.9 Cassava pasta	20
2.1.7.10 Amala	20
2.1.7.11 Abacha	21
2.1.7.12 Cassava Vegetable	21
2.1.7.13 Cassava Snacks	21
2.1.8 Cassava Breeding	21
2.1.9 Sensory Evaluation of Foods	22
2.1.10 End-user preferences	23

CHAPTER THREE

3. MATERIALS AND METHODS	25
3.1 Study Site	25
3.2 Research Design	25

3.2.1	Survey design and sampling	25
3.2.2	Survey tools and manuals	29
3.2.3	Procedures for pre-test	29
3.3	Sensory Evaluation of <i>Gari</i> and <i>Eba</i>	30
3.3.1	Production of <i>gari</i>	30
3.3.2	Production of <i>eba</i>	30
3.3.3	Consumers Acceptability	30
3.4	Survey Data Analysis	31

CHAPTER FOUR

4.	RESULTS AND DISCUSSION	32
4.1	Social-economic and Demographic Characteristics of Survey Respondents	32
4.2	Quality Characteristics of Cassava and “gari” End-Users in Osun and Benue State, Nigeria	39
4.3	The most preferred and less preferred traits in cassava and “gari” by the end-users in Benue and Osun State	40
4.4	Comparisons between traits references of cassava and “gari” End-Users in Osun and Benue State, Nigeria	41
4.5	Consumers Acceptability: Social-economic and Demographics of consumers in Benue	48
4.6	Overall Liking of the four selected samples by the consumers using	

Hedonic test and Just About Right (JAR) Test	64
4.7 Good Quality according to Consumers in the selected location	73
4.8 Bad quality according to consumers in Selected Locations	76
4.9 Global lists of top quality characteristics for the final product (<i>eba</i>)	78
CHAPTER FIVE	
5. CONCLUSION AND RECOMMENDATION	81
5.1 Conclusion	81
5.2 Recommendation	83
REFERENCES	84
APPENDICES	85
Appendix A	90
Appendix B	93
Appendix C	101
Appendix D	108

LIST OF TABLES

Table	Page
2.1 Top Ten Cassava Producing Countries	7
2.2 Released Cassava Varieties in Nigeria	10
3.1 Geographical references of survey areas	26
4.1 Socioeconomic and Demographic Characteristics of the Respondents in Benue	37
4.1b Socioeconomic and Demographic Characteristics of the Respondents in Osun	38
4.2 Quality characteristics of cassava root and “gari” Identified by end-users in Osun State	43
4.2b Quality characteristics of cassava root and “gari” Identified by end-users in Benue State	44
4.3 The most preferred traits by cassava and “gari” end-users in Benue State	45
4.3b The most preferred traits by cassava and “gari” end-users in Osun State	46
4.4 Key user-preferred quality traits for <i>gari</i> by consumers in Osun and Benue State	47

LIST OF FIGURES

Figure	Page
2.3: End-Users of cassava and its Products	24
3.1 Map of Nigeria showing Benue State, Nigeria	27
3.1b Map of Nigeria showing Osun State, Nigeria.	28
4.1 Marital status of eba consumers in Benue	50
4.2 Marital status of eba consumers in Osun	51
4.3 Age range of eba consumers in Benue	52
4.4 Age range of eba consumers in Osun	53
4.5 Gender of eba consumers in Benue	54
4.6 Gender of eba consumers in Osun	55
4.7 Ethnicity of the consumers of eba in Benue	56
4.8 Ethnicity of the consumers of eba in Osun	57
4.9 Occupation of eba consumers in Benue	58
4.10 Occupations of eba consumers in Osun	59
4.11 Education status of eba consumers in Benue	60
4.12 Education status of eba consumers in Osun	61
4.13 Frequency of consumption of eba by consumers in Benue	62
4.14 Frequency of consumption of eba by consumers in Osun	63
4.15 Overall likings of four eba samples by the consumers in Benue	65
4.16 Overall likings of four eba samples by the consumers in Osun	66
4.17 Overall acceptability of the color of the four <i>eba</i> samples in Benue using Just	

	About Right Test	67
4.18	Overall acceptability of the color of the four <i>eba</i> samples in Osun using Just About Right Test	68
4.19	Overall acceptability of the smoothness of the four <i>eba</i> samples in Benue using Just About Right Test	69
4.20	Overall acceptability of the smoothness of the four <i>eba</i> samples in Osun using Just About Right Test	70
4.21	Overall acceptability of the sourness of the four <i>eba</i> samples in Benue using Just About Right Test	71
4.22	Overall acceptability of the sourness of the four <i>eba</i> samples in Osun using Just About Right Test	72
4.23	Consumer testing: Frequencies of good characteristics mentioned on most preferred <i>eba</i> sample in Benue	74
4.24	Consumer testing: Frequencies of good characteristics mentioned on most preferred <i>eba</i> sample in Osun	75
4.25	Consumer testing: Frequencies of bad characteristics mentioned on most preferred <i>eba</i> sample in Benue	77
4.26	Consumer testing: Frequencies of bad characteristics mentioned on most preferred <i>eba</i> sample in Osun	78
4.27	List of quality Characteristics of <i>eba</i> in Benue State, Nigeria	79
4.28	List of quality Characteristics of <i>eba</i> in Osun State, Nigeria	80

ABSTRACT

Breeding of improved cassava varieties has been concentrated on preferred characteristics by the farmers to the detriment of attributes preferred by other end-users which made the final product not generally acceptable by all the end users. This study aimed at identifying the preferred quality characteristics of *gari/eba* among farmers, processors, traders and consumers to help breeders to develop new improved cassava varieties that will meet the quality characteristics of good *gari* as preferred by the end-users.

Four (4) communities that are major producers and consumers of *gari* were selected in Benue (*Ty-omu, Shangevya-koti, NyamII* and *Al'Okete*) and Osun (*Oyan, Elefon, Wasimi, Ago-owu*) States. Purposive sampling technique was used to collect information from 110 respondents in Benue and 109 in Osun through Focus group discussions, individual interviews and market interview among the farmers, processors, and traders using a well-structured questionnaire. Four selected cassava varieties (TMS-IBA011412, TMS14F1278PP0003, TMS14F1022P0003, *atu/banada*) were processed to *gari* and turned to *eba* (using ratio 1:3 *gari*/water) for consumer's acceptability. A well structured questionnaire comprising of 9-points hedonic test, Just About Right test (JAR) and Check-All-That-Apply test (CATA) was administered to 300 consumers for consumer acceptability. Data collected were subjected to statistical analysis using statistical package for social scientist (SPSS) and xlstat package.

The results showed that the most preferred traits in cassava by Benue State farmers are dense root, low moisture roots, white-flesh root, non-decaying root, big long roots, non-woody roots and 8-15 roots per stand. Processors prefer non-decaying roots, white mash with low moisture, and *gari* that is white and dry, non-coarse, and gelatinize faster. Marketers/ consumers prefer dry, bright/shiny, white, sweet, dense, fine, cooked aroma and sour *gari*. Osun State respondents revealed that farmers prefer dense root, non-decaying root, white-flesh root, high dry matter roots, big-long roots, 8-16 roots per stand and non-woody roots while processors prefer non-decaying roots, white mash with low moisture, and *gari* that is non-coarse, dry, white and

gelatinize easily. Marketers/ consumers prefer dry, white, dense, sour, and fine *gari*. Key user-preferred quality traits for *gari* in both regions were dry *gari* followed by white, dense, fine, sour, bright/shiny and aroma and sweet *gari* in that order. In comparison, in-term of taste and appearance of *gari*, consumers in Osun State prefer sour and white *gari* while Benue State consumers did not like sour *gari* but preferred sweet and shiny *gari*. The results of the consumer's acceptability showed the frequencies of the good characteristics of final product (*eba*) in Benue and Osun State. The frequencies of good characteristics mentioned by Benue consumers on most preferred *eba* sample produced from *banada* showed that neatness had the highest with frequency of 146 out of 150 consumers, followed by smoothness (143), good taste (143), mouldable (140), good aroma (138), stretchy (137), white (126), moderately soft (116), fermented odour (79), not sour (78), and less lump (60). The frequencies of good characteristics mentioned by Osun consumers on most preferred *eba* sample made from *atu* showed that mouldable had the highest with frequency of 150 out of 150 consumers, followed by neatness (148), good taste (141), good aroma (140), smoothness (140), stretchy (133), moderately soft (127), sour (116), cream (90), fermented odour (64), white (39).

The information presented in this work with an in-depth laboratory characterization of the raw roots and the product is essential to identify product profiles within breeding. The findings will help breeders to develop improved cassava varieties that will be acceptable by multi end-users.