
**FACULTY OF AGRICULTURE AND ANIMAL SCIENCES
DEPARTMENT OF AGRIBUSINESS AND EXTENSION**

**EFFECT OF POST-HARVEST HANDLING PRACTICES ON THE
QUALITY AND MARKETING OF DRIED CASSAVA CHIPS IN ARAPAI
SUB-COUNTY, SOROTI DISTRICT**

BY

**ACERO FORTUNATE NEPILU
REG. NUMBER: BU/UP/2020/1299
E-MAIL: acerofortunate@gmail.com**

**SUPERVISOR
MR. OKIROR SIMON PETER**

**A SPECIAL PROJECT REPORT SUBMITTED TO THE DEPARTMENT
OF AGRIBUSINESS AND EXTENSION IN PARTIAL FULLFILMENT OF
THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF
BACHELOR OF AGRIBUSINESS OF BUSITEMA UNIVERSITY**

OCTOBER 2024

DECLARATION

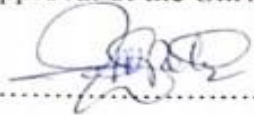
This study is original and has not been published or submitted for any other degree award to any other university before.

Sign.....  Date..... 5/11/2024

Accro Fortunate Nepilu

APPROVAL

This Special Project Report has been submitted to the Department of Agribusiness and Extension with approval of the University Supervisor.

Sign  Date 5th NOV / 2024

Mr. Okiror Simon Peter
Supervisor

DEDICATION

I dedicate this report to my beloved parents (Mr Epilu Stephen and Mrs Amuge Stella) whose unwavering love, encouragement and sacrifices have been the cornerstone of my journey, may God richly bless you.

ACKNOWLEDGEMENT

Prosperous conclusion of this research required support from different people. I was so fortunate to have that support and supervision in several aspects from my supervisor, fellow students and my parents.

First of all, I thank the almighty God for his unending grace, protection, favour and love during the research period.

Secondly, I like to extend my gratitude to my supervisor, Mr. Okiror Simon Peter for his continuous encouragement and guidance during the research period. In addition, my sincere appreciation goes to all the staff of Busitema University particularly in the Department of Agribusiness and Extension for their endless support throughout the time I have been in the University.

Special thanks to my family members especially my parents, Ms Amuge Stella and Mr. Epilu Stephen, for supporting me financially which helped me stay comfortable during the course.

Finally, I thank all my course mates for their maximum cooperation which contributed to the smooth running of my studies. Am glad I have all of you in my life and may God richly bless you.

TABLE OF CONTENTS

DECLARATION	Error! Bookmark not defined.
APPROVAL	Error! Bookmark not defined.
DEDICATION	iii
ACKNOWLEDGEMENT	iv
LIST OF TABLES	viii
LIST OF FIGURES	viii
LIST OF ACRONYMS	ix
ABSTRACT	x
CHAPTER ONE	1
1. INTRODUCTION	1
1.1 Background	1
1.2 Problem statement.....	2
1.3 Research objectives.....	2
1.3.1 General objective	2
1.3.2 Specific objectives	3
1.4 Research questions.....	3
1.5 Significance/importance/contribution	3
1.6 Justification of the study	3
1.7 Scope.....	4
1.7.1 Content scope.....	4
1.7.2 Geographical scope.....	4
1.8 Limitations of the study	4
CHAPTER TWO	5
2 LITERATURE REVIEW	5
2.1 General overview of literature	5
2.1.1 Cassava (<i>Manihot esculenta</i>) varieties and adaptation	5
2.1.2 Cassava chips importance and processi	5
2.2 Literature Review by thematic areas.....	6
2.2.1 Variety of cassava and its influence on cassava chips quality	6
2.2.2 Quality of cassava chips.....	6
2.2.3 Thematic area 3: Marketability of dry cassava chips.....	7

2.3 Related and relevant literature	8
2.3.1 Post-harvest handling practices and methods	8
2.3.2 Drying of cassava.....	10
2.4 Gaps left in the literature.....	11
2.5 Measurements and methods used.....	12
CHAPTER THREE.....	12
3. METHODOLOGY	12
3.1 Research area and study population.....	12
3.1.1 Research area	12
3.1.2 Study population	13
3.2 Study approach and design	13
3.3 Study methods and tools	13
3.4 Sampling and sampling size selection	13
3.5 Data type, source and collection	14
3.6 Data analysis presentation and interpretation	14
3.6.1 Data analysis of objective 1	14
3.6.2 Data Analysis of objective 2	14
3.6.3 Data Analysis of objective 3	14
3.7 Ethical Considerations	14
CHAPTER FOUR.....	15
4. PRESENTATION AND DISCUSSION OF RESULTS	15
4.1 Characteristics of respondents	15
4.1.1 Socio-demographic characteristics	16
4.1.2 Different sources of household incomes	18
4.1.4 Regularity (frequency) of income	20
4.1.5 Different varieties of cassava grown by farmers	21
4.1.6 Importance of cassava varieties grown by the farmers	21
4.2 Research findings based on study objectives	22
4.2.2 Findings based on objective 2	24
4.2.3 Findings based on objective 3	27
4.3 Discussion of results	28
CHAPTER FIVE	31
5. CONCLUSIONS AND RECOMMENDATIONS.....	31

5.1 Conclusion	31
5.2 Recommendations.....	31
5.2.1 Gaps for further research.....	32
REFERENCES.....	32
APPENDICES	36
APPENDIX 1: RESEARCH QUESTIONNAIRE.....	36
APPENDIX 2: A MAP OF ARAPAI SUBCOUNTY SHOWING THE STUDY AREA.....	42

LIST OF TABLES

Table 1 : Socio-demographic characteristics of respondents in Arapai sub-county (categorical)	16
Table 2 : Socio-demographic characteristics (discrete/continuous)	17
Table 3 : Sources of income.....	18
Table 4 : Average household incomes (UGX) from different sources	19
Table 5 : Varieties of cassava grown by farmers	21
Table 6 : shows the reasons for cassava production	21
Table 7 : shows the post harvest handling practices that were utilized by the farmers.....	22
Table 8 : shows the desirable and undesirable quality attributes of dry cassava chips.....	24
Table 9 : Shows the dry cassava chips quality attributes and their effect on marketing	27

LIST OF FIGURES

Figure 1 . Regularities with which cassava farmers received their household incomes from the different sources.	21
Figure 2 : Showing the post-harvest handling practices carried out by farmers.	23
Figure 3 :Shows the post harvest handling techniques used by farmers during the processing of cassava into chips.....	24
Figure 4 : Proportion of cassava farmers (%) with the desirable and undesirable quality attributes of the dried cassava chips in the study area.	27
Figure 5 : The graph shows the shows the dry cassava chips quality attributes and their effect on marketing	28

LIST OF ACRONYMS

FAO	Food and Agriculture Organization.
NGO	Non-governmental organizations
PHHP	Post-harvest handling phase
SPSS	Statistical Package for Social Sciences
UGX	Uganda shillings
SDA	Seventh day Adventist.

ABSTRACT

Cassava (*Manihot esculenta* L.) plays a crucial role in the people's diet as a staple food crop and source of income to many livelihoods. It is usually consumed in its fresh, cooked form or transformed into dry chips and flour so as to increase its shelf life. However, realizing its full potential is hindered during the post-harvest handling phase. This study therefore assessed the perceived effect of post-harvest handling on quality and marketability of dried cassava chips among farmers in Arapai sub-county, Soroti district. Specifically, it was designed to achieve the following objectives; i) To assess the post-harvest handling practices and technologies used by the cassava farmers. ii) To assess the desirable and undesirable quality attributes of the dried cassava chips among the farmers. iii) To assess the perceived effects of the quality attributes on marketability of the dried cassava chips among farmers. Data was collected through quantitative approaches of 78 cassava producers. Analysis was done using SPSS and Excel. Results showed that most respondents were aged between 16 and 70 years, with more females (55.1%) than the males (46.2%). Most of the respondents were household heads (46.2%), with some spouses (25.6%), children and parents. Some respondents had attained tertiary level of education (42.3%) indicating moderate level of literacy in the study population however, 32.1% were peasants. The married were 61.5% and majority were Catholics (42.3%). Household monthly income ranged from UGX 106,000 to UGX 176,000 and their annual income was between UGX 210,000 and UGX 21,120,000 from at least three income sources monthly, quarterly and annually. Most of the farmers cultivated NAROCASS (50%) cassava variety for both food and income (83.3 %). Farmers practiced at least four post-harvest handling practices like peeling (100%), washing (96.2%), grating (94.4%) and fermenting (62.8%). All cassava farmers depended on the sun for drying their cassava tubers (100%) commonly on the bare ground (28.2%) and empty sacks (19.2%). Majority of respondents strongly agreed that moldiness (4.5) and cleanliness (4.1) highly affect the marketability of dry cassava chips. Therefore, the study recommended that farmers should be trained on the different post-harvest handling practices and their importance on chips quality and marketability while being supported with improved equipment and sensitized on the different cassava varieties to grow and their importance so as to obtain products that suits the market.

CHAPTER ONE

1. INTRODUCTION

1.1 Background

Cassava (*Manihot esculenta*) is a perennial woody shrub with an edible root which thrives in tropical and subtropical regions worldwide including India, Indonesia, Nigeria, and Brazil (Jbo & Mathews, 2011). It is grown in two major varieties sweet and bitter, classified on the basis of the cyanogenic glucosides (*Linamarin* and *Lotaustralin*) content of their roots and leaves (Jackson & Chiwona-karlton, 2020). Cassava is chosen for its diverse attributes such as its adaptability to diverse environments, resistance to harsh climatic conditions, ability to thrive in marginal soil conditions and resistance to pests and diseases (Jbo & Mathews, 2011).

Cassava is the fourth most produced crop on the list of major food crops in developing countries after rice, wheat, maize. It is widely cultivated in regions of Africa, Asia, America India, Indonesia, Nigeria and Brazil (Nestel & Cock, 2019). The global cassava production in 2009 exceeded 241 million tons with Africa contributing to more than 60% of this output with Nigeria emerging as the world's largest producer with 59 million tons (Jbo & Mathews, 2011). Notably Nigeria exported approximately 3.2 million tons annually, achieving a record revenue of \$136 million in 2013 (A Otekunrin & Sawicka, 2019). Cassava was introduced in Uganda through Tanzania by Arab traders between 1862 and 1875. Since its initial introduction it quickly spread to other areas of Uganda and is currently one of the most important food crops ranking second to bananas in terms of area occupied, total production and per capita consumption (Ssemakula, 2000). It is cultivated for various purposes including food consumption, income generation and trade primarily in form of dried cassava chips which accounts for 45% of its utilization (Kilimo, 2012). Uganda is ranked as the sixth-largest cassava producer in Africa with a total production of 4.2 million metric tons typically (Kilimo, 2012). Currently, the major cassava growing areas in Uganda are Soroti, Kumi, Mbale, Lira, Iganga and Tororo in which people derive their well-being (Phillips et al., 2013). Locally, it is usually consumed in its fresh, cooked form or transformed into dry chips and flour which highly contributes to the enhancement of food security (Abok et al., 2016) by improving storage and increasing the availability of cassava-based products (Buyinza & Kitinoja, 2018).

Cassava is traditionally transformed into chips through a process of peeling, cutting into chunks and drying either on the direct ground, tarpaulins or any other suitable materials (Onyenwoke &

5.2.1 Gaps for further research

Environmental factors. The study did not consider exploring how environmental conditions such as temperature and humidity impact the quality and shelf life of dried cassava chips.

Supply chain dynamics. The study did not examine the efficiency and effectiveness of dried cassava chips supply chain like transportation and distribution channels on cassava quality.

REFERENCES

- A Otekunrin, O., & Sawicka, B. (2019). Cassava, a 21st Century Staple Crop: How can Nigeria Harness Its Enormous Trade Potentials? *Acta Scientific Agriculture*, 3(8), 194–202. <https://doi.org/10.31080/asag.2019.03.0586>
- Abok, E. O., Ooko, G. A., & Okoth, M. W. (2016). Cassava chips quality as influenced by cultivar, blanching time and slice thickness. *African Journal of Food, Agriculture, Nutrition and Development*, 16(4), 11457–11476. <https://doi.org/10.18697/ajfand.76.16855>
- Abong, G. O., Okoth, M. W., Imungi, J. K., & Kabira, J. N. (2011). Effect of slice thickness and frying temperature on color, Texture and Sensory Properties of crisps made from four Kenyan Potato Cultivars. *American Journal of Food Technology*, 6(9), 753–762. <https://doi.org/10.3923/ajft.2011.753.762>
- Afon, A. A. (2010). Modeling of hot-air drying of pretreated cassava chips. *Agricultural Engineering International: CIGR Journal*, 12(2), 34–41.s
- Ama, A., Mechanization, A., & July, L. A. (2020). *AMA511. July. Analysis of economic efficiency and perceived constraints to small scale.* (2017). 20(1), 2951–2961.
- Arapai, Soroti, Uganda - Population and Demographics - CityFacts.* (n.d.).
- Ariong, R. M., Okello, D. M., Otim, M. H., & Paparu, P. (2023). The cost of inadequate postharvest management of pulse grain: Farmer losses due to handling and storage practices in Uganda. *Agriculture & Food Security*, 1–22. <https://doi.org/10.1186/s40066-023-00423-7>

- Behavior, P., Badariah, T., Ahmad, T., & Nordin, M. S. (2014). *University Students ' Subjective Knowledge of Green Computing and*. 7(2), 1–11. <https://doi.org/10.5539/Abstract>
- Bilate Daemo, B., Belew Yohannes, D., Mulualem Beyene, T., & Gebreselassie Abteu, W. (2023). Assessment of Cassava Utilization Patterns, Postharvest Handling Practices, and Productivity Influencing Factors in South and Southwest Ethiopia. *Journal of Food Quality*, 2023. <https://doi.org/10.1155/2023/9914370>
- Buyinza, T., & Kitinoja, L. (2018). Commodity Systems Assessment of Cassava in Uganda. In *Postharvest Education Foundation: Vol. PEF White* (Issue August).
- Chuks, P. (2014). *Adoption of Improved Cassava Production and Processing Technologies in Oshimili North Local Government Area of Delta State , Nigeria*. 14(1), 21–25.
- Elisabeth, D. A. A., Utomo, J. S., Byju, G., & Ginting, E. (2022). Cassava flour production by small scale processors, its quality and economic feasibility. *Food Science and Technology (Brazil)*, 42. <https://doi.org/10.1590/fst.41522>
- FAO. (2016). Food Loss Analysis: Causes and Solutions. In *Food Loss Analysis: Causes and Solutions - case studies in the Small-scale Agriculture and Fisheries Subsector* (Issue May).
- Fayemi, O. E., & Ojokoh, A. O. (2014). *The effect of different fermentation techniques on the nutritional quality of the cassava product (FUFU)*. 38, 183–192. <https://doi.org/10.1111/j.1745-4549.2012.00763.x>
- Flibert, G., Abel, T., & Aly, S. (2016). African cassava Traditional Fermented Food: The Microorganism's Contribution to their Nutritional and Safety Values-A Review. *International Journal of Current Microbiology and Applied Sciences*, 5(10), 664–687. <https://doi.org/10.20546/ijcmas.2016.510.074>
- Gacheru, P. K. (2015). *Quality and Safety of Sun-Dried Cassava Chips and Flour in Kenyan Markets and Tent Solar Dried Cassava Chips*. 1–88.
- Graffham, A., Naziri, D., Sergeant, A., Sanni, L., & ... (2019). Market opportunities for cassava in Nigeria. *Gates Open ...*, May.
- Haggblade, S., Djurfeldt, A. A., Nyirenda, D. B., Lodin, J. B., Brimer, L., Chiona, M., Chitundu, M., Chiwona-Karltun, L., Cuambe, C., Dolislager, M., Donovan, C., Droppelmann, K., Jirström, M., Kambewa, E., Kambewa, P., Mahungu, N. M., Mkumbira, J., Mudema, J., Nielson, H., ... Weber, M. (2012). Cassava commercialization in Southeastern Africa. *Journal of Agribusiness in Developing and Emerging Economies*, 2(1), 4–40. <https://doi.org/10.1108/20440831211219219>

- Hussayn, J. A., Gulak, D. M., Aboaba, K. O., & Keshinro, O. O. (2020). Effects of Agricultural Commercialization on Poverty Status of Smallholder Cassava Farming Households in Oyo State, Nigeria. *Scientific Papers-Series Management Economic Engineering in Agriculture and Rural Development*, 20(4), 255–265.
- IITA. (1990). Cassava in Tropical. *A Reference Manual*.
- Jackson, J., & Chiwona-karltun, L. (2020). *for cassava , a major staple containing a natural toxicant*. 343–366. <https://doi.org/10.1016/B978-0-12-814272-1.00008-5>
- Jbo, J. B. O., & Mathews, C. (2011). Adaptation of cassava (manihot esculenta) to the dry environments of limpopo, south africa: Growth, yield and yield components. *African Journal of Agricultural Research*, 6(28), 6082–6088. <https://doi.org/10.5897/AJAR11.764>
- Kilimo, T. (2012). Development of Inclusive Markets in Agriculture and Trade (DIMAT). *Undp*, 1–48.
- Kleih, U., Phillips, D., Jagwe, J., & Kirya, M. (2012). Cassava Market and Value Chain Analysis Uganda Case Study Final Report (Anonymised version) July 2012. *Cassava Markets and Value Chain Analysis, July*.
- Kolawole, P. O., Agbetoye, L., & Ogunlowo, S. A. (2010). Sustaining world food security with improved cassava processing technology: The Nigeria experience. *Sustainability*, 2(12), 3681–3694. <https://doi.org/10.3390/su2123681>
- Makerere, A. K., Ospina, B., & Dufour, D. (2014). *Expanding utilization of RTB crops and reducing their post-harvest losses Final Business Case Extending the shelf life of fresh cassava roots for increased incomes and postharvest loss reduction*.
- Mbanjo, E. G. N., Rabbi, I. Y., Ferguson, M. E., Kayondo, S. I., Eng, N. H., Tripathi, L., Kulakow, P., & Egesi, C. (2021). Technological Innovations for Improving Cassava Production in Sub-Saharan Africa. In *Frontiers in Genetics* (Vol. 11). <https://doi.org/10.3389/fgene.2020.623736>
- Mishra, U. S., & Padhi, B. (2021). Sustaining the sustainable development goals. *Economic and Political Weekly*, 56(34), 30–31.
- N, M. M. (2015). *Processing technologies available to cassava processors and range of products derivable from cassava processing in Enugu State , Nigeria . Peeling Boiling Cooling Shreading Steeping Washing away Starch Decanting Spreading Sun-drying Bagging Packaging Fryi*. 1(1), 80–100.
- Nestel, B., & Cock, J. (2019). Cassava: El desarrollo de una red internacional. In *Journal of*

- Oladele, A. O., Alabi, O. O., & Maharazu, I. (2020). Cassava Products Value Chain Analysis Among Actors' Processors Under Traditional and Improved Technologies in Nasarawa State, Nigeria. *Russian Journal of Agricultural and Socio-Economic Sciences*, 104(8), 63–74. <https://doi.org/10.18551/rjoas.2020-08.08>
- Onwualu, A. P., District, M., Engineering, W., State, O., Engineering, P. H., Engineering, E. C., Island, W., Technologies, E., & Engineering, P. H. (2010). *Phone : 08033853895* (Vol. 18, Issue 2).
- Onyenwoke, C. A., & Simonyan, K. J. (2014). Cassava post-harvest processing and storage in Nigeria: A review. *African Journal of Agricultural Research*, 9(53), 3853–3863. <https://doi.org/10.5897/AJAR2013.8261>
- Phillips, D., Kleih, U., Alacho, F., Kirya, M., Jagwe, J., & Posthumus, H. (2013). *C : AVA II – Investment Study Uganda Case Study 1 st Draft Report July 2013. July*, 1–77.
- Prempeh, R., Aduening, J. A. M., Asante, B. O., Asante, I. K., Offei, S. K., & Danquah, E. Y. (2017). Farmers' knowledge and perception of postharvest physiological deterioration in cassava storage roots in Ghana. *Agriculture & Food Security*, 1–7. <https://doi.org/10.1186/s40066-017-0103-y>
- Roothaert, R. L., & Magado, R. (2011). Revival of cassava production in Nakasongola District, Uganda. *International Journal of Agricultural Sustainability*, 9(1), 76–81. <https://doi.org/10.3763/ijas.2010.0547>
- Sobukola, O. P., Ajayi, F. F., Faloye, O. R., Henshaw, F. O., Sanni, S. A., Bodunde, G., & Agbonlahor, M. (2021). Characterization of some quality attributes of vacuum fried yellow fleshed cassava chips from different varieties using designed experiment. *Journal of Food Processing and Preservation*, 45(11), 1–16. <https://doi.org/10.1111/jfpp.15946>
- Ssemakula, G. N. (2000). Improvement of local cassava germ plasm in Uganda. *Uganda Journal of Agricultural Sciences*, 5(1), 8–11.
- Tobiloba, O., Oluwaseun, K., & Leramo, R. O. (2019). Performance of Cassava Peeling Machines in Nigeria: A Review of Literature. *Journal of Physics: Conference Series*, 1378(2). <https://doi.org/10.1088/1742-6596/1378/2/022084>
- Tugendhat, E. (2017). *Positive Impact Case Study Transforming the Uganda Maize System*.
- Ume, S. I., Onwujiariri, U. J., & Nwaneri, T. C. (2020). Effect of Cassava Processing to the Environment in South East, Nigeria - Implication on Adoption of Cassava Processing