Call: National Agency for Science and Engineering Infrastructure (NASENI)
Proposal Title: Standardization and upscaling of cashew value-added products for improved livelihood of women and youth entrepreneurs
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Executive Summary

Cashew (Anacardium occidentale) is a profitable cash crop in Africa with enormous rural development, employment, and income-generating potential. Despite Nigeria being among the world's biggest producers of cashews, the majority of the nuts are exported raw with little or no value addition. This retards the economic benefits that can be made by cashew processing, packaging, and marketing. Moreover, cashew apples, in most cases discarded, are considerable sources of untapped potential for processing to juice, wine, and other healthy products.

Youths and women, which enjoy poor access to formal employment and economic prospects, stand much to benefit from formal involvement in cashew value chains. However, delays such as inadequate technical skills, inadequate standardization, inadequate access to market, and inadequate use of cashew apples hinder progress.

This project aims for the standardization and upscaling of cashew value-added products to enhance the livelihoods of women and youths' entrepreneurs. It will use a participatory approach that includes baseline surveys, hygienic processing and food safety standards training, product diversification, development of standard operating procedures (SOPs), certification, and establishing solid market linkages.

The desired outcomes are improved entrepreneurial and technical skills, access to standardized and competitive cashew products, reduced post-harvest losses, improved income and jobs, and strong rural economies. Through the empowerment of youth and women as major players in agro-processing enterprises, the project will promote the Sustainable Development Goals (SDGs), that is, SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), and SDG 8 (Decent Work and Economic Growth).

Introduction

Cashew (*Anacardium occidentale*) is one of the most economically important cash crops in Africa, particularly in Nigeria, Ghana, Côte d'Ivoire, and Benin, as it significantly contributes to rural livelihoods and export revenues. Cashew production has grown exponentially over the years; however, the majority of cashew nuts end up going into the global market raw, with minimal processing into value-added products. The move hinders income generation, constrains the generation of employment, and reduces the contribution of cashew towards

sustainable development.

The cashew apple, often called the pseudo-apple of cashew, is the fleshy part of the fruit which holds the well relished cashew juice. The apple contain high levels of useful nutrients, including polyphenols, vitamin C as high as 200-300 mg for every 100 g, fibres, minerals, reducing sugars, organic acids, and carotenoids, which make them a choice crop for many domestic and industrial uses, such as the production of juice, syrups, jams, cashew meat and wines, ethanol, vinegar, biological chemicals, and citric acid, which undergoes fermentation (Gutiérrez-Paz *et al.,* 2024; Jayeola *et al,* 2024).

On the other hand, cashew nut has been processed into forms such as milk, yoghurt, butter, vegetable oil, and soup mix. Due to the premium value placed on nuts, cashew apples often hold little to no appeal to farmers and are often left to rot after the nuts have been removed from them after harvesting. This is further compounded by the astringency of the pseudo apple, a function of its high tannin constituent, which reduces the desire for direct consumption of the fruit (Das, Sasmal and Arora, 2020).

However, research has shown that cashew apples and kernels have both nutritional and medicinal values due to their potential for antioxidation, preservation, and alcohol production (Mtashbya *et al.,* 2025). These possible benefits underscore the need for scalable and innovative approaches to cashew apple and kernel processing to facilitate sustainability and unlock various benefits that will transform cashew fruits from post-harvest waste to invaluable industrial and commercial resources that empowers women and youth entrepreneurs.

Transforming Cashew Fruit, Pathway to Achieving the Renewed Hope Agenda Mantra

Processing cashew directly, remains a challenge that is aided by factors such as difficulty in transportation, bulky weights, and the need for fast and immediate utilization, about 2–3 hours post-harvest, to prevent them from spoiling (Kannan et al., 2022). The lack of technological know-how in many cashew-growing and processing countries also adds to this challenge, leading to a high level of cashew apple waste that could have otherwise been used for commercial benefits thus limiting farmers to dependence on cashew nut.

In order to reduce wastage and mitigate these limiting factors, cashew apples and kernels has been converted into an array of products, making it lighter in weight for transportation and improving its shelf stability and eventually, a longer shelf life (Nwosu, Adejumo, and Udoha, 2016). With the renewed hope agenda of the current administration of President Bola Ahmed Tinubu at the centre of economic revitalization, the need to invest in training of women and youth entrepreneurs in recent methods for preserving cashew apples and processing the nut locally such as cold storage, juicing of apples, roasting and flavoring cashe kernels becomes necessary, which abinitio are often sustainably unrealistic in rural regions where there may be inadequate infrastructure compounded by logistic constraints (Nwosu and Adejumo, 2016).

Advancements in processing techniques, including spray-drying and foam-mat drying, have increased the possibility of having stable cashew apple supply with preserved and highly nutritious essential biochemicals and higher market appeal, aligning with the global goal of food wastage elimination (zero hunger), improved economies, and sustainable food processing (Maia et al., 2019; Kha, Nguyen, & Roach, 2010). By bonding and or reducing the moisture content of the cashew apples, the fruit becomes less susceptible to microbial spoilage, and bioactive constituents and enzymes are preserved (Vu *et al.,* 2025). The resultant products are then packaged under controlled conditions with lighter weight, and extended shelf life, thus increasing their appeal for exportation to international markets where plant-based foo ingredients are sought.

The Usefulness of Cashew Apple and Nut in driving Sustainable Development Goals

Cashew is rich in reducing sugars, as well as other bioactive compounds and organic acids, making it a great substrate for industrial processes involving bioconversion (Kannan et al., 2021). By converting the pseudo apples of cashews into juice, wine, vinegar, jam, powders and cashew meat, and its nut for milk, yoghurt,) butter, vegetable oil and soup mix (Jayeola *et al.* 2018; 2020); creates a stabilizing effect that ensures that cashew and cashew derived products are available throughout the year for use in relevant industrial purposes and for scalable production of improved products without susceptibility to supply fluctuations.

Research Gaps

Even though Cocoa research Institute of Nigeria had processed cashew into an array of fore-listed products, standardization and upscaling of these value-added products becomes important to ensure that investments are well-placed and managed. Limited availability of economic analyses to determine the cost-effectiveness of varying cashew derived products hinders its full uptake and integration into mainstream commerce and agricultural chains. Addressing these gaps is important to unlocking the full potential of cashew and cashew derived products in post-harvest loss reduction.

Problem Statement

Cashew apples go to waste in many cashew-growing countries, including Ghana, Côte d'Ivoire, and Nigeria, because of their fast rate of spoilage within 24–48 hours after harvesting, caused by their high moisture content of about 80–88% (Gutiérrez-Paz *et al.,* 2024). Statistics show that this wastage can exceed 60% during peak periods in the cashew season and can reach 90% globally (Akyereko *et al.,* 2022).

Although research shows that some efforts have been made to use cashew fruit to produce wine, ethanol, vinegar, juices, and other products, they are mostly pilot scale or experimental status because the abundance of the crop fluctuates with seasons and the fruits are bulky, which makes transportation challenging (Nwosu, Adejumo, and Udoha, 2016). This problem is further compounded by a lack of investment in preservation, which reduces their availability all year and consequently, their products in the market (Maia *et al.,* 2019; Kha, Nguyen, and Roach, 2010).

Commercialization of cashew processing, standardization and upscaling of these venture offers a potential way of extending the shelf life of cashew apples while ensuring that they can be transported and used as a raw material for other products (Nwosu, Adejumo, and Udoha, 2016). However, there is not much achievement on how to galvanize our industrial sector to mop up cashew and achieve this process at a scale that can have a significant effect on losses after harvesting and become a major source of income for farmers, women and youths in processing sector.

Justification

Value addition through standardization and upscaling of cashew products—cashew kernels, roasted nuts, cashew butter, cashew milk, cashew meat, cashew apple juice, wine, butter—is a huge potential for income diversification, improved livelihoods, and young people and women empowerment. Unemployment and limited access to formal economic opportunities disproportionately affect youth and women, making value chains of cashew an important channel for inclusive economic growth.

Cashew fruits although with so much potential for economic and agricultural gains, remain grossly underused, but commercialization of the developed technologies by CRIN can unlock these benefits. Stabilizing cashew fruits through processing offers a way to unlock these gains by transforming a perishable apple and exportable nuts into a plethora of useful and commercially viable derived products. Approaching cashew fruit processing through this

method prepares a roadmap for sustainable cashew processing, which contributes to the global goals of achieving a circular economy, reducing food waste, and promoting biological products, a crucial component of the United Nations' SDG 12 (Ali and Peerzada, 2025).

Objective

The main objective of this proposal is to upscale and standardize cashew value-added products in order to enhance women and youth entrepreneurs' livelihoods.

Specific Objectives

1. To develop guidelines on standardization, packaging, labeling, and quality assurance of cashew value-added products.
3. To diversify products like cashew butter, simulated meat, milk, roasted kernels, and beverages (juice/wine).
4. To create linkages with domestic and international markets to increase access and competitiveness.
5. To reduce post-harvest loss of cashew apples by product innovation.
6. To increase income generation and employment opportunities among women and youth in the cashew-growing regions.

Methodology

The project will adopt a community-centered and participatory approach. Materials, consumables and equipment will be procured for the processing.

Phase 1: Baseline Survey

- Assess current practices in cashew processing among the women and youth.
- List gaps in infrastructure, skills, and knowledge.

Phase 2: Capacity Building and Training

- Provide training in hygienic processing, packaging, labeling, and quality control.
- Provide training on food safety standards such as HACCP and Codex Alimentarius guidelines.
- Demonstrate hands-on methods in processing cashew into a range of value-added products.

Phase 3: Product Development and Standardization

- Develop Standard Operating Procedures (SOPs) for processing cashews.
- Adopt quality assurance measures (analysis of moisture content, aflatoxin management, storage).
- Make small-scale processing equipment accessible.
- packaging and branding

Phase 4: Market Linkages and Upscaling

- Brokerage with agro-processing industries, supermarkets, and exporters.
- Brand building and certification (NAFDAC, SONCAP, etc.) empower women and youth cooperatives.
- Organize exhibitions and trade fairs to showcase cashew products.

Phase 5: Monitoring and Evaluation

- Track progress against indicators such as trained entrepreneurs' number, increase in household income, and reduction in post-harvest losses.
- Document success stories and learning.

Expected Outcomes

1. Improved technical skills of women and youth in standardized cashew processing.
2. Access to different quality cashew value-added products meeting local and global standards.

3. Better market access for women and youth entrepreneurs.
4. Check of post-harvest losses, particularly of cashew apple.
5. Improved income generation, employment, and improved livelihoods.
6. Improved contribution of cashew to food security, nutrition, and export diversification.

Potential Impact

- Empowerment of women and youth as key promoters of agro-processing enterprises.
- Strengthened rural economies through job creation.
- Improvement in food safety and competitiveness of products in global markets.
- Contribution to Sustainable Development Goals (SDGs), with particular focus on SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 5 (Gender Equality), and SDG 8 (Decent Work and Economic Growth).

Project Timeline

Phase/Activity	Description	Timeline (Months)
Phase 1: Baseline Survey	Assess existing cashew processing practices, identify gaps in skills, infrastructure, and opportunities.	Month 1
Phase 2: Capacity Building and Training	Hands-on training for women and youth in hygienic processing, packaging, labeling, quality control, HACCP standards, and product diversification.	Months 2 – 3
Phase 3: Product Development and Standardization	Develop SOPs, introduce quality assurance (aflatoxin control, moisture analysis, storage), provide small-scale equipment, promote product diversification.	Months 3 – 5
Phase 4: Market Linkages and Upscaling	Facilitate certification (NAFDAC, SONCAP), establish domestic and international market linkages, organize trade fairs/exhibitions, and support branding.	Months 5 – 7
Phase 5: Monitoring and Evaluation	Track progress (skills gained, income increase, post-harvest loss reduction), document success stories and lessons learned.	Months 6 – 8
Data Analysis	Analyze survey, training, and market data to measure project effectiveness and outcomes.	Months 7 – 8
Report Writing	Compile comprehensive final report with findings, impacts, and recommendations for scaling up.	Months 8 – 9

Budget (Indicative)

1. Baseline survey – 5 M
2. Capacity building and training – 12.6M
3. Product development and standardization – 6.2M
4. Market linkages and upscaling – 85.2M
5. Monitoring and Evaluation – 7.1M

Total – 116,100,000

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Annex I: Pictures of cashew value-added products


CASHEW
WINE
10% V/V ALCOHOL
75mls
CASHEW
WINE
10% V/V ALCOHOL
75mls


Cashew Apple
*Jam
*Jelly
*Candy


CASHEW
Sprit
40% V/V ALCOHOL
75mls
CASHEW
Sprit
40% V/V ALCOHOL
75mls


Kernl Butter
Ingredients:
Cashew Kernl
Ingredients: