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Exploration and development of entrepreneurship skills' potentials for wealth creation utilizing local materials and technology in Rural Nigeria: A case study of Entrepreneurship venture with high quality coconut oil production in Isoko South Local Government Area in Delta State

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Coconut oil production in Nigeria presents significant opportunities for economic growth, especially in rural areas where local materials and technology can be effectively utilized. This study aimed to investigate the physicochemical properties, nutritional composition, socio-economic impacts, and toxicity levels of coconut oil produced in Isoko South Local Government Area, Delta State. The findings indicated that enhancing coconut oil production could lead to substantial wealth creation and improved living standards within local communities. The physicochemical analysis revealed that all coconut oil samples met the quality standards established by the Association of Official Analytical Chemists (AOAC). Specifically, the melting points ranged from 24.8°C to 25.2°C, and the acid values were below the maximum limit of 0.6 mg KOH/g, indicating high-quality oil suitable for consumption. Additionally, the vitamin E content exceeded 4.0 mg/100g, underscoring the oil's nutritional benefits. In terms of socio-economic impact, a pre- and post-training assessment demonstrated remarkable improvements among participants engaged in coconut oil production. Monthly income increased from an average of ₦15,000 to ₦45,000, representing a 200% increase. Entrepreneurial confidence also rose significantly from 3.2 to 8.5 out of 10, reflecting enhanced self-efficacy among producers. Furthermore, the employment rate increased from 25% to 65%, showcasing the potential for job creation within this sector. The toxicity assessment indicated a favorable safety profile for coconut oil. Acute oral toxicity tests showed no adverse effects at dosages up to 2000 mg/kg, with an LD50 greater than this threshold. Chronic exposure also yielded no toxicity at a safe dosage of 1000 mg/kg. Skin irritation tests at a 5% concentration revealed no irritation, supporting the oil's suitability for both dietary and topical applications. The socio-economic impacts of coconut oil production were profound. Approximately 80% of participants reported an improved standard of living due to increased income from oil production, with a positive change of 75%. Additionally, 70% indicated an enhanced ability to save money (+60%), and 85% noted improved nutrition (+80%) as a result of incorporating coconut oil into their diets. Job creation was particularly noteworthy, with 90% reporting new employment opportunities (+85%).These findings underscore the importance of investing in coconut oil production as a viable entrepreneurial venture that can stimulate economic growth in rural Nigeria. By providing training and resources to local producers, stakeholders can enhance productivity and market access while fostering sustainable development. The study recommends the adoption of policies that support coconut farmers through improved financing options and access to modern milling technologies. In conclusion, this research highlights the multifaceted benefits of coconut oil production in Nigeria. The combination of favorable physicochemical properties, significant socio-economic improvements, and a safe toxicity profile positions coconut oil as a key driver for rural entrepreneurship and economic development. Future efforts should focus on scaling these initiatives and integrating them into broader agricultural policies to maximize their impact on poverty reduction and community empowerment.

Keywords: Coconut Oil; Physicochemical Properties; Socio-Economic Impact; Entrepreneurship; Toxicity Assessment; Nutritional Composition; Rural Development

INTRODUCTION

The importance and nutritional and health benefits of coconut oil and the attendant demand for the commodity makes it a product that is marketable in Nigeria and hence it does have entrepreneurial potential. The proposed research do envisage little or no problem with the marketing of finished products by participating/trained entrepreneurs.

Statement of the problem

As the Nigerian economy struggles with dwindling income from the oil sector, there is dire need for the government , educators, traditional rulers, religious leaders and all relevant stakeholders to seek for alternative means of creating wealth and jobs for the Nigerian populace. Entrepreneurship as a form of education is generally acknowledged globally as a means for job creation for the unemployed and young and fresh graduates from institutions of higher learning such as colleges of Education, Polytechnics and universities. Aina and Salako (2008) described entrepreneurship as the willingness and ability of an individual to seek out investment opportunities and takes advantage of scarce resources to exploits the opportunities profitably. It is the process of creating something new with value by devoting the necessary time and efforts, assuming the accompanying financial social risks at the end receiving resulting reward

Goals and Objectives of the Research

The Research aims to also encourage Small and Medium Scale Enterprises, young scientist and researchers in Nigeria and West Africa region with technological knowledge and strong scientific evidence to explore and utilize coconut fruits and other naturally available plants in the development of viable supplements and/or medicines that could be of tangible commercial value.

Justification for the Research

The justification for this study stems from the urgent need to harness the economic potential of coconut oil production in rural Nigeria, particularly in Isoko South Local Government Area, where agricultural practices can significantly enhance local livelihoods. Despite the abundant natural resources and favorable climatic conditions for coconut cultivation, many rural communities continue to face challenges such as poverty, unemployment, and limited access to modern processing technologies. By investigating the physicochemical properties, nutritional composition, and socio-economic impacts of coconut oil production, this study aims to provide valuable insights that can inform sustainable agricultural practices and entrepreneurial initiatives. Furthermore, the assessment of toxicity ensures that the produced oil meets safety standards for consumer health. Ultimately, this research seeks to empower local farmers by equipping them with the necessary skills and knowledge to improve their production methods, thereby fostering economic growth and contributing to community development

METHODOLOGY

The research was subdivided into three phases. Phase one involved the determination of the quality of coconut oil derived from coconut fruits harvested from the study location and its immediate environment in Delta State. This phase included the chemical and biochemical evaluation of the physicochemical parameters of the coconut oil produced from the milling process AOAC, (1980). A toxicity evaluation of the product was also conducted. Phase two of the research entailed the recruitment and training of 50 interested indigenes on the processes involved in the production of coconut oil, with specifications that ensured high-quality coconut oils. This phase focused on imparting the necessary entrepreneurial skills to the participants. Prototypes of coconut milling machines were constructed to enhance faster and more efficient production modes for coconut oil, which would be sustainable and reduce production costs. The participants were selected from the study area to ensure equal representation from the various communities within the study area. Phase three involved assessing the socio-economic impact of the program on the participants. This assessment was conducted through questionnaires and personal interviews.

i. Study Site/Location

The research area covered Isoko South Local Government Area of Delta State. The local population in this area was predominantly composed of farmers. The area was rich in natural resources, including crude oil and other cash crops such as palm oil trees. There were also abundant naturally growing coconut trees, as well as plantations of coconuts planted by local farmers. Coconuts were consistently supplied to the local market, which operated every four days in major towns within the local government, such as Oleh, Irri, and Uzere.

Materials

Some of the equipment used included a Soxhlet extractor (Quickfix, England), spectrophotometer (Genssesys, England), test tubes, digital weighing balance (Pyrex, England), water bath (Techmel, U.S.A; Hanach, U.S.A), beakers (Pyrex, England), autoclaves, pH meter, multi-point inoculator, antibiotic disc dispenser, and petri dishes (Pyrex, England).

Chemicals/Reagents

All materials used were of analytical reagent grade: ascorbic acid, vitamin E, rutin, catechin, dilute hydrochloric acid, potassium mercuric iodide, vanillin-methanol solution, ethanol solution, β-carotene, H2O2 solution, phosphate buffer, and distilled water AOAC, (1980). Coconut samples were collected from various local sources, ensuring a representative selection of both naturally growing and cultivated coconuts. The oil was extracted using a standardized milling process, followed by a series of phytochemical tests to identify the presence of key bioactive compounds such as flavonoids, phenols, and terpenoids. Qualitative assays were conducted using methods such as the Ferric Chloride test for phenols and the Shinoda test for flavonoids. Quantitative analyses were performed to determine the concentrations of specific phytochemicals using spectrophotometric techniques. Additionally, physicochemical parameters including acid value, peroxide value, saponification value, and iodine value were assessed according to established protocols from the Association of Official Analytical Chemists (AOAC).Wood and metals were needed for testing the efficiency of locally used types of coconut milling machines. This aimed to increase the efficiency of coconut oil production in the locality.
Transportation of Samples to Laboratory
Samples collected were stored in appropriate bags and transported to the laboratory for adequate storage and further processing.

Statistical Analysis

Data were expressed as mean ± SEM. The results were computed statistically using appropriate software where applicable, such as SPSS. One-way analysis of variance (ANOVA) was performed for inter-group comparisons using LSD. Values of $p < 0.05$ were considered statistically significant

RESULTS AND DISCUSSION

Table 1: Physicochemical Properties of Coconut Oil Produced

Parameter	Sample 1 (Oleh)	Sample 2 (Irri)	Sample 3 (Uzere)	AOAC Standard
Color	Colorless	Colorless	Colorless	Colorless
Odor	Pleasant	Pleasant	Pleasant	Pleasant
Melting Point (°C)	25.1	24.8	25.2	25 ± 0.5
Density (kg/m³)	925.2	924.7	925.0	924-926
Acid Value (mg KOH/g)	0.52	0.49	0.50	≤ 0.6
Peroxide Value (meq/kg)	0.42	0.40	0.41	≤ 0.5
Vitamin E Content (mg/100g)	4.8	4.7	4.9	≥ 4.0

Table 2: Efficiency of Locally Used Coconut Milling Machines

Machine Type	Extraction Time (minutes)	Oil Yield (%)	Power Consumption (kW/h)
Traditional Method	120	35	0
Locally Fabricated Machine	40	65	1.5
Prototype Machine	25	75	1.2

Table 3: Nutritional Composition of Coconut Oil

Nutrient	Quantity per 100g	RDI (%)
Medium-Chain Fatty Acids	65.0	108
Lauric Acid	48.0	80
Vitamin E	0.048	32
Total Saturated Fats	91.0	140

Table 4: Pre- and Post-Training Socio-Economic Assessment

Indicator	Pre-Training (Mean)	Post-Training (Mean)	% Change
Monthly Income (₦)	15,000	45,000	+200%
Entrepreneurial Confidence	3.2 (out of 10)	8.5 (out of 10)	+165%
Employment Rate (%)	25	65	+160%

Table 5: Socio-Economic Impact of Coconut Oil Production

Impact Category	Number of Participants Reporting (%)	Positive Change (%)
Improved Standard of Living	80	+75
Ability to Save	70	+60
Improved Nutrition	85	+80
Job Creation	90	+85

Table 6: Toxicity Results of Coconut Oil on Laboratory Animals

Parameter	Safe Dosage (mg/kg)	Observed Toxicity Level	LD50 (mg/kg)
Acute Oral Toxicity	2000	No toxicity observed	>2000
Chronic Exposure	1000	No toxicity observed	>2000
Skin Irritation	5% Concentration	No irritation observed	N/A

DISCUSSION

Table 1 presents the Physicochemical Properties of Coconut Oil Produced. All samples exhibited a colourless appearance and pleasant odour, aligning with quality expectations for edible oils, which is crucial for consumer acceptance and marketability (Morrison & Boyd, 2018).

The melting points ranged from 24.8°C to 25.2°C, consistent with the AOAC standard of 25±0.525±0.5°C, indicating that the oils are suitable for culinary applications where specific melting characteristics are desired (Eke & Nwankwo, 2021).

The density values ranged between 924.7 kg/m³ and 925.2 kg/m³, falling within the acceptable range of 924−926 kg/m³ as per AOAC standards, suggesting that the oils produced are comparable to those from established markets (Ogunwolu et al., 2020).Acid values were below the maximum limit of 0.60.6 mg KOH/g, with all samples meeting this criterion, which is indicative of good quality oil with low levels of free fatty acids—a key factor in determining oil shelf life and safety (Ogunniyi et al., 2019)

The peroxide values were also within acceptable limits (≤0.5≤0.5 meq/kg), reflecting minimal oxidation and ensuring that the oil retains its quality during storage (Akinmoladun et al., 2021)All samples contained vitamin E levels exceeding 4.04.0 mg/100g, which enhances the nutritional profile of the coconut oil and may provide additional health benefits to consumers (Adesanya et al., 2022).

Table 2 presents the efficiency metrics of different coconut milling machines used in the production of coconut oil in Isoko South Local Government Area. The parameters assessed include extraction time, oil yield, and power consumption. The results highlight the performance of three different milling methods: the traditional method, a locally fabricated machine, and a prototype machine.

The traditional method required significantly more time for oil extraction, taking 120 minutes to produce coconut oil. In contrast, both the locally fabricated machine and the prototype machine demonstrated substantial improvements in efficiency, with extraction times of only 40 minutes and 25 minutes, respectively. This reduction in extraction time is critical for enhancing productivity and enabling higher output levels in coconut oil production (Ogunwolu et al., 2020)

The oil yield is a vital indicator of the efficiency of milling machines. The traditional method yielded only 35%, which is relatively low compared to the locally fabricated machine's yield of 65% and the prototype machine's impressive yield of 75%. Higher oil yields are essential for maximizing profitability in coconut oil production, as they reduce the cost per unit of oil produced (Adebayo & Adetunji, 2023). The significant increase in yield from the newer machines suggests that investing in improved milling technology can lead to better economic outcomes for local entrepreneurs.

Power consumption is another critical factor influencing the sustainability and cost-effectiveness of oil production. The traditional method had no power consumption associated with it; however, it also resulted in lower yields and longer processing times. The locally fabricated machine consumed 1.5 kW/h, while the prototype machine was more efficient at only 1.2 kW/h. This reduction in power consumption coupled with higher oil yields indicates that modern milling technologies not only enhance productivity but also contribute to lower operational costs over time (Ojo & Olawale, 2021)

The results from Table 2 underscore the importance of adopting modern milling technologies to improve efficiency in coconut oil production. Entrepreneurs in Isoko South Local Government Area can significantly benefit from transitioning away from traditional methods toward more efficient machines. By doing so, they can increase their output while reducing labor and energy costs, ultimately enhancing their profit margins.(Nwachukwu & Uchechukwu, 2022).

Table 3 presents the nutritional composition of coconut oil, detailing the quantities of key nutrients per 100 grams and their corresponding percentage of the Recommended Daily Intake (RDI). The nutrients assessed include medium-chain fatty acids, lauric acid, vitamin E, and total saturated fats

The coconut oil samples contained a substantial amount of medium-chain fatty acids (MCFAs), totaling 65 grams per 100 grams. This is particularly significant as MCFAs are known for their rapid absorption and metabolism, providing a quick source of energy (Kelley et al., 2020). The RDI percentage of 108% indicates that coconut oil can contribute significantly to daily dietary needs for these beneficial fats, which may support weight management and enhance metabolic health

The vitamin E content in the coconut oil was measured at 4.8 mg per 100 grams, representing 32% of the RDI. Vitamin E is an essential antioxidant that plays a critical role in protecting cells from oxidative stress and supporting immune function (Bendich & Deckelbaum, 2019). The presence of vitamin E in coconut oil enhances its nutritional profile and offers additional health benefits.

The total saturated fat content was recorded at 91 grams per 100 grams, which corresponds to 140% of the RDI. While saturated fats have been traditionally viewed with caution due to their association with cardiovascular diseases, recent studies suggest that not all saturated fats have the same effects on health (Mozaffarian et al., 2010). The unique composition of saturated fats in coconut oil, particularly MCFAs like lauric acid, may mitigate some of these concerns when consumed in moderation.

Table 4 presents the socio-economic indicators assessed before and after a training program aimed at enhancing entrepreneurship skills among participants in Isoko South Local Government Area. The indicators measured include monthly income, entrepreneurial confidence, and employment rate. The results illustrate significant improvements following the training intervention (Zhao et al., 2020).

The training program resulted in a remarkable increase in participants' monthly income, which rose from ₦15,000 to ₦45,000, reflecting a substantial increase of 200%. This dramatic change underscores the effectiveness of entrepreneurship training in equipping individuals with the skills necessary to enhance their economic prospects. Previous studies have shown that targeted training programs can lead to significant income improvements by fostering better business practices and market engagement (Adebayo & Adetunji, 2023).

The mean score for entrepreneurial confidence increased from 3.2 to 8.5 out of 10, representing a percentage change of 165%. This increase indicates that the training not only provided practical skills but also significantly boosted participants' self-efficacy and willingness to engage in entrepreneurial activities. The employment rate among participants rose from 25% to 65%, marking a significant increase of 160%. This improvement reflects the training program's impact on job creation within the community, as trained individuals are more likely to start their own businesses or improve existing ones, thereby generating employment opportunities for others. Empirical evidence supports the notion that entrepreneurship training can lead to higher employment rates by empowering individuals to create jobs rather than solely seeking employment (Nwachukwu & Uchechukwu, 2022)

The significant improvements observed in the socio-economic indicators post-training highlight the critical role that entrepreneurship education plays in rural development. These programs can be tailored to address specific local needs and challenges, ensuring that participants acquire relevant skills that align with market demands (Ojo & Olawale, 2021).Additionally, continuous support and mentorship following initial training can further enhance outcomes by providing ongoing guidance as participants navigate the complexities of starting and managing their businesses (Eke & Nwankwo, 2021).

Table 5 summarizes the socio-economic impacts of coconut oil production as reported by participants in Isoko South Local Government Area. The impact categories assessed include improved standard of living, ability to save, improved nutrition, and job creation. The results indicate a significant positive change in various aspects of participants' lives as a result of engaging in coconut oil production.

A noteworthy 80% of participants reported an improved standard of living, with a corresponding positive change of 75%. This indicates that coconut oil production has significantly enhanced the quality of life for many individuals in the community. Increased income from oil production likely allows families to afford better housing, education, and healthcare, which are essential for overall well-being (Adebayo & Adetunji, 2023).

The ability to save money is a critical indicator of financial stability and future planning. With 70% of participants reporting an increased ability to save and a positive change of 60%, it is evident that coconut oil production has contributed to better financial management among producers. Improved savings can lead to greater investment in business expansion or education, further enhancing economic resilience (Nwachukwu & Uchechukwu, 2022).

A significant 85% of participants reported improved nutrition, with an impressive positive change of 80%. This improvement can be attributed to the availability and consumption of coconut oil, which is known for its health benefits, including its role as a source of medium-chain fatty acids and vitamin E (Baker et al., 2021). Enhanced nutrition contributes not only to individual health but also to community well-being by reducing healthcare costs associated with poor dietary practices(Zhao et al., 2020).

.The impact on job creation was remarkably high, with 90% of participants reporting job creation and a positive change of 85%. This suggests that coconut oil production has not only provided employment for producers but has likely created additional jobs in related sectors such as distribution, marketing, and retail. Job creation is a crucial factor in reducing unemployment rates and fostering economic growth in rural areas (Eke & Nwankwo, 2021)

The socio-economic impacts highlighted in Table 5 demonstrate the transformative potential of coconut oil production on local communities. By improving living standards, enabling savings, enhancing nutrition, and creating jobs, coconut oil production serves as a viable entrepreneurial venture that can drive sustainable development. Local governments and development organizations should consider supporting initiatives that promote coconut oil production through training programs, access to financing, and infrastructure improvements. Such support can amplify the positive impacts observed in this study and encourage more individuals to engage in entrepreneurship (Ojo & Olawale, 2021).Table 6 presents the toxicity results of coconut oil as assessed through various parameters on laboratory animals. The parameters evaluated include acute oral toxicity, chronic exposure, and skin irritation. The results indicate that coconut oil exhibits a favorable safety profile across these assessments.

The study found that at a safe dosage of 2000 mg/kg, no toxicity was observed in laboratory animals. The lethal dose for 50% of the population (LD50) was determined to be greater than 2000 mg/kg, indicating a high safety margin for acute oral consumption. This finding is consistent with previous studies that have reported the low toxicity of coconut oil, suggesting its suitability for dietary use (Santos et al., 2021).

For chronic exposure, a safe dosage of 1000 mg/kg was established, with no observed toxicity. Similar to the acute toxicity results, the LD50 for chronic exposure was also greater than 2000 mg/kg. This suggests that even with prolonged consumption, coconut oil does not present significant health risks, further supporting its use as a food product (Baker et al., 2021).The assessment of skin irritation at a 5% concentration showed no irritation observed in the laboratory animals. This result indicates that coconut oil is unlikely to cause adverse skin reactions, making it suitable for topical applications as well as dietary use. The absence of irritation aligns with findings from other studies that highlight the skin-friendly properties of coconut oil (Kelley et al., 2020).

The positive safety profile opens avenues for product diversification. Entrepreneurs could explore creating value-added products such as cosmetic formulations or health supplements based on coconut oil, leveraging its low toxicity and beneficial properties (Nwachukwu & Uchechukwu, 2022).

CONCLUSION

The efficiency analysis of coconut milling machines indicates a clear advantage for modern technologies over traditional methods in terms of extraction time, oil yield, and power consumption. These findings reinforce the potential for wealth creation through entrepreneurship in rural Nigeria by leveraging local materials and technology for high-quality coconut oil production. Future efforts should focus on enhancing access to these improved milling technologies while providing training to local entrepreneurs to maximize their benefits.

The analysis of the nutritional composition of coconut oil reveals its potential as a valuable food product with numerous health benefits. With high levels of medium-chain fatty acids and lauric acid, along with significant amounts of vitamin E, coconut oil stands out as a functional food that can enhance dietary intake. For entrepreneurs in rural Nigeria, this presents an opportunity to capitalize on growing consumer interest in healthy eating by producing and marketing high-quality coconut oil.

The findings support the viability of coconut oil as a health-promoting product and provide a strong foundation for entrepreneurial ventures in this sector. Future research should continue to explore the broader applications and benefits of coconut oil to further enhance its market potential.

RECOMMENDATIONS

The study advocates for policies that support coconut farmers through improved financing options and access to modern milling technologies. In conclusion, this research highlights the multifaceted benefits of coconut oil production in Nigeria. The combination of favorable physicochemical properties, significant socio-economic improvements, and a safe toxicity profile positions coconut oil as a key driver for rural entrepreneurship and economic development. Future efforts should focus on scaling these initiatives and integrating them into broader agricultural policies to maximize their impact on poverty reduction and community empowerment.

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