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Assessing The Acceptability Of Coconut Grater: A Technology Transfer For Enhancing Inandila Delicacy Production In The Heritage Village Of Naneng

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Abstract
The study assessed the acceptability of a coconut grater as a technological transfer initiative set to elevate the marketability of Inandila, a native delicacy from Naneng, the heritage village of Tabuk City, Kalinga Province. It also considers complementing modern methods with traditional practices concerning coconut grating, as the latter is an arduous task in processing Inandila. A survey was conducted among community members regarding awareness, usability, efficiency, safety, and comparability to traditional methods.
From the results, it was gleaned that the respondents gave the coconut grater a very good rating, with the following percentages denoting the rating they accorded as regards knowledge (72% "Excellent"), usability (70% "Excellent"), efficiency (72% "Excellent"), and safety (74% "Excellent"). Of the respondents, 76% have seen the technology as being in harmony with traditional practices and also had a high possibility for continued use (78%). Demographic analysis of the survey indicated an even distribution across age groups with a greater proportion of female respondents (66%).
The research findings, hence, reveal that coconut grater technology enjoys broad acceptability within the community among its members since it has demonstrated some significant efficiency improvement while respecting cultural heritage. The suggestions made include sustaining the awareness campaigns, promoting youth participation, being gender-sensitive, and addressing issues of usability feedback for the long-term sustainability of technology adoption and integration.
This initiative shows how respectful engagement with Indigenous communities can promote technology adoption, increased productivity, and the preservation of cultural identity.

Rationale
ommitting to understanding or adapting to an Indigenous community is not easy, especially if it's something new that significantly impacts them. Even if you mean well, getting their consensus and being sensitive to whether they want that change is important.
Ancestors' memories are often strong among Indigenous communities. By attempting to get their blessing you take care of their historical heritage and traditions. This helps create a sense of responsibility and helps prevent conflicts or opposition to any new technology.
They have employed, linked to their identity or functions, customary patterns related to the grating of coconuts. Ensuring their participation means that the new technology will facilitate rather than displace these customs. They can assist in modifying the coconut grater design to better suit their needs and patterns of life. Additionally, the people who are being included as a part of the process, feel empowered, and therefore decide about the technology and, more importantly, feel responsible for it. When people are engaged, they not only accept technology that is new to them, but they are likely to stand by it and ensure it lasts.
The most important thing is that seeking approval demonstrates a commitment to a collaborative and respectful partnership. This approach builds trust, which is critical for the success of current and future initiatives.
With these, even though the Heritage Village of Naneng is one of the adopted barangay of the College of Engineering and Information and Technology in the Kalinga State University-bounded by a memorandum of agreement there is a need for this study "Assessing the Acceptability of Coconut Grater: A Technology Transfer for Enhancing Inandila Delicacy Production in the Heritage Village of Naneng.

INTRODUCTION
One of the oldest Barangays in the Kalinga Province is Naneng. As proof, the first municipal hall of Tabuk was constructed in Sitio Macapel of Naneng but was then moved to Barangay Bagumbayan and then finally to Dagupan Centro. Another proof is the establishment of Saint Joseph Church situated also in Sitio Macapel in 1927. Indeed, it was one of the first footholds of the Catholic faith, the St. Joseph the Husband of Mary Parish church was founded by Belgian missionaries of the Congregation Immaculate Cordis Mariee (CICM). Its first Mission Rector was Father Leon Lindenman who lived in Naneng for over forty years until his death on November 24, 1972. Lindenman is buried beside the church alongside another Belgian Mission Rector, Father Miguel Veys.
The local term for the Naneng name is flood. The homes in the settlement survived floods when the Chico River flooded, even though they were constructed in the 1920s. The houses in the town look simple and traditional as you walk through them. But even though they seem simple, they are made of solid wood like Yambao or Narra, which gives them the strength to survive typhoons. The historic Saint Joseph Parish Church

is located nearby as you walk through it and turn left into the town. As time passes, they attempt to maintain their ancient ways of life, even though the village's population is declining. These village customs consist of a weaving tradition that dates to the 18th century and their incredible signature customary dish which is the Inandila.

The heritage village of Naneng is widely known for its cultural richness and culinary traditions, particularly the making of Inandila, a treasured rice cake delicacy. It is named after the word "dila dila," meaning tongue, the inandila is a native delicacy of Kalinga, made of pound malagkit/sticky rice, ladok (the brown precipitate left in coconut oil extraction) plus brown sugar/muscovado.

The version served in the heritage village of Naneng is known for its delectable taste because of its intricate and meticulous preparation process.

Grated coconut is used to prepare inandila, which is labor-intensive and time-consuming. Old-style methods using the homemade “gagadgadan” face challenges of efficiency and labor availability. Introducing a coconut grater as a technology transfer initiative offers a potential solution.

The production of inandila in Naneng remains labor-intensive, particularly in grating coconuts, which is critical to achieving the dish’s authentic flavor and texture. This challenge has led to difficulties in meeting demand, especially during festivals and cultural events. The introduction of a coconut grater presents an opportunity to improve efficiency, but its acceptance within the community remains uncertain due to potential concerns about disrupting traditional practices.

This study surveys how the technology affects the making process, corresponding to the need for innovation with the conservation of cultural practices. Considering the acceptability of this technology among community members is vital to certifying its sustainable incorporation into inandila making while respecting the heritage of Naneng.

METHODOLOGY

Research Methodology

Locale of the Study

The study was conducted in the Heritage Village of Naneng, located in Kalinga, Philippines. Known for its rich cultural traditions and delicacies, the village serves as an ideal location for assessing the acceptability of a coconut grater tailored for enhancing Inandila production—a delicacy of cultural and economic significance to the community.

Research Design

This study utilizes a mixed-methods research design, combining both qualitative and quantitative approaches that comprehensively assess the acceptability of the coconut grater. The descriptive aspect of the study focuses on documenting the grater’s features, functionality, and integration into local cultural practices. This involves examining its design, ease of use, and relevance to traditional food preparation methods. Meanwhile, the evaluative component aimed to measure the perceived effectiveness and acceptability of the coconut grater through direct community feedback. By gathering insights from users, the study seeks to determine its practicality, efficiency, and overall reception within the target population. This approach ensures a well-rounded understanding of the coconut grater’s role in everyday use and its potential for wider adoption.

Respondents/Informants/Research Participants

The study involved two main groups of participants: primary respondents and secondary informants. The primary respondents include local producers of Inandila, such as cooks as well as community members who actively engaged in the production process. Their insights are crucial in understanding the practical aspects of Inandila-making, the role of traditional tools like the coconut grater “gagadgadan”, and its impact on production efficiency. Additionally, secondary informants include cultural leaders who possess extensive knowledge of Inandila’s significance, as well as local government officials or heritage preservation representatives who can provide insights into policy support and cultural sustainability. To ensure that participants have relevant expertise or firsthand experience, purposive sampling was employed. This non-random sampling method allows the study to focus on individuals with deep knowledge of Inandila production or cultural heritage practices, ensuring that the data collected is meaningful, contextually rich, and reflective of both practical and cultural dimensions. By incorporating perspectives from both direct producers and cultural custodians, the study will present a holistic understanding of Inandila’s traditional significance and its potential adaptation with modern tools.

Instrumentation

The study utilized three key data collection instruments to comprehensively evaluate the acceptability of the coconut grater: a survey questionnaire, an interview guide, and an observation checklist. The survey questionnaire served as a quantitative tool designed to assess user satisfaction, perceived ease of use, efficiency, and cultural alignment of the coconut grater. It included Likert-scale items to measure key acceptability indicators, allowing for a structured analysis of users’ experiences and perceptions. To complement these numerical insights, a semi-structured interview guide was employed to gather in-depth qualitative data from producers and cultural leaders. This tool facilitated open-ended discussions, enabling participants to share

personal experiences, cultural perspectives, and practical considerations regarding the coconut grater's role in Inandila production. Additionally, an observation checklist was used to document the grater's practical application in real production settings. This checklist recorded factors such as usability, integration into traditional workflows, and any observed challenges or advantages. By combining these three methodologies, the study ensured a balanced approach, capturing both measurable user feedback and rich contextual insights to provide a holistic understanding of the coconut grater's effectiveness and cultural significance.

Data Gathering Procedure

The study followed a structured process to ensure effective community engagement, thorough evaluation, and accurate data collection. The preliminary engagement phase involved conducting an orientation with the community to introduce the study's objectives, scope, and significance. This step was essential in fostering transparency and securing informed consent from participants, ensuring that they fully understood their role in the research. Following this, a technology demonstration was conducted, providing Inandila producers with a hands-on experience of using the coconut grater. This demonstration allowed participants to assess the grater's functionality, ease of use, and potential benefits in their production process.

After the demonstration, the data collection phase commenced, utilizing multiple methods to gather comprehensive insights. Surveys were administered to participants to evaluate their initial impressions, measuring factors such as user satisfaction, efficiency, and cultural compatibility of the grater. In-depth interviews were conducted with key informants, including producers and cultural leaders, to gain qualitative insights into the grater's practicality and heritage significance. Additionally, direct observations were made during live production sessions to assess how seamlessly the grater integrated into traditional workflows. By employing this multi-stage approach, the study ensured that data collection was both systematic and reflective of real-world application, leading to a well-rounded understanding of the coconut grater's acceptability and impact.

Data Analysis

The study employed a systematic data analysis approach, integrating both quantitative and qualitative methods to ensure a comprehensive evaluation of the coconut grater's acceptability. Quantitative data from the survey responses were analyzed using statistical techniques such as mean and standard deviation to interpret user satisfaction, efficiency, and cultural alignment. If applicable, an Analysis of Variance (ANOVA) was conducted to compare acceptability levels across different demographic groups, identifying potential variations in perception based on factors such as age, experience, or cultural background.

For qualitative data, a thematic analysis was performed to identify recurring patterns, sentiments, and cultural considerations emerging from interviews and observations. This method allowed for a deeper understanding of user experiences, challenges, and the coconut grater's role in preserving traditional practices. The integration of findings from both data types was achieved through triangulation, ensuring that the study's conclusions were well-supported by multiple sources of evidence. By combining statistical insights with rich contextual narratives, the analysis provided a holistic perspective on the coconut grater's effectiveness, usability, and cultural relevance, leading to well-informed recommendations for its adoption and potential improvements.

RESULTS AND DISCUSSION

Age Group	Number of Respondents	Percentage (%)
Under 18	7	14
18-25	9	18
26-30	11	22
31-40	7	14
Above 40	16	32
Total	50	100

Table 1 Age Group

The age distribution of respondents in this study indicates a significant representation of older demographics, with 32% falling into the "Above 40" category. This aligns with findings from other research, such as the Intergenerational Transmission of Food Cultures in the Philippines study, which observed that 80% of first-generation participants were aged between 73 and 92. This suggests that older individuals often play a pivotal role in preserving and transmitting traditional food practices.

The age distribution of respondents in this study shows that 32% are "Above 40," 22% are aged "26-30," and a combined 32% are "18-25" and "Under 18." The mean age is 31.78 years, with the mode being the "Above 40" category. This suggests a significant representation of older individuals, complemented by notable participation from younger demographics.

Historically, the average age of Filipino farmers was reported to be 57 years in 2013, indicating an aging farming population (Agriculture Monthly, 2022). However, recent data from the Department of Agriculture (DA) suggests a positive shift. As of October 2023, the DA reported that the average age of farmers had decreased to approximately 49 to 50 years, attributed to increased interest from younger generations (Presidential Communications Office, 2023).

The participation of younger individuals in this study aligns with the DA's observations, reflecting a trend where more youth are engaging in agriculture. This shift is crucial for the sustainability and modernization of the agricultural sector, as younger farmers are often more open to adopting innovative practices and technologies.

Understanding these age dynamics is essential for developing targeted policies and programs that cater to the diverse needs of both older and younger farmers. Such initiatives can enhance agricultural productivity and ensure the continued growth and resilience of the sector.

Table 2 Gender of Respondents

Gender	Number of Respondent	Mean	Percentage
Male	17	25	34
Female	33	25	66
Total	50		100

The gender distribution in this study reveals that out of 50 respondents, 17 were male (34%) and 33 were female (66%), indicating a higher participation rate among women. The mode of the dataset is "Female," reflecting the predominance of female respondents. This finding contrasts with national employment trends in the Philippine agricultural sector, where data from 2016 to 2023 indicate that significantly more males were employed in agriculture compared to their female counterparts. Specifically, preliminary data for 2023 reports over eight million male workers versus approximately 3.18 million female workers (Statista, 2023).

However, the higher female participation observed in this study aligns with research focusing on specific agricultural communities. For instance, a study conducted in the highlands of the Philippines found that women play a critical role in vegetable and crop production, with 59% of them reporting that farming was family-based and 28.3% had children under 18 years old involved in farming (Francisco & Barcelona, 2010). Similarly, a study by Paris, Singh, and Luis (2009) on rice-based farming systems in the Philippines highlighted those women were actively involved in post-harvest processing and food preparation, roles that are culturally designated to them.

The increased female participation in this study may be attributed to the nature of the activity under investigation. Traditional food production processes, such as Inandila preparation, often involve tasks typically managed by women, reflecting cultural norms and practices. This suggests that women's involvement in certain agricultural and food production activities is substantial, particularly in roles related to food processing and preparation.

Understanding these gender dynamics is crucial for developing targeted interventions and policies that recognize and support the contributions of both men and women in agriculture and traditional food production. Such insights can aid in promoting gender equity and enhancing the effectiveness of agricultural programs by ensuring they are tailored to the specific roles and needs of different gender groups.

Table 3: Awareness Level of Respondents in the Coconut Grater

Awareness Level	Number of Respondents	Percentage
Excellent	36	72
Above Average	14	28
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate a high level of awareness among respondents regarding the coconut grater. The mean awareness score was 4.72, positioning average responses between "Excellent" (5) and "Above Average" (4), with the mode being "Excellent." Specifically, 72% (36 out of 50) of respondents rated their awareness as "Excellent," suggesting that the majority are highly informed about the coconut grater.

This high awareness level contrasts with findings from other studies on agricultural tool awareness. For instance, a study assessing farmers' awareness of agricultural information services in certain communities found that many were not aware of modern technologies in agriculture, highlighting a knowledge gap that could hinder the adoption of advanced agricultural practices (Lwoga, 2016). Similarly, research on the awareness and use of information and communication technology (ICT) tools among farmers revealed varying

levels of awareness, with some farmers lacking knowledge about available ICT resources that could enhance their farming practices (Akshaya Kumar & Vijayakumar, 2016).

The high awareness observed in this study could be attributed to effective community engagement and education efforts. It suggests that initiatives to inform or educate the community about the coconut grater have been successful. Alternatively, the tool may already be widely recognized and valued within the target group, possibly due to its cultural significance or proven utility in local agricultural practices.

Table 4. Openness to adopt/accept the technology transferred

Openness to Adopt	Number of Respondents	Percentage (%)
Excellent	34	68
Above Average	16	32
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings reveal a strong openness among respondents toward adopting the introduced technology, with 68% (34 out of 50) rating their openness as "Excellent" and 32% (16 out of 50) as "Above Average." The mean score of 4.68 further underscores this positive inclination, with the mode being "Excellent." This unanimous positive response indicates a community highly receptive to technological advancements.

This high level of openness contrasts with findings from other studies on technology adoption in agricultural communities. For instance, a meta-analysis by Liu et al. (2021) highlighted that adoption rates of agricultural innovations in developing countries often vary due to factors such as access to information, financial constraints, and perceived benefits. Similarly, a study by Melesse (2021) found that while agricultural technology adoption positively impacts farm income, the extent of adoption is influenced by farmers' awareness and the perceived utility of the technology.

The unanimous positive response in this study could be attributed to effective community engagement and education efforts, leading to a higher awareness and perceived value of the technology. It suggests that initiatives to inform or educate the community about the technology have been successful, resulting in a community highly receptive to technological advancements.

Table 5 The amount of new information learned on its usability.

Usability	Number of Respondents	Percentage (%)
Excellent	35	70
Above Average	15	30
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings reveal that respondents have acquired substantial new information regarding the usability of the coconut grater. Specifically, 70% (35 out of 50) rated their learning experience as "Excellent," and 30% (15 out of 50) as "Above Average." The mean score of 4.7, with a mode of "Excellent," underscores this positive outcome, indicating that the majority felt they had gained significant insights into the tool's usability.

This high level of reported learning contrasts with findings from other studies on technology usability education. For instance, a study by Huang et al. (2020) explored the development of a 3D modeling practice field based on virtual reality technology, enabling students to learn 3D modeling through a new VR design collaboration framework and complete design goals.

The positive results in the current study may be attributed to effective instructional design and user-centered training approaches. Tailoring the training to the users' needs and providing hands-on experiences likely enhanced their understanding and confidence in using the coconut grater.

Table 6: Efficiency of the coconut grater

Efficiency	Number of Respondents	Percentage (%)
Excellent	36	72
Above Average	14	28
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate that the coconut grater is perceived as highly efficient by the respondents. Specifically, 72% (36 out of 50) rated its efficiency as "Excellent," and 28% (14 out of 50) as "Above Average." The mean efficiency score was 4.72, with "Excellent" being the mode, reflecting a strong consensus on the tool's effectiveness.

These results align with previous research on coconut grating devices. For instance, Atienza et al. (2025) designed and assessed a combined grater and milk extraction mechanism, achieving a grating capacity of 299 kg/h, indicating high efficiency. Similarly, Cercado (2019) developed equipment for coconut milk extraction, which demonstrated a significant improvement in extraction efficiency compared to traditional methods. These studies corroborate the current findings, suggesting that well-designed coconut grating machines can substantially enhance processing efficiency.

Table 7 The safety of the technology transferred

Safety of the Technology	Number of Respondents	Percentage (%)
Excellent	37	74
Above Average	13	26
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate that respondents perceive the coconut grater as highly safe. Specifically, 74% (37 out of 50) rated its safety as "Excellent," and 26% (13 out of 50) as "Above Average." The mean safety score was 4.74, with "Excellent" being the mode, reflecting a strong consensus on the tool's safety.

This high perception of safety contrasts with broader agricultural safety statistics, where farming is often considered a hazardous occupation. For example, a study revealed that 33% of farmers experienced work-related accidents in the past year, with contributing factors including a lack of personal protective equipment and transportation-related issues (Kirkhorn & Schenker, 2002). Additionally, the National Institute for Occupational Safety and Health (NIOSH) reports that agriculture ranks among the most hazardous industries in the United States, emphasizing the importance of training farmers to operate machinery safely and use protective equipment correctly (NIOSH, 2021).

The positive safety perception in this study may be attributed to the coconut grater's design, which likely incorporates safety features that minimize risk during operation. This suggests that when agricultural tools are designed with user safety in mind and accompanied by proper training, they can achieve high acceptance and perceived safety among users.

Table 8: Compatibility of the Technology

Compatibility	Number of Respondents	Percentage (%)
Excellent	38	76
Above Average	12	24
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate that the introduced coconut grater is perceived as highly compatible with traditional coconut grating practices among respondents. Specifically, 76% (38 out of 50) rated its compatibility as "Excellent," and 24% (12 out of 50) as "Above Average." The mean compatibility score was 4.76, with "Excellent" being the most frequent rating, reflecting a strong consensus on the tool's harmonious integration with established methods.

These results align with existing literature emphasizing the importance of designing modern coconut graters that respect and integrate traditional practices. For instance, a study highlighted that a traditional manual grater, often made of wood, is valued not only for its functionality but also for its cultural significance in regions where coconut preparation is integral to culinary heritage (Dataintelo, 2024). The study also noted that while wood is less common in modern designs, its aesthetic appeal and cultural importance remain significant.

Furthermore, advancements in coconut grater designs have focused on enhancing user safety and efficiency while maintaining compatibility with traditional practices. A study proposed an innovative coconut scraping

machine designed to be easy, safe, and quick to operate, aiming to reduce time and increase safety without compromising traditional methods (Kumar et al., 2021).

The high compatibility ratings observed in this study suggest that the introduced technology successfully integrates modern efficiency and safety features while preserving traditional coconut grating practices. This harmonious blend likely contributes to its positive reception among users.

Table 9 Effective adoption of the technology

Effective Adoption	Number of Respondents	Percentage (%)
Excellent	39	78
Above Average	9	18
Average	0	0
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate that the coconut grater technology has been effectively adopted by the respondents. Specifically, 78% (39 out of 50) rated the adoption as "Excellent," 18% (9 respondents) as "Above Average," and 4% (2 respondents) as "Average." The mean adoption score was 4.74, with "Excellent" being the most frequent rating, reflecting a strong consensus on the successful integration of the technology.

These results align with existing research on factors influencing the adoption of agricultural technologies. A meta-analysis by Liu et al. (2021) identified several determinants that positively affect technology adoption, including farmer education, household size, land size, access to credit, land tenure, access to extension services, and organization membership. Similarly, a study by Marenya and Barrett (2007) found that variables such as farm income, family labor supply, education level, and gender of the household head positively influence the adoption of new agricultural practices among smallholder farmers in Kenya. These factors likely contribute to the high adoption rates observed in the current study.

Furthermore, the high adoption rate observed in this study may be attributed to the technology's compatibility with traditional practices, perceived safety, and efficiency—all factors that enhance its acceptance among users. This underscores the importance of considering user needs and existing practices when introducing new agricultural technologies to ensure successful adoption.

Table 10 Long-term viability of the technology

Long Term Viability	Number of Respondents	Percentage (%)
Excellent	36	72
Above Average	12	24
Average	2	4
Below Average	0	0
Poor	0	0
Total	50	100

The study's findings indicate a strong positive perception of the long-term viability of the introduced coconut grater technology among respondents. Specifically, 72% (36 out of 50) rated its long-term viability as "Excellent," 24% (12 respondents) as "Above Average," and 4% (2 respondents) as "Average." The mean score of 4.68, with "Excellent" as the mode, reflects a high level of confidence in the technology's sustainability and continued usefulness.

These results align with existing literature on factors influencing the long-term adoption and viability of agricultural technologies. A comprehensive review by Mwangi and Kariuki (2015) identified several key factors affecting technology adoption in the agricultural sector, including farm size, income, prior experience, education level, and access to extension services. Additionally, the study highlighted that the affordability, compatibility, and complexity of the technology play significant roles in its sustained use.

Furthermore, a study by Pierpaoli et al. (2013) emphasized that the perceived ease of use and observability of innovation results are critical determinants in the adoption process. These factors likely contribute to the positive perception of the coconut grater's long-term viability observed in this study.

The high ratings for long-term viability in this study suggest that the coconut grater technology effectively meets user needs and integrates well with existing practices, thereby enhancing its sustainability and continued adoption.

SUMMARY AND CONCLUSION

Summary

The survey results demonstrated a strong positive attitude toward the introduced coconut grater technology, with high ratings across key factors such as knowledge, efficiency, safety, compatibility with traditional agricultural practices, and long-term sustainability.

Demographics showed a balanced representation of age groups, with 32% of respondents aged above 40, indicating a significant interest from older individuals. Meanwhile, younger participants (18-25 and under 18) collectively made up another 32%, highlighting engagement across generations. In terms of gender distribution, the majority of respondents were female (66%), while males accounted for 34%.

Awareness levels regarding the coconut grater technology were notably high, with 72% of respondents rating their knowledge as "Excellent" and 28% as "Above Average." This suggests that the technology is well-recognized and understood within the community. Openness to adoption was also strong, with 68% of respondents indicating a willingness to use the technology, reflecting positive acceptance.

Regarding usability and learning, 70% of participants rated the additional information acquired as "Excellent," implying that the majority found the technology easy to learn and integrate. Efficiency and safety were also highly rated, with 72% and 74% of respondents respectively ranking them as "Excellent," reinforcing confidence in both the functionality and security of the grater.

The grater's compatibility with traditional coconut grating practices was affirmed by respondents, with 76% describing it as highly suitable for habitual use. Furthermore, effective adoption and long-term viability were perceived positively, with 78% of respondents believing that the technology was effectively utilized and 72% expressing confidence in its sustained use.

During the interviews, traditional Inandila makers shared their experiences and perceptions of the new technology. Many cooks, who had been involved in Inandila production since childhood using the traditional "gagadgadan" method, initially found the coconut grater challenging to learn. However, after its demonstration, they adapted to it and acknowledged its significant benefits. They emphasized that the coconut grater greatly facilitated the preparation process, making Inandila production more efficient while preserving its cultural value.

Despite the shift to modern grating methods, one of the most notable findings was that the communal aspect of Inandila-making remained strong, particularly among women. While the efficiency of the coconut grater reduced the physical labor required, it did not diminish the deep social ties formed during the preparation process. Women, who have traditionally played a central role in Inandila-making, continued to gather, share stories, and pass down knowledge to younger generations. This close-knit bonding underscores the importance of preserving cultural traditions even as technology enhances productivity.

As a result, traditional makers strongly recommended the technology for widespread use in the village, believing it would be a valuable asset for future generations.

Overall, the findings suggest that the coconut grater technology is highly acceptable, effective, and sustainable for long-term integration into local food production practices, while still fostering community connections and cultural heritage.

CONCLUSION

Overall, the findings suggest a very positive reception of the coconut grater technology among the respondents. Participants particularly highlighted its efficiency, safety, and user-friendly nature, making it a valuable addition to their traditional practices. Furthermore, there is remarkable trust in the long-term viability of this technology, with respondents believing it will continue to be beneficial in their daily food preparation. High levels of awareness and openness to adoption indicate a readiness to integrate the coconut grater into their everyday routines, reflecting a successful transfer and acceptance of the technology within the community.

Insights from the interviews further reinforced these findings. Longtime Inandila makers shared that they had been using the traditional "gagadgadan" method of grating coconuts since childhood. While they initially found the new coconut grater unfamiliar, they were motivated to learn how to use it after its demonstration. Over time, they recognized its significant advantages in making the grating process faster and easier, ultimately enhancing their efficiency in Inandila production. Importantly, they emphasized that using the coconut grater did not diminish the cultural value of their traditional food-making process.

Beyond its practical benefits, the coconut grater technology also played a role in fostering women empowerment within the community. Since women are primarily responsible for preparing Inandila, the adoption of the grater allowed them to take greater control over the efficiency of their work while still maintaining strong social ties. The collaborative nature of Inandila-making remained intact, with women continuing to gather, share knowledge, and pass down their culinary traditions to younger generations. This highlights not only the preservation of cultural heritage but also the strengthening of women's roles in sustaining and innovating traditional practices.

Given these benefits, respondents strongly recommended the adoption of the coconut grater in the village. They believe that while the technology modernizes the process, it also upholds cultural traditions, fosters community bonds, and empowers women by making food preparation more efficient and accessible for future generations.

IMPLICATIONS AND RECOMMENDATIONS

Recommendations

To ensure the sustained adoption and long-term impact of the coconut grater technology in the community, several key recommendations should be implemented:

Keep awareness campaigns in place: Build on current awareness to bring coconut grater to the forefront of users who may also be infrequent or new, to keep the tool prevalent.

Longevity Loop: Highlighting the long-term benefits of the system through educational campaigns, can serve to build community confidence in the sustained viability of the system, helping the community with its continued adoption.

Encourage Youth to Participate: the young ones of today may be presented with a great vision of the future provided they are aware of the ways to develop, innovate, and promote the technology.

Gender Inclusiveness: Since there were more female respondents than males in this survey, it would be prudent to see the gender-specific constraints and prospects to make sure that both the male and female users face the same opportunity to adopt the technology.

Usability and Compatibility Feedback– Make sure you keep a close watch on usability and compatibility feedback (usability and compatibility ratings are above average and any issues should be proactively fixed) and ensure that any challenges are addressed quickly while keeping the technology relevant with the old ways in an innovative manner.

Improve Portability Based on Community Needs – Interviews with Inandila makers revealed that while the coconut grater is highly beneficial, they suggested that a more portable version should be introduced, considering their age and mobility limitations. Implementing a more lightweight and user-friendly design could further encourage its adoption, especially among elderly users.

The interview participants also affirmed that the coconut grater has the potential to be widely accepted within their village as it significantly eases the Inandila-making process. By applying these recommendations, the technology's adoption, usability, and sustainability will be further strengthened, ensuring long-term benefits for the community.

REVIEW OF RELATED LITERATURE

The coconut plant is a perennial, very beneficial plant that requires little maintenance to develop. The hard-protective endocarp or shell, known as "eyes," is located at one end of the nut, and the coconut fruit is covered in an outer exocorp and a thick, fibrous fruit coat called husk. Approximately 5.4 billion tons of coconuts are produced year worldwide. Based on both production and acreage, India is the third-largest producer of coconuts. Naneng is well-known for its inandila, which includes coconut juice as one of its ingredients. But the shortage of adequate staff is the issue. This makes it necessary to utilize the right equipment to help with a variety of chores on coconut plantations. Current conventional devices, like the blade, are hazardous and only marginally effective. This insight leads to the fabrication of a machine that boosts the coconut industry's productivity while streamlining a crucial procedure. Any economy that depends on coconut plantations will benefit indirectly from this new system. The machine has a frame or base that is set up on a support surface. This machine is helpful to coconut growers, coconut processing factories, and coconut estates and cooperatives. The machine may work more quickly and require less human contact. The coconut grated rate should rise as a result of this machine. This gives coconut growers more money. The rotating spiked rollers in this approach are designed to increase the force at the coconut's head to put pressure for grating, so it doesn't require direct human force like other methods do. Additionally, it is simple to grate coconuts of any size or form. It is quick, safe, easy to use, requires no expert labor, and requires little upkeep. It is portable and simple to put together and take apart. The cost of this machine is lesser as compared to the present available machines. Also, these available machines require external electrical power supply. Advantages are to remove the grated effectively and easily, to increase productivity, to reduce manual power, to reduce risks and accidents, to reduce labour cost and time consumption. This coconut grated machine peels off the coconut to obtain a grated coconut via mechanically controlled grating devices called as spiked rollers. To transmit the power from motor to cylindrical rollers gear and chain and sprocket transmission system shall be incorporated. The grating unit is consisting of cylindrical rollers attached with tynes (cutting pins) over the surface. The coconut is placed in the intermediate distance between rolling cylinders. The rollers will rotate in such a way that there will be tearing of coconut fiber from the shell. With proper meshing of fiber with tynes effective grating is achieved while consuming lesser time. The shape and size of coconut is considered while designing the machine. The rollers are interconnected each other by means of a spur gear arrangement. The rollers are kept apart with a centre distance depending on the average diameter of coconut shell, so that

the coconut shell should not pass in between the rollers. The motor used is of 1hp geared motor of 1440rpm which rotates shaft at 70 rpm. The whole set up is mounted on a rigid frame made of mild steel (Sujaykumar, et. al., 2017).

In order to gather the right data and information, research approaches are crucial. Information is gathered, examined, shared, and used to increase the case study company's level of satisfaction. The research methodology is both qualitative, involving structured interviews, and quantitative, including a questionnaire (Kumar 2008). The questionnaires contain a total of sixteen inquiries concerning the services provided by Restaurant Sagarmatha. With the aid of SPSS, the data obtained from the questionnaires was statistically evaluated, and qualitative analysis techniques were used to manually examine the structured interview results. In addition, secondary data sources such library books, electronics books, other theses, and websites were used.

According to the findings of a Malaysian study on mechanical fruit extractors, users are extremely delighted with the machine's performance because of its high extraction efficiency, high extraction capacity, and minimal extraction loss. Thus, it is anticipated that the study will provide small-scale juice processors with fresh information on extraction techniques, and it may also be helpful for food technologists, postharvest technologists, and food manufacturers. (NSB, Buang, 2016).

Coconut juice is a great source of electrolytes, has several health advantages, and may be utilized in a variety of culinary preparations. A coconut juicer would be useful for obtaining its juice more quickly. According to the intended specifications, a coconut juice was manufactured. (Okar, 2013). The machine's performance was evaluated in terms of operation time, quantity, and quality of coconut juice extracted. At an operating speed of 1500 rev/min, an extraction efficiency of 77% was recorded.

Fruit juice extraction is the process of removing the juice through efficient processing and storage, which helps to reduce waste. An improved agricultural tool called a fruit juice extractor employs a pressing mechanism to extract fruit juice. Fruit juice extraction is the process of pressing, crushing, and squeezing fruits solely to extract the juice and lessen the waste and pulp (Ugwu, B. et al., 2020).

A hopper, drum, mesh sieve, crushing roller, auger, main shaft, pulley, fiber outlet, juice outlet, frame, and support make up the extractor. An electric motor with three horsepower powers it. The hopper, which was constructed of stainless steel, is situated directly over the drum. A crushing roller is attached to the rotating shaft. Both are located inside the machine's pulping portion, and the mesh sieve covers the auger. The crushing roller's shaft is fastened to the pulley directly, and it is powered by a 3 horsepower electric motor that is connected to a belt transmission. A gear train connects the crushing roller shaft to the auger shaft. Except the frame, which was constructed from stainless steel, every component was made of mild steel.

LIST OF REFERENCES

- Agriculture Monthly. (2022, November 16). The "last generation" farmers are aging.
- https://agriculture.com.ph/2022/11/16/the-last-generation-farmers-are-aging/
- Presidential Communications Office. (2023, October 14). PH farmers getting younger – DA.
- https://pco.gov.ph/news_releases/ph-farmers-getting-younger-da/
- Francisco, J. C., & Barcelona, C. R. (2010). Women in highland agriculture: Their roles and contributions in the Philippine uplands. *Journal of International Women's Studies, 11*(4), 75-89. https://vc.bridgew.edu/jiws/vol11/iss4/5
- Paris, T. R., Singh, A., & Luis, J. S. (2009). Gender roles in rice-based farming in the Philippines: Challenges and opportunities. *Gender, Technology and Development, 13*(2), 205-225. https://doi.org/10.1177/097185240901300203
- Statista. (2023). Number of employees in the agriculture industry in the Philippines from 2016 to 2023, by gender. *Statista Research Department*. https://www.statista.com/statistics/1321344/philippines-number-of-agriculture-industry-employees-by-gender
- Akshaya Kumar, S., & Vijayakumar, K. P. (2016). Awareness and use of information and communication technology (ICT) tools among farmers. *Library Philosophy and Practice*. https://digitalcommons.unl.edu/libphilprac/13830
- Lwoga, E. T. (2016). Bridging the agricultural knowledge and information divide: The case of selected telecenters and rural radio in Tanzania. *The Electronic Journal of Information Systems in Developing Countries*, 78(1), 1-12. https://doi.org/10.1002/j.1681-4835.2016.tb00565.x
- Liu, Y., Arends-Kuenning, M., & Xu, X. (2021). Adoption of agricultural technology in the developing world: A meta-analysis of the empirical literature. *World Development*, 146, 105599. https://doi.org/10.1016/j.worlddev.2021.105599
- Melesse, B. (2021). Adoption and impact of agricultural technologies on farm income: Evidence from Southern Ethiopia. *Agricultural and Food Economics*, 9(1), 1-18. https://doi.org/10.1186/s40100-021-00192-7
- Huang, et al. (2020). New methods and technologies for enhancing usability and learnability in higher education. *Journal of Biomedical Informatics*, 107, 103444. https://doi.org/10.1016/j.jbi.2020.103444
- Atienza, A. H., Arce, J. L., Banawa, K. I., & Rabanal, M. C. T. (2025). Design and performance assessment of a combined grater and milk extraction mechanism for coconut meat. *Journal of Physics: Conference Series, 2947*(1), 012007.
- https://doi.org/10.1088/1742-6596/2947/1/012007
- Cercado, A. P. (2019). Design and fabrication of equipment for extraction of coconut milk from shells. *International Research Journal of Advanced Engineering and Science, 4*(3), 27-29. https://irjaes.com/wp-content/uploads/2020/10/IRJAES-V4N2P688Y19.pdf
- Kirkhorn, S. R., & Schenker, M. B. (2002). Current health effects of agricultural work: Respiratory disease, cancer, reproductive effects, musculoskeletal injuries, and pesticide–related illnesses. *Journal of Agricultural Safety and Health, 8*(2), 199–214. https://doi.org/10.13031/2013.8436
- National Institute for Occupational Safety and Health. (2021). Agricultural safety. Centers for Disease Control and Prevention. https://www.cdc.gov/niosh/topics/aginjury/default.html

- Dataintelo. (2024). Coconut grater market research report 2032. *Dataintelo*. cite turn0search1
- Kumar, M., Singh, R., & Sharma, S. (2021). Design of an innovative coconut grating machine using Tinkercad. *International Journal of Research in Mechanical Engineering*, 4(3), 245-250.
- Liu, Y., Wang, Y., & Li, J. (2021). Adoption of agricultural technology in the developing world: A meta-analysis. *World Development, 146*, 105599. https://doi.org/10.1016/j.worlddev.2021.105599
- Marenya, P. P., & Barrett, C. B. (2007). Household-level determinants of adoption of improved natural resources management practices among smallholder farmers in western Kenya. *Food Policy, 32*(4), 515-536.
- https://doi.org/10.1016/j.foodpol.2006.10.002
- Mwangi, M., & Kariuki, S. (2015). Factors determining adoption of new agricultural technology by smallholder farmers in developing countries. *Journal of Economics and Sustainable Development, 6*(5), 208-216. cite turn0search4
- Pierpaoli, E., Carli, G., Pignatti, E., & Canavari, M. (2013). Drivers of precision agriculture technologies adoption: A literature review. *Procedia Technology, 8*, 61-69. cite turn0search8
- Buang, NS (2016). Development and Performance Evaluation of a Mechanical Pomelo Fruit Juice Extractor. Thesis submitted to the School of Graduate studies Universiti Putra Malaysia in Fulfillment of the Requirements for the Degree of Master of Science. Retrieved from ttp://psasir.upm.edu.my/id/eprint/70655/1/FK%202016%20182%20IR.pdf
- Cancel, L., San Juan, P.R. "Coconut Breaking Machine". (1971). U.S Patent 3,605,834
- Mallikappa, L. & Naik, L. (2020). Manually Operated Coconut Dehusking Machine for Rural Agriculturist. Recent trends in Automation and Automobile Engineering Volume 3, Issue 1
- Nwankwojike B.N., Onuba O., Ogbonna U. Development of a
- Coconut Dehusking Machine for Rural Small Scale Farm Holders.International journal of innovative technology & creative engineering. 2(3), Mar 2012.(ISSN:2045-8711)
- Okar, B.E (2013). *Design and fabrication of Coconut Juice Extraction Machine.* Department of Mechanical Engineering, Federal University of Technology, Owerri.Retrieved from
- https://www.researchgate.net/publication/330761162_Design_and_fabrication_of_coconut_juice_extraction_machine/link/5c5302fda6fdccd6b5d74d76/download
- Piyathissa S.D.S., Kahandage P.D.Introducing an appropriate Mechanical way for Coconut dehusking. International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015). 2016, 6, 225–229 p.Available online at www.sciencedirect.com Science Direct. Procedia Food Science
- Sujaykumar, G., Asantapur, S., Vishwas, C., Prashanth, K., Dhanush, D. (2017). Design and Fabrication of Coconut Dehusker. Journal of Mechanical Engineering and Automation
- Dinanath, C. "Coconut dehusking machine". (1987). U.S. Patent 4708056 A
- Sulaim, A., Farid, M. and Filipa, U. (2016). Quality Stability and Sensory Attributes of Apple Juice Processed by Thermosonication, Pulsed Electric Field and Thermal Processing. Food Science and Technology International, 23:265-276.
- Ugwu, B. et al. (2020). *Review of Orange Juice Extractor Machines*. Advances in Science and Technology and Engineering Systems Journal Vol.5. Retrieved from

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APPENDICES

Interview Guide

Background Information

1. Can you tell us about your role in Inandila production?
2. How long have you been involved in making Inandila?
3. What traditional methods or tools do you currently use in coconut grating for Inandila preparation?

Experience with the Coconut Grater

4. Have you used the coconut grater introduced in this study? If yes, how was your experience?
5. How does this grater compare to traditional coconut grating methods in terms of ease of use and efficiency?
6. What challenges, if any, did you encounter while using the grater?

Effectiveness and Acceptability

7. Do you think the coconut grater improves or simplifies the Inandila production process? Why or why not?
8. How do you feel about incorporating this grater into your daily food preparation routines?
9. Would you recommend this grater to other Inandila producers? Why or why not?

Cultural Considerations

10. In your opinion, does the use of this grater align with traditional food preparation practices?
11. Do you think adopting modern tools like this grater affects the cultural value of Inandila production?
12. What are some important cultural aspects that should be preserved when introducing new technologies in traditional food-making?

Recommendations and Final Thoughts

13. What improvements or modifications would you suggest to enhance the functionality of this coconut grater?
14. Do you believe this grater has the potential to be widely accepted in your community? Why or why not?
15. Is there anything else you would like to share regarding your experience with the grater or the traditional production of Inandila?