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Empowering the Community Through Candlenut Peeling Machine Training and Mentoring in Sembahe Village

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ABSTRACT
A candlenut peeling machine is a technological innovation aimed at improving the efficiency of separating candlenut seeds from their shells. Hand-peeling candlenuts requires a lot of time and effort, and it carries a high risk of damaging the candlenut kernels due to uneven impact. This candlenut peeling machine is equipped with a mechanism that reduces seed damage and increases productivity. The machine can be operated manually or semi-automatically and works on the principle of utilizing pressure and friction to break the shell without damaging the seeds inside. Experimental results show that this machine has a high success rate in separating candlenut seeds from their shells and reduces the number of damaged seeds compared to traditional methods. The use of this machine aims to increase the productivity of candlenut farmers and add value to the candlenut processing industry.

Keyword: Candlenut Peeling Machine, Efficiency, Productivity, Processing Technology, Candlenut Processing

1. Introduction

Indonesia is one of the largest candlenut producers in the world. One of the hazelnuts producing areas is Karo Regency, North Sumatra. According to BPS, Karo District produces around 2,312 tons of candlenuts per year 2024 [1]. This achievement makes Karo one of the ten largest candlenut producing regions in North Sumatera [2]. On the other hand, the abundance of candlenut production in Karo Regency has not been matched by adequate processing technology. The process of separating candlenut seeds from their skins is still done manually, by cracking and prying [3]. This method not only takes a long time and a lot of energy, but also has the potential to pose a risk of injury to workers. Damage to candlenut kernels due to improper handling can also be fatal, including contamination by fungi. In addition, low production efficiency can hinder the increase in added value of candlenut commodities, low productivity, and quality of production [4]. Therefore, it can be concluded that the process of separating candlenuts from their shells is one of the main factors in determining the final quality of candlenuts.

Currently, the process of separating the hazelnut shell is also increasingly developing with several technologies in the form of hazelnut separation machines from the shell [5]. Pecan shell separation machine is an appropriate technological innovation that aims to increase efficiency and productivity in the pecan processing process [6].

The working principle of this machine is based on breaking the candlenut shell and filtering the candlenut seeds from the shell [7]. Mechanically, this machine consists of several main components, namely an electric drive motor, pulley, belt, gear, or chain, thinning roller, auger, screw conveyor, and vibrator. Candlenuts that have been broken into the skin will enter the hopper and then automatically moved to the sieve with the help of a vibrator [8]. In the screening, the smaller candlenut seeds will pass, while the larger shells will be retained [9]. The drive motor functions to operate the entire machine mechanism so that the separation process can run continuously [10]. The use of this machine is expected to reduce the time and labor required in the manual candlenut processing process, as well as produce cleaner and higher quality candlenut seed products.

The candlenut sheller group of Sembahe Village, Karo Regency, North Sumatra is a small community of candlenut shellers consisting of mothers, located in Sembahe Village, Karo Regency. Located in Sembahe Village, this group is dedicated in processing raw candlenuts into ready-to-use candlenut seeds. With patience and thoroughness, they separate the candlenut seeds from their skins, then clean them thoroughly. They not only produce quality candlenut products, but also create jobs for women in the village. Their products are marketed to various regions, both in packaged form and in large quantities for industry. Despite facing challenges such as market price fluctuations and limited capital, the group remains enthusiastic in developing their business. They hope that in the future they can increase their production capacity and expand their marketing network, so that the welfare of group members can improve.

Seeing the great potential in candlenut processing of the Sembahe Village candlenut sheller group, this research aims to develop an efficient and easy-to-operate candlenut shell separator machine. It is hoped that with this machine, the group can increase the productivity and quality of its processed products, so that the economic value of candlenuts will increase. In addition, this innovation is also expected to serve as an example for other candlenut processing groups in Indonesia, and encourage the development of appropriate technology in the agricultural sector.

2. Methods

2.1. Tools and Materials

The materials in the manufacture of the candlenut sheller were selected with technical specifications designed to ensure strength, durability, and operational efficiency. The materials used include: Mild Steel Plate, Elbow, Concrete Iron, Dynamo and Cok Sambung which are assembled in such a way as to form a perfect candlenut sheller. The selection of these materials is based on comprehensive technical considerations, with the main objective of producing a candlenut sheller that has high durability, operational efficiency, and ease of maintenance.

2.2. Community Service Location

The community service was carried out at the Sembahe candlenut sheller community house in Dusun III Sembahe, Sibolangit District, Deli Serdang Regency, North Sumatra. The partner location is 31 km from the University of North Sumatra with a travel time of about 65 minutes by car, as shown in Figure 1 below.

(a) **(b)**

Figure 1. (a) Sembahe Candlenut Sheller Community House, (b) Location map of partner network from the University of North Sumatra

2.3. Candlenut Crushing Process Procedure

a. Assembly of the Candlenut Sheller

The assembly method of the candlenut sheller is carried out in several stages. First, prepare materials such as Mild Steel Plate, Angle Iron, and Concrete Iron as well as tools such as welding machines, grinders, drills, and measuring tools. Second, cut and shape the materials according to the design, then weld the main components of the Mild Steel Plate to form the basic frame. Next, install and weld Angle Iron at critical points for additional support and add Rebar as an additional frame. After that, assemble the sheller system, ensure that the mechanism functions properly, and check the alignment of the components. Perform a thorough inspection and testing of the tool to ensure optimum performance. Finish by cleaning the tool and applying a protective coating such as anti-rust paint to prevent corrosion. The final result of the candlenut sheller can be seen in Figure 2 below.

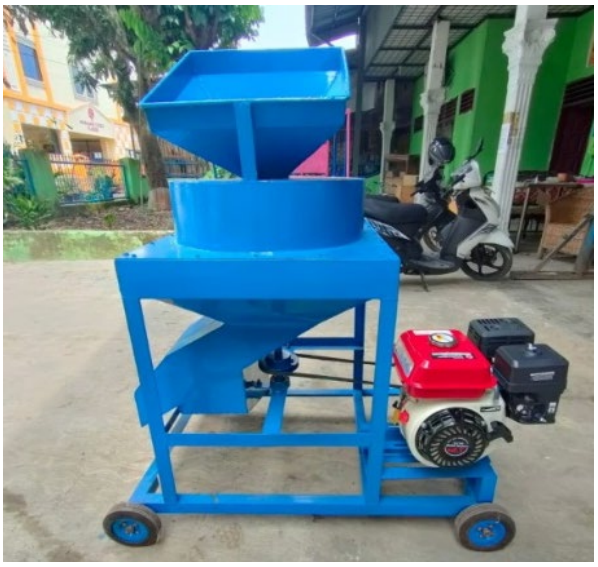

Figure 2. Pecan sheller

b. Candlenut shelling

After the tool assembly process was completed, the next stage was the candlenut shelling which was carried out with the candlenut sheller community in Sembahe. First, candlenuts that have been dried and cooled to freeze are prepared as raw materials. Second, the candlenut sheller machine is turned on to start the operational process. Third, the candlenuts are put into the sheller through the funnel located at the top of the tool. The machine will work automatically, separating the candlenut shells from the contents effectively and efficiently.

3. Result and Discussion

Technology was created to assist humans in completing work, such as the candlenut sheller machine. Candlenut (Aleurites moluccana) is one of Indonesia's spice crops that contains oil resources. Candlenut, with its hard shell but white seeds that are rich in oil, has long been an important commodity in various industries, ranging from culinary, medicine, to cosmetics. The most crucial part of candlenut processing is separating the seed or kernel from its hard shell. Therefore, the role of the hazelnut separator machine from the shell is needed to facilitate the work of hazelnut shellers to separate the hazelnut seeds from the shell with a quality hazelnut shape. This machine is specially designed to break the hazelnut shell efficiently and quickly, without damaging the core inside. With the pecan shelling machine, the process of separating pecans from their shells becomes more effective, reducing the labor and time required, and increasing the capacity and quality of the final product. In addition, this machine also helps maintain the consistency of the size and shape of the candlenut core produced, making it easier for further processing. The components used for the design of the candlenut sheller machine are iron frame, inlet funnel, electric drive motor, pulley, belt, gear, or chain, thinning roller, and auger, screw conveyor, vibrator, sieve, and outlet funnel. In this community service activity, the socialization of the use of the candlenut separator machine from the shell is carried out in the Candlenut Sheller Group of Sembahe Village, Karo Regency as can be seen in Figure 2 below.

(a) **(b)**

Figure 3. (a) Socialization of candlenut shell separator machine, (b) Demonstration of candlenut shell separator machine

In addition, socialization was conducted to determine the condition of candlenuts before being put into the machine. Candlenuts must be completely dry and very cold (close to freezing). To achieve dry conditions, candlenuts must be dried in the sun and avoid wet areas. Meanwhile, to achieve a very cold condition, candlenuts must be put into the refrigerator. Thus, the candlenuts obtained are separated from the shell and are perfectly round and minimize broken candlenut seeds.

Through intensive socialization activities, the candlenut sheller group of Sembahe Village has successfully understood and adopted the new technology, namely the candlenut separator machine from the shell. The effective knowledge transfer process was characterized by the enthusiasm of the participants in asking questions and trying to directly operate the candlenut separator machine from the shell. Finally, the machine was symbolically handed over to the partner group represented by a representative of the Pecan Sheller Group of Sembahe Village, Karo Regency. Thus, it is expected that the quality and quantity of candlenut seed separation from the shell can be significantly improved, thus having a positive impact on the economy of the local community and can ensure the sustainability of the program.

4. Conclusion

The development of candlenut peeling equipment is a crucial step in improving efficiency and productivity in the agricultural sector, particularly in candlenut processing. This tool successfully addresses the challenges of traditional methods, including long processing times and the high risk of seed damage. With a mechanism designed to minimize damage to candlenut shells and maximize production output, the candlenut peeler has proven to be more effective than manual methods.

Testing results indicate that this tool is highly successful in separating candlenut seeds from their shells and significantly reduces the number of damaged seeds. Therefore, the use of this candlenut peeling tool is expected to enhance the competitiveness of candlenut farmers and contribute to the overall candlenut processing industry. The adoption of this technology not only helps maintain the quality of candlenut seeds but also has the potential to yield greater economic benefits for farmers and related industry stakeholders.

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REFERENCES

[1] BPS, 2024. *Kabupaten Karo Dalam Angka 2024*. Karo: BPS Karo.
[2] Sinaga, D., *Sepuluh Daerah Penghasil Kemiri Terbesar di Sumatera Utara*. [Online] Available at: https://www.ninna.id/sepuluh-daerah-penghasil-kemiri-terbesar-di-sumatera-utara/. 2023.
[3] Tage, O., Fahrizal, Priyono & 1, S. M., Rancang Bangun Alat Pemecah Biji Kemiri Sistem Impact. *Propeller Jurnal Permesinan (PJP)*, 1(1), pp. 21-39. 2023

[4] Abbas, H., Rahman, F., Agus, F. & Paisal, Rancang Bangun Mesin Pemecah Cangkang Kemiri. *ILTEK: Junal Teknologi*, 18(2), pp. 112-116. 2023
[5] Jackson, M., Langston, C., Madsen, L. & Davis, R., The Effect of Impactor Geometry on End-to-End Pecan Cracking. *AgriEngineering*, Volume 6, pp. 2470-2480. 2024.
[6] Wei, H. et al., Progress in comprehensive development and utilization of pecan resources. *IOP Conf. Ser.: Earth Environ*. Sci, Volume 705. 2021.
[7] Costa, L. et al., Measuring pecan nut growth utilizing machine vision and deep learning for the better understanding of the fruit growth curve. *Computers and Electronics in Agriculture*. 181. 2021
[8] Tinambunan, T. W., Siahaan, E. W. & Zai, A., Rancang Bangun Pembuatan Mesin Pemecah Kemiri Dengan Kapasitas 35 Kg/. *Jurnal Teknologi Mesin Uda*. 3(1):128-134. 2022.
[9] Sugandi, W. K., Kramadibrata, M. A. M., Yusuf, A. & Putra, E. A., Uji Kinerja dan Analisis Ekonomi Mesin Pemecah Cangkang Kemiri Sunan MPC KS-0218 Jenis Ayakan Getar. *TEKNOTAN*. 14(2): 37-44. 2020.
[10] Rashid, Z. et al., Development of an Innovative Universal Walnut Cracking and Separating Machine for Farmers and Walnut Industry of Kashmir Valley. *J. Inst. Eng. India Ser*. A.104: 355–365. 2023.