

The agricultural technology in improving the smallholder rubber quality in Tapanuli, 1906 – 1942



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Abstract Generally, the quality of smallholder rubber in Tapanuli in the colonial period showed good quality compared to other production areas in the Dutch East Indies. This region is located in the western part of Sumatra, which means it does not face directly with the center of the Southeast Asian rubber market, which is Peninsular Malaysia, especially in Penang and Singapore. Each region in Tapanuli has a characteristic type of processed rubber. These characteristics reveal from which areas the processed rubber originated, such as Mandailing-Kuken, Loka-Lokan, Smoked Sheet (in small amounts), and the one with the best quality was CrepeSheet. This study discusses agricultural technology used in connection with the efforts to improve the quality of smallholder rubber in the Tapanuli Residency in the colonial period, the agricultural technology used, and the reasons behind the need for production quality. This study employed qualitative approach through historical research methods. Both primary and secondary data were collected through observation, supplemented by visits to relevant institutions, including the National Library of the Republic of Indonesia and the National Archives of the Republic of Indonesia. From the data, it can be concluded that the relatively far geographical location requires farmers to produce rubber with good quality in order to minimize transportation costs. The minimization of transportation costs is intended to benefit from the production of rubber plants. This quality assurance is carried out using simple but relatively good agricultural technology tools, such as tapping knives, latex storage devices, good latex coagulants, and slab grinding tools, to dry and fuse sheets.

Keywords: smallholder rubber, Tapanuli, agricultural technology, quality, profit

1. Introduction

Since the mid-19th century, the automotive and electricity industries have progressed. Automaterials such as trains were initially used to transport goods (Mohtar, 2021). Increasing the production of these two industries demands the need for supporting components. One of the important components is rubber processing material. In particular, the automotive industry produces tires (Mubyarto, 1991). The need for rubber processing materials in large quantities was responded to enthusiastically by producers, both in the form of a plantation industry and by rubber farmers (smallholdings). One of the most important rubber-producing regions in the world is the Dutch East Indies, especially in Eastern Sumatra (Elvira et al., 2023; Harahap et al., 2021; Riskita et al., 2023; Sarkar, 2024). In this Dutch colony, rubber was then produced by planters in the form of industrial capitalism, plantations, and rubber farmers (smallholding) (Siregar & Yasmin, 2023). In its development, smallholder rubber production far exceeded plantation rubber production during the colonial period.

The history of agricultural technology and its impact on rural economies is a subject of considerable significance, particularly in regions where agriculture forms the backbone of the local economy (Anatona, 2024; Sulistiyono et al., 2022). One of the most important smallholder rubber productions in the Dutch East Indies was the Tapanuli Residency (Siregar & Yasmin, 2023). The residency, located on the west coast of Sumatra, was well known as a rubber production center in the Dutch East Indies because of its relatively better production quality, not only for production areas in Sumatra but also compared to other smallholder rubber production areas, especially those in Kalimantan. The quality of this product can be measured by at least two indicators: water and material content and postharvest processing. In particular, the latter can be observed during postharvest processing. In general, at the rubber farmer level in the Dutch East Indies, production was limited to *slab products*, but in Tapanuli, it was indicated that it would be further processed into *crepe* and even *sheets*, both *smoke sheets* and *plain sheets*. The period between 1906 and 1942 was particularly transformative for smallholder rubber production in this region, as it witnessed the introduction and dissemination of new agricultural technologies aimed at improving the quality of rubber. This paper discusses agricultural technology used in connection with efforts to improve the quality of smallholder rubber in the Tapanuli Residency during the colonial period, the agricultural technology used, and the reasons behind the need for production quality.



The importance of this research lies in its potential to fill significant gaps in the history of agricultural development in Indonesia. While much has been written about the expansion of large-scale plantations during the colonial era, the experiences of smallholder farmers, particularly in less-studied regions such as Tapanuli, have received comparatively less attention. Previous studies have been conducted in other areas, such as the residency of rubber plantations (Inagurasi, 2014; Itawan, 2023; Wicaksono, 2021) and science development (Itawan, 2022). Understanding how smallholder farmers in Tapanuli adopted and adapted agricultural technologies to enhance rubber quality can offer valuable insights into the broader dynamics of rural development and economic change in colonial Indonesia. Moreover, this study contributes to a more nuanced understanding of how technological innovations are diffused in rural settings, where factors such as local knowledge, social structures, and economic constraints play critical roles in shaping agricultural practices.

The significance of this research extends beyond historical inquiry, as it also holds relevance for contemporary agricultural policy and development. In many parts of the world, smallholder farmers continue to play a vital role in agricultural production, yet they often face challenges in accessing and effectively utilizing new technologies. By examining the historical case of Tapanuli's smallholder rubber farmers, this study can provide valuable lessons for current efforts to promote agricultural innovation and sustainability in similar contexts. These findings may inform strategies to increase the adoption of agricultural technologies among smallholders, emphasizing the importance of aligning these technologies with local needs and capacities.

Furthermore, this research highlights the interplay between global economic forces and local agricultural practices. The early 20th century was a period of increasing global demand for rubber, driven by the rise of the automotive industry and other industrial uses. This global demand has created pressures and opportunities for rubber-producing regions, including Tapanuli. By analyzing how smallholder farmers respond to these global economic trends through the adoption of agricultural technologies, this study offers insights into the ways in which local agricultural systems are integrated into global markets. Such an understanding is crucial for developing policies that support the resilience and competitiveness of smallholder farmers in today's increasingly interconnected world.

2. Methods

This study employs a qualitative approach through a historical method. This method is a systematic approach used to study past events, processes, and contexts to gain insights and understand patterns that can inform present and future situations. This method involves the collection, evaluation, and interpretation of data from primary and secondary sources, such as documents, archives, artifacts, and oral histories (Siregar & Yasmin, 2023). This is characterized by its emphasis on context, causality, and change over time, aiming to construct a narrative that explains how and why particular events occurred. The author believes that this method is suitable because this period (1906–1942) is crucial, as it encompasses significant historical events, such as the colonial administration's efforts to increase agricultural productivity and the global demand for rubber, which likely impacted local practices. This method is suitable for tracing the evolution of these technologies, analyzing their adoption by smallholders, and assessing their effectiveness in improving rubber quality.

In this research, both primary and secondary data were collected through observation, supplemented by visits to relevant institutions, including the National Library of the Republic of Indonesia and the National Archives of the Republic of Indonesia. These visits facilitated the acquisition of archives, books, and other publications pertinent to the study's objectives. Following data collection, the subsequent steps involved data verification and interpretation of the findings in a written format.

3. Results and Discussion

3.1. Quality of smallholder rubber in Tapanuli

Rubber planting activities in Tapanuli have been conducted for a long time. Although the initial year is not known exactly, the export data from two types of rubber sent through Tapanuli in 1913 for hevea species and 1914 for ficus types can be used as initial assumptions as to when the rubber plants began to blossom (Mvo (Memorie van Overgave) de Residentie Tapanoeli, 1920).

For hevea species, good tapping can be performed when the age of the tree reaches 6 years. If the export year is reduced by the best age for hevea to be tapped, the first planting was carried out in 1908. In contrast to hevea, ficus-type rubber trees can be tapped when the tree turns 7. This means that Ficus has been planted since 1907, one year before the beginning of Hevea planting. Even so, whether the people had begun planting or whether it was Onderneming who did it first in that year is still uncertain. What is certain that the year 1908 is a year that must not be forgotten because this year was the year of economic revival in Tapanuli, especially for the people of Tapanuli themselves. This is especially true for people who cultivate rubber plants (Stibbe & Uhlenbeck, 1921).

Each region in Tapanuli has a characteristic type of processed rubber. These characteristics reveal from which areas the processed rubber originated, such as Mandailing-Kuken, Loka-Lokan, Smoked Sheet (in small amounts), and the one with the best quality was CrepeSheet. Although other products were not as popular as CrepeSheet, these products also sold well on the market. The ratio of the export value at Sibolga Port to that at Creepe Sheet was 20% higher than that at Sibolga Port, with

ratios of 60% and 40%, respectively (P. Brook & H. W. J., 1926). The difference between Mandailing kuken and CreepeSheet is that Mandailing kuken is much thicker than CreepeSheet is, so it is not surprising that the water content of Mandailing kuken is higher than that of CreepeSheet.

The low-quality product was loka-lokan. Owing to this fact, the price was rather low. This was also due to the issue of its cleanliness, where a large amount of dirt was found in it as well as sediments, such as tree bark and small twigs, to small rocks that added weight. This occurred because, in the process, the latex that came out of the rubber tree trunk would be left for 3 to 4 days without being mixed with any material. This meant that the coagulation process occurred by itself (naturally) without any additional ingredients; therefore, many impurities gravitated during the process. Loka-lokan shaped half a circle. This form is obtained because, in general, the latex that exits the tree trunk is contained in a coconut shell.

One more product with the lowest quality was Belarus Lumps. As the name implies, Barus lumps are products that are produced only by the people of Barus. The quality is worse than that of Loka-Lokan because the product is dirtier. As mentioned previously, Barus lumps is just a frozethatit and "Ondernemingber", which contains all impurities with a small percentage of rubber content.

The creep sheet is generally produced by the Tapanuli people and is a hallmark of processed rubber products in Tapanuli. A creep sheet is a combination of two names: sheet and crepe. The name combination is given because the form of the processed rubber does not look like a sheet or crepe to facilitate the product; it was later called a creep sheet. In terms of shape, Creep Sheather has a length of approximately 3–4 meters with uneven thickness, similar to a long cloth but slightly thicker. The water content is very low, especially compared with that of slabs. Owing to its small water content and long shape, it is in great demand by the market, especially when it is sent directly to Europe and America (Gelder, 1950).

Some people produce smoke sheets in Tapanuli. It is rubber production obtained from the drying process by smoking. The processing method for producing a smoke sheet is similar to that for a creep sheet; if the smoke sheet is dried by smoking, then the drying of the creep sheet is obtained through wind blowing. Therefore, Creep Sheet is also called an angina (windy) sheet or plan sheet.

In terms of quality, the creep sheet was the best product among all products produced by the Tapanuli people. Creep Sheets with top-notch qualities contain only 1–2% water content, with very little water content. Creep Sheets are the easiest products to sell and do not incur high transportation costs because of their thin and light shape, so they can be sold directly to Europe and America. Mandailing kuken, which is also an original Mandailing product, has 30–50% water content. This level is still too far from the Creep Sheet.

Since January 1, 1928, the classification of processed rubber has been divided into 3 categories. The first is those processed by using a machine. The second category includes those processed without using a machine, whereas the third category includes those that do not belong to either category I or II. In the same year, Tapanuli exported 2,443 tons of rubber, where 1,846 tons or 91.5% of total exports came from the first category (Third Report on Native Rubber, 1929).

In 1929, Tapanuli rubber exports of dry rubber increased to 94.5%. The following year, it reached 2,500 tons, with 99.4% dry rubber (Sixth Report on Native Rubber Cultivation, 1931). Furthermore, even though the global economy is still experiencing economic depression, people in Tapanuli still manage to maintain the quality of the rubber they sell. In 1931, despite a decline in production, from 1,702 tons to 1,693 tons, 99.8% of these tons were in the first category (Ninth Report on Native Rubber Cultivation, 1932).

However, the quality decreased dramatically due to the very low selling price of the Creep Sheet in 1932, which reached only 5–6 cents per kilogram. As a result, traders and buyers agreed not to provide price differences between dry rubber and low-quality rubber, which led to a decline in production quality because people were reluctant to filter latex (Tenth Report on Native Rubber, 1932).

These periods did not last long. In the following year, 293 tons of rubber were produced, all or 100% of which were in the form of dry rubber (Thirteenth Report on Native Rubber Cultivation, 1933). This situation continued as early as 1933, when the exports of smallholder rubber in Tapanuli amounted to 103 tons, where only 1 ton of production was in the form of wet rubber, and the remaining 102 tons were dry rubber (Fourteenth Report on Native Rubber Cultivation, 1933).

Since October 1934, exports of dry rubber have been divided into two groups. The first group consisted of blankets and sheets that were produced without using machines rotated by humans but still in the form of dry rubber, and the other group consisted of all types of processed sheets that were considered for their quality, including rubber made by machines rotated by humans. The second group had the worst qualities, which were known as scraps (2a) and slabs (2b) (Twenty-first Report on Native Rubber Cultivation, 1935).

This rule was the result of the meeting of the producing countries, which then joined the IRRA (International Rubber Regulation Agreement) to discuss the production and export of rubber due to the impact of overproduction after Stevenson's Scheme was abolished in 1928. Each member was given a quota according to the maximum production they could manage. This rule is known as rubber restriction. This restriction was expected to be able to control the availability of world rubber so that the prices could be controlled properly to benefit rubber-producing producers. In the Dutch East Indies, special export taxes were imposed on the public on June 1, 1934, by applying certain taxes on dry rubber by market prices (Sumarno, 1998).

A year after the enactment of a special tax, on April 1, 1935, individual restrictions were introduced in the Tapanuli region. This restriction required that the tapped or untapped rubber trees remained recorded. Rubber export activities in 1934 and 1935 were sluggish. During those two years, they could only manage to produce 1,699 tons in 1935 and 1,209 tons in 1934 in the first quarter. The sluggish production activity was caused by the owners of the plantation (the community) being preoccupied with arranging production licenses for individual restrictions that had been in effect since April 1, 1935.

The quality and quantity of production returned to increase in the second and third quarters of 1935. In the second quarter, rubber exports in Tapanuli were 665 tons (Twenty-third Report on Native Rubber Cultivation, 1935). In the third quarter, Tapanuli rubber exports under individual restrictions amounted to 631 tons, of which 424 tons were Creep Sheets (Twenty-fourth Report on Native Rubber Cultivation, 1936). Until the end of 1935, during the last quarter, rubber exports made through the port in Tapanuli were almost entirely in the form of dry rubber. A total of 1,117 tons of total production are produced, 751 tons of which are Creep Sheet products. The increase in the quality of rubber produced by the people was accompanied by an increase in the price of the Creep Sheet, where prices in the fourth quarter of 1935 were more expensive than those in the third quarter, where they reached 32 cents per kilogram (Twenty-fifth Report on Native Rubber Cultivation, 1936).

The increase in the quality of smallholder rubber continued. In the first quarter of 1936, dry rubber production reached 100%, with a total production of 1228 tons. Sheet-type products amounted to 885 tons, and 343 tons were blanket-type products. Although the production slightly declined in the second quarter, the amount of dry rubber, especially sheet rubber, still dominated. The total second quarter exports were 117 tons, consisting of 414 tons of blankets and 703 tons of sheet types (Twenty-seventh Report on Native Rubber Cultivation, 1936). In the third quarter, the number of exports began to increase, with a total production of 1,524 tons, 473 tons of which belong to Group 1a (blankets) and the remaining 1,051 tons belong to Group 1b (sheets). This also continued until the last quarter, with total exports of 1,643 tons, of which 1,080 were sheet type (Twenty-ninth Report on Native Rubber Cultivation, 1937).

The price of Creep Sheet was 46½ cents by using a coupon, increasing production in the third quarter of 1936. The price could reach 55--60 cents in November. The rising prices in early 1937 caused the export quantities to increase. Prices ranging from 66--70 cents made people more motivated to spur the amount of production. During 1937, total production amounted to 8,193 tons, of which 2,104 tons were blankets and 6,069 tons were sheets. In this year, groups 2a and 2b also had scales. There were 18 tons for 2a (scraps) and 2 tons for 2b (slabs) (Verslag, 1937).

In 1938, the amount of rubber exports declined. This occurred because of the low price of rubber, especially rubber sold without coupons. Therefore, the people could only manage to produce 574 tons of rubber. This slightly improved, where in the third quarter, the total production reached 1,216 tons. This may have occurred not only from the increase in selling prices but also because the people tried to reach the maximum production before the fasting month, which fell into the fourth quarter. Therefore, in the fourth quarter, the tapping activity decreased (Native Rubber Report for Second Half-year, 1939).

In 1938, the production of sheets was the lowest, especially compared with that in the previous 3 years. In the previous 3 years, the total sheet export in Tapanuli never reached a value of less than 3000 tons, which unfortunately occurred in 1938. The export activity was again vigorous in 1939. The production of smallholder rubber has increased. In 1939, the total exports of dry rubber amounted to 4,196 tons (Verslag, 1939).

The heating of foreign policy conditions before World War II slowed economic activity, at least beginning in 1940. Rubber production began to decline due to fears of a security situation that could have been out of control. Nevertheless, when we look back, either when the rubber prices were high or when they were low, the Tapanuli people were always able to maintain quality. The exported rubber was always in the form of dry rubber, with the main product being the people sheet used as scraps for the Creep Sheet.

3.2. Simple agricultural technology

The people still used traditional tools such as hoes and machetes to cultivate the land. These tools were used for "weeding" and land treatment. In the process of tapping, people use a knife called *pisaudjebongor pisauserdang*. There is an arch at the tip of this knife, in which there is a very sharp part used to peel the tree bark (Alauddin, 1969).

The word "*Serdang*" in *Pisau Serdang* is reminiscent of an empire called the Serdang Kingdom located on the East Coast of Sumatra. The possibility arises that this knife was produced in one of the Serdang Kingdoms. It is possible that this knife was obtained when rubber was shipped from Tapanuli to Belawan Port.

In regard to collecting latex, many people use coconut shells that have been split into two rather than aluminum bowls. In some cases, coconut shells, bamboo and pottery were used. Latex flow gutters were also very simple. People used cans that were cut as wide as two fingers for the latex to flow through. Several people have also used bamboo blades or leaves as media.

During the coagulation process, each region in Tapanuli uses different materials. Nonetheless, *acetic acid* was the most favorable ingredient in the latex thickening process. In addition to *acetic acid*, the Tapanuli people also used *Acidotex* as an ingredient for the clotting process. *Acidotex* is widely produced in Penang, and its quality is better than that of *acetic acid*. Alum is also a material used for the coagulation process. The alum that was most often used was that from Padang, which had a much better quality. This occurred because alums from Padang were able to make the frozen latex heavy. Before people

became familiar with some of these chemicals, people in Tapanuli used *Tuak* (Batakese ale) as a mixture to agglomerate latex. In addition, lemons were also used even though latex could not be fully solid.

When producing processed rubber, people also use simple tools; for example, when *mandailing kuken*, 2 pieces of heavy board are needed, where the sides are shaped like a rhombus. The *slabs* are subsequently placed between the two boards on a stage, after which they are pushed slowly and repeatedly. This tool is called *triptans*. *Tjipitan* is often used by the Tapanuli people to press *slabs* to reduce the water content. After the process of suppression is complete, the *kuken* is then dried under hot sun and breezes using a pole made of bamboo, similar to a simple clothesline.

Similar to *mandailing kuken*, the process of making *Creep* Sheetal so through the pressing stage. Previously, latex was subjected to a coagulation process via *acetic acid*. *Acetic acid* is relatively strong in freezing latex, so the *slab* does not tear easily when ground. This grinding machine is called a thinning machine (*mesinpemipis*) (Pemimpin Tani, 1928). It takes a person to operate this machine by turning the lever on the right side of the machine. This lever serves to rotate the mill so that the *slab* that has been placed turns flat. A holey *crepe* is then patched with another *crepe*, after which the *crepe* is dried on clothesline-shaped poles in large quantities by utilizing the sun's heat and wind gusts.

3.3. Reasons for quality assurance

As stated in the previous section, the shipments of smallholder rubber products in Tapanuli were always in the form of dry rubber or the like. This was still possible despite rubber price fluctuations. Regardless of whether the prices were high or low, they could always manage to produce dry rubber, especially a *creep sheet*.

One interesting question then arises about why people in Tapanuli produce rubber in the form of dry rubber or a *creep sheet*. Some allegations later emerged about this. First, Tapanuli's geographical location, which was generally hilly and had steep ravines, made trading locations difficult to reach. It also had to do with transportation. Tapanuli, which generally has a river with shallow, rocky, and swift currents, made it impossible to pass; therefore, their main means of transportation were land transportation.

Shipments by land were carried out by carts and trucks. The price to pay was 2 per *pikul* for the dry season and 5 per *pikul* for the rainy season according to carts. For trucks, farmers had to pay 1½ to 2 cents for each kilogram. This means that each *pikul* cost 92.65 cents. It can be imagined how much transportation costs would have to be incurred by the farmers if the people would have continued to produce wet rubber. Certainly, it would be higher, even though wet rubber was very cheap. Hence, people prefer to produce dry rubber because, in addition to the price being high, the shipping cost is low. However, the processing of dry rubber was slightly longer than the processing of wet rubber.

The considerable difference in price between dry rubber and wet rubber could also be a reason why people preferred to produce the former. In addition, the ease of sale transactions for dry rubber products also becomes the reason for the fact that dry rubber products can be sent directly to Europe or America because their quality is guaranteed with only a 1–2% water content, so the buyers do not need to perform the drying process again.

3. Conclusions

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Ethical considerations

Not applicable.

Conflict of interest

The authors declare that they have no conflicts of interest.

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