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Management of Pests and Coconut (*Cocos nucifera*) Products in Northen Sumatra

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ABSTRACT

The coconut plant (*Cocos nucifera* L.) plays an important role in the production of cooking oil. In 2021, the area of coconut plantations in North Sumatra was 442,072.76 hectares, while the area planted in Tanjung Balai was 3,470.50 ha, with a total yield of 3755 tons. This study look at the cultivation and management of pests and coconut plant products in Tanjung Balai, North Sumatra. There were three types of coconuts found in Sei Kepayang, Tanjung Balai: tall, java, and dwarf coconut. Of the 22 coconut trees seen, 18 (81.81%) were affected by pests and diseases, including *B. longissima*, *Orytes rhinoceros*, *Fusarium* sp. shoot wilt disease, *Curvularia* sp. leaf spot disease, *Pestalotiopsis palmarum* gray spot disease, and monkeys and squirrels on the plants. Coconuts have a significant impact on coconut productivity. The products included cooking oil, as well as charcoal, broomsticks, rice-cake wrapp, and weaved handicrafts.

Keywords: ***coconut, coconut pests, coconut products***

INTRODUCTION

The coconut plant (*Cocos nucifera* L.) plays an important role in the production of cooking oil. Coconut is a tropical plant that the Indonesian people have long recognized, as evidenced by its widespread distribution throughout the archipelago. In 2010, the area of coconut plantations was recorded as 3739.35 thousand ha, with people's plantations covering 3697.03 thousand ha (98.87%), large state plantations covering 4.92 thousand ha (0.11%), and private plantations covering 38.02 thousand ha (1.02%) (Ditjenbun 2012). Almost every aspect of this plant is good to human health. The more the human need, the greater the demand for coconut (copra). However, there is an imbalance: every year, demand for coconut (copra) rises while output falls. This is because the typical plant reaches the productive age (60 years or older). Cultivation care is modest, including maintenance, fertilization, pest and disease control, and eradication. Despite intense attempts to remove pests and diseases (Ibrahim 2010), attacks continue to occur.

Pest and disease attacks are one of the challenges to the growth of coconut plants. Pests that might harm coconut plantations include the *Oryctes rhinoceros* beetle, *Rhynchophorus ferrugineus*, *Brontispa longissima*, *Artona catoxantha*, *Limacodidae* caterpillars such as Parasa, Thosea, and Setora, among others (Hosang 2010). The disease spreads rapidly in the field and might cause plant mortality. The disease can spread in groups and occurs when the plant starts producing or matures. Symptoms of shoot rot disease by Phytophthora palmivora attack include the drying of the shoot or spear leaves, followed by the young leaves around them, causing the leaves to break and decay, and finally the plant dies (Marhaeni 2008).

History of Coconut Plants

The coconut plant is believed to have originated in South America, grown in the Andes Valley of Colombia, since thousands of years BC. Other records suggest that coconut plants originated in South Asia, Malaysia, or the Western Pacific. Furthermore, coconut plants have spread from one beach to another. Coconuts can be dispersed by rivers or oceans, or by crew men docked from one beach to another (Warisno 1998). The cultivation of this plant in the world's earliest civilization locations, where it has been known since 300 BC in the Philippines and Sri Lanka and 3000 years ago in India, suggests that the coconut originated in the surrounding tropics. Finally, the experts decided that the coconut originated in the region now known as Malaysia-Indonesia. Coconuts migrated from this area to others via sea currents and human intermediates.

The name "coconut" first appeared in English writings in 1555, with the word "coco" originating in Spanish and Portuguese and meaning "face of an ape". The two countries undertook a study and discovered that the monkey's face is similar to the three indentation marks or "eyes" around the bottom of the coconut. Until the early twentieth century, full coconuts were used as payment in the Indian Ocean's Nicobar archipelago (Mardiatmoko and Ariyanti 2011).

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Coconut Classification

According to Rukmana and Yudirachman (2016), the taxonomy of coconut plants is organized as follows: kingdom: Plantae; division: Spermatophyta; superdivision: Angiosperm; class: Monocotyledonae; order: Palmales; family: Palmae; genus: Cocos; species: *Cococ nucifera*. The Arenan or Arecace is a sole member of the genus Cocos (*Cocos nucifera*). Coconut plants are multifunctional since every element of the plant is useful to human health, they also hold significant cultural and economic value in people's life (Luntungan 2008).

Coconut Plant Botany

Coconut is an annual plant with a stiff trunk, unbranched (monopodial) foliage, and fibrous roots. In English, coconut is known as coconut palm, coco palm, or coconut tree (Mardiatmoko and Ariyanti 2011).

- Root

Coconut roots are fibrous, with between 2000 and 4000 strands depending on soil fertility, environment, and plant health. The base of the coconut trunk gets extended, and then the soil shrinks again, forming an inverted cone. This section is referred to as the "bole" or "root bulb". This bulb produces a spherical, extended primary root.

- Trunk

A coconut tree's trunk typically grows straight up, except for coconut trees that thrive in specific locations such as river sides, cliffs, and so on, where the trunk develops bent towards the sun. The coconut trunk is gray and slippery, with a height of up to 20 m and a diameter ranging from 20 cm to 30 cm, depending on variety, climate, soil, and planting distance.

- Leaf

Coconut leaves have a stalk (petiole) and a leaf sheath (rachis). The fronds have leaf blades or leaflets with skewered centers (midrib). The length of the leaf blades changes according to their position. The leaf blades in the center of the leaf axils are longer than those at the base or tip of the axil.

- Flower

Coconut plants begin to flower in different ways depending on the type. In *Genjah* (dwarf coconut), coconuts mature after 3–4 years; *Kelapa Dalam* (tall coconuts) are 4 to 8 years old, whereas hybrid coconuts are around 4 years. *Manggar* (*mayang*) grows from the leaf armpits and is still wrapped in a sheath (spadix). *Mayang* is a branching flower stalk that produces multiple yellowish-white flowers.

- Fruit

Three to four weeks after the cover opens, the fertilized female flowers develop into prospective fruits. However, not all of these fruits can grow large, as half to three-quarters of them will fall owing to insect and disease attacks, nutrient inadequacies, dryness, or poor pollination processes.

Coconut Plant Varieties

In coconut species, two main varieties are known, namely the tall coconut variety and the *genjah* variety (*dwarf coconut*). By collecting information from 22 farmers, continuous cross-pollination led to the emergence of new varieties.

- Dwarf coconut

Genjah coconuts have a slim trunk from the base to the tip, reach a height of 5 m or more, bear fruit quickly (3-4 years after planting), and can live for more than 50 years. They are self-pollinating.

- *Tall coconut*

Kelapa Dalam (tall coconut) is widely grown in various coconut producing countries. The characteristics that can be observed in the type of tall coconut are that the trunk is tall and large, can grow up to 30 m or more. The base of the trunk is usually enlarged, begins to bear fruit slowly (6–8 years after planting), but can reach a lifespan of 100 years or more, carrying out cross-pollination.

- Hybrid coconut group

Hybrid coconut is the product of cross-pollination between two homozygous parents with distinct characteristics, such as *Genjah* as the mother tree and *Kelapa Dalam* as the father tree. It is hoped that this cross would combine the best features of both parents, as well as provide a heterosis (hybrid) vigor effect.

Problems identified at the research location include farmers' poor knowledge of coconut farming and processing into the principal product of cooking oil, VCO, and other items. As a result, the research team compiles a list of difficulties and offers appropriate solutions for coconut product cultivation and management.

METHODS

This study was carried out on December 17–21, 2021 in Sei Kepayang, Tanjung Balai, North Sumatra, at an elevation of 4 m above sea level and a distance of approximately 183.6 km from Medan (North Sumatra capital). A survey was conducted to identify concerns in the field. Next, a questionnaire was provided to 30

responders, which included 22 coconut growers and 8 coconut product processors. Data was gathered through interviews and the completion of questionnaires that were provided through mentoring and guidance on how to fill out the questionnaires. The collected data was examined and shown in the form of tables and pie charts, and solutions to coconut-related problems are found.

RESULTS AND DISCUSSION

Pests and Diseases of Coconut Plants

- Brontispa beetle (*Brontispa longissima)*

The *Brontispa longissima* beetle causes harm to coconut trunks, particularly in young trees (Figure 1). Both the larvae and the beetles are in the folds of the young leaves that have not yet opened, and they bore the tissue of the young leaves, leaving elongated stalks that can cause the affected coconut trees to bear no fruit in the coming years. Of the 22 coconut trees observed, 18 (81.81%) were attacked by pests and diseases such as *B. longissima*, *Orytes rhinoceros*, *Fusarium* sp. shoot wilt, *Curvularia* sp. leaf spot disease, and *Pestalotiopsis palmarum* gray spot on coconut plants, all of which had a significant impact on the productivity of coconut fruits produced.

Figure 1 *Brontispa* sp. attack s pest infestation

- Shoot wilt disease

Although the exact etiology of this disease is unknown, residues of *Botryodiplodia* sp. and *Fusarium moniliforme* were discovered during an inspection of the damaged trees of coconut will shoot disease (Figure 2). The first indication is that the leaf tips are curled (drooping), with blackish-brown and dry leaf sheaths at the terminals. Table 1 displays the findings of the questionnaire administered to coconut growers in Sei Kepayang, Tanjung Balai.

Figure 2 Coconut wilt shoot disease by *Fusarium moniliforme.*

Figure 3 depicts the eight different types of coconuts grown by coconut farmers in Sei Kepayang, Tanjung Balai: java, ordinary, *natura*, green, tall, *kampung*, *nias*, and hybrid. According to a survey of 22 farmers, the most commonly planted types of coconuts are java and hybrid, each with 5 farmers. The least common coconuts are green, *natura, ganju*, ordinary, and *kampung* coconut, each with one farmer.

Figure 4 depicts nine types of pests discovered by coconut producers in Sei Kepayang, including the *Brontispa* sp. coconut beetle, mealybugs, leafhoppers, *kidu*, squirrels, pigs, dan monkeys. According to a poll of 22 farmers, the most common pests attacking coconut plantations were monkey and squirrel, with 10 responses representing all coconut producers. Meanwhile, mealybugs and kidu pests were the least likely to threaten coconut plantations.

The causes of crop failure were found using questionnaires provided to coconut farmers, which included internal variables such as limited superior seeds, expensive fertilizers, and undersized fruits, as well as external factors such as floods, high rains, and monkeys dropping fruits (Figure 5). According to the findings of a survey of all respondents farmers, the most common coconut-related product is charcoal made from coconut shells, which is manufactured by up to 7 farmers. The lowest-producing goods from coconut plants are woven footwear and copra, which both employed one farmer.

The problem in the field was identified due to the long journey (183.6km) from Medan, the provincial capital, which took 4 hours. However, the damaged road access forced the travel time to be 5.30 hours (Figure 6). According to the results of a poll of 22 farmers, the most difficult aspect of managing coconut plant pests was the road to coconut plantations, however only one farmer responded. According to the findings of the survey, the most popular product was variance charcoal, such as: black charcoal, charcoal, and bricket charcoal (Figure 7) made from coconut shells, which was manufactured by up to 7 farmers. While the lowest-value items were made from coconut

Table 1 Questionnaire collected from coconut farmers in Sei Kepayang, Tanjung Balai

Question Number	A	B	C	D	No answer
1	15	2	1	2	2
2	8	6	3	2	3
3	-	1	20	-	1
4	13	2	3	-	4
5	2	7	11	-	2
6	3	-	1	14	4
7	18	1	-	-	3
8	9	5	-	8	1
9	12	3	5	-	2
10	5	2	3	5	7
11	7	4	1	9	1
12	5	4	1	8	4
13	3	11	1	5	2
14	8	2	1	9	3
15	3	2	-	14	4
16	4	4	3	9	2
17	6	2	5	7	2
18	-	2	11	6	3
19	2	9	4	7	2
20	6	2	4	6	4
21	2	8	2	14	3
22	2	13	1	5	2
23	2	5	1	11	3
24	5	2	6	6	3
25	11	1	3	3	4
26	5	2	6	9	2
27	4	5	4	4	5
28	1	2	18	7	4
29	3	1	7	5	7
30	6	6	1	2	7

Figure 3 Types of coconut grow in Sei Kepayang, Tanjung Balai. a = java, b = ordinary, c = *natura*, d = green, e = tall, f = *kampung*, g = *nias*, and h = hybrid.

plants, mainly footwear and copra, which each employed one farmer.

Squirrel (*Callosciurus notatus*)

Squirrels can do extensive damage to coconuts. Squirrel damage differs from rat damage in that it has holes toward the center or tip of the fruit. Squirrels destroy coconuts by boring the old coconuts at the end of the fruit. The spindle hole in the shell is round, but in the fibrous section, it is irregular. Squirrels rarely live in monoculture coconut farms and frequently come from adjacent areas; they build nests on a variety of plants, although rarely on palmae trees. The nest is larger and more regular in design, constructed from twigs and branches. Hunting squirrels can help to decrease the damage they inflict. In addition to hunting, it is

Figure 4 Nine types of pests in coconut tree. a = *Brontispa* sp. coconut beetle, b = mealybugs, c = leafhoppers, d = kidu, e = squirrels, f = pigs, and g = monkeys.

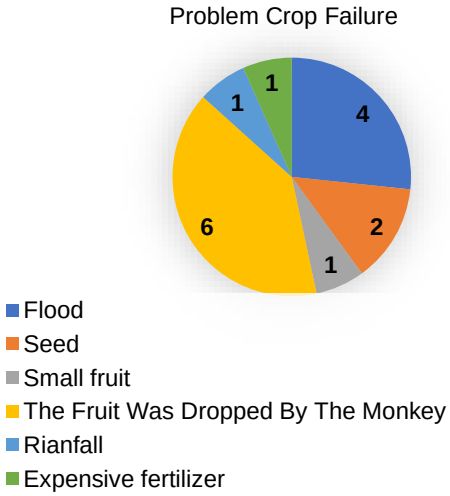

Figure 5 Types of problem crop failure of coconuts in Sei Kepayang, Tanjung Balai.

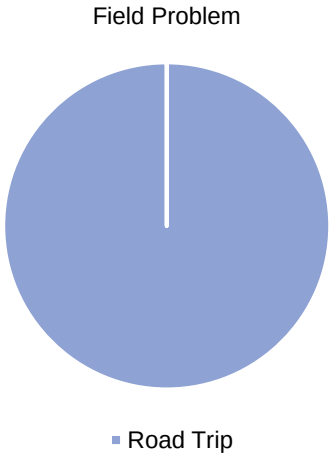

Figure 6. Detection of field problem

recommended to utilize traps (Sidqi *et al*. 2011). According to data on squirrel attacks observed on 22 trees, up to 90% (22 trees) were constantly visited by squirrels who enjoy coconuts.

Monkey

Monkeys can reduce the harvest of coconut plantations. The young coconut fell after being dropped by a monkey. Aside from the infestation of pig and monkey pests, the main cause of this condition was a lack of plant upkeep combined with limited visits from farmers to the garden (Qomar *et al*. 2018).

Caterpillar

Opisina arenosella, a leaf-eating caterpillar (black headed caterpillar), is a pest that attacks coconut plants. This bug causes tremendous damage, particularly in coastal and swampy locations, affects all stages of coconut growth. The onslaught begins with the lowermost leaves.

Figure 7 Product of coconut by chorcoal. a = Black charcoal, b = Charcoal, and c = Bricket chorcoal.

Products from Coconut Plants

- Charcoal

Coconut shells are another portion of a coconut that can be used and processed. Drums for charcoal burners, matches to start fires, and kerosene as fuel were among the tools and materials used in the charcoal production process. Before burning the coconut shell, the processors generated an ignition within the drum. The basket shell was placed in a drum, and the top was loaded with coconut fiber and kerosene before being torched. After the ignition, when the fire comes to burn evenly, other batches of coconut shell were placed into the drum until it is full (Ningrum 2017). The shell of oil processing leftovers was recorded up to 60 kg from 8 activated charcoal managers.

- Broom

Coconut waste (skewers) was widely available because most people have coconut plants in their homes. So far, coconut trash in the form of leaves has not been used optimally, despite the fact that using it as a handicraft product might boost income if done in free time, based on the findings of discussions with ten members of the broom producing community. The community was eager for aid in manufacturing skewer crafts, as well as guidance for craftsmen in developing skewer broom goods that will gain market share (Budagara *et al*. 2019).

- Rice-cake wrap

The community in Sei Kepayang Village, Tanjung Balai, documented up to 22 persons using leaves to wrap food, including rice-cake (*ketupat*) wraps made from coconut leaves, cigarettes made from dried areca nut leaves, and palm leaves. Crafts are mostly made out of leaves, shells, and trunks. The Dayak Randu' community used coconut leaves for *janur* at wedding ceremonies (Nuryanti *et al*. 2015).

CONCLUSION

Farmers in Kepayang Village, Tanjung Balai, primarily plant tall, java, and hybrid coconuts. The pests that most commonly attacked coconut plants include *Brontispa longissima*, *Orcytes rhinoceros*, monkeys, and squirrels. Coconut-originated products included charcoal, skewer brooms, and rice-cake wrapps.

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