International Conference on Law and Social Science
Editorial Office: postgraduate at Riau Islamic University, Universitas Islam Riau, Pekanbaru, Indonesia.
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Review of the Dispute Between Coconut Farmers and Palm Oil Estates Regarding the Population Explosion of Coconut Beetle in Inderagiri Hilir Regency

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Abstract:
Indragiri Hilir is one of the regency in Riau Province – Indonesia; widely acclaimed as world coconut spread. More than a half of populations in this area depend on coconut plantation. However, a devastating population outbreak of Oryctes rhinoceros, one of coconut pest known as invasive spesies has been causing significant loss. This problems often provoked conflict between coconut farmer and oil palm estates. Issues regarding problems related to the pest outbreaks have been going on for years and publicities concerning the issues are numerous. However there are not many scientific reports to support comprehensive approach that would resulted in sustainable management of the pest. Therefore, the aim of the paper is to gain attention and support toward comprehensive approach and sustainable management of the invasive pest. The objectives of the paper is to elucidate big picture of condition and related factors causing the pest outbreak. In this paper, information and data regarding condition of public coconut plantation are presented and discussed based on publicities and the previous study conducted in one of the area affected by the pest outbreak. The study was conducted by evaluating the chronology of the infestation outbreak and by sampling of the pest population in distance to the suspected source of the infestation. Overall studies revealed that the pest outbreak correlated with the environmental change that increasing habitat carrying capacity for the pest. Solution given however has not been sufficient to address the problem in sustainable manner. Therefore integration of education, application of comprehensive approaches and law enforcement of regulation is needed involving the stakeholders to enable sustainable pest management that would ensure the coconut in this area remain" the tree of life" for the society.

Keywords: *Coconut; Inderagiri Hilir; oil palm estates; pest*

I. Introduction

In Indragiri Hilir Regency, coconut plantations significantly contribute to the economy, social, and culture of most people in this regency. Known as "the tree of life," every part of the coconut tree has economic value (Syah, 2023). Indragiri Hilir represents Riau Province, is the largest coconut producing area ini Indonesia (Alouw and Wulandari, 2020). Coconuts from this region not only meet the domestic demand but also have the potential to be exported (Arifin, 2022); (Yunian Putra and Anggraini, 2016); (Anggrasari, Sari and Arminda, 2023). However, several factors limit coconut production in Indragiri Hilir (Syah, 2023) (Alouw and Wulandari, 2020). One such factor is the rapid increase in the population of a pest, the coconut beetle, or Oryctes rhinoceros. This beetle is recognized as a worldwide invasive pest, especially in coconut and oil palm plantations (Hao *et al.*, 2022). The infestation of this pest can be devastating, leading to the death of both young and mature plants. Significant environmental changes, particularly the availability of abundant breeding sites, can trigger the population outbreak (Bedford, 2014).

The pest population outbreak in public coconut plantation provoke conflict between coconut farmer and oil palm estates. Numerous publicities describe the incidences in several areas in the regency. The dispute involves various parties such as regional government, people's representatives, plantation office, TNI (The Indonesian National Armed Forces) and POLRI (Indonesian police). Publicity reveales this has been going on for the last two decades, but strangely it continues.

Considering that coconut is a source of life for most of the people in this area, for the sake of the welfare of the community it is necessary to evaluate the administration by first looking at the issue as a whole through case mapping and recommendations for a thorough and sustainable approach

II. Legal Materials and Methods

Considering that what happened was an issue that involved the public, public information in the form of online news was used to summarize it chronologically. Apart from that, a circular from the provincial plantation service to the head of the Indragiri Hilir district plantation service with number 500.8.5.3./DISBUN-2/2024/1217 was used to strengthen the conditions reported online.

Review of an investigation previously conducted in Tanjung simpang village - Pelangiran District was used as a case study (Ulpah, 2020). The investigation was conducted through interview, direct sampling and site investigation towards both conflicting parties: coconut farmers and the palm oil estates in the area.

III. Result and Discussion

The recap carried out from online publicities (table 1) shows that cases began to emerge from 2010 until this paper was written (Figure 1).

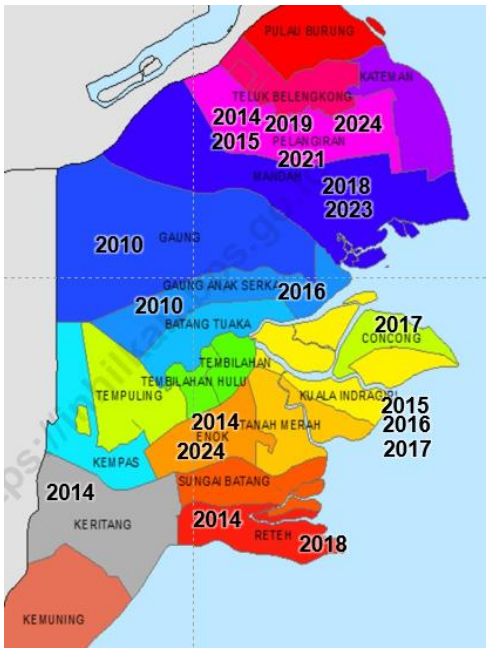

Figure 1. Year of pest outbreak incidences in various district in Indragiri Hilir Regency

Community disputes involve at least nine palm oil companies in this area. Mediation between the conflicting parties involves the regional government, people's representatives, environmental agencies, plantation office, the Licensing Service, the Indonesian Army and Police.

It can be seen that the level of infestation and damage that occurs varies.

Heavy infestation from this pest can cause plant death. This has a serious impact on the community's economy considering that coconut plants are the main source of income for majority people in this area.

Table 1. Recap of online publicities regarding the issue of coconut pest infestation in Indragiri Hilir Regency, 2010-2024.

Year	District	Loss/damage	Estate involved	Note
2010	Mandah	NA	NA	Involving IPB Team
2014	Enok, Reteh, Keritang	NA	PT BPLP	Damage data collection; Involving BLH, Kesbangpol, TNI dan POLRI
	Pelangiran (Desa Bungus)	Reduction of productivity from 4 ton/3 monts to none	PT BRNS	Involving DPRD, BLH, Disbun, Dinas Perizinan
2015	Kuindra	Damaging 5000 plants	PT IJA	DPRD, BLH, Disbun, Dinas Perizinan
	Pelangiran Desa Rotan Semelur	Yield reduction	PT BRNS	Occurred since 2012
2016	GAS	Affected all area close by the estate	PT CPK	Reduction in productivity up to 50 %
	Kuindra (Sungai Bungur, sungai Ular)	Unable to hasvest (initially 10 ton each harvest)	PT IJA	land clearing by the estate
2017	Kuindra (Sungai Bela	Damaging 300 thaousand trees	PT IJA	DPRD, Bupati, Forkopimda
	Concong	Hundreds plant affected		
2018	Reteh (Desa Seberang Sanglar)	Pest explotion and land damage	PT BPLP	- replanting -conpensation from the estate
	Mandah (Desa Bekawan)	Beetle infestation	PT RSA	PEMDES, DPRD;

Year	District	Loss/damage	Estate involved	Note
				Demand of 300 m buffering zone
2019	Pelangiran (Desa Tanjung Simpang dan Desa Saka Palas Jaya	1192,5 ha light infestation and 783 ha heavy infestation	PT THIP	PEMDA, Disbun; Conpensation Rp 210.000 per plant; destruction of dead plat and pesticide assistance
2021	Pelangirann(Desa Gembaran)	within 10 days identification, 14 thousand plant found damage	PT THIP	Koramil, polsek
	Mandah		PT GIN	replanting Program socialization
2023	Mandah (Desa Bantaiyan)	Plant damage and Yield Reduction	PT GIN	Company assistance is unadequate
2024	Pelangiran (Desa Tanjung Simpang)	demonstration; 157999 trees damage	PT THIP	Pemda, Pemdes Occurred since 2022
	Enok (Desa Pengalihan)	Hundreds hectares	PT PWP	Disbun, DPRD, BLH

Source: Various online news, accessed 09/05/2024

The community demanded that the company be responsible for this incident because the incident that occurred was believed to be due to the activities of a nearby company.Some companies provide compensation which of course is not commensurate with the losses suffered by the community. There are also companies that deny responsibility until an investigation is carried out by an independent team.

Desa Tanjung Simpang; a case study

A pest outbreak in a public coconut plantation in Tanjung Simpang has sparked a dispute. The farmers believe that the pest outbreak originated from the replanting activities carried out by a nearby oil palm company. The company, however, denies these allegations. To resolve the issue, the Indragiri Hilir Regency authority ordered a scientific investigation, which was agreed upon by both parties.

The investigation took place in Tanjung Simpang Village, Sub-district Pelangiran in Indragiri Hilir, covering both the public coconut plantation and the company's oil palm plantation. Interviews were conducted with coconut farmers affected by the Rhinoceros beetle infestation to understand their sociocultural perspectives and their understanding of the pest infestation. Officials from the oil palm plantation were also interviewed about their activities that might have contributed to the pest outbreak.

Additional information was obtained from village officials.

In the public coconut plantation, field investigations were carried out to assess plant damage through direct visual evaluation and drone assistance.

Figure 2. Severe damage of public coconut palm directly adjacent to palm oil plantation in Desa Tanjung Simpang

Potential breeding sites were identified by digging and delving into the area, collecting and counting specimens. Systematic assessments were conducted every 100m from the boundary of the oil palm plantation, through visual damage evaluation and trapping using the synthetic pheromone of the beetle at 150m intervals. In the oil palm plantation, potential beetle breeding sites were identified. Field assessments were also performed to evaluate the condition of the field and the newly replanted oil palm.

After two visits and field assessments to both the public coconut plantation and the oil palm plantation, the collected data was thoroughly studied. With ample scientific information supporting the data, the findings were formulated and presented to each party and the regency authorities.

The level of infestation was influenced by the distance of the coconut palm plantation from the company's oil palm plantation. Severe damage was observed within the area adjacent to and up to 100m from the company's oil palm plantation, then gradually decreased with increasing distance from the company's oil palm plantation. Drone photos also revealed this phenomenon (Figure 2).

Digging and delving into the potential breeding site of the beetle revealed the presence of the beetle and its larvae. All coconut trees found up to 1100m from the

company's oil palm plantation were attacked by the beetle with varying intensity. The average number of beetles captured using pheromone traps also decreased with increasing distance from the company's oil palm plantation.

Additional findings were also considered. Firstly, the timeline of the beetle infestation symptoms synchronized with the company's replanting activity. Secondly, the replanting was conducted due to the poor condition of diseased palm oil trees caused by Ganoderma. Thirdly, replanting provided abundant breeding sites for the beetle. Fourthly, the farther the location from the company's palm

oil plantation, the lesser the infestation and also the fewer the beetles captured. Fifthly, the legume cover crop planted did not grow as expected. Lastly, the most important step that should have been done but was neglected was anticipation, socialization, and extension to the society in the area that might have been affected by replanting activity.

In conclusion, the damage to the coconut plantation was caused by the infestation of the Rhinoceros beetle, *Oryctes rhinoceros*. The pest population outbreak resulted from the replanting activity of the company's oil palm plantation.

The Overall picture

The economy aspect of coconut in Indragiri Hilir is crucial since this commodity has been becoming main source income for about 70 % people in this area (Syarifuddin, 2022). Therefore it is comprehensible that any factors affecting the coconut production become public concern. As a matter of fact, considering the serious impact of this pest, the issue of the pest population explosion is not only a concern to the people of Indragiri Hilir' but also to the provincial office. This is stated in a circular from the provincial plantation service to the district plantation service dated January 31, 2024. However, this direction was actually due to reports from village communities; which shows that the problems that arise have not received adequate solutions. If it is examined, directive contains the instruction that the regional Plantation Service must seek a solution in its area. It is hoped that the District Plantation Service will facilitate the need to handle these pests, provided that a budget is available for this.

As indicated by the above recap (table 1), the issues have been occurring for years. Dissappointedly, that it is recurring in a certain locality such as in the Pelangiran. The data also show that there are supposedly capable parties involved. However, there is still no ray of hope for the people there.

Relatively similar findings reported by Syafrudin (2021) when studying illegal logging that provoke fury to the society in Pungkat village, Gaung District, Indragiri Hilir Regency. Through yudicial empirical research the author concluded that obstacles that cause the ongoing problem in Pungkat Village was ineffective coordination between agencies, weak supervision and minimal budget to enforce the legislation. The author also suggested solution to disentangle the problem through comprehensive actions of detection, prevention and repression. Another study by (Febrian and Yuza, 2023) revealed that Regional Government of Riau Province, through the Plantation Service as the leading sector in forestry sector policy governance, is not optimal in carrying out its role.

As to the case with the coconut pest population outbreak, additional approach is compulsory which is the understanding the nature of the pest together with the integrated and sustainable management to ensure proper control of the pest as one of limiting factor for coconut production in this area.

The nature of the pest

The coconut rhinoceros beetle (CRB: *Oryctes rhinoceros* Linnaeus) is believed to originate from South and Southeast Asia, and since 1909 has reached the Pacific island region. This insect is classified as an invasive pest; that is, organisms that have the potential to cause significant ecological or economic damage in a new environment. This beetle is one of the most destructive pests of coconut and oil palm crops in Asia and the Pacific Islands, causing significant economic impacts in important coconut and oil palm producing areas (Paudel *et al.*, 2021).

The development of the coconut beetle pest population must be monitored seriously. This is because climate change is expected to have a significant influence on species range expansion, habitat shifts, and the risk of biological invasions due to changes in survival rates and rapid reproduction. This is likely to affect geographical distribution and distribution patterns, thereby threatening agricultural production and food security. Therefore, it is important to understand the impact of climate change on changes in the ranges of such invasive species (Hao *et al.*, 2022).

Damage to coconut plants is caused by adult insects boring into the crown and boring developing fronds; affecting tree development and yield. Symptoms of attack include young coconut leaves (leaf leaves) being cut like scissors, so that when the leaf leaves open they form triangular/fan shape. Severe damage cause plant death. In sub-district of Tanjung Simpang in Indragiri Hilir Regency, the damage that occurred in 2019 was recorded that the area of the coconut plantations affected was estimated at 1,975.5 hectares. Based on the classification, the coconut plantations affected are in the light category, reaching 1,192.5 hectares and 783 hectares heavily. This pest attack is very detrimental economically because it can cause coconut plants to die, both young and old coconut plants (Ulpah *et al.*, 2020).

Results of a study mention that CRB infestation could severe damade resulted yield losses up to more than 50% in the plantation of oil palms (Izaitul Aida *et al.*, 2020).

Adult female beetles lay eggs on the remains of organic material. After hatching the larvae will enter the soil or live in the remains of organic material until they become pupae and finally become imago.

Depends on the environment conditions, the life cycle of Rhinoceros beetle can vary from four to nine months. Mostly more than one generation may occur per year. If conditions are favorable, there may be more than 3 generations per year (John and Kenneth, 2020).

Breeding sites greatly facilitate the increase in the population of these beetles. The remains of felled trees can become breeding nests, so control will be difficult because the larvae live in tree remains or in the soil so to control them you have to dismantle and dig up their breeding places (Mansfield *et al.*, 2023).

By using environmental variables and data on coconut beetle outbreaks and based on different climate change scenarios, (Hao *et al.*, 2022) predict that the Oryctes rhinoceros pest will continue to threaten economically important host plants until 2080. Therefore effective strategy is needed to anticipate the spread of populasion outbreak of such devastating pest.

Suggestion of appropriate management

Damage caused by this pest is intolerable if the population goes uncheck. However, due to the nature of the infestation, chemical control using pesticide is not feasible in established plantation. So far, the most effective control carried out is the use of traps with pheromones (ferotrap). This trap only controls male beetle pests around the plantation, while adult beetle pests have a high migration ability.

As it is with most of plant pests, the sustainable approach is carried out through Integrated pest management (IPM). It is a

broad-based approach that integrates practices for economic control of pests. IPM integrates various pest control techniques while minimizing risks to health and the environment.

The integrated pest management (IPM) approach is recommended for managing the coconut rhinoceros beetle (CRB). According to Jackson et al (2020), Here's how IPM can be applied to coconut palms:

1. **Monitoring and Detection:**
    - Regularly monitor palm damage to detect localized CRB outbreaks and assess control effectiveness.
2. **Biological Control:**
    - Use Oryctes rhinoceros nudivirus (OrNV) as a biological control agent (both in the invaded and native range).
    - Co-evolved natural enemies (in the native range) can also contribute to CRB control.
3. **Sanitation:**
    - Essential for IPM, sanitation involves removing organic waste, dead palms, and other potential breeding sites.
    - Complements biological control efforts.
4. **Localized Outbreaks and Breeding Sites:**
    - Localized CRB outbreaks occur when breeding sites are uncontrolled (e.g., after cyclones or storms).
    - Breeding sites increase during plantation renovation (when old palms are felled for replanting).
5. **Additional Options for IPM:**
    - Pheromone traps can monitor adult beetle activity.
    - Visual surveys of palm damage complement trap data.
    - Commercial products containing Metarhizium majus fungus can be applied to breeding sites.
6. **Insecticides and Expert Advice:**
    - Insecticide treatments are not recommended for established coconut palms due to potential risks.
    - If CRB eradication is necessary, expert advice is crucial for choosing appropriate insecticides and managing residues.

Since coconut and palm oil both are targeted by this pest, therefore worth mentioning here the Integrated Pest Management (IPM) strategies for oil palm, which are similar to those for coconut, involve monitoring, biological control, and sanitation. However, due to the higher value of oil palm, additional

investment in control measures is justified. Here's how IPM for CRB in oil palm works:

1. **Monitoring:**
    - Monitor beetle activity using pheromone traps and assess palm damage, especially in young palms.
2. **Biological Control:**
    - Use Oryctes rhinoceros nudivirus (OrNV) for biological control (both in invaded and native ranges).
    - Apply Metarhizium majus biopesticides to breeding sites that cannot be removed.
3. **Sanitation:**
    - Remove organic waste, especially during plantation renewal when waste accumulates.
    - In CRB's native range, consider spreading waste thinly and planting fast-growing cover crops (often legumes) over it.
4. **Insecticide Treatments:**
    - For young palms sensitive to CRB damage, insecticides may be necessary.
    - Be cautious with timing to avoid harming oil palm pollinators during flowering.

As it is suggested by Jackson et al. (2020) One of important step following detection of a new CRB infestation is clearing active and potential breeding sites in affected areas . It can be done through following actions:

1. **Removal of Standing Dead Palms:**
    - CRB adults are attracted to standing dead palm trees that have started to rot from the crown.
    - Females lay eggs in the rotting palm trunk, and the developing larvae feed on the decaying fibers near the top of the trunk.
    - As larvae grow, they can penetrate deeper into the trunk, leaving a column of frass and cut fibers.
    - Dead standing palms should be felled, cut into pieces, and either burned or buried to eliminate potential breeding sites.
    - In some cases, larvae may develop in the crown of live palms, especially where there are large accumulations of organic matter in the frond bases.
2. **Disposal of Dead Felled Palms:**
    - Mature palm trees fall due to fungal diseases (such as Ganoderma), strong winds during cyclones, or senile

palms being felled for replanting.

- Dead palms on the ground should be cut into manageable lengths before disposal by burning or burying.
- For oil palm plantation renovation, cutting the trunk into small lengths accelerates breakdown.

3. **Covering Palm Stumps:**
    - After felling palms, stumps become suitable sites for larval development as they rot.
    - In palm plantations with a zero-burning policy (common in Asia), ground cover is planted soon after felling to make debris less attractive to flying beetles.
    - Legumes like Mucuna spp. and Pueraria javanica are commonly used as ground cover; they add nitrogen to the soil and cover decaying trunks.
4. **Managing Organic Matter and Compost:**
    - Organic matter, especially palm debris, provides excellent food for CRB larvae.
    - Deep piles of organic material attract egg-laying females.
    - Fronds, empty fruit bunches, and sawdust from palm timber processing are susceptible.
    - Regularly spreading palm debris among the palms helps it break down and release nutrients.
    - Compost or farmyard manure should be turned regularly, and larvae removed. Pigs and chickens can also assist by consuming exposed larvae.

Integrated pest management emphasizes natural pest control mechanisms and promotes healthy crop growth. Early actions which are based on monitoring of population and damage really makes the difference. As reported by (Ripin and Latip, 2021). The palm damage severities were successfully reduced from 5.41% to 2.12% by 2020 through control management follow-up after the pests' population was detected. The incidence of pest attacks will continue to rise unless mitigation and control measures are implemented. Therefore, conducting a field census is crucial to assess pest density.

Additionally, the field census informs management about the need for simultaneous control measures to reduce costs, as pest management can be expensive. Furthermore, the positive relationship between palm damage percentage and average rainfall distribution highlights their close correlation. Regular field inspections are recommended to monitor the *O. rhinoceros* population in oil palm fields and maintain effective pest control.

Understanding *O. rhinoceros* incidence is essential for proper management. In doing so, all stackeholders involved must have

sufficient information regarding the pest and factors affecting the pest population outbreak. In this case, government should actively involve in educating farmers and also in enforcing law or regulation appropriate to the involved parties. The concept of governance serves as a starting point for comprehending plantation sector policies in Riau Province. Beyond mere government or administration, governance encompasses institutions with the authority to formulate policies across various sectors. The roles of government is crucial, since there are conflict in plantation sector, land and non land issue (Febrian and Yuza, 2023).

Policymakers also need to encourage scientists to carry out research on how coconut value chain problems especially environmental factors will be tackled and try to recruit more extensionists (Zainol et al. 2023)

IV. Conclusion and Suggestion

In order to maintain the existence of coconut as a commodity that makes a major contribution to the economy of Indragiri Hilir Regency, an impartial economic policy by government is needed.

Research has shown a connection between pest infestations and environmental changes that enhance the pests' habitat capacity.

However, the solutions provided so far have not been adequate for sustainable problem-solving. As a result, it's necessary to integrate education, implement holistic strategies, and enforce regulations with the participation of all stakeholders . This will facilitate sustainable pest control, ensuring that the coconut trees in this region continue to be a vital resource for the community.

To effectively address the issue, it's essential that all involved parties demonstrate sincere commitment.

It's necessary to facilitate coordination among all stakeholders and government representatives.

The development and implementation of appropriate standard operating procedures (SOPs) for prevention and response are crucial. This includes educating about plantation practices that could lead to pest outbreaks.

It's crucial to establish a holistic and integrated approach by setting up units for surveillance and advisory services to preempt incidents, with the involvement of scientific researchers.

Acknowledgement

Appreciation goes to the Head of BPTP back in the 2019 who appointed the author (Saripah Ulpah) to be the team leader in relation to SPK No 074/Disbun-PPP/1/2019/026 dated 17 January 2019 regarding " Kajian Organisme Pengganggu TanamanPerkebunan di Kabupaten Indragiri Hilir Kerjasama BPTP Riau dengan Dinas Perkebunan Kabupaten Indragiri Hilir"

References

Alouw, J. C. and Wulandari, S. (2020) 'Present status and outlook of coconut development in Indonesia', *IOP Conference Series: Earth and Environmental Science*, 418(1). doi: 10.1088/1755-1315/418/1/012035.

Anggrasari, H., Sari, A. K. and Arminda, F. R. (2023) 'Indonesian Coconut Oil Export Opportunities with Main Trade Partner Countries in the International Market', *Buletin Penelitian Sosial Ekonomi Pertanian Fakultas Pertanian Universitas Haluoleo*, 25(1), pp. 44–55. doi: 10.37149/bpsosek.v25i1.445.

Arifin, Z. A. (2022) 'The Analysis of Coconut Market Value Chain', *International Journal of Law Policy and Governance*, 1(1), pp. 33–39. doi: 10.54099/ijlpg.v1i1.255.

Bedford, G. O. (2014) 'Advances in the control of rhinoceros beetle, Oryctes rhinoceros in oil palm', *Journal of Oil Palm Research*, 26(3), pp. 183–194.

Febrian, R. A. and Yuza, A. F. (2023) 'Plantation Sector Policy Governance By the Regional Government of Riau Province (Leading Commodities Study)', *Jurnal Ilmiah Peuradeun*, 11(1), pp. 345–362. doi: 10.26811/peuradeun.v11i1.802.

Hao, M. *et al.* (2022) 'Global potential distribution of Oryctes rhinoceros, as predicted by Boosted Regression Tree model', *Global Ecology and Conservation*, 37(March), p. e02175. doi: 10.1016/j.gecco.2022.e02175.

Izaitul Aida, I. *et al.* (2020) 'Susceptibility and resistant of different host varieties of oil palm and coconut palm towards pest, rhinoceros beetle (Oryctes rhinoceros)', *Asian Journal of Agriculture and Rural Development*, 10(1), pp. 56–67. doi: 10.18488/journal.1005/2020.10.1/1005.1.56.67.

John, D. V and Kenneth, A. (2020) 'a Report on the Coconut Rhinocerous Beetle and Its Menacing Life', *Uttar Pradesh Journal of Zoology*, 41(17), pp. 13–21.

Mansfield, S. *et al.* (2023) 'Assessment of coconut palm damage caused by coconut rhinoceros beetle, Oryctes rhinoceros (Coleoptera: Scarabaeidae)', *New Zealand Journal of Crop and Horticultural Science*, pp. 1–22. doi: 10.1080/01140671.2023.2278791.

Paudel, S. *et al.* (2021) 'Can Biological Control Overcome the Threat from Newly Invasive Coconut Rhinoceros Beetle Populations (Coleoptera: Scarabaeidae)? A Review', *Annals of the Entomological Society of America*, 114(2), pp. 247–256. doi: 10.1093/aesa/saaa057.

Ripin, M. and Latip, S. (2021) 'Oryctes rhinoceros Infestation and its Interaction with Oil Palm Damage in Selected Oil Palm Plantation', *International Transaction Journal of …*, 12(9), pp. 1–10. doi: 10.14456/ITJEMAST.2021.187.

Syah, S. U. (2023) 'Potential and Feasibility of Development of Coconut Product Hiliration in Indragiri Hilir Regency, Riau Province', *Proceedings of the 1st International Conference on Social Science (ICSS)*, 2(1), pp. 29–40. doi: 10.59188/icss.v2i1.81.

Syarifuddin, S. (2022) 'Internasional_Coconut-Based+Community+Economic+Development+Strategy-min.pdf', 2(1), pp. 13–21.

Ulpah, S. *et al.* (2020) 'The Incidence of Rhinoceros Beetle Outbreak in Public Coconut Plantation in Tanjung Simpang Village, Indragiri Hilir, Riau Province', (ICoSET 2019), pp. 151–154. doi: 10.5220/0009145801510154.

an Ajar Materi Trigonometri Berbantuan Software iMindMap pada Siswa SMA', *Al-Jabar : Jurnal Pendidikan Matematika*, 7(1), pp. 39–47. doi: 10.24042/ajpm.v7i1.129.