BIO-INOVED
Jurnal Biologi-Inovasi Pendidikan
Volume 4, Issue 3, October 2022 page. 254-259

P-ISSN : 2684-9062 | E-ISSN : 2714-9803
https://ppjp.ulm.ac.id/journal/index.php/bino
DOI: 10.20527/bino.v4i3.13529

Education strategy for farmers in Kamanasa to controlling the population of golden snails (*Pomacea canaliculated* L.)

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Article Information

Keyword:
Education strategy; Kamanasa farmers; Golden snails; Direct learning; Society

Kata Kunci:
Strategi pendidikan; Petani Kamanasa; Keong emas; Pembelajaran langsung; Masyarakat

History:
Received : 06/06/2022
Accepted : 01/08/2022

Abstract

The high population of golden snails is a pest of rice for farmers in Kamanasa. Proper education is needed so the farming community can solve this golden snail pest problem independently and sustainably. This study aims to analyze the population density of golden snails in the Malacca Regency Kamanasa rice field area, determine the environmental factors that influence it, and analyze appropriate educational strategies for farming communities. The method used to record the population density of golden snails is a survey method with field observation points determined by purposive sampling. At the same time, the determination of educational strategies is carried out by studying literature. The population density data were analyzed using the population density formula by Odum and Barrett. Based on the research data, the population density of golden snails at observation points I, II, III, IV, and V shows that the density of golden snails in the rice fields of Kamanasa, Malacca Regency is relatively high. Direct learning is the most suitable educational method because people with different cognitive backgrounds can more easily understand concepts through direct interaction in the field. In addition, guidelines written in popular languages are needed so that the community can independently sustainably manage the golden snail.

Abstrak

Populasi keong emas yang tinggi menjadi hama padi bagi petani di Kamanasa. Edukasi yang tepat diperlukan agar masyarakat tani dapat menyelesaikan masalah hama keong emas ini secara mandiri dan berkelanjutan. Penelitian ini bertujuan untuk menganalisis kepadatan populasi keong emas di areal persawahan Kamanasa di Kabupaten Malaka, mengetahui faktor-faktor lingkungan yang mempengaruhi, dan menganalisis strategi pendidikan yang tepat untuk masyarakat tani. Metode yang digunakan dalam mendata kepadatan populasi keong emas adalah metode survei dengan titik pengamatan lapangan ditentukan secara purposive (*Porpusive sampling method*), sedangkan penentuan strategi pendidikan dilakukan dengan studi literatur. Data kepadatan populasi keong emas dianalisis menggunakan rumus kepadatan populasi menurut Odum dan Barrett. Berdasarkan data hasil penelitian kepadatan populasi keong emas pada titik pengamatan I, II, III, IV, dan V menunjukan tingkat kepadatan keong emas di areal persawahan Kamanasa Kabupaten Malaka tergolong tinggi. *Direct learning* (pembelajaran langsung) merupakan metode pendidikan yang paling cocok karena masyarakat dengan latar belakang kognitif yang berbeda dapat lebih mudah memahami konsep melalui interaksi langsung di lapangan. Selain itu, diperlukan pedoman yang ditulis dengan bahasa populer, sehingga masyarakat secara mandiri dapat melakukan penanggulangan keong emas secara berkelanjutan.

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A. Introduction

Rice is the food that controls the most fundamental people's motivation to meet the needs of life and is the primary commodity for the people in Indonesia (Sudianto et al., 2018). During rice planting, animals or disturbing organisms, called pests, can usually damage the farmers' cultivated plants (Bande et al., 2020). Pest attacks are troubling the farmers because they have to look for new varieties with production that is not necessarily satisfactory and may be commercially less profitable, but the distribution is increasing. Generally, pest attacks cause the condition of the plant's body to deviate from its normal state (Alfathir & Estiasih, 2018).

Golden snails are one of the main pests in rice cultivation in the Rice Field Ecosystem of Kamanasa, Malacca Regency, which attack rice plants from the vegetative phase of light, medium, and severe attacks. Heavy attacks occur on rice plants aged 1-30 days after planting conditions to increase the production of rice plant saplings, and rice crop production decreases and even crop failure (Liunokas et al., 2019). Golden snails are one of the main pests in rice cultivation in the Rice Field Ecosystem of Kamanasa, Malacca Regency, which attack rice plants from the vegetative phase of light, medium, and severe attacks. Heavy attacks occur on rice plants aged 1-30 days after planting conditions to increase the production of rice plant saplings, and rice crop production decreases and even crop failure (Yuliani & Aidannisa, 2019).

Kamanasa rice fields are a reasonably large rice field area with an orderly irrigation system, river water flows, ponds, and swamps that support the development and increase of the golden snail population. However, this condition is a problem for farmers in the cultivation of rice crops because the population of gold snails has increased from the rice growing season to the next rice growing season (Siregar et al., 2017).

Farmers in Kamanasa rice fields often experience difficulties in efforts to overcome the explosion of the golden snail population, so rice crop production efforts and food self-sufficiency programs programmed by the Malacca Regency government always failed (Taopik & Sari, 2019). Data and information related to the population density of gold snails in Malacca Regency are not yet available, making it difficult for the government to make efforts to overcome the population of gold snails that are environmentally friendly and benefit the farmers (Yenisbar & Yani, 2021). The fore, information related to population density is needed to determine whether the decreasing or increasing of gold snails carry out efforts to overcome the population explosion so that the rice field ecosystem is in a balanced condition at a trophic level which is done through education and counseling.

An agricultural training and extension education in Malacca Village was carried out in 2017 by a previous researcher. This training focuses on improving the quality of crop production. However, there is no precise measurement of the results and role of training and counseling education in terms of the population density of gold snails (*Pomacea canaliculate* L.) in the Kamanasa rice field ecosystem. According to Zulhendri & Henmaidi (2021), education is essential for farmers to improve agricultural competence, develop knowledge, and develop skills and attitudes in carrying out their work.

The education referred to here is informal education such as counseling, workshops, or training (Agussabti et al., 2020). In addition, education is also expected to facilitate the community to carry out pest management in a sustainable manner (Budiyanto et al., 2018). Therefore, educational activities are expected to prepare the community to have the expertise to independently solve problems in the field. Furthermore, this educational activity aims to understand the community's importance of controlling pests, one of which is the golden snail. Thus, the formulation of the problem raised in this study is how is the role of education and counseling in Malacca Regency, East Nusa Tenggara Province (NTT) in terms of the population density of gold snails (*Pomacea Canaliculate L*) in the Kamanasa rice field ecosystem?

This research aims to study the population density of golden snails in the Malacca Regency Kamanasa rice field area, determine the environmental factors that affect the population density and analyze appropriate educational strategies for farming communities. Meanwhile, the benefit of this research is as preliminary data to see the role of agricultural education and counseling on the control of gold snails in the Kamanasa rice field area, Malacca Regency, East Nusa Tenggara Province (NTT). In addition, this research is also information material for the Malacca Regency government and farmers to overcome gold snail pests in the Kamanasa rice field area, Malacca Regency, East Nusa Tenggara Province (NTT).

B. Material and Method

The research location is in the Kamanasa rice field area of Malacca Regency in January-Maret 2022. The tools and materials needed in the study include roll meters, raffia ropes, cameras, labeled plastic

bags, thermometers, hygrometers, pH meters, stationery, gloves, gold snails in the field, and 70% alcohol.

The method used in the study was a survey method based on several field observation points determined by the purposive sampling method at 5 observation points, according to Tanzeh & Arikunto. Each observation point with an area of 100 m^2. This observation was carried out once a week after planting rice until the rice grains came out (end of the vegetative phase). Each observation point is observed in the count and recorded the individual number of golden snails found. Data Analysis Techniques. To determine the population density of golden snails is determined based on the number of individuals found at the study site with the population density formula according to Sutton & Anderson.

Determination of educational methods is carried out through the study of literature. The criteria for determining educational methods include their ease of being applied in the community environment, making it easier to be understood by people with different cognitive backgrounds, and supporting independent activities by the community in a sustainable manner.

C. Results and Discussion

Survey Results on the Density of Golden Snails in the Kamanasa Rice Field Area

The density of the gold snail population in the rice field area of Malacca Regency Kamanasa is stated in Table 1. Table 1 shows that the population density of gold snails in the Kamanasa rice field area is classified as very dense at observation point 1 to observation point 4. In contrast, observation point 5 is classified as dense. Still, the golden snail's average density category is classified as very dense because this species has a high reproduction rate, sufficient feed, a relatively high level of resistance to chemical pesticides, and enough shelters for gold snails in the rice fields.

Environmental factors affecting the population density of the golden snail (*Pomaceae canaliculata L.*) include temperature, flexibility, and pH in the rice field ecosystem of Malacca Regency Kamanasa, as presented in Table 2. The data obtained shows that the air temperature at the study site was 25^{o}C, while the average air humidity was 83%. The right temperature for the life process of the golden snail ranges from 23^{o}C – 32^{o}C, while the air humidity ranges from 70% - 80%. pH, which is ideal for survival, as well as the biological activity of the golden snail, ranges from 5-8 (Suharto & Kurniawati, 2009). The data shows that bioecological temperature, softness, and pH are included in the category of being ideal for supporting the reproductive pattern and survival activities of golden snails in the Kamanasa rice field area of Malacca Regency (Saputra et al., 2018). Golden gold snails have a temperature tolerance level between 18-28 ^{o}C and humid areas. In this condition, the ability of the female golden snail to produce eggs ranges from 200-600 eggs. Golden snails can also adapt to drought by estivating for quite a long time with a pattern of adaptation of physiological behavior by immersing themselves in the mud (Saputra et al., 2018).

Table 1 Density of golden snails in the Kamanasa rice field area

Type Name	Observation Point 100 m^2	Number of Individual	Category
Pomaceae canaliculata L.	I	7.993	Very Dense
	II	9.511	Very Dense
	III	2.350	Very Dense
	IV	4.420	Very Dense
	V	1.470	Dense

Description: If the number of individual is 0-10 (Classified as very little density). If the number of individuals ranging from 11-20 individuals shows a slight level of density). If the number of individual ranges from 21-30, it is classified as a sufficient level of density). If the number of individual ranges from 31-40 it is classified as a solid category) if the individual swabs above (41 are classified as very dense) are standard according to Abel 1991.

Table 2 Environmental factors affecting the population density of golden snails

Environmental Factors	Description
Temperature	25^{o}C
Moisture	80%
pH	6,0

Golden snails can also withstand muddy substrates and immerse themselves in rainy conditions. Golden snails tend to consume rice in the vegetative phase because of the soft tissue structure of how to carry out a pattern of eating behavior with grazing supported by sensory organs found in the lateral part of the mouth in the form of a scarred tongue. In addition, in the vegetative phase, rice plants are eaten by cutting rice plants so that rice plants experience deviant or abnormal growth (Siregar et al., 2017).

The habits of farmers who plant rice or other crops continuously, the availability of food sources, and the availability of hiding places will continue to support the increase in population density of golden snails from one growing season to the next. With consumption patterns and population density in the Kamansa rice field ecosystem, it is strongly suspected that the existence of gold snails is the

leading cause of low rice crop production or loss of rice production. The pattern of controlling gold snails using chemical pesticides will continue to increase the population because gold snails experience resistance to chemical pesticide sprays by farmers in the Rice Fields of Kamanasa, Malacca Regency. The coat that is the body armor of the golden snail is one of the obstacles in efforts to control it with chemical pesticides because the ethics of the body organs detect environmental conditions in unfavorable conditions the golden snail can roll the body in the coat for a long time (Atini & Rusae, 2022).

The Role of Education and Counseling on The Control of Golden Snails in the Kamanasa Rice Field Area, Malacca Regency

Based on the research results, the educational and counselling activities carried out in Malacca Village have provided many benefits in improving the quality of rice crop production in Malacca Village, including improving the quality of its human resources. However, the survey results of golden snail's density in the Malacca Regency Kamanasa rice field area, the education and extension in this area have not focused on controlling gold snails which are extraordinary pests and can damage rice yields in Malacca District. Therefore, it is necessary to educate and counsel others on the existence of very dense gold snails to control the pest of the golden snail. According to Wayan et al. (2022), this gold snail pest is found in many Subak rice fields because during the study, for several days, the rainfall increased. The rain that occurs in the morning, afternoon, and night causes the air temperature to become humid. This reality is what makes the development of gold snail pest's increase. Based on the research results of Parmithi & Lindayani (2019) about the gold snails (*Pomaceae cannaliculata* L.), the most effective concentration of extracts to kill gold snail pests are lemongrass extract (*Andropogon nardus*) and *noni* leaves (*Morinda citrifolia*). Then according to Indrasari et al. (2022), the extract that affects the mortality of gold snails is a single extract, namely breadfruit leaf extract.

The control should be with the Integrated Pest Control (IPM) system to maintain the balance of the rice field ecosystem in Kamanasa, Malacca Regency. The pattern of control with chemical pesticides is carried out if the population is above the economic threshold or harms farmers by paying attention to the pattern of behaviour and the organs of body defence on gold snails. If the population is below the economic threshold and the level does not harm farmers, the pattern of pest control of gold snails should be used by biological agents (Harahap, 2017). To manage the rice field ecosystem, this is necessary to analyze environmental control that is balanced and sustainable so that there are no problems that have a broader impact in the future. The pattern of pest emergence is due to improper ecosystem management patterns that provide space for the development of gold snail populations that are difficult to control population explosions (Laksana, 2022).

The most appropriate educational method is to use the stages of direct learning (Nudin et al., 2021). The community is guided by direct theory and practice on agricultural land to control the population of golden snails. Theory education in the room may not be able to be carried out optimally because of the different backgrounds of the community. Still, it will be more meaningful if it is carried out directly in the field. According to Hakim et al., (2018), direct learning can increase interest, potential and creativity in learning. According to Immanuel (2016), students who are taught using a direct learning model can increase the value of learning outcomes. While according to Arifin et al. (2020), the counselling participants increasingly understand, understand and master the techniques of making organic fertilizer plus local raw materials by using direct learning. In addition, Imran et al. (2019) state in the field of counselling, there is something called Anjangsana, a counselling activity carried out at the place of each farmer. The farmers are given information, knowledge and skills.

Educational methods are not yet enough to solve this problem. Generally, if educational activities are completed, people need guidelines to do them independently (Oishi, 2020). The goal is to overcome the large population of golden snails sustainably. This is where the importance is that in addition to educational methods, educators or extension workers need to make manuals in a form that is interesting and easy to understand by the public (Rahayu & Widodo, 2017). Manuals do not need to be too complicated or bold. Although the studies are scientific, they are written in a popular language (Zuhri et al., 2020). The existence of education and counselling related to the control of gold snails in the rice field area of Kamansa, Malacca Regency, is expected to be an attraction and a direct learning resource for the community and agricultural students in the new environment.

D. Conclusion

Population densities of golden snail (*Pomaceae canaliculata* L.) are classified as very dense. This

density level is due to the relatively high life-supporting factors of the golden snail. Among these supporting factors, namely: the availability of food is quite high (rice is in the vegetative phase), the reproduction rate is quite high, resistance to chemical pesticides is high, and having a mantel as body armour if the environmental situation is not favourable, and sensory organs that can detect bad environmental conditions. Environmental parameters such as temperature, humidity, and pH in the research area are very optimal for the life of gold snails. Therefore, direct learning is recommended as an educational method because it is considered the most appropriate. This method involves the community interacting in the field directly with rice fields and golden snails. In addition, people with different cognitive abilities can more easily understand through hands-on practice. In addition, a manual written using the popular language is also needed so that the management of the golden snail population can be carried out by farmers independently and sustainably.

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