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Analysis of Rice Field Rat (*Rattus argentiventer*) Attacks After Owl (*Tyto alba*) Application in Karawang Regency, West Java

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ABSTRACT

Environmentally friendly control using biological methods for rice field rats is currently being carried out, one of which is using the natural enemy of rice field rats, namely the owl predator which can control rice field rat pests without damaging rice and land or causing pollution. This research aims to evaluate the value of losses experienced by farmers caused by rice field rat pests in Karawang Regency, analyze farmers' perceptions and behavior towards controlling rice field rat pests using owls, implementation of rice field rat pest control in Karawang Regency, and policy priorities that can be implemented and taken to optimize the sustainable use of owls in the context of controlling rice field rat pests in Karawang Regency. The method used is a survey and field observation which includes observing the number of active rat nests, calculating the percentage of attacks, calculating the number of owls after introduction, calculating crop production, and farmers' perceptions of controlling field rats using owls, as well as data analysis. Results showed that the use of owls is effective in controlling rice field rat pests, this is shown by the correlation between the high number of owls and the reduced level of rat attacks in rice field areas.

1. INTRODUCTION

Rice is a staple food source for almost 95% of Indonesia's population. However, in the process of producing rice, farmers often face problems with rice field rats which can cause damage to rice plants from the time the rice is planted until the rice is ready to be harvested, and even attack rice in the storage warehouse (Sipayung *et al*., 2018). In this case, pests are organisms that attack or reduce the quality and quantity of plants so that their growth and development are disrupted (Destarianto *et al*., 2013). Rats are quite a complicated problem to solve. This is because farmers always plant rice almost every year so the availability of food for rats is abundant. Apart from that, rats can damage up to 80% of the rice plants in one plot in one night, especially if there are quite a lot of rats attacking. Rat pests damage the crossed out, stems, leaves, and grains of rice plants so that the rice plants cannot develop and the plants may eventually die. This of course causes high losses for farmers because apart from damaged crops, the amount of budget spent by farmers tends to increase (Yuliana *et al*., 2022). Several methods used to control rats include massive use of chemical pesticides. However, this method can have a negative impact on both humans and the environment. The health risks caused by non-organic pesticides are directly more dangerous than the use of other types of chemicals (Asiaka & Ludang, 2022).

Several methods used to control rats include the massive use of chemical pesticides. However, this method is said to hurt both humans and the environment. The health risks caused by non-organic pesticides are directly more dangerous than the use of other types of chemicals (Prajawahyudo *et al*., 2022). Poisoning due to exposure to pesticides is a threat to agricultural workers in various regions of the world (Hook *et al*., 2018; Sharma *et al*., 2019). Based on information from the World Health Organization (WHO), one of the causes of death of 12.6 million people

per year is caused by this chemical. Studies in developed countries show that the incidence of poisoning in agricultural workers is around 18.2% per 100,000 workers (WHO, 2018). Field rat control methods using owl (*Tyto alba*) is also used massively by one of the villages in Karawang Regency, namely Pasir Mulya Village, which has implemented conservation of the Javanese husky predator since 2018. Before using owls, farmers often complain that their harvest results are not optimal, where farmers in Pasir Mulya Village admit that they can only produce a maximum of 3 tons of grain per 1 hectare, even though ideally every hectare of rice fields can produce 7-10 tons of grain. However, currently, farmers in Pasir Mulya Village have succeeded in reducing the number of field rats using this method and are even able to increase their crop yields.

The use of rodenticides and poisonous baits will contaminate agricultural products, kill natural enemies, and affect human health if they are not used carefully. Therefore, the issue related to rat pests was immediately addressed by introducing the use of the owl biological predator method which is said to be able to optimally help control rice field rat pests which is implemented by the North Sumatra Food and Horticulture Crop Protection Center (BPTPH) and the Center for Seed and Plantation Plant Protection (BBP2TP) North Sumatra as a supervisor in the development of owls.

On the other hand, the use of this method has not been implemented evenly in Karawang Regency, even though several sub-districts in this regency are endemic areas for rats which can seriously disrupt agricultural productivity. Moreover, Karawang Regency is the second highest rice producer in West Java Province after Indramayu with total rice production reaching more than 1 million tons in the 2019-2021 period (BPS, 2022). Therefore, rice production in Karawang Regency is very important to maintain and this area is crucial for further analysis.

Based on above discussion, this research will focus on analyzing the effectiveness of using owls by comparing three villages in Karawang Regency with the level of implementation of owls in different areas. By comparing the three villages, the rat control using owls will make it possible to know its effectiveness in suppressing rice field rat pests which have been disrupting the productivity of rice harvests in the Karawang Regency area.

2. RESEARCH MATERIALS AND METHODS

2.1. Research Time and Materials

The research was carried out on community-owned rice fields in Pasir Mulya and Lemah Mulya Villages, Majalaya District, and Ciwaringin Village, Lemahabang District, Karawang Regency, West Java from October 2022 to April 2023. The materials used include 20 questionnaires used to fill out surveys, labels used to indicate attacks and active rat nests, cell phone cameras for documentation during research, meters to measure the distance of rice rat attacks, and scales to determine rice production results.

2.2. Survey

A survey of rice rat attacks was carried out on rice fields in Pasir Mulya Village and Lemah Mulya Village (Majalaya District) using owls, and Ciwaringin Village (Lemahabang District) with no owls. Apart from that, 20 farmers per village also filled out questionnaires regarding their perceptions of controlling field rats. Observations of field rat control were performed by observing directly in the field and conducting interviews with farmers.

2.3. Observation of the Number of Active Rat Nests

The number of active rat nests was calculated by observing each rat nest in the rice field at a 100 m x 100 m point of land. The observation interval is once every 20 days. The technique for observing the number of active rat nests is carried out by covering potential holes in rat nests and then checking the next day. If the hole is open and there are traces of activity of rats, then it is concluded that the hole is an active field rat, but if there is no activity and the hole is still closed, then the hole is an inactive rat nest.

2.4. Calculation of the Number of Owls

The number of owls after the introduction was calculated by observing the "rubuha" or owl houses used as nesting and breeding places installed after the introduction and counting the number of owls contained in the "rubuha". Owl counts

were carried out at night using flashlights and also ladders to climb to the "rubuha". During the introduction, a pair of male and female owls were placed in the "rubuha".

2.5. Calculation of Attack Intensity

The rice planting space used is 25cm x 25cm, the observation interval is once every 20 days with a land area of 100 m x 100 m per plot. The percentage of attack intensity can be calculated using the formula:

$$\text{Attack intensity} = \frac{Plants\ are\ attacked}{Plants\ are\ attacked + Plants\ are\ not\ attacked}\ X\ 100\%$$

There were 10 observation plots used in each village. So the total number of plots used as samples from 3 villages is 30 plots. Determination of plots was carried out on land where there is "rubuha" as showed in Figure 1.

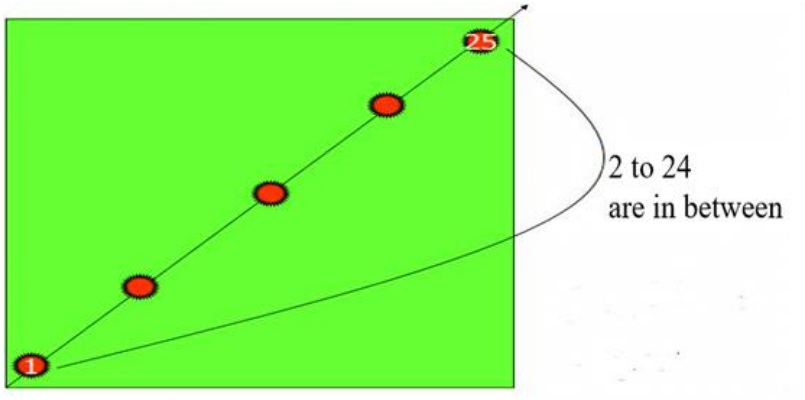

Figure 1. Method for taking sample plants for calculating the percentage of attacks

2.6. Calculation of Harvest Production

Harvest production was obtained from respondents after harvest by calculating the farmer's harvest production and converting it into tons/ha. The calculation of harvest production results is taken from the results of the questionnaire that has been carried out. The number of farmers who were respondents was 20 people from each village which was the research locus.

2.7. Farmer Perception of Using Owls

Farmers' perception of controlling field rats using owls were taken from the results of a questionnaire given to respondents who had been determined from each village. Farmers' perceptions of controlling field rats using owls were taken from the results of a questionnaire that had been carried out. The number of farmers who were respondents was 20 people from each village which was the research locus.

2.8. Correlation of Active Nests and Field Rat Attacks

To analyze the correlation between active nests and the percentage of rice field rat attacks, 2 variables were determined. The variables used are the number of active nests as the independent variable (*X*) and the percentage of rat attacks as the dependent variable (*Y*).

2.9. Correlation of the Number of Owls with Field Rat Attacks

To analyze the correlation between the number of owls and the number of active rat nests, 2 variables were determined. The variables used are the number of owls as the independent variable (*X*) and the number of active rat nests as the dependent variable (*Y*).

2.10. Correlation of Farmers' Perception to Harvest Production

The correlation between farmers' perceptions of controlling field rats and crop production is determined by 2 variables. The variables used are farmers' perceptions of controlling field rats *X* and crop production as the dependent variable *Y*. Data on farmers' perceptions of controlling rice rats was obtained from a questionnaire made quantitatively with a weighting of 1-2 with 2 alternative answers, all answers to the questionnaire were classified into 2 categories as follows: (a) The answer **No** means a value of 1, and (b) The answer **Yes** means a value of 2

The simple correlation coefficient denoted (r) is a measure of the direction and strength of the linear relationship between two independent variables (*X*) and the dependent variable (*Y*), provided that the r value ranges from the value ($-1 \leq r \leq +1$). If the value r = -1 means the correlation is perfectly negative (stating the direction of the relationship between X and Y is negative and very strong), r = 0 means there is no correlation, r = 1 means the correlation is very strong in a positive direction. Meanwhile, the meaning of the r will be consulted in Table 1.

Table 1. Guidelines for interpreting correlation coefficient tables

Coefficient interval	Correlation level
0.00 – 0.199	Very low
0.20 – 0.399	Low
0.40 – 0.599	Currently
0.60 – 0.799	Strong
0.80 – 1.000	Very strong

2.11. Data Analysis

To analyze the data obtained, a method with quantitative correlation analysis was used. This research looks for cause and effect in a symptom and looks for relationships between various factors. The variable that is suspected to be the cause or precursor of another variable is called the independent variable (*X*). The variable that is thought to be the result of the variable that precedes it is called the dependent variable (*Y*). Examination of the correlation between variables and the variables used uses Spearman's Rank correlation coefficient software R. Apart from that, the Kruskal-Wallis test was also used to determine differences in scores between groups. In this case, the Kruskal-Wallis test is used to see the differences in the average value of each category in the three villages.

3. RESULTS AND DISCUSSION

3.1. Existence of Active Rat Nests (holes)

The significance of the difference in the number of active rat nests can also be proven based on the results of the Kruskal-Wallis Test which was carried out, where it can be seen that the average number of active rat nests in Pasir Mulya Village and Lemah Mulya Village is less than the average number of active rat nests in Ciwaringin Village. These results prove that there is a statistically significant difference seen from the values p-value The Kruskal-Wallis test obtained is $p < 2.2\times10^{-16}$. This implements the usage of *Tyto alba* to reduce rice field rat pests, which has been carried out in Pasir Mulya Village and Lemah Mulya Village, it has been proven to reduce the rice field rat population, which can be seen from the smaller number of active rat nests compared to Ciwaringin Village as seen in Table 2.

```
> kruskal.test(sarang~desa, data=data)

        Kruskal-Wallis rank sum test

data:  sarang by desa
Kruskal-Wallis chi-squared = 85.101, df = 2, p-value < 2.2e-16
```

Figure 2. Kruskal-Wallis test calculation of the number of active rat nests in each village

Table 2. Descriptive analysis of the number of active ricefield rat nests (Kruskal–Wallis test, *p*-value <0.05 is significant)

Variable	Pasir Mulya		Lemah Mulya		Ciwaringin		*p*-value
	Rat rat	SD	Rat rat	SD	Rat rat	SD	
Number of active rat nests	1.75	0.631	2.00	0.641	7.25	1.235	**< 2.2×10^{-16}**

These observation results are also in line with research from Sipayung *et al*. (2018), which had been carried out previously in Deli Serdang Regency. The results of this research also showed that the highest number of active rat nests were found in villages that did not introduce owls with the number of nests reaching 18 holes (Sipayung *et al*., 2018). Meanwhile, in another village in Deli Serdang which has used owls to control field rats, no active rat nests were found at all (Sipayung *et al*., 2018). So, it can be concluded that there is a difference in the number of active rat nests for rice fields that were introduced with owls and land that was not introduced. Land that has been inhabited by owls can be considered more ideal because it tends to have a higher number of active rat nests, but now it is lower compared to land that does not have owls.

3.2. Rat Attack

In general, this study concluded that the use of owls is effective for controlling rice field rat pests, this is shown by the results of the correlation between the high number of owls and the reduced level of rat attacks in rice field areas. Farmers' perceptions of the use of field rat control methods using owls also show a positive correlation with farmers' crop yields. So, it can be said that indirectly the use of owls to control rice field rat pests also contributes to increasing crop yields.

Table 3. Field rat attacks in villages that already use owls (%)

Plot	Pasir Mulya Village (with owls)				Lemah Mulya Village (with owls)				Ciwaringin Village (no owls)			
	50 DAP	70 DAP	90 DAP	110 DAP	50 DAP	70 DAP	90 DAP	110 DAP	50 DAP	70 DAP	90 DAP	110 DAP
Plot 1	8	4	4	8	12	8	8	8	60	64	68	64
Plot 2	12	8	8	12	12	8	8	8	68	68	76	72
Plot 3	8	8	8	8	12	8	12	12	68	68	72	72
Plot 4	12	12	12	8	16	8	8	12	72	72	72	68
Plot 5	4	12	12	16	16	12	12	12	60	60	64	70
Plot 6	16	12	16	12	16	16	12	12	64	64	68	80
Plot 7	8	12	12	8	12	12	8	12	72	72	72	82
Plot 8	8	12	8	8	12	16	12	8	68	72	76	72
Plot 9	16	12	8	4	8	12	12	8	68	68	68	70
Plot 10	12	8	8	4	8	12	4	4	60	60	68	64
Average	10.4	10	9.6	8.8	12.4	11.2	9.6	9.6	66	67	70	71

*DAP: days after planting

Table 3 shows that the low percentage of rice field rat pest attacks caused by the use of owls shows that the use of owls is effective in eradicating field rats. The advantages of owls in controlling field rats are that owls are fierce predators in catching prey from long distances, have fast flight speed, have sharp hearing, and can hear the sound of rats from a distance of 500 m (Sipayung *et al*., 2018). Owls can prey on 2 to 5 rats every day, and for one month one owl can kill more than 100 rats (Primadani *et al*., 2020). This shows that owls can prey on field rats well and reduce the population of rats.

The significance of the difference in the level of rat attacks can also be proven based on the results of the Kruskal-Wallis test (Figure 3). The average level of rice rat attacks in Pasir Mulya Village and Lemah Mulya Village is lower than the average level of rice field rat attacks in Pasir Mulya Village and Lemah Mulya Village. Ciwaringin Village. These results prove that there is a statistically significant difference seen from the values p-value Kruskal-Wallis test obtained, namely $p < 2.2(10^{-16})$ as presented in Figure 3. This implements that the usage of *Tyto alba* to reduce rice

field rat pests, which has been carried out in Pasir Mulya Village and Lemah Mulya Village, has proven to be effective in reducing the level of rice field rat pest attacks because the attack level value is lower compared to Ciwaringin Village as seen in Table 4.

```
> kruskal.test(serangan~desa, data=data)

        Kruskal-Wallis rank sum test

data:  serangan by desa
Kruskal-Wallis chi-squared = 83.479, df = 2, p-value < 2.2e-16
```

Figure 3. Kruskal-Wallis test calculation of rat attack levels in each village

Table 4. Descriptive analysis of rice field rat attack rate (%) (Kruskal–Wallis test, *p*-value < 0.05 is significant)

Variable	Pasir Mulya		Lemah Mulya		Ciwaringin		*p*-value
	Rat rat	SD	Rat rat	SD	Rat rat	SD	
Rat infestation level	9.7	3.38	10.7	3.06	68.65	5.19	$< 2.2(10^{-16})$

3.3. Correlation of the Number of Active Rat Nests with Rat Attacks

Based on the results of the Spearman correlation test, it can be seen that the number of active rat nests and the percentage of rat attacks have a significant correlation because they show a significance value of less than 0.05 ($p = 2.2(10^{-16})$) as can be seen in Figure 3. In addition, if analyzed based on the direction of the relationship between the two, it can be seen that the number of active rat nests positively influences the percentage of rat attacks where the R-value (gradient) is positive (r = 0.89) as presented in Figure 4. This shows that if the number of active rat nests in a plot of land increases, the percentage of rat attacks on crop yields can also increase. Meanwhile, if analyzed based on the category of strength of correlation between the number of active rat nests and the percentage of rat attacks, it can be seen that the two have a strong correlation because they have a value correlation coefficient of 0.947.

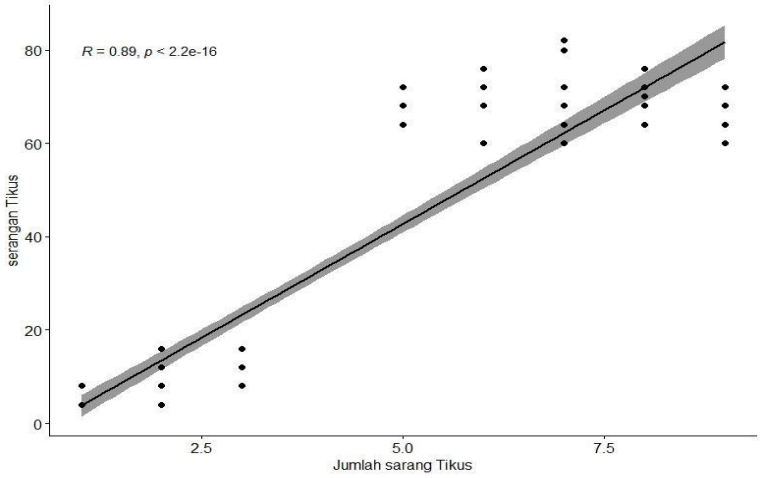

Figure 4. Correlation of the number of active rat nests with rat attacks

These results are in line with previous research from Sudarmaji *et al*. (2005) and Singleton *et al*. (2010), which shows that the more active rat nests there are in rice fields, the higher the level of rat attacks in those rice fields. Field rats are nocturnal animals and start their activities from dusk until morning. Activities carried out by field rats at night among them explore food and water sources, shelter, and recognize mates and individuals from other groups (Anggara

et al., 2016). The foraging activity carried out by field rats at night will be higher if the availability of rice, which is their food source, is also high. The large number of active rat nests, which correlates with a high number of attacks, also indirectly impacts the damage that occurs in rice fields. According to observations made by Anggara *et al.* 2016, the eating activity carried out by rice field mice was carried out by jumping from the embankment in the rice field area to then reach and cut the desired panicle.

3.4. Number of Owls After Introduction

Through observations of "rubuha" installed on land in the villages being observed, it can be seen that there is an increase in the number of owls occupying "rubuha", where Pasir Mulya Village which has successfully implemented rat control there is an increase in the number *Tyto alba* as many as 14 individuals. Meanwhile, in Lemah Mulya Village, which is implementing rat control, there has been an increase in numbers. *Tyto alba* has as many as 20 individuals, as can be observed in Table 5. This can be related to the results of previous research conducted by Berliani *et al*. (2021) who found that the presence of "rubuha" on agricultural land was proven to attract the attention of owls, where there were several owls that approached the researcher's "rubuha" after the "rubuha" were placed on the agricultural land being observed. This phenomenon could be related to the discoveries made in Pasir Mulya Village and Lemah Mulya Village because there was an increase in the number of owls every week the observations were made.

Table 5. Increase in the number of owls after introduction

Observation	Pasir Mulya	Lemah Mulya	Ciwaringin
1 (50 DAP)	189	10	0
2 (70 DAP)	194	16	0
3 (90 DAP)	196	24	0
4 (110 DAP)	203	30	0

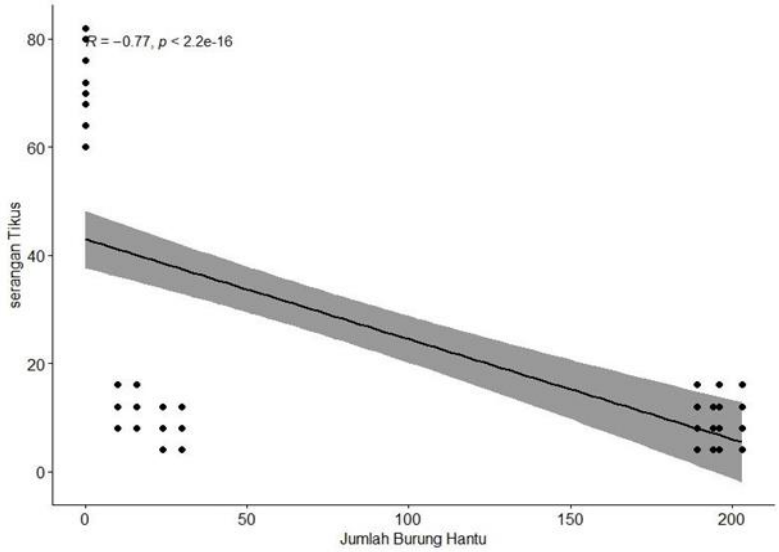

Figure 5. Correlation of the number of owls and rat attacks

3.5. Correlation of the Number of Owls with Rat Attacks

Based on the results of the Spearman correlation test, it can be seen that the number of owls in the rice fields and the percentage of rat attacks have a significant correlation because they show a significance value of less than 0.05 ($p = 2(10^{-16})$) as can be seen in Figure 5. In addition, if analyzed based on the direction of the relationship between the two, it can be seen that the number of owls negatively affects the percentage of rat attacks where the r-value (gradient) The

resulting value is negative (r = –0.77). This shows that the more owls there are in the rice fields, the lower the level of rat attacks. Meanwhile, if analyzed based on the category of strength of correlation between the number of active rat nests and the percentage of rat attacks, it can be seen that both have a moderate correlation because they have a value correlation coefficient of 0.585.

These results are in line with research conducted by Pusparini & Suratha (2018) in Wringinrejo Village, Banyuwangi Regency, and Putri *et al*. (2020) in Plumpang Village, Lamongan Regency, where research results show that utilization of *Tyto alba* is effective in suppressing rice field rat attacks in rice fields in the village. Owls can be used as effective pest control for field rats because field rats are one of the main prey of owls. An owl can prey on 2 to 5 rats per night (Setiabudi *et al*., 2015).

3.6. Harvest Productivity

In Ciwaringin Village, which has not yet introduced owls, it is known that there is no significant difference, namely a decrease in crop yields of 4.22% (Table 6), which is smaller than the decrease in yields that occurred in Lemah Mulya Village. This can happen because farmers in Ciwaringin Village also started the planting process on December 13 2022 when the rain intensity decreased. Apart from that, the location of the rice fields in Ciwaringin Village is very close to the rice fields in Pasir Mulya Village, where the crops in Ciwaringin Village do not suffer from empty rice grains, so the main issue faced by the farmer group in Ciwaringin Village is only related to rice field rat attacks.

Table 6. Crop productivity (dry grain) before and after implementation of owls (ton/ha) for one planting season

	Pasir Mulya	Lemah Mulya	Ciwaringin
Before implementation	5.31	7.70	3.79
After implementation	6.07	7.10	3.63
Increase (%)	14.31	-7.79	-4.22

In several previous studies, the utilization of owls has also been known to be able to increase farmers' crop yields. One of these things can be seen from the results of research conducted by Fitri (2017) in the Tlogoweru Tourism Village, Guntur District, Demak Regency which shows that after the introduction of owls, Farmers' harvests in Tlogoweru Village were able to increase by 40% to 100%. This is known to happen because using the owl method can reduce rice field rat attacks on farmers' land in Tlogoweru Village by up to 1% so that crop failure can be reduced. Apart from that, similar results were also shown from the research conducted by Wijaya & Pambudi (2019) in Sumberagung Village, Sleman Regency who found that after the implementation of agricultural land intensification use owls, there was an increase in crop yields from the original average harvest of 3 ton/ha to 7 ton/ha in one harvest. So, it can be concluded that the use of the owl method to suppress rice field rat attacks has been effective in helping increase farmers' crop yields.

3.7. Farmers' Perceptions of Method Using Owls

To find out the farmer perception category, a score has been calculated for each question answered which is then compiled and given a positive or negative perception assessment category based on the scale range calculation formula Neuman (2013). Based on the results of these calculations, it can be seen in the chart above that Pasir Mulya Village and Lemah Mulya Village have implemented the owls, as many as 100% of the 20 farmers in each village who had filled out the questionnaire had a positive perception of the use of the method owls. Apart from that, through the questionnaire, it was also discovered that 39 out of 40 farmers, or 97.5% of the total farmers in the two villages who were respondents had the maximum assessment score, where the farmers showed a positive perception of all the questions given.

One of the crucial differences that can be seen between farmers in the two villages that have used owls and villages that have not used owls is how the farmers in Pasir Mulya Village and Lemah Mulya Village admitted that they had received socialization or training and even material assistance. from the government regarding controlling rat pests using owls. Meanwhile, not a single farmer respondent in Ciwaringin Village admitted to having received socialization from the government regarding rat pest control owls. Therefore, farmers in Pasir Mulya Village and

Lemah Mulya Village have a higher probability of understanding and accepting the use of this method. Owls in Ciwaringin Village, which has not introduced *Tyto alba* at all, it can be seen in the chart above that the majority of farmers, namely 65% (Table 7) of the total respondents who filled out the questionnaire, have a negative perception of the use of owls in pressing field rat pest.

Table 7. Farmers' perceptions of using owls

Village	Positive (%)	Negative (%)
Pasir Mulya (with owls)	100	0
Lemah Mulya (with owls)	100	0
Ciwaringin (without owls)	35	65

3.8. Correlation of Farmers' Perceptions and Harvest Production

Based on the results of the Spearman correlation test, it can be seen that farmers' perceptions of the use of owls to control field rats are positively correlated with farmers' crop yields (r = 0.023). However, this correlation is not statistically significant (p = 0.86, not significant) as seen in Figure 6. This shows that the better the farmer's perception of the use of owls to control rice field rat pests, the higher the yield, although statistically, it is not significant.

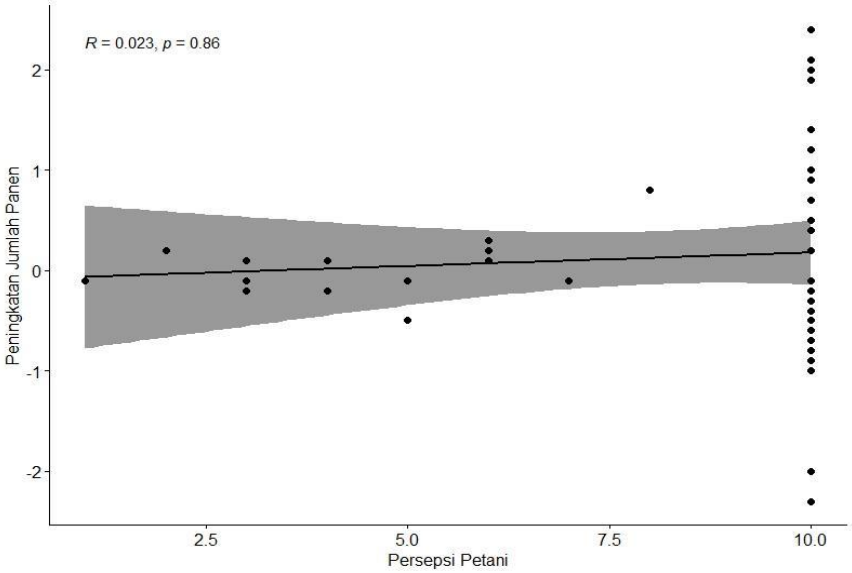

Figure 6. Correlation of farmers' perceptions to the increase of rice harvest

Receiving this information can be obtained from fellow farmers, and counseling or outreach held by the community and/or government. Furthermore, the understanding and interpretation applied from farmers' perceptions regarding the use of methods can be seen from the application of these methods on their agricultural land. The research results show that farmers' perceptions are good regarding the application of the method *Tyto alba* and correlate with increased crop production, indicating that the use of owls to control rice field rat pests can indirectly help to increase farmers' crop production. These results are in line with research by Sipayung *et al*. (2018), Primadani *et al*. (2020), and research conducted by Ardigurnita *et al*. (2020). Correlation results that are not significant can occur because the farmer's perception is not the only factor that most influences the amount of crop production from the land owned by the farmer. Land area, the influence of seeds, the use of urea, pesticides, and labor also influence the amount of crop production produced from a rice field area (Onibala *et al*., 2017). Other factors that influence the amount of crop production include rainfall, temperature, elevation, and soil pH (Nurkholis *et al*., 2020). Some of the results of

this research show that although farmers' perceptions and implementation of rice rat pest control methods using owls have been effective, if other supporting factors are not optimal, then crop production could decrease. As happened in Lemah Mulya Village, farmers' perceptions regarding the method of controlling field mice using owls in the area are good, however crop yields continue to decline due to high rainfall and the invasion of grass stunt disease in rice plants in the area, thereby reducing the amount of crop production.

4. CONCLUSION

In general, this study concluded that the use of owls (*Tyto alba*) is effective for controlling rice field rat pests, this is shown by the results of the correlation between the high number of owls and the reduced level of rat attacks in rice field areas. Ricefield rat attacks in villages that use owls are only 8.8-12.4%, while villages that do not use owls reach 71%. Farmers' perceptions of the use of ricefield rat control methods using owls also show a positive correlation with farmers' crop yields. Villages that use owls produce 6.07-7.10 ton/ha, which is higher than villages that don't use owls which only reach 3.63 ton/ha after harvest. So, it can be said that indirectly the use of owls to control rice field rat pests also contributes to increasing crop yields.

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