Analysis of the Utilization of Spraying Drones in Labulang Hamlet Farmer Groups in Patobong Village, Mattiro Sompe District

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Abstract

This study aims to determine the analysis of the use of drone sprayers in farmer groups which includes a description of the use of drones, the level of knowledge and the level of motivation of farmers both individually and together. This research consists of 4 main stages including: observation, determining research variables, data processing and drawing conclusions. Data collection was carried out using observation, interview and questionnaire techniques. To find out the results of the study, data analysis techniques were carried out, namely: multiple linear regression, hypothesis testing, namely the t test and F test. The number of samples involved was 32 people. The results showed that: 1) the type of Spraying drone used in the field is DJI Agras T40 with a payload capacity of 20 liters. 2) The level of knowledge of farmers has two criteria, namely high and medium. The farmers with a high level of knowledge amounted to 34.3% and those with a moderate level of knowledge amounted to 65.6%. 3) The level of motivation of farmers has three criteria, namely high, medium and low. The farmers who have a high level of motivation amounted to 12.5%, a moderate level of motivation amounted to 31.3% and a low level of motivation amounted to 56.3%. 4) Based on the results of the t test and the F test, it shows that the level of knowledge and the level of motivation have a significant effect on the use of drone spraying in Labulang Hamlet, Patobong Village, Mattiro Sompe District, so that H1 independent variables are "accepted" on the dependent variable and H0 is rejected.

Keyword: Drone spraying, knowledge, motivation, farmer

Abstrak

Penelitian ini bertujuan untuk mengetahui analisis penggunaan drone penyemprot pada kelompok Tani yang meliputi deskripsi penggunaan drone, tingkat pengetahuan dan tingkat motivasi petani dalam menggunakan drone, baik secara sendiri-sendiri maupun secara bersama-sama. Penelitian ini terdiri dari 4 tahapan utama diantaranya: observasi, menentukan variabel penelitian, pengolahan data dan penarikan kesimpulan. Pengumpulan data dilakukan dengan teknik observasi, wawancara dan angket. Untuk mengetahui hasil penelitian dilakukan teknik analisis data yakni: regresi linier berganda, uji hipotesis yakni uji t dan uji F. Jumlah sampel yang dilibatkan sebanyak 32 orang. Hasil Penelitian menunjukkan bahwa: 1) jenis drone Spraying yang digunakan di lapangan adalah DJI Agras T40 dengan kapasitas muatan 20 liter. 2) Tingkat pengetahuan petani memiliki dua kriteria, yakni tinggi dan sedang. Adapun petani dengan tingkat pengetahuan tinggi sebesar 34.3% dan yang memiliki tingkat pengetahuan sedang sebesar 65.6%. 3) Tingkat motivasi petani memiliki tiga kriteria, yakni tinggi, sedang dan rendah. Adapun petani yang memiliki tingkat motivasi tinggi sebesar 12.5%, tingkat motivasi sedang sebesar 31.3% dan tingkat motivasi rendah sebesar 56.3%. 4) Berdasarkan hasil uji t dan uji F menunjukkan bahwa tingkat pengetahuan dan tingkat motivasi berpengaruh secara signifikan terhadap penggunaan drone spraying di Dusun Labulang Desa Patobong Kecamatan Mattiro Sompe, Sehingga H1 variabel independen “diterima” terhadap variabel dependen dan H0 ditolak.

Kata Kunci: Drone penyemprot, pengetahuan, motivasi, petani

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Analysis of the Utilization of Spraying Drones in Labulang Hamlet ….
1. INTRODUCTION

The main milestone in the food problem is agriculture because through agricultural products humans can produce food that will be processed into food. Therefore, food needs will always be needed as long as humans are alive. So, agriculture is very important to develop. Along with the decreasing land and increasing population, it is necessary to have solutions or development of the agricultural sector to overcome these challenges. When entering the industrial revolution 4.0, digitalization has had an impact on the agricultural industry. Agriculture is becoming increasingly mechanized, from acreage mapping, land conversion, planting, maintenance, harvesting, to post-harvest.

Industrial Revolution 4.0 technology for modern farmers is known as "smart farming 4.0" (Sitanggang, 2021). Artificial intelligence, robotics, Internet of Things (IoT), drones, blockchain, and data analysis technologies are all used in agriculture 4.0 to produce high-quality, accurate, efficient, and durable agricultural products. This agricultural system is an advancement of precision agriculture with the aim of increasing the quantity and quality of agricultural products while maximizing worker productivity. Smart farming is a precision agriculture innovation that uses data obtained from sensor systems, drones, and remote sensing that aims to improve the accuracy of agricultural business management.

Drones or drones are equipped with flight control devices or systems that use high-definition cameras, GPS, radio waves, and other flight control systems. Typically, drone cameras are RGB (Red, Green, and Blue) cameras. This unmanned atomizer has a fairly large capacity, its working width can reach 4 meters, the spraying speed can reach 3 km/h with a height of up to 2 meters from the ground floor, and the working capacity is 1.2 hectares per hour (0.83 hours/ha). The spray magnitude of the drone can be set to control the spray quantity. Drone spraying is also able to see the condition of rice plants from the air by using multispectral imaging to capture data from infrared and visual perspectives so that farmers can distinguish between healthy plants and unhealthy plants.

Initially, drone technology was only used in the military, but now it has been applied in agricultural land to facilitate the work of farmers. Indonesia has enormous agricultural potential because this country has fertile land, one of which is in Patobong village, Mattiro Sompe district. Patobong Village, Mattiro Sompe District, is a village in Pinrang Regency. The topographic condition of most areas in Pinrang Regency, especially Patobong Village, Mattiro Sompe District, is a lowland that allows this area to be suitable for planting rice. The Central Bureau of Statistics of Pinrang Regency stated that the rice harvest area in Mattiro Sompe District in 2020 was 10,300.00 ha. One of the main problems faced by farmers in Patobong Village, Mattiro Sompe District is the inability to sow large areas of land and plant many types of seeds at the same time. Therefore, drone technology has emerged that can overcome these problems so that agriculture is more efficient than conventional methods. Drones bring many benefits to agriculture, including saving time, less costs incurred by farmers, and minimizing negative impacts on farmer health.

Currently, drone technology has been used in several areas in Pinrang Regency, one of which is in Patobong Village. But the use of spraying drones cannot be used by farmers as a whole and comprehensively, apart from the limited number of drones in the area, farmers also do not know how to operate spraying drones, because this drone can only be operated by drone pilots so if the drone pilot is not there then the drone cannot be operated. Therefore, researchers are interested in conducting a study entitled "Analysis of the Utilization of Spraying Drones in Labulang Hamlet Farmer Groups in Patobong Village, Mattiro Sompe District".

2. RESEARCH METHODS

The method in this study is descriptive quantitative which is ex post facto. This research was conducted in July-August 2023 in Labulang Hamlet, Patobong Village, Mattiro Sompe District, Pinrang Regency. The sample involved in this study was farmers from Labulang Hamlet, totaling 32 people. This study consists of two variables, namely: dependent variables and independent variables. Data was collected by observation, interview, questionnaire and documentation techniques. The data collection instruments in this study have been validated by validators before being used in the field and validity and reliability tests have been carried out. To find out the results of the study, multiple linear regression analysis was carried out, hypothesis testing, namely t-test
and f test.

3. RESULT AND DISCUSSION

3.1 Research Results

3.1.1 Knowledge Level

The level of knowledge can be determined based on respondents' answers regarding the questionnaire distributed, the following figure is the result of the knowledge level variable test:

Figure 1. Knowledge Level Variable Test Results

<table>
<thead>
<tr>
<th>Knowledge Level</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinggi</td>
<td>11</td>
<td>34.4</td>
<td>34.4</td>
<td>34.4</td>
</tr>
<tr>
<td>Sedang</td>
<td>21</td>
<td>65.6</td>
<td>65.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: SPSS output

Based on figure 1 above, it can be seen that farmers in the Labulang Hamlet Farmer Group in Patobong Village, Mattiro Sompe District have a moderate level of knowledge compared to farmers who have a high level of knowledge.

3.1.2 Motivation Level

The level of motivation can be known based on the results of respondents' answers regarding the questionnaire distributed, the following figure is the result of the motivation level variable test:

Figure 2. Motivation Level Variable Test Results

<table>
<thead>
<tr>
<th>Motivation Level</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinggi</td>
<td>4</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>Sedang</td>
<td>10</td>
<td>31.3</td>
<td>31.3</td>
<td>43.8</td>
</tr>
<tr>
<td>Rodha</td>
<td>18</td>
<td>56.2</td>
<td>56.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: SPSS output

Based on figure 2 above, it can be seen that farmers in the Labulang Hamlet Farmer group in Patobong Village, Mattiro Sompe District, who have a high level of motivation of 12.5%, who have a medium level of motivation of 31.3% and who have a low level of motivation as much as 56.3%.

3.1.3 Multiple Linear Regression Analysis

Multiple linear regression analysis was used to see the effect between the level of knowledge and the level of motivation on the use of spraying drones on farmers in Labulang Hamlet, Patobong Village, can be seen in the picture beside:

Figure 3. Multiple Linear Regression Results

The calculation results in the table above, the regression equation is obtained as follows:

\[ Y = 2.157 + 0.498X_1 + 0.426X_2 \]

Based on the results of the regression above, information was obtained, among others:

1) A constant of 2.157 which means that the value of the independent variable (knowledge and motivation) is constant or does not change, then the dependent variable (drone use) will also be constant.

2) The knowledge variable (\( X_1 \)) increased significantly by 1 point as evidenced by the positive regression coefficient of 0.498 while the other independent variables were constant. As a result, the knowledge variable will raise the value of the variable use of spraying drones to 2.157.

3) The motivation variable (\( X_2 \)) increased significantly by 1 point as evidenced by the regression coefficient, which is 0.426 and is positive, while the other independent variables are constant. Thus the motivation variable will increase the variable value of the use of spraying drones by 0.426.

3.1.4 Hypothesis Test Results

1) Test t (Partial)

In order to be partially known how each independent variable affects the dependent variable, a partial test (t test) is used.

Figure 4. Test Results t
From the results of the t test above, an explanation is obtained, namely:

a) A significance value of 0.001 which is less than 0.05 is possessed by the knowledge variable. It can be said that the independent variable, namely knowledge, has an influence on the dependent variable, namely the use of spraying drones, because the estimated result $t$ count is $2.046 > t$ table $2.045$. Then the first hypothesis is $H_1$: Knowledge variables significantly influence the use of spraying drones.

b) A significance value of 0.000 that is less than 0.05 is possessed by the motivational variable. It can be said that the independent variable, namely motivation, has an influence on the dependent variable, namely the use of spraying drones, because the estimated result $t$ calculate $2.046 > t$ table $2.045$. Hence the hypothesis of the second $H_1$: The variable of motivation significantly affects the variable of the use of drone sprayers.

2) Test F (Simultaneous)

In order to ascertain the effect of various independent variables on the dependent variable, simultaneous tests were carried out.

This study requires a sample of 32, independent variable 2 and a fact level of 5%, then obtained $F$ table of $(k; n-k) = (2; 32-2) = (2, 30) = 3.316$.

![Figure 5. F Test Results](source: SPSS output)

Information from the table above, resulting in a significant score of $0.000 < 0.05$ and a $F$ calculate value of $3.32 > F$ table of $3.31$ can be stated that the independent variables namely knowledge and motivation have an impact or influence on the dependent variable namely the use of spraying drones. Then it can be said that the dependent variable is the use of drones significantly influenced simultaneously by independent variables of knowledge and motivation.

3.1.5 Coefficient of Determination $r^2$

The value of the coefficient of determination lies between 0 and 1. The influence of a factor is even greater if the coefficient of determination is close to 1. The result of the coefficient of determination ($r^2$) can be seen in the following figure:

![Figure 6. Results of the Coefficient of Determination](source: SPSS output)

Value $r^2$ (adjusted R squared) from the regression model used to assess the explanatory power of the independent variable to the dependent variable based on the results of the evaluation of the coefficient of determination in the table above. From table 4.8, the value of $r^2$ is 0.789 which states that variations in knowledge and motivation level variables can explain 78.9% variation in drone use variables.

3.1.6 Correlation Analysis

The strength of the linear (related) relationship between two variables is assessed using correlation. Positive and negative relationships between variables may occur, in this study used the Pearson correlation. In parametric statistics, the Pearson correlation test is applied to normally distributed data.

The test was conducted at a significance level ($\alpha$ value) of 0.05.

1) Hypothesis

$H_0$ = indicates that there is no relationship between the independent and dependent variables.

$H_1$ = declares that the independent and dependent variables are connected.

2) Basic Decision Making
H₀ is rejected and H₁ is accepted if the value of Sig. (2-tailed) < 0.05
H₀ is accepted and H₁ is rejected if the value of Sig. (2-tailed) > 0.05

The value of the correlation coefficient is also contained in the correlation. A statistical indicator of covariance or the relationship between two variables whose values range from -1 to +1 is the correlation coefficient. Both variables have a unidirectional bond if the correlation coefficient is positive, but if it is negative, the variables have an inverse relationship.

Figure 7. Correlation Analysis Results

<table>
<thead>
<tr>
<th></th>
<th>Pengembalian Pearson</th>
<th>Motivasi Pearson</th>
<th>Penggunaan Drone Pearson</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Sig (2-tailed)</td>
<td>.634**</td>
<td>1</td>
<td>0.794**</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS output

Based on the facts presented in table 4.10, information is obtained that the motivation variable with knowledge has a significant bond or relationship, with a significant value of 0.000 because the value is less than 0.05 then H₀ is rejected and H₁ is accepted, so it can be said that there is a bond between the independent variable and the dependent variable. Strong criteria are met because the correlation value is 0.634 which indicates a close bond (correlation) between the knowledge variable and the motivation variable.

3.2 Discussion
3.2.1 Description of the Use of Drone Sprayer

The results showed that the spraying drone used in the field is a type of DJI Agras T40 Spraying drone with a payload capacity of 20 liters. The cost of spraying that must be prepared by farmers who use drone technology is 250 thousand / hectare, to spray 1 hectare of land requires 7 tubes or 7 flights which can take 30 minutes, while farmers who use conventional methods (knapsack) are 300 thousand / hectare with a capacity of 14 liter tubes. Conventional spraying takes up to 180 minutes and 12 tubes are needed to cover 1 hectare of land. Based on the information above, it can be seen that the cost of spraying pesticides using drone spraying is cheaper, saves energy and time compared to spraying using conventional methods.

The use of spraying drones in Patobong Village, Mattiro Sompe District, is only used by several farmer groups, one of which is the Labulang Hamlet farmer group. Based on information obtained by researchers that drones in the area are still limited because the price of buying and selling spraying drones is very expensive. So there are several farmer groups who choose to use conventional methods in order to immediately spray their land. But farmers who have used spraying drones always share or share information with farmers who still use conventional methods so that one by one they have begun to know and be motivated to use spraying drones. Farmers in Patobong Village, Mattiro Sompe sub-district, hope that the government can distribute or facilitate drones to each farmer group.

3.2.2 Independent/Free Variable (X)
1) Knowledge (X₁)

The results showed that the respondent's level of knowledge was declared valid. Where the results of the questionnaire test on knowledge variables have 2 criteria, namely high and medium. Based on table 4.3, the test results of the level of knowledge of respondents with high criteria have a frequency of 11 people, if expressed in percent, which is 34.4%. While the level of knowledge of respondents with moderate criteria has a frequency of 21 people, if expressed in percent, which is 65.6%. So it can be concluded that the total level of knowledge of respondents with a frequency of 32 people is 100% and is declared valid.

2) Motivation (X₂)

The results showed that the motivation level of respondents was declared valid. Where the results of the questionnaire test on motivation variables have 3 criteria, namely high, medium and low. Based on table 4.4, the test results of the motivation level of respondents with
Analysis of the Utilization of Spraying Drones in Labulang Hamlet

high criteria have a frequency of 4 people, if expressed in percent, which is 12.5%. The medium criterion has a frequency of 10 people, if expressed in percent, which is 31.3%. And the low criterion has a frequency of 18 people if expressed in percent of 56.3%. So it can be concluded that the amount of motivation level of respondents with a frequency of 32 people is 100% and is declared valid.

3.2.3 Use of Spraying Drones Against Farmers in Labulang Hamlet, Patobong Village, Mattiro Sompe District

1) Based on t-Test Results (Partial)

The results explained that the level of knowledge and level of motivation had a significant influence on the use of spraying drones in Labulang Hamlet, Patobong Village, Mattiro Sompe District, based on the results of the t-test which can be seen in Table 4.6. The knowledge level variable has a significance value of 0.001 < 0.05. While the variable level of motivation has a significant value of 0.000 < 0.05. T count obtained a value of 2.046 > t table 2.045, it can be concluded that the variables of knowledge level and motivation level affect the use of spraying drones. So that H1 variability level of knowledge and level of motivation had a significant effect partially (acceptable) on the variable use of drone sprayers and H0 was rejected.

2) Based on Test Results F (Simultaneous/Together)

The results explained that the level of knowledge and level of motivation had a significant influence on the use of drone spraying in Labulang Hamlet, Patobong Village, Mattiro Sompe District, from the F test results which can be seen in Table 4.8. A significant value of 0.000 < 0.05, for F calculate a value of 3.32 > F table of 3.31. So it can be said that the independent variables namely knowledge and motivation have a significant influence on the dependent variable, namely the use of spraying drones.

Based on the description of the t-test and F-test above, the author concludes that the use of spraying drones in Labulang Hamlet, Patobong Village, Mattiro Sompe District, which is carried out individually or together has a significant effect on knowledge and motivation variables.

3.2.4 Impact of Using Drones

Here are the impacts felt by farmers in Labulang Hamlet, Patobong Village, Mattiro Sompe District while using drones:

1) Work faster

The use of drones in agriculture can be done quickly because the spraying process using drones is faster than using conventional methods.

2) Reducing the number of workers

Drones or drones are equipped with flight control devices or systems that use high-definition cameras, GPS, radio waves, and other flight control systems, so spraying can be carried out over long distances controlled via remote control. Therefore, during the spraying process does not require too much power.

3) Reduce farm costs

The use of spraying drones can prevent excessive use of pesticides and liquid fertilizers, so the costs incurred by farmers are not too large.

4) Reduce the risk of harm to farmers' health

The use of spraying drones can reduce the risk of harm to farmers' health, because at the time of spraying there is no direct contact with pesticide liquids. So as to prevent adverse effects on the health of farmers that may occur if there is direct contact with harmful chemicals.

4. CONCLUSION AND SUGGESTION

4.1 Conclusion

Based on the results of the study, it can be concluded that:

1) The results showed that the use of drone spraying in Patobong Village, Mattiro Sompe District, is still not fully used by farmers, there are only a few farmer groups that use the tool, one of which is the Labulang Hamlet Farmer group. Apart from the limited number of drones in the area, the price of drones is also expensive. So there are still some farmers
who choose to use conventional methods to spray their land.

2) The level of knowledge of Labulang Hamlet farmers in Patobong Village, Mattiro Sompe District, regarding the use of spraying drones is still relatively low. Based on the results of data processing and analysis, respondents who have a high level of knowledge are 34.4% while those who have a medium level of knowledge are 65.6%.

3) The motivation level of Labulang Hamlet farmers in Patobong Village, Mattiro Sompe District is still relatively low in using spraying drones. Based on the results of data processing and analysis, respondents who have a high level of motivation are 12.5%, who have a medium level of motivation are 31.3%, and who have a low motivation level are 56.3%.

4) The results of the study were based on the description of the t test and F test, the author concluded that the use of spraying drones in the Labulang Hamlet Farmer group in Patobong Village, Mattiro Sompe District had a significant effect on knowledge and motivation variables.

4.2 Suggestion

Based on the results of the study, suggestions were proposed:

1) For the local government, it is better to conduct counseling to farmers on how to use and the advantages of spraying drones, so that farmers can be motivated to use drones, and provide facilities (drones) to farmers.

2) For future researchers, the results of this research can be used as a bridge to conduct further research, especially in the same fields and objects. It is expected that further researchers will expand the research variables used so as to produce more accurate data.

Reference


Analysis of the Utilization of Spraying Drones in Labulang Hamlet .......