Adoption Of Lighting Technology In Onion Farming

Nurhapsa[1]
Agribusiness Study Program, Faculty of Agriculture, Animal Science and Fishery, University Muhammadiyah Parepare, Email: hapsa_faktan@yahoo.co.id

Edi Kurniawan[2]
Agribusiness Study Program, Faculty of Agriculture, Animal Science and Fishery, University Muhammadiyah Parepare

Suherman[3]
Agrotechnology Study Program, Faculty of Agriculture, Animal Science and Fishery, Universitas Muhammadiyah Parepare

Sitti Nurani Sirajuddin[4]
Department of Socio economics, Faculty of Animal Science, Hasanuddin University

Betrixia Barbara[5]
Social Economy Study Program, Faculty of Agriculture, University of Palangkaraya

Abstract

This study aimed to examine the factors influencing farmers' adoption of innovation and technology in onion farming. The sample was taken randomly from as many as 44 shallot farmers who applied light technology and mosquito net technology in Mataran Village, Enrekang Regency. Primary and secondary data were used in this study. The data were analyzed descriptively and using a logistic function approach. The results of the study show that the level of land area and age have a significant and positive effect on the opportunities for farmers to adopt the technology of using lights in onion farming. While the family size and farming experience did not significantly affect the chances of farmers adopting the technology of using lights in onion farming, local government support is needed to assist farmers in applying technology that can increase the productivity of onion farming.

Keywords: *technology adoption, logit model, light technology*.

Introduction

Shallots were one of the horticultural commodities (Alemu et al., 2022) that made a significant contribution to the economy in Enrekang Regency because they were the main source of income for some people, absorbed much labor, and became a source of foreign exchange for the country in South Sulawesi Province (Tori & Kholil, 2023; Muhaimin & Abdul, 2017). However, the production and productivity of shallot in Enrekang Regency are still low (average 10.8 tons/ha) (Andi Faisal Suddin et al., 2021). The low productivity of shallots in Enrekang Regency can be seen from how farmers allocate the production inputs used in their farming. According to a theoretical review and secondary data, there are several reasons why the productivity of shallots

in Enrekang Regency is low or declining, including a lack of technological advancement or a lack of farmer adoption of new technology (Rahayu et al., 2019).

Advances in technology and agriculture have made many farmers depend on chemical fertilizers to increase the productivity of their farms (Casella et al., 2022). This includes using chemical pesticides to control pests and diseases (Tinaprilla & Utami, 2022). However, this can harm them when using chemical fertilizers, causing soil conditions to become less fertile and chemical pesticides cause environmental pollution and the loss of natural enemies that function to maintain the balance of the ecosystem.

One form of innovation or new technology applied by shallot farmers in Enrekang Regency to increase production and productivity, increase business efficiency, and reduce chemical pesticides is using lamps and mosquito nets. However, farmers are not necessarily able to directly apply these innovations and technologies to their farms. This is due to various factors influencing the adoption of the invention or technology (Darwanto & Waluyati, 2019; Gunawan et al., 2021).

Several research results were related to the factors influencing farmers to adopt innovation or technology. For example, research conducted by Manongko et al. (2017) showed that the factors that have an authentic relationship to the level of technology adoption in shallot farming are the area of farming land, income, and cosmopolitan level, while formal education has a significant connection as well as non-formal education and age. Farmers have an unreal relationship with technology adoption in shallot farming. Roessali et al. (2019) research showed that factors that significantly influence farmer behavior in adopting True Shallot Seed technology are farmer age, education level, land area, farmer income, number of family members, land status, and region. Furthermore, Putra et al. (2016) research show the role of extension workers and farmer groups in influencing the adoption of shallot cultivation technology. Based on the description in the previous paragraph, this study aims to determine the effect of land area, farmer age, farmer's formal education, farming experience, and number of family members on the application of technology and innovation in onion farming in Enrekang Regency.

Materials and Method

This research was carried out in Mataran Village, Anggeraja District, Enrekang Regency, which is one of the centres of shallot production and also farmers use lamp and mosquito net technology in onion farming. Sampling was carried out by simple random sampling of 44 shallot farmers who applied lamp and mosquito net technology. The data collected were analyzed descriptively and using the logit function approach as follows:

$$L\left(\frac{Pi}{1-Pi}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

Where:

Pi = opportunity for farmers to use lighting technology, P1 = 1 if farmers use lighting technology and P1 = 0 if farmers do not use lighting technology

α = Intercept

X1 = Land area (ha)

X2 = Formal education (years)

X3 = Age (years)

X4 = number of family members (persons)

X5 = Farming Experience (years)

Expected parameter sign (hypothesis): , β_1 , β_2 , β_4 , , > 0; β_3 ,β_5 < 0.

RESULTS AND DISCUSSION

Respondent Farmer Profile

The profiles of respondent farmers that will be described are the farm's area, the farmer's age, education level, experience of farming, and the number of family members of the farmer.

Age of Farmers

The farmer's age level strongly influences a farmer's ability or productivity. Nurhapsa (2015) states that the older a person is, the more productivity and workability of a person also increases and will subsequently experience a decline and workability at a certain age. In addition, thinking skills, thinking maturity and physical abilities will also decrease. The distribution of respondent farmers by age is shown in Table 1. Based on Table 1, it can be explained that most of the respondent farmers are still classified as productive age, which is 40 people (90,8%). This shows that the respondent farmers can still think and have the physical ability and mature thinking to manage their farming well to obtain optimal income or profit.

Table 1. Distribution of Farmers Answering by Age

No	Age (year)	Amount (Person)	Percentage (%)
	20 - 30	2	4,5
	31 – 40	18	40,9
	41 - 50	7	15,9
	51 – 60	13	29,5
	61 – 70	3	6,8
	71 - 80	1	2,3
Total		44	100

Source: Processed Primary Data, 2022

Education Level of Farmer

The level of education of respondent farmers also affects the ability of farmers to manage their farms. In addition, the education level of the respondent farmers also affects the level of innovation adoption. The distribution of respondents based on education level is shown in Table 2. Table 2 shows that as many as 84.1% of respondent farmers have junior and senior high school education and some have Diploma and Bachelor's education. These results indicate that the respondent farmers have a fairly adequate education, making accepting and implementing innovations in their farming easier. Sufficient so that farmers with good education are relatively easier to take innovations than farmers with less education. The level of education in question is the respondent farmer's formal education.

Table 2. Distribution of Farmers by Level of Education

No	Education Level	Amount (Person)	Percentage (%)
	Primary school	1	2,3
	Junior high school	3	6,8
	Senior High School	34	77,3
	Diploma	1	2,3
	Bachelor Degree	5	11,3
Total		44	100

Source: Processed Primary Data, 2022

Onion Farming Experience of Respondent Farmers

The farming experience in question is the time respondents have cultivated shallots expressed in years. Farming experience is one of the determining factors for the success of farmers in managing their farming. There is a tendency that the longer a farmer is involved in a farming business, the more experience he gets and the more he knows the good and bad of the farming he manages. The distribution of respondent farmers based on farming experience is shown in Table 3.

Table 3. Distribution of Farmers by Farming Experience

No	Farming Experience (year)	Amount (Person)	Percentage (%)
	1 - 5	6	13,6
	6 - 10	12	27,3
	11 - 15	13	29,5
	16 - 20	8	18,2
	21 - 25	5	11,4
Total		44	100

Source: Processed Primary Data, 2022

Based on Table 3, it can be explained that, in general, the respondent farmers have quite a long farming experience. This shows that the respondent farmers already have quite a lot of experience in farming shallots. So they tend to have more control over their business management and understand the pros and cons of farming.

Number of Family Members

The number of family members owned by a farmer shows the economic burden borne by the farmer and also as a source of labor that can be used in his farming. The distribution of respondent farmers based on the number of family members is shown in Table 4.

Table 4. Distribution of Farmers by Number of Family Members

No	Farming Experience (person)	Amount (Person)	Percentage (%)
	1 - 3	19	43,2
	4 – 6	25	56,8
	7 - 10	0	0
Total		44	100

Source: Processed Primary Data, 2022

The number of dependents in the family can be used as a source of labor that will be used in onion farming. Respondents generally have a number of dependents between 1-6 people. This shows that the respondent farmers do not experience difficulties obtaining labour to manage their farms.

Cultivation Land Area

The land is one of the factors of production to manage to farm. The area of shallot farming area managed by respondent farmers is shown in Table 5.

Table 5. Distribution of Farmers by Cultivation Land Area

No	Land Area (ha)	Amount (Person)	Percentage (%)
	0,10 - 0,50	30	68,2
	0,51 – 1,00	13	29,5
	1,00 – 1,50	1	2,3
Total		44	100

Source: Processed Primary Data, 2022

The land managed by the respondent farmers is generally their own land with an area of 0.1 – 1.0 hectares. This shows that farmers' land tenure is relatively narrow, so it becomes an obstacle to increasing the shallots' production capacity.

Factors Affecting Farmers Adopting Technology Using Lights in Shallot Farming

The results of estimating factors that influence the chances of adopting light technology in shallot farming using the logit model are shown in Table 6.

Table 6. Factors Influencing Farmers to Adopt Lighting Technology in Shallot Farming in Enrekang District.

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1[a]	luaslahan	5,593	1,916	8,520	1	,004	268,483	6,280	11477,864
	pddkn	-,164	,199	,684	1	,408	,849	,575	1,252
	umur	,067	,045	2,257	1	,133	1,069	,980	1,167
	jmlagtklg	,290	,348	,698	1	,403	1,337	,677	2,642
	pglmut	-,104	,085	1,495	1	,221	,901	,762	1,065
	Constant	-3,498	3,304	1,121	1	,290	,030		

a. Variable(s) entered on step 1: luaslahan, pddkn, umur, jmlagtklg, pglmut.

Based on Table 6, it can be explained that the factors that significantly affect the opportunity for farmers to adopt the technology of using lights in shallot farming at $\alpha = 0.05$ and $\alpha = 0.15$ are the area of the land and the age of the farmer. At the same time, the level of education, the number of family members, and farming experience have no real effect on the opportunities for farmers to adopt the technology of using lights in shallot farming in Mataran Village, Anggeraja District, Enrekang Regency. The land area factor has a significant and positive effect on the opportunities for farmers to adopt the technology of using lights in shallot farming. These results can be explained by the fact that if the land area increases by one unit, the chance for farmers to adopt the technology of using lights is 268.48 times higher. Theoretically, land area significantly affects farmers' opportunities to adopt technology because farmers with large land holdings show better economic capacity. The results of this study are in line with the results of research conducted by Bachri et al. (2019) regarding the factors that influence the adoption of technological innovations by lowland rice farmers in Pond Village, Percut SeiTuan District, and Deli Serdan Regency, showing that land area has a significant and positive effect on the adoption of lowland rice technology innovation.

Furthermore, Manongko et al. (2017) research showed that the level of formal education significantly affected the adoption rate of shallot cultivation technology in Tonsewer Village, Tompaso District. The age factor has a significant and positive effect on the

opportunities for farmers to adopt the technology of using lights in shallot farming in Mataran Village, Anggeraja District, Enrekang Regency. This can be explained by the fact that if the age increases by one year, the chance for farmers to adopt the technology of using lights in shallot farming is 1.069 times greater. The older the farmer, the faster they will adopt technological innovations, and the higher the farmer's age, the more the farmer knows about his farming business. The number of family members has no significant and positive effect on the chances of farmers adopting light technology in shallot farming. The coefficient value of the number of family members is 1.337. This can be explained by the fact that if the number of family members increases by one, the chance for farmers to adopt the technology of using lights in shallot farming is 1.337 times greater. The larger the family, the greater the opportunity for farmers to adopt the technology. The number of family members can be a source of labor that can assist in the management of shallot farming.

The farming experience factor has no significant and positive effect on the opportunity for farmers to adopt light technology in shallot farming. The coefficient value of farming experience is 0.901, which means that for every year of farming experience gained, the likelihood of farmers adopting lighting technology increases by 0.901.The results of this study are different from the results of research was done by Bachri et al. (2019) on the factors that influence the adoption of technological innovations by lowland rice farmers in Pond Village, Percut SeiTuan District, Deli Serdan Regency, which shows that farming experience has a real and positive effect on farmers' chances of adopting the technology.

Conclusion

Land area and farmer age significantly affect farmers' opportunities to adopt light technology in shallot farming, whereas the number of family members, education level, and farming experience has no significant effect. The need for local government support (related agencies) to assist farmers in applying technology that can increase the productivity of shallot farming.

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