

Farmers' Behavior Towards the Risks of Cabbage and Chicory Farming in Plaosan District, Magetan Regency, East Java

Sriyadi¹, and Bambang Heri Isnawan²

¹Department of Agribusiness, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia

²Department of Agrotechnology, Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia

*Corresponding author: sriyadi@umy.ac.id

Article History: Received: 18 January 26, Final Revision: 24 January 26, Accepted: 26 January 26, Online Publication: 30 January 26

ABSTRACT

Vegetable horticultural goods like chicory and cabbage often face production and income risks. Rational farmers tend to be risk averse. Disparities in decision-making can result from individual differences in risk aversion. This study aims to (1) analyze the level of risk of costs, production, and income of cabbage and chicory farming; (2) analyze farmers' behavior towards the cost risk, production, and income of cabbage and chicory farming; and (3) analyze social factors that affect farmers' behavior on the risks of cabbage and chicory farming. A descriptive analytical method was used in the study. Observation and structured interviews with 100 farmers of cabbage and 100 farmers of chicory utilizing questionnaires were used to gather data. The findings indicate that growing cabbage is riskier than growing chicory. Regarding both commodities, the majority of farmers behave in a risk-averse manner. Risk aversion falls with better education, more years of agricultural experience, larger households, and higher farm revenue, but rises with larger acreage, older age, and more frequent crop failure. In general, farmers who grow cabbage are less willing to take risks than those who grow chicory. In order to lower farming hazards and increase revenue stability, extension programs are crucial for enhancing farmers' knowledge of the best times to grow chicory and cabbage.

Keywords: cabbage farming; chicory farming; farmer behavior; income risk; risk aversion

INTRODUCTION

Vegetables are the horticultural subsector that Indonesian farmers grow the most. Fruits and vegetables are currently only regarded as dietary supplements. However, numerous studies have demonstrated that they contain nutrients and active molecules called phytonutrients and phytochemicals that have a number of health advantages, including the ability to prevent, treat, and heal illness. Fruits and vegetables are good sources of fiber, vitamins, and other minerals. The body uses a variety of vitamins and minerals found

in fruits and vegetables as an antidote to dangerous substances called antioxidants [1].

Vegetable crop yields vary by region in terms of sort, variety, quality, and quantity of production. Vegetables appear in many varieties because they must adjust to the particular soil, climate, and topography of each location [2]. This vegetable product is outstanding because to its very high economic value, as evidenced by the amount of labor needed, costs incurred, income generated,

and profits earned.

Vegetables are farmed by farmers across Indonesia, from lowlands to highlands, and are the most widely consumed and well-liked horticultural product [3]. Vegetables offer a range of yields in terms of both quantity and quality since plants must adapt to the topography, soil, and temperature [4]. Vegetables are a critical commodity in Indonesia because price fluctuations can impact inflation. Vegetables are also a valuable product, which motivates many farmers to grow them [5].

The potential competitiveness of vegetable commodities is one of their comparative advantages; as long as the economy is stable and not in recession, vegetable commodities can always attain high competitiveness [6]. The agricultural sector, which includes vegetables, is at the vanguard of economic development in the majority of emerging nations. The significant contribution of the agricultural sector to GDP formation serves as evidence of this [7].

Price volatility and production failures are risks associated with vegetable gardening. Farmers who are essentially logical are hesitant to take chances [4, 8, 9, 10]. A person's decision-making

process will vary depending on how they perceive danger [11, 12]. Socioeconomic factors affect farmers' willingness to take risks [13]. Land area, farmer age, education, experience, frequency of agricultural failures, and farming revenue are some of these socioeconomic determinants.

Given the context and articulation of the problem, the study seeks to: 1. Examine the degree of risk associated with vegetable farming's expenses, output, and revenue. 2. Examine how farmers behave in relation to the expense, danger, output, and revenue of growing vegetables.. 3. Examine how societal influences influence farmers' decisions on the dangers of growing vegetables.

This research is urgent since numerous studies on farming risks, especially those related to vegetable production, have been carried out in Indonesia. Nevertheless, there is a lack of research on risk that looks at how farmers in Magetan Regency, East Java, respond to risk and the social factors that affect their actions. Additionally, the quadratic utility regression function model approach was used to assess farmers' behavior about the danger of growing vegetables.

MATERIALS AND METHODS

Vegetable Farming Risk Research in Plaosan District, Magetan Regency, East Java was conducted using descriptive analysis methods [14, 15, 16, 17]. The research location was Plaosan District, Magetan Regency, East Java, and from Plaosan District, one of the vegetable production centers was chosen, namely Plaosan Village with 4 hamlets (Plaosan, Temboro, Nepen,

Sumberwuluh), each hamlet was taken by 50 respondents (25 cabbage respondents and 25 chicory respondents). Observation and interviews with questionnaire guidelines were used to gather data. Inductive processes are used in data processing to make conclusions based on both actual facts at the study site and concretely known facts and events.

Risk of Shallot Farming

The level of risk connected to the costs, output, and income of vegetable growing was evaluated using a coefficient of variation. Kimbal's results [18] demonstrate how cost, manufacturing,

and revenue risks can be measured using the standard deviation and variance magnitude. The following is a mathematical representation of the coefficient of variation:

$$KV = \frac{\sigma}{\bar{X}} \quad (1)$$

Information : KV = coefficient of income variation.
 σ = standard deviation of income
 $\bar{X}$ = average revenue

The little coefficient of variation shows that the distribution's mean value is not very variable.

In terms of cost, output, and income, this suggests that there is minimal average risk.

Farmers' Behavior Toward Risks

A quadratic utility function model is used to determine how farmers act in respect to the cost

$$U = b_0 + b_1M + b_2M^2 \quad (2)$$

Information : U = value utility
 M = the acceptance obtained at the equilibrium point of the alternative option is filed.
 b_0 = intersep
 b_1 = regression coefficient
 b_2 = risk preference coefficient

The equilibrium value, or the state of equilibrium between values under uncertain and definite conditions, is found using Bernoulli's principle and the Neumann-Morgenstern technique improved with neutral probability (50:50). The money made by cultivating onions is this balancing

risk, output, and revenue of vegetable farming:

value, sometimes referred to as the certainty equivalent, or CE. Utility functions can be obtained by linking the utility's scale. Because each farmer has a distinct CE value, changes in their income will cause their utility curves to differ.

Socioeconomic Factors Influencing Farmer Behavior Towards Risk

Multiple linear regression models were used to analyze farmers' risk-taking behavior, which was impacted by variables like income, land area, age, education, experience, number of family members, and failure frequency. The risk coefficient is a

dependent variable with the following independent factors: land area, age, education, experience, number of family members, frequency of failures during the preceding five years, and farmers' annual revenue from farming.

$$b_2 = \alpha_0 + \sum_{i=1}^7 \alpha_i X_i + \mu \quad (3)$$

Information:

b_2 = risk preference coefficient
 X_1 = land size (hectare)
 X_2 = farmer age (year)
 X_3 = farmer education (year)
 X_4 = farmer experience (year)
 X_5 = number of members of the peasant family (person)

X_6 = failure frequency
 X_7 = farmer income from farming (IDR/year)
 α_0 = intersep
 α_1 = land area regression coefficient
 α_2 = farmer age regression coefficient
 α_3 = regression coefficient of farmer education
 α_4 = regression coefficient of farmer experience
 α_5 = regression coefficient of the number of members of the peasant family
 α_6 = failure frequency regression coefficient
 α_7 = regression coefficient of farmer income from farming
 μ = confounding variables

The two steps of the previously mentioned analysis model test using ordinary least squares (OLS) are (1) confirming the classical assumptions and (2) evaluating the model's applicability [19, 20]. Because the data utilized in this study are either cross-sectional or single-point, multicollinearity and heteroscedasticity tests are often used assumption tests [20]. The model utilized for identification is the outcome of ordinary least square (OLS) analysis if the model under study does not contain a classical assumption disorder. Both heteroscedasticity and multicollinearity disorders have been eliminated from the model if they are present.

Heteroscedasticity test: The Shazam data analysis program used a variety of tests, including the Harvey, Glesjer's, Koenker, and Breusch-Pagan tests, to ascertain whether heteroscedasticity

abnormalities were present. The model is modified using the heteroscedasticity model and the Feasilbe Generalize Least Square (FGLS) method is used for analysis if at least one of the four tests reveals a heteroscedasticity disorder [21]. Four different kinds of heteroscedasticity models were employed to improve the model for heteroscedasticity disorders [22]. The models depvar (dependent variable), mult (multiplicative), stdlin (standard deviation functions as a linear function of exogenous variables), and varlin (variance functions as a linear function of exogenous variables) are the first four examples. One of the four heteroscedasticity improvement models was selected as the best (suitable) model to determine the factors influencing the risk preference coefficient.

RESULTS AND DISCUSSION

Risk Analysis of Cabbage and Chicory Farming

To determine the production risk, cost, and income, the coefficient of variation from the production, cost, and revenue of chicory and cabbage farming was examined. The analysis of the coefficient of variation determines the quantity

of the coefficient of variation for farmers' income, costs, and productivity from growing chicory and cabbage. Table 1 displays the analysis of the coefficient of variation in the output, expenses, and profits of cultivating chicory and cabbage.

Table 1. Average, standard deviation and coefficient of variation in cabbage and chicory farming costs per hectare, 2025

Farming	Cabbage in Plaosan District, Magetan Regency			Chicorice in Plaosan District, Magetan Regency		
	Cost	Production	Income	Cost	Production	Income
Cost	22,500,530	14,527	24,250,100	18,750,420	16,750	20,250,100
Standard Deviasi	7,752,251	9,856	15,715,500	6,123,250	2,400	8,950,280
Coefficient of Variation	0.345	0.678	0.648	0.327	0.143	0.442

Source: Primary Data, processed 2025

The results of the study show that although the cost risk of growing chicory and cabbage differs, the risk of producing and making money from growing cabbage is greater than that of growing chicory. Growing cabbage has a significant income risk because to the high output risk. producing cabbage is riskier than producing chicory because it is more susceptible to pests and diseases. The risk of growing cabbage is also influenced by production variations. The results of the study show that there is a considerable financial risk associated with cultivating vegetables like cabbage and chicory. The results of this study are in line with research showing that growing

vegetables carries a higher risk [23, 24,25].

This production differential results from farmers not planting cabbage at the same time. Varied planting timings result in varied growth and harvest times, which in turn result in different yields because weather and climate have a big influence on cabbage growth. For example, it should go without saying that farmers will produce less cabbage if they grow it during the wet season, when rainfall is substantially higher. In contrast, farmers who plant cabbage before to the start of the rainy season would undoubtedly boost yields because there would be less rainfall during that time.

Farmers' Behavior Toward Risks

To find out how farmers reacted to the risks of growing cabbage and chicory, the quadratic utility function was employed. The utility function of each farmer was estimated using the procedure described in the study technique and the Bernoulli-Morgenstern principle, which was improved with a neutral probability (50:50).

The lowest and greatest determination coefficients (R^2) for each farmer's utility function in the production of cabbage in Plaosan Village, Plaosan District, Magetan Regency, are 0.955 and 0.995, respectively. This shows that for farmers with the lowest determination coefficient value (R^2), 95.50% of the variation in the utility value of growing cabbage comes from changes in revenue, with the remaining 4.50 percent coming from changes in other factors not included in the model. Variations in cabbage farming revenue account for

99.50% of the variance in the utility value of farming for farmers with a determination coefficient value of (R^2), with the remaining 0.50 percent coming from variations in other parameters not included in the model. While the lowest f-count is 48.531 and the highest is 1,001.750.

Regarding chicory cultivation in in Plaosan Village, Plaosan District, Magetan Regency, had the highest determination coefficient (R^2) at 0.997 and the lowest at 0.965. For farmers with the lowest determination coefficient value (R^2), this means that a 96.50 percent variation in chicory farming revenue is responsible for the variation in the utility value of chicory farming, while a 3.50 percent variation is caused by other factors not included in the model. In the case of farmers with the lowest determination coefficient value (R^2), this means that variations in the revenue from chicory farming account for 99.70 percent of the

variation in the utility value of chicory farming, while variations in other factors not included in the model account for 0.30 percent. While the lowest

f-count is 61.751 and the highest is 1,125.500.

Table 2. Distribution of cabbage and chicory farmers' behavior towards risk, 2024

Behaviour	Cabbage in Plaosan District, Magetan Regency		Chicorice in Plaosan District, Magetan Regency	
	Sum	Presented %	Sum	Presented %
Averter	87	87	80	80
Netral	13	13	20	20
Lover	0	0	0	0
(R ²) Lowest		0.955		0.965
(R ²) Highest		0.995		0.997
Lowest F-count		48.531		61.751
Highest F-count	1,001.750		1,125.500	

Source: Primary Data, processed 2024

Table 2 shows that 87% of the 100 farmers that grow cabbage have a negative and significant risk coefficient (b_2), indicating that they are hesitant to take the chance. Ten, or 10% of farmers, have a negative risk coefficient (b_2), whereas three, or 3% of farmers, have a positive but not significant risk coefficient (b_2). These results imply that no farmer is ready to take any hazards and that farmers act in a neutral way toward the risks involved in cultivating cabbage. The study's findings show that when faced with the dangers of cultivating cabbage, the majority of farmers act hesitantly. 80 farmers, or 80% of the 100 farmers who grow chicory, have a risk coefficient (b_2) that is negative and significant, indicating that they approach the risks of chicory farming cautiously; 15 farmers, or 15% of the farmers, have a risk coefficient (b_2); and 5 farmers, or 5% of the farmers, have a risk coefficient (b_2) that is positive but not significant, indicating that they act neutrally toward the risks of chicory farming and that no farmers are willing to take a chance. The study's findings show that when faced with the dangers of growing chicory, the majority of farmers act hesitantly. The study's findings show that farmers who grow cabbage and chicory vegetables act grudgingly when faced with farming hazards. The study's findings are consistent with other research demonstrating

farmers' reluctance to accept the hazards associated with growing veggies [10].

It makes sense that most farmers are reluctant to take risks because most agricultural households face a significant financial dilemma [26]. Because they live so close to the limit of subsistence and are regularly affected by weather unpredictability, farmers in rural areas are unable to utilize the calculation of maximum earnings in farming. To make big earnings, farmers will try to avoid failing and avoid taking big risks. The majority of farmers exhibit this kind of conduct, which is known as "safety first."

Farmers who cultivate cabbage and chicory are driven to increase their profits because they are somewhat pricey and produce quickly. Due to the significant dangers involved, such as pest and disease assaults or volatile price fluctuations, the majority of farmers with little to no capital have not ventured to cultivate chicory and cabbage on a large commercial scale. When harvest time comes, small farmers or farmers with limited capital must inevitably sell their produce, regardless of the price, because they no longer have a budget to support their living needs. When cultivating cabbage and chicory, most farmers employ a monoculture overlap technique. August through October is the planting season for chicory and cabbage.

Socioeconomic Factors that Affect Farmers' Behavior Towards Risk

Land area, age, education, experience, number of family members, frequency of failures over the previous five years, and annual agricultural revenues are socioeconomic factors that are thought to influence farmers' risk-taking behavior. In this case, the risk coefficient (b_2) was

used as the dependent variable since the quadratic utility function was examined. Therefore, it is believed that seven factors influence how farmers behave in hazardous circumstances. Table 3 displays the findings of a multiple linear equation model that examines the variables affecting farmers' propensity for taking risks.

Table 3. Regression coefficient and t-calculate the function of farmer behavior on the risk of cabbage and chicory farming, 2025

Independent Variables	Regression Coefficient	T-Count
Intersep	0.885E-05***	12.750
Land (X_1)	-0.756E-10NS	-0.875
Farmer Age (X_2)	-0.354E-07*	-2.575
Farmer Education (X_3)	0.637E-08**	2.854
Farmer Experience (X_4)	0.283E-07NS	1.756
Number of Family Members (X_5)	0.675E-08NS	1.341
Failure Frequency (X_6)	-0.354E-06NS	-0.773
Farmer Income (X_7)	0.258E-05**	2.875
Dummy (D)	0.715E-06***	3.751
Coefficient of Determination (R^2)	0.935	
$F - hitung$	8.753***	
DW	1.801	

Source : Primary Data Analysis.

Information:

- *** : significant in $\alpha : 1\%$
- ** : significant in $\alpha : 5\%$
- * : significant in $\alpha : 10\%$
- NS : insignificant on $\alpha : 10\%$
- T-Table (With $df = \infty$) at $\alpha : 1\% = 2.576$; $\alpha : 5\% = 1.960$; and $\alpha : 10\% = 1.645$
- F-table, on $\alpha : 1\% = 2.510$; $\alpha : 5\% = 1.940$; and $\alpha : 10\% = 1.670$

Three of the seven independent factors—farmers' age, income, and education—have a significant influence on the non-free variable, the risk coefficient, which measures how risk-averse farmers are, as Table 3 shows.

Finding multicollinearity and heteroscedasticity is the next step in determining any departures from the multiple linear regression model's standard assumptions. A perfect or clear linear relationship between some or all of the variables that make up the regression model is

known as multicollinearity. An indicator of correlation coefficients between independent variables is used to determine whether the estimator model has a multicollinearity issue. The analysis's findings demonstrate that the multiple linear regression model employed does not have a multicollinearity issue since the correlation coefficient between the free variables is comparatively low.

Heteroscedasticity occurs when each disturbance u_i element's change is not constant.

One problem with cross-sectional data is heteroscedasticity. To determine the heteroscedasticity problem, this study used the Harvey Test, Glesjer's Test, Koenker Test, and Breusch-Pagan Test techniques. The study's findings indicate that the estimator model has a heteroscedasticity issue. The depvar model (heteroscedasticity improvement with dependent variables), the mult model (heteroscedasticity improvement with multiplicative), the stdlin model (heteroscedasticity improvement with standard deviation is a linear function of exogenous variable), and the varlin model (heteroscedasticity improvement with variance is a linear function of exogenous variable) were the enhanced models that were employed to remove the impact of heteroscedasticity. Table 4 displays the results.

The heteroscedasticity model has a determination coefficient value (R^2) of 0.935, according to the analysis results in Table 4. This indicates that variations in land area, age, education, experience, number of family members, frequency of failures during the preceding five years, and farming income can account for up to 93.50 percent of the variation in the risk coefficient

value or farmer behavior toward risk. Other factors that affect but are not included in the model can account for the remaining 6.50 percent.

The computation's outcome showed that the independent factors taken together significantly affect the dependent variables, with a likelihood ratio (LR) value of 22.446 higher than the chi-square value of 20.090. In other words, a farmer's overall socioeconomic characteristics—such as land area, age, education, experience, number of family members, frequency of failures over the previous five years, and agricultural revenue—have an impact on how they react to risk.

Table 4 demonstrates that of the four models used to remove the influence of heteroscedasticity, the Depvar model (improvement of heteroscedasticity with dependent variables) is the most successful because, compared to the other three models, it has the most independent variables with the greatest real effect—that is, every independent variable has a real effect. To determine the factors influencing farmers' risk-taking behavior, the depvar model—which improves heteroscedasticity with dependent variables—was selected.

Table 4. Regression analysis between risk coefficients with seven independent variables that have eliminated the influence of heteroscedasticity, 2025

Independent Variables	Regression Coefficient	Heteroscedasticity Free Regression Coefficient			
	OLS	DEPVAR	MULT	STDLIN	VARLIN
Intersep	0.885E-05*** (12.750)	0.786E-05*** (15.531)	0.655E-05NS (0.854)	0.531E-05NS (0.754)	0.236E-06*** (3.539)
Land (X_1)	-0.756E-10NS (-0.875)	-0.856E-10*** (-11.232)	-0.857E-10* (-1.755)	-0.715E-10NS (-1.245)	-0.514E-11NS (-0.231)
Farmer Age (X_2)	-0.354E-07* (-2.575)	-0.275E-07*** (-10.257)	-0.323E-07NS (-1.270)	-0.823E-07NS (-0.613)	-0.513E-08* (-1.711)
Farmer Education (X_3)	0.637E-08** (2.854)	0.765E-08*** (12.911)	0.531E-08*** (2.855)	0.564E-08NS (1.513)	0.753E-08*** (2.765)
Farmer Experience (X_4)	0.283E-07NS (1.756)	0.458E-07*** (7.755)	0.254E-07NS (0.751)	0.746E-07NS (1.324)	0.615E-08NS (0.574)

Number of Family Members (X_5)	0.675E-08NS (1.341)	0.685E-08*** (11.544)	0.876E-08NS (0.766)	0.651E-08NS (0.413)	0.715E-08NS (1.413)
Failure Frequency (X_6)	-0.354E-06NS (-0.773)	-0.455E-06*** (-9.571)	-0.735E-06NS (-0.887)	-0.547E-06NS (-0.751)	-0.376E-07* (-1.919)
Farmer Income (X_7)	0.258E-05** (2.875)	0.3533E-05*** (10.553)	0.725E-05*** (3.430)	0.475E-06NS (1.521)	0.817E-06* (1.986)
Dummy (D)	0.715E-06*** (3.751)	0.872E-06*** (8.776)	0.985E-06*** (3.356)	0.652E-06*** (2.967)	0.581E-06*** (2.919)
R ²	0.935	0.935	0.935	0.935	0.935
F-Count/LR	8.753***	22.446***	22.446***	22.446***	22.446***

Source : Primary Data Analysis.

Information :

- OLS : *Ordinary least square*
- *Depvar* : Improved heteroscedasticity with *dependent variables*
- *Mult* : Improvement of heteroscedasticity with *multiplicative*
- *Stdlin* : Improvement of heteroscedasticity with *standard deviation is a linear function of exogenous variable*
- *Varlin* : Correction of heteroscedasticity with *variance is a linear function of exogenous variable*
- *** : significant on $\alpha : 1 \%$
- ** : significant on $\alpha : 5 \%$
- * : significant on $\alpha : 10 \%$
- NS : insignificant on $\alpha : 10 \%$
- The number in parentheses is t-count
- T-table (with $df = \infty$) at $\alpha : 1\% = 2.576$; $\alpha : 5\% = 1.960$; and $\alpha : 10\% = 1.645$
- F-table, at $\alpha : 1\% = 2.510$; $\alpha : 5\% = 1.940$; and $\alpha : 10\% = 1.670$
- Chi-Square, at $\alpha : 1\% = 20.090$; $\alpha : 5\% = 15.510$; and $\alpha : 10\% = 13.360$

Every independent variable has a true partial effect on dependent variables, according to the *depvar* model (improvement of heteroscedasticity with dependent variables).

Land

Farmers have relatively small land areas, with an average of 2,526 m² for chicory cultivation and 2,719 m² for cabbage growing. As demonstrated by Table 4, which indicates that the land area has a significant and negative regression coefficient, an increase in land area will, *ceteris paribus*, result in a significant drop in the risk coefficient. Inare to risk failure. In other words, the larger the farmland, the more reluctant farmers are to risk failure. These results are consistent with studies that indicate farmers are less willing to take

The results of the socioeconomic factors that affect farmers' attitudes on the risks involved in growing cabbage and chicory can be summarized as follows (table 4):

on the risk of failing the larger their acreage [12], but in contrast to the study's findings [10].

Farmers consider growing cabbage and chicory to be a risky decision due of the unpredictability involved. A small piece of land that is already hazardous increases the likelihood of failure, especially when paired with a vast amount of land. In addition to the unknown factor, pest diseases and deteriorated soil conditions also provide a risk of failure. Saturation, a condition of the soil that makes it difficult for water to be absorbed, affects some farmer-owned areas. Cabbage and chicory may initially thrive if the soil

is still planted, but they will eventually wilt and perish. Many scientists believe that this is caused by over use of inorganic fertilizers and pesticides, which contaminate the soil with chemicals. As a result, farmers are less inclined to grow chicory and cabbage on big tracts of land.

Farmer Age

Farmers are 44 years old on average, with the youngest being 22 and the oldest being 65. *Ceteris paribus*, because aging has a negative and considerable regression coefficient, getting older will cause the risk coefficient to significantly decline. Put differently, younger farmers are less likely to take on the danger of failure, but elderly farmers are more reluctant to do so.

This makes sense because older farmers may be more skilled and experienced, but they also tend to be more conservative and easily fatigued. Younger farmers are more physically fit and more receptive to new ideas despite having less experience and expertise. This growing tendency is often reflected in the actions of younger farmers who are more willing to take risks. A few young farmers who are starting to have the guts to change how they use production parameters serve as examples of this. For example, they have started using organic fertilizers rather than chemical ones, and they have started using fewer chemical pesticides, though they will still use them if needed to fight pests and diseases because this is how farmers typically do it. Every week, bugs and diseases show up. These results align with earlier studies that demonstrate an increase in farmers' aversion to failure as they get older [12], Age has the similar tendency in research [10], i.e., it is negatively associated to the risk coefficient, but this relationship is not statistically significant. These findings run counter to studies that indicate younger farmers take fewer risks than their more experienced counterparts [25].

Education

Farmers have an average of 12 years of formal education, with a range of 6 to 16 years. As a result, the average farmer holds a junior high

diploma (SMP). When other factors are consistently taken into account, the regression coefficient for the farmer education variable is positive and significant. This implies that a greater degree of education will cause the risk coefficient to rise significantly. In other words, more educated farmers are more inclined to take risks. This is made possible by the risk-taking nature of the average farmer, who has completed junior high school and is generally well-educated. These findings are in line with studies demonstrating that farmers with greater levels of education exhibit stronger risk aversion. [12], Although in research [10] the trend is the same even when education is not important.

Experience

Farmers' experiences cultivating cabbage and chicory vary greatly. Farmers have grown cabbage and chicory for 9 to 44 years, with an average of 19 years. *Ceteris paribus*, the regression coefficient for farmers' experience growing cabbage and chicory is positive and significant, suggesting that the risk coefficient will increase significantly as farmers gain more experience with these crops. Put another way, if farmers are more skilled at cultivating cabbage and chicory, they will be less reluctant to take chances. These results are consistent with earlier research showing that farmers with greater agricultural experience are less risk averse [12], even while research [10] demonstrated that farming experience is not significant, the tendency is still the same.

Farmers have the knowledge and skills required to grow cabbage and chicory thanks to their observations and experience, which includes both firsthand environmental information and wisdom passed down from generation to generation. Mature farmers are highly trained and aware of the potential repercussions of their decisions, including those pertaining to price and production, and they are open to learning from their mistakes. This is exemplified by certain farmers who are members of farmer groups, who always consider the experiences and events of the past before deciding to cultivate chicory and cabbage. They also look at other areas that produce

comparable goods because it may be inferred that if other areas produce the same goods, the price at harvest will decline, requiring the usage of different crops. Farmers will make an effort to plan ahead in order to avoid making the same mistakes because they will learn priceless lessons from past failures.

Number of Family Members

The average farmer has a family of 3, however families can range in size from 2 to 4. Because the variable number of family members has a positive and large elasticity, adding more family members will significantly raise the risk coefficient, providing all other variables remain constant. This suggests that having a larger family will make farmers less inclined to take chances.

This is because there is a clear correlation between the number of family members and labor availability. Please be advised that cultivating cabbage and chicory requires a lot of labor. Most farmers use family labor for everything from seed preparation to soil cultivation, planting, weeding, fertilizing, watering, harvesting, and post-harvest. The study's findings also demonstrate that the leader of a large family must put in more effort to support the family and produce positive outcomes. This encourages farmers to be more daring and take more risks. These findings are consistent with research that indicates farmers are less risk averse the more family members they have [12], even though the number of family members is small in research [10], the pattern is the same regardless of the study's conclusions [27, 28, 29].

Failure Frequency

Most farmers fail to grow cabbage and chicory because of seasonal unpredictability, which leads to the emergence of pests and diseases. Apart from the high cost of cultivating cabbage and chicory, these crops also fail due to price fluctuations. Over the past five years, failures have happened 0.9 times on average, with a range of 0 to 2 times. In the farming of chicory and cabbage, the elasticity of the frequency of failure has a considerable and significant value, which means

that, if all other factors remain constant, an increase in the frequency of failure will result in a significant decrease in the risk coefficient. Put another way, when failures happen more often, farmers are less inclined to take chances. This outcome is consistent with studies that demonstrate a negative relationship between the risk coefficient and failure frequency, indicating that farmers become less risk averse as they encounter more failures [10,12].

Income

Farmers earn between IDR 36,000,000 and IDR 141,000,000 annually, with an average of IDR 42,500,000. Most of this revenue comes from the production of tobacco, chile, chicory, and cabbage. The positive and significant elasticity of a year's worth of farmers' earnings means that, *ceteris paribus*, an increase in agricultural income will result in a significant increase in the risk coefficient. Put another way, farmers will be less afraid to take risks if they earn more money from farming. The study's findings are consistent with other studies demonstrating that farmers' risk aversion will decrease as income rises [12], even though research [10] discovered a strong but non-statistically significant relationship between income and the risk coefficient.

This makes sense because the major reason farmers grow cabbage and chicory is to make a lot of money. These crops are expensive to raise, hence a significant income is required. Even affluent farmers dare to grow chicory and cabbage on a bigger scale. Since they still have a budget for living expenses, they don't mind embracing the potential of failing.

Dummy

Dummy variables are used to distinguish between the crop commodities being farmed, such as cabbage and chickory; for instance, $D = 0$ for chicory and $D = 1$ for cabbage. The regression coefficient for the dummy variable is positive and significant, indicating that farmers' willingness to take on the risks involved in growing chicory and cabbage varies. The average coefficient values for

growing cabbage and chicory are $-0.213\text{E}-06$ and $-0.542\text{E}-07$, respectively. This suggests that farmers are less willing to take on the danger of growing

CONCLUSION

Based on the research and discussion findings, the following conclusions can be drawn: (1) It is riskier to cultivate cabbage than chicory. (2) Farmers who cultivate chicory and cabbage both act hesitantly when averting risks. (3) Land area, age, education, experience growing cabbage and chicory, number of family members, frequency of failures in growing these crops over the past five years, and farming income are socioeconomic factors that significantly influence farmers' behavior regarding the risk of growing these crops. Education, previous experience growing chicory and cabbage, the number of family members, and farming revenue have a beneficial impact, while land acreage, the farmer's age, and the frequency of not cultivating these crops during the previous five

chicory than they are of growing cabbage. This is due to the former's increased susceptibility to illnesses and pests.

years have a negative impact. The farmer is less willing to take risks the bigger the land, the older he gets, and the more times he fails. A farmer who is better educated, has more experience cultivating cabbage and chicory, has more relatives, and makes more money from farming will be less dangerous. (4) Compared to cultivating chicory, farmers are less willing to take on the hazards associated with growing cabbage. Growers who plant cabbage and chicory on time will get the best results; those that plant them later will get less than optimal results. Government controls on when to sow cabbage and chicory are necessary in situations like these. Farmers are given advice on when to plant cabbage and chicory.

ACKNOWLEDGMENTS

We would like to express our gratitude to the University of Muhammadiyah Yogyakarta for

providing this research funding

REFERENCES

- [1]. Velisitas P. M, Hilman A, Budi T. R (2022). Gambaran Pengetahuan dan Sikap tentang Konsumsi Buah dan Sayur pada Peserta Didik SMA Katolik Rex Mundi Manado. *Jurnal Kesmas*. Volume 12 Nomor 1. Hal 86-89. <https://ejournal.unsrat.ac.id/v3/index.php/kesmas/article/view/46323/41436>
- [2]. Pranata, A., & Umam, A. T. (2015). Pengaruh Harga Bawang Merah Terhadap Produksi Bawang Merah Di Jawa Tengah. *JEJAK*, 8(1). <https://doi.org/10.15294/jejak.v8i1.3852>
- [3]. Harahap, A. S., Luta, D. A., Sri, D., & Sitepu, M. B. (2022). Karakteristik Agronomi Beberapa Varietas Bawang Merah (*Allium ascalonicum* L.) Dataran Rendah. Seminar Nasional UNIBA Surakarta, 287–296. [file:///C:/Users/sriya/Downloads/372-Article Text-675-1-10-20220805.pdf](file:///C:/Users/sriya/Downloads/372-Article%20Text-675-1-10-20220805.pdf)
- [4]. Helmayuni, Mardianto, & Agustin, F. (2022). Analisis Risiko Produksi Dan Perilaku Petani Menghadapi Risiko Usahatani Bawang Merah Di Nagari Paninggahan Kecamatan Junjung Sirih Kabupaten Solok. 2(2), 159–166. <https://ejournal-unespadang.ac.id/index.php/EJPP>
- [5]. Rahmadona, L., Fariyanti, A., & B. (2017). Daya Saing Komoditas Bawang Merah di Kabupaten Majalengka, Jawa Barat. *Jurnal Hortikultura Indonesia*, 8(2), 128–135. <https://doi.org/10.29244/jhi.8.2.128-135>
- [6]. Harinta, Y. W., Basuki, J. S., & Sukaryani, S. (2018). Pemetaan dan Pengembangan Agribisnis Komoditas Unggulan Sayuran di Kabupaten Karanganyar. *Jurnal Agriekonomika*, 7(1), 37–45. <https://doi.org/http://dx.doi.org/10.21>

- 107/agriekonomika.v6i1.1895.
- [7]. Septiadi, D., & Joka, U. (2019). Analisis Respon dan Faktor-Faktor yang Mempengaruhi Permintaan Beras Indonesia. *Agrimor: Jurnal Agribisnis Lahan Kering*, 4(3), 42–44. <https://doi.org/10.32938/ag.v4i3.843>.
 - [8]. Mutisari, R., & Meitasari, D. (2019). Analisis Risiko Produksi Usahatani Bawang Merah di Kota Batu. *Jurnal Ekonomi Pertanian Dan Agribisnis*, 3(3), 655–662. <https://doi.org/10.21776/ub.jepa.2019.003.03.21>
 - [9]. Saifan, S., Shibli, R., Yajid, M. S. A., Abd Hamid, J., & Azam, S. M. F. (2021). A Time Series Analysis to Enhancing Net Revenue of Farming in Malaysia through Agriculture Extension and Risk Aversion. *AgBioForum*, 23(2), 113–122.
 - [10]. Pujiharto & Sri Wahyuni. (2017). Analisis Perilaku Petani Terhadap Risiko Usahatani Sayuran Dataran Tinggi: Penerapan Moscardi and de Janvry Model. Universitas Nusantara PGRI Kediri, 01(1), 65–73.
 - [11]. Erny, Darwanto, D. H., Masyhuri, & Waluyati, L. R. (2019). Farmer's behavior towards lembah palu shallot farm risks in central sulawesi, Indonesia. *EurAsian Journal of BioSciences*, 13(2), 931–936. <https://www.proquest.com/openview/cb60064817f30384f6b5eabd88d02bcf/1?pq-origsite=gscholar&cbl=2042720>
 - [12]. Sriyadi, & Yekti, A. (2021). Farmers' behavior towards risks of shallot farming: a case study in Kalisoro village, Tawangmangu district, Karanganyar regency, Central Java. *E3S Web of Conferences*, 316, 1–13. <https://doi.org/10.1051/e3sconf/202131602043>
 - [13]. Choiril, C., Soetriono, S., & Hani, E. S. (2018). Analisis Faktor-faktor Sosial Ekonomi yang Mempengaruhi Perilaku Petani dalam Menghadapi Risiko Usahatani Kentang. *SOROT*, 13(1), 15–27. <https://doi.org/10.31258/sorot.13.1.4810>
 - [14]. Martínez-Rodríguez, A., Martínez-Olcina, M., Hernández-García, M., Rubio-Arias, J. Á., Sánchez-Sánchez, J., Lara-Cobos, D., Vicente-Martínez, M., Carvalho, M. J., & Sánchez-Sáez, J. A. (2021). Mediterranean Diet Adherence, Body Composition and Performance in Beach Handball Players: A Cross Sectional Study. *International Journal of Environmental Research and Public Health*, 18(6), 2837. [https://doi.org/10.3390/ijerph18062837file:///C:/Users/sriya/Downloads/2099-4428-1-SM\(1\).pdf](https://doi.org/10.3390/ijerph18062837file:///C:/Users/sriya/Downloads/2099-4428-1-SM(1).pdf)
 - [15]. Kroytor, O. K., Malykh, M. D., & Karnilovich, S. P. (2020). Kinematic support modeling in Sage. *Discrete and Continuous Models and Applied Computational Science*, 28(2), 141–153. <https://doi.org/10.22363/2658-4670-2020-28-2-141-153>
 - [16]. Maibvise, C., & Mavundla, T. R. (2019). A model to promote the uptake of male circumcision as an HIV-preventive measure in high HIV and low male circumcision prevalence settings. *Health SA Gesondheid*, 24, 1–8. <https://doi.org/10.4102/hsag.v24i0.1070>
 - [17]. Hadi Darwanto, D., & Rahayu Waluyati, L. (2019). Farmer's behavior towards Lembah Palu shallot farm risks in Central Sulawesi, Indonesia. *EurAsian Journal of BioSciences Eurasia J Biosci*, 13(July), 931–936. <https://www.proquest.com/openview/cb60064817f30384f6b5eabd88d02bcf/1.pdf?pq-origsite=gscholar&cbl=2042720>
 - [18]. Chen, K. Z., Meilke, K. D., & Turvey, C. (1999). Income risk and farm consumption behavior. *Agricultural Economics*, 20(2), 173–183. [https://doi.org/10.1016/S0169-5150\(98\)00079-6](https://doi.org/10.1016/S0169-5150(98)00079-6)
 - [19]. Winkelmann, R. (2008). Econometric analysis of count data. In *Econometric Analysis of Count Data*. <https://doi.org/10.1007/978-3-540-78389-3>
 - [20]. Gujarati, D. (2012). *Econometrics by Example*. <https://zalamsyah.staff.unja.ac.id/wp-content/uploads/sites/286/2019/11/7-Econometrics-by-Example-Gujarati.pdf>

- [21]. Greene, W.H., *Econometric Analysis*, Second Edition. Macmillan Publishing Company. New York, (1993).
- [22]. White, K.J., S.D. Whistler., S.A. Haun. *Shazam Econometrics Computer Program: User's Reference Manual Version 6.2*. McGraw-Hill Book Company, (1990).
- [23]. Tanaya, I. G. L. P., Rosmilawati, R., & Hidayati, A. (2020). Analisis Risiko Produksi Usahatani Sayuran Di Kabupaten Lombok Utara. *JURNAL AGRIMANSION*, 21(2), 69–81.
<https://doi.org/10.29303/agrimansion.v21i2.383>
- [24]. Triyono, Fauzan, M., Mu'awanah, J., & Sedek, M. (2021). Production Factor Efficiency of Shallot Farming in Pati, Central Java, Indonesia. *E3S Web of Conferences*, 316, 1–10.
<https://doi.org/10.1051/e3sconf/202131602036>
- [25]. Fauzan, M. (2016). Pendapatan, Risiko dan Efisiensi Ekonomi Usahatani Bawang Merah di Kabupaten Bantul. *AGRARIS: Journal of Agribusiness and Rural Development Research*, 2(2), 107–117.
<https://doi.org/10.18196/agr.2231>
- [26] Scott, J.C. (1977) *The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia*. Yale University Press, New Haven.
- [27]. Ghozali, M. R., & Wibowo, R. (2019). Analisis Risiko Produksi Usahatani Bawang Merah di Desa Petak Kecamatan Bagor Kabupaten Nganjuk. *Jurnal Ekonomi Pertanian Dan Agribisnis*, 3(2), 294–310.
<https://doi.org/10.21776/ub.jepa.2019.003.02.7>
- [28]. Istiyanti, E., & Maylani, K. (2022). The efficiency of shallot farming in the highlands and lowlands in Magetan Regency, East Java Province. *E3S Web of Conferences*, 361, 1–10.
<https://doi.org/10.1051/e3sconf/202236102009>
- [29]. Rahmawati, N., & Triyono, T. (2017). Keberanian dalam Mengambil Keputusan dan Risiko sebagai Karakter Wirausaha Petani Padi Organik di Kabupaten Bantul. *AGRARIS: Journal of Agribusiness and Rural Development Research*, 3(2).
<https://doi.org/10.18196/agr.3253>