

How Risk Attitudes Affect The Implementation Of Good Agricultural Practices In Sugarcane Farming

Annisa Fauzia Astari¹, Irham², Arini Wahyu Utami²

¹Master of Agribusiness Management, Faculty of Agriculture,
Universitas Gadjah Mada

²Faculty of Agriculture, Universitas Gadjah Mada
Jl. Flora Bulaksumur (A10 Building) Yogyakarta, Indonesia
annisa.fauzia.a@mail.ugm.ac.id

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ABSTRACT

Indonesian Ministry of Agriculture issued Minister of Agriculture Regulations Number 53 in 2015 about Good Agricultural Practices for Sugarcane as an effort to increase the production and productivity of sugarcane. The implementation of GAP on various commodities differs since risk across commodities and risk attitude among farmers are varying. Hence, this study aims to analyze (1) the implementation level of Sugarcane GAP among farmers of the Wonolangan Sugar factory and (2) the influence of risk attitudes toward GAP implementation. The study was conducted on 102 randomly-selected farmers in Lumajang and Probolinggo Regency. The level of GAP implementation was measured by Likert scale with nine indicators of Sugarcane GAP. The level of GAP implementation was categorized into low, medium, and high based on the total score of GAP implementation obtained from each farmer. One-sample t-test was used to test the implementation level of GAP. Risk attitudes were measured with a Likert scale, referring to Pennings and Garcia method. The influence of risk attitudes towards GAP implementation was analyzed using OLS regression. The result of t-test shows that the level of GAP implementation among sugarcane farmers was medium and high, and most farmers were risk-averse. Of the nine components used as indicators, seed preparation and labor welfare were in the medium category. Based on the OLS regression, risk-taker farmers had a lower GAP implementation than that of risk-averse farmers. Farmers' lack of knowledge about GAP guidelines, can be supported by the presence of socialization activities by sugar factories, extension workers, and related institutions.

Keywords: Good Agricultural Practices, Risk Attitudes, Sugarcane

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INTRODUCTION

Indonesian government has designed various efforts to increase the production and productivity of sugarcane through the expansion of sugarcane area program, rehabilitation of ratoon

plants, ratoon care, arrangement of varieties based on typology of each region, implementation of load-cutting and transporting criteria with clean fresh sweet criteria, application of appropriate cultivation technology

and assistance in the form of tools and machines (Kementerian Pertanian, 2015). However, these efforts were not in good progress until the government issued guidelines in the form of Minister of Agriculture Regulation Number 53 in 2015 about Good Agricultural Practices for Sugarcane. The guideline regulates nine components in sugarcane cultivation, namely arrangement of varieties, determination of planting period, land determination, tillage, seed preparation, planting, treatment, harvest, and labor.

Sugarcane plantation area in Indonesia is dominated by smallholder sugarcane farmers that are still not implementing Good Agricultural Practices (GAP) and it can affect the sugarcane productivity nationally (Anggraini, 2018). Since the sugarcane GAP guideline was issued in 2015, research about sugarcane GAP implementation has yet to be done. However, research about level of GAP implementation has been carried out on several commodities and it is known that the level of implementation of GAP in organic rice farming in Bantul Regency can be categorized high (Sriyadi et al., 2017) but also providing security for producers and consumers and ensuring environmental sustainability for sustainable production. Organic farming systems are expected to solve

the problem for realizing food security and enhancement of people's welfare. The results of research indicated that, (1, the onion farming in Bantul Regency is categorized as low (Suharni et al., 2017) but its productivity is low. In 2015, the productivity of shallots in Bantul Regency was 7.66 tons/ha. The application of Good Agriculture Practices (GAP, in garlic farming in Temanggung Regency is categorized as low (Wardani & Darwanto, 2019), and in pepper farming is categorized as good (Setiawan et al., 2015).

From those studies, it can be concluded that the level of farmers' GAP implementation in each commodity is different. This depends on farmers' perceptions and assessments of the positive or negative benefits that are expected to be obtained by farmers for their farming (Sari et al., 2016) and it can also be affected by farmers' socio-economic factors, such as gender, age, level of education, landholding size, farming experience, and membership in the organization (Suwanmaneepong et al., 2016) Good Agricultural Practices (GAP). In addition, it is also caused by different risk on each commodity and farmer's risk attitudes. Risk attitudes are a decision maker's interpretation of the content of the risk, and how much they like or dislike the risk, typically characterized as risk-taker and risk-

averse (Bishu et al., 2018). Thus, risk attitudes can be categorized into risk-takers, risk-neutral, and risk-averse.

In general, the most important sources of risk are price, production, and financial (Kisaka-Lwayo & Obi, 2012). Sources of risk in agriculture are also derived from markets, business, technology, loss, social and legislation, and human factor (Asnah et al., 2015). The Good Agricultural Practices Guidelines for Sugarcane is an agricultural policy issued by the government, so it is a source of risk for farmers. A risk-taker individual is usually more innovative since, in the early stages of innovation implementation, it is not always followed by success (Hanafie, 2010). Understanding farmers' risk attitudes can steer the policy in the right direction so that the objectives of the policy can be realized (Wauters et al., 2014).

Most decision-makers are risk-averse in various sources of farming risk (Iqbal et al., 2016). For example, research in Enrekang and Northwest Mexico shows that most farmers have a risk-averse attitude (Nurhapsa et al., 2018; Torres et al., 2019) *management and investment decisions at the farm level. They are key factors related to farmers' attitudes towards the environment and climate change. Several methodological approaches, which were considered to*

*be preferable for measuring the level of risk of an economic agent, ranging from highly risk-tolerant to highly risk-averse attitudes, are available. The Multiple Price List (MPL). However, different results were shown on farmers in Nigeria, 88.7% of cassava farmers in Nigeria have a risk-neutral attitude (Ayinde, 2017). Based on studies in Australia, it is known that farmers who are risk-takers have a relatively high level of Best Management Practices implementation (Greiner et al., 2009) in general terms and in response to regional challenges. One tool for achieving environmental improvements in agriculture is the design and promotion of region-specific 'best management practices' (BMPs). It is also consistent with studies on French beans farmers in Kenya that farmers who are risk-taker tend to comply with global-GAP standards than risk-averse farmers (Kibet et al., 2018) *aversion to loss ($p=0.094$.**

Research on the farmers' level of GAP implementation in sugarcane farming since the issuance of these guidelines has never been carried out, so the first objective of this study is to determine the level of GAP implementation of sugarcane farmers'. In addition, different results from previous studies on different commodities become the background of this study to find out the influence of farmer's risk attitudes

towards the implementation of GAP in sugarcane farmers, and to support this objective, it is necessary to know the risk attitude of sugarcane farmers.

METHODS

Data Collection

This research was conducted among sugarcane farmers in Lumajang and Probolinggo Regencies (Figure 1). The sugarcane farmers participating in the study were partners of Wonolangan Sugar Factory located in Probolinggo Regency. Respondents were randomly selected, and we were able to interview 102 farmers; 59 farmers from Lumajang Regency and 43 farmers from Probolinggo.

Measuring The Level of GAP Implementation

The level of sugarcane GAP implementation was measured by a Likert scale of one to five, based on nine components of the Sugarcane GAP. The nine components of GAP were: arrangement of varieties (8 items), determination of planting period (3 items), determination of land (3 items), tillage (8 items), seed preparation (4 items), planting (4 items), treatment (23 items), harvest (3 items), and labour (4 items). The total score of GAP implementation categorized into low (GAP score of 64-140), medium (score of 141-220), and high level (score of 221-300) adopted from Sriyadi et al.

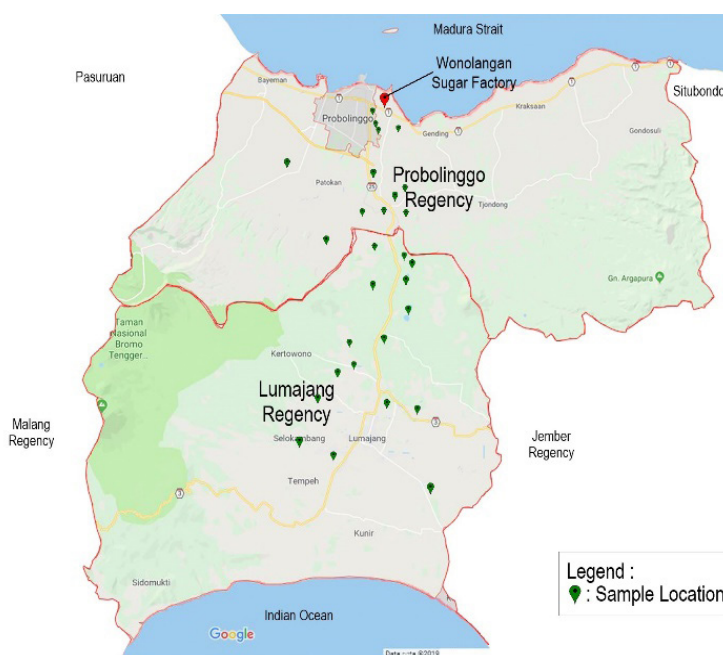


Figure 1. Research Location
Source: Google Maps

(2017) and computed with the following formula:

$$\text{Interval} = \frac{\text{Highest Score} - \text{Lowest Score}}{\text{Number of Categories}}$$

Measuring Risk Attitude

Farmer's risk attitude was measured by a Likert scale of -4 (strongly disagree) to 4 (strongly agree), as referred to the Pennings & Garcia's method that is also used by Domingo *et al.* (2015). Farmers were asked questions that describe their preferences or attitudes related to the risk. The questions include: (1) When cultivating sugarcane, I prefer to know with certainty the financial returns; (2) In sugarcane production, I am willing to take higher financial risks in order to realize higher average returns; (3) I like taking financial risks in sugarcane production ; (4) When selling my produce, I am willing to take higher financial risks in order to realize higher average returns; (5) I like "playing it safe" when cultivating sugarcane and selling produce; (6) In making on-farm decisions, I (am risk-averse) don't like taking risks; (7) In making on-farm decisions, I prefer certainty to uncertainty in terms of decision outcomes. The total score of the seven questions indicated farmer's risk attitude: those with total negative values were risk-takers; those with total positive values were risk-averses; and

those with a total value of zero (0) were risk-neutrals.

Data Analysis

One-sample t-test was used to test whether the level of GAP implementation is low (GAP score ≤ 140). The $t_{\text{statistic}}$ was computed with the following formula:

$$t_{\text{statistic}} = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

Where, \bar{x} is mean of the data, μ is the tested value, s is standard deviation, and n number of observation. H_0 was rejected, if $t_{\text{statistic}} < -t_{\text{table}}$ (-0.67693), indicating the average total score of farmers' level of GAP implementation ≤ 140 (low). On the other hand, H_0 was failed to reject, if $t_{\text{statistic}} \geq -t_{\text{table}}$ (-0.67693), meaning that the average total score of farmers' level of GAP implementation > 140 (medium or high). The one-sample t-test was also used to test whether farmer's risk attitude is categorized as risk-averse (risk-attitude score > 0). H_0 was rejected, if $t_{\text{statistic}} > t_{\text{table}}$ (0.67693), showing that the average total score of farmers' risk attitude > 0 (risk-averse). And H_0 was failed to reject if $t_{\text{statistic}} \leq t_{\text{table}}$ (0.67693), portraying the average total score of farmers' risk attitude ≤ 0 (not risk-averse).

As to assess the effect of farmer's risk attitudes on GAP implementation, OLS regression was used. The model is as follows:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + d_1D_1 + d_2D_2 + e$$

Where Y is total score of GAP implementation (total of Likert scale), b_0 is intercept, b_1 to b_5 is regression coefficients of the independent variables, d_1 and d_2 is regression coefficients of the independent dummy variables, X_1 is farmer's age (year), X_2 is size of cultivated land (hectare), X_3 is farming experience (year), X_4 is farmer's involvement in farmer's group (total of Likert scale), X_5 is farmer's education (year), D_1 is farmer's gender (1 = female ; 0 = otherwise); D_2 is farmer's risk attitude (1 = Risk-taker ; 0 = otherwise), and e is residuals.

RESULTS AND DISCUSSION

The Level of GAP Implementation in Sugarcane Farming

The level of sugarcane GAP implementation in this study is divided into three categories, there are low, medium and high. From the result of

one sample t-test, obtained the value of $t_{\text{statistic}}$ was 30.301 and the value of t_{table} for df 101 at a 95% confidence level is -0.67693. The value of $t_{\text{statistic}}$ is greater than t_{table} , then H_0 failed to reject, it means the average total score of farmers' GAP implementation is greater than 140. This value is the upper limit for the low level of sugarcane GAP implementation, thus the level of GAP implementation of Wonolangan Sugar Factory farmers was not low (medium and high).

Table 1 shows that there are no farmers in the low level of GAP implementation. Out of 102 farmers, 56.9% had a medium level of GAP implementation and 43.1% had a high level of GAP implementation. The level of GAP implementation on sugarcane farmers had not been entirely high.

It was caused by many farmers do not yet know the guidelines for sugarcane GAP. Only 21.6% of farmers already knew about the guidelines (table 4). The results of this study are

Table 1. Level of GAP Implementation and Risk Attitudes Measurement Results

Level of GAP Implementation	Risk Attitudes		Total (%)
	Risk-Averse (%)	Risk-Taker (%)	
Medium	44.1	12.7	56.9
High	33.3	9.8	43.1
Total	77.5	22.5	100.0
$t_{\text{statistic}}$: level of GAP implementation			30.301**
$t_{\text{statistic}}$: risk attitude			3.691**

Source : Primary data analysis (2019)

Information : ** (significant at the 5% error rate)

Table 2. GAP Implementation on Nine Indicators

Indicators	Maximum Score	Average Score	GAP Implementation (%)	Criteria
Land Determination	15	13.48	89.87	High
Harvest	15	13.23	88.17	High
Varieties Arrangement	40	33.94	84.85	High
Planting	20	15.42	77.11	High
Tillage	40	30.37	75.93	High
Determination of Planting Period	15	11.02	73.46	High
Treatment	115	80.67	70.15	High
Seed Preparation	20	10.6	52.99	Medium
Labor	20	10.02	50.1	Medium
Total	300	219		
Average			73.63	

Source : Primary data analysis (2019)

not consistent with previous studies, for example, the level of GAP implementation in organic paddy and pepper farmers categorized as high and good (Setiawan et al., 2015; Sriyadi et al., 2017) but also providing security for producers and consumers and ensuring environmental sustainability for sustainable production. Organic farming systems are expected to solve the problem for realizing food security and enhancement of people's welfare. The results of research indicated that, (1, whereas in onion and garlic farmers are categorized as low (Suharni et al., 2017; Wardani & Darwanto, 2019) but its productivity is low. In 2015, the productivity of shallots in Bantul Regency was 7.66 tons/ha. The application of Good Agriculture Practices (GAP. In addition, the complexity and difficulty of GAP guidelines to be understood can

be one of the obstacles for farmers to implement GAP (Wongprawmas et al., 2017).

From each indicator of sugarcane GAP (table 2), it can be known that 7 of 9 GAP indicators were in the high level of GAP implementation. Indicators that are in the high level of GAP implementation included land determination, harvesting, varieties arrangement, planting, determination of planting period, tillage, and maintenance. Meanwhile, indicators that are at the medium level of GAP implementation were seed preparation and labor. Overall the percentage of sugarcane GAP implementation reached 73.63%.

Land determination was an indicator with the highest percentage of GAP implementation, reaching 89.87%. That is because the land used by farmers

is not contaminated with metals and chemical residues and the land is suitable for sugarcane cultivation. In addition, the land is a not endemic area for plant pests, especially sugarcane pests.

At harvest indicator, although the sugarcane farmers had fulfilled the criteria of sweet, clean, and fresh, obstacles sometimes occurred during the queuing mill at the sugar factory. The GAP guideline recommends that sugarcane be loaded and ground within 24 hours after harvesting, but the SOPs of sugar factories differed, the maximum to milled sugarcane is 36 hours from harvest. In addition, the obstacles were also caused by defective milling tools during the milling process.

The varieties arrangement indicator had a percentage of GAP implementation reaching 84.85%. This was obtained because farmers had used superior varieties according to the recommendations of the GAP guidelines, for example, *Bulu Lawang*, *PS 862*, and *PS 864*. Obstacles in the arrangement of the varieties also related to the obstacles in the determination of the planting period, that was the discrepancy between the composition of the varieties' maturity and the time of planting as farmers cultivated sugarcane on dry land with limited water availability. Planting was usually done by farmers at the beginning of the rainy season. However,

the beginning of the rainy season was difficult to predict at that time. Based on the sugar cane GAP guidelines, planting is recommended from September to November for dry land.

The percentage of GAP implementation in the seed preparation indicator was only 52.99% because farmers rarely used seeds from seedling, tissue culture gaps, and certified nurseries gardens. Usually, farmers used seeds from other farmers or have their nurseries, whereas, in the sugarcane GAP, farmers were encouraged to use seeds that came from certified nurseries gardens. The use of these seeds was due to the availability of capital owned and the high returns expected by the farmers. So, farmers are not willing to spend more. In addition, seeds from their nurseries or other farmers are easier to obtain.

On the labor indicator, the percentage of GAP implementation that only 50.10% was caused by the welfare of the labor that has not been fully borne by farmers. Labour safety could be said to be low, especially in the application of chemical pesticides and fertilizers. There were still many workers who had not used protective equipment when applying chemical pesticides and fertilizers. In addition, health care for workers was not available, but in the event of a work accident, farmers were

willing to take responsibility whether it was full or partial responsibility and resolved amicably.

The Influence of Farmer's Risk Attitudes towards GAP Implementation

Sugarcane farmers who became the respondents were aware that agricultural activities are full of risks. However, it did not necessarily make farmers have a risk-taker attitude, although farmers would still face the risks from agricultural activities, which will be carried out by minimizing the risk of exposure being faced. The willingness of farmers to face this risk was because farmers realized that sugarcane farming would provide benefits in the long run, even though in certain years it will cause losses. In addition, farmers also argued that their land is more profitable for sugarcane farming than other farming.

The results of this study that 77.5% of farmers were risk-averse and 22.3% of farmers are risk-takers (table 1). This is consistent with research on farmers in Bangladesh, Enrekang, and Northwest Mexico (Mitra & Sharmin, 2019; Nurhapsa et al., 2018; Torres et al., 2019) management and investment decisions at the farm level. They are key factors related to farmers' attitudes towards the environment and climate change. Several methodological approaches, which were

considered to be preferable for measuring the level of risk of an economic agent, ranging from highly risk-tolerant to highly risk-averse attitudes, are available. The Multiple Price List (MPL that most of the farmers are risk-averse. From the results of the one-sample t-test, the value of $t_{\text{statistic}}$ (3.691) > t_{table} (0.67693), which means rejecting H_0 and the average total score of farmers' risk attitudes > 0 or risk-averse. The results of risk attitudes measurement in this study are also in accordance with the previous study, that most decision-makers are risk-averse and will avoid a risky situation even if the returns are higher (Ullah et al., 2015). In this case, a farmer is a decision-maker in their farming activities.

The results of OLS analysis (Table 3) indicate that 30.13% of dependent variable variation can be explained by the independent variables included in the model, while 69.87% is explained by variables that are not included in the model. Based on the significant of prob F value, it means that the independent variables simultaneously influence the GAP implementation of sugarcane farmers. Partially, only farmer's education and farmer's involvement in farmer's group affecting the implementation of GAP. Is is indicated by a significant value of $t_{\text{statistic}}$ (prob $t < \alpha$).

Table 3 shows that the risk-taker attitude had a negative effect on the

level of GAP implementation, indicated by the negative value of the regression coefficient. The negative value of the risk-taker attitude variable indicates that farmers with risk-taker attitudes tended to have lower GAP implementation than farmers with risk-averse attitudes. It is not consistent with existing theories and research. Farmers with risk-taker attitudes should have a higher level of GAP implementation than farmers with risk-averse attitudes. Statistically, there was no difference in the GAP implementation between a risk-taker and risk-averse farmers ($\text{prob } t > \alpha$) in this study. At the high level of GAP implementation (table 1), 34.3% of farmers were risk-averse and 10.8% of farmers are risk-taker. It shows that farmers with risk-averse attitudes are

more implementing GAP than farmers with risk-taker attitudes. Likewise, at the medium level of GAP implementation, 43.1% of farmers were risk-averse and 11.8% of farmers were risk-taker.

In table 4 can be known that out of 23 farmers, three people knew about the sugarcane GAP guidelines. When comparing it to risk-averse farmers, only 13.6% of risk-taker farmers knew about GAP guidelines, meaning that risk-averse farmers have more knowledge about GAP guidelines than risk-taker farmers. This can be the cause of the GAP implementation of risk-taker farmers which was lower than risk-averse farmers. Age, income from other occupations, and estimated annual income, education and training are some of the factors that influence

Table 3. Results of Ordinary Least Squares Model

Variable	Expected sign	Coefficient	t statistic	Prob t
Constant	+/-	172.4127 ***	9.845045	0.0000
Age	-	0.236434 ns	0.726838	0.4691
Size of Cultivated Land	+	0.091157 ns	0.470970	0.6388
Experience	+	-0.290720 ns	-0.760560	0.4488
Farmer's involvement in farmer's group	+	3.239902 ***	5.111880	0.0000
Education	+	2.255959 ***	3.205463	0.0018
Gender	-	-8.497108 ns	-0.959417	0.3398
Risk Attitude : Risk Taker	+	-4.737356 ns	-0.887833	0.3769
R ²				0.3498
Adj R ²				0.3013
F statistic				7.2231
Prob F				0.0000***

Source : Primary data analysis (2019)

Information : *** (significant at the 1% error rate) ; ns (not significance)

Table 4. Relationship Between Farmer's Risk Attitudes with Farmer's Knowledge of GAP Guidelines, Age, Education, and Organization Involvement Based on The Percentage of Total Farmers

		Risk Attitude		Total (%)	Pear-son χ^2	Signf. χ^2
		Risk Averse (%)	Risk Taker (%)			
Knowledge of GAP Guidelines	Know	18.6	2.9	21.6	1.28	0.259 ^{ns}
	Not Know	58.8	19.6	78.4		
Age	25 - 34	6.9	2.9	9.8	20.17	0.888 ^{ns}
	35 - 44	23.5	9.8	33.3		
	45 - 54	37.3	7.8	45.1		
	55 - 64	7.8	2.0	9.8		
	> 65	2.0	0.0	2.0		
Education	Elementary School	33.3	6.9	40.2	9.31	0.097*
	Junior High School	19.6	3.9	23.5		
	Senior High School	15.7	9.8	25.5		
	Higher Education	8.8	2.0	9.8		
Farmer's Organization Involvement	Active	6.9	2.0	8.8	10.59	0.014**
	Quite active	2.0	0.0	2.0		
	Less active	28.4	1.0	29.4		
	Not Active	40.2	19.6	59.8		
Total		77.50	22.5	100.0		

Source : Primary data analysis, (2019)

Information : ** (significant at the 5% error rate); * (significant at the 10% error rate); ns (not significance)

risk attitudes (Ayinde, 2017; Mitra & Sharmin, 2019) so that it can be a factor that does not directly affect farmer's GAP implementation. Training and education increase farmer risk preferences, while age decreases farmer risk preferences (Mitra & Sharmin, 2019).

Individuals who are more educated are more willing to take risks than less educated (Dadzie & de-Graft Acquah, 2012)stats, and : <https://www.researchgate.net/publication/241699647> Attitudes : The Duakwa Article DOI: 10.5923/j.ijaf.20120202

.06 CITATIONS 3 READS 1044, including : Samuel University 6 SEE All - text , letting . Available : Samuel Retrieved : 25 Abstract Ascertaining the attitude of farmers toward risk is an important first step in understanding their behaviour and coping strategies they normally adopt to mitigate the effects of risk they constantly face within the environment they oper - ate . This study aims at examining risk attitudes of farmers using the Equally Likely Certainty Equivalent with a Purely Hy - pothetical Risky prospect (ELCEPH. Farmers with risk-

taker attitude had higher education compared to farmers with risk-averse attitude. It is known by the number of risk-taker farmers who have educated up to senior high school as much as 43.48% of the total risk-taker farmers. Meanwhile, 43.03% of risk-averse farmers only reached elementary school level.

Risk-taker farmers tend not to be actively involved in organizational activities compared to risk-averse farmers. It can be known in the number of not active risk-taker farmers (table 4), 86.96% of risk-taker farmers were not actively involved in organizational activities. In fact, information dissemination is usually through organizational activities, for example, information about how to cultivate sugarcane and credit that can be obtained by farmers, especially those who are active in the organization. It certainly affects a farmer's knowledge about GAP. Thus, risk-taker had lower GAP implementation than risk-averse farmers.

CONCLUSION AND SUGGESTION

The level of sugarcane GAP implementation in most of Wonolangan Sugar Factory farmers were in the medium level. The GAP implementation of risk-taker farmers that was lower than risk-averse farmers did not

have a significant effect, but farmer's education and organization involvement were the factors influencing the GAP implementation in Wonolangan Sugar Factory farmers. The higher level of farmer's education and organization involvement, the higher the GAP implementation of farmers will be. Farmers' lack of knowledge about GAP guidelines, can be supported by the presence of socialization activities by sugar factories, extension workers, and related institutions. Training and socialization programs that fit to farmers' needs and expectations can be an attraction for farmers to be more actively involved in farmer's group activities.

REFERENCES

- Anggraini, A. (2018). Produktivitas Tebu Rakyat. In Irham, A. Nurhayati, M. Cholidi, & Daniyanto (Eds.), *Peluang Peningkatan Produksi Gula dan Pendapatan Petani melalui Program Konsolidasi Pengelolaan Tebu Rakyat* (pp. 67-68). Yogyakarta: Phoenix.
- Asnah, Masyhuri, Mulyo, J. H., & Hartono, S. (2015). *Tinjauan Teoritis dan Empiris Efisiensi, Risiko, dan Perilaku Risiko Usaha Tani Serta Implikasinya dalam Upaya Pencapaian Swasembada Pangan*.

- Forum Penelitian Agro Ekonomi*, 33(2), 81–94.
- Ayinde, O. E. (2017). Risk Analysis in Innovation System: A Case - Study of Production of Vitamin A Ca. *Journal of Agricultural Faculty of Gaziosmanpasa University*, 34(3), 261–268. <https://doi.org/10.13002/jafag4190>
- Bishu, K. G., O'Reilly, S., Lahiff, E., & Steiner, B. (2018). Cattle Farmers' Perceptions of Risk and Risk Management Strategies: Evidence from Northern Ethiopia. *Journal of Risk Research*, 21(5), 579–598.
- Dadzie, S. K. N., & de-Graft Acquah, H. (2012). Attitudes Toward Risk and Coping Responses: The Case of Food Crop Farmers at Agona Duakwa in Agona East District of Ghana. *International Journal of Agriculture and Forestry*, 2(2), 29–37.
- Domingo, S. N., Parton, K. A., Mullen, J., & Jones, R. (2015). *Risk Aversion among Smallholder High-value Crop Farmers in the Southern Philippines*. PIDS Discussion Paper Series, No. 2015-03, Philippine Institute for Development Studies (PIDS), Makati City.
- Greiner, R., Patterson, L., & Miller, O. (2009). Motivations, Risk Perceptions and Adoption of Conservation Practices by Farmers. *Agricultural Systems*, 99, 86–104.
- Hanafie, R. (2010). *Pengantar Ekonomi Pertanian*. Yogyakarta: Andi.
- Iqbal, M. A., Ping, Q., Abid, M., Kazmi, S. M. M., & Rizwan, M. (2016). Assessing Risk Perceptions and Attitude Among Cotton Farmers : A Case of Punjab Province, Pakistan. *International Journal of Disaster and Risk Reduction*, 16, 68–74.
- Kementan. (2015). *Pedoman Budidaya Tebu Giling yang Baik*. In *Kementerian Pertanian*. Jakarta.
- Kibet, N., Obare, G. A., & Lagat, J. K. (2018). Risk Attitude Effects on Global-GAP Certification Decisions by Smallholder French Bean Farmers in Kenya. *Journal of Behavioral and Experimental Finance*, 18, 18–29.
- Kisaka-Lwayo, M., & Obi, A. (2012). Risk Perceptions and Management Strategies by Smallholder Farmers in KwaZulu-Natal Province, South Africa. *International Journal of Agricultural Management*, 1(3), 28–39.
- Mitra, S., & Sharmin, S. (2019). Risk Attitudes and Financial Profitability of Tomato Farmers - A Study in

- Bangladesh. *Journal of Agricultural Sciences – Sri Lanka*, 14(3), 207.
- Nurhapsa, N., Arham, A., & Sirajuddin, S. N. (2018). Risk Behavior of Onion Farmers in The District Enrekang. *Sebelas Maret Business Review*, 3(1), 1–7.
- Sari, D. P., Syafruddin, R. F., & Kadir, M. (2016). Penerapan Prinsip-Prinsip Good Agricultural Practice (GAP) untuk Pertanian Berkelanjutan di Kecamatan Tinggi Moncong Kabupaten Gowa. *Jurnal Galung Tropika*, 5(3), 151–163.
- Setiawan, F., Inonu, I., & Sitorus, R. (2015). Implementasi GAP (Good Agriculture Practice) Lada dan Pengaruhnya terhadap Produktivitas Lada di Desa Petaling Banjar, Kecamatan Mendo Barat. *Enviagro, Jurnal Pertanian Dan Lingkungan*, 8(2), 72–82.
- Sriyadi, S., Istiyanti, E. I., & Risvansuna Fivintari, F. (2017). Evaluasi Penerapan Standard Operating Procedure-Good Agriculture Practice (SOP-GAP) pada Usahatani Padi Organik di Kabupaten Bantul. *AGRARIS: Journal of Agribusiness and Rural Development Research*, 1(2), 78–84.
- Suharni, S., Waluyati, L. R., & Jamhari, J. (2017). The Application of Good Agriculture Practices (GAP) of Shallot in Bantul Regency. *Jurnal Agro Ekonomi*, 28(1), 48–63.
- Suwanmaneepong, S., Kullachai, P., & Fakkhong, S. (2016). An Investigation of Factors Influencing the Implementation of GAP among Fruit Farmers in Rayong Province, Thailand. *International Journal of Agricultural Technology*, 12(7.2), 1745–1757.
- Torres, M. A. O., Kallas, Z., & Herrera, S. I. O. (2019). Analysis of Farmers' Stated Risk Using Lotteries and Their Perceptions of Climate Change in The Northwest of Mexico. *Agronomy*, 9(1).
- Ullah, R., Shivakoti, G. P., & Ali, G. (2015). Factors Effecting Farmers' Risk Attitude and Risk Perceptions: The case of Khyber Pakhtunkhwa, Pakistan. *International Journal of Disaster Risk Reduction*, 13, 151–157.
- Wardani, A. N. T., & Darwanto, D. H. (2019). The Impact of GAP-SOP on The Production and Technical Efficiency of Garlic in Temanggung Regency. *Agro Ekonomi*, 29(2), 299.

- Wauters, E., Winsen, F. van, Mey, Y. de, & Ludwig Lauwers. (2014). Risk Perception, Attitudes Towards Risk and Risk Management: Evidence and Implications. *Agricultural Economics*, 60(9), 389–405.
- Wongprawmas, R., Canavari, M., & Waisarayutt, C. (2017). A Multi-Stakeholder Perspective on the Adoption of Good Agricultural Practices in The Thai Fresh Produce. *British Food Journal*, 117(9), 2234–2249.