

PERCEPTION OF FARMERS TOWARD ORGANIC PESTICIDE

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ABSTRACT

This study aims to analyze the perception of farmers in Central Java, toward the organic pesticides regarding their benefits, the safety of use, price and quality, easiness level, usage, the internal, and external factors affecting the perception of farmers, then level of education and knowledge of pesticide organic. This study is cross-sectional research with a sample of 36 potato farmers from Dieng Plateau, uses primary data obtained from the questionnaire. The results showed that the main perception of using organic pesticide was influenced by internal factors, the lowest perception score is for the usage. The components of this paper consist of introduction, literature review, materials and methods, result and discussions, conclusions with limitation and future research.

Penelitian ini bertujuan untuk menganalisis persepsi petani terhadap pestisida organik mengenai manfaatnya, keamanan penggunaan, harga dan kualitas, tingkat kemudahan, penggunaan, faktor internal, dan eksternal yang mempengaruhi persepsi petani, kemudian tingkat pendidikan dan pengetahuan tentang pestisida organik. Penelitian ini adalah penelitian cross-sectional dengan sampel 36 petani kentang dari Dataran Tinggi Dieng, menggunakan data primer yang diperoleh dari kuesioner. Hasil penelitian menunjukkan bahwa persepsi utama penggunaan pestisida organik dipengaruhi oleh faktor internal, skor persepsi terendah untuk penggunaan. Komponen makalah ini terdiri dari pengantar, tinjauan literatur, bahan dan metode, hasil dan diskusi, kesimpulan dengan keterbatasan dan penelitian masa depan.

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1. Introduction

Pesticides make crop production more efficient by providing superior crop protection and reducing the need for land preparation (Padgitt, Newton, Penn, & Sandretto, 2000). The truth about the effectiveness of pesticides in repelling pests has been proven (Oerke, Dehne, Schönbeck, & Weber, 1994). In the 1990s, the per hectare expenditure of pesticides in rice production in Asian countries such as India, Philippines, and Indonesia was 7.7 - 26.2 USD (Dung & Dung, 2003; Qiao, Huang, Zhang, & Rozelle, 2012). Millions of farmers are made heavily dependent on the use of synthetic fertilizers and chemical pesticides that are environmentally destructive, which is caused by the agricultural policy applied by the government is so industrial, that unconsciously tends to waste renewable energy, exploitative natural resources oriented to increase yields production (Fatmawati, Lahming, Asrib, Pertiwi, & Dirawan, 2018).

Agro-chemicals, considered essential in producing optimal results under each set of climatic condition and production practice, had become an internal part of crop production and their use was well-known (Shetty, 2015). Even though agrochemicals can increase production, but sooner or later can increased environmental pollution and risk of harm to public health and consumers, also decreased land productivity. Chemical pesticide abuse is increasing in many Asian countries with adverse effects that can affect consumers (Qiao et al., 2012). One of the most detrimental effects of chemical pesticides on farmers and the environment is the impact on the health of consumers in developed and developing countries (Alarcon et al., 2005; Osorio, Maza, Panagos, & Maibach, 2002; Thundiyil, Stober, Besbelli, & Pronczuk, 2008). About three million people, according to the Food and Agriculture Organization, were exposed to toxins with the most significant number of poisonings and deaths in developing countries (FAO, 2000).

Farmers are at risk the most of poisoning due to their exposure to pesticide during the harvest season. In the worst case, acute pesticide poisoning may happen, affecting health in the vital body systems such as digestive, respiratory and nervous systems (Hoppin et al., 2007; Pingali & Roger, 1995). Evidence in recent decades has shown that pesticides are detrimental to human health and ecosystems (Tadesse & Asferachew., 2008). WHO in 2005 stated reported that around 40,000 people died due to pesticides worldwide, equivalent to 10% of all victims in the agricultural sector (Sharma, 2007). Meanwhile, there are some advantages of vegetable pesticides compared to the chemical pesticides, namely minimizing the occurrence of environmental damage, and not endangering other non-target creatures, such as predators, parasitoids, pollinating insects, and useful honey bees (Prabayanti, 2010).

Some researchers have also criticized the use of chemical pesticides for the adverse effects on not only the farmers but also the society in general (Pingali & Roger, 1995; Yudelma, Ratta, & Nygaard, 1998). Some studies have investigated factors that affect the behavior of the farmers to use pesticides such as the characteristics of farmers, training (Hashemi & Damalas, 2011; Khan, Mahmood, & Damalas, 2015), education, various perceptions such as risk and technology of pesticides (Wilson & Tisdell, 2001), attitudes (Liu & Huang, 2013; Wang, Tao, Yang, Chu, & Lam, 2017), as well as external driving forces such as government regulations (Marcoux & Urpelainen, 2011; Schreinemachers & Tipraqsa, 2012). The best commodity for the horticulture sub-sector in Indonesia, one of which is potatoes which are national superior commodities with high economic value (Pronk et al., 2018).

This study discusses the perception of potato farmers toward the organic pesticides in Tambi Village, Kejajar Subdistrict, Wonosobo Regency, Dieng Plateau. The survey results from the Banjarnegara District Health Office in Central Java which took a sample of 217 farmers stated that only 15 people or about 7 percent were free of pesticide poisoning, while 77 were mildly poisoned or 35.5 percent, 120 were moderate poisoning or 55.3 percent, and 5 farmers experienced severe poisoning or 2.3 percent (Sucahyo, 2014). Central Java has the largest average potato production in Indonesia from 2012 to 2016 of 273,973 tons, with one of the largest potato producing districts in Kejajar, which is in

Wonosobo District (BPS, 2017; Sarjono, Sanny, & Melati, 2018). In 2016, the total population of this area was 6,088 people with 3,175 male and 2,913 female. Most people worked as farmers (37.94%), followed by alternative medication experts (35.98%), farmworkers (21.21%), and 3% others (migrant workers, civil servants, mobile traders, and domestic helpers)(Arundati et al., 2017). The problem we found was the excessive use of pesticides by the farmers. Thus, this research aims to study the perception of farmers toward organic pesticides.

2. Literature Review

Perception is a complex cognitive process and produces a unique picture of reality that can be different from reality (Krech, 2000). According to Lancaster (Lancaster, 1996), consumers need the characteristics of a product, and the perception of an organic product can influence choices. Visual objects such as shapes and colors and semantic meanings and relationships can influence perception (Hwang, Wang, & Pomplun, 2011).

Perception formation based on internal factors includes mood and interpretation from previous experiences (Glass, 2018). Learning, memory, motives, personality, emotions, and attitudes are internal factors influencing personal behavior (Hawkins & Mothersbaugh, 2010). Factors are characteristics of the environment and the associated objects that can change the point of view. Exogenous attention is driven by active stimuli in the stimulus set in the visual field, giving a rapid and temporary effect on perception (Barbot, Landy, & Carrasco, 2012).

Pesticides are substances or mixtures of substances commonly used in agriculture or public health protection programs, aimed at protecting plants from pests, weeds or diseases, and humans from transmitted diseases, such as malaria, dengue fever, and schistosomiasis. Some examples of pesticides are insecticides, fungicides, herbicides, rodenticides, and plant growth regulators (Alewu & Nosiri, 2011; NSW EPA, 2013). Organic pesticides are made of natural ingredients such as animals, plants, bacteria, and others (CCOHS, 2017). Organic pesticides break down in the environment with biological and physicochemical processes, so they do not endanger the health of the society. However, pesticides are chemicals with specific properties, regulating effectiveness in the system, such as evaporating, oxidizing, hydrolyzing, and metabolizing.

The differences in the pesticide types are the nature and reaction rate. Organic pesticides are made from natural ingredients, while non-organic pesticides are made synthetically. It is essential to read and follow the instructions for using organic pesticides because organic does not mean non-toxic. Farmers are defined as those who are part-time or full-time workers engaged in various activities that mainly depend on agriculture such as cultivating land, growing crops and raising livestock as the primary source of income (McElwee, 2004).

3. Methodology

The method used in this study is a descriptive method that is finding the facts with the right interpretation. This research studies problem, procedures, situations, relationships, activities, attitudes, views, ongoing processes, and the influences of a phenomenon in society.

We used primary data gathered using questionnaires and secondary data obtained from some literature and reports. We measured the perception of 36 potato farmers toward organic pesticides with twenty questions. The cardinal measurement shows the magnitude and the difference between the meaningful value scales in Stevens's terminology using the interval scale (Gob, McCollin, & Ramalhoto, 2007). In agriculture, Likert scales are often used to measure individual preferences on the acceptance of modified food products (Herath, Camps-Arbestain, & Hedley, 2013), and farmers' preferences to the crop characteristics (Nelson, 2013).

Respondents' answers are connected in the form of statements or expressed in words. The highest score is for 'Strongly Agree' (SS) with a score of 4, 'Agree' (S) with a score of 3, 'Disagree' (TS) with a score of 2, and 'Strongly Disagree' (STS) with the lowest score of 1. To calculate the score, we

multiplied the score by the number of respondents. For $S_4 = 4 \times 36 = 144$, $S_3 = 3 \times 36 = 108$, $S_2 = 2 \times 36 = 72$, and $S_1 = 1 \times 36 = 36$. The ideal score for each question item is 'Strongly Agree' with the highest score of 144 while the lowest score is 36 for 'Strongly Disagree.' The interpretation values are as follows:

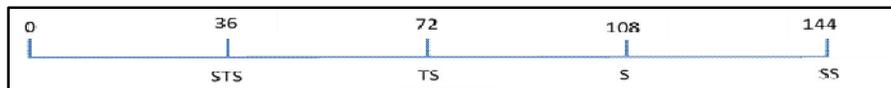


Figure 1. Likert scales

To know the score of perception of farmers toward the organic pesticides, we multiplied the score by the number of respondents and number of questions. The data analysis technique used in this research is descriptive technique using Likert scale (Riduwan, 2008). The formula is as follows: Perception Level of Farmers = (Total score of data collection results)/(Total ideal score (the highest)) x 100%. The score ranging from 0%-20% means 'very poor', 21%-40% means 'poor', 41%-60% means 'fair', 61%-80% means 'good', and 81%-100% means 'excellent'.

4. Results and dicussion

Education

The result of the education research from Tambi's potato farmers, showed the most education level of 23 respondents graduated from primary school (63.89%). Education level of Junior High School, 12 respondents or 33,33%. Only one respondents (2,78%) never attended school. This result showed that potato farmers still have low education level.

Table 1. Education Level of Potato Farmer in Kejajar

Education	Amount	
	N	%
Bachelor (S1 / S2 / S3)	-	-
Diploma (D1 / D2 / D3)	-	-
Graduated from high school	-	-
Graduated from junior high school	12	33,33
Graduated from elementary school	23	63,89
Not going to school / Not graduating from elementary school	1	2,78
Total	36	100

Source: Processed by the author (2018)

Knowledge of Pesticide Organic

Potato farmers did not know enough about organic pesticides, seen from the answers to questions about whether or not they know about organic pesticides sold in the market. Only four respondents (11.11%) knew the existence of organic pesticides while the rest (88.89%) never heard it. Thus, it makes sense that most of them (94.44%) never used organic pesticides, meaning that only 5.56% of respondents are using it. These results showed that potato farmers still rely on chemical pesticides because many of them do not know the organic pesticides.

Table 2. Knowledge of Potato Farmer in Kejajar About Pesticide Organic

Question	No/ Never	Yes/ Ever
Do you know about organic pesticides sold on the market?	88.89%	11.11%
Have you ever used organic pesticides?	94.44%	5.56%
Do you currently use organic pesticides?	94.44%	5.56%

Source: Processed by the author (2018)

Perception of Pesticide Organic

Person's perception can influence how someone will act. The perception of pesticide organic score is shown in table 1. This section will explain about the results of perceptions of potato farmers with 20 statements. The statement will answer perceptions from seven aspects, which are about internal factors, external factors, profit, security, price and quality, convenience or easiness, and the perception about the usage of organic pesticides.

Table 3. Tabulation of all scores, perception index, and interpretation

Statements	Total Score	Perception Index (%)	Interpretation
Purchasing organic pesticides for experiment or trial	98	68.1	Good
Organic pesticides are safe for farmers	91	63.2	Good
Organic pesticides are safe for potatoes	88	61.1	Good
Organic pesticides are safe for land or soil	89	61.8	Good
Using organic pesticides because of the advice of agriculture counselors	81	56.3	Fair
Using organic pesticides because of influence (invitation) of fellow farmers	80	55.6	Fair
Purchasing organic pesticides to increase knowledge and skill	91	63.2	Good
Price of organic pesticides matches with their quality	86	59.7	Fair
Purchasing organic pesticides to increase sales	83	57.6	Fair
Purchasing organic pesticides to imitate other farmers	78	54.2	Fair
Purchasing organic pesticides to increase prestige/pride	82	56.9	Fair
Following the suggestion of agriculture counselor in using organic pesticides	88	61.1	Good
Doing the things as suggested by fellow farmers in using organic pesticides	81	56.3	Fair
Using organic pesticides if having a share in decision making	86	59.7	Fair
Using organic pesticides if their price is relatively the same or cheaper from the chemical pesticides	87	60.4	Good
Easy to use organic pesticides if the pest attacking the farming is a few	85	59.0	Fair
Easy to use organic pesticides as already have the tools	83	57.6	Fair
Easy to use organic pesticides if they are readily available around	81	56.3	Fair
Will purchase organic pesticides next year	70	48.6	Poor
Will purchase organic pesticides for the current farming period	74	51.4	Fair

Source: Processed by the author (2018)

Internal Factors Influence the Perception of Farmers; One of the internal factors is the curiosity to experiment or try as seen with a total score of 98 (the highest). The farmer perception index for this aspect is 68.1% ($98/144 \times 100\%$) or in the good category. While another internal factor affecting the perception is decision making. It total score of 86 which is the highest of all perception statements. The farmer perception index is averagely 59.7% ($86/144 \times 100\%$) or fair.

External Factors Influence the Perception of Farmers; The perception of farmers toward organic pesticides, influenced by external factors such as advice from the government or other agricultural organizations, the total score of farmer perception is 81 with the farmer perception index of 56.3% ($81/144 \times 100\%$). The score of farmer perception, triggered by invitation or influence of fellow farmers who already used organic pesticides, is 80 with the farmer perception index of 55.6%

(80/144 x 100%). The score of perception for imitating other farmers who use organic pesticides is 78 with the average perception index of 54.2% (78/144 x 100%). These four values indicate a fair score. There is one factor affecting the perception of farmers toward organic pesticides well, namely the factor of following the advice of agriculture counselors with the score of 88 and perception index of 61.1% (88/144 x 100%).

Perception of Farmers toward Relative Profit; The score of perception toward organic pesticides, for increasing knowledge and skills is 91 with the average perception index of 63.2% (91/144 x 100%) or in the good category. While the score of perception toward organic pesticides for increasing sales and profits is 83 with the average perception index of 57.6% (83/144 x 100%) or in fair category. The lowest score is for increasing prestige and pride with a total perception score of 82 and average perception index of 56.9% (82/144 x 100%) or in fair category.

Perception of Farmers toward Safety of Use; The score of perception toward organic pesticides regarding the safety of use for the farmers is 91 with the average perception index of 63.2% (91/144 x 100%). The score of the safety of use for the potatoes is 88 with the average perception index of 61.1% (88/144 x 100%). While the score of the safety of use for the land is 89 with the average perception index of 61.8% (89/144 x 100%). These three scores are in good category.

Perception of Farmers toward Price and Quality. The score of perception toward organic pesticides regarding quality according to the price is 86 with the average perception index of 59.7% (86/144 x 100%) or in fair category. While the score of perception toward organic pesticides regarding price relatively the same or cheaper compared to the chemical pesticides is slightly higher, namely 87 with the average perception index of 60.4% (87/144 x 100%) or in good category.

Perception of Farmers toward Easiness Level. The perception toward the easiness level of organic pesticides includes the easiness in using the pesticides in potato farming. The score of perception toward organic pesticides regarding the easiness level, if they are always readily available, is 81 with the average perception index of 56.3% (81/144 x 100%). The score of perception toward organic pesticides regarding the easiness level as their tools are already available is 83 with the average perception index of 57.6% (83/144 x 100%). While the score of perception toward organic pesticides regarding the easiness level if the number of pests is a little is 85 with the average perception index of 59.0% (85/144 x 100%). These three scores indicate that their values are just fair.

Perception of Farmers toward Usage. The score of perception toward using organic pesticides (table 3) is 70 with the average perception index of 48.6% (70/144 x 100%) which is the lowest among all answers. So, the perception is in poor category. While the score of perception toward organic pesticides regarding using for the current farming period is 74 with the average perception index of 51.4% (74/144 x 100%) or in fair category.

Total Score Perception.

For $S_4 = 4 \times 36 \times 29 = 4176$, $S_3 = 3 \times 36 \times 29 = 3132$, $S_2 = 2 \times 36 \times 29 = 2088$, and $S_1 = 1 \times 36 \times 29 = 1044$. The total score for all statements with 'Strongly Agree' answers is 4,176 while for 'Strongly Disagree' answers is 1,044. Our research uses twenty statements distributed to 36 potato farmers with a total score of 2,430. Thus, the score of perception of farmers can be portrayed in figure 2 as follows.

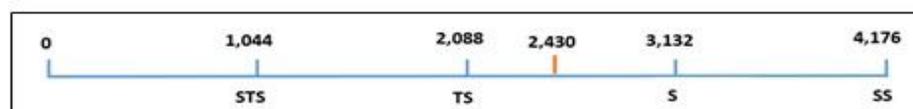


Figure 2. The Likert scale of farmer perception index

Source :processed by the author (2018)

According to Riduwan(2010), the measurement of the Likert scale can be shown in figure 3.

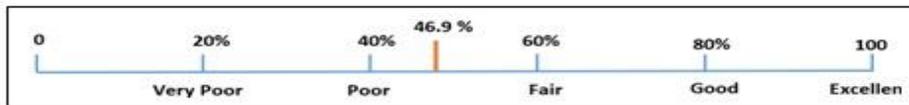


Figure 3. The Likert scale of farmer perception level

Source :processed by the author (2018)

Although the perception of farmers toward the safe use of organic pesticides is good, there is still doubt of farmers to use the organic pesticides. The level of perception index of potato farmers in Tambi village toward organic pesticides was 46.9%, classified as poor. The results of the questionnaire showed several factors causing the perception of potato farmers toward organic pesticides fair. The chemical pesticides are considered more profitable for farmers because they do not take much time to use, cheaper, and better in quality. The weakness of organic pesticides is their application which must be done repeatedly. The habit of using chemical pesticides makes farmers reluctant to switch to using organic pesticides. Asserted from in individuals, there are five types of competencies namely motives, innate traits, self-concepts, knowledge, and skills (Spencer & Spencer, 1993). Knowledge which can be developed can influence attitudes, whose ultimately affects the intention of using organic pesticides. The agriculture counselors can empower farmers to participate in organic pesticide usage. Therefore they must have good competence (Van den Ban & Hawkins, 1996), to generate economic benefits for farmers and consumers (Fernandez-Cornejo et al., 2015). In order to help master new knowledge (Noe, 2017), training seen as an important issue in human resource management (Abbasi, Albrecht, Vance, & Hansen, 2012). Assignment training should be made appropriately to identify the right person for attending the right courses and workshops (Ismail, Abdullah, Mohd Soffian Lee, Mohamad, & Ibrahim, 2018).

5. Limitations and directions for future research

This study is limited as it only discusses the perception of potato farmers in Tambi, Keajar, Wonosobo, Dieng, Central Java, with 36 respondents. The research method did not conduct in-depth interviews. The future research may study this topic with some improvements both for the development and further utilization of the results of the perception of farmers.

6. Conclusion

Based on internal factors, the highest perception index of farmers for purchasing organic pesticides is because they want to experiment. Inversely, the perception toward using organic pesticides in the next year has the lowest score. This result is caused, because the farmers are lack of knowledge to use organic pesticides, level of education affects the values, way of thinking, the point of view, and perception, thus affecting the decision process and consumption pattern. The government or agricultural organizations need to provide counseling to increase knowledge of the farmers so their perception toward organic pesticides may change. They may purchase and use organic pesticides in the future.

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