

Pesticide Handling Program In Agricultural Area To Prevent Environmental Pollution And Health Risk

A Literature Review

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ABSTRACT: Pesticides are a class of chemicals that are generally used by agriculture to eradicate weeds and pests or nuisance plants. Pesticides that are used uncontrollably can cause various environmental pollution and interfere with human health. These impacts can be in the form of ecosystem instability, environmental pollution and have an impact on the death of humans who are exposed to pesticides that contain toxins and residues in the materials and crops. The purpose of this study is to help increase knowledge about types of pesticides, their benefits, impacts on environmental pollution and human health due to pesticides as well as handling and programs for controlling pesticides. The method used in making this literature review is the Systematic Literature Review which is a method for analyzing, comparing, interpreting the findings in a literature, to answer research questions. Journal searches were carried out on the Google Scholar website with the keywords used, namely pesticides, agricultural environment, environmental pollution, health risks, pesticide handling programs. There were 41 articles obtained and only 20 articles published in the last 10 years (2011-2021) and in accordance with the research question. The results obtained are that there is an impact given by excessive use of pesticides on the environment, namely soil, water, air and other plant pollution as well as impacts on farmers' health in the form of respiratory disorders, diabetes, skin disorders and poisoning. The conclusion in this literature review is that the use of pesticides that are not in accordance with the rules can increase the incidence of poisoning in pesticide spraying farmers. Pesticide exposure can enter the farmer's body through the skin, respiration and digestion that occurs when carrying, storing, transferring concentrate, mixing, spraying and cleaning the spray equipment that has been used.

Keywords: farmer; pesticide; health impact; environmental impact; pesticide management program.

Introduction

Increased national development and the occurrence of industrial improvements that require facilities that will support the industrial process, namely by increasing the agricultural sector. The use of pesticides is a factor that cannot be separated from the daily activities of farmers. Pesticides are a class of chemicals that are generally used by agriculture to eradicate weeds and pests or nuisance plants. Reliable pesticide efficacy, high success rate and relatively easy use. The benefits of pesticides are no longer in doubt because they are proven to be very accurate, therefore they are used in various activities or fields, starting from agricultural, household and health

activities (Pamungkas, 2016). The use of pesticides in unreasonable amounts has the potential to cause environmental pollution on land, water, and air, and has the potential to cause human health problems. In addition, excessive use of pesticides will have a negative impact. These impacts can be in the form of ecosystem instability, environmental pollution and have an impact on the death of humans who are exposed to pesticides that contain toxins and residues in the materials and crops (Wahyuni, 2010). If exposure to pesticide chemicals is associated with the environment, the use of pesticides must be vigilant because the substances contained can harm the environment and the health of humans or other living creatures. This can have an impact on the environment, where the toxic nature of pesticides can affect the entire taxonomy of biota including living things in the long term Risk analysis is a scientific process used to estimate the possibility of negative health impacts due to exposure to hazardous chemicals. Risk analysis consists of 3 components, namely risk management, risk assessment, and risk communication or called risk communication. There are four stages of risk assessment that must be met to determine the magnitude of the risk, namely hazard identification, dose response determination, exposure assessment, risk characterization (Yuantari, Widianarko and Sunoko, 2015).

One of the risk factors that occur in pesticide poisoning that usually occurs in farmers, especially in the agricultural sector, is due to mixing, knowledge and washing of spray equipment that is not in accordance with the rules or regulations that have been set in the pesticide guidelines. WHO estimates that every year 1-5 million cases of pesticide poisoning occur in agricultural workers with a death rate of 220,000 people and around 80% of pesticide poisonings are reported in developing countries in Asia, Africa, Central America and Latin America. In developing countries only use about 25% of the total use of pesticides worldwide but in terms of deaths caused by pesticides, about 99% experienced by countries in the region. This is due to the low level of education and knowledge of farmers about the dangers or side effects caused by pesticides, especially on health. Efforts to anticipate events caused by pesticides are alternative programs, the use of environmentally friendly organic pesticides is the best solution to replace chemical pesticides. The results of this literature review can make a target for the community, especially those directly involved in the agricultural sector in the pesticide handling program to prevent health risks and environmental pollution

MATERIALS AND METHODS

The method used in making this literature review is the Systematic Literature Review which is a method for analyzing, comparing, interpreting the findings in a literature, to answer research questions. As for some research questions related to the title of this literature, among others: 1) What is Pesticide? ; 2) What is the relationship between pesticides and agricultural environmental pollution; 3) How are pesticides related to health risks? ; 4) How is the health management caused by pesticides? ; 5) How is the pesticide handling program to prevent environmental pollution and health risks? Journal searches were carried out on the Google Scholar website with the keywords used, namely pesticides, agricultural environment, environmental pollution, health risks, pesticide handling programs. There were 41 articles obtained and only 20 articles published in the last 10 years (2011-2021) and in accordance with the research question.

RESULTS

Table 1. Results of Literature Review

Researchers	Titles	Output
Regita, <i>et al</i> (2013)	The Relationship between Pesticide Use and Handling of Shallot Farmers	The results showed that there was an improper use of pesticides by shallot farmers in Wanasari Village (69.1%), poor pesticide handling

	and Pesticide Residues in Soil on Agricultural Land in Wanasari Village, Wanasari District, Brebes Regency	(50.9%), and the measurement results of soil sample residues (100% negative for organochlorines). However, research has not been able to analyze the relationship between pesticide use and soil residue on agricultural land.
Dhiaswari, D., <i>et al.</i> (2019)	The Effect of Shallot Farmer's Behavior and Pesticide Use on the Impact on the Environment in Klampok Village, Wanasari District, Brebes Regency	The results showed that the average score of shallot farmer behavior, pesticide use, and the impact on the environment were 69.76%, 63.47%, and 65.9%, respectively, and were included in the good category. These results prove that there is a relationship between the behavior of farmers in the use of pesticides with the impact on the environment.
Supriatna, <i>et al.</i> (2021)	Soil Pollution by Pesticides in Vegetable Plantation, Eka Jaya Village, South Jambi District, Jambi City (Study on the Presence of Macroza Fungus and Earthworms)	Some of the negative effects of inappropriate use of synthetic pesticides, namely: a. Pest attacks will be much more severe due to the death of natural enemies of pests b. Possible secondary pest attack. c. The emergence of immunity/resistance of pests and pathogens to synthetic pesticides. d. Soil fertility in the fields from year to year decreases
Gyawali (2018)	The Impact of Pesticides Use on Farmer Health and Environment	The effects of pesticides that appear on farmers in Kebonagung Village are still relatively mild, such as redness and itching on the hands which do not interfere with the farmer's work. For the impact on the environment, it is found that the ecosystem gap is due to the excessive use of pesticides.
Istianah., & Yuniastuti, (2017)	<i>Pesticide Uses and its Effects on Public Health and Environment</i>	Impacts on the environment in the use of pesticides are: contamination of water and soil, air and other plants. Pesticide residues were found to pose a risk to human health as well as to the environment and to non-target organisms
Oktaviani, R., Pawenang, (2020)	Risk of Pesticide Poisoning Symptoms in Greenhouse Farmers.	The results showed that there were 4 variables that had a significant relationship with the symptoms of pesticide poisoning, namely age, years of service, type of spraying equipment, and use of PPE.
Yuantari, <i>et al.</i> (2015)	Pesticide Exposure Risk Analysis on Farmers' Health	Exposure to pesticides can enter the farmer's body through the skin, respiration and digestion. Farmers can be exposed to pesticides when they come into direct contact with pesticides. The greater the chance of exposure to pesticides, the greater the incidence of chronic poisoning in farmers.
Saputri, (2018)	Relationship of Pesticide Exposure History with Type 2 Diabetes Mellitus Incidence in Spraying Farmers in Ngablak District, Magelang Regency	The results showed that the variables associated with the incidence of type 2 diabetes mellitus were years of service, frequency of pesticide spraying, use of PPE, and pesticide dose with $p < 0.05$. There is a significant relationship between the above variables and the incidence of type 2 diabetes mellitus as a result of the study.

Iswandari <i>et al.</i> , (2020)	The Impact of Pesticides Use on Farmer Health and Environment	The effects of pesticides that appear on farmers in Kebonagung Village are still relatively mild, such as redness and itching on the hands that do not interfere with the farmer's work. For the impact on the environment, it is found that there are ecosystem gaps due to excessive use of pesticides.
Minaka, <i>et al.</i> (2016)	The Relationship between the Use of Pesticides and Personal Protective Equipment with Health Complaints on Horticultural Farmers in Buleleng, Bali	This study found that more than half (60.9%) of horticultural farmers in Pancasari Buleleng Village had specific health complaints related to the use of pesticides. In addition, it was found that farmers have a risky behavior of being exposed to pesticides when mixing, spraying and handling pesticides after spraying. Specific health complaints related to the use of pesticides were found to be related to the use of organophosphate group pesticides, improper use and care of PPE.
Kurniasih, <i>et al.</i> (2013)	Factors Related to Pesticide Exposure and Its Relationship with Anemia Incidence in Horticultural Farmers in Gombong Village, Belik District, Pemalang Regency, Central Java	The results showed that exposure to pesticides had a tendency of 5,333 times greater effect on the incidence of anemia compared to respondents who were not exposed to pesticides. The results of multivariate analysis showed that there was a relationship between pesticide exposure and the incidence of anemia.
Zubaeda, & Imelda, (2019)	Risk Factors of Subjective Health Complaints of Farmers Spraying Pesticides on Rice Plants in Rantaualih Village, Empat Lawang Regency	There is a significant relationship between age, years of service, duration of spraying, time of spraying and the number of types of pesticides with subjective health complaints.
Putri <i>et al.</i> , (2016)	The Relationship between Pesticide Handling Methods and Pesticide Poisoning Levels in Farmers in Banjarrejo Hamlet, Kembang Kuning Village, Cepogo District, Boyolali Regency	The results of the bivariate analysis showed that there was a relationship between the method of storing pesticides and the level of pesticide poisoning (0.016), the method of mixing pesticides with the level of pesticide poisoning (0.010), and the method of washing spray equipment with the level of pesticide poisoning (0.026).
Wismaningsih, & Oktaviasari, (2016)	Identification of Pesticide Types and Use of PPE on Farmers in Ngantru District, Tulungagung Regency	The results showed that the most widely used insecticide was chlorantranilprole (67.8%). The most widely used fungicide is the active ingredient Propineb (82.1%). All farmers always use PPE in the form of masks, hats, long-sleeved shirts, and long pants.
Rosanti & Andarini, (2017)	Assistance Program for Establishing Occupational Health Effort Posts (UKK) for Farmers in Demangan Ponorogo Village	The establishment of the Demang Jaya Sehat UKK Post with a legal permit from the Demangan Village Head has the aim of creating a healthy, independent and productive farming community based on the principles of basic occupational health services.
Souisa, <i>et al.</i> , (2020)	Improvement of Pesticide Impact Prevention Behavior on Farmer's Health.	There is no relationship between pesticide exposure variables and nutritional status of farmers in Panti District, Jember Regency.
Astuti & Widyastuti	Environmentally Friendly Organic Pesticides Vegetable Plant Pest Control	The form of handling pesticides to prevent environmental pollution and health risks is to use organic pesticides which have advantages,

(2016)		including: (1) more friendly to the environment because they are organic and easily biodegradable in nature, (2) organic pesticide residues do not last long on plants, (3) add value to the resulting product, (4) will not cause resistance to pests
Kardinan (2011)	Use of Vegetable Pesticides as Local Wisdom in Plant Pest Control Towards Organic Farming Systems Sistem	The forms of handling pesticides to prevent environmental pollution and health risks are: (1) Using attractants, substances that leave no residue on fruit, are environmentally friendly, and effective, (2) Eradication of fruit flies (3) Using bait protein, sticky traps, sanitation / cleanliness of the agricultural environment, fruit wrapping, smoking to maintain the population (4) Prevention through quarantine.
Purnama, <i>et al.</i> (2015)	Development of Natural Pesticide Production from <i>Beauveria Bassiana</i> and <i>Trichoderma Sp.</i> Towards Organic Farming	The use of biological agents as pest control is considered good because it is based on the principle of ecosystem balance, namely eradicating pests using their natural enemies. In addition, wilt disease can also be eradicated using biological agents.
Kristiandi, <i>et al.</i> (2020)	Utilization of Siamese Orange Peel as a Natural Pesticide	The presence of a positive content of alkaloids in the control treatment and 50% treatment. Positive flavonoids in the treatment of 10%, 20%, 30%, 40% and 50% while for the control there is no flavonoid content, as well as the positive content of tannins and sulfur in all treatments this is because the orange peel as a natural pesticide already contains direct raw materials.

DISCUSSION

Pesticide Pesticides are chemical compounds, micro organisms, viruses, and other substances used to protect plant parts. Farmers hope that the yield of agricultural products can increase so that farmers use pesticides to remove pests and weeds. However, the use of pesticides has a negative side effect, namely it can kill living things that are not the target, causing a reduction in biodiversity, there are also natural pesticides that have been used for a long time by our ancestors. This ancestral wisdom originated from the habit of using herbal ingredients, poisonous plants (gadung, green cassava, pucung, and jenu) or other plants with special abilities against plant pests/diseases. Based on research (Sukainah et al., 2020), farmers in Samangki Village, Maros Regency, still use synthetic chemical pesticides to eradicate pests and plant diseases. This is because synthetic chemical pesticides are not difficult to find in the market and have been used for generations.

Even though the use of synthetic chemical pesticides poses a potential danger to human health. In addition, research conducted by (Suryani et al., 2020) recommends to the Mandalahurip Village Government, Tasikmalaya Regency that there is a need for counseling or training on the use of pesticides such as how to apply pesticides, the function of using pesticides and the dangers of using pesticides for humans and the environment and farmers are also advised to always use complete PPE when carrying out pesticide application activities.

Pesticide Relationship with Environmental Pollution In the agricultural sector, pesticides are chemicals that are used excessively and damage the environment. One of the negative impacts of using chemical pesticides is soil pollution, which is a condition when chemicals enter and change the natural environment of the soil. These substances enter the soil, settle and poison and damage the soil. In addition, the use of chemical pesticides has an impact on ecosystem instability, the occurrence of residues in crops

and processed materials, environmental pollution and poisoning can even cause death in humans. Some of the negative effects of inappropriate use of pesticides according to research (Siahaan & Restiati, 2021) are water and soil pollution which ultimately affect humans and other creatures, the death of natural enemies from pests and pathogens and will cause resurgence, the possibility of secondary pest attacks, the emergence of resistance (resistance) of pests and pathogens to synthetic pesticides and the presence of soil fertility in lands that use pesticides from year to year has decreased. Meanwhile, the results of the study (Dhiaswari, et.al 2019) stated that the behavior of shallot farmers in Klampok Village, Wanasari District, Brebes Regency on average had fairly good criteria. Farmers in onion planting do not use chemical fertilizers excessively and they use compost as basic fertilizer in processing. As a result, the behavior of onion farmers and the use of pesticides have a significant impact on the impact on the environment. This means that the better the behavior and use of pesticides, the better the environmental impact given.

Pesticide Relationship to Health Risk

Excessive or inappropriate use of pesticides can have an impact on the health of farmers and consumers. A pesticide exposure enters the farmer's body through the skin, respiration and digestion (Yuantari, M et al, 2015). Farmers are at risk of exposure to pesticides when mixing and spraying pesticides. Specific health complaints related to the use of pesticides are related to the use of organophosphate group pesticides, inappropriate use and care of PPE (Minaka ADA, et al, 2016). The effects of pesticides that appear on farmers are still relatively mild, such as redness and itching of the hands (Iswandariz et al., 2020). Fatally, farmers who spray pesticides are at risk for pesticide poisoning. Pesticide poisoning in farmers can occur due to exposure to pesticides when farmers spray crops (Wismaningsih, E. R. & Oktaviasari, D. I, 2017).

Spraying pesticides against the wind will increase the entry of pesticides into the body. Spraying when the air temperature starts to get hot will increase evaporation, so the amount of water vapor mixed with residue will also increase. Based on research conducted by Saputri, E (2018) which shows that there is a significant relationship between working period, use of PPE, frequency of pesticide spraying, and pesticide dose with the incidence of type 2 diabetes mellitus. Variables related to the incidence of type 2 diabetes mellitus are working period, use of PPE, frequency of pesticide spraying, and pesticide dose with p value <0.05.

Handling Health Risks Due to Pesticides

One way to prevent diseases caused by pesticides is to use Personal Protective Equipment (PPE). PPE is an equipment used when handling pesticides with the aim of closing all the entrances to the body (portal of entry), namely long sleeves, gloves, masks, hats, and boots. The reluctance to use PPE shows the farmers' low knowledge about the risk of pesticide exposure (Yushananta P, et al, 2021).

Pesticide Handling Program to Prevent Environmental Pollution and Health Risks

The use of pesticides in agricultural activities can cause various kinds of environmental pollution and health risk disturbances, this is due to the use of chemical pesticides for a long period of time in agricultural activities (Astuti & Widyastuti, 2016). In order to avoid environmental pollution and health risks, it is necessary to have a form of prevention in the form of a treatment program. One form of pesticide handling program is to use natural pesticides that can be made from a variety of existing elements. Such as the use of vegetable pesticides, making pesticides from Siamese orange peel and other elements that have been researched and are safe to use as natural pesticides and can reduce forms of environmental pollution (Kristiandi & Febrina, 2020). With the pesticide handling program using natural pesticides, it is necessary to conduct counseling or socialization regarding the

manufacture of natural pesticides from certain elements aimed at people who often carry out agricultural activities. This program is expected to be a form of prevention of environmental pollution and can reduce daily risks to farmers.

CONCLUSION

Pesticide is a chemical synthesis that serves to protect plants from pests. The use of pesticides on plants aims to produce plant products with good quality, but if used above the threshold value, it will have a negative impact on the product produced, the surrounding environment, and even health problems for farmers and consumers. In addition to pesticides made from chemicals, there are also natural pesticides that have been used for a long time by the ancestors of the Indonesian people. Prevention of environmental pollution and health risks can be done by establishing a treatment program, one of which is by using natural pesticides that can be made using various existing elements. Pesticides that are used in excess can cause poisoning to farmers who spray pesticides. Exposure to pesticides can enter farmers' bodies through the skin, respiration and digestion when they come into direct contact with these substances. The form of handling pesticides to prevent environmental pollution and health risks is to use organic pesticides which have advantages, including: (1) more friendly to the environment because they are organic and easily biodegradable in nature, (2) organic pesticide residues do not last long on plants, (3) add value to the resulting product, (4) will not cause resistance to pests. And always use complete PPE when making direct contact with pesticides.

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