


THE ROLE OF K3 AWARENESS IN PREVENTING HEALTH RISKS DUE TO PESTICIDES IN FARMERS

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Abstrak	
<p>Keywords:</p> <p><i>Occupational Health and Safety (K3), Pesticides, Farmers, Personal Protective Equipment (PPE), Sustainable Agriculture</i></p>	<p><i>The use of pesticides in the agricultural sector in Indonesia has increased significantly, along with the high dependence of farmers on these chemicals to protect crops from pests. However, inappropriate use of pesticides and minimal awareness of the importance of Occupational Health and Safety (OHS) has resulted in a high risk of poisoning and health problems for farmers. This study uses a literature review method to analyze the role of OHS awareness, especially the use of Personal Protective Equipment (PPE), in preventing health risks due to pesticide exposure. The results of the study indicate that low knowledge and application of OHS among farmers are the main factors in the high number of cases of pesticide poisoning. OHS education and training have proven effective in improving preventive behavior and reducing health complaints among farmers. However, there is still a gap between knowledge and practice in the field, so that ongoing and contextual educational interventions are needed. Consistent application of OHS principles not only protects the health of farmers but also supports healthier and more sustainable agriculture</i></p> <p><i>This is an open access article under the CC BY-NC-SA 4.0 license</i></p> <div style="text-align: center;">  </div>

INTRODUCTION

In developed countries, the agricultural industry has successfully transitioned from a high-labor, low-productivity industry to a low-labor, high-productivity industry. Increasing agricultural mechanization, agricultural electrification and the use of chemicals (pesticides) are factors that drive this change, but on the other hand, these factors also increase work risks that affect occupational health and safety. This reduction in the workforce requires workers to be competent in carrying out several agricultural jobs, and often have to work alone without supervision. In this situation, knowledge and understanding of OSH and a positive attitude

towards OSH are prerequisites for preventing accidents and occupational diseases. (Commission 2019)

Pesticides are substances that can be toxic, but on the other hand pesticides are very much needed by farmers to protect their crops. Current climate change, the use of active ingredients in pesticides up to 60%. Farmers in Indonesia are very dependent on the existence of pesticides, this is known from data from the Ministry of Agriculture that there has been an increase in the number of pesticides from year to year with the largest amount used being insecticides. Improper use of pesticides can endanger the health of farmers and consumers, non-target microorganisms and have an impact on environmental pollution, both soil and water. (Muharry, 2015)

The World Health Organization (WHO) reports that around 355,000 people die each year from pesticide poisoning worldwide. Most of these poisoning cases occur in developing countries that have limited access to health facilities and adequate training on occupational safety. According to WHO data in 2017, as many as 168,000 agricultural workers in developing countries die each year from pesticide poisoning, many of which are caused by minimal awareness and use of Personal Protective Equipment (PPE). (Adolph, 2016)

The tools or equipment that must be used when working according to the dangers and risks of the work to maintain the safety of workers and others around them is Personal Protective Equipment (PPE). Based on the Decree of the Directorate General of P2PL, Ministry of Health of the Republic of Indonesia Number 31-I / PD.03.04.LP of 1993 concerning the minimum Personal Protective Equipment (PPE) that must be used according to the type of work and pesticide classification, several types of PPE that must be used when spraying outside the building include: head coverings (hats or caping), face protection or respiratory protection (masks), work clothes (long-sleeved shirts and long pants that are either continuous or separate), hand protection (gloves) and foot protection (boots that have long soles, made of rubber, are not easily torn and do not wrinkle easily). (Aeni et al., 2020)

Occupational health should aim at promoting and improving the highest possible level of health, both physical, mental and social, of workers in all types of work and positions; prevention of workers from health disorders caused by work environment conditions; protection of workers in their work from risks due to factors that are detrimental to health; placement and maintenance of workers in a work environment that is adjusted to their physiological and psychological abilities; and the suitability of work to humans and each person to their work. In this case, the concept of work culture in the perspective of occupational health is intended to provide an understanding of various aspects of handling and preventing work-related diseases as a manifestation of a value system. Currently there are thousands of chemical compounds and mixtures, most of which are dangerous but technically can be controlled. Most accidents occur due to ignoring the properties of chemicals related to the process.

Chemical Safety or chemical safety is an effort to protect human health and or workers, facilities and installations and the environment in all parts of the work at the chemical life cycle node from chemical misuse and incorrect use of chemicals. Chemicals are widely used in industrial environments, which can be divided into two large groups, namely one chemical industry, namely an industry that processes and produces chemicals, such as fertilizers, sulfuric acid, soda, explosives, pesticides, paints, detergents, and others. The scope of chemical companies is a company that uses processes related to chemical or physical changes in the properties of the material and especially in the chemical part and composition of a substance. Two chemical user companies, are companies that use chemicals as process aids, for example textile, leather, paper, electroplating, metal processing, pharmaceuticals and others.

In the workplace, many chemicals are used every day so that workers are likely to be exposed. The danger can increase under certain conditions according to its nature, such as flammable, toxic, and so on. All types of work related to chemicals have a risk of danger, starting from the process, storage, transportation, distribution and use. However, no matter how great the danger of chemicals, proper handling can minimize or even eliminate the risk of

danger that arises. (Roestijawati et al., 2025)

RESEARCH METHODS

This study uses a literature review method as the main approach in exploring and analyzing various previous study results that are relevant to the topic of the role of awareness in preventing health risks due to pesticide exposure in farmers. This approach was chosen to systematically review the available scientific evidence, with the aim of identifying patterns of relationships, trends, and knowledge gaps related to the topic being studied. The literature search process was carried out online through several credible scientific databases, including Google Scholar, PubMed, Scopus, and ScienceDirect. In addition, national journals such as the Journal of Public Health, the Journal of Agriculture, and the Journal of Environmental Science were also searched to obtain local perspectives, especially from studies conducted in Indonesia.

RESULTS AND DISCUSSION

Pesticide comes from the word pest which means pest and sida comes from the word caedo which means killer. Pesticide has a simple meaning as a pest killer. According to the Food and Agriculture Organization (FAO) 1986 and Government Regulation of the Republic of Indonesia No. 7 of 1973, a mixture of chemicals used to prevent, eradicate and control pest animals or plants such as rodents, including insects that spread disease, with the aim of human welfare is a pesticide. Another definition of pesticide is a chemical substance or compound, a body regulator and growth stimulant, other materials, and microorganisms or viruses used to maintain plants (PP RI No. 6 of 1995). USEPA states that substances or mixtures of substances used to prevent, reject or eradicate pests in animals, plants and pest microorganisms are called pesticides. (Aeni et al., 2020)

The use of pesticides on a large scale can cause health problems, especially for spraying farmers. One of the impacts caused by the use of pesticides is poisoning in rice farmers. This needs to be a concern for public health, especially in developing countries. One effort to prevent pesticide poisoning in farmers is to use complete Personal Protective Equipment (PPE), such as masks, work clothes, boots, and gloves.

World Health Organization (WHO) the negative impacts caused by pesticides on public health are very toxic and dangerous. Direct contact with these pesticides carries the risk of acute or chronic poisoning. Headaches, nausea, vomiting and so on, even skin irritation and blindness are symptoms of acute poisoning from pesticides. Data from the World Health Organization (WHO), 1-5 million cases of pesticide poisoning occur in workers in the agricultural sector, where most of these cases occur in developing countries, 20,000 of which are fatal due to pesticide use. (Rasjid et al., 2019)

Pesticide hazard prevention behavior is important to be implemented by farmers so that it can reduce or even eliminate the risk of chemical pesticide poisoning. Pesticide poisoning occurs because it is drunk, or inhaled through breathing or absorbed through the skin. Several factors that can influence the occurrence of pesticide poisoning are external factors (from outside the body) such as the amount of pesticide used, type of pesticide, pesticide dose, frequency of spraying, length of service as a sprayer, length of spraying, use of personal protective equipment, pesticide handling methods, spraying time and actions regarding wind direction and basic sanitation. While internal factors (from within the body) include age, gender, genetics, nutritional status, level of knowledge and health status. A common problem is that many farmers still ignore the above matters due to a lack of knowledge and awareness of farmers. Knowledge is one of the factors that shape behavior. The level of knowledge can be influenced by the learning process and the environment. Knowledge of pesticide hazard prevention behavior for farmers has an impact on farmer behavior and affects the health status of individuals and consumers. (Souisa et al., 2020)

Based on the Decree of the Directorate General of P2PL of the Indonesian Ministry of Health Number 31-I/PD.03.04.LP of 1993 concerning the minimum Personal Protective

Equipment (PPE) that must be worn according to the type of work and pesticide classification, several types of PPE that must be worn when spraying outside the building include: head covering (hat or caping), face protection or respiratory protection (mask), work clothes (long-sleeved shirt and long pants that are either continuous or separate), hand protection (gloves) and foot protection (boots that have long soles, made of rubber, are not easily torn and do not wrinkle easily). The personal protective equipment that farmers should wear are:

1. Work uniform
Useful to cover all or part of the splash of toxic materials. The material can be made of drill cloth, leather, plastic, asbestos or aluminum-coated cloth. The form can be an apron (covering part of the body, namely from the chest to the knees), apron or overalls with long pants, and long sleeves (overalls).
2. Headgear
The head covering worn by farmers can be a hat or hood to protect the head from chemicals and unfavorable climate conditions. It must be made of materials that have gaps or holes, usually made of asbestos, leather, wool, cotton mixed with aluminum.
3. Nose and Mouth Protective Equipment
Breathing can be protected from the dangers of gas, vapor, dust or contaminated air in the workplace that can be toxic, corrosive or irritating, then a mask must be used. Masks can be made of cloth with a certain pore size or using a mask. Masks can be made of cloth with a certain pore size or other materials according to the nature of the chemicals being handled.
4. Gloves
Useful to protect hands from chemicals, both solid and solution. Gloves can be made of rubber (protecting yourself from exposure to chemicals), so that pesticide solutions cannot enter the skin.
5. Work Shoes
Useful to protect feet from chemical solutions. Work shoes or boots are essential for pesticide spraying. The material can be made of leather, synthetic rubber or plastic. When wearing boots, the ends of the pants should not be tucked into the shoes, because pesticide liquid can enter the shoes. (Aeni et al., 2020)

The main function of using PPE is to reduce and prevent the risk of injury or illness due to work activities. By wearing appropriate PPE, farmers can be better protected from injuries, infections, and long-term health impacts that may arise from continuous exposure to hazards. The use of PPE is an important step in supporting occupational safety and health in the agricultural sector. However, the reality in the field shows that awareness and implementation of the use of PPE by farmers is still relatively low. The results of interviews with several farmers showed that most of them had not routinely or completely used PPE while working. A 45-year-old rice farmer said that he only wore long clothes and no footwear when in the rice fields. He had boots, but found it difficult to walk while wearing them, so he preferred to go barefoot. (Khadijah & Susilawati, 2024)

The results of various studies show that education and socialization regarding K3 have a very positive impact on changing farmers' attitudes and behavior. Through interactive methods involving active participation of farmers, there has been a significant increase in understanding and attitudes towards the importance of implementing K3. However, challenges are still found in the field. Many farmers have not consistently applied K3 principles in their daily activities. Most do not use complete personal protective equipment when interacting with pesticides, and K3 practices at important stages such as mixing, spraying, and storage are still relatively poor. This fact shows a gap between the level of knowledge and its application, so that educational efforts are needed that are not only momentary, but continuous and contextual according to the conditions of farmers. The implementation of comprehensive K3 training, which includes theory and direct practice, has been proven to be able to reduce health complaints experienced by farmers by up to 30% within a few months after the program is implemented. Not only that, the use of chemical pesticides can also be reduced without negatively affecting crop yields. In

fact, some farmers have experienced increased yields after implementing healthier and more sustainable agricultural principles, such as the use of integrated pest control techniques and environmentally friendly land management. (Kurnia, 2017)

In general, farmers use more than one type of pesticide in each application, namely 68.70% of farmers use two types of pesticides for each spraying, while farmers who use one and three types (types) for each application are only 9.1%. The dosage of pesticides used by farmers for each application, it is known that 44.4% of farmers use doses exceeding the recommendations, while those who use the recommended dosage are 36.4% and some even use doses up to 2 times the recommended dosage size as much as 12.1%. This is due to concerns that the use of the recommended dosage will not be effective in controlling Plant Pest Organisms (OPT).

Excessive use of pesticides will increase control costs, increase the death of non-target organisms and can reduce environmental quality. Pesticides in the soil will experience decomposition either physically, chemically or biologically, but for persistent compounds will accumulate in the soil. Soil contamination by persistent pesticides will cause a decrease in the population and diversity of fauna, disrupt the nitrite cycle, and inhibit the process of humus decomposition in the soil. Pesticide persistence in the soil is influenced by adsorption, soil type, and pesticide formulation, humidity, temperature, pH, leaching, water flow, volatilization, erosion, degradation by light, absorption by plants, and the influence of farming methods. The use of pesticides that are not appropriate for the target, type of pesticide or inappropriate dose/concentration will have an impact on environmental pollution. This is proven by the results of research that excessive use of pesticides can pollute water and soil to the point that an increase in Pb content of 77.946 mg/Ha in the soil after planting shallots was found. (Saputri et al., 2016)

CONCLUSION

Awareness of the importance of Occupational Health and Safety (OHS) plays a major role in preventing health risks due to pesticide exposure in farmers. The use of pesticides that are not in accordance with procedures and minimal use of Personal Protective Equipment (PPE) have resulted in high rates of poisoning and health problems, both acute and chronic, among farmers. Knowledge and positive attitudes towards OHS, especially in the use of PPE, have been shown to significantly reduce health risks. However, there is still a gap between the level of knowledge and application of OHS in the field, which is influenced by factors of habit, comfort, and lack of ongoing education. Therefore, efforts to increase awareness and application of OHS must be a priority in supporting the health and safety of farmers and realizing sustainable agriculture.

SUGGESTION

1. Improving Education and Socialization
The government and related institutions need to improve K3 education and socialization programs for farmers on a regular basis, using interactive and contextual methods according to local conditions.
2. Provision and Supervision of Personal Protective Equipment
There is a need to provide PPE that is comfortable, easily accessible and affordable for farmers, as well as strict supervision of its use in the field.
3. Practical and Ongoing Training
K3 training is not only theoretical, but also practical and sustainable, so that farmers become accustomed to applying K3 principles in every agricultural activity.
4. Development of Environmentally Friendly Technology
Encourage the use of integrated pest management techniques and natural pesticides to reduce dependence on high-risk chemical pesticides.

5. Monitoring and Evaluation

A routine monitoring and evaluation system is needed for farmer behavior and health, in order to assess the effectiveness of the K3 program and make continuous improvements.

BIBLIOGRAPHY

- Adolph, R. (2016). *Analisis Perilaku Penggunaan Alat Pelindung Diri (APD) Pada Petani Penyemprot Pestisida Di Kecamatan Purba, Kabupaten Simalungun*. 1–23.
- Aeni, H. F., Nisa, R., & Nurfadillah, R. (2020). Pendidikan Kesehatan Tentang Pemakaian Alat Pelindung Diri Dan Bahaya Pestisida Di Desa Sigambir Kabupaten Brebes. *Dimasejati: Jurnal Pengabdian Kepada Masyarakat*, 2(1), 45. <https://doi.org/10.24235/dimasejati.v2i1.6641>
- Comission, E. (2019). *Penerapan Keselamatan dan Kesehatan Kerja di Bidang Pertanian di Indonesia*. 4(1), 1–23.
- Khadijah, S., & Susilawati, S. (2024). Penerapan Perilaku Keselamatan dan Kesehatan Kerja (K3) Pada Petani. *Indonesian Journal of Innovation Multidisipliner Research*, 2(2), 173–178. <https://doi.org/10.69693/ijim.v2i2.124>
- Kurnia, K. W. (2017). Pelatihan Keselamatan Dan Kesehatan Kerja (K3) Pertanian Di Desa Antapan, Kecamatan Baturiti, Kabupaten Tabanan. *Jurnal Widya Laksana*, 5(1), 47. <https://doi.org/10.23887/jwl.v5i1.9107>
- Muharry, A. (2015). Analisis Risiko Paparan Terhadap Kesehatan Petani. *Obesitas Sentral Dan Kadar Kolesterol Darah Total*, 11(1), 87–95.
- Rasjid, A., Zaenab, Z., & Nurmin, N. (2019). Hubungan Antara Perilaku Dengan Penggunaan Alat Pelindung Diri Pada Petani Pengguna Pestisida Di Desa Tonrong Rijang Kecamatan Baranti Kabupaten Sidenreng Rappang. *Media Kesehatan Politeknik Kesehatan Makassar*, 14(1), 12. <https://doi.org/10.32382/medkes.v14i1.790>
- Roestijawati, N., Hidayat, M. Z. S., Burkon, L. K., & Rahmawati, I. (2025). *Pemberdayaan Kader Tani Dalam Upaya Pencegahan Penyakit Akibat Kerja Dan Kecelakaan Kerja Di Desa Tambaksari Kidul Sumbang Pendahuluan Desa Tambaksari Kidul merupakan salah satu desa yang berada di Kecamatan Penelitian lain yang dilakukan oleh Tim Kesehatan Masyarakat Fakultas Kesehatan*. 2(2), 151–160.
- Saputri, R. D., Darundiati, Y. H., & Dewanti, N. A. Y. (2016). Hubungan Penggunaan Dan Penanganan Pestisida Pada Petani Bawang Merah Terhadap Residu Pestisida Dalam Tanah Di Lahan Pertanian Desa Wanasari Kecamatan Wanasari Kabupaten Brebes. *Jurnal Kesehatan Masyarakat*, 4, 2356–3346.
- Souisa, G. V., Talarima, B., & Rehena, Z. (2020). Peningkatan Perilaku Pencegahan Dampak Pestisida Pada Kesehatan Petani. *Jurnal Pengabdian Kepada Masyarakat*, 26(3), 109. <https://doi.org/10.24114/jpkm.v26i3.16845>