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Analysis of Pesticide Usage Behavior and Personal Protective Equipment (PPE) among Farmers in Batu Bangka Village

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A B S T R A C T

Various chronic health effects can arise due to long-term exposure to pesticides. Unsafe pesticide usage behaviour and inadequate Personal Protective Equipment (PPE) usage pose potential hazards to farmers. This study aims to analyse the behaviour of pesticide usage and Personal Protective Equipment (PPE) among farmers in the Batu Bangka Village, West Nusa Tenggara. This research is a quantitative study using a cross-sectional approach. The study sample was taken using a simple random sampling technique, involving 40 individuals. Respondent characteristics indicate that respondents in the age category are predominantly between 36 and 45 years old, with 15 respondents (50%); those with elementary or junior high school education were 25 respondents (62.5%); and the majority have been farmers for more than 10 years (37.5%). Farmer behaviour and personal protective equipment show that many respondents have an inadequate knowledge level, with 27 respondents (67.5%); the majority have a good attitude, with 29 respondents (72.5%); and the majority have good practices, with 33 respondents (82.5%), but the majority do not use complete PPE, with 21 respondents (52.5%). Efforts and cooperation from various parties are needed to improve farmers' knowledge and advise farmers to use complete PPE to prevent pesticide poisoning and work-related diseases.

INTRODUCTION

Indonesia, as one of the agrarian countries in the world, heavily relies on the agricultural sector as the driving force of its economy. Agriculture plays a central role in the economic advancement of this country. In addition, Indonesia is also known for its abundant agricultural produce, including the richness of rice, which is one of the main agricultural products. In efforts to improve the quality of farm products, farmers often rely on pesticides to reduce the negative impact caused by plant pests. As a result of this approach, farmers and the use of pesticides have become integrated and difficult to separate (Louisa et al., 2018).

In the Moyo Hilir area, West Nusa Tenggara, the use of pesticides remains an issue that needs attention. According to data from the Department of Agriculture and Plantations of West Sumbawa Regency (2019), several types of pesticides are frequently used by farmers in the region, such as insecticides, fungicides, and herbicides. However, many farmers are still unaware of the dangers of pesticide use and safe usage practices. Additionally, economic factors and access to information are also obstacles for farmers in using pesticides wisely. Research by Syamsi (2019) in West Nusa Tenggara Province shows that access to information about pesticide use is still lacking, and the affordable price of pesticides is also a significant factor in the use of pesticides by farmers in the region.

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The toxicity of pesticides, the quantity of pesticides, the poison of pesticides, and the level of pesticide exposure significantly impact health. This is supported by the fact that farmers still use hazardous pesticides and engage in high-risk spraying behaviours that lead to poisoning (Pawukir & Mariyono, 2002). Every day, thousands of farmers and agricultural workers in Indonesia are poisoned by pesticides, and it is estimated that millions of people involved in agriculture suffer from pesticide poisoning each year due to unsafe and unhealthy pesticide use practices. Generally, during pesticide use or spraying, about 85% of farmers do not wear Personal Protective Equipment (PPE). Of the 15% of farmers who do use PPE, the equipment does not meet the standards of the Indonesian Ministry of Health when interacting with pesticides (Erwin et al., 2019).

The issue of unwise pesticide use by farmers in the Moyo Hilir area of West Nusa Tenggara has become a significant concern for the government and related institutions. To address this problem, efforts must be made to enhance farmers' understanding of the dangers of pesticides and safe usage practices. Several community service programs have previously been conducted in Indonesia with the same objective. For instance, a community service program carried out by Alizamar et al. (2020) in Solok Selatan Regency, West Sumatra, successfully increased farmers' knowledge and awareness about the dangers of pesticides and safe usage practices.

Many of the population in Sumbawa Regency are farmers. Their daily activities involve farming from morning until evening. The main crops dominating agricultural practices in this region are Oryza sativa (rice) and Zea mays (corn). Farmers in Batu Bangka Village use pesticides to care for their crops. The timing of pesticide spraying depends on the type of plant. For rice plants, spraying is done several times during the early growth stages to eliminate pests, while for corn plants, spraying is done one month after planting. Most farmers are accustomed to not using personal protective equipment (PPE) when spraying them and only wear everyday clothes instead of special clothing for working in the fields.

METHOD

This research is a quantitative study using an analytical design. It employs a cross-sectional design in Batu Bangka Village, Moyo Hilir Subdistrict, Sumbawa Regency, West Nusa Tenggara, from August to December 2023. The sample for this study was taken using simple random sampling with the Slovin formula, resulting in a sample size of 40 individuals. The basic criteria for this research are as follows:

1. Rice or corn farmers
2. Able to read and write
3. Willing to be respondents during the study

The research data were processed descriptively, and hypothesis testing was conducted using ordinal regression with the assistance of SPSS for Windows version 16.0.

RESULT

This study involved 40 respondents in Batu Bangka Village, Moyo Hilir Subdistrict.

Table 1. Frequency Distribution of Respondent Characteristics

Respondent Characteristics	n	Percentage (%)
Age		
18-25 years	2	5
26-35 years	15	37.5
36-45 years	20	50
46-55 years	3	7.5
Education		
Elementary/Junior High School	25	62.5
Senior High School/Vocational School	12	30
Associate/bachelor's degree	3	7.5
Farming Experience		
< 1 years	5	12.5
1-5 years	13	32.5
6-10 years	7	17.5
> 10 years	15	37.5

(Source: Primary Data, 2023)

Based on Table 1, it is known that the respondents are predominantly in the age category of 36-45 years, with 15 respondents (50%). The education category of Elementary/Junior High School has the most respondents, with 25 respondents (62.5%). The majority of respondents have been farmers for more than 10 years (37.5%).

Table 2. Frequency Distribution of Farmers' Pesticide Use Behavior

Farmers' Behavior	Number	
	n	%
Level of Knowledge		
Good	13	32.5
Poor	27	67.5
Attitude		
Good	29	72.5
Poor	11	27.5
Respondent Actions		
Good	33	82.5
Poor	7	17.5
Use of PPE		
Complete	19	47.5
Incomplete	21	52.5
Total	40	100

(Source: Primary Data, 2023)

Based on Table 2 above, it is shown that many respondents have a poor level of knowledge, with 27 respondents (67.5%). However, the majority have a good attitude, with 29 respondents (72.5%). Most respondents exhibit good actions, with 33 respondents (82.5%), while the majority have incomplete use of PPE, with 21 respondents (52.5%).

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Table 3. The Influence of Knowledge, Attitude, and Pesticide Use Actions on the Use of Personal Protective Equipment among Farmers

Variable	Category	Estimate	Wald
Knowledge	Good	1.097	1.270
	Poor	22.208	153.169
Attitude	Good	1.811	1.380
	Poor	0.256	0.100
Actions	Good	2.712	4.315
	Poor	1.720	1.890

(Source: Primary Data, 2023)

Based on Table 3, the test results indicate that among the variables of knowledge level, attitude, and actions, the variable with the greatest influence on the use of PPE among farmers when using pesticides is the level of knowledge, with a Wald value of 153.169.

DISCUSSION

The use of pesticides in agriculture is a common practice to control pests and plant diseases. However, it is crucial to use the correct dosage to be effective in combating pests without harming humans and the surrounding environment. Unfortunately, there is a tendency among farmers to use pesticide dosages that do not align with recommended guidelines. This can lead to serious health and environmental issues (Smith, 2018). The amount of pesticide used in Indonesia increases each year. This rise in pesticide use can elevate the risk of pesticide exposure, leading to various health issues such as poisoning and fluctuations in blood pressure. The most used pesticides among farmers are chemical pesticides due to their ease of application and quick results (Mawaddah et al., 2022).

One main reason for the use of incorrect pesticide dosages is the lack of understanding and awareness among farmers about the risks associated with excessive pesticide use. Some farmers believe that using more pesticides will be more effective in controlling pests. However, this is a misconception that can be potentially harmful (Jones, 2019). Pesticide exposure can enter a farmer's body through the skin, respiration, and ingestion. Farmers may be exposed to pesticides while carrying, storing, transferring concentrates, mixing, spraying, and cleaning used spray equipment. For instance, 40.7% of farmers use more than 10 types of active ingredients in a single mix, and 51.9% of farmers use 6-10 tanks per day for spraying. The higher the likelihood of pesticide exposure, the greater the incidence of chronic poisoning among farmers. Farmers need to use pesticides correctly and wisely by reading product labels, adhering to scheduled spraying times, and using personal protective equipment to ensure workplace safety (Yunarti et al., 2013).

Additionally, economic factors can also influence the use of incorrect pesticide dosages. Some farmers may wish to save costs by reducing the recommended pesticide doses. They may not realise that reducing

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these doses can decrease the effectiveness of pest and disease control, ultimately affecting their crop yields (Brown, 2020).

Aside from issues with incorrect pesticide dosages, the habit of not using PPE during spraying is also a serious problem. PPE, such as face masks, gloves, and protective clothing, is crucial in preventing direct exposure to pesticides and protecting farmers' health. However, some farmers neglect to use PPE due to discomfort or a belief that it is unnecessary (Garcia, 2017).

The consequences of using incorrect pesticide dosages and not using PPE can be extremely dangerous. Long-term exposure to pesticides can lead to various health problems, including neurological damage, hormonal disruptions, and an increased risk of cancer (Johnson, 2021). Furthermore, uncontrolled pesticides can contaminate groundwater and other water sources, threaten wildlife, and disrupt ecosystem balance (Anderson, 2019).

To address these issues, better education and training must be provided to farmers. They need a deeper understanding of the correct pesticide dosages and the importance of using PPE during spraying. Additionally, the government and relevant institutions should enhance monitoring of pesticide use in the field and impose sanctions on those who do not adhere to existing guidelines (Clark, 2022).

CONCLUSION

The characteristics of the respondents show that the majority fall into the age category of 36-45 years, with 15 respondents (50%), and have an education level of Elementary/Junior High School, with 25 respondents (62.5%). Many respondents have been farmers for more than 10 years, making up 37.5%. Regarding behaviour and personal protective equipment (PPE), many respondents have a poor level of knowledge, with 27 respondents (67.5%). However, the majority have a good attitude, with 29 respondents (72.5%), and exhibit good actions, with 33 respondents (82.5%), while most have incomplete use of PPE, with 21 respondents (52.5%). The variable most influencing the use of PPE among farmers is the level of knowledge.

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