



An investigation of pesticide practices in rural Indonesia

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Abstract

Objectives: This research aims to understand local perceptions regarding pesticide usage.

Methods: Interviews, focus group discussions (FGDs), and live experiences were conducted with farmers in the Karo Regency, Indonesia. Six farmers, one FGD group, as well as pesticide vendors and staff from the Department of Agriculture, were interviewed.

Results: Local perceptions heavily influence pesticide usage. Pesticides are considered irreplaceable medicine with no alternative options. Health risks, if perceived, are addressed through local traditions. Pesticides and farmers have formed a close relationship, wherein farmers cannot detach themselves from their dependency on pesticides.

Conclusions: There is a need for a more thorough assessment to make farmers more mindful in pesticide usage.

Keywords: pesticides, local context, health beliefs, climate change, farmers, norms, Indonesia

Introduction

Indonesia ranks among the top five countries in terms of pesticide usage.¹ Awareness of the hazards posed by pesticides to human health is primarily due to widespread knowledge of pesticide residues in food products, as well as their environmental impacts.^{2,3} There are associations with health disorders such as cancer, diabetes, and other non-communicable diseases, as well as an increased risk of preterm birth and adverse effects on child growth.⁴⁻⁶

Despite this awareness, pesticide use remains deeply entrenched in the agricultural sector. Farmers continue to rely heavily on pesticides, including use that exceeds recommended levels, despite interventions such as educational initiatives in sustainable agricultural management practice.⁷ A common justification among farmers is the perceived absence of viable alternatives.⁸

Furthermore, governmental policies are sometimes blamed for fostering dependency.⁹

Yet, the comfort farmers find in using pesticides undoubtedly reflects broader social dimensions, as human beings are inherently interconnected with their environment.¹⁰ This brief report seeks to clarify the underlying reasons behind the persistent use of pesticides, drawing on the lived experiences of Karo farmers in Indonesia.

Methods

This research employed a qualitative approach. Data collection included in-depth interviews with six individual farmers, a focus group discussion (FGD) involving seven participants, and interactions with pesticide vendors and staff from the Department of Agriculture. The data were analyzed thematically

using NVivo software. Ethical approval was obtained from the Social-Humanities Research Ethics Committee at Universitas Sumatera Utara. Verbal consent was also secured from all participants during the research process.

Research inquiries explored the experiences and underlying reasons for pesticide usage. Probing techniques and observational

verification were employed to gain a deeper understanding of the informants' perceptions.

Results

The profiles of the informants are presented in Tables 1 and 2.

Table 1. Profile of in-depth interview informants

Name	Sex	Occupation
Astra Wijaya Munthe	Male	Farmer
Oppung Martha	Male	Farmer
Murni Zega	Female	Farmer
Iman Restu	Male	Farmer
Jonathan Munthe	Male	Farmer
Prokha Purba	Male	Farmer
Jappeni Julienz Zandrato	Male	Pesticide vendors
Dewanta Putra Barus	Male	Pesticide vendors
Maya Simanjorang	Female	Pesticide vendors
Metehsa Purba	Male	Head of the Karo Regency Agriculture Office

Table 2. Profile of FGD participants

Name	Sex	Occupation
Sudieli Telaumbanua	Male	Farmer
Sediaro Nazara	Male	Farmer
Raradodo Telaumbanua	Male	Farmer
Merdianto	Male	Farmer
Mr. Zebua	Male	Farmer
Mr. Teri	Male	Farmer
Mr. Vivi	Male	Farmer

After conducting data analysis, we summarized the research themes as presented in Table 3.

Table 3. Research Themes

Theme	Description
Pesticide Usage	Patterns of pesticide use, causes, and problems experienced by farmers
Beliefs	Source of knowledge, local knowledge, and local traditions
Perceptions of Health Impacts	Use of protective equipment and perceptions of health impacts

Based on the themes outlined above, we present the research findings as follows.

Pesticide Usage

The use of pesticides in the agricultural areas studied is indeed extensive. Throughout the planting season, farmers apply pesticides to their fields frequently. Moreover, when signs of pest infestation appear, they tend to double or even triple the dosage. Weather conditions also significantly influence pesticide application. During periods of rainfall, the intensity of pesticide usage increases, reaching up to three applications per week. The choice and frequency of pesticide use are guided by farmers' perceptions of the type and impact of rainfall. For instance, if the rain is perceived as potentially harmful to the crops, they will select a specific type of pesticide; if the rainfall is considered light, they will opt for a different type. This was explained by informant Prokha Purba.

Yes, but when it comes to the weather, if it rains frequently, like two or three times a week, then we might spray (pesticides) up to three times a week. It really depends on the weather. During the dry season, the crops are also often sprayed, using solutions that are strengthened with insecticides.

Of course, farmers utilize pesticides based on their existing knowledge. This knowledge appears to stem from observations, particularly when they detect signs of pest infestations, as well as information provided by pesticide vendors. When pests (referred to locally as *kutu*) become more prevalent, farmers tend to increase the application of pesticides accordingly. The narrative shared by Oppung Martha further illustrates this point, "The dosage depends on the pest; if there are a lot of pests, the "*kutu*," then we increase it, we increase the dose."

Thus, pesticide dosage is largely determined by the situation as perceived by the farmers. In instances where they are uncertain about the specific type of pesticide required, they typically consult pesticide vendors, describing the problems they encounter. As Prokha Purba

mentioned, "If there's an issue like that, I just ask the pesticide vendor, Bro, my chili plants are like this, what should I do?"

Sometimes, due to difficulties in articulating the issues affecting their crops, informants resort to take picture with their mobilephone. Prokha Purba again shared his story,

"I'll take a photo of the chili plants later," he said while asking the pesticide vendor, "Bro, what should I use for this? Oh, then they gave me that." Sometimes, they even forget what pesticide was given. "Then they'll mix it, measure this much, measure that much, and give it. Oh, later they'll give this, strengthen this, increase this and that."

Recommendations from vendors or others in the industry are often sought, making it convenient for farmers to find solutions.

Beliefs

The utilization of pesticides often diverges from formal knowledge. Farmers interact with vendors, agricultural officers, and social media to learn about pesticides. However, their local practices often do not align with this knowledge. This discrepancy highlights important nuances in our understanding of pesticide use in agricultural fields.

For example, one informant, Jappen Julienz Zendato, shared his narrative.

There are also things that farmers cannot control. Like the weather changing, from dry season to rainy season, then suddenly raining again, and back to dry season. Farmers just can't control that.

This condition is indeed a natural phenomenon beyond the farmers' control, leaving them no choice but to use pesticides to mitigate its perceived effects. This aligns with the earlier explanation that farmers heavily rely on their perceptions of weather changes to determine the dosage of pesticides they apply. Consequently, farmers conclude that alternative techniques are not beneficial and rely almost exclusively on pesticides. Iman Restu said,

We've also tried applying what they call organic, fermenting organic materials. It couldn't handle the pests either. It only works for enlarging tubers. If it's for spraying, organic won't do. Basically, for plants in our area, any plant, if you use organic application, it won't work. That's why all plants depend on pesticides.

Iman Restu's story reflects the lack of confidence in alternatives to pesticides to ensure crop success. This strong reliance on pesticides is also supported by local beliefs. Many informants think that if plants show signs of distress, similar to a human feeling unwell, they require treatment. As Asta Wijaya Munthe remarked,

Especially when we have extreme weather, there's a lot of pesticide use. Because of the rain, the plants get cold. Just like humans, we need to apply a lot to the plants so they stay healthy. It's like medicine for humans.

Thus, plants are considered to have conditions that need to be "treated," as failure to do so leads to losses from failed harvests. This local perspective extends beyond plants to the soil as well. As conveyed by Prokha Purba,

Farming actually requires mastery. Farmers keep learning because even if the disease starts as stem rot, it can infect the roots. Even if a lot of fertilizer is used, if the soil isn't sterile or healthy, the plants will deteriorate. That's why many people try to make the soil healthy. If the soil isn't healthy, even if you feed it, you still have to give pesticides. If the soil isn't healthy, the plants won't thrive. So, farming can be said to be both easy and difficult.

Pesticide use is not simply due to a lack of knowledge. Instead, it reflects the persistence of misconceptions among farmers, who place greater trust in their own experiential learning. This, of course, presents a unique challenge for initiating change.

Perceptions of Health Impacts

As explained earlier, farmers perceive pesticides as medicine for plants and soil and as a way to combat adverse weather conditions. As a result, they prioritize the use of pesticides as something highly important. Unfortunately, in applying pesticides, awareness of self-protection is extremely limited. Based on observations, when farmers mix, prepare, and spray pesticides, none of them use adequate personal protective equipment. They can experience dizziness, cold-like symptoms, or shortness of breath. However, these are seen as minor and easily resolved with simple remedies. "For health issues, just feeling breathless and coughing after pumping. What we do is just drink plenty of water. After spraying, drink white milk. When you get home, go to the store and drink white milk. Don't use powdered, so the milk is thick," said Oppung Marta. The "white milk" referred to here is not pure milk, but canned sweetened condensed milk, as opposed to powdered milk. Farmers consider the risks of pesticide exposure to themselves too insignificant to warrant concern.

Discussion

The initial findings of this research reveal a strong perception among farmers that pesticides as the sole solution to the problems they face. As reflected in the narratives of the informants, these issues include their efforts to cope with challenges related to weather, crops, soil, and even their health.

Farmers have their own interpretations of their experience and the role of pesticides as a necessity. The relationship between farmers and pesticides has become deeply ingrained, with pesticides often seen as a necessary human response to the difficulties they face. This bond is so strong that farmers view organic alternatives as ineffective, as also observed among other Indonesian farmers.¹¹

Pesticides are considered necessary medicine when their crops are "unwell." Just as a sick person might feel cold and require treatment, farmers believe their plants also need to be properly "medicated," and medicines are

pesticides. The relationship between human (farmer) and non-human (pesticide) has endured over time, shaped by social dynamics and reinforcing the belief that pesticides are the only viable choice in farming practices. Conversely, local farmers place more trust in the effectiveness of conventional (chemical) pesticides, further diminishing their confidence in alternative methods.

These perceptions of pesticides also extend to how farmers view the health impacts they experience when using pesticides. It is evident in the research findings that while the health impacts of pesticides on themselves exist, they have anticipated ways to address these impacts, albeit erroneously.

Indeed, the aforementioned misconceptions do not exist in isolation, but are also shaped by an environment that reinforces them. Pressure from pesticide vendors and the institutional weaknesses of local governments clearly contribute significantly, further supported by inadequate legal regulations to protect consumers and farmers.^{9,12,13}

This study does not focus on the complex issues surrounding this matter. However, the information on local perceptions may serve as a small piece of evidence that highlights a very serious problem: the vulnerability of farmers in developing countries.^{14,15} Farmers involved in this study revealed that they have never received health check-ups or monitoring from health institutions. It is therefore conceivable, given the farmers' highly negative perceptions, efforts to address the issue of pesticide use will face considerable obstacles. This largely neglected situation is likely to have long-term consequences, not only for the farmers themselves, but also for the environment and consumers of agricultural products.¹⁶⁻¹⁹

Conclusion and Recommendation

The local context revealed in this study provides important educational material that should be incorporated when educating farmers. By including these specific local perceptions, intervention efforts can be better designed and

more effective. The central government must instruct local institutions, both in the health and agriculture sectors, to take active measures in monitoring pesticide use to prevent significant future losses. Furthermore, regulations governing the sale of pesticides need to be tightened alongside enhanced campaigns promoting the use of organic pesticides.

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