

Mask-Wearing Behavior Among Rice Farmers Exposed to Pesticides: A Qualitative Study Based on the Theory of Planned Behavior

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Abstract

Research Objective. To explore mask-wearing behavior among rice farmers who apply pesticides in Antirogo Urban Village, Jember Regency, using the Theory of Planned Behavior (TPB). **Methodology.** This descriptive qualitative study was conducted from April to May 2026. Eleven informants participated: ten rice farmers as main informants and the head of the farmer group as a key informant. Data saturation was reached in interviews with the ten main informants, while the key informant provided contextual information. Data were obtained through in-depth interviews, direct observation during pesticide spraying, and documentation and were analyzed using the interactive model of Miles, Huberman, and Saldaña. **Results.** Five TPB-related themes comprising 15 categories were identified: attitude, subjective norms, perceived behavioral control, intention, and behavior. Farmers generally recognized the protective value of face coverings and the health risks of pesticide exposure, but many described heat, breathing difficulty, and discomfort. Family and peer encouragement was weak, access and field conditions constrained use, and intentions were easily disrupted by situational barriers. Only two main informants used a face covering consistently throughout spraying; other practices were inconsistent or absent. **Conclusion.** Positive beliefs alone did not ensure consistent protection. Interventions should combine risk communication, supportive family and peer norms, field supervision, and access to comfortable respiratory protective equipment selected in accordance with pesticide-use guidance.

Keywords: *rice farmers, mask-wearing behavior, pesticides, respiratory protection, Theory of Planned Behavior*

INTRODUCTION

Pesticide exposure remains an important occupational-health concern in agriculture. A meta-analysis among Indonesian farm workers reported an association between pesticide exposure and reduced cholinesterase levels (Azizah et al., 2025). Exposure may occur through inhalation, dermal contact, and ingestion (Rosina & Puspikawati, 2026). During spraying, particles or vapors may enter the respiratory tract and contribute to acute symptoms and longer-term respiratory health problems (Susanti & Sari, 2025). Appropriate personal protective equipment, including respiratory protection selected for the pesticide and task, is therefore an important component of exposure prevention.

In Indonesia, consistent use of personal protective equipment among farmers remains challenging. A meta-analysis identified knowledge, spraying frequency, and PPE use as factors associated with pesticide-poisoning risk (Sandra et al., 2025), while an observational study reported an association between PPE use and physical signs of organophosphate poisoning (Muslima et al., 2022). Other studies have highlighted comfort, social support, knowledge, attitudes, and access as determinants of PPE use among pesticide-spraying farmers (Jannah & Handari, 2020; Hayat et al., 2023; Lidianta et al., 2025). These findings indicate that access to equipment alone may not be sufficient to establish consistent protective behavior.

Previous research has largely measured knowledge, attitudes, compliance, or health outcomes. Fewer qualitative studies have examined how psychological, social, and situational factors interact in

farmers' day-to-day decisions to wear respiratory protection during pesticide spraying. The Theory of Planned Behavior (TPB) proposes that attitude, subjective norms, and perceived behavioral control contribute to intention and subsequent behavior. Studies in agricultural settings have demonstrated the usefulness of TPB for examining pesticide-use intentions and safety behavior (Batbay & Kahramanoğlu, 2024; Uikey et al., 2025). A qualitative TPB approach can therefore clarify why awareness of risk does not always translate into consistent action.

Antirogo Urban Village was selected because pesticide use is common in local rice cultivation and inconsistent PPE use has been reported in agricultural health-promotion activities in the area (Safitri et al., 2024). This study therefore aimed to explore mask-wearing behavior among rice farmers who apply pesticides in Antirogo Urban Village, using the TPB constructs of attitude, subjective norms, perceived behavioral control, intention, and behavior. The findings are intended to inform context-sensitive occupational-health promotion and farmer-safety interventions.

METHODS

This descriptive qualitative study used the Theory of Planned Behavior as a sensitizing framework. The study was conducted in the rice-field area of Antirogo Urban Village, Summersari District, Jember Regency, from April to May 2026. Purposive sampling was used to recruit rice farmers who actively applied pesticides and were willing to participate. The study included ten main informants (rice farmers) and one key informant (the head of the farmer group), for a total of 11 informants. Data saturation was assessed concurrently with data collection and was considered reached when additional interviews with the main informants no longer generated new information or categories. Saturation was reached after ten main-informant interviews; the key informant contributed contextual information and supported triangulation.

Data were collected through in-depth interviews, direct observation during pesticide-spraying activities, and documentation. The semi-structured interview guide covered attitude, subjective norms, perceived behavioral control, intention, and mask-wearing behavior. Field investigation was conducted by EZA, AKN, and RDP, and the interview material was transcribed verbatim. Analysis followed the interactive model of Miles, Huberman, and Saldaña (2014), consisting of data condensation, data display, and conclusion drawing and verification. A hybrid deductive-inductive process was used: open coding identified categories emerging from the data, and the categories were subsequently mapped to the five TPB-related themes. ENR and PDI reviewed the coding and final thematic structure. Trustworthiness was strengthened through methodological triangulation across interviews, observations, and documentation and by comparing the accounts of main and key informants.

RESULTS

The study included 11 informants: one key informant (the head of the farmer group) and ten main informants (rice farmers who applied pesticides). The ten main informants contributed the primary accounts of attitude, subjective norms, perceived behavioral control, intention, and behavior; the key informant provided contextual information and supported interpretation of field practices. Informant characteristics are presented in Table 1.

Table 1. Characteristics of Informants

Code	Sex	Age	Length of Farming	Description
IK	M	60	> 30 years	Head of farmer group (key informant)
IU 1	M	60	> 30 years	Member

Code	Sex	Age	Length of Farming	Description
IU 2	M	45	10 years	Member
IU 3	M	63	30 years	Member
IU 4	F	56	> 30 years	Member
IU 5	F	60	> 40 years	Member
IU 6	M	58	33 years	Member
IU 7	M	75	65 years	Member
IU 8	M	70	40 years	Member
IU 9	M	60	20 years	Farm laborer
IU 10	F	50	> 20 years	Member

Note: M = male; F = female; IK = key informant; IU = main informant.

Analysis identified five TPB-related themes comprising 15 categories: (1) attitude, (2) subjective norms, (3) perceived behavioral control, (4) intention, and (5) behavior. Each theme contained three categories. Table 2 summarizes the thematic structure, representative evidence, and contributing data sources.

Table 2. TPB theme-category map and representative evidence

Theme	Categories	Representative evidence	Data source
Attitude	Benefits of masks; perceived pesticide risk; comfort	"It is hot in the rice fields, and wearing a mask makes it feel even hotter." (IU 2)	Interview; observation
Subjective norms	Family support; peer/community influence; advice from officers	"Farmers here never remind each other, and they never forbid it either." (IU 2)	Interview
Perceived behavioral control	Access; physical/weather barriers; efforts to overcome barriers	"Once a year from the farmer group. We are given two each." (IU 5)	Interview; documentation
Intention	Intention to use; commitment to self-protection; barriers to maintaining intention	"Sometimes I forget." (IU 1)	Interview
Behavior	Consistency; type of face covering; attention to wind direction	"I wear it from the beginning of spraying until the end." (IU 6)	Interview; observation

Attitude

The attitude theme included three categories: perceived benefits of face coverings, perception of pesticide risk, and comfort during use.

a. Understanding the Benefits of Face Coverings

Most main informants understood that a face covering could help reduce inhalation exposure. However, this positive belief was conditional. Some considered protection necessary when applying insecticides to control pests but unnecessary when applying products perceived as less dangerous, such as foliar fertilizers.

"If it is pesticide for killing caterpillars, I use it; if it is fertilizer, I do not, because caterpillar pesticide is dangerous..." (IU 3)

"Yes, it is important. If it were not important, why would I buy it?" (IK)

b. Perception of Pesticide Risk

Farmers were aware of the risks of pesticides, but their risk assessment was subjective and influenced by personal experience. The absence of immediate clinical symptoms after spraying without a mask strengthened their belief that they were safe. Only informants who had experienced poisoning or had higher knowledge considered the risk to be serious and cumulative.

"If we do not wear a mask, it does not happen immediately, but over time it can eventually affect the lungs." (IU 6)

"The wind is unpredictable; sometimes it blows toward me..." (IK)

c. Comfort in Using Masks

Physical discomfort was the most frequently described negative belief. Many main informants mentioned heat, breathing difficulty, and discomfort as reasons for reluctance to wear a face covering, particularly when working under direct sunlight.

"It is hot in the rice fields, and wearing a mask makes it feel even hotter." (IU 2)

"It feels hot when wearing a mask. It feels uncomfortable." (IU 5)

Subjective Norms

The subjective-norms theme included three categories: family support, influence of fellow farmers and community views, and advice from health or agricultural officers.

a. Family Support

Social control from the family was very weak and varied. Most families never reminded farmers to use masks, and some even weakened farmers' intention to use them.

"He said it was troublesome." (IU 4)

"Yes, my child reminds me. Yes, when I am spraying pesticide, I am told to wear a mask." (IU 5)

b. Influence of Fellow Farmers and Community Views

Among fellow farmers, not wearing masks had become an accepted norm. There were no social sanctions for those who did not wear masks, and there was no appreciation for those who did. Mask use had even once been viewed as strange by peers.

"Farmers here never remind each other, and they never forbid it either." (IU 2)

"Yes, at that time when I was young, people said, 'Why are you wearing a mask?'" (IU 6)

c. Advice from Health Workers and Officers

Farmers' compliance tended to be reactive to external pressure from officers or landowners rather than arising from internal awareness. Agricultural extension workers only provided advice without adequate mask distribution.

"Yes, I have to wear it when there are officers. If an officer tells me to wear it, then I wear it." (IU 9)

"The agricultural extension worker (PPL) only recommends that we should wear it... but there is no budget for it." (IK)

Perceived Behavioral Control

This theme included three categories: access to face coverings, physical and weather-related barriers, and farmers' efforts to overcome barriers.

a. Ease of Obtaining Masks

Access to masks among farmers showed varied conditions. Some farmers stated that masks were easy to obtain at nearby agricultural stores or pharmacies. However, others faced geographical

barriers, such as having to travel approximately one kilometer. For some farmers, the main source of masks was distribution from farmer groups or partnership programs, such as Sampoerna, which were conducted only once a year in very limited quantities.

"No, there is none. It is far, I have to ride a bicycle. About one kilometer." (IU 4)

"Once a year from the farmer group. We are given two each." (IU 5)

b. Physical Barriers and Weather Conditions

Even farmers who had easy access to masks did not necessarily use them consistently. Physical barriers such as shortness of breath and heat remained the main reasons for refusal. As an alternative, farmers developed the strategy of spraying in the direction of the wind as a form of protection. However, this strategy has a fundamental weakness because wind direction cannot be predicted.

"The wind is unpredictable; sometimes it blows toward me." (IK)

c. Efforts to Overcome Barriers

Farmers described several coping strategies, including using cloth or a headscarf as a face covering, washing and reusing a mask, or purchasing masks independently through an online platform. These practices reflected attempts to manage access and comfort; the study did not technically assess their protective adequacy.

"I use my headscarf, Ma'am." (IU 6)

"I wash it with soap, clean it, and use it again so that it becomes clean again." (IU 7)

"I bought it on Shopee." (IU 10)

Intention

a. Intention to Use Masks

The intention to use masks was not formed evenly among informants. Farmers who had received masks from partnership programs and understood the risks showed more consistent intention. However, among most informants, this intention remained very fragile and easily weakened by situational barriers.

"Whenever I spray up to four times, I always wear a mask." (IU 7)

"I really have no intention of using a mask because I think it is troublesome." (IU 8)

b. Commitment to Self-Protection

Commitment to protecting oneself through mask use varied greatly. Some informants showed awareness that self-protection is a personal responsibility, but this did not always lead to consistent real action.

"Actually, if a person cares about himself, he will wear it; if he does not care, he will not wear it." (IU 2)

"It depends on habit. We may feel uncomfortable, but if we know the risk, we try to make ourselves comfortable with it." (IU 6)

c. Barriers to Maintaining Behavior

Although intention existed, various situational barriers made it difficult to maintain consistently. Factors such as hot weather, forgetting to bring a mask, discomfort, and the absence of supervision caused intention not to transition into patterned behavior.

"Sometimes I forget." (IU 1)

"No, because it makes me short of breath." (IU 4)

Behavior

a. Consistency of Mask Use

Mask-wearing behavior varied substantially. IU 6 and IU 10 used a face covering consistently from the beginning to the end of spraying. Some main informants used one intermittently, removing and replacing it because of heat or breathing difficulty, while IU 1, IU 4, and IU 8 did not use one during spraying.

"Sometimes I wear a mask, sometimes I do not." (IU 5)

"I wear it from the beginning of spraying until the end." (IU 6)

"Never, Ma'am." (IU 8)

This condition illustrates a gap between understanding the importance of masks and actual behavior in the field.

b. Types of Face Coverings Used

The most commonly reported item was a white cone-shaped device described by informants as a KN95-type mask and obtained through a partnership program.

"The white one with the cone shape." (IU 4)

Other informants used cloth masks or a headscarf, and one informant reported washing and reusing a mask. These face coverings should not be interpreted as equivalent. The study did not verify certification, fit, condition after reuse, or suitability for the pesticide products applied; selection was mainly driven by comfort and availability.

c. Attention to Wind Direction

As an alternative self-protection strategy, several farmers who did not use a face covering reported spraying in the direction of the wind to reduce blowback toward the face. This was a participant-described coping practice rather than a technically evaluated protective measure.

"Yes, there is a smell, but I spray in the direction of the wind, so it does not hit my face." (IU 1)

However, according to the key informant, this strategy has a fundamental weakness because wind direction in open fields is dynamic and unpredictable.

"The wind is unpredictable; sometimes it blows toward me." (IK)

DISCUSSION

The findings demonstrate that mask-wearing behavior was shaped by interaction among the five TPB-related themes rather than by knowledge alone. Main informants generally recognized the protective purpose of face coverings and the potential health risks of pesticide exposure, but these beliefs did not consistently translate into behavior. The results therefore indicate an intention–behavior gap influenced by experiential beliefs, social expectations, perceived control, and field conditions.

Attitude

Positive beliefs about protection coexisted with negative experiential beliefs about heat, breathing difficulty, and inconvenience. Farmers also judged risk conditionally according to the product used and whether immediate symptoms occurred. These are participants' perceptions and should not be interpreted as evidence that products perceived as "fertilizer" or less irritating are safe without appropriate protection. Earlier studies similarly identified comfort, knowledge, and attitude as important

determinants of PPE use among pesticide-spraying farmers (Jannah & Handari, 2020; Hayat et al., 2023).

Subjective norms

Family reminders were inconsistent, peers generally normalized non-use, and farmers often wore a face covering only when officers were present. This pattern suggests that external prompts had not developed into a stable community norm. TPB research in agricultural settings also emphasizes that behavior depends on the combined influence of attitudes, normative expectations, and perceived control (Batbay & Kahramanoğlu, 2024; Uikey et al., 2025)⁹⁻¹⁰. Group-based interventions may therefore be more sustainable than messages directed only at individual farmers.

Perceived behavioral control

Access varied among informants, but availability alone did not determine use. Heat, breathing difficulty, weather, forgetting, and established work routines remained important barriers. Farmers used cloth, headscarves, reused masks, or a white cone-shaped device described as KN95-type; however, the study did not verify certification, fit, condition, or compatibility with the pesticide product. These items should not be treated as equivalent to respiratory protective equipment selected according to applicable pesticide-use and occupational-safety guidance. Spraying with the wind was a participant-reported coping strategy and was not evaluated as an effective control measure.

Intention and behavior

Intentions were fragile and situational. Only two main informants consistently used a face covering throughout spraying, while others used one intermittently or not at all. This confirms that stated awareness or intention is insufficient when practical barriers, weak social reinforcement, and habitual practices remain unchanged. The local findings are consistent with TPB-based evidence that attitude and perceived behavioral control are important determinants of pesticide-safety behavior (Batbay & Kahramanoğlu, 2024; Uikey et al., 2025).

Practical implications

Interventions should address several levels simultaneously: clear communication about acute and chronic risks, involvement of family members and peer leaders, consistent reinforcement by agricultural and health officers, and reliable access to comfortable, standard-compliant respiratory protection appropriate to the pesticide and work task. Distribution alone is unlikely to be sufficient unless accompanied by guidance on selection, fit, use, replacement, and disposal. Because this study was descriptive, these proposed strategies require evaluation in future intervention research.

Study Limitations

This study was conducted in one urban village using purposive sampling and a small qualitative sample; therefore, the findings are intended for contextual understanding rather than statistical generalization. Interviews and observations may have been affected by social-desirability responses or changes in behavior when researchers or officers were present. Observation occurred during a limited period and may not represent practices across all seasons, pesticide products, or spraying conditions. The study also did not technically assess mask certification, fit, filtration performance, pesticide-label requirements, or exposure levels. These limitations should be considered when transferring the findings to other agricultural settings.

CONCLUSION

Mask-wearing behavior among rice farmers who applied pesticides in Antirogo Urban Village was inconsistent. Positive beliefs about respiratory protection coexisted with negative beliefs related to heat, breathing difficulty, inconvenience, and established work habits. Subjective norms were weak, perceived behavioral control was constrained by access and field conditions, and intentions were often disrupted before they became consistent behavior. The findings demonstrate an intention–behavior gap but do not establish the technical adequacy of the face coverings used.

Occupational-health interventions should combine risk education with family and peer support, regular reinforcement by agricultural and health officers, and access to comfortable respiratory protective equipment selected according to pesticide-use guidance and applicable safety requirements. Future research should evaluate the feasibility and effectiveness of these combined strategies in different farming settings.

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