

Research Article

Study of Literature: Health Belief Model Components Influencing the Use of Personal Protective Equipment among Farmers

Mariani^{1*}, Fitria Saftarina², Suryani Agustina Daulay³, TA Larasati⁴

¹⁻⁴ Faculty of Medicine, Universitas Lampung, Indonesia

* Corresponding Author: e-mail : mariani@gmail.com

Abstract: Pesticide exposure remains a major occupational risk for farmers, while the use of personal protective equipment (PPE) is still low. This literature review aims to identify Health Belief Model (HBM) components that influence PPE use among farmers. Literature searches were conducted through Google Scholar, PubMed, ScienceDirect, and SpringerLink using the keywords “Health Belief Model”, “PPE”, “farmers”, and “pesticides”. Articles published from 2019–2024 with observational or relevant qualitative designs were included. Ten studies met the criteria. The review showed that perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy contribute to PPE use behavior. Perceived barriers and low self-efficacy were the most frequent obstacles, while cues to action and perceived benefits were strong facilitators. Improving farmers’ awareness of pesticide risks, ensuring PPE availability, and strengthening health education interventions are essential to enhance protective behavior. Future research should emphasize community-based interventions, policy support, and culturally appropriate strategies to promote consistent PPE use among agricultural workers globally and sustainably.

Keywords: Farmers; Health Belief Model; Personal Protective Equipment; Pesticide Exposure; Protective Behavior.

1. Introduction

Farmers constitute an occupational group with a high risk of pesticide exposure because agricultural activities such as mixing and spraying chemicals are conducted directly in the field. Various studies indicate that pesticide exposure can cause both acute and chronic health disorders, particularly among agricultural workers in developing countries (Temesgen et al., 2025). This risk increases when farmers do not use Personal Protective Equipment (PPE) appropriately, even though the use of PPE is an important measure to reduce pesticide exposure (Ulandari et al., 2024).

The level of compliance with PPE use among farmers remains low, influenced by knowledge, attitudes, PPE availability, and risk perception regarding pesticide hazards (Abdollahzadeh & Sharifzadeh, 2021; Ulandari et al., 2024). In addition, barriers such as discomfort, limited access, and low confidence in using PPE also contribute to farmers’ protective behaviors (Shah et al., 2025). Educational interventions based on behavioral models have been shown to improve attitudes and PPE use, as demonstrated by studies employing the Health Belief Model (HBM) approach (Ahmadipour & Nakhei, 2024).

HBM is a theoretical framework that has been widely used over the past decade to analyze preventive behaviors related to pesticide risks among farmers. The components of HBM include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy, which empirically influence farmers’ decisions to use PPE (Ahmadipour & Nakhei, 2024; Temesgen et al., 2025). Therefore, it is important to identify which HBM components are most influential in enhancing farmers’ PPE usage

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behavior. This literature study aims to examine HBM components that influence PPE use based on recent research findings from various countries.

Farmers represent an occupational population that is routinely exposed to pesticides due to the direct handling, mixing, and spraying of chemical agents in agricultural environments, creating sustained risks to both acute and chronic health outcomes that demand systematic behavioral prevention strategies. Empirical evidence demonstrates that pesticide exposure is closely linked with neurological, respiratory, and dermatological complications, particularly when safety practices are inconsistently applied in routine farm operations (Damalas & Abdollahzadeh, 2016; Sookhtanlou & Allahyari, 2021). The decision to implement protective measures is not solely determined by availability of equipment, but is strongly shaped by cognitive risk appraisal and behavioral intention frameworks that influence daily work habits. Research examining pesticide applicators consistently shows that beliefs about susceptibility and harm significantly correlate with observable protective behavior, suggesting that perception-driven models are essential for understanding compliance (Perry et al., 1999; Abdollahzadeh & Sharifzadeh, 2021). Consequently, occupational health interventions increasingly emphasize behavioral determinants to bridge the persistent gap between knowledge of pesticide hazards and consistent implementation of Personal Protective Equipment (PPE).

The Health Belief Model (HBM) provides a structured theoretical framework for analyzing how individual perceptions influence protective decision-making in occupational settings, including pesticide use among farmers. Studies applying HBM indicate that perceived susceptibility, perceived severity, perceived benefits, and perceived barriers collectively shape behavioral intention by influencing how farmers interpret personal vulnerability and anticipated consequences (Moradhaseli et al., 2021; Ataei et al., 2021). These perceptual components interact with social and environmental cues to determine whether safety behaviors become habitual or remain inconsistently practiced. Evidence from agricultural contexts shows that farmers with heightened awareness of pesticide risks demonstrate stronger intentions to adopt preventive behaviors, reinforcing the explanatory power of HBM in occupational health research (Abdollahzadeh & Sharifzadeh, 2021; Perry et al., 1999). Such findings underscore the importance of integrating behavioral theory into agricultural safety programs to ensure that risk perception translates into sustained protective action.

Educational and behavioral interventions grounded in HBM have been shown to modify cognitive appraisals and strengthen protective intentions among farming populations. Structured training programs improve recognition of pesticide hazards, increase perceived benefits of PPE, and reduce psychological or practical barriers that discourage compliance (Ahmadipour & Nakhei, 2024; Moradhaseli et al., 2021). Empirical evaluations reveal that when farmers perceive clear advantages and attainable safety practices, their likelihood of adopting PPE increases significantly. Predictive models further demonstrate that cues to action such as extension services, training exposure, and peer influence function as catalysts that transform intention into measurable behavioral change (Temesgen et al., 2025; Ataei et al., 2021). These intervention outcomes highlight the dynamic relationship between cognitive perception and environmental reinforcement in shaping occupational health behavior.

Despite growing recognition of behavioral determinants, variability persists in PPE adoption across farming communities due to contextual, educational, and structural differences. Access to safety equipment, prior work experience, and exposure to extension services interact with individual beliefs to either reinforce or undermine protective behavior (Damalas & Abdollahzadeh, 2016; Sookhtanlou & Allahyari, 2021). Studies consistently demonstrate that farmers operating within supportive informational environments exhibit stronger protective intentions and more consistent safety practices. Analytical models combining behavioral theory with contextual predictors show that cognitive perception alone is insufficient without enabling conditions that support implementation (Temesgen et al., 2025; Ataei et al., 2021). Therefore, examining PPE behavior through an integrated behavioral framework is essential to capture the complex interplay between perception, intention, and environmental facilitation that ultimately determines pesticide safety practices among farmers.

2. Preliminaries or Related Work or Literature Review

Health Belief Model in Occupational Pesticide Safety

The Health Belief Model (HBM) serves as a foundational theoretical framework for explaining how individual perceptions shape preventive health behaviors in high-risk occupational environments such as agriculture. Within pesticide handling contexts, HBM

proposes that perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy interact to influence farmers' decisions to adopt Personal Protective Equipment (PPE). Empirical investigations demonstrate that farmers who perceive pesticide exposure as personally threatening and consequential are more inclined to translate awareness into protective intention and behavior (Abdollahzadeh & Sharifzadeh, 2021; Mahmoodabad et al., 2019). Qualitative evidence further reveals that cognitive recognition of risk alone is insufficient without addressing habitual practices and contextual barriers that undermine compliance (Mahyuni & Harahap, 2020). Educational interventions grounded in HBM show measurable improvements in protective perceptions and behavioral outcomes, confirming the model's explanatory and practical value in agricultural safety promotion (Ahmadipour & Nakhei, 2024).

Behavioral Intention and the Extended Theory of Planned Behavior

Behavioral intention theory, particularly the extended Theory of Planned Behavior (TPB), provides complementary insight into how attitudes, subjective norms, and perceived behavioral control influence farmers' protective decisions. Research extending TPB demonstrates that intention to use PPE is strengthened when farmers perceive social approval, personal capability, and tangible benefits associated with pesticide safety practices (Rezaei et al., 2019). Empirical findings indicate that protective behavior emerges from a cognitive negotiation between risk perception and perceived feasibility, linking motivational constructs with observable safety actions. Field studies involving pesticide applicators confirm that education, experience, and environmental reinforcement contribute to stronger behavioral intention and higher PPE compliance (Okoffo et al., 2016). Integrating TPB with health-oriented perception models enriches explanatory capacity by capturing both rational decision processes and social influences shaping occupational safety behavior.

Occupational Health Behavior and Protective Practice Adoption

Occupational health behavior theory emphasizes that protective practices are embedded within broader social, environmental, and experiential systems that influence risk interpretation and action. In agricultural settings, PPE adoption reflects an interplay between knowledge acquisition, perceived vulnerability, and structural accessibility to safety resources. Empirical studies demonstrate that farmers' protective behaviors are reinforced when risk awareness is paired with accessible training and supportive extension mechanisms (Ahmadipour & Nakhei, 2024; Okoffo et al., 2016). Survey-based analyses further show that behavioral determinants are multidimensional, involving cognitive belief structures alongside contextual facilitators that either enable or constrain safety implementation (Mahmoodabad et al., 2019; Abdollahzadeh & Sharifzadeh, 2021). Qualitative perspectives highlight that sustained behavioral change requires addressing entrenched routines and comfort considerations that often supersede risk knowledge (Mahyuni & Harahap, 2020).

3. Materials and Method

The writing of this literature study was conducted through article searches using several databases, namely Google Scholar, PubMed, ScienceDirect, and SpringerLink. The search was performed using the keywords "Health Belief Model", "HBM", "personal protective equipment", "PPE", "farmers", "petani", and "pesticide". The search was limited to articles published within the 2019–2025 period to ensure the use of recent and relevant literature.

The inclusion criteria in this literature study comprised: (1) research articles with relevant observational, cross-sectional, case-control, or qualitative designs; (2) studies involving farmer or agricultural worker respondents exposed to pesticides; (3) articles discussing Health Belief Model components (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy); and (4) articles assessing PPE usage behavior or pesticide safety behavior. The exclusion criteria included articles that were not fully accessible, did not involve farmer respondents, or did not evaluate PPE usage behavior. Based on this search, 14 articles were obtained. After selection according to the inclusion and exclusion criteria, 10 articles met the requirements and were further analyzed in this literature study.

4. Results and Discussion

Results

From the literature search results, a total of 10 articles met the criteria for review. These articles discuss the relationship between Health Belief Model components and the behavior of Personal Protective Equipment (PPE) use among farmers. The independent variables examined include perceived susceptibility, perceived severity, perceived benefits, perceived

barriers, self-efficacy, and cues to action. The dependent variable assessed in all studies was PPE usage behavior or the intention to use PPE. The sample sizes in the studies varied, ranging from 55 to more than 594 respondents. Detailed research characteristics are presented in Table 1 below.

Table 1. Research Objectives.

No	Title (Researcher)	Method	N	p-value
1	<i>Predicting farmers' intention to use PPE for prevent pesticide adverse effects : An examination of the Health Belief Model (HBM).</i> (Abdollahzadeh & Sharifzadeh, 2021)	A cross-sectional quantitative study using an HBM-based questionnaire to assess farmers' intentions in using PPE.	387	Cross-sectional observational study using the Health Belief Model questionnaire to assess safe work practices regarding pesticides.
2	<i>A survey of the safe use determinants of pesticides in Ardakan pistachio farmers according to the Health Belief Model.</i> (Mahmoodabad et al., 2019)	A quantitative descriptive study using the HBM survey among pistachio farmers in Iran.	310	All HBM constructs are described descriptively; results indicate that levels of knowledge and risk perception vary, but statistical analysis of the relationships between variables is not reported.
3	<i>Health Belief Model Application Related to Safe Work Behavior Against Poisoning Prevention in Farmers Using Pesticides.</i> (Suharmanto et al., 2025)	Cross-sectional observational study using the HBM questionnaire to assess safe work practices regarding pesticides.	400	All HBM constructs were significantly associated with safe pesticide behavior; farmers with high perceptions were more likely to take precautions and use PPE consistently.
4	<i>The Health Belief Model in Prevention Pesticide Toxicity.</i> (Mahyuni & Harahap, 2020)	Qualitative study through in-depth interviews and observation of farmers who use pesticides.	55	Farmers understand the dangers of pesticides but are inconsistent in prevention; barriers such as old habits and inconvenience are major factors in low safety behavior.
5	<i>Analysis of Factors Affecting PPE-Use Behavior Among Women Farmers of Childbearing Age in South Dempo District.</i> (Ulandari et al., 2024)	Cross-sectional study with multivariate analysis of sociodemographic and environmental factors.	116	The availability of PPE, education level, and income significantly influence PPE usage behavior, while extension worker support does not show a significant relationship.
6	<i>Pesticides exposure and the use of personal protective equipment by cocoa farmers in Ghana.</i> (Okoffo et al., 2016)	Quantitative field survey study of cocoa farmers in Ghana.	240	Most farmers do not use complete PPE; factors such as education, farming experience, and extension support are positively associated with protective behavior.
7	<i>The Effect of Education on Safe Use of Pesticides Based on the Health Belief Model.</i> (Ahmadipour & Nakhei, 2024)	Quasi-experimental study (pretest–posttest) with HBM-based educational intervention.	84	The educational intervention significantly improved scores on all HBM constructs and pesticide safety behaviors; perceived barriers

8	<i>Assessing Pesticide Handling Practices and Predictors Among Farm Workers in Awi Zonal Administration Using the Health Belief Model.</i> (Temesgen et al., 2025)	HBM-based cross-sectional study with multivariate analysis of predictors of pesticide safety behavior.	594	decreased after the intervention. Cues to action and perceived benefits have a positive effect on the intention to practice safe sex, while perceived barriers are the main obstacle to protective behavior.
9	<i>Understanding Farmers' Protective Behavior Toward Pesticide Use in Northern India: A Health Belief Model Approach Using PLS-SEM and fsQCA.</i> (Shah et al., 2025)	Quantitative study using Partial Least Squares-SEM and fuzzy set QCA approaches.	106	Perceived benefits, cues to action, and self-efficacy are strong predictors of protective behavior; perceived barriers and severity are not significant.
10	<i>Knowledge on Pesticide Handling Practices and Factors Affecting Adoption of Personal Protective Equipment: A Case of Farmers from Nepal.</i> (Thapa et al., 2021)	Quantitative cross-sectional study with factor analysis of PPE adoption..	281	Education, pesticide training, and the habit of reading labels are positively associated with PPE use, while age and land ownership are not significant.

The synthesis of the ten reviewed studies demonstrates that research on farmers' use of Personal Protective Equipment (PPE) consistently positions behavioral perception as a central explanatory variable, particularly when analyzed through Health Belief Model constructs. Quantitative cross-sectional investigations reveal that intention to use PPE is strongly associated with farmers' internal appraisal of pesticide risk and anticipated protective outcomes, indicating that perception-driven frameworks reliably predict safety behavior (Abdollahzadeh & Sharifzadeh, 2021; Mahmoodabad et al., 2019). Studies employing structured questionnaires show that variation in protective intention is not random but follows identifiable cognitive patterns linked to perceived vulnerability and benefit recognition. This convergence of findings across independent samples suggests that behavioral determinants operate systematically rather than situationally within pesticide safety contexts.

Evidence from intervention-based and quasi-experimental research further strengthens the conclusion that perceptual constructs are modifiable and directly influence behavioral adoption. Educational programs grounded in behavioral theory produce measurable increases in farmers' perceived benefits and reductions in perceived barriers, which subsequently elevate PPE compliance rates (Ahmadipour & Nakhei, 2024). These findings demonstrate that cognitive restructuring through targeted instruction can translate into sustained protective practices when reinforced by accessible information. The consistency of post-intervention behavioral improvement indicates that PPE usage is responsive to structured behavioral learning rather than being fixed by preexisting habits.

Cross-sectional analyses focusing on safe pesticide handling practices reveal that perceived susceptibility and perceived severity function as motivational precursors to protective behavior. Farmers who internalize pesticide exposure as personally threatening exhibit higher likelihoods of engaging in preventive measures, although the strength of this association varies depending on contextual and demographic factors (Temesgen et al., 2025; Abdollahzadeh & Sharifzadeh, 2021). Statistical modeling shows that these perceptions influence intention indirectly through risk appraisal mechanisms that shape decision confidence. The variability observed across populations suggests that susceptibility perception alone is insufficient without concurrent reinforcement from environmental or educational cues.

Findings related to perceived benefits display stronger consistency across studies compared with other cognitive constructs. Farmers who recognize tangible advantages such as reduced health risk and improved work safety demonstrate higher adherence to PPE protocols, indicating that benefit appraisal serves as a powerful behavioral motivator (Ahmadipour & Nakhei, 2024; Mahmoodabad et al., 2019). Analytical models confirm that

perceived benefits frequently emerge as significant predictors of protective intention even when controlling for demographic variables. This pattern underscores the importance of framing safety interventions around visible and practical outcomes that farmers can directly associate with PPE use.

Perceived barriers emerge as the most stable inhibitory factor influencing PPE adoption across diverse research settings. Studies consistently report that discomfort, cost concerns, accessibility limitations, and entrenched work habits discourage farmers from implementing protective measures despite awareness of pesticide hazards (Mahyuni & Harahap, 2020; Temesgen et al., 2025). Multivariate analyses reveal that high perceived barriers correlate negatively with behavioral intention, suggesting that cognitive resistance operates alongside structural limitations. The persistence of this relationship across both qualitative and quantitative studies highlights the necessity of addressing environmental and ergonomic obstacles within safety promotion strategies.

Cues to action represent a critical transitional mechanism linking perception with observable behavior. Exposure to extension services, safety training, peer influence, and prior poisoning experiences consistently stimulates protective decision-making by reinforcing risk awareness and practical readiness (Abdollahzadeh & Sharifzadeh, 2021; Temesgen et al., 2025). Statistical evaluations demonstrate that external prompts increase the probability of PPE use by activating existing cognitive beliefs and converting intention into execution. This evidence suggests that behavioral activation requires continuous informational reinforcement rather than isolated awareness campaigns.

Self-efficacy findings indicate that confidence in personal capability functions as a moderating variable that determines whether protective intention is sustained under real-world conditions. Farmers who believe they can effectively implement PPE protocols are more likely to persist in safe practices, particularly following training interventions that enhance practical competence (Ahmadipour & Nakhei, 2024). However, some studies report diminished influence of self-efficacy when environmental constraints overshadow individual confidence, illustrating the interaction between personal belief and situational feasibility (Temesgen et al., 2025). Collectively, the literature indicates that PPE adoption is best understood as the product of dynamic interplay between perception, reinforcement, and contextual enablement rather than isolated cognitive factors alone.

Discussion

Based on the review of the 10 analyzed studies, all components of the Health Belief Model were found to contribute to Personal Protective Equipment (PPE) use behavior or safe pesticide behavior among farmers. Variations in findings across studies were influenced by differences in sample size, respondent characteristics, types of agriculture, and analytical approaches such as cross-sectional, qualitative, and behavioral models applied in each study (Abdollahzadeh & Sharifzadeh, 2021; Ahmadipour & Nakhei, 2024; Mahmoodabad et al., 2019; Mahyuni & Harahap, 2020; Okoffo et al., 2016; Shah et al., 2025; Suharmanto et al., 2025; Temesgen et al., 2025; Thapa et al., 2021; Ulandari et al., 2024). In general, HBM components such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy demonstrated varied relationships with farmers' protective behavior, and several components showed stronger consistency than others (Suharmanto et al., 2025).

Perceived susceptibility was examined in several studies, and most showed an association with safe pesticide behavior. Studies reporting statistical findings indicated that farmers with better perceptions of susceptibility were more likely to undertake preventive actions, including the use of personal protective equipment (PPE), compared with those with lower susceptibility perceptions (Suharmanto et al., 2025; Ahmadipour & Nakhei, 2024; Abdollahzadeh & Sharifzadeh, 2021). Some studies described susceptibility perceptions descriptively without relational analysis, thus not demonstrating a direct influence on behavior (Mahmoodabad et al., 2019). There were also studies that did not find a significant relationship between perceived susceptibility and intentions for safe pesticide behavior, although some respondents had high perception scores (Temesgen et al., 2025). These varied findings indicate that susceptibility perception is not always the primary determinant of safe behavior, particularly when knowledge and exposure to information remain limited (Mahyuni & Harahap, 2020).

Perceived severity has also been widely examined, and several studies indicate an association with PPE use behavior or safe pesticide behavior. Farmers who assessed pesticide exposure as potentially causing serious consequences tended to be more compliant in implementing preventive measures (Suharmanto et al., 2025; Ahmadipour & Nakhei, 2024;

Abdollahzadeh & Sharifzadeh, 2021). However, some studies describe that although farmers understand the severity of risk, this perception is not always followed by behavioral change due to limited access to information and long-established work habits (Mahyuni & Harahap, 2020). Other studies did not find a significant relationship between perceived severity and intentions for safe pesticide behavior (Temesgen et al., 2025; Mahmoodabad et al., 2019).

Perceived benefits represent a component with more consistent findings compared with susceptibility and severity. Several studies indicate that farmers' understanding of the benefits of PPE use or safe pesticide practices is associated with increased protective behavior (Suharmanto et al., 2025; Abdollahzadeh & Sharifzadeh, 2021; Ahmadipour & Nakhei, 2024). Improvements in perceived benefits following health education were also shown to increase PPE use (Ahmadipour & Nakhei, 2024). Another study using Partial Least Squares–Structural Equation Modeling (PLS-SEM) demonstrated that perceived benefits are among the predictors of farmers' protective behavior (Shah et al., 2025). Although qualitative research noted that understanding benefits does not always translate into action, the pattern of positive association remains dominant (Mahyuni & Harahap, 2020).

Perceived barriers constitute the component with the most consistent findings. Barriers related to PPE use, such as discomfort, hot weather, limited access, cost, and workload, were shown in several studies to be the primary reasons for low protective behavior among farmers (Suharmanto et al., 2025; Abdollahzadeh & Sharifzadeh, 2021; Ahmadipour & Nakhei, 2024). Other studies demonstrated that high barriers are associated with low intentions to practice safe pesticide behavior, reinforcing that perceived barriers are the principal factor inhibiting preventive practices (Temesgen et al., 2025; Shah et al., 2025). Structural factors such as PPE availability were also shown to have a significant impact, particularly among women farmers of childbearing age (Ulandari et al., 2024). This consistency indicates that perceived barriers are the strongest factor hindering farmers' protective behavior.

Cues to action also exert a substantial influence on safe pesticide behavior. Exposure to information through extension activities, training, poisoning experiences, and guidance from officers has been shown to improve safe pesticide practices (Suharmanto et al., 2025; Abdollahzadeh & Sharifzadeh, 2021; Ahmadipour & Nakhei, 2024). Other research also indicates that cues to action are significantly associated with intentions for safe pesticide behavior (Temesgen et al., 2025). Analysis using PLS-SEM further demonstrated that cues to action are an important predictor of protective behavior (Shah et al., 2025). Another descriptive study showed that extension activities can increase farmers' awareness of pesticide risks (Mahmoodabad et al., 2019).

Self-efficacy demonstrates varied relationships across studies. Farmers' confidence in their ability to implement safe pesticide practices and PPE use is associated with increased protective behavior in several studies (Ahmadipour & Nakhei, 2024; Shah et al., 2025). Improvements in self-efficacy through training have also been shown to enhance safe pesticide practices (Ahmadipour & Nakhei, 2024). However, some studies did not find a significant relationship between self-efficacy and intentions for safe pesticide behavior, suggesting that environmental factors may limit the role of self-efficacy in certain contexts (Temesgen et al., 2025).

In addition to HBM components, several non-HBM variables also influence PPE use behavior among farmers. Education level, income, work experience, age, extension support, and PPE availability were shown to affect protective behavior in several studies (Ulandari et al., 2024; Okoffo et al., 2016; Thapa et al., 2021). PPE availability was identified as the most dominant non-HBM factor influencing protective behavior among women farmers of childbearing age (Ulandari et al., 2024). Educational level and work experience were also associated with PPE use behavior, where farmers with better education or experience demonstrated higher knowledge and safer practices (Okoffo et al., 2016; Thapa et al., 2021).

When viewed integratively, all HBM components and non-HBM variables interact in shaping PPE use behavior among farmers. Perceived susceptibility, perceived severity, and perceived benefits form risk perceptions, whereas perceived barriers and cues to action directly influence behavioral decision-making. Self-efficacy plays a role when environmental barriers can be minimized, and external variables such as education, extension activities, and PPE availability strengthen or weaken the effectiveness of HBM components in shaping farmers' protective behavior (Suharmanto et al., 2025; Ulandari et al., 2024; Okoffo et al., 2016).

The expanded synthesis of the reviewed literature confirms that farmers' Personal Protective Equipment (PPE) use behavior emerges from a multidimensional interaction between cognitive perception, behavioral intention, and contextual reinforcement

mechanisms described within the Health Belief Model framework. Across the analyzed studies, perceived susceptibility and perceived severity operate as foundational cognitive triggers that shape how farmers interpret pesticide exposure, yet their behavioral translation depends heavily on how risks are internalized within daily agricultural routines. Evidence indicates that perception alone rarely guarantees behavioral compliance, as long-standing occupational habits, environmental discomfort, and informational gaps frequently mediate the decision to adopt protective measures. The literature consistently illustrates that farmers who cognitively recognize pesticide hazards still negotiate practical feasibility before implementing PPE, revealing a dynamic tension between awareness and action. This interaction demonstrates that occupational safety behavior is not a linear outcome of knowledge acquisition but rather a negotiated process influenced by psychological readiness, environmental conditions, and experiential learning.

A critical pattern emerging from the literature is the stabilizing role of perceived benefits and perceived barriers as competing determinants that directly influence behavioral execution. Farmers who clearly associate PPE use with tangible health protection and work efficiency display stronger protective adherence, suggesting that benefit appraisal functions as a motivational anchor within pesticide safety decision-making. Conversely, perceived barriers such as discomfort, heat stress, financial limitations, and restricted equipment access persist as dominant inhibitors capable of overriding even high levels of risk awareness. Studies repeatedly show that behavioral resistance is often rooted in experiential inconvenience rather than ignorance of hazard, emphasizing that protective compliance requires both cognitive acceptance and environmental compatibility. This duality highlights that successful safety interventions must simultaneously amplify perceived advantages while systematically reducing structural and ergonomic obstacles that discourage consistent PPE use.

The integrative perspective provided by cues to action and self-efficacy further clarifies how perception transitions into sustained protective behavior within real agricultural contexts. External prompts including training programs, extension services, peer modeling, and prior exposure incidents function as activation mechanisms that reinforce risk awareness and convert intention into operational behavior. Self-efficacy strengthens this process by fostering confidence in the farmer's ability to maintain protective routines despite environmental pressures, although its influence diminishes when systemic barriers remain unresolved. The literature demonstrates that behavioral durability is highest when informational reinforcement, practical skill development, and accessible protective infrastructure operate synergistically. Taken together, these findings support the interpretation that PPE adoption is best understood as a continuous behavioral cycle shaped by perception, activation, capability, and contextual enablement rather than as an isolated compliance event.

5. Conclusion

Based on the review of ten studies, all components of the Health Belief Model were shown to play a role in influencing Personal Protective Equipment (PPE) use behavior among farmers, where perceived susceptibility, perceived severity, and perceived benefits tend to enhance protective behavior, whereas perceived barriers constitute the most dominant factor hindering the implementation of safe pesticide practices; cues to action function as important triggers through extension and information, and self-efficacy contributes to farmers' confidence in undertaking preventive actions, with non-HBM variables such as education, work experience, extension support, and PPE availability also influencing behavior as environmental factors that strengthen or weaken the effectiveness of HBM components in shaping PPE use behavior among farmers.

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