

5. Handling of pesticides

5.1 What causes improper handling of pesticides?

Most farmers in developing countries have never had any formal education or training regarding pesticide handling or safety precautions with pesticides. This results in millions of poisonings and deaths among users, bystanders and consumers every year (2, 3). Knowledge is therefore one of the most important factors in the prevention of pesticide poisonings (1). It is necessary to train and educate farmers to remove erroneous beliefs in order to make farmers protect themselves against the adverse health effects related to pesticide use (1).

However a number of studies have shown that pesticide practices are formed by larger structural influences above the presence or absence of accurate knowledge (6). In some countries the knowledge and awareness of the adverse health effects caused by unsafe pesticide spraying is already high among farmers using pesticides (1, 5).

Therefore other factors besides knowledge become essential when trying to understand the farmer's behavior. Some of the factors interacting with the farmer's knowledge are: the availability of pesticides, the farmer's economy, the convenience or inconvenience of using preventive measures such as PPE, effectiveness, time consumption, peer pressure, etc. (1, 2, 4, 5, 7, 8).

Box 5.1. Examples of improper handling of pesticides:

- Storage of pesticide products at home and/or unlocked (1)
- Mixing of pesticides in the kitchen (1)
- Mixing of pesticides next to rivers and waterholes (4)
- Inadequate disposal of empty pesticide containers in rivers or in the open. (1)
- Eating and drinking during pesticide application (1, 4, 5)
- Cleaning the spray nozzle by sucking its mouth (4, 5)
- Using no or inadequate protective clothing (1)
- Not reading label or not understanding its recommendation (4, 7)
- Using a stronger mixture than recommended, believing "the stronger the better" (2)

5.2 Availability

In industrialized countries the production, sale and use of pesticides is monitored and controlled relatively tightly (5). Even though many developing countries (e.g. Bolivia) have signed the Rotterdam and Stockholm conventions, highly hazardous pesticides are still easily available, due to lack of enforcement of legislation, and smuggling between countries (2, 4).

The easy availability of highly hazardous pesticides is one of the most important reasons for the high number of poisoning cases, especially self-poisoning (5, 7, 9). Due to the fact that no regulations laid down to control who buys and sells pesticides are enforced, pesticides are widely used among farmers (5) who haven't got any education or training in correct handling of pesticides (10). In addition lack of enforcement of regulations results in vendors selling extremely hazardous pesticides (2) or repackaging pesticides in unlabeled or incorrect labeled containers (5). This can be seen as highly problematic since a survey among vegetable farmers found that more than 50 % of the farmers received their information on pesticides from pesticide dealers (5).

For further reading on accessibility:

- See fact sheet 4: Accessibility of pesticides

5.3 Knowledge and misinformation

The education level of the farmer is closely related to correct handling of pesticides (7) without experiencing symptoms after spraying (10). Lack of information and proper education about pesticide handling is a widespread problem in many developing countries (1, 2, 4, 8). Most farmers know that pesticides are poisonous chemicals (2), however the knowledge level varies among regions and countries.

Box 5.2. The basic objectives of education are:

“To ensure that peasants understand the health hazards of relevant pesticides, use protective equipment properly, practice personal hygiene measures, become familiar with and adopt proper work practices, recognize early symptoms of overexposure to pesticides, and obtain first aid at the earliest time possible” (1).

5.3.1 Knowledge about health effects

Qualitative studies have shed light on the knowledge of health effects among farmers in developing countries. Two studies have shown that most farmers know that pesticides can be dangerous through oral ingestion (1), some farmers are aware of the respiratory exposure route, and only few are aware of the dermal exposure route (1, 8). Absorption through the skin is believed to be the most frequent means of pesticide exposure for farmers (11).

However, it is critical that some farmers think that pesticides are harmless or attribute symptoms of illness after spraying to other causes than pesticides (8). Furthermore pesticides are by some farmers perceived as medicine to treat the crop and therefore farmers do not think that pesticides may cause negative health effects to humans (2, 8). In some cases farmers even apply pesticides on the skin to treat infections on themselves or their family (4). Other farmers think they are already taking sufficient precautions (8). A study from Pakistan showed that farmers who experienced health problems from pesticides were more concerned about health effects and used PPE more often than farmers not experiencing health problems from pesticides (12).

5.3.2 Knowledge about the handling of pesticides

Apart from the farmer's education level, applying the right dose, reading instructions on the pesticide containers before use and using personal protective equipment (PPE) have been shown to prevent symptoms after spraying (4, 10).

Dosage

There is evidence that many farmers perceive pesticides necessary to preserve crops (2, 5). A common belief among farmers in some developing countries is that an excessive use of pesticides will reduce pest attack and the farmers therefore often apply too big doses (2, 4). Some farmers spray the double or triple amount of what is needed during one cropping season and do not think about pest resistance (2). Another common erroneous belief among some farmers from Bangladesh is that they think that pesticides besides the control of pests also increase soil fertility (2).

Reading the label in the application process

One of the main precautions the farmers could take in the application process is to read the label on the pesticide container. The label describes how to correctly apply the pesticide. The label, when properly followed, provides protection for applicators, consumers and the environment (13). However, a high proportion of farmers cannot read or understand instructions on pesticide packages, which are often written in foreign languages (7). Even though it is written in their own language it is estimated by UNESCO that one out of five individuals on world basis are still not able to read it. The biggest burden of illiteracy is in African and Asian countries (14).

There can be different reasons for not reading the label:

- The label is in a different language (7)
- Farmer reads label, but does not understand how to apply (4)
- Illiteracy (4)
- Reluctancy to read label (7)
- Farmer does not read label and relies on his or her own logic or information from family members and neighbors (5)

Use of personal protective equipment (PPE)

The use of PPE has been shown to reduce adverse health effects among farmers using pesticides (4). However, a number of barriers for the use of PPE are mentioned by farmers:

- It is uncomfortable in the hot and humid climate (5, 8)
- It is time consuming (5)
- It is hampering work output (5)
- It is more important working carefully with the pesticides than to use PPE (7)
- Peer pressure: it would be embarrassing using PPE when nobody else does (5)
- It is too expensive or farmers are not willing to pay (8)

Box 5.3. Where do farmers get their knowledge from?

- 1.** Education
- 2.** Pesticide vendors
- 3.** Use their own experiences with pesticides to decide which pesticides to use and how much to apply
- 4.** Other farmers, neighbors and family
- 5.** Government extension service

5.4 Other factors affecting pesticide practice

5.4.1 Strong attitudes

Even though farmers are aware of the health hazards of pesticides they continue to use them because they regard pesticides as indispensable for saving their crops (5). Some farmers think that taking precautions does not help and will cause more harm than good (8).

5.4.2 Convenience, effectiveness and time consumption

Many farmers keep doing unsafe practices of pesticide handling due to reluctance, convenience, effectiveness and time consumption even though they are aware of correct handling (5, 8) It can be inconvenient to wear sufficient PPE or time-consuming to carry out alternative methods in agriculture.

5.4.3 Economy

Farmers may not be willing to pay for PPE (8) and alternatives to pesticides can be more expensive to purchase, not taking into account that these products need to be applied fewer times (and in lesser amounts). There is a connection between education and willingness to pay for PPE. The more educated the farmer is, the more willing he is to pay for PPE (8).

Scarcity of work is so comprehensive in some countries that the farmers are confronted with the dilemma of the uncertainty of having an income to support their family and the probability of being ill by spraying in the field with pesticides (8).

5.4.4 Cultural beliefs

In some regions cultural beliefs of how to apply pesticides influence the farmers' pesticide practice. Cultural beliefs are the commonly held norms and moral standards of a culture which set expectations for behavior (15).

Examples of cultural beliefs in pesticide handling among farmers in the Philippines:

- Pesticides harm only certain types of people - e.g. the old, the weak, but not those who are 'immune' like young people (8).
- There is a parallel in managing or caring for the health of plants and humans. For example "In the same way that a sick baby is given medicines, a young rice crop needs pesticides for its sickness" (8).

For further reading on farmers knowledge and behavior:

- Mekonnen Y, Agnoafir T. Pesticide sprayers' knowledge, attitude and practice of pesticide use on agricultural farms of Ethiopia. *OccupMed*. 2002;52(6):311-5.
- Palis FG, Flor RJ, Warburton H, Hossain M. Our farmers at risk: behaviour and belief system in pesticide safety. *JPubHealth*. 2006;28(1):43-8.
- Parveen S, Nakagoshi N. An analysis of pesticide use for rice pest management in Bangladesh. *JIntDevelopCooperation*. 2001;8(1):107-26.
- Van Der Hoek W, Konradsen K, Athukorala K, Wanigadewa T. Pesticide poisoning: a major health problem in Sri Lanka. *SocSciMed*. 1998;46(4-5):495-504.
- Zyoud SH, Sawalha AF, Sweileh WM, Awang R, Al-Khalil SI, Al-Jabi SW, et al. Knowledge and practices of pesticide use among farm workers in the West Bank, Palestine: safety implications. *EnvironHealth PrevMed*. 2010;15:252-61.
- For more information about correct use of PPE, the label on the container, and safety precautions in general: <http://psep.cce.cornell.edu/Tutorials/core-tutorial/Default.aspx>

5.5 What to do?

A reduction in the availability of the most toxic pesticides through implementation and enforcement of regulations is essential in order to prevent pesticide poisoning, but in many developing countries this is problematic due to lack of resources (see Fact sheet 4: Availability of pesticides). Although other factors than knowledge seem to have an influence on pesticide handling of farmers, enhancing the farmers basic knowledge of the correct handling of pesticides (see box 5.2) is important in order to reduce the number of poisonings. A second step in improving agricultural practices of pesticide application is the adoption of alternative methods in agriculture for example through the introduction of Integrated Pest Management (IPM). IPM has proved to be more economic for the farmer and has advantages for human health and the environment (5).

For further reading on “What to do?”:

- See Fact sheet 6: Prevention of pesticide poisonings

Educative session

Educative videos

1. **Lack of knowledge and misinformation:** The Bolivian peasant, Oscar, sprays with pesticides and tells about which pesticides he prefers to use and why and if he applies the information on the label in his work with pesticides.
2. **Storage of pesticides – difficult to find a safe place:**
 - Rafael Cervantes, medical doctor at the Fundación Plagbol, describes where farmers store pesticides, why it can be difficult to find a safe place and consequences related to improper storage.
 - Julia Vargas, Administrator of a health center in Bolivia, tells about where people store pesticides inside the home and about children getting exposed.
 - Jose Richardo Chape Yujra, nurse, tells about accidents where children accidentally drink or eat pesticides.

Study questions

Lack of knowledge and misinformation

- Through which routes are Oscar getting exposed to pesticides?
- Do you think that Oscar's improper handling of pesticides is caused by lack of knowledge and misinformation or can it be due to other barriers. Discuss this.

Improper storage

- What causes improper storage of pesticides and what are the consequences?
- Can you think of ways to prevent improper storage of pesticides and its consequences. Mention one structural approach and one individual-based approach.
- Consider the complexity of the farmer's behavior when handling pesticides using the Health Belief Model.

For further reading about the Health Belief Model:

- http://www.utwente.nl/cw/theorieenoverzicht/Theory%2oclusters/Health%2oCommunication/Health_Belief_Model.doc/
- Kahn M. Adverse health effects, risk perception and pesticide use behavior: Federal Urdu University of Arts, Science and Technology; 2009
- Abraham C, Sheeran P. The Health Belief Model. In: Conner M, Norman P, editors. Predicting Health Behaviour: Research and practice with Social Cognition Models. Second ed: Open University Press; 2005. <http://www.ihepsa.com/files/predicting%2oHealth%2obeh%2oavior.pdf#page=45>

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2. Parveen S, Nakagoshi N. An analysis of pesticide use for rice pest management in Bangladesh. *JIntDevelopCooperation*. 2001;8(1):107-26.
3. WHO. Public Health Impact of Pesticides Used in Agriculture. Geneva: World Health Organization; 1990
4. Jørs E, Morant RC, Aguilar GC, Huisi O, Lander F, Baelum J, et al. Occupational pesticide intoxications among farmers in Bolivia: A cross-sectional study. *Environmental Health: A Global Access Science Source*. 2006;5(10).
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8. Palis FG, Flor RJ, Warburton H, Hossain M. Our farmers at risk: behaviour and belief system in pesticide safety. *JPubHealth*. 2006;28(1):43-8.
9. Eddleston M, Karalliedde L, Buckley N, Fernando R, Hutchinson G, Isbister G, et al. Pesticide poisoning in the developing world—a minimum pesticides list. *The Lancet*. 2002;360.
10. Jørs E. Acute pesticide poisonings among small-scale farmers in La Paz country Bolivia: University of Copenhagen; 2004.
11. Perry MJ, Marbella A, Layde PM. Association of Pesticide Safety Knowledge With Beliefs and Intentions Among Farm Pesticide Applicators. *JOccupEnvironMed*. 2000;42(2).
12. Kahn M. Adverse health effects, risk perception and pesticide use behavior: Federal Urdu University of Arts, Science and Technology; 2009
13. PSEP. The Label. [cited 29.06.11]; Available from: <http://psep.cce.cornell.edu/Tutorials/core-tutorial/module4/index.aspx>.
14. UNESCO. Chapter 7: Mapping the global literacy challenge: United Nations Educational, Scientific and Cultural Organization; 2006
15. Prenhall. Cultural Beliefs. [cited 29.06.11]; Available from: http://wps.prenhall.com/hss_arnett_adolescence_2/13/3390/868035.cw/index.html.