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Understanding limited glove use among pesticide applicators

A qualitative study on Java Island, Indonesia

Manja Coppens

vegIMPACT
Improved Vegetable Production and Marketing for small farmers to Increase the Food Security status and to promote Private Sector Development in Indonesia

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Summary

Chemical pesticides are widely used and misused in Indonesian agriculture. Research shows that use of personal protective equipment during pesticide spraying is no common practice in Indonesia. The purpose of this study is to understand which factors attribute to the likelihood of wearing gloves during pesticides spraying. Thus, the study might contribute to development of occupational health interventions aimed at promotion of protective behaviour for pesticide spraying. Results of this study answer the question:

How could the likelihood of wearing gloves while spraying pesticides for small-scale vegetable farmers and fieldworkers in Sukamanah be explained using the Health Belief Model?

A mixed methods approach was used for data collection in Sukamanah, on Java Island in Indonesia. Semi-structured interviews were held with 40 farmers and field-workers, fourteen females, six health professionals, delegates of the district's health department and two extension workers. Five sprayings sessions and two vegIMPACT trainings were observed. Interviews were transcribed and field notes were transferred into trip reports. All data was coded by hand. Codes were compared to the factors of the Health Belief Model and combined into themes.

The majority of pesticide applicators acknowledged being at risk of negative health effects due to pesticide exposure. Respondents believed that susceptibility could be reduced or eliminated by vitality or personal strength, consuming certain food and beverages (e.g. milk, tamarind) and timing of spraying activities based on weather conditions. Respondents were divided in their perceptions of severity of the health impact due to pesticide exposure. The most important perceived barriers to wearing gloves are: too difficult to wear, not having any gloves and not being used to wear gloves. Wearing gloves was believed to protect the applicator's health, which enables him to work. Farmers are rarely confronted with cues to action (e.g. advice from others, risk of pesticides in media). Brief knowledge tests before and after participation of the vegIMPACT training showed that participants had trouble understanding long term risks of pesticide exposure. Experiences with pesticide poisoning seldom result in adoption of preventive strategies. Socio-political developments and expressed expectations highlight significance of governmental advice. Yet, the government does not put safe use of pesticides on the governmental agenda. Thus, health professionals cannot provide appropriate care and preventive advice.

In order to tackle unsafe pesticide use in the future it is recommended to put the item on the political agenda, stimulate protective behavior of key figures and use engaging training methods to promote risk understanding for pesticide applicators.

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This thesis would not have been possible without the support of many. Hereby, I would like to express my gratitude.

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Glossary

Term	*Definition*
Health professional	An individual who systematically provides health care services to people, families or communities
Health literacy	The capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions
Occupational health	Safe and healthy work environment
Perceived severity	Belief about the seriousness of a certain health threat
Perceived susceptibility	belief of a person to be prone to be affected
Perceived threat	The extent to which a person considers himself to be facing harm
Personal protective equipment (PPE)	Safety tools used to help employees in protecting themselves against the hazards in the work environments (e.g. mask, gloves, face shield)
Pesticide	Substance used to control pests. N.B. This research focuses on use of chemical pesticides, including insecticides, herbicides and fungicides
Pesticide poisoning	Pesticides affect a person
Protective behaviour	Actions that limit the risk of pesticides (e.g. following instructions on pesticide labels, taking into account wind direction, making use of appropriate protective clothing, ensuring good personal hygiene, avoiding contact with the chemical, maintaining the spraying instruments, safe storage of pesticides and spraying instruments and safe disposal of empty cans)
Risk/hazard	Potential for injury or illness
Toxicity	Ability to cause injury or illness

1. Introduction

1.1 Problem definition

Agriculture is one of the most important sources of income in Indonesia. The agricultural sector was responsible for 35.9 percent of employment in 2011 (International Labour Organization, 2015) and accounted for fourteen percent of Indonesia's gross domestic product in 2014 (World Bank, 2015). Concerns about pest outbreaks are part of farmer's daily conversations. Although pesticides are harmful for health of sprayers and those in direct or indirect contact (World Health Organization, 1990), Indonesian farmers use them widely.

Chemical pesticides can affect the human body via ingestion, the respiratory system, skin contact and skin absorption (Canadian Centre for Occupational Health and Safety, 2016). Dizziness, limited visual ability and vomiting are symptoms of acute pesticide poisoning. Long term health effects vary from asthma to different types of cancer and neurological damage (WHO, 1990). Exposure during pregnancy may result in premature birth and birth defects. The majority of pesticide poisoning occurs in developing countries. Estimation of the number of unintended pesticide poisoning cases in developing countries is difficult due to underreporting, lack of data and misdiagnosis (Forget, 1991). According to the World Health Organization (WHO) (2004) the hazard of pesticide can be measured by the formula: Hazard = Toxicity x Exposure (The Pennsylvania State University, 2009). Thus, the higher the toxicity, the larger the risk. Likewise, a longer exposure period is related to higher risk on poor health (Damalas & Eleftherohorinos, 2011). Therefore, limiting pesticide exposure and limiting pesticide use is beneficial for the health of its users and surroundings. Pesticide usage has an impact throughout different levels of society and product value chain.

Farmers and fieldworkers are directly influenced by pesticide exposure. If farmers forbear to wash their full body after spraying, pesticides are brought home. Residues of the chemicals might stick on their hands. With the same hands they will touch their relatives and prepare meals. In effect, family members are indirectly exposed. Bystanders could also be indirectly exposed through the wind. Since empty containers are mostly washed in the river, citizen of nearby villages will be indirectly exposed.

Previous studies show that pesticides are widely overused and misused in Indonesia (Yuantari et al., 2015). Chemical pesticides are perceived as easy substances to ensure good yields. The amount of pesticides registered on the Indonesian market has increased from 1557 in 2008 till 2628 in 2010 (McGee, 2010). Farmers tend to mix different types and brands, irrespective of active ingredients. Besides, few farmers take into account the wind direction. According to traditional gender division, males take care of spraying, while females are responsible for weeding. Weeding activities taking place simultaneously with spraying are not uncommon. As a result, fieldworkers engaged in weeding might be exposed through the air, water and soil. Murphy et al. (1999) conducted a retrospective cohort study on reproductive outcomes of female pesticide sprayers (N=161) and female farmers (N=353) in West-Sumatra. Nearly 100 per cent of participants seemed to measure and mix pesticides by hand with a spoon or other instrument. Therefore, almost all participants were at risk due to direct skin exposure. Women carried residual liquid on top of the tanks on their back. Over time, the residual liquids would spill down on clothing and skin. As a result, the sprayer's back, loins and legs are highly exposed to pesticides. Nearly none of the participants wore gloves while spraying (Murphy et al., 1999).

Protective behaviour can limit exposure to the substance (Food and Agriculture Organization of the United Nations, 2001). Protective behaviour focusses on; following instructions on pesticide labels, taking into account wind direction, making use of appropriate protective clothing, ensuring good personal hygiene, avoiding contact with the chemical, maintaining the spraying instruments, safe storage of pesticide spraying instruments and safe disposal of empty cans (Van Der Maden, Gordijn, Wulansari & Koomen, 2015). Appropriate personal protective equipment (PPE) consists of a hat,

mask, googles, long-sleeved shirt, gloves, long pants and boots.

Research shows that protective behaviour is no common practice in Indonesia (Yuantari et al., 2015; Van der Maden, Walansari & Koomen, 2014). Therefore, a large part of the Indonesian population is at risk to suffer from the effects of acute and chronic pesticide exposure. A survey among 32 farmers and 112 female fieldworkers pointed out that more than 90 percent of respondent wore a hat and a long sleeved t-shirt when mixing and/or spraying pesticides. Usage of additional PPE, was far less common: boots (0%), eyeglasses (0% of farmers; 0.9% of female fieldworkers), a mask (12.5% of farmers; 8.9% of female fieldworkers), gloves (9.4% of farmers; 19.6% of female workers) and long pants (9.4% of farmers; 20.5% of female fieldworkers) (Van der Maden, Walansari & Koomen, 2014).

Article 23 of the Health Act (law 23, 1992) states that occupational health executed in a way that all workers are able to work in good health without putting themselves or their community at risk, and achieve optimal work productivity in conjunction with the labour protection programme. Several factors contribute to poor law enforcement: low number of competent inspectors, limited resources for inspections and insufficient follow-up inspections in case of citations or violations. Moreover, inspections are generally focused on the formal sector. Hence, little is known about work safety of small scale farmers (International Labour Organization, 2004).

Multiple parties, such as the WHO, Food and Agriculture Organization (FAO), non-governmental organizations and local authorities have tried to stimulate safe use of pesticides through initiatives such as education on personal protection. Results of these initiatives were often unsatisfactory. Understanding which factors affect the way farmers handle pesticides is a lot more complex than expected (Fan et al., 2015).

1.2 Literature review

Over the years, many researchers have tried to explain limited use of personal protective equipment by studying knowledge, attitudes and practices (Hanshi, 2001; Salameh, Baldi, Brochard & Saleh, 2004; Recena, Caldas, Pires & Pontes, 2006; Yassin, Mourad & Safi, 2002; Yuantari et al., 2015: Zyoud et al., 2010). In these studies, unsafe pesticides usage was ascribed to lack of knowledge. Researchers have frequently highlighted the need for training and improvement of existing trainings (Atreya, 2007; Devi, 2009; Recena et al., 2006; Salameh et al., 2004; Zyoud et al., 2010).

According to results of a systematic literature review (Remoundou, Brennan, Hart & Frewer, 2014) higher levels of knowledge on the associated risk and higher risk perceptions do not necessarily result in better use of personal protective equipment and adherence to protective advice. Yuantari et al. (2015) studied melon farmers (N=57) in Central-Java. The majority showed sufficient levels of knowledge on PPE, symptoms of pesticide poisoning, routes of exposure and health impact, as well as positive attitude towards PPE. Though, only 3.8 percent wore glasses and 1.9 percent of participants wore boots when spraying (Yuantari et al., 2015). This result suggests that improving knowledge of farmers is insufficient for achievement of behavioural change.

Limited usage of personal protective equipment should be explained by other factors. Personal factors to take into account are age (Damalas & Hashemi, 2010; Matthews, 2008), gender (Atreya, 2007; Christie, Van Houweling & Zseleczky, 2015), educational level (Blanco-Muñoz & Lacasaña, 2011; Damalas & Hashemi, 2010; Yassin et al., 2002; Zyoud et al., 2010), the ability to understand pesticide labels (Devi, 2009; Fan et al., 2015; Hashemi, Rostami, Hashemi & Damalas, 2012; Mokhele, 2011; Waichman, Eve & Da Silva, 2007), access to PPE (Flocks, Kelley, Economos & McCauley, 2012; Salazar, Napolitano, Scherer & McCauley, 2004), perceived peer pressure (Heong, Escalada, Sengsoulivong & Schiller, 2002) and incorrect perceptions such as being immune to pesticides (Palis, Flor, Warburton & Hossain, 2006; Yassin et al., 2002). Most of these studies were focused on the perspective of the pesticide user.

Besides this individual perspective, researchers suggest to study protective behaviour in pesticide use

from a socio-cultural (Andrade-Rivas & Rother, 2015) and economic perspective (Wilson & Tisdell, 2001). Fan et al. (2015) discussed issues of trust in pesticide retailers and the government. This is supported by several studies claiming that users have received government's safety information without any effect on safe pesticide handling (Matthews, 2008; Remoundou, Brennan, Hart & Frewer, 2014).

1.3 Theoretical framework

The Health Belief Model (HBM) (Rosenstock, 1974; Becker, 1974; Becker & Rosenstock, 1984) is used to structure data. This cognitive model has derived from Subjective Expected Utility Theory. The theory suggests that people are active and generally make decisions based on rational thinking. This process is influenced by a person's perceptions of usefulness of a particular behaviour. The HBM is the most frequently applied model in health psychology to explain health behaviour (Khan, 2010). The model has been used before in studies aimed at understanding behaviour of farmers and fieldworkers when handling pesticides (Abotaleb & Heshmati, 2016; Arcury, Quandt & Russell, 2002; Heong & Escalada, 1999; Khan, 2010; Raksanam, Taneepanichskul, Robson & Siriwong, 2014).

Simply put, the HBM claims that in order to adopt health behaviour, a person must believe he or she is susceptible, believe the health problem is serious and believe that the benefits of taking action outweigh the barriers. A trigger (cue to action) might be needed to stimulate taking action. The HBM consists of the following elements:

- **Perceived threat** - the extent to which a person considers himself to be facing harm
  - ❖ **Perceived susceptibility** – belief of a person to be prone to be affected.
  - ❖ **Perceived severity** – belief about the seriousness of a certain health threat.
- **Behavioural evaluation**: the product of perceived benefits minus perceived barriers of certain health behaviour.
  - ❖ **Perceived benefits**- belief about possible gains of a certain health behaviour.
  - ❖ **Perceived barriers**- belief about factors that make adopting certain health behaviour more difficult.

These factors can be influenced by a large rage of variables. These *modifying factors* are categorized into demographic, environmental, cultural, behavioural, socio psychologic and structural variables (Becker et al., 1975). When applying the HBM, researchers select categories based on relevance to their specific study. Thus, many versions of the HBM exist. Raksanam et al. (2014) distinguished work-related and sociocultural factors. Khan (2010) has made a distinction between demographic and socioeconomic factors. Others (Arcury et al., 2002) eliminated the whole category of modifying factors. Researchers differed strongly in their categorization of knowledge. It was mentioned to be a part of socioeconomic factors (Khan, 2010) and a cue to action (Arcury et al., 2002). Cues to action (Becker et al., 1975) consist of several internal and external factors that might trigger behavioural change. Receiving health related advice from others is an example of an external cue to action. An internal cue to action might be experiencing skin irritation after spraying activities. The final factor influencing the likelihood of change is health motivation (added in Becker et al., 1977). Health motivation describes the individual's perception of importance of health and motivation to pursue it. Health motivation is found to be one of the most important predictors of adoption of protective behaviour when handling pesticides (Abotaleb et al., 2016).

Weakness of the HBM is the lack of attention for social influences. The model focuses merely on the individual. Plus, relationships between variables of the HBM are not explicitly defined. There are no clear rules for complication of the variables (Munro, Lewin, Swart & Volmink, 2007). The model was selected for the resemblance of its factors with themes that have derived from this study. One of the major assets of this model is its simplicity, which makes it easy to apply. According to the HBM, behaviour is a function of a person's perceived value of health outcome due to exposure and the expectation that the exposure will lead to that particular health outcome.

In this study, an adjusted version of the HBM was used to structure the results (figure 1). The current grouping of factors is debatable and might require further research in case of future application. The adjusted model consists of the elements: perceived susceptibility and perceived severity of health impact due to pesticide exposure, perceived threat, modifying factors, cues to action, perceived benefits and perceived barriers of the preventive action and the likelihood of wearing gloves while spraying pesticides. The modifying factors are categorized as: demographic, environmental, cultural, behavioural, socio-psychologic and structural variables.

This research focuses on wearing gloves as a recommended preventive health action. Skin absorption is the most common route of exposure in work situations (Canadian Centre for Occupational Health and Safety, 2016). Wearing gloves while mixing and spraying pesticides reduces the risk of skin absorption trough the hands (Garrod & Rajan-Sithamparanadarajah, 2003).

Unlike most studies that have applied the HBM, this study does not make use of scales to measure variables. The most important argument is that this research is more of an attempt to gain a broad understanding of a large scope of factors contributing to the likelihood to adoption of protective behaviour, rather than a confirmation of the assumptions of the HBM. A trial of usage of self-efficacy - and risk perception scales pointed out the difficulty of usage in this particular study population. Working with scores and referring to hypothetical situations (e.g. *How certain are you that you can wear gloves while spraying pesticides when you are feeling under pressure from work?*) made the respondents feel uncomfortable. Therefore, preference was given to more simple questions to make respondents feel at ease and share ideas.

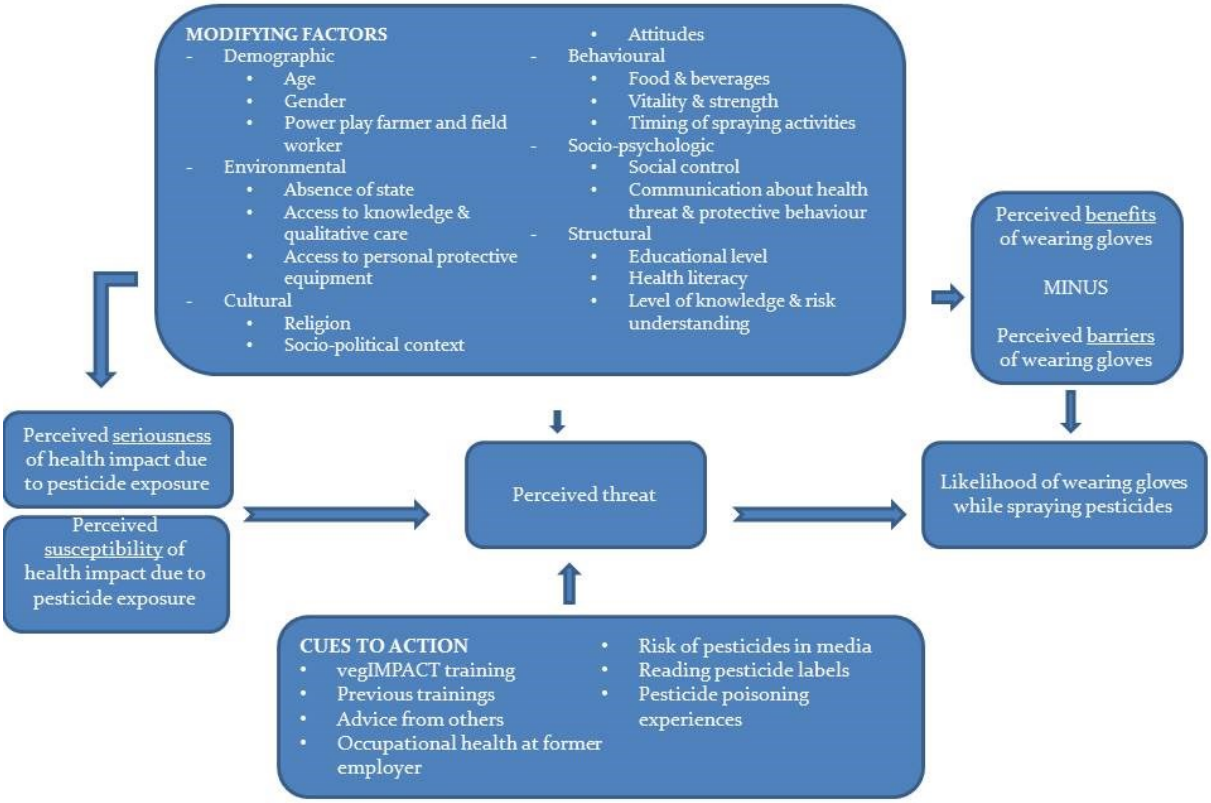

Figure 1: Adjusted Health Belief Model (adjusted from Becker et al., 1975)

1.4 Institutional context

This research is written as an assignment for vegIMPACT. The project is executed by Wageningen University Research Centre and several local partners, such as Fresh Dynamics Asia and the

Indonesian Vegetable Research Institute. The project is financed by the Dutch government. VegIMPACT aims to improve production and marketing for small scale vegetable farmers in Indonesia. With a multifaceted approach, vegIMPACT supports food security and private sector development. This study is embedded in the work package Occupational Health (OH). The OH goal is to reduce occupational health risk of Indonesian farmers and labourers, especially females. Unsafe pesticide use, the largest occupational hazard for agricultural workers, is targeted for risk reduction. Trainings are given to farmers and fieldworkers and females of farming families. A set of personal protection equipment (gloves, mask, apron and face shield) is handed out to every participant. During a trial in Brebes, a province in Central-Java, researchers found limited effects of the training. Few participants were prepared to use PPE. The training has been adjusted based on findings in Brebes. This study has been conducted during implementation of the training in Banten. As the project has ended in September 2016, research results and recommendations will be passed on to other actors with similar goals.

1.5 Objective

This study is aimed at exploring the factors that influence the way small scale vegetable farmers and fieldworkers in Sukamanah handle pesticides. High level of cultural diversity between islands of Indonesia and even within islands disables generalization. Therefore, the research focusses on a single case. The area near Jiput in Banten, a province in Java, is known to account for a large share of Jakarta's supply of hot pepper. Sukamanah, a village near Jiput was selected as a study location. According to a brief stocktaking, few agricultural workers had received training about safe pesticide use in the past. Most small scale farmers struggle to make a living. A good yield allows for family meals and children's tuition. Therefore, guaranteeing good yield is the farmer's top priority. What does that mean for occupational safety?

The study serves a double purpose. Firstly, the research adds to the scientific debate described above**.** Results of the study might contribute to knowledge and insights in order to understand the barriers to perform protective behaviour. Whereas most studies are narrowed down to the individual perspective, this study incorporates perspectives of different stakeholders such as spouses, health professionals and extension workers. Secondly, the research possesses social relevance by collection of information on a practical issue. Results may be used to support decision making when selecting an approach to tackle the issue in society. Critical observations of the researcher alongside farmer's and fieldworkers' experiences offer insights in barriers. These are translated into opportunities to improve the current approach. Health professionals interested in limitation of occupational pesticide exposure in Indonesia could make use of the recommendations for further research or development of an occupational health intervention for farmers and fieldworkers in Indonesia.

The study addresses the following research and sub-research questions (table 1):

How could the likelihood of wearing gloves while spraying pesticides for small-scale vegetable farmers and fieldworkers in Sukamanah be explained using the Health Belief Model?

Table 1: Sub-research questions and their place in this thesis

Research question	§
1. How do farmers and fieldworkers perceive the threat of pesticides on their health?	3.1
1.1. How do farmers and fieldworkers motivate the likelihood of getting harmed by pesticides?	3.1.1
1.2. What is the perceived severity of negative health impact during to pesticide exposure?	3.1.2
2. Which factors might indirectly influence the likelihood of wearing gloves while spraying pesticides?	
2.1. Which demographic, environmental, cultural, behavioral, socio-psychologic and structural variables might have an indirect effect on the likelihood of wearing gloves while spraying pesticides?	3.2
2.2. Which cues to action might influence the perceived threat of pesticide exposure?	3.3
3. What is the likelihood to wear gloves while spraying?	3.4.3
3.1. What are the perceived benefits of wearing gloves while spraying?	3.4.1
3.2. What are the perceived barriers of wearing gloves while spraying?	3.4.2
4. How useful is the HBM for answering the primary research question?	4

2. Methods

During October 2015 and February 2016 a qualitative study has been conducted in Sukamanah, Banten, West-Java, in Indonesia (figure 2). In order to react on relevant changes and events, flexible methods were used. The researcher followed an open procedure. Decisions on subjects for data collection and topics to discuss were made instantly. Slower procedures would only restrict the study.

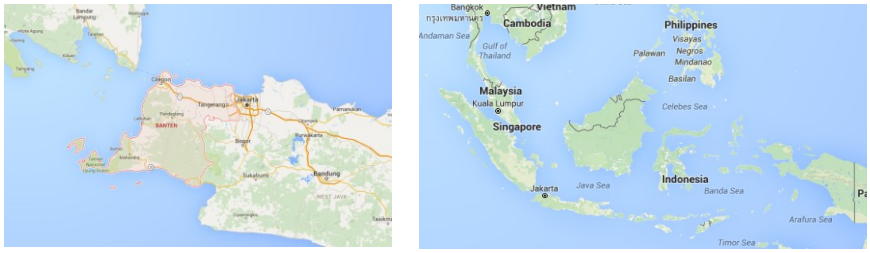

Figure 2: Sukamanah, Banten, West-Java, Indonesia (Google Maps, 2015)

2.1 Data Collection

Data collection was based on qualitative research with mixed methods (figure 3). The methods consist of semi-structured interviews, training- and field observations. Six field visits of two till five days were part of the research. The field visits included a stay at the house of one of the members of a female farmer group, accompanied by one or two students of Universitas Indonesia. According to Collins (2004) explanation of a person's actions should be found in face-to-face situations.

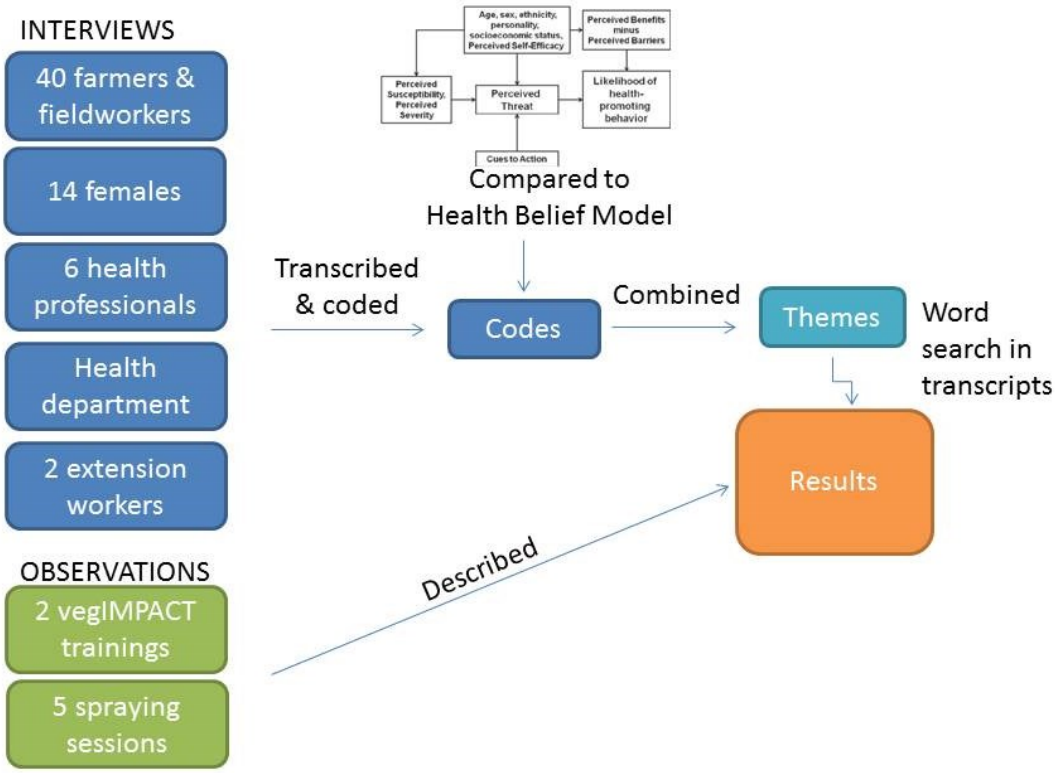

Figure 3: Data collection and - analysis visualized

2.1.1 Semi-structured interviews and observations with farmers and fieldworkers

Data has been collected via semi-structured interviews with farmers and fieldworkers. 40 farmers and fieldworkers were interviewed. Inclusion criteria were being male, aged between eighteen and 65, being able to speak Indonesian, cultivating vegetables for income and living in Sukamanah. Persons above 65 years old in the Sukamanah area are known to use a dialect, which is not spoken by the translator. Therefore, persons older than 65 years are excluded from the study. Recruitment of respondents was done via farmer group coordinators. VegIMPACT shared a list of farmer group members and coordinators of Sukamanah. Interviews were conducted at the respondents' or farmer group coordinator's house or in the field house.

The interviews lasted between eighteen and 108 minutes. On average an interview lasted 48 minutes. The interviews have been conducted orally in Indonesian. A medical anthropology student of Universitas Indonesia translated English questions into Indonesian and Indonesian answers into English directly. A few farmers were interviewed twice; before and after a training from vegIMPACT. Informed consent has been obtained orally before start of the data collection. All interviews were recorded with a mobile phone.

In order to ensure quality of the interviews and offer transparency on methods and resources to the reader, an interview guide has been developed (Annex 1). This interview guide has been used for preparation by the translator. Interviews were based on topic lists which were modified throughout the process. Modifications were based on findings within previous interviews and documented in a logbook (Annex 2). Comments of the respondents that were remarkable for their potential to provide an answer to the research question were selected and turned into nine statements. The respondents were asked to state whether they agreed or did not agree with the statement. They were encouraged to motivate their answer. The moderate standardized character of a semi-structured interview allowed the researcher to prepare questions beforehand and simultaneously enabled the researcher to add questions that popped up during the interview. Based on reflection on findings, decisions were made on who to interview next about what topic. In order to create a comfortable situation for the respondent, other attendees were accepted to listen to the interview.

Five spraying observations were conducted between the 4th and 6th of December 2015 and 20th and 21st of January 2016. Participants were shadowed and observed from the moment of leaving the house until departure from the field. Mixing, spraying and storage activities were described in field notes. A mobile phone was used to make pictures of the activities, materials and land. An adjusted version of a performance checklist from the Ontario Pesticide Education Program (n.d.) was used (Annex 3) to guide the observation process.

2.1.2 Semi-structured interviews and observations with other stakeholders

Semi-structures interviews with other stakeholders and spraying- and training observation served the purpose of gaining insight in contextual factors. Therefore, females who own or work on land in Sukamanah (N=14), health professionals (N=6) and civil servants from the health department (N=6) and agricultural extension workers (N=2) were interviewed. Interviews with females and health professionals were held according to the same principles as was done during data collection with male respondents; semi-structured interviews, held in the home (females) or work environment. Information from the civil servants is based on attendance of a conversation between researchers from vegIMPACT and the civil servants at their office. Experiences of the extension workers were collected during a formal conversation between the extension workers and the vegIMPACT researchers.

Between December 2015 and February 2016 vegIMPACT arranged a course in Sukamanah. Recruitment was organized via coordinators of farmer groups. Via a baseline survey data had been collected for 23 persons. The survey covered topics such as work conditions, current pesticide practises, knowledge about pesticides, exposure to pesticides and training access.

Separate trainings were organized for female and male farmers and field workers. For this study only the male trainings were observed. A total of 62 male farmers and fieldworkers had been invited to join. The course consisted of three trainings. In sum, 51 farmers participated in at least one of the two trainings. More than half of them joined only one training (N=27). The first training counted most participants, with 39 males, whereas the second training was attended by 33 farmers and fieldworkers. The first training dealt with pest and disease monitoring and management. The second training was focused on the link between pesticide exposure and health. The third training elaborated on knapsack maintenance and safe use of pesticides. Only the first two trainings were observed, since the last training had been scheduled after the researcher had left Indonesia. The trainings were held at the living rooms of the farmer group coordinators. The trainings lasted seven hours each.

Two vegIMPACT trainings were observed. Notes were taken and reflected upon in field reports. Photographs of the training setting were taken with a mobile phone. Observations of the trainings were especially focused on interaction of the trainer with the participants. Questions of the participants and reactions on the training material were noted down.

In order to compare glove wearing behavior with and without participation of the vegIMPACT training, control group interviews were held (February 13-14, 2016). Semi-structured interviews were held with eleven farmers in Jaja Mekar, a village nearby Sukamanah. Topics such as, risk perception, pesticide poisoning experiences and beliefs about the link between pesticides and health were discussed. All respondents received a pair of gloves and the instructions to use them while spraying pesticides. Via a telephone survey two months later, respondents were asked to report the frequency of glove use during spraying.

2.2 Data management

Data derived from interviews has been transcribed into a Microsoft Word document. Field observations were captured via photographs and field notes. Within 24 hours after data collection, audiotapes and photographs were saved on a laptop and flash drive. After completion of the study, data might be shared with vegIMPACT after names and other detectable features are extracted to assure anonymity. Data is available upon request for other interested researchers as well.

2.3 Data-analysis

Data-analysis consists of two categories: *analysis of interview outcome and analysis of observations*.

2.3.1 Analysis of interview outcome

Transcripts of semi-structured interviews were coded by hand. This method appeared to be most convenient, since no access could be obtained to software. Plus, this method allowed working anywhere independent of access to internet. An open coding procedure is used. Codes were given in case an issue had been rehearsed in multiple interviews, it surprised, the respondent pointed it out as significant, it touched a topic found earlier in literature or it reminded of a theory or concept. Codes were combined with the elements of the Health Belief Model into themes (figure 1).

Themes were split up in several items. Take for example ‘Food and beverages’ as an item (figure 4). ‘Food and beverage’ is part of the modifying factors. The theme modifying factors is separated into six sub-themes: demographic, environmental, cultural, behavioural, socio psychologic and structural variables. A list of words has been composed per theme. These words were used to scan transcripts on relevant sayings. Relevant saying were collected, counted and combined into a description.

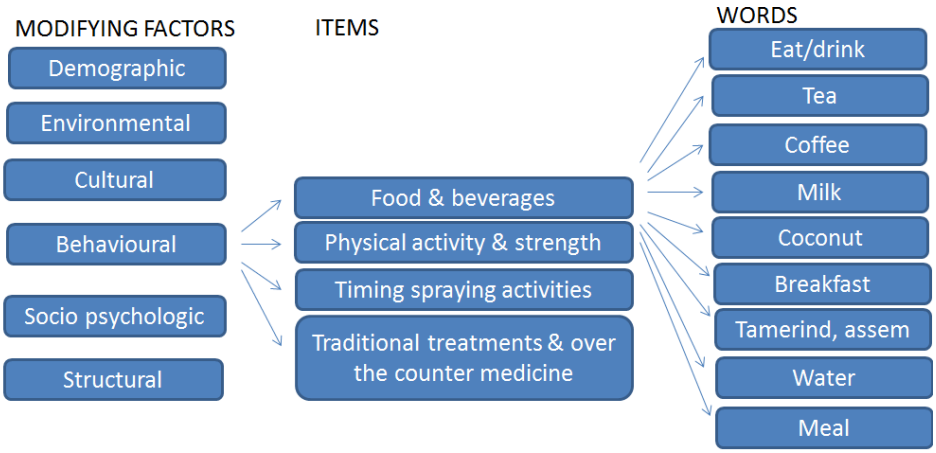

Figure 4: Search words per item illustrated for food and beverages

2.3.2 Analysis of observations

Descriptions of field observations and training observations were coded. The themes and sub-themes of the interviews are used as codes. Coded parts of the field report were mainly used to complement the sections 'Likelihood of wearing gloves' and 'putting on the gloves'. The report of the training is primarily used to provide a training description as a part of the theme 'cues to action'. Coded quotes of training participants were also used to contribute to the other themes.

2.4 Validity and reliability

Reliability is ascertained by this detailed description of research methods. The logbook informs the reader about decisions made during the interview process (Annex 2). During interviews topics were questioned in different forms. Answers were checked for consistency. This method helped to check for internal validity.

3. Results

Respondents are aged between 25 and 70 years old. The average farmer respondent is a 45-year-old male who did not finish high school and now owns and manages land. To most families in Sukamanah, agriculture is the primary source of income. The profession of being a farmer is passed from generation to generation. '*Directly when you're born, you will be a farmer.'* (Female fieldworker, overhearing an interview, November 11, 2015). Children help their parents out in the field. Parents share knowledge and show their children the farming techniques. Thus, the next generation gradually rolls into the job. Most farmers cultivate paddy as well as vegetables. Besides hot pepper, farmers are growing other vegetables such as beans, cucumber, corn, tomato, okra and eggplant. Many farmers join a farmer group. These groups have been established on governmental recommendation. Farmers groups consist of approximately ten farmers. Membership is voluntary and based on location of the field. Farmer groups represent a certain area. Members share experiences and discuss agricultural issues. One person is chosen to be farmer group coordinator. The farmer group coordinator is the contact person for governmental institutions. Via the coordinator, the farmer group may receive financial support, trainings or advice on cultivation from the government. Sukamanah is divided in neighbourhoods. Each neighbourhood has a chosen leader. Regular meetings are facilitated by the leader. Everyday businesses are discussed during these meetings. Above all leaders is the mayor of Sukamanah.

Land tenure and labour in Sukamanah is arranged in multiple forms. Some own land, others rent land and others work on land (figure 5). In this thesis report, the first two are called farmers. The latter is referred to as fieldworker. A fieldworker works at someone else's field. Salary is his form of income. An owner has bought his land or received it as heritage or a gift from family or others. A special arrangement exists for renting land. The majority rents a land for free or against a low price. In return, the renter will give a certain percentage of its yield to the land owner. Owners and renters work on their own field or hire fieldworkers to help them or substitute them in the field.

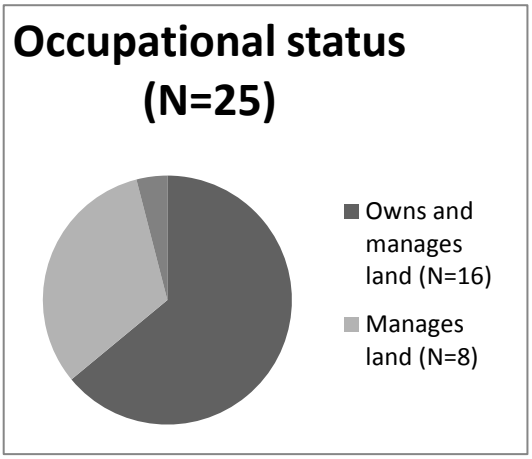

Figure 5: Occupational status of male respondents

3.1 Individual factors

Combination of perceived susceptibility and perceived severity creates an image of perceived threat.

3.1.1 Perceived susceptibility

Most of the respondents (19 out of 27) did think they could get affected by pesticides. The majority of this group (N=13) had experienced symptoms of acute pesticide poisoning themselves. Eight

interviewees did not think they could be harmed by pesticides. The most important argument was that they used personal protective material. Coverage varied between a cotton shirt used as a mask to a protection set consisting of gloves, a mask and boots. A single argument stood out for its uniqueness: […] *'bad sickness will attack rich people, not me'* (fieldworker, personal communication, November 10, 2015). Active lifestyle of farmers, compared to a sedentary life style of townspeople, was his explanation of these differences. According to the head of the district health department (personal communication, October 1, 2015) farmers and fieldworkers are aware of the risk of pesticides, but they do not think it will harm them. Few females were concerned about their husband's safety while handling pesticides. Their perceptions were based on beliefs and limited knowledge about routes of exposure. '*I am not worried about my husband getting exposed, because the pesticide is kept on his back and the sprayer is in his hand and kept away from his body*. *Therefore, it is not harmful.*'(Wife of farmer, personal communication, October 1, 2015).

Several respondents (N=8) have expressed concerns about children being exposed to pesticides. Pesticides were kept away from the children by several strategies, such as storing the knapsack and pesticides in the field house, keeping the pesticide bottle in a closed plastic bag high enough so children could not touch it and not letting the children join work in the field. When asked for a motivation to keep children away from pesticides, respondents reacted like it was an obvious thing to do. '*It's a medicine. It's poisonous*.' (Farmer, personal communication, December 6, 2016). Parents were concerned their children would mistake a pesticide bottle for a drink and swallow it. Perceived susceptibility for children was broadly agreed upon. Concerns about the risk for the pesticide applicator were mentioned less. Consensus about susceptibility for children was merely based on an image of 'the ignorant child drinking medicine'. Adults (especially men) in the village are traditionally known as experts of agriculture. At an early age, they have been taught by their parents, who were farmers too. This comes along with a certain status. People seem to agree that you should handle pesticides carefully. How to be careful is up to the farmer himself. It is impolite to question his methods. The idea: The expert knows what he is doing, and thus will not be seriously harmed by pesticides.

Text box 1: Individual factors

Perceived susceptibility - The majority of respondents expressed to acknowledge being at risk of negative health effects due to pesticide exposure. Several farmers believe that experienced farmers know how to handle pesticides thoughtfully and therefore, they will not get seriously harmed by pesticides.

Perceived severity- Respondents were strongly divided in their perceptions of the severity of negative health impact due to pesticides. Discourse of daily conversations implies a focus on the functional aspects of pesticides rather than the risk for health damage.

3.1.2 Perceived severity

For most respondents it was unclear whether they thought about pesticides as a large risk for their health or not (10 out of 21). They reckon it depends on how one handles the pesticides, or note that it is just sometimes a risk. Others think the worst thing that can happen is feeling like being drunk, very dizzy with the urge to vomit. Six respondents considered negative health impact from pesticides severe. Four of them base their judgement on information they had read on the labels of pesticide bottles. One may wonder: Do people with safety concerns read labels or do people get safety concerns by reading the label? This might be an interesting question for future research. Finally, five respondents did not express the negative health impact of pesticides as a serious issue to the researcher. It is only dizziness, not that bad, was the argument of most of them (N=3).

When talking about pesticides, most respondents referred to it as 'medicine'. In a medical context 'medicine' is used to describe substances that are used to treat a disease. '*Now more pests are*

coming to the plants and harm the vegetables that I plant, so we have to use the pesticide to cure the plants and vegetables.' (Farmer group coordinator, interview, November 10 2016). When plants start to show abnormal signs, such as yellow or curly leaves, pesticides are used to 'cure' the plants. Referring to pesticides as medicine brings along a value. The terminology focusses on treatment impact rather than its danger. Feel the difference of talking about pesticides as a poison instead. This word implies both the function of getting rid of pests or weeds and simultaneously handling with caution. Poison is known for its universal danger, both for the target it is used for and the user. When referring to pesticides as 'medicines', only the functional aspect is highlighted.

To the farmers and fieldworkers, health is not a topic of priority. Despite of extensive introductions and explanation of the goals of this research, presence of the researcher in the village has created other expectations. In informal talks, the researcher has been asked to provide agricultural tools and bring the farmers into contact with agricultural experts. To the researcher, focusing on health often felt out of place. Villagers were keen to learn about planting techniques and pest management instead.

3.2 Modifying factors

Multiple factors are believed to enlarge or diminish the risk of pesticides on a person's health status. One could distinguish six categories, namely (1) demographic variables, (2) environmental variables, (3) cultural variables, (4) behavioural variables, (5) sociopsychology variables and (6) structural variables.

3.2.1 Demographic variables

Age

Several respondents suggest that older farmers are less likely to develop an intention to change. *'It depends on age. Most elderly have been a farmer for years. They don't find the information from the training that important.'* (Farmer, interview, February 11, 2016). A local key figure in agricultural innovation confirmed this by stating that older people are in general less welcoming towards new methods (Text box 1) (key figure, formal conversation, September 30, 2015).

'*The younger ones* [farmers] see *the older ones as examples. They rather follow them than to follow the training's information.'* (Farmer, interview, February 11, 2016). The latter citation suggests that seniority in farming life is appreciated over expertise of the trainers. This might imply a lower likelihood of behavioral change.

Text box 2: An example of a local organic pesticide initiative

Local farmer D. grew into the role of local expert in natural predators and organic pesticides. He owns a paddy and shallot field. Ten years ago D. noticed multiple signs of environmental degradation, such as fish turning grey. He linked these events to excessive pesticide use. He uses local knowledge of plants and roots and started mixing several ingredients to produce his own botanical pesticides. The farmer shifted from semi-organic in 2008 to organic pesticides in 2015. Nowadays he provides free consults for interested farmers. At times, farmers consult the local expert about their health problems due to pesticide spraying. In those cases he suggests to use personal protective equipment. As an innovator, he acknowledges resistance to change. From his experience, especially **older people** tend to be less welcoming towards new methods. Others are prone to be **sceptic towards new ideas due to their personality**. At Farmer Field School (FFS), farmers learn to trust what they see. Those who did not join FFS stay sceptic after they had seen results in the field. As opposite to telling someone what to do, this local expert prefers **dialogue** (local expert, formal conversation, September 30, 2015).

Gender

Due to gender based task division, men are more exposed to pesticides than women. In Sukamanah spraying pesticides is perceived as a typical male activity (N= 5). Spraying is seen as a task that is too heavy for females. The tank is heavy and one might get tired carrying it. Women are supposed to take care of the children and take care of domestic tasks. Several women follow their husband to the field and help out with weeding, planting and harvesting.

Power play farmer and fieldworker

It is common for a farmer with multiple lands or a large land and sufficient income, to hire a worker to work together with him or for him. Hiring someone is like doing someone a favor. An average wage is around 25 000 till 50 000 rupiah a day. Others pay per task. Most often, the worker uses the tools from the one who pays him to work. In case of spraying, the tank from the paying farmer is used. A clear power relation arises. '*They* [workers] *will use my method, because they work for me.'* (Farmer, interview, November 11, 2015). In many cases the paying party determines spraying conditions. That means that the employer determines which pesticide brand is used and the timing of spraying. Two farmers have said that they do not desire any advice on spraying methods from their workers.

Text box 3: Demographic variables

Age – Older farmers and fieldworkers may be less likely to adopt new behaviours

Gender – Males are more often directly exposed to pesticides than females, due to gender based task division in the household.

Power play between farmer and fieldworker – The paying party determines spraying conditions. Several farmers provide preventive tools or advices (e.g. gloves, milk), usage is mostly not obliged or monitored.

3.2.2 Environmental variables

Absence of state

Many interviewees have mentioned the need for governmental support in work safety when spraying. Several expressed the desire for governmental training about safe handling of pesticides (N=4). All interviewees were invited to participate in the vegIMPACT training about this exact topic. One may state this highlights an exclusive role for the government in the process of learning and adoption of new techniques for farmers. When respondents talk about governmental advice, they appear to value these recommendations and comply with them. '*I have to follow the instructions of the government: what should I plant, how we do it.'* (Farmer, interview, November 9, 2015).

Occasionally, the government provides the farmers with support in the form of agricultural trainings and visits of an extension worker. Once in four years, a representative of the government visits the area and provides advises about crop management and organization and hands out free materials like seeds and fertilizer. An extension worker from the local agricultural agency noted that there is no cooperation between the agricultural and health departments with respect to protection against pesticide exposure. Besides, the extension workers were not familiar with any cases of pesticide poisoning in the area. *'We have strong people'* (Extension worker, interview, October 1, 2015). The latter expression indicates the extension worker's low risk perception and limited knowledge about the health risks of pesticide use.

During one of the vegIMPACT trainings, a discussion about governmental negligence arose between a pest and disease observer and some farmers. The government was blamed for neglecting her responsibility to communicate about health and safe use of pesticides. The pest and disease observer noted that the government is too busy fulfilling other tasks. Besides, there are plans to promote use of organic pesticides instead of the chemical type that is currently used (pest and disease observer, vegIMPACT training, January 19, 2016). Farmers argued that one has to address the risk of chemical

pesticides first, along with sharing knowledge about safe use practices, before promoting organic pesticides. Otherwise, farmers would not use the new product (participant vegIMPACT training, vegIMPACT training, January 19, 2016). Yet, the pest and disease observer (2016) pointed out that farmers had had the opportunity to join a farmer field school. The topic of safe use of pesticides has been covered at farmer field schools. Thus, lack of knowledge due to not participating in the governmental training, is a person's own responsibility. The discussion during the training continued to address limited opportunities to join farmer field schools. More respondents expressed the feeling of lack of governmental involvement in health of farmers (N=4). '*The government gives us training about cultivation, but not about health or how to protect ourselves while working. That is why it is hard for us to think about our health'* (farmer, interview, December 6, 2015).

While legislation on pesticide use is somehow similar to European legislation, the local government seems to neglect its responsibility to monitor compliance. Limitation of occupational pesticide exposure is not a priority. Governmental control is low. Public health policy is focused on achievement of millennium developing goals. Anno 2015, sanitation is top priority in health promotion in Indonesia. A talk with several representatives (a.o. occupational health, environmental health, head) of the district health department revealed three issues in tackling health damage due to pesticide exposure. (1) Together the representatives acknowledged a messy task division between several health departments. No consensus was obtained about the question which department is responsible for safe use of pesticides. This resulted in no one taking responsibility for the topic. (2) Further, there is a lack of registration of pesticide poisoning cases. In effect, the persons in charge are not aware of the existence and scope of the issue. (3) Moreover, the district does not offer any training on safe pesticide use, nor on treatment of (acute) pesticide poisoning for health professionals. Subsequently, nurses and midwifes lack knowledge on this topic. Therefore, symptoms of acute poisoning are often not recognized. According to conversations with health professionals, occupational health is not acknowledged as an issue.

Access to knowledge and qualitative care

Sukamanah contains five mother and child's clinics. Midwifes take care of childbirth, birth control and children's health. Occasionally, the midwife receives patients with other health complaints too. The resident midwife has a positive attitude towards pesticide use for pest management. In her own field, she sprays pesticides to make a higher profit. The midwife does not acknowledge the occupational risk of handling pesticides and lacks knowledge about the health risk of the chemical. She has never found any symptoms of acute pesticide poisoning (midwife, interview, September 30, 2015).

Besides the mother and child clinic, Sukamanah villagers search for care at the traditional massager. Sukamanah's traditional massager is a woman in her forties, living in a simple house with her family. Two years ago she taught herself how to help people with health complaints such as nausea, fever or tooth ache. Once or twice a day, she gets picked up from her house and brought to a patient. In approximately two hours she massages the entire body. She usually receives about 15,000 till 20,000 rupiah (approx. 1- 1.50 euro) per treatment. Most complaints disappear in two till three days. Many of the massager's clients are farmers. According to the massager, hard work is the biggest risk for farmer's health. The largest health risk of spraying pesticides is a carrying a heavy tank. Back problems and dizziness are a farmer's biggest health concerns. According to the massager, dizziness (§3.3.6: most frequent symptom of pesticide poisoning) is the symptom of *masuk angin* (traditional massager, interview, December 4, 2015). *Masuk angin* (translated: the wind entering the body) is a well-known condition all over Indonesia. According to ancient beliefs, wind can enter the body through pores in the skin. This condition covers various types of vague pain, fever and cold. This condition is said to be influenced by factors such as the climate and food. *Kerokan* is a widely used practice to treat *masuk angin*. The skin around the hurting body part is scrapped with a coin. The skin showing redness is a symbol of the wind leaving the body (student Universitas Indonesia, personal communication, December 17, 2015). The traditional massager does not acknowledge the health risk

of pesticides. She has no knowledge about pesticides. No health advice is given by her. If requested, the massager tells what medicine to buy at a local kiosk (traditional massager, personal communication, December 4, 2015).

Kiosks are simple stores at the front of houses. The small stores are spread all around the village and sell the same products; candy, soda, some sample size shampoo, detergent and medicines. Medicines are packed in small amounts and costs about 2,000 to 4,000 rupiah (approx. 0.15- 0.30 euro). Over the counter-medicine (e.g. aspirin) are used to treat all kinds of physical complaints. Common ingredients of medicine to cure *masuk angin* are species, honey and ginger. Customers often know for themselves what medicine to take. No questions are asked about the cause of the symptoms. No health advice is given by the seller (kiosk owner, informal conversation, December 6, 2015).

Health professionals at the nearby local health clinic have limited knowledge about the risk of pesticides on the health of applicators. A nurse, midwife and GP of one local health clinic have been interviewed. A health agent- a nurse- is assigned to monitor health in Sukamanah. The agent checks the mother and child clinics, visits patients at home who are not able to come to the local health clinic and reports findings to the head of health promotion. Her limited knowledge about pesticides has been derived from experiences from relatives. There are no reports on pesticide poisoning in Sukamanah (health agent Sukamanah, interview, January 21, 2016). The local health clinic midwife did not acknowledge pesticide exposure as an occupational hazard for farmers. Similar to the health agent, the midwife's limited knowledge on pesticides originated from a relative's experience with pesticide poisoning. The doctor named two of the three routes of exposure of pesticides and was able to name at least three symptoms of acute pesticide poisoning. The GP had never experienced a case of pesticide poisoning (general practitioner, interview, January 19, 2016). When asked about their feelings concerning the involvement of the local health clinic in farmer's health, most farmers and fieldworkers stated that there is no (N=8). The local health clinic does not offer any training about safety while handling pesticides, nor does the clinic share knowledge about the topic in any other way.

Farmers experience barriers in visiting the local health clinic in case of general and pesticide related health complaints. According to many, a visit to the local health centre is too expensive (5,000 rupiah/0.35 euro) (N=6). Others reckon the local health centre is too far from their fields and houses (N=2). Interviewees who did consult the local health clinic after an acute pesticide poisoning just received some over-the-counter medicine such as paracetamol and the advice to be careful while spraying (N=2). The health professional in function did not elaborate on how to be careful. One interviewee did not report any changes in the way he handled pesticides. The other respondent asked someone else to spray for him.

Access to personal protective equipment

I do not use gloves, because I do not have any gloves, is a frequently heard expression (N=6). Qualitative personal protective equipment cannot be found is Sukamanah. Shops in Jiput sell motorcycle gloves, rubber second hand gloves (15,000 rupiah/1 euro) and boxes of thin latex gloves. An average fieldworker's wage is 25,000 till 50,000 rupiah per day (approx. 1.75-3.50 euro). For a lot of families' children tuition is number one priority in the household expenses. Having a pair of gloves is seen as a luxury.

The next citation illustrates striking budget decisions made in Sukamanah households. *'They* [farmers and fieldworkers] *prefer to buy cigarettes over buying boots. If they care, they will make an effort to pay for the prevention tools.* […] *But they always have money for cigarettes.'* (Midwife local health clinic, interview, December 4, 2015). While smoking a package of cigarettes a day (approx. 10,000 rupiah/0.10 euro) is not an exception, saving money for gloves seems to be difficult.

Text box 4: Environmental variables

Absence of state – Respondents experiences lack of involvement of the government with health of farmers. They have expressed the desire to receive governmental training on safe use of pesticides. The current lack of focus on safe handling of pesticides can be explained by (1) Messy task division within the health department, (2) limited insight in the scope of the negative health impact of pesticides due to lack of registration of pesticide poisoning cases and (3) not providing any training about the health impact of pesticides to health professionals.

Access to knowledge and qualitative care – If farmers or fieldworkers seek care, most will first turn to a traditional healer for traditional treatment or a kiosk for over-the-counter medicine. Midwifes are present and occasionally a health agent visits the village. They are not aware of the health risk of pesticides and lack knowledge about the risk of pesticides. Therefore, they fail to recognize symptoms of pesticide poisoning. No adequate care or relevant preventive advises can be given. The local health clinic does not pay any attention on safe use of pesticides. Therefore, nurses are not trained to recognize pesticide poisonings or provide preventive advice. In this sense, the farmer's local health system does not stimulate the farmer to use pesticides safely.

Access to personal protective equipment – Gloves of good quality can be bought at a kiosk a few kilometres away from the village for about the price of two packs of cigarettes. Gloves are perceived to be a luxury. Farmers and fieldworkers rather spend their money on other products.

3.2.3 Cultural variables

Religion

Indonesia houses the largest population of Muslims worldwide. According to the Central Intelligence Agency (2010), 87.2 percent of the population is Islamic. Likewise, religion is an important element of daily life in Sukamanah. Several mosques are spread around the village. Many villagers are wearing religious clothing like a *hijab* (veil) or *taqiyah* (Islamic skullcap). Every night between six and seven PM, one can hear the *muadhdhin* calling the villagers for evening prayer. After evening prayer, people gather to read the Koran. As religion is an important aspect of the individual's life, it is essential to take into account when trying to understand how respondents deal with health threat. During the interviews, respondents had thanked god for health (N=4, including two females). According to the health agent, farmers are less prone to make an effort to change their situation, since they believe their destiny is in the hands of god. '*They* [farmers and fieldworkers] *just think like: Okay this is what I have now. Just give it to God. I cannot do anything if something happens to me. Just work. What happens happens. I'm not willing to make things better'* (Health agent, interview, January 21, 2016). This is confirmed by a farmer's statement: '*[…] it's up to the gods whether I am sick or not.'* (Interview, February 16, 2016).

Socio-political context

Farmers are portrayed as innovators (Winarto 1995). Experimenting with and adopting new ideas, resources and technologies have always been part of the farmer's role (Winarto, 2004). Over the years, farmers have faced all kinds of climatologic and environmental circumstances which have required flexibility and creativity.

Over the last decade, a lot has changed in the Indonesian agricultural sector. Implementation of a rice intensification program (BIMAS, mass guidance) in 1965 by the Indonesian government is considered to be the start of the green revolution. This program involved rehabilitation in infrastructure, agricultural extension, dissemination of fertilizers, seeds that provide high yields, pesticides and credit. The approach is characterized as an exercise of power of the government. In the following years, several different approaches were introduced, such as a mass intensification program without provision of credits, a program that involved foreign countries supplying pesticides, fertilizers and credits and an intensification program characterized by group farming, rather than individual production. During this time aerial spraying had been substituted by hand spraying. The national rice demand was growing rapidly. In 1997 and 1998 Indonesia had faced a Food Production

Crisis. In response, a novel food intensification program was implemented. It was aimed at increasing food productivity, especially for rice, soybean and corn (Winarto, 2004).

The Green Revolution was followed by the implementation of Integrated Pest Management (IPM) in 1986. It was introduced as a control system that engages several forms of harmonious control without causing financial loss or impairment to the environment. IPM in rice involved management of cropping pattern, cultivation of resistant high yielding crop varieties and judicious use of pesticides. Practical IPM training for rice production had been developed by the Food and Agricultural Organization (FAO). Experts of the program marked that farmers lack field skills that are necessary to adopt adequate crop protection techniques. Farmers had to be able to distinguish predators and make use of field monitoring outcome. The need for training in basics in biology and ecology emerged (Winarto, 2004).

Indonesia was one of the first countries to introduce Farmer Field Schools (FFS). The FFS approach is aimed at extending science-based knowledge and skills to farmers (Feder, Murgai & Quizon, 2004). FFS are known for their participatory training methods and hands-in-the-dirt experimentation. FFS participants are shaped to be "*confident pest experts, self-teaching experimenters and effective trainers of other famers*" (Wiebers, 1993). FFS are built upon four principles: (1) produce a healthy crop, (2) preserve beneficial predators, (3) weekly field observations to decide upon what management actions are necessary to grow profitable crops and (4) getting farmers ready to be experts in their field (Winarto, 2004).

These developments on the political spectrum might help to gain understanding of the farmer's attitude towards governmental influence and thoughts about autonomy and innovation. Pesticides were first brought to the farmers by the government, along with other sources meant to improve production. The government has failed to provide adequate instructions on safe usage of pesticides. During the Green Revolution and in the early days of IPM, agricultural innovation was featured by a top down approach from the government. This has gradually changed the farmer's status from *creative innovator* to *executor of agricultural policy*.

Attitudes

During the interviews three main attitudes came across that might be characteristic for the Sukamanah farmer and fieldworker culture, namely (1) *mind your own business,* (2) *take things lightly* and (3) *passivity*.

Mind your own business

'*I don't care about other people's business. That's why I stick to myself. In the end, I am the one that feels it when sick. The same accounts for feeling healthy.'* (Farmer, interview, January 22, 2016)

Several respondents (farmer group coordinators, women and farmers) (N=8) have stated that farmers and fieldworkers do not want to listen to another person's advice on safe pesticide use. Farmers are said to have individualistic attitudes. *''We don't have the willingness. We do not realize the negative effect of it. We don't have the willingness to understand that it is dangerous. What we think about right now is how to produce crops of good quality*.' (Farmer group coordinator, interview, November 15, 2015). The farmer group coordinator highlights three barriers in the process of risk communication, namely (1) a lack of willingness to understand the risk, (2) lack of acknowledgement of the risk of pesticides and (3) focus on production.

Take things lightly

From the researcher's experiences in Indonesia, taking things lightly seems to have a fundamental value in Indonesian culture. Although one might argue this to be a universal value, it is extremely

visible when walking down the streets of Indonesia. On January 14 this year, suicide bombing and gunfire in the name of Islamic State took the lives of eight people and got 23 others injured in Jakarta city center. In Depok, a city near Jakarta, people stayed calm and the daily routine had not been interrupted. A street vender became famous that day, for continuing to sell satay at the crime scene. This example might illustrate a notable tendency to take things lightly and shut eyes for negative influences.

'I don't think about anything that might happen next. I just live now. I don't want to think about my problems. Just be free.' (Farmer, interview, November 14, 2015)

Closing your eyes for problems was merely brought up when people were talking about attitudes of others (farmer group coordinator, interview, November 15, 2015). Two farmers have witnessed severe sickness (e.g. liver problems) and death of two farmers. They suspected pesticide exposure to be the cause. The affected farmers and grieving relatives did not acknowledge that: '*They want to close their eyes and pretend like there's no problem with pesticides'* (farmer, interview, January 21, 2016).

Passivity

Based on the researcher's general observations, passivity seems to be a recurrent theme in people's attitudes. With reference to the research question, passivity is considered a wait-and-see attitude towards change. A person would rather wait around for help to come instead of taking action himself. As an illustration of this attitude, an example is given by a description of the way training participants handled new agricultural information during the vegIMPACT training. After the first training many farmers were highly enthusiastic about the grafting technique (joining tissues of different crops to grow together). They called it *the marriage between tomato and eggplant* (farmer, interview, February 11, 2016). It is known to be a complicated technique that involves numerous steps in order to achieve satisfying results. During the training it was explained briefly. The participants were left with many questions. Since the upcoming trainings would not cover the topic, discontent had been expressed to the researcher. During the training participants received the telephone number of the agricultural trainer and were invited to contact in case of questions. None of the participants had contacted the trainer. One might consider this an illustration of the wait-and-see attitude. Furthermore, there were a number of requests for tools, help, loans, money and trainings during the interviews. Two farmer group coordinators visited the researcher at night to request material support. Besides, respondents use lack of help from the government and other organizations as an argument for not adopting protective behavior. The described attitudes might be interpreted as passive. A passive attitude is not supportive for adoption of new protective strategies.

Text box 5: Cultural variables

Religion – A large proportion of the research population is Muslim. Some might believe their faith is in hands of god and therefore they might be less prone to take preventive actions.

Socio-political context – Implementation of a rice intensification program in 1965 has marked the start of the Green Revolution. The government stimulated production of rice, and later vegetables (e.g. soybean and corn) by provision of pesticides, fertilizer and credit. In 1986 Integrated Pest Management was introduced as system that introduced harmonious control in agricultural production without damaging the environment or causing financial loss. A few years later, Farmer Field School were introduced to improve knowledge and skills on crop production and preservation of the ecosystem through participatory training.

Attitudes – Several typical attitudes of farmers and fieldworkers might affect the likelihood of behavioural change. A *mind your own business*-attitude withholds farmers from following up advices from others. A person with the typical tendency to *take things lightly*, will probably not perceive pesticides as a large threat for his health and therefore will be less likely to adopt protective behaviour. A *passive* attitude towards change diminishes the likelihood to adopt protective behaviour.

3.2.4 Behavioural variables

Food and beverages

Several foods and drinks are consumed by the farmers and fieldworkers for their preventive or curative effect (Table 2). A full stomach is believed to protect the farmer from getting harmed by pesticides. Especially having breakfast before spraying is recommend by several respondents (N=2). Not having had breakfast is used as an explanation of the occurrence of acute pesticide poisoning symptoms. Milk is used for both preventive (N=11) and curative (N=7) purposes. In addition, one could argue that drinking coffee has a special role in the Sukamanah diet. Female spouses pointed out how coffee protected their husbands against the harm of pesticides (N=3). Two (including one female) respondents portrayed coffee as a treatment for symptoms of acute pesticide poisoning. More often (N=7), drinking (sweet black) tea was mentioned as an instant treatment in case of poisoning from the chemical. From origin, Sukamanah villagers use tamarind as a treatment for symptoms such as dizziness and nausea (N=12). Tamarind is often mixed with hot water and red sugar and drank as a tea. Besides, some (N=3) use coconut water, preferably from a young coconut, to treat symptoms of poisoning when working in the field.

Statement 1:

I drink milk, so I can't be harmed by pesticides.

8 agree, 2 disagree

Table 2: Food and beverages and their perceived preventive or curative effect

	Prevention	Treatment
Milk	N=11	N=7
Tamarind	-	N=12
Tea	-	N=7
Coffee	N=3	N=2
Coconut water	-	N=3
Breakfast	N=2	-

Statement 2:

Being physically active protects me from getting harmed by pesticides.

5 agree, 5 disagree

Vitality and strength

Besides diet, some believe vitality of the body influences susceptibility for negative health impact of pesticides. '*We have a strong body, strong immunity, we're fit and healthy. The pesticide won't have an effect on our body. If we don't feel well while we're working or spraying, the spraying activities will*

easily have an impact on our body.' (Farmer, overhearing an interview in the field house, December 6, 2015). The farming life is characterized by physical labour. The farming lifestyle would therefore protect the farmer and fieldworker from getting harmed by pesticides. '*Rich people don't engage in practical activity like us, so they're more vulnerable.'* (Farmer, overhearing an interview in the field house, December 6, 2015). With the latter quote, the farmer explains that people from the cities, who have rather sedentary lifestyles, are more prone to be harmed by pesticides than farmers. A similar statement has been tested for ten respondents. Half of the respondents confronted with the statement '*Being physically active protects me from getting harmed by pesticides*', agreed with the statement.

Throughout the interviews *being a strong person* and *strength* has been mentioned repetitively. Being strong could be measured by the amount of tanks one is able to spray in one day (N=2), the amount of time one is able to work continuously (N=1), how much weight one can carry (N=1) or whether one complains about physical condition or not (N=1). An extension worker has told about a traditional habit to prove the strength of a person. Pesticides are taken in the mouth and spitted on the pest. If the pest died, while the person was not harmed, it was perceived as a sign of strength (agricultural extension worker, group conversation, October 1, 2015). *'Farmers will not be aware of the risk when acute pesticide poisoning occurs, because they are strong enough*.' (Local expert of text box 1, vegIMPACT training, January 20, 2016) The local expert links being strong to not being aware of the risk of pesticides. According to the local expert, the symptoms of acute pesticide poisoning can easily be cured with medicines. Therefore, it will not be an issue for concern. This example illustrates that the local expert links being strong to the severity of the effect of pesticides on the farmer's body.

Timing of spraying activities

Farmers and fieldworkers appear to plan their spraying activities on specific times in order to gain more impact in pest management and limit exposure to pesticides for the sprayer. Some take into account strength and predictability of the wind. Since the wind is less strong and wind direction does not change as much as during the day, several farmers prefer to spray between nine PM and twelve AM (N=2). Similarly, spraying activities are tailored to beliefs about pest behaviour. Pests are believed to hide from the sunlight in the morning (field worker, short conversation while working in the field, October 2, 2015). According to local knowledge, pests present themselves in the evening (N=2).

'I won't use gloves or any preventive tools if the weather is good. I mean, if I am spraying at night, the wind will not come and the pest will stay at their place. At that time I won't use gloves, even if I have them (field worker, interview, November 10, 2015). According to the fieldworker, susceptibility is low due to weather conditions. For this person, perceived threat is low. Hence, the fieldworker will not use gloves while spraying.

Text box 6: Behavioural variables

Food & beverages – Several types of food and drinks (e.g. milk, tamarind, tea) are believed to protect the body against or cure the body from the negative impact of pesticides. Thus, farmers and fieldworkers try to manipulate the health of their body by self-care.

Physical activities and strength – The physically active lifestyle and level of strength of farmers and fieldworkers are believed to protect the body from harm of pesticides.

Timing of spraying activities – Several farmers take into account beliefs about weather conditions and pest behaviour when planning spraying activities. Spraying is mostly done at night since the wind is less strong at night and the wind direction changes less than during the day. To some, timing spraying activities takes away the need to use personal protective equipment.

3.2.5 Socio-psychologic variables

Social control

Informal social control is sensible in Sukamanah. Houses in the village are built around the main roads in the village and a small area behind the road. Villagers know and are keeping an eye on each other. With respect to wearing gloves while spraying, one might be influenced by the assumption of what others might think of him or how people actually react on the act. Sixteen respondents were asked to share their opinion about the following statement: '*People would laugh at me if I would wear a mask, gloves and a face shield while spraying in the field.*' The majority (10 out of 16) disagreed with the statement. The farmers and fieldworkers supported their opinion by claiming that everybody knows the tools are meant to protect you. Three respondents agreed with the statement and supported their argument by pointing at the fact that wearing gloves is unusual in the village and people might find it *funny* (farmer, personal communication, February 15, 2016). The remaining three respondents answered not to care about people's reactions. *'It protects our health. We can't buy health. It's very important. Laugh or yell. I don't care.* […] *I just stick to myself.'* (Farmer, interview, January 22, 2016). The farmer values health over the risk of social rejection. The statement shows how an individualistic attitude (§3.2.3 attitudes) in a social context might promote the likelihood of adoption of protective behavior.

Statement 3:

People would laugh at me if I would wear a mask, gloves and a face shield while spraying in the field.

3 agree, 10 disagree,

3 don't care

Communication about pesticide poisoning

As noted below in 'previous pesticide poisoning experiences', many farmers and fieldworkers have experienced some health complaints due to pesticide exposure. It is not common to talk about such experiences with others. '*Farmers never complain about anything, except from if it's already very bad. Farmers are strong'* (farmer, interview, December 6, 2015). The following statement has been tested: *A strong man is the one who might experience feeling dizzy or nauseous after spraying, but doesn't complain about it.* Six respondents agreed and one disagreed with the statement. It is uncommon to share experiences with pesticide poisoning. This reinforces lack of awareness of the risk of pesticides within the community.

Statement 4:

A strong man is the one who might experience feeling dizzy or nauseous after spraying, but doesn't complain about it.

6 agree, 1 disagrees

Text box 7: Socio-psychologic variables
Social control & -pressure – Social control is high in Sukamanah. Most of the respondents did not expect people in the village to laugh if the farmer or fieldworker would wear a mask, gloves and a face shield while spraying in the field.
Communication about health threat and protective behaviour – Since men are expected not to complain about physical impairments, pesticide poisoning experiences are rarely shared amongst farmers and fieldworkers.

3.2.6 Structural variables

Educational level

From the 20 respondents of which the educational level is known, the majority had made it to high school (N=10) (figure 6). Eight others had dropped out after primary school. Two respondents obtained a bachelor degree.

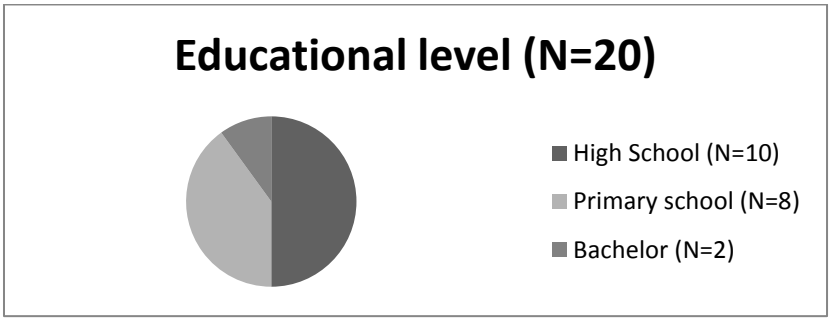

Figure 6: Educational background of male respondents

According to a midwife, farmers and fieldworkers with a low level of education are not able to understand the risk of pesticides for their health. '*If they* [Sukamanah farmers and field workers] *have a high level of education they will have the willingness* [to use protective equipment] *and they already understand the risk of their occupation. They who have a low level of education do not seem to care about it, because they don't understand about the risk of it.'* (Midwife local health clinic, interview, December 4, 2015). The researcher had the impression that understanding the risk of pesticides, even after participation in the vegIMPACT training is difficult for farmers and fieldworkers.

Level of knowledge & risk understanding

Knowledge on the risk of pesticides has been extracted from spontaneous comments during the interviews prior to the vegIMPACT training (N=30) (Table 3). The spontaneous comments serve as indicators for risk awareness and level of knowledge about several related topics. Four topics are covered: (1) routes of exposure within the body, (2) acute- and (3) long term pesticide poisoning symptoms and (4) personal protective equipment. Eleven out of 30 male farmers and fieldworkers (37%) mentioned routes of exposure. Eight of them summed up more than one. 22 out of 30 respondents (73%) referred to acute pesticide poisoning symptoms. The majority had experienced these symptoms themselves (19 out of 22). Two out of 30 respondents (7%) mentioned symptoms of pesticide poisoning due to long term exposure. 23 out of 30 respondents (77%) named at least one piece of personal protection equipment that one could use to limit exposure to pesticides. Nearly half of them could sum up three or more types of personal protective equipment. Most frequently mentioned items were a mask (21 out of 23), gloves (15 out of 23) and a long sleeved t-shirt (11 out of 23). Others pointed out long pants (7 out of 23), shoes or boots (4 out of 23), a hat (3 out of 23) and glasses (1 out of 23). In sum, most frequently mentioned topics related to the risk of pesticides

were personal protective equipment (77%) and acute pesticide poisoning symptoms (73%). Long term effects of pesticide poisoning were least mentioned.

Table 3: Number of respondents mentioning topics related to the risk of pesticides prior to vegIMPACT training

Items	**Correct answer/ N=30**
Routes of exposure	11
Symptoms of acute pesticide poisoning	22
Symptoms of long term pesticide poisoning	2
Personal protective equipment	23
Other protective behaviour	18

Toxicity of pesticides seems to be difficult to understand. The vegIMPACT trainer wrote the formula down and explained it during the training. After the training, eight of the participants were asked to explain which factors determine the magnitude of the risk of pesticides. None of the respondents could answer correctly. Still, several farmers and labourers are aware of the relationship between dosage and risk. Many make a link between price and effect. According to interviewees, cheaper types of pesticides contain a lower dose of active ingredients. Simultaneously, most expensive types of pesticides are perceived to be most effective in rooting out pest. Low dose pesticides are regarded as a low risk (N=1) or no risk (N=2) for health damage. Strong pesticides are known to bring along a greater risk of harm (N=5).

A spraying observation two days after the second vegIMPACT training (January 20, 2016) supports limited ability to understand the risk of pesticides. A farmer, who participated in the vegIMPACT training, had been observed when he followed his fieldworker into the field. The fieldworker was assigned to spray chili plants. In previous conversations, the farmer had acknowledged the risk of pesticides for the sprayer's health and expressed his concerns. During the spraying observation, several risky situations occurred: (1) limited protection of the fieldworker (motorcycle mask only), (2) presence of a child in the field while spraying (Figure 6), (3) direct skin exposure due to a finger in the tank, (4) the farmer working in a field next to the field being sprayed, barefoot in water that was connected with the water that contained spills of pesticides (Figure 7) and (5) a person walking through the field right after it had been sprayed. This example displays the difficulty farmers experience with translating the knowledge about the risk of pesticides and intention to protect against pesticides to practical situations in the field.

Figure 6: Child in the field.

Figure 7: Farmer in contaminated water (Photos taken by Manja Coppens on January 20, 2016)

Health literacy

An essential element of perceived health threat is understanding the risk of unsafe pesticide use. Zoom in on long term risks of pesticide exposure. To what extent are farmers capable to understand health risks? '*Long term exposure to pesticides is linked to several types of cancer*', was said during the vegIMPACT training. Trainers talked about neurological damage and lung problems. How was this information received by the participants? In the village, health complaints seem to be categorized in serious illness and casual inconveniences. Doctor's visits are not found to be too expensive. Therefore, medical knowledge could be limited. In order to get an idea of the capacity of farmers and fieldworkers to process and understand health information shared during the vegIMPACT training, health literacy was measured for ten interviewees. Health literacy is defined as: '*the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions*.'(Parker, Ratzan & Lurie, 2003). Health literacy was measured for ten interviewees with use of the REALM-R scale. Three out of ten scored six or lower, which indicates poor health literacy. It might be interesting to study the link between health literacy and perceived threat of pesticides in a future study, while using a larger sample size.

Text box 8: Structural variables

Educational level – The average farmer or fieldworker did not finish high school. Several respondents suggested that low educational level reduces the likelihood of adopting protective behaviour.

Level of knowledge and risk awareness – Most frequently mentioned topics related to the risk of pesticides were personal protective equipment (77%) and acute pesticide poisoning symptoms (73%). Long term effects of pesticide poisoning were least mentioned.

Health literacy – Three out of ten respondents had an indication for poor health literacy.

3.3 Cues to action

3.3.1 vegIMPACT training

Before onset of the vegIMPACT training, six invited males were asked about their expectations of the training. Four respondents expected to learn more about cultivation and pest management. The remaining two suspected to gain knowledge about safe use of pesticides and cultivation. After the first training, four participants were asked to share their motivation to join the training. Two were

motivated by gaining knowledge on cultivation, two wanted to gain knowledge in general and one mentioned gaining knowledge on health, safe pesticide use and cultivation.

The first training was held by an expert in agriculture. The trainer started off with a question: '*Do you have any problems in your field?'* Discussed topics are: experiences of pesticide poisoning, the negative effect of pesticides on the environment and alternative pest management strategies. Several exercises stimulated active learning. Exercises were meant to make farmers able to understand the advantages and disadvantages of different animals in the field, getting insight in the ecosystem and understanding pest resistance. Several farmers asked specific questions about what they had seen in the field. For example: '*How to prevent the leaves of plant from getting curly and yellow?'* (Farmer group coordinator, vegIMPACT training, December 15, 2015).

The second training was held by a female trainer of vegIMPACT. An interactive approach was used. The trainer asked several questions. For example: '*What's the most common route of exposure?'.* The participants posed questions too, such as: 'How about tamarind [as first aid in case of pesticide poisoning]?' (Farmer, vegIMPACT training, January 18, 2016). Theoretical parts were alternated with individual and group exercises. Body mapping is an example of a group exercise (Figure 8). The participants were given a piece of paper, some markers and colourful stickers. The trainer asked the participants to draw a body and use the stickers to point out all the body parts that have felt strange after spraying.

Figure 8: Farmers mapping all body parts that have ever felt strange after spraying (photo taken by Manja Coppens, 2015)

A public health officer of the local health clinic explained the effect of pesticides on the body, the principles of safe use of pesticides and first aid in case of pesticide poisoning. A video was shown. It showed the health impact of pesticides. A discussion arose concerning the benefits of using personal protective equipment and the practical difficulties while working in the field. At the end of the training, all participants were given a motor cycle mask and a pair of rubber gloves.

Eight participants were later asked about their experiences of the vegIMPACT training. All eight participants were positive about the vegIMPACT training. When describing their positive experiences, four interviewees mentioned gaining knowledge about the effect of pesticides on health. Four participants mentioned gaining knowledge about cultivation. Others were positive about learning about pest management (N=2), protection (N=2), receiving personal protective equipment (N=2) and learning about health, and clearing up misunderstandings. The latter farmer pointed at the custom of people in Sukamanah to give sweet tea to someone who suffers from acute pesticide poisoning. That is discouraged by the public health officer of the local health clinic.

A brief knowledge test was used to check to what extent participants were able to reproduce information provided during the training (Table 4). Six topics were sorted from most correct answers

to least correct answers: prevention methods (13/16), three symptoms of acute pesticide poisoning (11/16), routes of exposure (10/16), first aid in case of pass out (3/16), three symptoms of pesticide poisoning due to long term exposure (3/16) and others exposed in the household (1/15). The low score on the latter topic is specifically notable as for the respondents had spent a notable amount of time doing an exercise to map the routes of exposure within the household. Imagines were used to create a map of exposure for involved agents.

Table 4: Amount of respondent answering correctly on knowledge test after vegIMPACT training (N=16)

Topic	**N correct**
Preventive methods	13
≥3 symptoms of acute pesticide poisoning	11
Routes of exposure	10
First aid in case of pass out	3
≥3 symptoms of pesticide poisoning due to long term exposure	3
Other exposed in the household	1

Communication about the vegIMPACT training

A few days after the training, seventeen participants were asked whether they had talked about the training. Twelve out of seventeen had talked to someone about the training (Figure 9). Five others declared to not have had the chance to talk to other persons because they had been busy. The majority of the persons, who did talk to someone else about the training, had talked about health related topics. Another popular topic was the segmentation technique, presented during the first training. One person only discussed this topic with others. Three others did not specify the topics they had discussed with other persons. Most farmers talked to other farmers about the training (N=11). Some farmers (N=4) talked to farmers who did not participate in the training. According to a farmer, some reacted positively on what the farmer told them. The interlocutors understood the risk of pesticides and had acknowledged the importance of personal protection while spraying. Others were sceptical. Since they had always been spraying and did not experience any health complaints, they did not see the urge to protect themselves (farmer, interview, February 12, 2016). Others talked about the training with their wives (N=2). The women stated to have read all reading material of the training. Training content was tailored to gender based roles and therefore different. Many couples did not discuss training content. Conversations about the training were rather informal. The conversations were held in field houses, on the street and at the mosque.

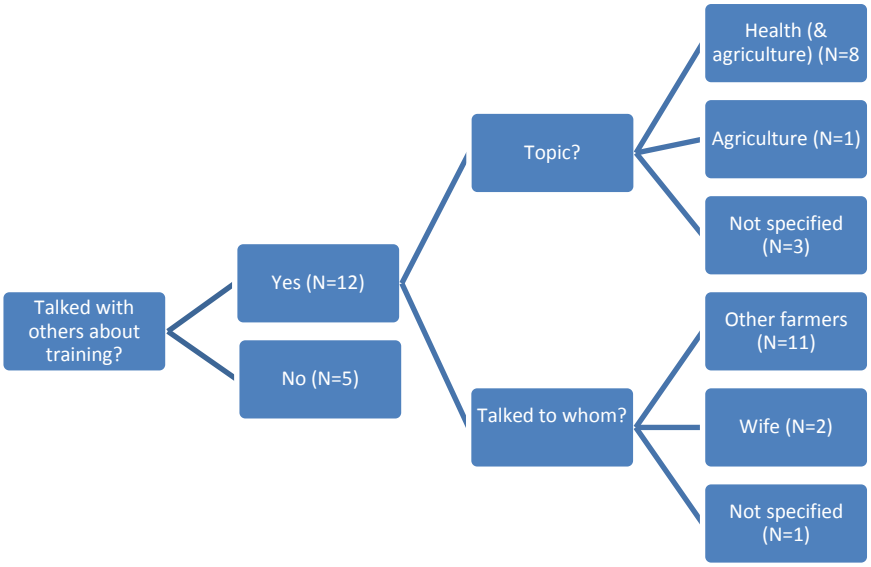

Figure 9: Communication about the training (N=17)

3.3.2 Previous trainings

According to the vegIMPACT baseline survey, eight out of 25 farmers and fieldworkers had received training about safe pesticide use before. Four received training from the public sector, namely farmer field school (N=2), extension workers and a pest and disease observer. The other half participated in trainings given by the private sector, specifically a seed company (N=2), a palm oil company and a pesticide company. During the interviews, six participants mentioned to have participated in a training held by the government. One of them started to wear gloves after the training. Four interviewees went to farmer field school. At farmer field school participants learnt to use a low dosage of pesticides and to attract pest with bright colours. Two participants joined a training offered by the private sector. Training content was mainly focussed on cultivation, some on pest management. The few trainers that do address safe pesticide use spend a short time on the topic.

3.3.3 Advice from others

Farmers and fieldworkers receive health advice from each other, relatives and health professionals. For many (N=7), farming is a profession that is passed from father to son. Women too (N=3) got introduced to the farming life by their parents. Most farmers and fieldworkers have never received any instructions on safe use of pesticides from their parents.

One of the farmers stated that all older farmers wear gloves and a mask for protection. The older farmers suggested him to use them as well. He followed their advice. '*They were all healthy people*.' (Farmer, interview, January 22, 2016). This example may illustrate that seniority in the farming life and a healthy appearance promote following up advice. A parallel could be made in the farmer's coping strategy with handling agricultural issues. Observing results is used to make a decision whether to adopt a new strategy or not. For this farmer, good health of the persons using gloves and a mask convinced him to wear gloves and a mask while spraying pesticides.

Since farmers cope with disappointing yields and yellow or rotten leafs, they consult others on pest management (N=8). The kiosk owner who sells pesticides gives the farmer advice on the type and brand of pesticides and spraying methods. The kiosk owner's advice is followed by the farmers. Kiosk owners do not give advice on safe use of pesticides, since they assume that farmers already know how to handle pesticides (kiosk owner, informal conversation, December 4, 2015).

Other farmers ask their friends for spraying advice (N=2). Those issues are mostly discussed between

farmers who have fields next to each other. Advice is followed with the same naturalness. Before the start of the vegIMPACT training, safe use of pesticides has never been a formal topic of conversation during farmer group gatherings. However, some farmers (N=2) have discussed the possibilities of wearing personal protective equipment. As a result, one farmer started wearing an old t-shirt as a mask.

In sum, farmers and fieldworker selfdom receive advice on safe use of pesticides. Following advice of others is based on trust. Friends and relatives are generally trusted. Healthy appearance and seniority in farming are signals for the farmer that a person is reliable.

3.3.4 Occupational health at former employer

Two respondents have worked for a company at another Indonesian island. At their previous worksite, they learned about the essence of safety during work. Before onset of the vegIMPACT training both respondents stated to use gloves while spraying.

3.3.5 Risk of pesticides in media

According to the respondents, safe pesticide use is not often mentioned in the media. Television is part of the contents of most Sukamanah households. Especially in the evening, a lot of people are watching television. Only a pair of respondents mentioned gaining information about pesticides from national television and pesticide advertisements (farmer, personal communication, February 11, 2015). One farmer especially gained knowledge about long term risks from a television show (farmer, personal communication, January 22, 2015).

3.3.6 Pesticide poisoning experiences

21 respondents have experienced at least one symptom of acute pesticide poisoning (Table 5). Dizziness was most frequently mentioned among male farmers and field workers (N=16). The second most frequently mentioned symptom is having skin problems (N=6). The problems include itchiness, irritation, burned sensation, a rush or redness on the hands, wrists and underarm. The third most found symptom is a sore or dry throat (N=5). Another complaint was nausea (N=4). The latter was always mentioned in combination with dizziness. Other health complaints are eye problems (N=3), such as blurred sight and sore eyes, pain on the chest (N=1), feeling weak (N=1) and shortage of breath (N=1). Symptoms disappeared in about half an hour (N=6).

Table 5: Experiences of pesticide poisoning symptoms

Symptom	**N**
Dizziness	16
Skin problems	6
Dry throat	5
Nausea	4
Eye problems	3
Chest pain	1
Feeling weak	1
Shortage of breath	1

Five out of the 21 respondents made a change in the way they handled pesticides after the poisoning incident (Figure 10). Two stated taking into account the wind direction. One person started wearing gloves and a mask. Another person stopped smoking while spraying. The next farmer declared to be more careful with his spraying technique, especially when spraying high. Five respondents did not make any changes after their experiences with pesticide poisoning. The other eleven did mention making any changes or not.

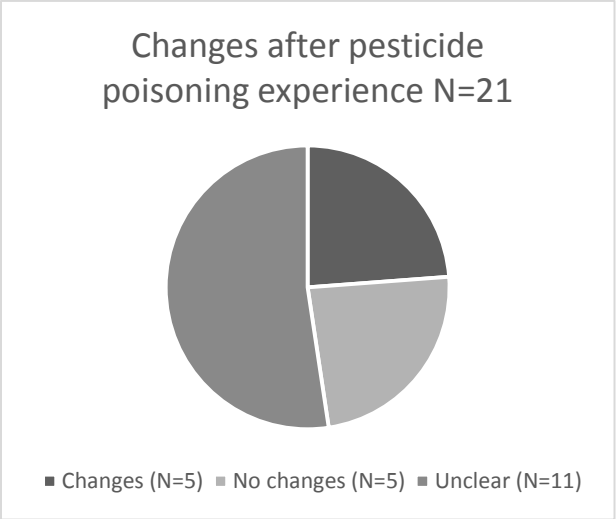

Figure 10: Amount of respondent who have or have not made a change in pesticide handling after experience with pesticide poisoning (N=21)

3.3.7 Reading pesticide labels

The label of a pesticide bottle could be a source of information about the type of pesticide, recommended dosage, risk and personal protection when using pesticides. Before vegIMPACT taught the farmers how to read the label, eleven farmers stated to have read the labels. The label was mostly used to gather information about dosage (N=5), risks of pesticide (N=5), personal protection (N=3) and what type of pest can be controlled with this pesticide. According to a farmer group coordinator (interview, November 15, 2016), farmers do read safety instructions on the label of a pesticide bottle, still they do not pay attention to it.

When evaluating the vegIMPACT training in a personal conversation, two farmers had stated that they thought understanding the label was the most difficult part of the training (farmer group coordinator, interview, February 16, 2016; farmer, interview, February 16, 2016). Another farmer (interview, December 5, 2016) pointed out that he was not able to read the instructions on the label since they were written in English.

Text box 9: Cues to action

vegIMPACT training – Participants of the vegIMPACT training expected the training to focus on cultivation and pest management rather than on safe pesticide use. Training experiences were positive about new knowledge on effects of pesticides and cultivation. Training content about preventive methods and symptoms of acute pesticide poisoning could easily be reproduced. Respondents struggled with naming symptoms of long term exposure and affected persons in the household. Knowledge from the training was spread via informal conversations with other farmers.

Previous trainings – Part of the respondent have had agricultural training in the past. In most trainings safe pesticide use was not discussed or only briefly discussed.

Advice from others - Farmers and fieldworker selfdom receive advice on safe use of pesticides. Following advice of others is based on trust. Friends and relatives are generally trusted. Healthy appearance and seniority in farming are signals for the farmer that a person is reliable.

Occupational health at former employer – Attention for safe pesticide use at the former employer creates habits that are maintained over time.

Risk of pesticides in media – Lack of attention on safe use of pesticides in media.

Experiences pesticide poisoning – At least half of the respondents have experienced symptoms of pesticide poisoning. Most frequent complaints are dizziness, skin problems and a sore throat. Few respondents have adopted adequate protective behaviours after experiencing pesticide poisoning.

Reading pesticide labels – Few farmers read pesticide labels. Pesticide labels are found to be difficult to understand.

3.4 Likelihood of wearing gloves

3.4.1 Perceived benefits of wearing gloves

Gloves are used as protection against harm of pesticides (N=17). Respondents value health. Gloves are expected prevent skin exposure at the hands. Others have stated that gloves make the farming life easier. When using gloves while spraying, there is no need to wash hands before smoking, eating or drinking (N=4). However, colleague farmers seemed to think differently. Nine out of nine farmers disagreed with the statement '*When wearing gloves while spraying, there's no need to wash my hands before eating*'.

Health motivation

Respondents were directly asked about their perception of the meaning of health (Table 6). Five out of eight stated that being healthy means being able to work. Being able to work equals providing income to the family. To others, health is equivalent to feeling good (N=2) and being able to do religious activities (N=1). The first argument – being healthy means being able to work – has been stressed by the traditional massager as well. According to the massager (interview, December 4, 2015), good health is a prerequisite for being about to have money to feed the family.

Statement 5:

It's too difficult to wear gloves while spraying.

6 agree, 2 disagree

Tabel 6: Perceived benefits of wearing gloves while spraying pesticides

Meaning of health	N
Being able to work	5
Feeling good	2
Being able to do religious activities	1

3.4.2 Perceived barriers of wearing gloves

Respondents came up with nine different barriers to wear gloves (Table 7). Most of the respondents who talked about barriers had never used gloves before. Some added that the named barrier did not compete with the benefits of wearing gloves. Respondents (N=9) said that wearing gloves while spraying is too difficult. Farmers and fieldworkers were confronted with the following statement: *It's too difficult to wear gloves when spraying.* Six respondents affirmed the statement and two did not. Others (N=6) have never used gloves before, because they do not have any. Not being used to wear gloves is considered a barrier by five respondents. Using gloves for spraying is not comfortable, according to some farmers (N=3). The gloves do not fit properly on the hand, are slippery and thot. Other perceived barriers are being too busy, hot climate, the conviction that the hands could still get exposed, lack of willingness to wear them and having an employer who does not wear any gloves.

Table 7: Perceived barriers of wearing gloves while spraying pesticides

Perceived barriers	N
Too difficult	9
Don't have gloves	6
Not being used to	5
Uncomfortable	3
Hot climate	2
Too busy	1
Hands will still be exposed	1
Don't want to	1
Employer does not wear gloves	1

3.4.3 Putting on the gloves

Before onset of the vegIMPACT training eleven out of 33 respondents stated to wear gloves during spraying activities (Figure 11). Nine of them elaborated on the material of the gloves. The majority (N=5) used latex, doctor style gloves. Others used a cotton edition (N=3) and one used motor cycle gloves. Thirteen respondents said not to wear any gloves and another nine were unclear about wearing gloves or not. Gloves that were used by the respondent were often in a bad condition. The gloves had holes in them or showed spots, indicating that they were not (properly) washed. A farmer group had received a box of latex gloves from a seeds company. The same pair of latex gloves was used frequently until it was outworn.

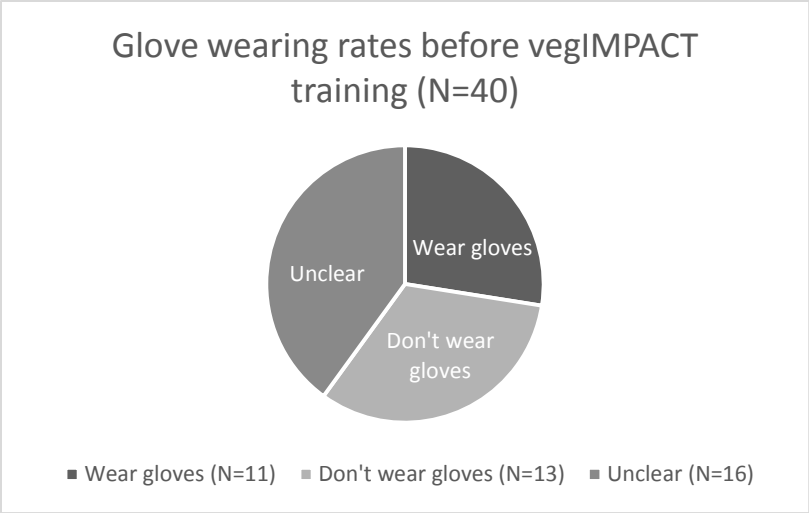

Figure 11: The amount of respondents wearing gloves whiles spaying pesticides before the vegIMPACT training

After completing the first training, every participant received a set of rubber gloves, a motor cycle mask with active carbon filter and a face shield. Fourteen participants were asked about their experiences of wearing the gloves (Figure 12). A large majority (N=11) had tried the gloves at least once. The remaining three interviewees did not spray yet. Three of the group that used gloves, had not used gloves before. Three others already used other types of gloves. The final five were unclear about whether they had used gloves before.

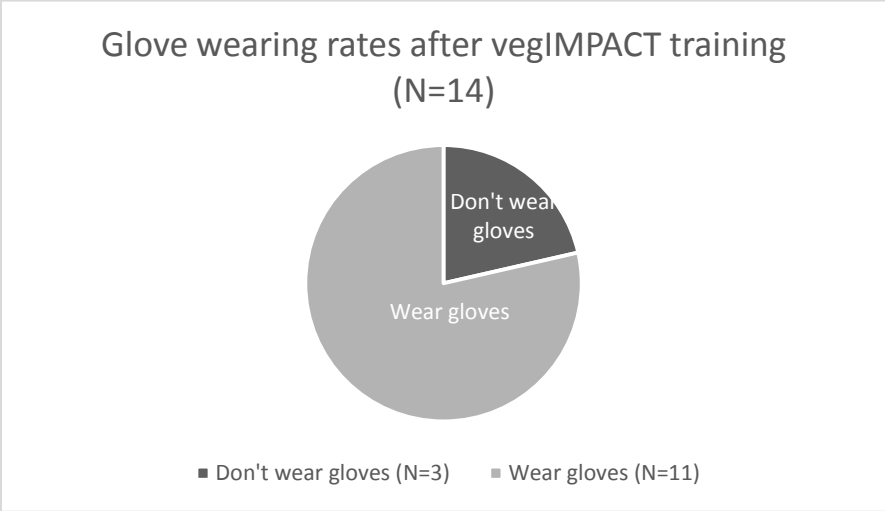

Figure 12: The amount of respondent wearing rubber gloves whiles spaying pesticides after the vegIMPACT training

Several interviewees expressed their experiences wearing the rubber gloves received from vegIMPACT (Table 8). Experiences were equally positive and negative. The gloves were found both comfortable (N=2) and uncomfortable (N=3). Respondents complained about the gloves being too hot to work with (N=3) and making it hard to grasp (N=2). Others claimed the gloves felt good (N=3), made them feel safe (N=1) and did not bother them while working (N=1).

Table 8: Experiences of wearing rubber gloves from vegIMPACT training (N=11)

Positive experience	**N**	**Negative experience**	**N**
Feels good	3	Uncomfortable	3
Comfortable	2	Too hot	3
Feels safe	1	Difficult to grasp	2
Not bothering	1		

The control group in another village did not receive any training about safe use of pesticides. After a short interview they received a pair of gloves. The researcher obtained permission to contact the control group for a short telephone interview. Twelve persons received a pair of rubber gloves. The group was contacted two months later. Five respondents participated in the telephone survey. All of them had used the gloves while spraying pesticides. Two of the farmers had used the gloves every time they had sprayed. One participant used the gloves three out of four times, another five out of ten times and the remaining farmer used the tools once out of three times spraying. Gloves being too hot (N=2) and forgetting to bring them to the field (N=1) are reasons for participants not to use gloves.

4. Discussion

This study has been executed in an attempt to explain which factors affect the likelihood of wearing gloves while spraying pesticides for small-scale vegetable farmers and fieldworkers in Sukamanah. Structuring the results according to the Health Belief Model revealed the complexity of the issue.

Before the vegIMPACT training, one third of the farmers and fieldworkers stated to wear gloves. All of the training participants who were asked to report their glove use retrospectively, stated to have tried the gloves or have the intention to try them during future spraying activities. Similarly, all participants of the control group who were asked the same question, stated to have used the gloves. Hence, the results imply that providing gloves stimulates wearing gloves. Yet, offering training on safe use of pesticides does not necessarily make a difference in the likelihood of wearing gloves. Since the research is dependent on self-reporting of the respondents, overestimation of glove wearing behaviour is at risk for bias.

Most farmers and fieldworkers do believe they could get harmed by pesticides. Preventive strategies such drinking milk and planning spraying activities based on strength of the wind suggest that farmers and fieldworkers believe to be susceptible to health damage. For many, this belief is the result of pervious experiences of acute pesticide poisoning. Results of this study indicate that several factors can limit perceived susceptibility. A large number of respondents shared the belief that they are not supposed to talk about physical complaints. Pesticide poisoning experiences are not commonly shared amongst farmers and fieldworkers. This might contribute to limited awareness of the scope of the damage done by pesticides and thus the susceptibility of pesticide applicators. Being strong and vital is believed to protect the sprayer from getting harmed by pesticides. Plus, preventive strategies (e.g. drinking milk, taking into account the wind direction, wearing a cotton t-shirt as a mask) are believed to eliminate the risk. The perceived severity of health damage due to exposure to pesticides is limited. This can be explained by short duration of acute pesticide poisoning symptoms and inability to show causality between long term pesticide exposure and pesticide poisoning symptoms. These findings on moderate yet modifiable perceived susceptibility and limited perceived severity point at moderately high perceived health threat.

Respondents do not seem to understand long term risks of pesticide exposure. Other studies confirmed this finding (Crissman, Cole & Carpio, 1994; Quandt, Arcurry, Austin & Saavedra, 1998; Wiflson et al., 2001). A large majority did not mention long term risks when talking about pesticides and health prior to the vegIMPACT training. Awareness and understanding of long term risks might be seen as one of the most important factors affecting perceived severity. Risks of long term exposure can result in major health damage, reduced productivity and might become fatal. During the vegIMPACT training, participants were informed about long term risks of pesticide exposure. Afterwards, a greater part of participants was not able to sum three effects of long term exposure to pesticides. One might wonder whether farmers and fieldworkers are able to digest information about risks due to long term exposure. Health literacy scores did not suggest low health literacy to be the main cause. One might explain the issue by (1) characteristic attitudes or (2) long duration of the training in combination with (3) limited educational background of participants. Typical attitudes such as *mind your own business* and *take things lightly* could counter behavioural change. A person with an individualistic *mind your own business* attitude might not want to take advice from others, especially if the person is from outside the area. *Taking things lightly* might limit internal processing of the new knowledge. If a person wants to close his eyes for risks, the person might not want to acknowledge the risk. What is the use of personal protective equipment if there is no risk? Thus, adoption of protective behaviour is unlikely.

Results suggest that the farmer and fieldworker's environment does not stimulate protective behaviour such as wearing gloves while spraying pesticides. There is lack of examples of good practice. According to many respondents, the majority of farmers and fieldworkers do not wear gloves while spraying pesticides. In line with findings of Feola et al. (2012), a special example role is

assigned to key figures. In Sukamanah, key figures are the farmer group coordinators and heads of the neighbourhood. Not all key figures used gloves while spraying.

Safe use of pesticides is not an issue on the governmental agenda. There is lack of awareness about the problem on both national and regional level. Pesticide poisoning cases are not monitored. Sukamanah's health agent is not aware of pesticide poisoning cases within the village. Most farmers and fieldworkers do not consult the local health clinic. This reinforces lack of awareness of the issue on local, provincial and national level. In addition, health professionals are not trained to recognize symptoms of pesticide poisoning. The gross majority of interviewed health professionals did not possess sufficient knowledge about the health risk of pesticides. In effect, farmers and fieldworkers who actually consult a health professional in case of pesticide poisoning, do not receive appropriate care and preventive advice. With the combination of lack of health care seeking behaviour of farmers and fieldworkers and lack of knowledge of health professionals, an important opportunity of health promotion continues to be neglected. Several respondents expect the government to provide training about safe use of pesticides. In contrast to Fan et al. (2015)'s findings, the government seems to play an important role in the farmer's experience. Historical developments and expressed expectations highlight significance of governmental advice.

Experiences of applying the Health Belief Model (HBM)

The findings of this research prompt a re-thinking of the usability of the HBM in understanding what factors influence the likelihood of adopting preventive behaviours. Describing results according to the HBM has offered structure to the findings. Overall, the elements of the HBM matched the research findings quite well. A flexible approach was taken when constructing the categories. However, application of the model had several limitations.

Adoption of a new behaviour involves more cognitive processes than displayed in the HBM. According to the HBM the likelihood of action is a product from *perceived threat* and *perceived benefits of action* minus *perceived barriers of action*. This relationship is too simplistic. Azjen (1999) suggested that an action is the result of an intention. Intention is based on *attitudes, subjective norm* and *perceived behavioural control*. Thus, the belief *'not using gloves while spraying pesticides is a serious threat for my health'* will not directly influence the likelihood of action. A link can be made with the Prochaska's (1997) Model of Stages of Behavior Change. The model displays the level of preparedness to change in terms of awareness of the risk, the desired action, intending to take action, practice and maintenance.

The direct link between *cues to action* and *perceived threat* suggests a simple sender, channel and receiver process (Shannon & Weaver, 1949). This simplistic presentation neglects the processes of change of the message. Researchers should take into account the way a message is constructed, coloured and changed by inter-human processes. For example: the extent to which the perceived threat of a participant of the vegIMPACT training is influenced by the content of the training, depends on several factors. It depends on the ability to process information and the training methods that are used. Besides, processing of the information depends on a person's willingness to listen.

The model focusses predominantly on a person's cognitive processes in handling external input. Although multiple *modifying factors* have been integrated in the study, the Health Belief Model fails to embed the behaviour in its cultural context and social structures. The factors of the Health Belief Model were mainly focused on negative influences, which resulted in the risk of victim-blaming. Future research aimed at understanding the level of compliance with a certain health behaviour might benefit from more opportunities to study daily conversations and contextual factors (Krumeich, Weijts, Reddy, & Meijer-Weitz, 2001).

Limitations and strengths

This section identifies some limitations that put the quality of the findings and the ability to answer the research question at risk. One such case is selection of respondents based on purposive sampling. Although, this might be an acceptable method, since aiming for statistical representativeness is not a goal of qualitative research. Furthermore, research has shown that people are more likely to show socially acceptable behaviour when they know they are being watched. This phenomenon is called reactivity. Reactivity is a risk for internal validity (Boeije, 't Hart, Hox, 2009). Yet, to ensure to operate ethically responsible, it was inevitable to let the participant know he was being observed. Language barriers asked for help of an interpreter. Involving a translator might change interview dynamics, as it might create a formal vibe, which might inhibit free sharing of ideas and information. This is controlled for by providing the translator with clear instructions, such as literal translation and inform the researcher on cultural aberration which might imply non literal meaning. Losing information in translation is inevitable (Kumar, 1989). Further, form, order and wording are essential for ascertaining the quality of research. Experiences during the research process learned that it was more important to follow the flow of the conversation in order to make the respondent feel at ease, then to follow a strict structure. Therefore, validity of the research might be at risk.

Besides limitations, the research has several strengths. A large scope of different stakeholders has been interviewed. This allows the research to provide a broad view upon the issue. Next, the open, stepwise approach provided more detailed information to assess the complexity of the issue. Direct checking of remarkable statements with a larger number of respondents contributed to the quality of the data. Furthermore, the researcher made use of multiple methods to collect data, namely interviews, field observations and training observations. Comparison of data obtained by the different methods allowed for checking of statements. Moreover, the researcher gained more understanding of the farmer and fieldworker's life by short stays in the community.

Recommendations

Three findings that have derived from this study may be considered the main recommendations. This study provides some suggestions that farmers and field workers value governmental advice. (1) Promoting behavioural change via the government is therefore recommendable. Agenda-setting would be a logical first step. There is a need for monitoring of pesticide poisoning to raise risk awareness on different levels. Plus, limited knowledge on the risk of pesticides and protective behaviour had highlighted the need for training of health professionals. Lastly, there is a demand for governmental training on safe pesticide use for small-scale farmers and fieldworkers.

Another important role is given to key figures such as farmer group coordinators and the head of the neighbourhood. (2) Key figures who adopt protective behaviours may be role models to farmers and fieldworkers that are close to them. Therefore, special attention should be paid to pesticide spraying practises of the key figures.

Finally, this study implies that understanding risk communication pesticide exposure seems to be a difficult task. (3) It is recommended to put more emphasis on explaining risks of long term pesticide exposure. Preference should be given to most engaging training methods with attention for stages of change and highly interactive methods (Burke et al., 2006) that promote dialogue. Engagement of participants in the development of training materials is recommendable (LePrevost, Storm, Blanchard, Asuaie & Cope, 2013). These recommendations contribute to tackling the unsafe practises of pesticide applicators and creating an environment that stimulates protective behaviour.

5. Conclusion

While applying the HBM to structure results of the study, three disadvantages of the model were revealed, namely: (1) incompleteness of included cognitive processes, (2) failing to embed behaviour in its social - and cultural context and (3) poor sensitivity for the process of change of a message. Yet, the HBM has succeeded in offering an insight in the complexity of factors associated with adoption of protective behaviour.

Although a large number of farmers perceive themselves susceptible to pesticides, the susceptibility is believed to be modifiable by factors such as being fit and strong, drinking milk or tamarind. Acute pesticide poisoning symptoms are not perceived as severe. Risks of long term exposure are seldom well understood.

If evaluating the expectations about wearing gloves while spraying pesticides, benefits and barriers are weighted against each other. The most frequently stated barriers are gloves being too difficult to wear, lack of access to gloves and not being used to wear gloves. As frequently stated, gloves are believed to protect the applicator from getting harmed by pesticides. Since good health (*health motivation*) stands for being able to work, wearing gloves allows the applicator to continue working.

The likelihood of cues to action (e.g. advice from others) to affect a person's perceived threat, depends on factors such as attitudes (e.g. *mind your own business*), skills (e.g. health literacy), trust in the messenger and the construction of the message.

The role of the government should not be underestimated. At the time of the research, safe use of pesticides was not on the political agenda, which resulted in low risk awareness of health professionals and few educational activities.

Further research should put more attention on addressing contextual factors and inter-human processes. Promotion of safe pesticide use via the government is therefore the main recommendation. Other recommendations are: giving key persons a function as role models and putting emphasis on explaining risks of long term exposure to pesticides.

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Annexes

Annex 1: Interview guide

MSc Thesis Communication, Philosophy & Technology (CPT)

a qualitative study on Java island, Indonesia

Interview guide

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Introduction

Interviews will be conducted as part of a study on glove-wearing behavior during pesticide handling by small-scale vegetable farmers and field workers in Jiput, West-Java. In order to ensure quality of the interviews and offer transparency on methods and resources to the reader, an interview guide has been developed. Besides, this interview guide could be used for preparation by the translator. The study is based on the following research question:

'How could low rate of glove-wearing behaviour during pesticide handling be explained for small-scale vegetable farmers and field workers in Jiput, West-Java?'

Purpose

To answer the research question there is a need for in depth information on farmers', field workers' and farmers' wives' perspectives on pesticides and (ill) health. With regard to large cultural differences between Indonesian areas, it is not possible to generalize based on data of other studies in Indonesia. Therefore, unstructured interviews are held within Jiput.

Description participants

Since the case study is aimed at understanding Jiput's farmers' and fieldworkers' behavior in pesticide use, the interviews will be held primarily with farmers and fieldworkers in villages in Jiput. During November till March, vegIMPACT will provide a training in occupational health. The first interviews will be held in Kadusekul. Participants are recruited via contact persons of vegIMPACT. All interviewees are living in Jiput. Participants are between twenty and 60 years old. Persons above 60 years old in the Jiput area are known to use a dialect, which is not spoken by the translator. Therefore, persons older than 60 years are excluded from the study.

Role differentiation

The interviewing process involves three different roles, the interviewer, the respondent and the translator. Before start of an interview, a topic list with some associated questions will be developed by the researcher, Manja Coppens. These will be translated by the translator, Justine Yohana. The translator is a medical anthropology student at University Indonesia. A list of possible important topics with explanation has been constructed by the researcher to prevent ambiguity in understanding by the translator and researcher. During the interview, the researcher will be in charge of asking questions and will take care of audio recording after having obtained permission by the respondent. The researcher will keep track of time. Questions are based on the interview blue print, or might come up spontaneously as a result of an answer given by the respondent. The respondent is expected to provide answers to the questions. Questions will be directly translated into Bahasa Indonesia by the translator. The respondent will be asked to answer in Bahasa Indonesia. After each answer, the translator will translate the given answer into English as literally as possible. The researcher might make notes in key words. In case of extensive answers (≥6 sentences) or the expectation of highly valuable information, the researcher might interfere to ask for translation. The interview will start with an easy to answer open question, to get the respondent in the talking flow.

Type of interview

Preference is given to a semi-structured interview. The moderate standardized character of a semi-structured interview will allow the researcher to prepare questions on beforehand and

simultaneously enables the researcher to add questions that pop up during the interview.

Interview methods

Qualitative data collection could provide rich data. The words that someone uses to express himself, the issues that one describes and the issues that someone does not mention could be seen as valuable information. In fact, it could provide insight in a person's norms, values, perceptions and beliefs of the participant. Or at least, that what a respondent chooses to share during the interview. Therefore, it is important to avoid steering questions. The researcher will give preference to open questions. Furthermore, silence will not directly be filled with a new question, to allow the respondent to elaborate without being steered in a certain direction. If answers on the main questions do not cover most relevant sub topics, sub questions may be asked. It is important to make the respondent feel safe to answer the questions. The paraphrasing technique will be used to check for understanding and make the interviewee feel heard.

Interviews will be conducted at the home environment of the interviewees. Thus, the interviewee might be more likely to feel at ease and secure to share ideas. Besides, interviewing at the house of the interviewee might limit distraction from the conversation. At the same time, the researcher could get an idea about the living situation of the respondent.

Interview blueprint farmer/field worker

This interview blueprint is developed to guide the content of the interview. The topic list is based on the thesis proposal. Interviewees could have participated in the vegIMPACT baseline survey.

Topic list

1. Elaborate on baseline survey outcomes
2. Perception of ill-health
3. Help-seeking behaviour
4. Self-efficacy
5. Past experiences with interventions
6. Past experiences with (health) organizations

Introduction

- Thank for time and hospitality.
- Introduction. Link with vegIMPACT. Questions with reference to survey answers.
- Program: x topics, interview will take 30-60 minutes.
- Ask to give answers as elaborative as possible. There are no right or wrong answers.
- Ask for permission to record interview.
- Participation is voluntary. Answers will be handled with confidentiality.
- Check data. Name, age, owns/hires/works on field, cultivates X
- Any questions? Feel free to prose questions any time.

➢ Researcher notes date, time, location, attendees
➢ After each interview, research will discuss with translator and note down impression of participant's mood. Were there any changes? Possible sensitive topics?
➢ If relevant ask for permission to take pictures (spraying/protection materials, washing place, storage place). Ensure confidentiality.

START AUDIO TAPE

Interview participant of baseline survey (small-scale vegetable farmer)

1. Ice breaking questions
    a. How did you start cultivating vegetables?
    b. What if I told you I would like to become a farmer. What would you advise me?
    c. How did you learn how to be a good famer?
    d. Would you recommend you children to follow your steps? Why yes or no?
2. During the survey you said that **pesticides have/have no effect on health**. If yes, via… And the pesticide can enter the body via… **How do you know?**
    a. When did you first talk about this topic?
    b. On what kind of occasion?
    c. I would like to know a bit more about how you perceive the risk of pesticides (appendix 2).
    d. Are there any personal traits or behaviors that could protect someone from getting exposed, and from getting harmed? Could you explain?
3. You indicated that you would like to learn more about safe use of pesticide. **What do you expect to learn?**
4. Pesticides are poisons that can enter the body via different routes. One of the routes is via skin contact. Wearing gloves can help you to prevent your hands from getting exposed to the poison.
    a. Have you ever tried to work with gloves?

    If yes:

    - How long ago was that?
    - Could you describe the gloves (material, finger tops covered)?
    - If disposable, how often did you use them? How did you dispose them? If cotton or other fabric; Was it necessary to wash them? If yes, how (water/soap, separate or together with domestic clothes) and how often?
    - During what type of activities? How did you experience that? Why did you stop using the gloves?
    - Did you talk to others about using the gloves? To who? About what (Negative/positive> explain)?

    If no:

    - Why didn't you?
    - Do you know people who use gloves? Have they shared their experiences with that? Positive/negative?

    b. Would you like to try to work with gloves?
    - During which activities? Why?
    - During which activities wouldn't you want to wear the gloves? Why not?
    - I would like to ask you to make an estimation of how confident you are that you can use gloves while handling pesticides as of now. Fill in the form (appendix 1). Please explain the considerations you had when you were filling in the form (check for remarkable scores and elaborate).
5. Could you tell me about the last time you **experienced physical complaints after spraying pesticides?**
    - *Nota bene: Try to steer as little as possible. We're interested in how the participant describes his condition and the consequences.*
    a. What were the complaints?

   b. Did you talk to someone about your complaints? Who? How did this person respond to your complaints?
   c. Did you seek help? Could you describe the health care provided?
   d. Did your condition affect your daily life? How? Long-term/short-term.
   e. Did you make adjustments in your pesticide handling methods afterwards? What changes? Did you receive support in making those changes?
6. Let me take you into an imaginary situation. It's a warm day in November. Time for spring beans! You've planted your crops and work on your field every day to make sure you'll get good yields. Last week you discovered fusarium on a few of your spring bean plants. This morning you spoke to your neighbor. Same problem! After a discussion, you both decided not to take a risk and increase the frequency of pesticide sprays per week. Today you started to do some weeding. You are just about to grab lunch when you hear your neighbor's voice behind you. His face looks pale and his voice sounds weak. He's coughing heavily and seems to have problems with his breath. His pesticides knapsack is still on his back. When you run towards him, you are just in time to grab his shoulders, when he's about to collapse. You have got to help him! **What would you do?**
7. Let's continue to talk about your health in general. **Could you describe the last time you felt ill?**
   a. Health complaints, effect on daily life (who worked on the field? Loss in income? Medical costs?), health seeking actions, duration of illness, ideas about the cause?
   b. Do you avoid getting ill now? How?
8. Different health and agriculture professionals and organizations could advise you on safe pesticide use. Which type of professionals and organizations do you know?
   a. Trustable?
   b. Experiences?
9. If you could think of very possible solution, what would it take for you to start wearing gloves while handling pesticides?

CLOSURE

- Thank for participation
- Any questions?
- Would you like to add something that might be relevant to the research?

Appendix 1: Self-efficacy measurement

Please rate how certain you are that you can use gloves in each of the situations described below by writing the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

0	10	20	30	40	50	60	70	80	90	100
Cannot				Moderately					Highly certain	
do at all				can do					can do	

	Confidence (0-100)
When I touch the pesticide can/bottle	
When I mix pesticides	
When I spray pesticides	
When I am feeling under pressure from work	
When I feel physical discomfort when wearing gloves	
When the weather is hot	
When my neighbors or friends do not use gloves when handling pesticides	
Without support from my family or friends	

Appendix 2: Risk perception measurement

Please rate how certain you are of the statements given below. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of concern by recording a number from 1 to 4 using the scale given below:

1	2	3	4
Not at	not enough	enough to cause	enough to worry
All	to cause concern	a little concern	a great deal

	Level of concern (1-4)
How do you believe that your health is hurt by pesticides?	
Do you believe that the health of the other farmworkers is hurt by pesticides?	
Do you believe that health of the children of farmworkers is hurt by pesticides? Do you believe that health of unborn children of farmworkers is hurt by pesticides? Do you believe that the ability of farmworkers to have children is hurt by pesticides?	

Annex 2: Logbook

Field visit 1: 30th of September till 2nd of October 2015

The first field visit was organized by a local employee of vegIMPACT. The purpose of the visit was to gain insight in pesticide use in vegetable production by small farmers, the level of adoption of protective behavior by sprayers and identification of stakeholders with significant relevance. Unstructured interviews were held with farmers, farm workers, heads of different departments of the regional government, professionals in public health, professionals in agriculture, the board of a nongovernmental organization (NGO) in humanitarian help.

Field visit 2: 9th till 15th of November 2015

Questions of the interviews were based on the interview guide, which was adjusted during the field trip. Main topics of discussion were: pesticide risk perception, experiences of negative health effect due to pesticide exposure, communication with others about this topic, protective behavior during pesticide handling, perception of health status, the meaning of health, communication with health professionals, health seeking behavior and perception of governmental support in preventive measurements. The order of the questions depended on the flow of the conversation. During the first interviews the scales appeared to be too difficult and not useful to find the desired information. Therefore, the self-efficacy scale and risk perception scale were eliminated from the interview guide. Besides, questions were shortened as they seemed to need a less extended introduction (imaginary situation with pesticide poisoning).

Field visit 3: 4th till 6th of December 2015

During the third field visit, several different stakeholders were interviewed: a traditional massager, kiosk owner, general practitioner, farmers and farmer's wives.

Topics of discussion for traditional massager:

- Description of work as traditional massager
- Most frequent health complaints of farmers
- Knowledge and awareness of health risk of pesticides
- Experiences with pesticide poisoning
- What would you advise a farmer to stay healthy?

Topics of discussion for female respondents: experiences of the vegIMPACT training for women (most difficult, best part, a less good part, missed something), whether they had heard something they wanted to use in their daily lives, communication with others about the training (with whom, about what)

Added to topic list for male farmers:

- Rate health status (explain why, what does health mean to you)
- How do you apply pesticides? Describe like a recipe (what do you need, how long does it take, what steps do you take)

Based on remarks of respondents during the previous interviews (1st field visit and 2nd field visit) a list of statements had been developed.

Statements:

1. Applying pesticides is a typical male task.
2. I drink milk, so I cannot be harmed by pesticides.
3. Being physically active, protects me from getting harmed by pesticides.
4. If all of my friends were wearing gloves while spraying, I would also want to wear gloves.
5. It is too difficult for me to wear gloves during spraying medicine.

6. I am spraying the way I do already for many years, so I don't see the point in changing my habits.

Field visit 4: 14th till 16th of December 2016

Between December 14th and 16th a training for male farmers had been observed. Two participants of the training had been interviewed the morning after the training.

Topic list for vegIMPACT training participants:

- Experiences with the training (positive, suggestions for improvement, setting)
- Motivation for participation
- Intention to change

Field visit 5: 18th till 21th of January 2016

This field visit includes two training observations, two spraying observations, an interview with a general practitioner and with a health agent. Furthermore, six farmers were interviewed about their experiences with the vegIMPACT training, farmers who were invited but did not show were asked for their motivation and a short conversation with a wife of a farmer had taken place.

Topics list for the general practitioner:

- Most frequent health complaints of farmers
- Knowledge and awareness of health risk of pesticides
- Experiences with pesticide poisoning
- Why do farmers not protect themselves?

Topic list for health agent:

- Tasks and responsibilities of a health agent
- Biggest health problems of farmers in Sukamanah
- Knowledge and awareness of health risk of pesticides
- Why do farmers not protect themselves?

Added to topic list for vegIMPACT training participants:

- Knowledge
    - 3 routes of exposure
    - First aid in case of pass out
    - Persons (in)directly exposed in the household
    - Formula absolute risk
    - Symptoms of poisoning due to long term exposure to pesticides
    - Methods to prevent harm of pesticides
- Statements:
    - A strong man is the one who might experience dizziness or nausea after spraying, but doesn't complain about it.
    - People would laugh at me when I wear gloves, a mask and a face shield in the field.
    - I don't care about health. I just want to have good yields.

Field visit 6: 11th till 17th of February

The topic list for vegIMPACT training participants was in general similar to the one of field visit 5. Three elements were added: experiences of using the PPE provided by vegIMPACT during the training, intention to wear PPE and communication about the training. Formula of absolute risk of pesticides was taken out of the knowledge test, since nearly no one could answer this correct, which seemed to make the interviewees uncomfortable. A health literacy measurement tool was used to score people's health literacy. The persons were asked to read eleven words (presented on a paper) out loud. The words: hormon, herpes, rektal, alkoholisme, inflamasi, hepatitis, antibiotika, diagnosis,

osteoporosis, impetigo, menopause. Each word that had been pronounced correctly and within five seconds added one point to the totale scole. The pronunciation was checked by the translator. The total score was calculated and compared to the standard for health literacy.

Two statements were added:

- I don't need to tell anybody about dizziness or nausea after spraying. I can just handle it by myself.
- After using pesticides for 10 years or longer you get resistant to it, so it cannot harm your health anymore.
- When wearing gloves while spraying, there's no need to wash my hands before eating.

Besides interviews with participants of the vegIMPACT training, control group interviews took place in Jaja Mekar.

Topic list of control group:

- Introduction (age, cultivation, field owner/ manager/ worker)
- Problem in the field
- PPE
- What do your 3 closest neighbors in the field wear when spraying?
- Statements
- Health grade
- Meaning of health

Annex 3: Pesticide spraying observation checklist

Name applicator:	**Field owner:**	Date/time/place:
Product used: - **Brand name** - **Type** - **Amount**		
Field description - **Size** - What is cultivated - When was it planted, when expected harvest? - Describe surroundings - **Problem plants?**		
Spraying purposes - **Why spray?** - **Who decides?** - **Spraying frequency**		
Describe what applicator wears ○ Shirt ○ Trousers ○ Shoes ○ Gloves ○ Mask ○ Googles ○ Hat ○ Appron/overall ○ Others Checks condition of PPE before wearing	Describe	type, condition (clean/holes) and how it's worn

Gets pesticides from storage		
Describe storage place - Where? - Locked? - Leaks? - What else is stored there? - Accessible for children?		
Actions	Performed	Comment
Puts on chemical resistant gloves	Yes/no	Material (picture)
Unlocks storage building/cabinet	Yes/no	
Checks storage area for spills or leaking containers	Yes/no	
Locks storage area when leaving	Yes/no	
Other		

Mixes and loads pesticides		
Wears PPE properly	Yes/no	
Opens container on flat surface	Yes/no	
Measures amount with a tool	Yes/ no	Describe tool
Pours product into tank without splashes or spills	Yes/no	
Triple rinses measuring devices	Yes/no	
Triple rinses product containers - Fills container ¼ full, closes lid, shakes, pours rinsate into spray tank -3x	Yes/no	
Measures appropriate amount of water	Yes/no	How
Leaves an air gap to prevent back siphoning	Yes/no	
Returns left over product and measuring containers to storage area. Locks storage area	Yes/no	

Applies pesticide safely		
Wind direction (draw field, field house, persons)		
Others present? - Who - Activities - Place - Clothing/PPE		
Actions	Performed	Comment
Wears PPE properly	Yes/no	
Checks that no one is in the spray area	Yes/no	
Checks the equipment before starting	Yes/no	
Checks wind speed and direction and writes it down	Yes/no	
Arranges settings in knapsack (if applicable)	Yes/no	
Dilutes left over pesticide 10-1 and re-sprays the area	Yes/no	
Others:		

Clean up after spraying		
Wears PPE properly	Yes/no	
Carries tank to washing area - Describe how transported (leaks?) - Distance to washing area		
Washes tank - Water (from?)(where does the water go?) - Soap?	Yes/no	
Reports anything that needs fixing to boss	Yes/no	

Removes and cleans PPE		
Washes gloves while wearing them in water with soap	Yes/no	
Keeps gloves on while removing other safety equipment	Yes/no	
Washes all equipment in water with soap in clear water and hangs them to dry	Yes/no	
What is done with disposable equipment? - When - Where - How		
Washes outside of gloves again with water and soap	Yes/no	
Takes gloves off and washes inside. Fills with water to check for leaks, hangs them up to dry. If leaks, disposes them	Yes/no	
Others: - When wash hands? - With what? - How long? - Properly?		

Personal hygiene criteria		
Takes off work clothes - Where?		
Takes a bath - Soap - How long - Smell - Check fingernails		
Put on clean work clothes	Yes/no	where

Taking breaks		
Washes hands at beginning of break	Yes/no	With soap?
Keeps food and drinks away from pesticides	Yes/no	

Smoking		
During spraying	Yes/no	
During break - Hands washed?	Yes/no	

First aid		
First aid kit available?	Yes/no	Where? What's inside?
Water sources available?	Yes/no	Distance, source of water
Pesticide spill on clothing - Removes clothing, rinses with water, calls for help	Yes/no/n.a.	
Pesticide spill in eyes - Washes with water, calls for help	Yes/no/n.a	
Pesticide spill on skin - Washes with water, calls for help	Yes/no/n.a.	
Trouble breathing - Get fresh air, calls for help	Yes/no/n.a.	
Pesticide is swallowed - Calls for help	Yes/no/n.a.	

Physical examination		
Working clothes for pesticide application - Spills - New holes		
Any physical complaints?	Yes/no	
Hands & wrists - Redness - Irritation		
Others		

***bold questions** are asked to applicator