Situation Analysis

Farmers' Awareness and Perceptions Of the Effect of Pesticides On Their Health

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Executive Summary

This paper reports the results of a pilot qualitative study conducted by IPM farmer trainers and IPM farmer graduates. It was conducted in 3 vegetable growing areas: Kandal and Siem Riep provinces and areas around Phnom Penh. 210 vegetable farmers were purposively selected for interviews based on being a vegetable farmer as well as using pesticides routinely to control pests and plant diseases. The aim of the pilot was to assess how farmers feel pesticides affect their own and their family's health, determine what kinds of products they commonly use, how they handle pesticides, and what signs and symptoms of poisoning they may have experienced during or shortly after spraying. The results are to be used to design appropriate health awareness interventions among farmers.

Although the results are largely anecdotal, there were a number of likely valid findings that are cause for concern about the state of pesticide use in Cambodia. Highly hazardous products that are banned elsewhere in Asia are in use. As classified by World Health Organization; 43% were using Ia products (extremely hazardous), another 9% Ib (highly hazardous), and in total, 84% used products from moderate to extremely hazardous to human health (Ia, Ib, II). Farmers had no idea what they were using as all the labeling is in a foreign language (Thai or Vietnamese). Furthermore all information on the use of pesticides came from untrained sources; neighbors or pesticide sellers. Farmers were exposed to multiple doses on multiple occasions. Crops were sprayed up to 20 times per season with up to 5 different pesticides mixed together per tank per spray operation. Few used protective equipment resulting in likely heavy skin contamination to the hands (during mixing of the chemical concentrate) and legs and feet during spraying. There was evidence that significant poisoning is occurring as 35% reported a sign reflecting moderate poisoning during or after spraying (vomiting) and another 1 and 5% reported a serious episode (seizure and loss of consciousness, respectively).

In view of the already compromised health status of Cambodian adults who suffer from high rates of resistant malaria and tuberculosis, potential pesticide poisonings will not doubt be adding a greater burden to their health and productivity. Urgent measures therefore must be taken to keep these hazardous products out of Cambodia, properly label pesticides, better inform farmers on the hazards of pesticide use, and push pesticide policy makers to enact effective bans and restrictions on products that are harmful to human health.

Introduction

Cambodia's economy is largely based on agriculture. Approximately 90% of the population live in rural areas[1] and grow rice as their staple crop. Vegetable production is of secondary importance and is mainly in lowland areas especially around the Mekong river (the provinces of Kandal, Kompong Cham and Kompong Chhnang) and the districts around Phnom Penh. Kampot and to a lesser extent Siem Reap, are also reported to be large vegetable growing areas. The most common vegetable crops grown in these regions are petsai, lettuce, Chinese kale, cauliflower, cabbage, tomato and bean.

Earlier evidence by way of experience in farmer field schools revealed that in Cambodia the use of pesticides had filtered down to the smallest of villages. The IPM project found that vegetable growers were particular heavy users of pesticides and had become dependent on highly toxic pesticides to manage pests and diseases. We heard that farmers often mixed and sprayed a cocktail of dangerous insecticides repetitively to one vegetable crop. The availability of pesticides, lack of information and knowledge of hazards as well as poverty, illiteracy and lack of health facilities seemed to ensure that pesticides could be a major cause of poisoning and ill health in rural communities.

The purpose of this study was to start quantifying these impressions and collect information about what farmers think the use of pesticides means to the health of their crop, their family and themselves. Therefore, a survey on farmers' perceptions of the health effects from pesticide use was designed to provide an entry point for discussion with farmers, as well as to give an insight into what farmers think about pesticides. The baseline information collected from this study will be used to design appropriate community health awareness interventions that will improve farmers' knowledge and use of pesticides for their health and environment. The specific objectives of the survey was:

1. To find out farmers' perceptions and use of pesticides and how they may affect their health
2. To identify key issues that are relevant to farmers' health and use of pesticides in Cambodia for further training to increase farmers' awareness and use of pesticides
3. To explore participatory interview techniques with farmer groups

Methodology and sample

The survey was conducted in three study areas: the provinces of Kandal and Siem Reap and areas around Phnom Penh where heavy use of pesticides had been reported. IPM trainers and farmers from the Vegetable Farmers Field Schools were selected to be the interviewers. Some farmers in the villages were also trained to interview other farmers in the field. A questionnaire with closed and open-ended questions was designed to collect data about farmers' socio-economic background, family health status, perceptions and use of pesticides and perceived signs and symptoms of pesticide poisoning experienced in the past. The questionnaire forms were later analysed in Phnom Penh office.

The criteria used to select the sample population in the study areas were i) vegetable farmers who ii) routinely applied pesticides to their crops. They were purposively selected using a

[1] Reference: Cambodia Population Census report, UNDP 1998

snowballing[2] technique in the field. A total of 210 vegetable growers were interviewed, which included 30% women. The sample size for each study area was as follows:

- Kandal province: 128 farmers were interviewed from: Popeal Khe village (67), Baren Leu (5), Baren Krom (7), Svay Chour (8), Prey Khmer (10), Boh Ang Kagn (5), Kok Prack (8) Kok Posh (10) and Chroy Dang (8).
- Areas around Phnom Penh City: farmers in the villages of Tnot Chrom and Chham Roeun Phal village and the Boeung Thom Ponn commune).
- Siem Reap province: 18 farmers in Siem Reap province and the Pork district.

Key findings

I Socio-economic background

While all the respondents' main occupation was growing vegetables, most had other secondary income generating activities. These included driving taxis, casual day labor, growing rice and in Siem Reap; basket weaving. The majority of respondents (78%) were married while the remaining 22% were single or widows. In all the study locations, the majority of farmers owned their land. Another 15% of the farmers rented land from their neighbours. The age breakdowns of the respondents were as follows:

Age Categories	#	%
15-19	12	6%
20-24	27	13%
25-29	31	15%
30-34	25	12%
35-39	44	21%
40-44	23	11%
45-50	37	18%
<50	11	5%
TOTAL	210	100%

The average land area for vegetable production was 0.25 ha per family in Kandal, 0.23 ha around Phnom Penh and 0.21 ha in Siem Reap districts. The most commonly grown crops were:

- Kandal: Chinese kale, lettuce, tomato, cabbage, bitter gourd, bean, cauliflower, petsai, cucumber and sponge gourd.
- Phnom Penh area: Chinese kale, cauliflower, cucumber, water convolvulus, basil, wax gourd and mustard.
- Siem Riep: yard-long bean, petsai, Chinese kale, cucumber, bitter gourd, cabbage, cauliflower, tomato, and water melon.

All vegetables were for commercial produce and sold to Phnom Penh or other market towns.

The majority (82%) of respondents had received some primary education and had basic literacy skills. 9% of farmers had also attended high school. 9% of respondents had never attended school and could not read or write.

[2] ('Snowballing' is a sampling method that is used when little or no data is available about a particular population to be studied. It is an easy and quick method whereby one respondent identifies another respondent of the same criteria and so on)

II Farmers' Perceptions of Pesticides

The majority (93%) of farmers interviewed said that they believed the use of pesticides helps them control pests and makes their crop look "beautiful", healthy and marketable, and therefore could be sold for a good price. Thus, pesticides are regarded as very important for successful vegetable production. These farmers said that they could not grow vegetables without pesticides.

Interestingly, 7% of respondents thought that spraying pesticides did not always result in good produce, but sometimes caused them more harm than good. However, they said they have *"no choice"* and therefore the cost of taking the risk was lower than not to use any pesticide at all.

Most farmers believed that the more products used at one time – in quantity, frequency and types of insecticide - the greater the benefit. *"The vegetable crop would become more healthy"*. Only 6% of farmers thought that if they used an incorrect pesticide or mixed several chemicals together for a specific crop, it would do more damage to the plant than good. But otherwise, not much consideration or importance was given to using the correct dose or mixing several different brands together.

The perceived effectiveness of pesticides to control pests varied. 20% of farmers stated that pesticides kill insects immediately, but the majority thought they could not kill all larvae. This was mentioned especially in regard to the diamond back moth and army worm because these species had become resistant to the pesticides commonly used. A further 5% of respondents observed that if a lot of different kinds of pesticides are applied, the pest (larvae) population would increase.

III Farmers' Use of Pesticides

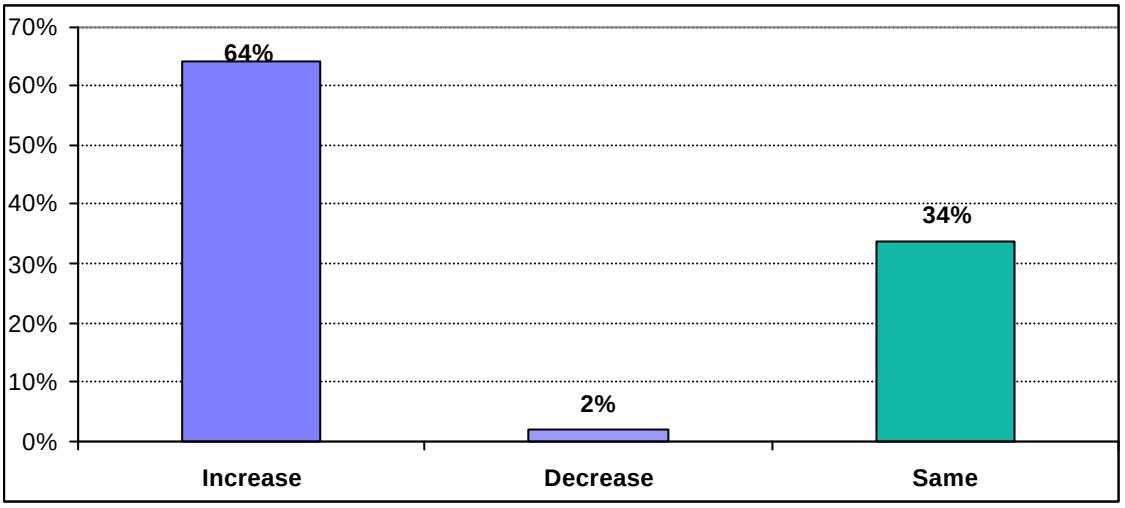
Patterns of pesticide use over time

The reasons for continuing to use pesticides on vegetable crops every year varied by respondents depending on the number of years the farmer had been growing vegetables. The age range of the respondents was large; between 16-65 years, and the number of years experience growing vegetables equivalently large; 6 months-7 years. But the majority (75%) had at least 5 years experience growing vegetables and consistent pesticide use.

Only 2% of the farmers said they reduced the level of pesticide use this year. Reasons were due to feeling weak, which was reported more among older farmers with more years of experience using pesticides. Although many women said they spray during pregnancy, the other reason for reduced use over the last year was pregnancy among a few women respondents.

34% of farmers' claimed their pesticide use had stayed the same from year to year. But the majority (64%) said they had increased the amount and kinds of pesticides every season. This was due to a perceived increasing prevalence of insects. These farmers believed *"pesticides available these days are not as strong as in the past*". Figure 1 shows the usage patterns of pesticide application for farmers since they first began to use pesticides for vegetable production.

Figure 1: Farmers' usage patterns for pesticide application since they first began to use pesticides.



Types of pesticides used

During the survey, the interviewer identified the names of the pesticides by observing the product farmers either used or had stored in their homes. Generally, farmers did not know the name of the product they used and referred to the chemical by the colour of bottle, its strength or specific controlling purpose.

The study found numerous highly neurotoxic agents (organophosphate, organochloride and carbamate[3] insecticides) in use by the respondent farmers. They included Folidol (*parathion methyl*), *mevinphos*, Monitor (*methamidophos*), Azodrin (m*onocrotophos*) and Furadan (*carbofuran*). Some growers used DDT, a long acting and persistent organochlorine.

Parathion methyl and *mevinphos* are classified by the World Health Organization's International Programme on Chemical Safety[4] as Ia products (extremely hazardous to human health) while *methamidophos*, *monocrotophos* and *carbofuran* are class Ib; highly hazardous. Most of these products have been banned in the rest of Southeast Asia. It therefore appears that Cambodia is serving as a dumping ground for products that cannot be sold in countries neighboring Cambodia.

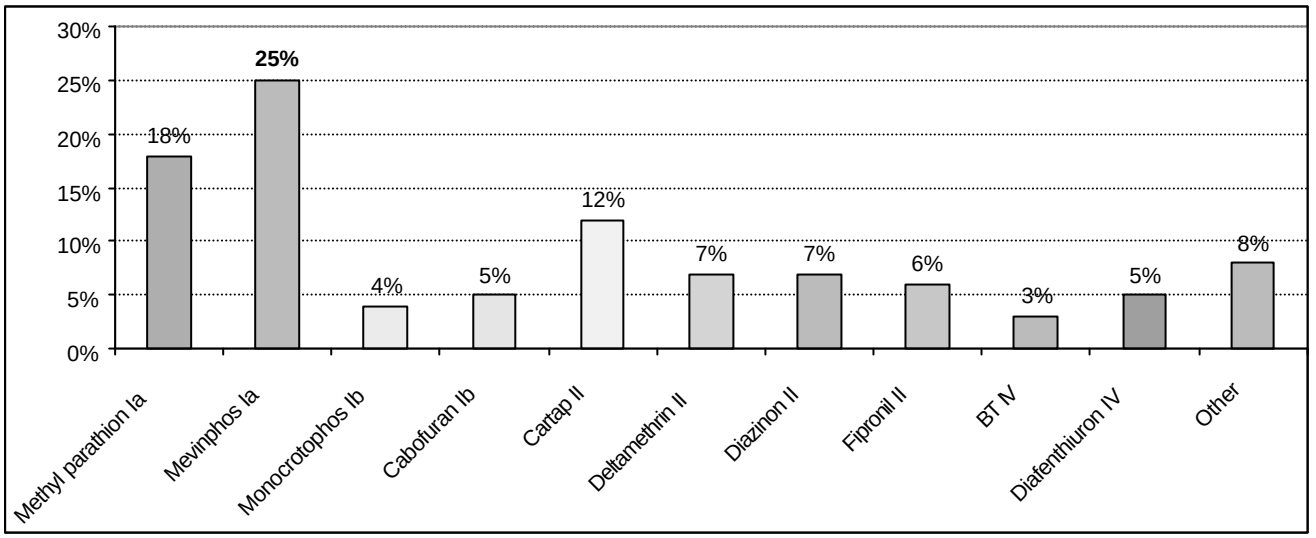
Looking at the most common types of pesticides used in the study areas shown below in Figure 2, it is alarming to note that 43% of the respondents were using a class Ia product, 52% either a class Ia or Ib, and 84% using products that are moderate (class II), high or

[3] These pesticides have been prohibited in certain countries due to their low LD_{50} levels (lethal dose to kill 50% of an experimental animal population). Organophosphate poisoning may affect the central nervous system (brain) and peripheral nervous system (nerves found outside of the brain and spinal cord). This particularly affects the muscles, glands and smooth muscles that make the body organs function. Poisoning by organochloride compounds can affect the central nervous system. These kinds of pesticide (endosulfan specifically) are rapidly and easily absorbed through the skin and stay in the body a long time (DDT due to absorption by fat cells). Carbamates, behaves the same way as the organophosphates and causes over stimulation of nerves. The effect comes on sooner after exposure (as fast as 15 minutes) and does not last as long 3 hours. (Ref. Guidelines for Farmer to Farmer IPM health studies, FAO/IPM Jakarta, 1998).

[4] International Programme of Chemical Safety. ***The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 1998-1999.*** WHO/PCS/98.21.

extremely hazardous to human health. Only a few farmers (8%) were using chemicals that are unlikely to present acute hazards in normal use (IV).

Figure 2: Percentage of pesticides most commonly used by farmers growing vegetables



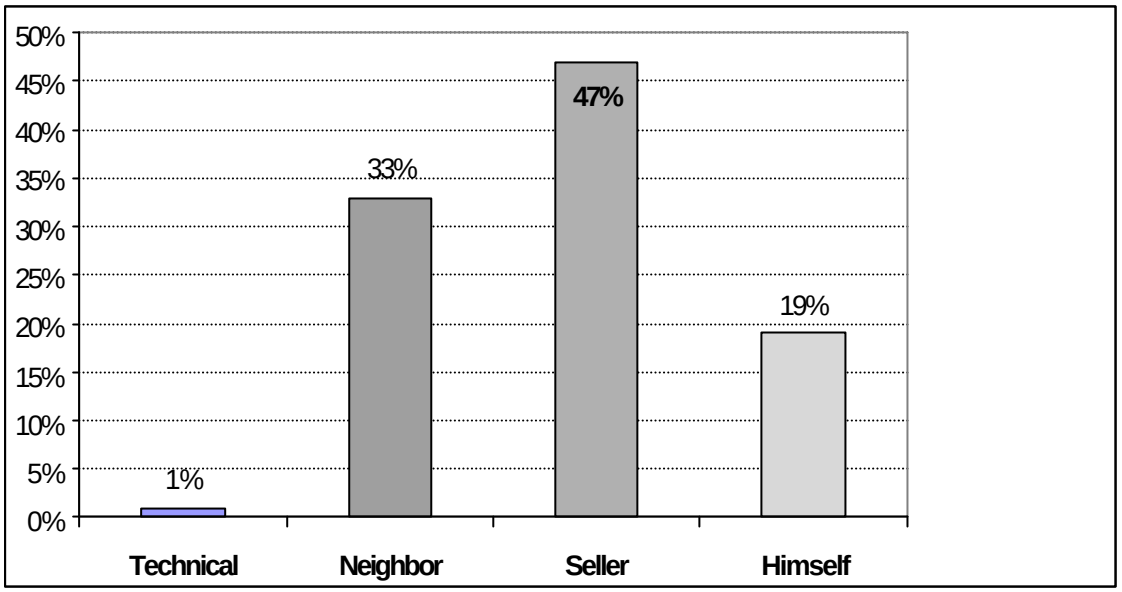
Pesticide application

The survey found that farmers often apply insecticides in high doses, very frequently. It was quite common for farmers to use pesticides over twenty times on one crop in one season. The solution used was also a mix of numerous insecticides, fungicides and bio-insecticides. Up to 5 (and sometimes more) different kinds of pesticides were used on most of the vegetable crops; specifically on cabbage, Chinese kale, petsai, yard-long bean and cauliflower. This practice is due in part to simple self-determined "medication" (e.g. the more the better) complicated by the fact that farmers do not understand the instruction labels that are written in Vietnamese, Thai, English or French. Others said they were following the directions given to them by the pesticide seller. This was regarded acceptable because pesticide sellers, who are the providers, are perceived to have wide knowledge of crops and pesticides *"similar to a doctor"*. The surveyors also observed that pesticides were sometimes bought pre-mixed by the seller and sold in smaller quantities.

Sources of knowledge

The access and availability of information about pesticide use was very limited or non-existent. 47% of farmers said they obtained information from pesticide sellers in the market and 33% from neighbors or relatives. Only 1% had been given any information from a technical field officer. 19% said they had never received any information. Most farmers had never received any *expert technical* advice about how to use pesticides on their crops.

Figure 3: The sources of information about pesticide usage



Storage and disposal

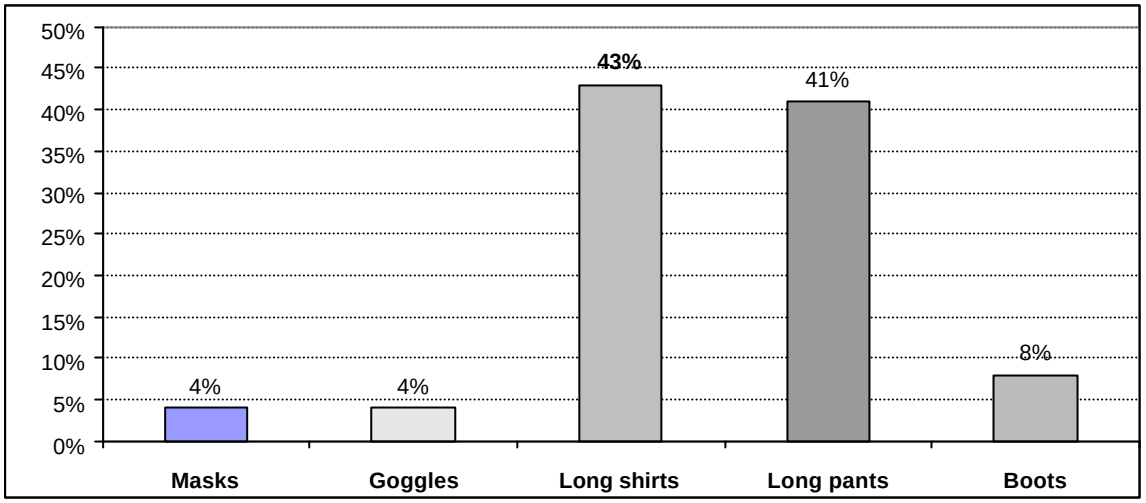
Reported practices in regard to pesticide container storage and disposal were unsafe. Most insecticides were stored in the house, sometimes in the living space near cooking areas and often within reach of young children. The respondents disposed their used bottles of pesticides with little caution. Quite frequently finished bottles were said to be just left in the field, canal or pond and even on the ground close to the house.

Only a little more than a quarter of respondents (27%) considered the handling and storage of pesticides to be important. This group felt that if the bottle was handled irresponsibly and came into contact with the sprayers' skin, this could be dangerous.

Protective versus risk behaviour

The majority of respondents (82%) said they wore protective clothing while spraying which was limited to a long sleeved shirt and long pants. Figure 4 shows the different types of protective equipment farmers reported they usually used while spraying. However, not all respondents said they would use these materials *every time* they sprayed. Only 7% of the farmers said they changed their clothes after spraying and 32% did not consider it necessary to change their clothes at all. Approximately one half of respondents said they did not wash their hands after spraying. Furthermore, it was not unusual for men to smoke cigarettes simultaneously while handling pesticides and the spray equipment. Very few farmers used masks or goggles and no one said they used gloves. They were also unaware why one might want to use these materials during spray operations.

Figure 4: Percentage of farmers who reported using protective equipment during spraying.



IV Family Health and Pesticides

Most of the farmers interviewed said that their spouses, children and other family members contributed to vegetable growing. Activities include planting, weeding, applying fertilizer, spraying pesticides and harvesting of crops. A total of 48% of farmers said they allowed their children to apply the pesticides. More than half of the respondents (56%) said they were not concerned about their partner's health when they used pesticides. A further 20% of the farmers thought pesticides were not a risk to the health of their child or themselves. Despite some knowledge of the dangers of pesticide use, many farmers still allowed their sons and daughters to continue spraying. While they reported that children often suffered from excess tiredness, dizziness, headache and pale skin after spraying, the pesticide - illness link was not made.

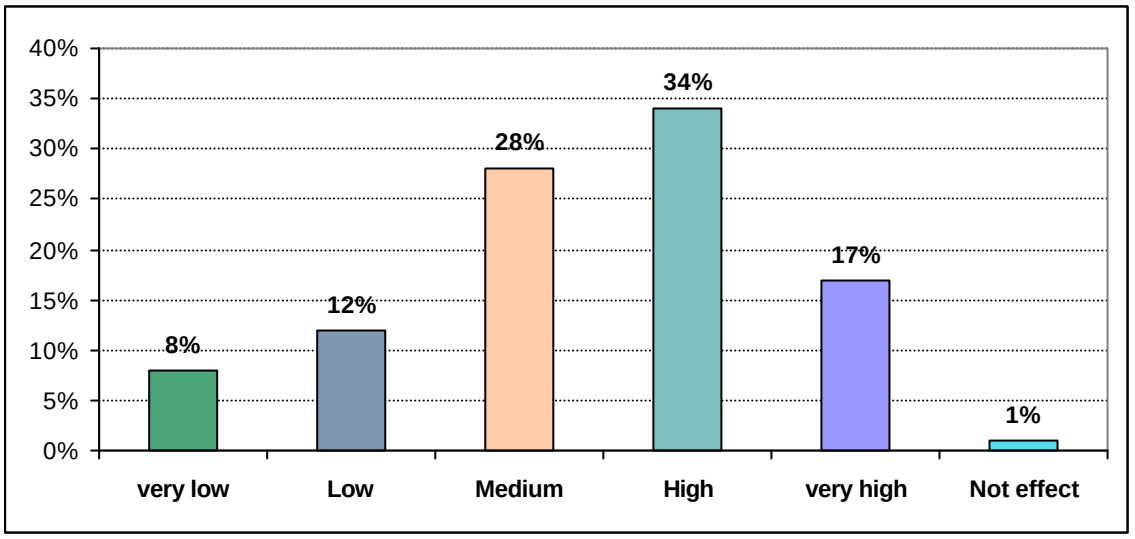
Many women farmers had the impression that if they sprayed during pregnancy, post delivery the baby was less healthy and suffered more illness episodes than in their non-spraying counterparts. Mothers defined it as a generalized *"weakness of their children"* associated to frequent spraying. However, 76% of male farmers believed that pesticides could not affect the health of mothers and newborns. Of all the respondents, 24% had witnessed some sort of illness event in their child that they thought was associated to pesticide exposure.

One farmer in Siem Reap whose daughter sprayed pesticides quite frequently, and now has a lung disease said, *"We (all the families) think that the cause of this illness was partly because of using pesticides"*.

V Effect of Pesticides on the Farmers' Personal Health

Almost all the farmers interviewed (99%) believed that pesticides could have some affect on their health. The more experienced farmers thought that pesticides had a stronger affect on health resulting in many or severe health problems, compared to those farmers who had been using pesticides for a shorter time. Figure 5 shows how low or high farmers rated the effect of pesticides on their health. 34% and 17% said the effects were high and very high, compared to 8% and 12% believing it was very low or low (respectively). 28% of farmers thought the effects were medium and that pesticides sometimes did and sometimes did not affect health. Only 1% said that pesticides had no influence on their health.

Figure 5: Ratings of farmers' attitudes towards the affect of pesticides on their health from no effect at all to a very high effect

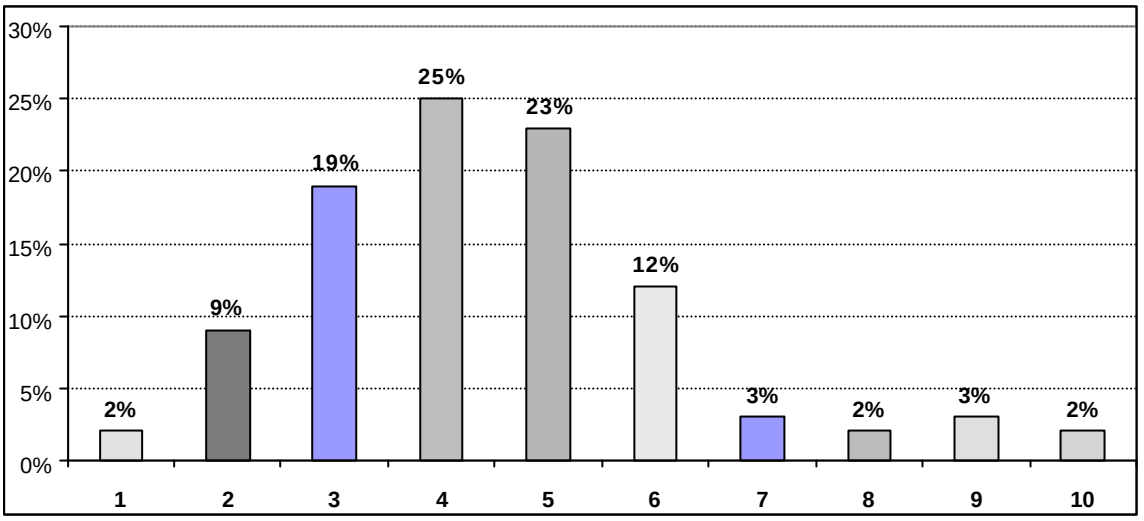


The perception that long term used of pesticides can contribute to ill health was relatively common. Nearly half (45%) of the respondents thought that if they used pesticides for a long time it might cause their body to become weaker, reduce their life span, or even lead to sudden death. It was also thought that the poisoning from spraying could happen more quickly to an older person compared to a younger farmer. Some farmers, predominantly the ones who had recently begun to grow vegetables, did not perceive pesticides as a health hazard because they had never suffered (knowingly) from poisoning. They said that although they did suffer from tiredness, dizziness and headaches after spraying they always recovered after they bathed themselves. Therefore these symptoms were not considered within the definition of poisoning because they were transient.

Signs and symptoms

Most farmers (88%) reported to have had some experience of poisoning from pesticides. 12% of farmers did not believe that dizziness, headaches and occasional vomiting after spraying were symptoms of poisoning. But the majority reported the following symptoms during or shortly after applying pesticides to include headaches, dizziness, fatigue, excessive sweating (especially of legs, hands and back), excessive salivation, nervousness, shortness of breath, cold legs, hands and back at night while sleeping, a dry throat, chest pains, coughing, stomach cramps, diarrhea, runny nose, red eyes, vomiting and unconsciousness. Sometimes the long-time users of pesticides complained of body tremors and numbness. Furthermore, 25% of farmers reported up to four symptoms at one time and 45% between 5-10.

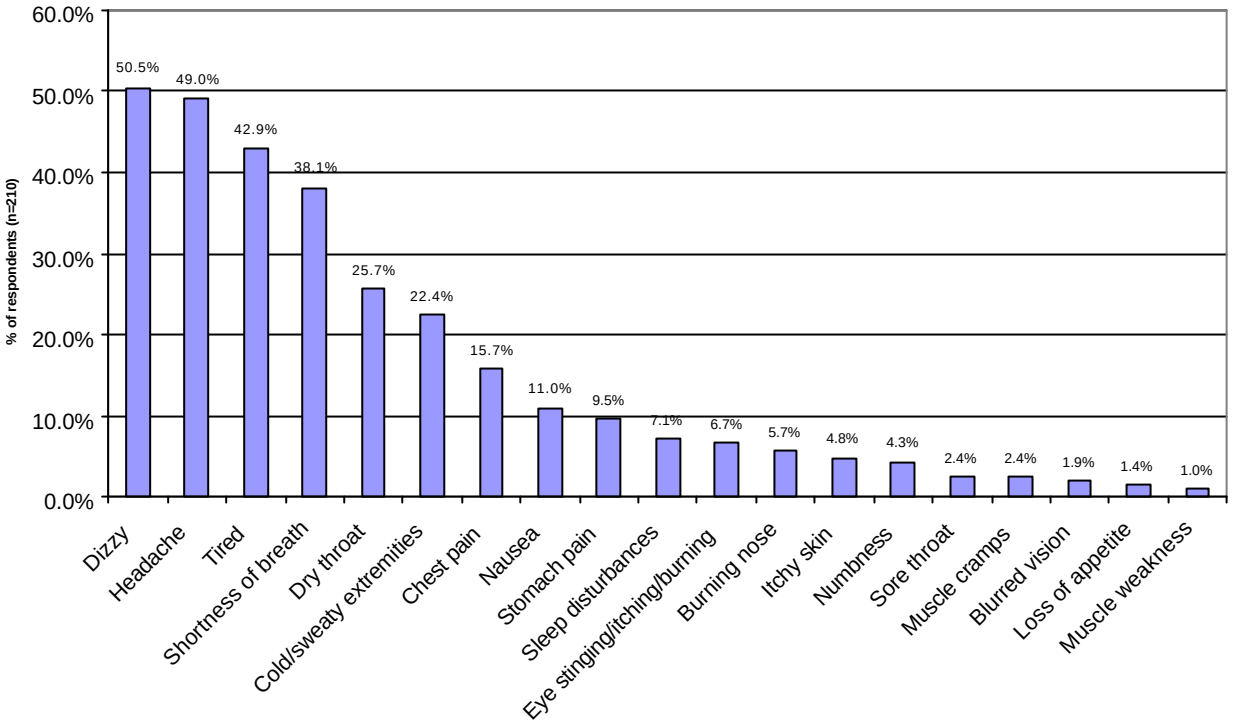
Figure 6: Number of signs and symptoms experienced after spray operation



The specific symptoms 'ever-experienced' are graphically displayed in Figure 7. The first three although non-specific and potentially associated to other conditions or hard work in the sun (dizziness, headache and fatigue), are all symptoms of the central nervous system effects of mild pesticide poisoning common to the organophosphates, organochlorines, carbamates and high doses of pyrethroids. Of interest is the consistently reported syndrome of localized extremity diaphoresis (excessive sweating) at night after spraying. These farmers do in fact have very wet lower limbs when compared by touch to their upper skin areas. [5] This appears consistent with areas of the skin that have had direct pesticide exposure.

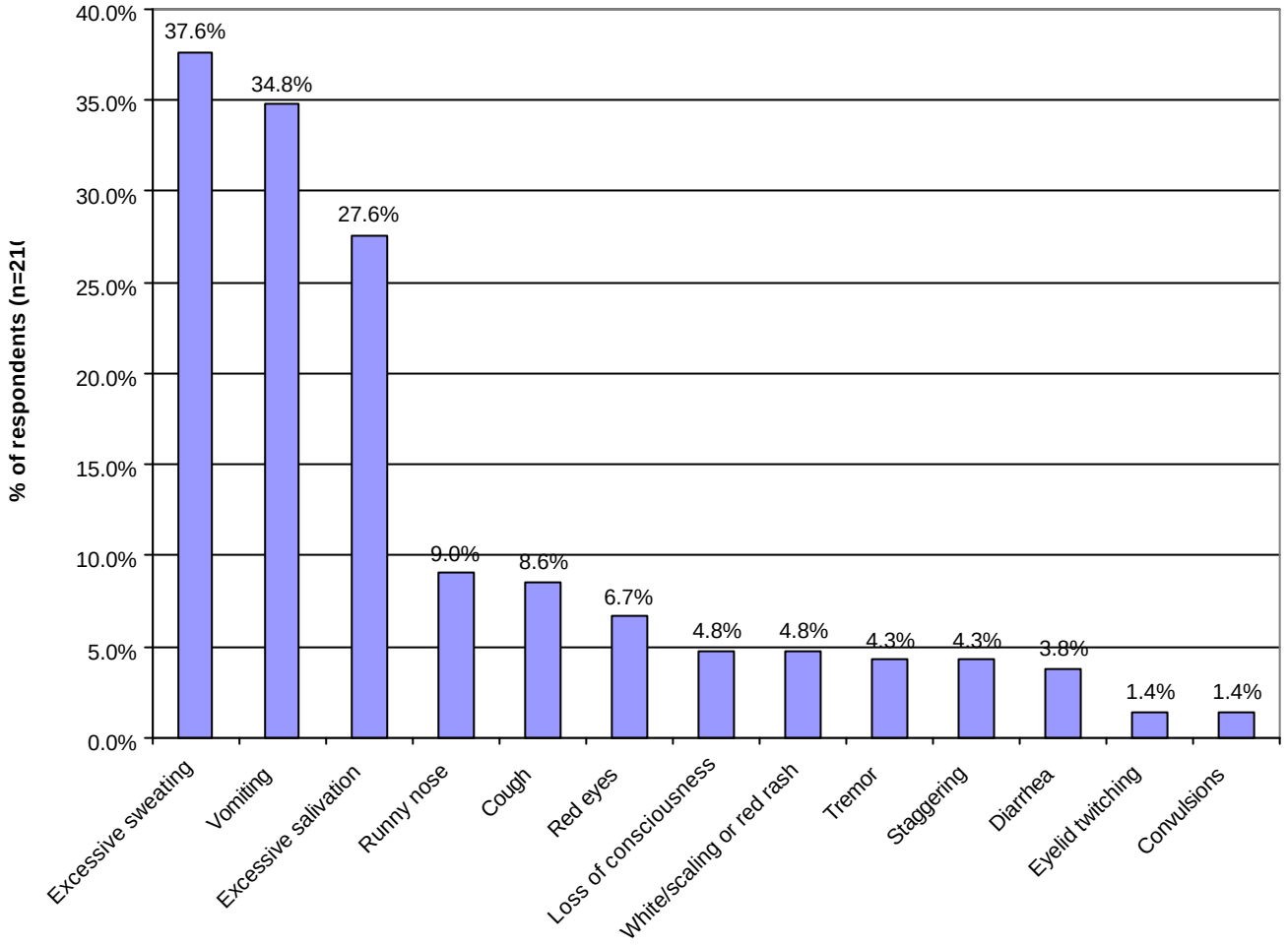
[5] The FAO Regional Health Advisor Helen Murphy, a medical epidemiologist, reported the above findings after examined two such farmers.

Figure 7: Symptoms Ever Experienced after spraying



In terms of signs presented in Figure 8, which are more verifiable, it is a concern the 79 farmers (35%) who reported an episode of vomiting after spraying. This represents more moderate pesticide poisoning. But of greater alarm are the 10 farmers (5%) who give a history of serious poisoning through a story of passing out while another 3 told the interviewers they had a seizure. Although a medical professional witnessed none of these, they are indirect indications that serious poisoning may be occurring. This is not surprising given the highly toxic nature of the pesticides in use.

Figure 8: Signs Ever Experienced after spraying



Perceived Routes of Exposure

Approximately half of the respondents (49%) believed that the untoward effects of pesticides occur by the spray entering their body through the skin. 28% said that it entered the body both through the skin and inhaling the spray at the same time. Another 23% did not understand the routes of exposure. The farmers reported ill effects up to 4 hours after exposure. They felt the severity of the poisoning depended on the kind of pesticide, the volume or strength and the protective measures farmers had taken while spraying.

Treatment seeking behaviour

When suffering from mild symptoms of nausea, headaches and dizziness the respondents mentioned many remedies that they prescribed themselves or were recommended by a friend or relative. These varied from consuming sugar cane, candy, lemon juice, honey, tamarind, medicinal (herbal) tea and "coining" which is applied to "release the intoxication/illness". For more complicated symptoms such as vomiting, excessive sweating, tiredness, headache, dizziness, nervousness, and unconsciousness, 48% of farmers said they had called for a private doctor to cure them at home, and in more serious cases of poisoning they went to the provincial hospital. Some farmers reported to have been to the hospital three times when they became "very pale in color" or developed a lung problem. Most doctors did not give

any advice on how to prevent these symptoms, but some suggested to wear protective cloths such as mask and gloves, and to be *"more careful when using pesticides"*.

The fact that so many home remedies were reported and that close to 50% of the respondents sought medical treatment after spraying is further evidence that a significant amount of pesticide poisoning is occurring.

Case Study: A farmer's experience of pesticide poisoning

Mrs Srey Ya is 36 years old and grows vegetables with her husband in Samrong Thom commune, Kien Svay district

"*My husband and I have been growing vegetables for 5 years. We only have 0.1 hectare of land and produce cucumber and yard long beans. Growing vegetables is our main source of income and it is important that our produce is good and healthy so we can sell it at the market. I have always used pesticides on the vegetables and spray the same chemical every planting season. During one season I spray between 20 – 25 times, which is 4 tanks of pesticide in one go. I mix three different types of insecticide* [Methyl Parathion, Mevinphos and cartap-hydrochloride], *which I buy, from the market. This makes the pesticide more effective and last longer. I like to use pesticide because it helps the crop grow better and look more attractive. I know it has a strong affect on the crop as I notice it kills all the pests in the field.*

I was told how to mix and use the pesticide from the market seller and my neighbours who also use pesticides. I can read but cannot understand the labels on the bottles and packages of pesticides. When I have finished a bottle of pesticide I do not keep it [discards in the field] *and I store half-used bottles in a basket under my house. When I spray I usually wear a long sleeve shirt, long trousers and a kramar* [khmer style scarf], which *covers my head. After I spray I always change my clothes that are very wet, and then wash my hands.*

Ever since I began to use insecticide on my vegetables I have noticed that my health has deteriorated. My body is not as strong as it used to be. When I was pregnant I know I suffered from some poisoning, as I suddenly collapsed in the field and then vomited. I could not stand up for 4 days. When I gave birth to my daughter she looked very small. I think she is not strong too. She always gets ill and looks a lot paler than other children in my village, whose mothers have never sprayed pesticides.

Another time I was seriously ill with a headache, dizziness, and shortness breath and vomiting during a whole night. It was difficult to sleep because my legs, hands and back were so cold. Eventually I had to call for a doctor who told me I looked very pale. He advised me to reduce the amount of spraying I do or wear more protective clothing. My husband worries about my health and tells me to stop spraying, but we are poor and need to use pesticides to earn more money".

Discussion and Recommendations

This study was descriptive in nature and conducted without comparative non-spraying farmer controls. But nonetheless, there are many valid findings that reveal a potentially serious situation on the state of pesticide use in Cambodia. The following are causes for alarm:

1. There is evidence that significant pesticide poisoning is occurring.
    - 67% report 3-5 signs or symptoms potentially associated to pesticide use per spray operation; another 22% reported 6-10.
    - 35% reported an episode of vomiting shortly after applying pesticides that indicates moderate poisoning.
    - From 1-5% reported a serious episode of poisoning (seizure and loss of consciousness respectively)
    - Close to 50% have sought medical care for poisoning.

2. Cambodian farmers are using highly hazardous products, which are well-documented risk factors for pesticide poisoning[6].
    - 43% were using extremely hazardous products (Ia),
    - 52% were using an extreme or highly hazardous product (Ia or Ib)
    - 84% were using a moderate to extremely hazardous product (Ia, Ib or II)

Many of these products have been banned and are not longer available in neighboring countries. Most are imports, as reflected by their labeling in Vietnamese and Thai. This is an indication that Cambodia is serving as a dumping ground for old stocks that these neighbors can no longer sell in their own countries.

3. The Cambodian farmer has no idea what he/ she is using, its appropriate dose, indication, handling procedure, or human health hazards.
    - Labels are illegible for the Khmer farmer.
    - 99% of the respondents have not received technical information from an informed source.
    - 63% did not feel pesticide handling and storage could be a health hazard.

4. Farmers are exposed to multiple doses on multiple occasions through a season; another documented risk factor for pesticide poisoning[6].
    - Crops are sprayed up to 20 times per season
    - Up to 5 different products are mixed together and applied to a single crop per spray session

5. Prolonged dermal exposure is likely occurring. Hands and feet are likely heavily contaminated as few use boots and no one reported using gloves. 92% wear unwashed, contaminated clothing to spray, which amplifies skin exposure. Dermal exposure is the most important route of entry and an important risk factor for pesticide poisoning[6].

6. Pesticide use is on the incline with 64% reporting more reliance on pesticides.

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[6] A longitudinal controlled study of more than 900 spray operations in Indonesia revealed that using a Ia, Ib, II pesticide, applying a pre-mixed cocktail of multiple pesticides, dermal exposure, especially wearing wet contaminated clothing and spraying frequently increased the risk of pesticide poisoning. (Kishi M. et al. Relationship of pesticide spraying to signs and symptoms in Indonesian farmers. Scan J Work Environ Health 1995;21:124-33.)

7. Children are directly or indirectly being exposed. Close to 50% of the respondent farmers reported that they allow their children to apply pesticides.

Thus we have a picture of extremely toxic substances unknowingly being handled in a hazardous manner resulting in what farmers clearly view as frequent episodes of poisoning. This represents an assault to the Cambodian farmer's health already at great risk facing a huge HIV-AIDS epidemic, highly resistant malaria and exceedingly prevalent tuberculosis. Imports are difficult to control, the process of re-labeling all these products into Khmer will take time and formal agriculture extension programs to train farmers is often an ineffective method to reduce pesticide poisoning. Therefore, other more grass root measures must be taken to resolve this critical situation.

The first priority is to create awareness among farmers and their families on the risks of using pesticides to ensure more informed choices on pesticide application. This can be done through farmer field schools where farmers can conduct their own informal health studies. Such work is being done in Indonesia, Vietnam, and starting in Sri Lanka. Farmers inventory the pesticides they use by hazard levels, observe each other's hazardous pesticide handling, storage, and disposal practices, and conduct simple sign and symptoms of pesticide poisoning surveys among each other. Through this non-formal experiential process, they quickly become aware of the risks of pesticide use. In Thailand, children are conducting these studies among their communities in schools that have an IPM program.

Of equal importance is developing information on pesticides that the Khmer farmer can understand. An illustrated (using photographs) reference list in Khmer of available products is critically needed until the labeling issue can be solved. Only with such a reference list can farmers classify the products they are using. Having farmers produce their own posters for their villages can follow this. Package labels from used containers can be removed and pasted to posters , labeled in Khmer in farmer field schools and used to inform other farmers.

Finally more media attention to this issue is required to inform the general public who likely are consuming foods with highly toxic pesticide residual levels. Health care providers who must be alert to recognize and appropriately treat pesticide poisoning must also be targeted during any information campaign. The latter sector can be helpful allies to press for better enforcement of regulations. If informed farmers refuse to buy hazardous products and demand less toxic substances coupled with similar demands by consumers for safer foods, pesticide dealers and policy enforcers will have to respond.