Pesticides-Health survey

Data of 109 farmers in Chaiprakarn, Chiang Mai, Thailand July 2004

Contents

Summary

A survey on the health effects of pesticides was conducted by 24 farmers in Chaiprakarn District in Chiang Mai province. This survey yielded 109 sets of data which are presented in this report.

The majority of the farmers in this survey grows vegetables (67%) and fruits (24%). Among the 109 farmers, 45 different pesticides were being used. These include 9 chemicals belonging to WHO toxicity classes Ia and Ib. The list includes two chemicals that were already banned in Thailand (Methamidophos and Monocrotophos) and two chemicals that were still registered at the time of the survey, but have recently been banned (Methyl parathion and Endosulfan).

Analysis of spraying behavior shows that almost all farmers get easily exposed to pesticides. 54% of the farmers get wet during spraying, 40% works with leaking equipment and many farmers drink (63%) or eat (11%) during the spraying operations. About 41% of the farmers do not use gloves during spraying, and 45% of the farmers do not use gloves when they are mixing the chemicals. This shows clearly that many farmers do not take sufficient precaution.

As a result of their exposure to pesticides farmers often experience signs or symptoms of poisoning. The majority of the farmers (53%) had moderate symptoms of poisoning. One farmer had even experienced severe symptoms of pesticide poisoning.

Storage of pesticides and disposal of empty containers were found to be especially a risk factor for children and farm animals. 59% of the farmers have a way of storage that is not safe for children and 58% of the farmers put children at risk through the disposal of empty containers.

Farmers can reduce their risks in several ways, especially by reducing the frequency and volume of spraying, and by switching from highly toxic chemicals to chemicals with lower acute toxicity. This would require IPM training for the farmers so that they can manage their crops with fewer and less toxic pesticides. Another way to reduce risks is by taking better precautions during the handling and storage of pesticides and the disposal of empty containers.

The Thai government can also help reducing risks for farmers by banning the most toxic chemicals. The most toxic chemicals that were used in Chaiprakarn include Carbofuran, Dicrotophos, Methomyl, Omethoate, Paraquat, Dichlorvos and Triazophos. Banning these chemicals would ensure that the farmers will in due course switch to safer alternatives. Also chemicals with lower toxicity can form a risk to farmers if they are carcinogenic or developmental toxins (e.g. Mancozeb).

Since October 2004 (few months after this survey) the use of Endosulfan and Parathion-methyl has been banned. This is however not a guarantee that their use will be completely abandoned by farmers. This survey shows that two banned chemicals (Methamidophos and Monocrotophos) were still in use. Government action is therefore required to enforce the banning of these chemicals.

Introduction

The IPM DANIDA project has in the past two years organized several training courses for groups of farmers on "the health effects of pesticides". During these courses the farmers learn to make a so called "cross-sectional survey", which is a one-time survey of the "pesticide-health" situation in their own farming community. The training helps the farmers to understand what is going on in their community and understand how and when they are most likely to be contaminated by chemicals. The training model used was developed by Ms. Helen Murphy.
(See website: www.ipmthailand.org/en/pesticides/pesticides_survey.htm)

During the 5-day training the participating farmers learn about various aspects of pesticide use. The training includes 5 major topics:

1. ***Identification of chemicals***
   Farmers learn to identify the types of pesticides used and to classify them according to their acute toxicity. Farmers learn to read and understand labels, and understand the colored warning signs on containers. They also learn about the toxicity classification used by WHO and they learn about the different chemical families (organophosphates, carbamates, pyrethroids, etc.).

2. ***Spraying behavior***
   Farmers learn to make observations of how the pesticides are used. They observe and analyze the protective measures that are taken during mixing and application. They observe how they can get contaminated during the handling of pesticides.

3. ***Storage of pesticides and disposal of containers***
   Farmers learn to make observations of how storage of pesticides are disposal of empty containers can form a risk for children, food, water, farm animals, etc.

4. ***Frequency and volume of pesticide use***
   Farmers calculate the volume of pesticides that are used during one year and they calculate the frequency of applications (number of risk days per year).

5. ***Signs and symptoms of poisoning***
   Farmers learn to recognize signs and symptoms of pesticide poisoning and how they differ from other signs and symptoms of poor health. For example they discuss about differences between sweating because of hard labor and sweating as a result of contamination with poisons.

During the 5-day program the farmers collects data about themselves, and each of them practices data collection with one other farmer. After the 5-day program the trained farmers get the task to each interview and observe 3 or more of their neighboring farmers. When they have completed this survey, the farmers meet again to analyze the data and to formulate their own conclusions.

This process of making a survey in their own community helps the farmers to make decisions that reduce the risks of pesticide use. For example they quickly understand that they can reduce risks by avoiding the most toxic substances (WHO class Ia and Ib) in favor if less toxic products (class III or IV). They also have learned how to

better protect themselves during spray operations and how to improve their storage of pesticides and the disposal of empty containers.

In July 2004 a pesticide-health survey was conducted by a group of 24 farmers in Chaiprakarn, Chiang Mai. This resulted in complete data sets for 109 farmers. This report presents these data.

Data of 109 farmers

Data sets of 109 farmers in Chaiprakarn were entered in a computerized database. All these data were collected in July 2004. The following tables give an overview of these data.

Type of farmers in this survey

The majority of the 109 farmers grow vegetables (especially garlic, onions, cabbage and cauliflower). About one quarter of the farmers grow fruits (lichee, longan, tangerine). Few of them grow rice. None of these farmers had been previously trained in an IPM farmer field school.

Table 1 – Crops grown by 109 farmers in Chaiprakarn

Crops	No. of farmers	% of farmers
Vegetables	73	67.0
Fruits	26	23.9
Rice	8	7.3
Garlic/onion	46	42.2
Cabbage	48	44.0
Longan	12	11.0
Lichee	11	10.1
Total *	109	

* Some farmers grow more than one type of crop

Table 2 – Gender of 109 farmers in Chaiprakarn

Gender	No. of farmers	% of farmers
Male	89	81.7
Female	20	18.3
Total	109	

Analysis of pesticides used

The farmers make an overview of all the pesticides that are being used. These chemicals are then grouped according to their toxicity classification and according to the chemical family to which they belong.

Table 3 – Overview of pesticides used by 109 farmers in Chaiprakarn

WHO Toxicity class	Common name	Chemical family	Status	No of farmers
Ia	Parathion-methyl *	Organophosphates	Registered (on watch list) *	6
Ib	Carbofuran	Carbamates	Registered (on watch list)	2
	Dichlorvos	Organophosphates	Registered	2

WHO Toxicity class	Common name	Chemical family	Status	No of farmers
	Dicrotophos	Organophosphates	Registered (on watch list)	8
	Methamidophos	Organophosphates	Banned	9
	Methomyl	Carbamates	Registered (on watch list)	19
	Omethoate	Organophosphates	Registered	5
	Triazophos	Organophosphates	Registered	1
	Monocrotophos	Organophosphates	Banned	1
II	Paraquat dichloride	Paraquat	Registered	42
	Carbosulfan	Carbamates	Registered	5
	Chlorpyrifos	Organophosphates	Registered	20
	Cypermethrin	Pyrethroids	Registered	58
	Deltamethrin	Pyrethroids	Registered	2
	Dimethoate	Organophosphates	Registered	4
	Endosulfan *	Organochlorines	Registered (on watch list) *	17
	Ethion	Organophosphates	Registered	1
	Fipronil	-	Registered	1
	Metaldehyde	-	Registered	2
	Profenofos	Organophosphates	Registered	1
	Propiconazole	-	Registered	1
III	Alachlor	-	Registered	7
	Difenoconazole	-	Registered	8
	Flusilazole	-	Registered	4
	Malathion	Organophosphates	Registered	3
	Metalaxyl	-	Registered	4
	Prochloraz	-	Registered	1
IV	Atrazine	-	Registered	1
(=U)	Carbendazim	-	Registered	4
	Chlorfluazuron	-	Registered	6
	Chlorothalonil	-	Registered	2
	Iprodione	-	Registered	4
	Mancozeb	Thiocarbamates	Registered	46
	Oxyfluorfen	-	Registered	14
	Propineb	Thiocarbamates	Registered	6
	Glyphosate	-	Registered	1
Not listed	2,4-D, isobutyl ester	-	Registered	1
	Glyphosate-isopropylammonium	-	Registered	38
	Abamectin	-	Registered	26
	Acetamiprid	-	Registered	2
	Beta-cypermethrin	Pyrethroids	Registered	1
	Bacillus thuringiensis subsp. aizawai	-	Registered	17
	Haloxyfop-R methyl ester	-	Registered	2
	White oils	-	Registered	1
	Glyphosate monoammonium	-	Registered	1

* The use of Parathion-methyl and Endosulfan has been banned in October 2004

Table 4 – Toxicity classification of pesticides used by 109 farmers in Chaiprakarn

Toxicity class	No. of chemicals	No. of farmers	% of farmers
Ia	1	6	5.5
Ib	8	40	36.7
II	12	93	85.3
III	6	23	21.1
U	9	62	60.6
Not listed	9	66	56.9
Total	45	109	

Table 5 – Chemical families of pesticides used by 109 farmers in Chaiprakarn

Chemical family	No. of chemicals	No. of farmers	% of farmers
Pyrethroids	3	60	55.0
Thiocarbamates	2	50	45.9
Organophosphates	12	46	42.2
Paraquat	1	42	38.5
Carbamates	3	25	22.9
Organochlorines	1	17	15.6
-	23	78	71.6
Total	45	109	

Among the 109 farmers, 45 different pesticides were being used. These include 9 chemicals belonging to WHO toxicity classes Ia and Ib.

The most popular chemicals used is Chaiprakarn are Cypermethrin (53.2%), Mancozeb (42.2%) and the controversial herbicide paraquat (38.5%).

The pesticides used include 5 chemicals that are registered in Thailand but on the "watch list". Methomyl is the most common of these watch list chemicals and is used by 17% of the farmers in Chaiprakarn.

Two banned chemicals were found. Methamidophos (banned since April 2003) was used by 9 farmers and Monocrotophos (banned since May 2000) was used by 1 farmer.

The use of two pesticides, Parathion-methyl and Endosulfan, has been banned since October 2004 (which was after the survey presented in this report).

Analysis of the volume and frequency of pesticide use

Farmers calculate the frequency of pesticide use (number of risk days in a year) and the volume of use.

Table 6 – Number of risk days per year for 109 farmers in Chaiprakarn

	Risk days per year
Min	2
Max	103
Average	25.0

Risk days per year	No. of farmers
2-10	16
11-25	51
26-50	49
51-75	6
76-103	3

Table 7 – Volume of pesticide use by 109 farmers in Chaiprakarn

	Volume (liters/year)
Min	80
Max	34,480
Average	4,771

Volume (liters/year)	No. of farmers
<1000	16
1000-5000	58
5000-10000	25
10000-20000	8
20000-30000	1
>30000	1

Analysis of spraying behavior

The farmers observe and analyze spraying behavior of themselves and other farmers. Results of these observations are used to discuss the risks of handling pesticides.

Table 8 – Spraying behavior of 109 farmers in Chaiprakarn

Spraying behavior	No. of farmers	% of farmers
Uses gloves when mixing	49	45.0
Uses protective clothes when mixing	58	53.2
Touch eyes when spraying	22	20.2
Touch face when spraying	42	38.5
Gets wet when spraying	59	54.1
Watches wind direction	83	76.1
Equipment is leaking	44	40.4
Smoking while spraying	7	6.4
Eating while spraying	12	11.0
Drinking while spraying	69	63.3
Washing after spraying	102	93.6
Wash clothes together with other clothes	14	12.8
Uses 2 types of hats	12	11.0
Uses monkey cap	63	57.8
Uses helmet	10	9.2
Uses normal cap	9	8.3
Uses big hat	31	28.4
Uses other hat	6	5.5
No hat	2	1.8
Uses eye glasses	31	28.4
Uses cloth mask	31	28.4
Uses sponge mask	45	41.3
Uses mask with filter	0	-
No mask	33	30.3
Shirt with long sleeves	109	100.0
Shirt with short sleeves	0	-
No shirt	0	-
Long pants	109	100.0
Short pants	0	-
Cloth gloves	2	1.8
Medical gloves	0	-
Rubber gloves	62	56.9
No gloves	45	41.3
Boots	107	98.2
Canvas shoes	1	0.9
Slippers	1	0.9
Other shoes	0	-
No shoes	0	-

These data give an idea of how farmers are handling pesticides and the precautions they take. The surveys show that even though farmers know that pesticides are poisons, they are often very relaxed and careless when handling the chemicals. Many farmers are exposed to the chemicals due to leaking equipment and because of drift during spray operations.

Most farmers don't realize that they run a very high risk during mixing of the chemicals because that is the moment when they handle the undiluted chemicals. Among these 109 farmers, the use of gloves at the moment when they mix the chemicals was quite low (only 45% of the farmers).

Participants of the training observe spraying behavior of a farmer during a field visit

Signs and symptoms of pesticide poisoning

Farmers carried out health studies to detect signs and symptoms of pesticide poisoning. They did this by making observations before and after a spraying session. Data on signs and symptoms of pesticide poisoning were analyzed and discussed by the farmers. Signs and symptoms were grouped in 4 levels (none, mild, moderate and severe).

Table 9 – Signs and symptoms of pesticide poisoning of 109 farmers in Chaiprakarn

Signs and Symptoms	No. of farmers	% of farmers
Sweating	71	65.1
Burning nose	10	9.2
Excessive salivation	8	7.3
Burning stinging itchy eyes	18	16.5
Red eyes	9	8.3
Dizziness	26	23.9
Exhausted	39	35.8
Head ache	32	29.4
Dry throat	25	22.9
Short of breath	3	2.8
Shaky heart	19	17.4
Muscle weakness	19	17.4

Skin rashes	3	2.8
Itchy skin	23	21.1
Numbness	23	21.1
Cough	3	2.8
Sore throat	4	3.7
Twitching eyelids	6	5.5
Blurred vision	25	22.9
Nose bleed	2	1.8
Runny nose	10	9.2
Excessive tearing	8	7.3
Insomnia	13	11.9
Tremor	10	9.2
Muscle cramps	11	10.1
Malformed Loss fingernails	1	0.9
Staggering gait	3	2.8
Diarrhea	1	0.9
Stomach cramps	1	0.9
Nausea	14	12.8
Chest pain (tightness burning)	4	3.7
Wheezing	1	0.9
Vomiting	6	5.5
Convulsions	0	-
Seizure	1	0.9
Loss of consciousness	0	-

Table 10 – Summary signs and symptoms of poisoning of 109 farmers in Chaiprakarn

Signs Symptoms Level	No. of farmers	% of farmers
- none	6	5.5
* mild	44	40.4
** moderate	58	53.2
*** severe	1	0.9
Total	109	100.0

Except for 6 farmers, all farmers had experienced some signs or symptoms of pesticides poisoning. The majority of farmers (53%) had moderate symptoms and 1 farmer had experienced severe symptoms of poisoning.

Blood tests are sometimes carried out to detect if Cholinesterase inhibiting chemicals are present in the blood, which is an indication of poisoning by organophosphates or carbamates. The blood test distinguishes 4 levels: 1) normal, 2) safe, 3) risk, and 4) dangerous. Of the 109 farmers covered in this report only 21 had a blood test. Organophosphates or carbamates were used by 15 of these 21 farmers. For 4 farmers the blood test indicated a risky level of cholinesterase inhibiting chemicals in their blood.

Table 11 - Blood test by 21 farmers

	No. of farmers	% of farmers
Normal	9	42.9
Safe	8	38.1
Risk	4	19.0
Dangerous	0	0.0
Total	21	100.0

Observations of pesticide storage and disposal of empty containers

Farmers observed the storage of pesticides and the disposal of empty containers to see how this could form a risk for children and farm animals, and to see how this could form a risk of contamination of food and drinking water.

Table 12 – Storage of pesticides and disposal of empty containers by 109 farmers in Chaiprakarn

	No of farmers	% of farmers
Storage child safe	45	41.3
Storage food safe	96	88.1
Storage water safe	98	89.9
Storage animal safe	43	39.4
Disposal child safe	46	42.2
Disposal food safe	94	86.2
Disposal water safe	92	84.4
Disposal animal safe	41	37.6

From these figures it is clear that in many cases children and farm animals can easily come in contact with chemicals. This is especially the case when pesticides are not kept in locked storage rooms and when empty pesticide containers are carelessly left behind in the field.

Participants of the training observe the storage of pesticides during a farm visit.

Conclusion

Farmers in Chaiprakarn district (Chiang Mai province) are regularly exposed to pesticides which results in frequent experiencing signs and symptoms of poisoning. These problems are partly due to the types of pesticides used and partly because farmers are not taking the necessary precautions.

There are several possibilities to improve this situation:

1) Switch to less toxic chemicals

Farmers can considerably reduce their risks by switching from chemicals with a high toxicity to chemicals with lower toxicity.

Chemicals that belong to WHO class Ia and Ib form an unacceptable high risk (e.g. Dicrotophos, Methamidophos, Methomyl, and Parathion-methyl). Many farmers in Chaiprakarn who still use these chemicals can easily reduce their risk by switching to less toxic insecticides, preferably chemicals belonging to WHO class III or IV (=U). It is surprising that none of these farmers is currently using Neem, which in many other locations in Thailand is a quite popular and relatively safe botanical insecticide.

Also Endosulfan and Paraquat should be avoided in favor of less toxic chemicals. Endosulfan is an Organochlorine insecticide in class II. In Thailand it has now (since October 2004) been banned because of its hazardous effects, so it is expected that farmers in Chaiprakarn will stop its use. Paraquat, a herbicide commonly used in Chaiprakarn is the most toxic herbicide in Thailand (it has already been banned in several countries, including Malaysia and Cambodia). Farmers can easily reduce risks by switching to less toxic herbicides.

2) Reduce the use

Farmers can reduce their risk by spraying less frequently and by using lower volumes of pesticides. But this can only be done if farmers are educated in Integrated Pest Management so that they learn how to manage the pests with fewer and less toxic chemicals.

3) Take adequate precautions when handling pesticides

Risk can also be reduced by making sure that contact with the chemicals is avoided as much as possible. During the pesticide-health training the farmers learn how they get contaminated and how they can improve their handling of chemicals to minimize risks. Unfortunately the necessary protective measures are not always easy to follow. Protective equipment may not be available or it may not be convenient to use it because of the warm weather conditions in a tropical climate.

4) Banning chemicals

The Thai government can reduce risk by banning the most toxic chemicals. This will have an immediate positive effect for all farmers in the country. Of the chemicals used in Chaiprakarn, a ban of Carbofuran, Dicrotophos, Methomyl, Omethoate, and Paraquat would be most effective in reducing the risks for these farmers. Two other highly toxic chemicals, Dichlorvos and Triazophos, should also be banned, but these were only used by few farmers in Chaiprakarn.

It is not sufficient to only consider the acute toxicity of pesticides. For example Mancozeb, a fungicide that is commonly used in Chaiprakarn, has a low acute toxicity (class IV) but it is a carcinogen, a developmental toxin and suspected endocrine disruptor (see PAN pesticides database on www.pesticideinfo.org). Banning this chemical would reduce the risks for the farmers.