Pesticides-Health survey

Data of 124 farmers in Mae Wang Chiang Mai, Thailand May 2004

Contents

Summary

In May 2004, a survey on the health effects of pesticides was conducted by farmers in Mae Wang district, Chiang Mai province. This survey yielded 124 sets of data which are presented in this report.

The majority of the farmers in this survey grow vegetables (87%). Among the 124 farmers, 42 different pesticides were being used. These include 8 very toxic chemicals belonging to WHO toxicity classes Ia and Ib. The list includes 1 banned chemical (Methamidophos, used by 12% of the farmers) and 7 "watch list" chemicals. Two of these (Endosulfan and Parathion-methyl) have recently also been banned.

Analysis of spraying behavior shows that almost all farmers get easily exposed to pesticides. 81% of the farmers get wet during spraying, 61% works with leaking equipment. About 35% of the farmers do not use gloves during spraying, and even more farmers (52%) do not use gloves when they are mixing the chemicals.

As a result of their exposure to pesticides the farmers in Mae Wang often experience signs or symptoms of poisoning. The majority of the farmers (80%) had moderate symptoms of poisoning.

Blood tests were carried out with 24 farmers and showed in 6 cases possible poisoning by cholinesterase inhibiting chemicals. These 6 farmers used a number of carbamates and organophosphates including Carbaryl, Carbosulfan, Chlorpyrifos, Methamidophos, and Profenofos.

Storage of pesticides and disposal of empty containers were found to be especially a risk factor for children and farm animals. 40% of the farmers have a way of storage that is not safe for children and 38% 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 requires intensive 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. Three of the chemicals found during this survey have been banned already (Methamidophos, Endosulfan, Parathion-methyl). Other very toxic chemicals that were used in Mae Wang include EPN, Carbofuran, Dichlorvos, Dicrotophos, Methomyl, and Oxamyl. Banning these chemicals would ensure that the farmers will in due course switch to safer alternatives.

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 point in time "snap-shot" survey of the "pesticide-health" situation in their own farming community. The training helps the farmers to 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 May 2004 a pesticide-health survey was conducted by a group of farmers in Chiang Mai. This resulted in complete data sets for 124 farmers. This report presents these data.

Data of 124 farmers

Data sets of 124 farmers in Chiang Mai province were entered in a computerized database. All these data were collected in May and June 2004. The following tables give an overview of these data.

Type of farmers in this survey

The majority of the 124 farmers grow vegetables. None of these farmers had been previously trained in an IPM farmer field school.

Table 1 – Crops grown by 124 farmers

Crops	No. of farmers	% of farmers
Vegetables	108	87.1
Gladiolus	27	21.8
Garlic or onion	12	9.7
Rice	11	8.9
Lily	10	8.1
Corn	5	4.0
Fruits	0	-
Other crops	6	4.8
Total *	124	

* Some farmers grow more than one type of crop

Table 2 – Gender of 124 farmers

Gender	No. of farmers	% of farmers
Male	119	96.0
Female	5	4.0
Total	124	

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 42 pesticides used by 124 farmers in Mae Wang, Chiang Mai

Toxicity class	Common name	Chemical family	Status	No. of farmers
Ia	EPN	Organophosphates	Registered (on watch list)	4
	Parathion-methyl *	Organophosphates	Registered (on watch list)	3
Ib	Carbofuran	Carbamates	Registered (on watch list)	3
	Dichlorvos	Organophosphates	Registered	4
	Dicrotophos	Organophosphates	Registered (on watch list)	1
	Methamidophos	Organophosphates	Banned	15

	Methomyl	Carbamates	Registered (on watch list)	6
	Oxamyl	Carbamates	Registered (on watch list)	1
II	Carbaryl	Carbamates	Registered	7
	Carbosulfan	Carbamates	Registered	30
	Chlorpyrifos	Organophosphates	Registered	31
	Cypermethrin	Pyrethroids	Registered	35
	Deltamethrin	Pyrethroids	Registered	1
	Dimethoate	Organophosphates	Registered	1
	Endosulfan *	Organochlorines	Registered (on watch list)	8
	Iminoctadine tris (albesilate)	-	Registered	1
	Lambda-cyhalothrin	Pyrethroids	Registered	26
	Paraquat dichloride	Paraquat	Registered	13
	Permethrin	Pyrethroids	Registered	15
	Profenofos	Organophosphates	Registered	10
	Propiconazole	-	Registered	3
	Quizalofop-p-tefuryl	-	Registered	4
III	Alachlor	-	Registered	1
	Difenoconazole	-	Registered	58
	Malathion	Organophosphates	Registered	4
	Metalaxyl	-	Registered	2
	Prochloraz	-	Registered	1
IV (=U)	Captan	-	Registered	2
	Carbendazim	-	Registered	3
	Chlorothalonil	-	Registered	3
	Flufenoxuron	-	Registered	1
	Mancozeb	Thiocarbamates	Registered	76
	Oxyfluorfen	-	Registered	1
	Quintozene	-	Registered	2
	Sulfur	-	Registered	8
	Triforine	-	Registered	1
Not listed	Abamectin	-	Registered	38
	Acetamiprid	-	Registered	1
	Bacillus thuringiensis subsp. aizawai	-	Registered	3
	Cartap hydrochloride	-	Registered	5
	Glyphosate-isopropylammonium	-	Registered	2
	White oils	-	Registered	1

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

Table 4 – Toxicity classification of 42 pesticides used by 124 farmers in Mae Wang, Chiang Mai

Toxicity class	No. of chemicals	No. of farmers	% of farmers
Ia	2	7	6
Ib	6	25	20
II	14	108	87
III	5	65	52
IV (=U)	9	83	67
Not listed	6	46	37
Total	42	124	

Table 5 – Chemical families of 42 pesticides used by 124 farmers in Mae Wang, Chiang Mai

Chemical family code	No. of chemicals	No. of farmers	% of farmers
Thiocarbamates	1	76	61
Pyrethroids	4	65	52
Organophosphates	9	58	47
Carbamates	5	43	35
Paraquat	1	13	10
Organochlorines	1	8	6
Other	21	94	76
	42	124	

Among the 124 farmers, 42 different pesticides were being used. These include 8 chemicals belonging to WHO toxicity classes Ia and Ib. The list includes 7 chemicals that are registered in Thailand but on the "watch list".

Methamidophos, a chemical that has been banned in Thailand since April 2003, was in May 2004 still being used by 15 farmers (12%).

The use of two pesticides, Parathion-methyl and Endosulfan, has been banned since October 2004 (which was a few months after the surveys 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 and volume of pesticide use by 124 farmers in Mae Wang

	Spray days per year	Volume per year
Minimum	2	120
Maximum	75	7,360
Average	16.9	1,541

Analysis of spraying behavior

The farmers observe and analyze the spraying behavior of themselves and of other farmers. The results of these observations are used to start discussions on the risks of handling pesticides.

Table 7 – Spraying behavior of 124 farmers in Mae Wang, Chiang Mai

Spraying behavior	No. of farmers	%of farmers
Uses gloves when mixing	59	47.6
Uses protective clothes when mixing	21	16.9
Touch eyes when spraying	55	44.4
Touch face when spraying	64	51.6
Gets wet when spraying	101	81.5
Watches wind direction	62	50.0
Equipment is leaking	77	62.1
Smoking while spraying	2	1.6
Eating while spraying	3	2.4
Drinking while spraying	21	16.9
Washing hands and shower after spraying	101	81.5

Spraying behavior	No. of farmers	%of farmers
Wash clothes together with other clothes	31	25.0
Uses 2 types of hats	17	13.7
Uses monkey cap	82	66.1
Uses helmet	1	0.8
Uses normal cap	8	6.5
Uses big hat	19	15.3
Uses other hat	13	10.5
No hat	15	12.1
Uses eye glasses	7	5.6
Uses cloth mask	72	58.1
Uses sponge mask	33	26.6
Uses mask with filter	0	-
No mask	19	15.3
Shirt with long sleeves	112	90.3
Shirt with short sleeves	9	7.3
No shirt	3	2.4
Long pants	120	96.8
Short pants	4	3.2
Cloth gloves	10	8.1
Medical gloves	0	-
Rubber gloves	71	57.3
No gloves	43	34.7
Boots	109	87.9
Canvas shoes	1	0.8
Slippers	4	3.2
Other shoes	0	-
No shoes	10	8.1

Farmers discuss about how they get contaminated when spraying pesticides

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, most of them don't follow the proper procedures when handling the chemicals. Many farmers are exposed

to the chemicals due to leaking equipment (62%) 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 that they handle the undiluted chemicals. The use of gloves at the time when they mix the chemicals (48% of the farmers) is lower than during the spraying (65%).

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 8 – Signs and symptoms of pesticide poisoning of 124 farmers in Mae Wang, Chiang Mai

Signs and Symptoms	No. of farmers	% of farmers
Sweating	86	69.4
Burning nose	27	21.8
Excessive salivation	57	46.0
Burning stinging itchy eyes	37	29.8
Red eyes	24	19.4
Dizziness	79	63.7
Exhausted	85	68.5
Head ache	86	69.4
Dry throat	90	72.6
Short of breath	15	12.1
Shaky heart	46	37.1
Muscle weakness	40	32.3
Skin rashes	36	29.0
Itchy skin	49	39.5
Numbness	15	12.1
Cough	20	16.1
Sore throat	27	21.8
Twitching eyelids	17	13.7
Blurred vision	37	29.8
Nose bleed	6	4.8
Runny nose	31	25.0
Excessive tearing	18	14.5
Insomnia	22	17.7
Tremor	32	25.8
Muscle cramps	5	4.0
Malformed Loss fingernails	0	-
Staggering gait	9	7.3
Diarrhea	12	9.7
Stomach cramps	10	8.1
Nausea	14	11.3
Chest pain (tightness burning)	24	19.4
Wheezing	9	7.3
Vomiting	22	17.7
Convulsions	0	-
Seizure	0	-
Loss of consciousness	0	-

Table 9 – Summary signs and symptoms of poisoning of 124 farmers in Mae Wang, Chiang Mai

Signs Symptoms Level	No. of farmers	% of farmers
- none	2	1.6
* mild	23	18.5
** moderate	99	79.8
*** severe	0	0
Total	124	100.0

Except for 2 farmers, all other farmers had experienced some signs or symptoms of pesticides poisoning. The majority of farmers (80%) had moderate 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 124 farmers covered in this report only 24 had a blood test. Of these 24 farmers, 6 farmers had a "risk" level. The cholinesterase inhibiting chemicals used by these 6 farmers were Carbaryl (2), Carbosulfan (4), Chlorpyrifos (1), Methamidophos (2), and Profenofos (1).

Table 10 - Blood test by 24 farmers in Mae Wang, Chiang Mai

Test result	No of farmers	% of farmers
Normal	5	20.8
Safe	13	54.2
Risk	6	25.0
Dangerous	0	0.0
Total	18	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 11 – Storage of pesticides and disposal of empty containers by 124 farmers in Mae Wang

	No of farmers	% of farmers
Storage child safe	74	59.7
Storage food safe	108	87.1
Storage water safe	79	63.7
Storage animal safe	62	50.0
Disposal child safe	77	62.1
Disposal food safe	110	88.7
Disposal water safe	72	58.1
Disposal animal safe	48	38.7

In many farms, 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 left behind in the field.

Conclusion

Farmers in Mae Wang are regularly exposed to pesticides. As a result of this they frequently experience signs and symptoms of poisoning. These problems are partly due to the types of pesticides used (they use many highly toxic chemicals belonging to the carbamates and organophosphates) and partly because farmers are not taking the necessary precautions.

The following options should be considered 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. The farmers in Mae Wang who use these chemicals (i.e. EPN, Parathion-methyl, Carbofuran, Dichlorvos, Dicrotophos, Methamidophos, Methomyl, and Oxamyl) can easily reduce their risk by switching to less toxic insecticides, for example chemicals belonging to WHO class III or IV (=U).

But also WHO class II chemicals should be avoided in favor of less toxic alternatives. For example Endosulfan is an Organochlorine insecticide which in Thailand has recently been banned because of its hazardous effects. Paraquat is the most toxic herbicide in Thailand and farmers can reduce their 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 (IPM) 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 risks by banning the most toxic chemicals, because this has an immediate positive effect for all farmers in the country. Of the chemicals used by these 124 farmers in Mae Wang, use of Methamidophos has been banned since early 2003 and since October 2004 also the use of Parathion-methyl and Endosulfan has been banned. This is a very positive development.

Considering the chemicals used in Mae Wang, a ban of EPN, Carbofuran, Dichlorvos, Dicrotophos, Methomyl, Oxamyl, Carbaryl, Carbosulfan, Chlorpyrifos, Profenofos and Paraquat would be most effective to further reduce the risks for these farmers.