



Knowledge, Attitude and Practice (KAP)  
Towards The Use of Chlorpyrifos and  
Paraquat and Their Impact On Human  
Health and The Environment  
2015

RCRD, CGFED & SRD



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## INTRODUCTION

Though the two pesticides paraquat and chlorpyrifos are highly toxic and widely used in Vietnam's agriculture, their adverse impacts on people, animals, beneficial insects and the environment find no mention in the training courses on pesticide use in agriculture conducted by government agencies. The media meanwhile day and night advertise the "benefits" of using these chemicals, which leads to their overuse and resistance by pests, and consequently an increase in plant diseases. Even so, farmers who grow rice, fruit and vegetables have generally depended on these pesticides to "ensure good yields".

Paraquat is a fast-acting, non-selective contact herbicide used for broad-leaved plants; it kills the green parts of leaves and causes leaf-burn with a strong oxidizing reaction. In humans, it is corrosive to the skin, causing burns and blisters, nail damage, eye injuries, etc. and also headaches and fever; acute poisoning and chronic exposure can cause respiratory distress and affect the central nervous system. In developing countries, it has been reported to be used in thousands of suicide cases in rural communities as it is easily available. Chlorpyrifos is an organophosphate insecticide which affects the respiratory and the central nervous systems and can cause a range of related problems. The two chemicals are also harmful to animals and birds, amphibians and fish, honeybees and other beneficial insects, and pose a threat to water sources and aquatic ecosystems.

The use of these two chemicals in agriculture has therefore been banned or restricted by the global community. *As of 2013*, paraquat had been banned in 36 countries and its use restricted in 11 countries. But it continues to be used in much of the developing world because of its relatively low cost, the weak regulatory structures and strong industry pressure. In Vietnam, it was earlier approved only for "minimal use" but later, in 2001, this restriction was withdrawn which resulted in a surge in its use; it is now widely used under various trade-names. Chlorpyrifos is also approved for unrestricted use.

To know more about the processes by which farmers learn about these chemicals and use them in the field, it is necessary to study their 'knowledge, attitude and practice' (KAP) in using pesticides in general and paraquat and chlorpyrifos in particular. The result of the study will reflect how farmers use the chemicals, as well as help find out the factors that influence their choice of highly poisonous chemicals with harmful impacts on human health and the environment.

To this end, a collaborative study to evaluate the "Knowledge, Attitude, and Practice (KAP) of farmers in using the active substances paraquat and chlorpyrifos and their impact on health and the environment" was undertaken in 2014 by three organizations -- (i) Research Center for Rural Development - An Giang University (RCRD), (ii) Research Center for Gender, Family and Environment in Development (CGFED), and (iii) Center for Sustainable Rural Development (SRD) -- in three ecological regions of the country in An Giang, Nam Dinh and Phu Tho provinces; these provinces represent the Mekong delta region, the plains of the Red river delta, and the midland mountainous

terrain. A KAP survey is an effective tool in assessing what individuals know about pesticides, what they think about pesticides, and their practices and behavior related to pesticide use.

The study was sponsored by Pesticide Action Network Asia and the Pacific (PAN AP). Previous research done by CGFED and RCRD in An Giang and Nam Dinh provinces as part of PAN AP’s Asian regional community monitoring study on the use of highly hazardous pesticides had laid the groundwork for the current study, and this was a follow-up of that study.

The study proposed to:

Survey the current use of paraquat and chlorpyrifos on crops (rice, fruit and vegetable),

(ii) study farmers’ level of knowledge, attitudes and practices in using these pesticides in the three ecological zones and their relative roles in agricultural production and impacts on health and the environment,

(iii) find out how the farmers select and apply these chemicals by their knowledge, attitude and practice,

(iv) determine the factors that influence farmers’ choice to use the two pesticides,

(v) study the impacts of the two pesticides on human health and the environment,

(vi) recommend policy measures for using these pesticides reasonably in the future.

The study was carried out through quantitative and qualitative analyses of data gathered in the three regions. Tools for the study consisted of (i) interviews with farmers using questionnaires (335 farmers, 48.7% male and 51.3% female) (**Table 1**), focus group discussions, (ii) interviews with officials and technical staff in plant protection and agriculture departments, and (iii) case studies of health impacts. Data were selected by quantitative and qualitative methods.

**Table 1. The gender distribution of samples in study sites**

Gender	Study sites							
	An Giang		Nam Dinh		Phu Tho		Total	
	n	Ratio (%)	n	Ratio (%)	n	Ratio (%)	n	Ratio (%)
<b>Male</b>	100	95.2	33	28.4	30	26.3	163	48.7
<b>Female</b>	5	4.8	83	71.6	84	73.7	172	51.3
<b>Total</b>	105	100	116	100	114	100	335	100

Quantitative data were used for statistical analysis and evaluation of farmers’ KAP relating to paraquat and chlorpyrifos with values based on the average, the majority and cross-reference, and relative qualitative and quantitative values. Clustering questions and grading/scoring questions were also used. Qualitative data were gleaned from written reports and in-depth discussions with officials, participatory rural appraisal and specialized reports. These were analyzed thematically to supplement and further explain the quantitative data or in-depth analysis of the problems found through

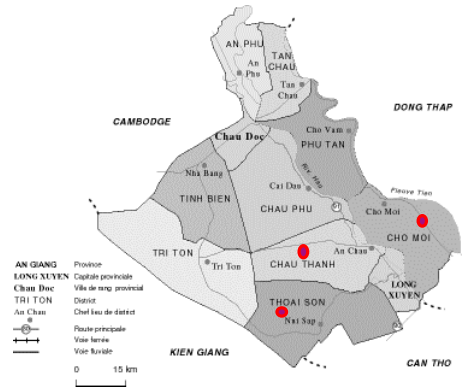
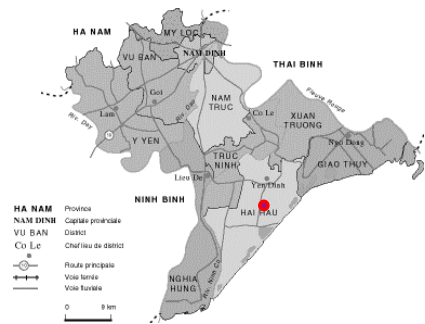
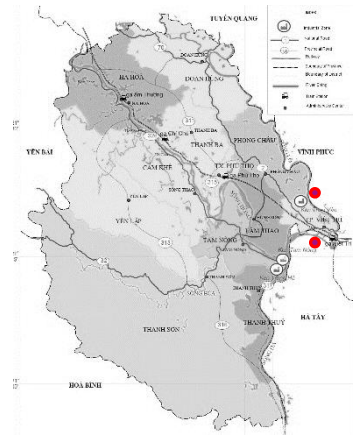
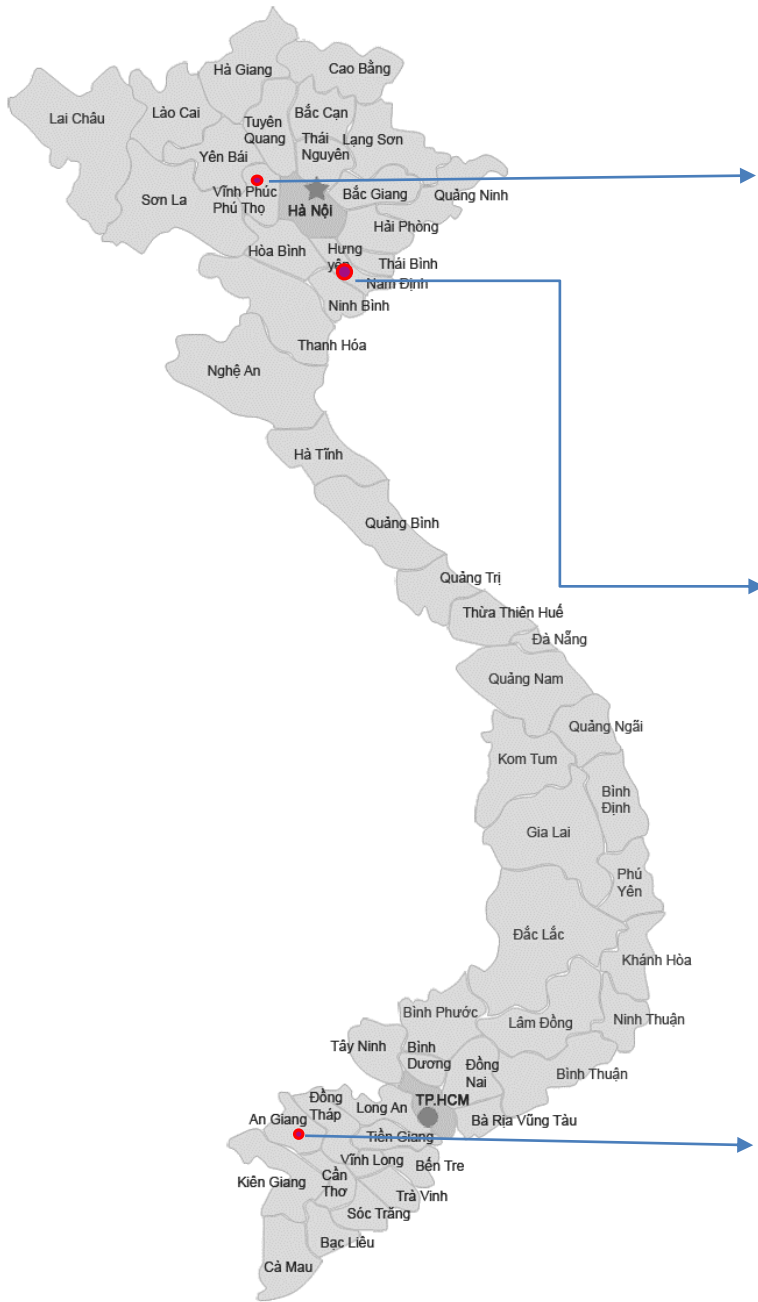
a process of assessment of the responses from the “study sites” and “farming models” in these areas.

Six districts (nine communes in these districts) in the three provinces (study sites or areas) and three types of farming there (farming models) – rice, fruit and vegetable– were chosen for the study (**Table 2**).

**Table 2. Type of farming and local distribution in each study sites**

Study sites			Details		Type of farming			
Province	Districts	Communes	Samples	Ratio (%)	Rice (%)	Fruit (%)	Vegetables (%)	Total
<b>An Giang</b>	Chau Thanh	Bind Thanh	35	10.45	33.3	32.4	34.3	100
	Cho Moi	Binh Phuoc Xuan	35	10.45				
	Thoai Son	Vinh Chanh	35	10.45				
<b>Nam Dinh</b>	Hai Hau	Hai Cuong	44	13.13	75.0	0.0	25.0	100
		Hai Long	49	14.63				
		Hai Son	23	6.87				
<b>Phu Tho</b>	LamThao	Cao Xa	72	21.49	19.3	0.0	80.7	100
	Phu Ninh	Bao Thanh	20	5.97				
		Tram Tran	22	6.57				
		<b>Total</b>	<b>335</b>	<b>100.00</b>				

Map of the study sites. Note: The red points are the research regions





## RESULTS AND ASSESSMENTS

### General background to the study areas

There were differences among the regions in the information on farmers' households because of the differences in the natural conditions of farming and customs.

An Giang farmers had more farmland per household and hence more income than farmers in the other two provinces. The province also had rice, vegetable and fruit cultivation (specially cultivated orchards) unlike the other two regions which had only rice and a combination crop of rice and vegetable. Fruit farmers had higher income than rice and vegetable farmers. On the other hand, education levels decreased from Phu Tho to Nam Dinh to An Giang -- 89% of the farmers in Phu Tho had secondary and high school education, 85% in Nam Dinh and only 44% in An Giang. Farmers in Phu Tho had the highest percentage in high school education, Nam Dinh in secondary school education, and An Giang in primary school education. In general, most of the farmers in the three study areas had education up to the secondary school level.

The average age of farmers in Phu Tho was 52 years, in Nam Dinh 48 years and in An Giang 46 years; correspondingly, Phu Tho farmers had longer experience (23 years) in farming and the use of pesticides than Nam Dinh (22 years) and An Giang farmers (16 years). The average age of respondents was 49 years. Overall, the average age of cultivating farmers was high, which could make it difficult to transfer new scientific and technical knowledge to them.

An Giang had a higher proportion of men engaged in agricultural work than Nam Dinh and Phu Tho; conversely, the proportion of female participation increased from An Giang to Nam Dinh to Phu Tho. In An Giang, therefore mostly the men decided the pattern of production and were directly involved in pesticide-related farm work whereas in Nam Dinh and Phu Tho these were women.

Over 98% of the farmers in the three areas were directly involved in farm work, crop care and pesticide spraying. The proportion of hired sprayers was very low.

### General knowledge and training

The survey showed that 86% of all the farmers agreed that pesticides were toxic; the rest considered these as nutrients and non-toxic or had no opinion. But not more than 43% of the farmers interviewed were trained in the use of pesticides. Of these, farmers in an Giang, where farmers grew rice, fruit and vegetables, were trained in many techniques such as 1M5R and 3R3I<sup>1</sup> whereas farmers in Nam Dinh and Phu Tho were trained more in techniques of growing<sup>2</sup> rice under the System of Rice Intensification (SRI) which helps reduce the use of pesticide, seeding, etc. Farmers in Pho Tho and farmers with higher levels of education had higher general knowledge from training,

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<sup>1</sup> "1 Must 5 Reduce" (1M5R): Must use certified seed, Reduce the amount of seeding, Reduce pesticide, Reduce fertilizer, Reduce the amount of water and Reduce lost after harvest.

### **Knowledge of paraquat and chlorpyrifos**

In general, farmers' knowledge about paraquat was "low" and that of chlorpyrifos "average". Only 9-11% of all the farmers who used paraquat and chlorpyrifos knew about the active ingredients in them. Their main criteria in choosing herbicides (paraquat) were the fluid-leaving or leaf-burning feature or a combination of the two (or just following old habits), and, in choosing chemicals for pest control, systemic and fast-killing actions, followed by chemicals with "exposure, poisoning and fast-killing" actions and then the less toxic pesticides. More farmers in Phu Tho sought to use less poisonous/toxic pesticides than in Nam Dinh and An Giang.

Men and women had different levels of knowledge about pesticides, particularly knowledge related to paraquat and chlorpyrifos. (Men had more knowledge about paraquat than women but lower knowledge of chlorpyrifos than women. Women and men may be exposed to agricultural pesticides along different pathways, and the health effects of chronic pesticide exposures on women and men vary considerably).

There was not much difference on this among the three types of farming.

### **Attitude towards paraquat and chlorpyrifos**

Most of the farmers (92.2%) said that paraquat and chlorpyrifos adversely affected human health and the environment. Even so, they used these chemicals to a great extent because they offered convenience in weed removal (paraquat) and helped protect crop yields and save time (chlorpyrifos). They knew that these chemicals were not safe for farmers' and consumers' health and the environment. But they saw no other feasible solution to removing weeds and controlling pests. Farmers in all the study sites considered chemicals as necessary and an essential for managing pests in rice, fruit and vegetable [although they prioritized other measures such as "using a reasonable amount of organic and nitrogen fertilizers", "complying with the seasonal calendar" (rice), "dealing with inverse crops" (fruit), and crop rotation (vegetable) when asked to choose from a set of eight measures for pest management]. Men and women had the same attitude towards paraquat and chlorpyrifos.

The reasons behind their choice of paraquat and chlorpyrifos were ensuring productivity and good yields (a score of 3.88 on a grading scale of 5 points), "the active substances were not prohibited" (3.75/5 points), "low cost" (3.51/5), "for fast killing of weeds and pests" (3.46/5), "everyone supported the use of chemicals" (3.33/5), "influenced by advertising" (2.93/5), "not seeing the specific harm" (2.39/5), etc. Farmers in Phu Tho often supported more progressive views than farmers in the other regions, and rice farmers had more progressive views than other farmers.

### **Attitude towards health and environmental impacts**

Overall, farmers in Nam Dinh and Phu Tho rated the level of the risk of their exposure to paraquat and chlorpyrifos while using these to be higher than farmers in An Giang. Similarly, rice and vegetable farmers rated the risk higher than fruit farmers.

Farmers had difficulty in choosing among various solutions while trying to maintain crop productivity and lessen pesticide impacts on health, environment and the

community. Farmers in Nam Dinh (4.82/5 points) and An Giang (4.46/5 points) considered crop yields and profits as highly important while farmers in Phu Tho were more interested in protecting health and community well-being (4:42/5 points). Among farming models, rice farmers said health, productivity and profitability were all important factors (4.2/5 points) whereas fruit and vegetable farmers paid more attention to productivity and profitability.

### *The effects of direct exposure to pesticides, especially on women*

The occurrence of eight common symptoms (fatigue, hot and itchy, vertigo and dizziness, headache, dry and hot skin, skin burn, cough and abdominal pain) among people who sprayed pesticides were evaluated. Depending on the age, body condition and gender, exposure to pesticides would have different symptoms.

Among the study sites, more farmers in Nam Dinh and Phu Tho showed the symptoms than in An Giang. As mentioned earlier, the majority of pesticide sprayers in Nam Dinh and Phu Tho were female while those in An Giang were male. *Women being more susceptible to the impacts of chemicals, they showed more symptoms.*

The most common (82 %) symptom was fatigue, with all farmers (100%) in Nam Dinh and Phu Tho showing it but only 31.3% in An Giang. More farmers in Nam Dinh and Phu Tho also suffered from vertigo, dizziness and headache. However, An Giang had a higher proportion of farmers (62.5 %) who felt “hot and itchy”.

Among farming models, the symptoms that the majority (over 50 %) had in common were fatigue (82.1%), feeling hot and itchy (57%) and headache (56.6%). Other symptoms were vertigo and dizziness (45.7%), dry skin (17.2%), cough (9.6%), skin burn (5.3%), and abdominal pain (3.6%). Fruit farmers were affected the least.

As for poisoning cases, 8.5% of the farmers had been poisoned when spraying pesticides (the percentage being the same for the study sites as well as the farming models). Phu Tho had more poisoning cases (8 cases) than Nam Dinh (6) and An Giang (4), mostly among rice farmers. Though the number of the poisoned was less than the non-poisoned, this is still alarming because they had acute symptoms with loss of body control. Besides, though 91.5% of the farmers reported “no poisoning”, it did not really mean that they were not “poisoned” -- they had developed cumulative toxicity (chronic toxicity) and some had acute symptoms, mostly from chronic poisoning. Chronic poisoning is a potential risk because some types of pesticides, especially paraquat and chlorpyrifos, are related to many types of cancer in humans.

Most farmers could properly classify the types of chronic or acute poisoning, except for a small percentage. The majority of the pesticide poisoning cases were so mild that farmers just treated themselves (bathing, changing clothes, resting, drinking lemonade, etc.) at home and did not report the cases to medical centers; only severe cases that needed emergency treatment or first aid were reported. So the pesticide-related health care unit did not have enough information on poisoning cases.

### *“Alarming level” of water contamination*

Water contamination from pesticides was seen as a problem. Nearly 90% of the farmers

agreed that pesticides polluted the water, and 67% said that “water pollution is at an alarming level”, the proportion being much higher in Nam Dinh and Phu Tho than in An Giang (38%). Going by types of farming, 73.6% of the rice farmers considered water pollution to be alarming, followed by vegetable and fruit farmers. Clean water for domestic use was getting scarce.

### **Practice and behavior of farmers in using pesticides on crops**

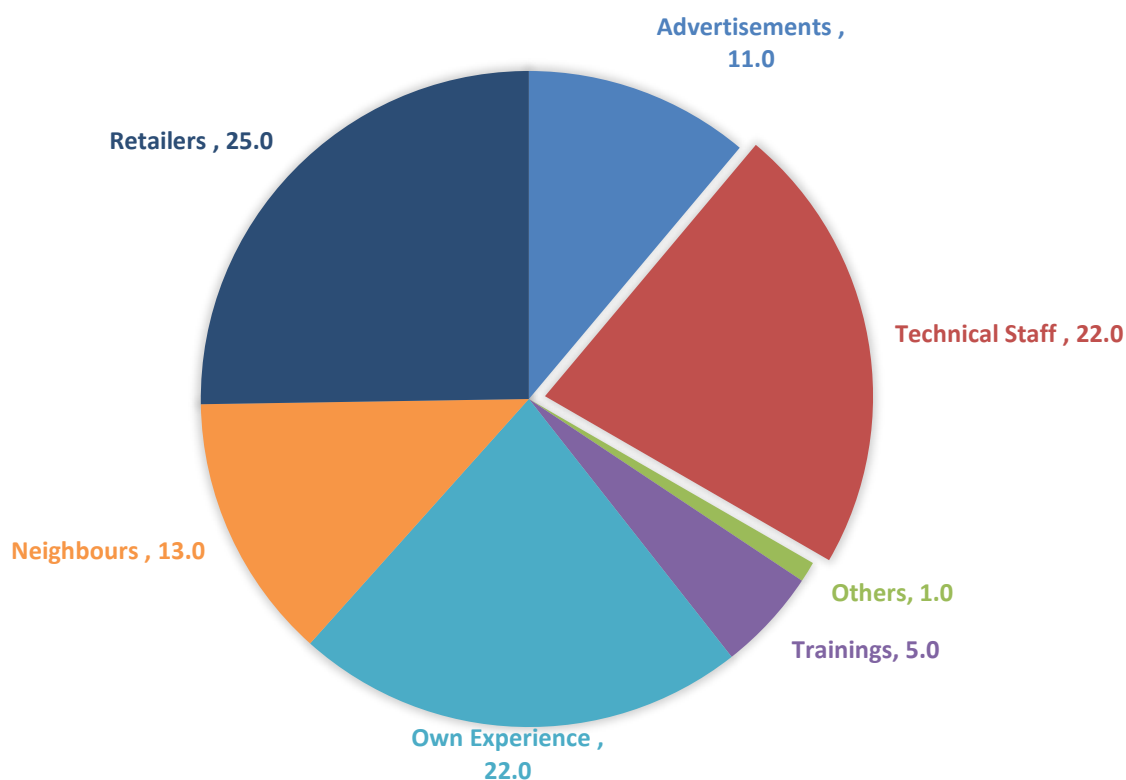
Farmers tended to choose ‘technical solutions ‘to get good yields rather than depend much on agricultural chemicals as reflected in their use of multiple measures for crop cultivation and restriction of chemical methods. Measures such as proper soil preparation, use of good seeds and “mastering good cultivation techniques” scored higher than “applying many chemical fertilizers” and “spraying pesticides”. Women particularly liked to avoid the harmful effects of the two pesticides.

Farmers in An Giang and Nam Dinh used paraquat the most at the soil preparation stage whereas farmers in Phu Tho used it during crop growth. As for chlorpyrifos, 91% of the farmers used it routinely to prevent pests. Farmers in Phu Tho, women farmers and farmers with higher levels of education showed more positive behavior in the use of the two chemicals than other farmers, and so also rice and vegetable farmers.

Farmers in An Giang had the highest intensity of using pesticides during a crop (5.5 times per crop), and, among farming types, fruit farmers used pesticides the most (8.6 times/crop) followed by vegetable farmers (4.2 times/crop); rice farmers had the lowest intensity (2.8 times/crop). The average for all farmers who sprayed pesticides was 3.8 times per crop.

Information on pesticides, though, came more from pesticide traders, own experience, neighbors and advertisements than from training classes and government technical staff. Significantly, farmers read pesticide use instructions and the purpose of treatment rather than the safety instructions given on labels. 56.4% of the farmers used pesticides as recommended, 31% used more than the recommended doses and a very low percentage (2.4%) sprayed pesticides below the recommended doses. Farmers in An Giang used higher concentrations than recommended compared with farmers in other study areas, their main reasons being faster effect and greater efficiency (53.3%) and sheer habit (14.7%). Only 32% of the farmers “believed” the instructions on the pesticide package.

**PIE CHART: SOURCES OF INFORMATION ON PESTICIDES**



Farmers also tried to limit the impact of pesticides during and after spraying according to the circumstances and specific conditions. A high percentage of farmers chose measures such as wearing protective clothes, hats, masks, etc., bathing, washing and changing clothes after spraying, and isolating the tools used for spraying pesticides. Fruit farmers were better in using protective equipment than rice and vegetable farmers.

To dispose of pesticide wastes, farmers in An Giang liked to burn or bury and sell empty bottles more than farmers in the other two provinces; more farmers in Nam Dinh and Phu Tho preferred to throw the bottles in trash bins or in the field. A significant 16% of the farmers threw pesticide waste at the place work, which highlights the need to raise awareness about safety through various means.

About banning the use of paraquat and chlorpyrifos, 54.8% of the farmers said that these should be banned but 34.8% wanted to continue the use. Farmers in An Giang had the highest support for continuing the use at 60%. This may have something to do with the fact that they had larger area of land and, as mentioned earlier, the highest frequency in using agricultural chemicals. (See box: “To ban or not to ban chemicals - looking for alternatives”)



### **To ban or not to ban chemicals -- looking for alternatives**

Analysis of the data showed that farmers understood the impact of using paraquat and chlorpyrifos on human health and the environment but their assessment of whether to continue or stop using these chemicals was mixed. While 34.8% of the farmers thought that they should continue using the chemicals, 54.8% said that they should not; 10.3% had "no opinion" or did not know. This indicated that the majority of them were aware of the harmful effects of the two chemicals, though there was a statistically significant differences in the extent of this awareness at the local level and among the types of farming.

More rice and vegetable farmers (59.9 % and 49.4% respectively) were for stopping the use of the chemicals. However, only 35.3% of the fruit farmers wanted to do so, and this related to their need to control weeds in orchards which made them use more herbicides. They thought that it would not affect the produce; it was also harder to control pests in orchards because the spraying conditions were not as convenient as in rice and vegetable farming.

To explain why the farmers wanted to use or not to use paraquat and chlorpyrifos, the team synthesized the data on their opinions about this. Among the 11 opinions, five supported the view that the chemicals should not be used for the following reasons: (i) it was not necessary to use these substances, (ii) the use caused more harm than good, (iii) adverse impacts on human health now and in the future, (iv) poisonous to the environment and the ecology, and (v) polluting sources of food for livestock, and damaging fishery resources. Opinions 6 to 11 were hesitant about or supported the use of the chemicals for the following reasons: (vi) there were no alternatives to pesticides, and farmers had to use them to protect crops, (vii) it was necessary to have less toxic chemicals or biological solutions to replace chemicals, (viii) using pesticides at low or the recommended dose, (ix) the government should control toxic chemicals, (x) though the government did not permit it, farmers still used the chemicals, and (xi) using to reduce costs.

The 'fluctuation rate' showed that people proposed to continue using the pesticides because of no substitutes and for crop protection. Farmers' opinions showed their awareness of the toxicity of paraquat and chlorpyrifos but no other solution was more effective even as they waited for new solutions. They also said that the use of the toxic chemicals was destroying the environment, and affected their next generation, livestock and fishery resources. Thus it was considered that farmers would support discontinuing the use of paraquat and chlorpyrifos if there were alternative solutions.

### **Assessment of knowledge, attitude and behavior of farmers according to study sites and farming models**

For an overall assessment, the team used the scoring tool for each content on knowledge, behavior and attitude of farmers. Depending on the contents, there was a negative (-) or positive (+) score. The total scores for each question on knowledge, behavior and attitude were summed up for testing or comparison. Points represented a fixed scale, which expressed certain level of knowledge, attitude and behavior of farmers by study sites and study models.

*General knowledge:* Farmers in Phu Tho (10.89 points) had the highest score, followed by Nam Dinh (7.78 points).

*Knowledge of paraquat:* Farmers in An Giang (0.59 points) scored much higher than farmers in Pho Tho (0.26 points) and Nam Dinh (0.04 points).

*Knowledge of chlorpyrifos:* Farmers in Phu Tho (14.15 points) scored the highest,

followed by Nam Dinh (11.62 points); An Giang farmers scored the lowest (3.77 points).

*Attitude of farmers:* Farmers in Phu Tho (30.31 points) and An Giang (29.56 points) had better attitude towards the use of paraquat and chlorpyrifos than farmers in Nam Dinh (27.31 points).

*Behavior of farmers:* Farmers in Phu Tho (20.13 points) had more positive behavior than farmers in Nam Dinh (12.94 points) and An Giang (8.55 points).

Comparison among the types of farming showed that the categories of general knowledge, knowledge of chlorpyrifos and behavior showed statistically significant differences. The other categories did not differ significantly.

*General knowledge:* Rice farmers (8.96 points) scored the highest.

*Knowledge of paraquat:* Vegetable farmers (0.41 points) scored the highest but the difference was not statistically significant.

*Knowledge of chlorpyrifos:* Rice farmers (11.78 points) scored the highest.

*Attitude of farmers:* Farmers growing fruit (30.4 points) scored the highest but the difference was not statistically significant.

*Behavior of farmers:* Rice (15.64 points) and vegetable farmers (12.89 points) had more correct behavior in using the two pesticides.

### **The correlation between knowledge, attitude and behavior**

Knowledge of paraquat did not depend on the variables of general knowledge and some household characteristics whereas knowledge of chlorpyrifos depended on education and knowledge from training, and those who own larger area of land have less knowledge about this chemical. Farmers' attitude depended on the area of the land they hire and their knowledge of chlorpyrifos. Farmers' behavior would be better when they are older, had higher education, more training and general knowledge, and have knowledge of chlorpyrifos and positive attitude.

However, most of these correlations were evaluated to be relatively weak to average. The coefficient of correlation was not so high and the variables of knowledge, behavior and attitude can easily change. Based on the correlation coefficient ( $r$ ), we can work out solutions to raise people's awareness about the harmful effects of the chemicals, which can change the attitude and behavior of pesticide users.

### **Assessment by technical staff**

According to technical staff in plant protection departments and stations, most farmers in the three provinces found it necessary to use paraquat because of its efficacy in removing weeds, and to save labor and reduce the cost of cultivation (though farmers in each region had their own reasons). A high percentage of farmers still used chlorpyrifos (some of them despite the training they had in various techniques to reduce pesticide use) because of its effectiveness in controlling pests.

## Pesticide management in Phu Tho and Nam Dinh

Plant Protection Sub-Department are responsible for managing all agricultural materials (pesticides, seeds, etc.). Partly because the local government was not concerned about this, the job was contractually assigned to professional agencies. But these agencies were given no power for administrative or legal actions against violations of pesticide-related rules and regulations. Commune-level professional units (comprising leaders and officials in charge of commune agriculture related to pesticides management) could not control pesticide distribution and use, regularly update information on which products were on the approved list and which were not, and then guide farmers and closely manage retail stores in the commune. Their understanding of the toxic levels of the pesticides was very low. Most of the officials interviewed did not have access to information on the Rotterdam Convention, Stockholm Convention and the FAO Code of Conduct.

As for retail stores, in many cases, these were located almost immediately next tea house or residential zone or market. There is no significant gap between the store and the living area (living room). All retail store owners interviewed had certificates issued by the district plant protection authorities but there were differences in the level of their understanding of the types of pesticides. They get their supplies from dealers (Level 1) and are not sure to which group or category a pesticide belonged. They only remembered trade-names and for which pests/diseases these are to be used, and suggested to farmers which trade-name is to be used to kill pests the fastest without warning them about its toxicity and effects on health and the environment. Even in official dispatches from the Agriculture and Rural Development of district or the commune relating to periodic pesticide spraying, there was no recommendation or warning to people to be careful when spraying. In this context, frequent discussions on the proper use of the chemicals in official dispatches and especially in the mass media could make farmers more aware of the current unscrupulous use of pesticides. Many retail store owners in the communes felt they were spreading poisons. Most of them had decided to do business in pesticides for a short time to get over family hard times and then get out. Some retail store owners also confirmed that they would not let their children do this business.

### **Case study 1: Vegetable farmer who had pesticide poisoning while working without protective wear**

Mr.N.V. Son (age 49), head of a household, lives in the Binh Thanh Commune, Chau Thanh district in An Giang province. After growing rice earlier, he had switched to vegetables, growing cucumber on 5,000 square meters of land. His family had eight members -- 4 males and 4 females, with 3 men in the working age. In January 2014, Son was accidentally exposed to pesticides and other harmful substances of unknown characteristics and poisoned.

Working without protective wear (goggles, mask, long sleeves, gloves, etc.), he was preparing to spray Tungmectin 5.0 (the active substance is Emamectin benzoate); when

he opened the bottle, the pesticide splashed on his face. After washing his face, changing clothes and getting some first aid at home and the nearest health center, he was moved to the district hospital. He returned home after 5 days and continued to use eye-drops for 7 days. However, even 6 months after the poisoning, he could not see clearly and found it painful to deeply focus on anything.

*(Source: RCRD in-depth interview, 2014)*

### **Case study 2: The use of paraquat in Hai Hau district, Nam Dinh province**

The research team discovered that "the new method of non-traditional rice cultivation" used in Hai Hau district was extremely dangerous because farmers used paraquat without preparing the soil and implanting. Immediately after harvesting, farmers sprayed a lot of paraquat on the remaining fresh stubbles to wilt them and kill germs and seeds of weeds. They waited for the rain to wash away the wilted straw and then scattered grain on the field without sowing and transplanting rice.

One can consult manuals on the toxicity of paraquat to be able to know how farmers and the surrounding communities have direct exposure to these chemicals from spraying and indirect exposure from food sources (rice, vegetables, meat, etc.) and drinking water.

The use of multiple herbicides in Hai Hau in fact made the Department of Agriculture and Rural Development of Nam Dinh to send an alert letter in 2013 to urge people to limit using paraquat (although it was said not to have impact on health). But the effects of highly toxic pesticides on human health are very persistent and long-term because these are persistent organic substances. They may not immediately affect people but the residues persist in the human body and in the environment.

In May 2014, the research team's survey in three communes of Hai Hau district found that a lot of paraquat was still being used.

Why do farmers use paraquat but no other substances? Farmers' answers were "the easy availability of paraquat", "very fast removal of weeds", "low cost", etc. There were other reasons too -- farmers got the pesticides as gifts or as promotional bottles for trial from pesticide companies; Syngenta Vietnam, which specializes in producing paraquat, negotiating with retailers to sell only paraquat in the local market, etc.

*(Source: CGFED in-depth interview, 2014)*

### **Case study 3: Interview with people in pesticide stores**

According to people in Level 2 pesticide stores in Chau Thanh district, the best- sold products with active paraquat in the local market are Gram Oxone 20SL, “Cỏ Cháy” 20SL and 20SL Nimaxone; and the best-sold products with active chlorpyrifos are Tungcydan 30EC, Dragon and Mocyttox.

Farmers use these active substances because they find them highly effective. Among these, the most profitable products for the stores are Tungcydan, Nimaxone, and Dragon (because import prices are relatively lower than other products and farmers use more). Typically, farmers ask the stores for the ‘special cure’ with the highest efficiency.

However, compared with other pesticides and herbicides, the amount of insecticide with chlorpyrifos used in Chau Thanh district is rather limited because of its highly poisonous effects on health and water.

*(Source: RCRD in-depth interview, 2014)*

## **RECOMMENDATIONS**

### **For farmers**

It is difficult to make recommendations for farmers in this KAP study because farmers get passive benefits from the use of paraquat and chlorpyrifos. These products come from the manufacturers and distributors under the coordination of the government and its agencies and departments. Farmers should, however, be provided with all information on the toxicity and harmful impacts of pesticides in general and paraquat and chlorpyrifos in particular. Increased knowledge can change the farmers’ attitudes and behavior, leading them to use safer and more ecological pesticides in the near future.

### **For technical staff and medical management**

Technical staff and managers at the local level are knowledgeable about paraquat and chlorpyrifos but their voices are not heard at higher levels. They should propose more strongly to superior officers to eliminate toxic pesticides. There should also be more research to prove the hazardous impacts of paraquat, chlorpyrifos and other common hazardous substances on human health. This will help the technical staff and policy-makers in agriculture understand more about the problems and take more positive action in reducing the use of pesticides.

### **For policy-makers at the local level**

Advertisements on pesticides should be restricted. Scientific research related to health and the environmental impacts of pesticides should be encouraged at the local level. And local governments should build more agroecology/organic/ecological based



farming models and support eco-organic products.

#### **For policy-makers at the national level**

It is essential to comply with the Conventions and codes of conduct related to pesticides such as the Stockholm Convention, Rotterdam Convention and FAO Code of Conduct.

Licensing of new pesticide products should be limited. There are too many companies and too many products listed in business directories. And too many companies have been allowed to hold workshops and introduce plant protection products or advertise in the mass media and in public which influence farmers and push them to use pesticides.

The government should facilitate more research on good agricultural practices (such as Vietnam/Global Good Agricultural Practices, organic farming and new technological advances which are being applied). It should in fact invest more on studies of the effects of commonly used pesticides on health and the environment so as to frame appropriate policies for pesticide management.

As many governments and international bodies have recognized paraquat and chlorpyrifos as toxic and problematic, the government should soon ban the circulation of these pesticides in Vietnam, which will help promote a healthy environment, sustainable system of agriculture and community health.

#### **For the study sites**

The research results show that the general knowledge of farmers in the study sites is limited, especially knowledge of chlorpyrifos. So people should be provided with information on training on the impacts of pesticides and agroecology based solutions.

At the study sites, farmers are piloting scientific and technical progress in agriculture, but they focus more on rice and should diversify their crops.

Advertisements on pesticides should be managed more closely on the mass media.

Information/instructions on pesticide packages should be clearly written in Vietnamese, especially information on the adverse effects of the chemicals, and their impacts on human health and the environment should be illustrated and depicted for easy understanding.

Specialized plant protection station of district level should have more training to upgrade the ability of their staff.

There must be a sound scientific and interdisciplinary approach (including the disciplines of agriculture, health and environment) in licensing pesticides as well as offering alternatives to paraquat and chlorpyrifos.

Scientists and governmental bodies should review data, including the long-term health impacts and hazards of pesticides, and offer alternatives to a particular pesticide before it is registered for use.

Photos from the Survey



Pesticides disposed in the field



Women are exposed directly to pesticides



Children are exposed to pesticides during spraying



Pesticides disposed near a water source in Hai Hau



Pesticide stored on trees branches Hai Hau





Paraquat, Vietnamse Brand



Paraquat by Sygenta



Chlorpyrifos, Vietnamese Brand



Paraquat used to clear the vegetable beds in An Giang



Paraquat sprayed to clear rice fields in An Giang





Pesticide containers  
collected in waste bags

[ END ]