Pesticide users at risk

Survey of availability of personal protective clothing when purchasing paraquat in China, Indonesia and Pakistan and failures to meet the standards of the Code of Conduct

A report by Barbara Dinham for the
Berne Declaration, Switzerland
Pesticide Action Network Asia and the Pacific
Pesticide Eco-Alternatives Center, China
Gita Pertiwi, Indonesia,
Lok Sanjh, Pakistan

Research by
Sun Jing, Pesticide Eco-Alternatives Center, China
Rossana Dewi R., Gita Pertiwi, Indonesia
Asim Muhammad Yasin, Lok Sanjh, Pakistan

Published by the Berne Declaration,
May 2007

Contents

BD
Berne Declaration
Déclaration de Berne
Erklärung von Bern

Berne Declaration
P.O. Box; 8031 Zurich; Switzerland
Phone: +41 277 70 04; Email: info@evb.ch
Web: www.evb.ch

Pesticide users at risk

Survey of availability of personal protective clothing when purchasing paraquat in China, Indonesia and Pakistan and failures to meet the standards of the Code of Conduct

Introduction

The impact of many pesticides on the health of farmers and agricultural workers in developing countries is compounded by the poor conditions of use and the difficulty of protecting against exposure. Access to information and training is lacking, and small-scale farmers will rely on advice from the pesticide dealers, as well as label instructions. Many pesticide users are not aware of the importance of protecting themselves when using pesticides and the means of protection may not be available. The most risky situations for pesticide exposure are when mixing and loading the concentrated product into the spray equipment, and during the actual spraying when contamination can be virtually unavoidable. In industrialised countries, agricultural spraying is frequently carried out from inside a closed tractor cab. In developing countries exposure risks are increased because the spray equipment is often of poor quality, in poor condition and is rarely, if ever, serviced. Users face problems of leaking spray tanks, splashes or soaking when loading the pesticide solution and blocked nozzles, leaks and spray drift during application.

To avoid exposure, pesticide users are recommended under the *International Code of Conduct on the Distribution and Use of Pesticides* (Code of Conduct) of the Food and Agricultural Organisation of the United Nations (FAO) to wear Personal Protective Equipment (PPE), defined as "any clothes, materials or devices that provide protection from pesticide exposure during handling and application. In the context of this Code, it includes both specifically designed protective equipment and clothing reserved for pesticide application and handling."[1] For manual spraying, the most essential items[2] are boots or covered shoes, a long-sleeved upper garment and garment that covers the legs. When carrying out mixing and loading of the formulation into the spray equipment it is necessary to wear gloves which prevent skin contact and eye protection such as a face shield or tight-fitting goggles. Other items can include face masks and protection from inhalation (see details in box 1). Important ways of reducing risk are the use of such items as filter or respiratory mask and impermeable apron.

Problems have been identified with PPE in tropical areas: it can be difficult to wear in the heat; the correct items are not always readily available; it is still used when damaged (gloves, impermeable clothing) or no longer effective (mask filters need replacing); it can be expensive compared to income; and quality and effectiveness may be sacrificed for cheapness. The recommended PPE in developing countries is generally less stringent than requirements in industrialised countries.
.
This report documents the outcome of an investigation into pesticide dealers selling the herbicide paraquat, the required PPE, and its availability in parts of China, Indonesia and Pakistan. Surveys were carried out between January and March 2007 by Pesticide Eco-Alternatives Center (PEAC) in Yunan province, China; Gita Pertiwi in East Java and Central Java province, Indonesia; and the Lok Sanjh Foundation (LSF), Pakistan (see Annex 1 for survey questionnaire and Annex 3 for details of organisations). The survey investigated: awareness among dealers of the recommended PPE; whether dealers sold the necessary items for protection or could direct users to a store to buy it; whether the dealer understood the pictograms on the label; information or training from the manufacturer to the dealer; and advice or recommendations given by dealers to their customers.

The interviewers made general observations on the conditions of the premises selling products and the quality of PPE, when available. They ascertained the main uses of paraquat and application and disposal practices in the regions.

The pesticide industry supports the Code of Conduct and implements its obligations through product stewardship activities, which are defined in the Code as: "the responsible and ethical management of a pesticide product from its discovery through to its ultimate use and beyond." The Code of Conduct gives the following guidance on the use of PPE and on the importance of encouraging its use when applying pesticides:

> ***3.5*** *Pesticides whose handling and application require the use of personal protective equipment that is uncomfortable, expensive or not readily available should be avoided, especially in the case of small-scale users in tropical climates. Preference should be given to pesticides that require inexpensive personal protective and application equipment and to procedures appropriate to the conditions under which the pesticides are to be handled and used.*
>
> ***5.3*** *Government and industry should cooperate in further reducing risks by:*
> ***5.3.1*** *promoting the use of proper and affordable personal protective equipment;*
>
> *Governments should*
> ***6.1.1*** *introduce the necessary legislation for the regulation of pesticides and make provisions for its effective enforcement, including the establishment of appropriate educational, advisory, extension and health-care services, using FAO guidelines as far as possible. In so doing, they should take full account of local needs, social and economic conditions, levels of literacy, climatic conditions and availability of appropriate pesticide application and personal protective equipment;*
>
> ***6.1.9*** *permit pesticide application and personal protective equipment to be marketed only if they comply with established standards*

Box 1. Pesticide application and PPE

PPE encompasses a range of measures to protect operators, which includes maintenance of equipment and care of clothes. Work clothing is the 'first line of defence', and the FAO Guidelines indicate that:

- The minimum requirement for all types of pesticide operations is lightweight clothing covering most of the body: a long-sleeve upper garment, a garment covering the lower body including the legs, footwear (boots or shoes) and, if spraying high crops, a hat. Shorts and short-sleeved shirts are not adequate protection.
- The most common additional protective equipment required is for gloves and eye protection when pouring, mixing and loading pesticide formulations.
- Aprons, boots, face masks, protective garments or hats may be required for protection from inhalation of vapour, fine dust or spray, protection against especially hazardous products, specialised application methods or applications in tall dense crops.
- Face shields protect the eyes and face against splashes when mixing and loading pesticide formulations against splashes; and can consist of a simple visor of clear transparent material.
- Protective clothing must only be used during handling and application of pesticides and should not be worn for other purposes.

Guidelines for Personal Protection when Working with Pesticides in Tropical Climates, FAO, 1990.

Paraquat and protection

The paraquat product available in all the survey areas is sold under the trade name Gramoxone, and manufactured by Syngenta. When used under poor conditions and without proper PPE, exposure to paraquat can cause a range of unpleasant symptoms, including: localised skin damage (dermatitis and burns), eye injuries, finger and toenail damage, nose bleeds, excessive sweating, nausea and vomiting.[3, 4] The mode of action of paraquat toxicity and lack of an antidote leads to many cases of acute poisoning, both suicidal and unintentional. Damage to the lungs may occur if paraquat is absorbed over time, and long-term exposure is associated with Parkinson's disease.[5]

Although classified by the World Health Organisation as 'moderately hazardous', ingestion of less than a teaspoon of the product is fatal as there is no antidote. To try to reduce accidental ingestion the manufacturers generally register a formulation which contains a blue/green dye, an emetic and a strong smell as warnings. Of the countries in this study, Indonesia recognised the level of hazard associated with exposure to paraquat. Eighteen products are classified for limited use in Indonesia, and three of these contain the active ingredient paraquat. The government notes that paraquat: can cause permanent damage to the ocular tissues or evoke damage to cornea or eye irritation up to seven days or more; can cause damage to internal skin tissues or can cause skin irritation up to 72 hours or more; and that even when used according to label instructions or following practical methods of pesticide use, it can cause poisoning through the mouth, skin and breathing, also resulting in accidental death if swallowed.[6]

Hazardous pesticides require particularly strong precautionary measures. Syngenta has noted the need for PPE during application of paraquat products: *During handling of the concentrated formulation the use of gloves and eye protection is recommended; a long-sleeved shirt, long trousers and boots should be worn during application. Separate washing of clothes used during spray operations and attention to personal hygiene by those handling all pesticides is also important.*[7] However guidance on PPE indicated on product labels in industrialised countries is stricter and more specific than suggested here. Label instructions on PPE may not be consistent across all countries. One study found that, comparing products of similar concentrations, the PPE required was generally less extensive in Malaysia, Thailand and Mexico than in the US or Germany and the guidance of the European Union.[8]

Stringent standards are required, for example, for users in the US, Germany and under the European Union regulation of paraquat. In the US all paraquat formulations are classified as a 'restricted use' product, which means that it can only be legally used by a certified pesticide applicator or under the direct supervision of a certified applicator.[9] A US product label on a concentration of 30.1% specifies that PPE for applicators and other handlers (other than mixers and loaders) must wear: long-sleeve shirt and long pants, shoes plus socks, protective eyewear, chemical resistant gloves (with quality specified), dust mist respirator (approved) with a specified filter. Those mixing and loading the product must in addition wear a chemical resistant apron and a face shield. Users are advised to discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate.

In Germany the concentration of Gramoxone products is 9.5% (weight / weight). Paraquat has been flagged by Syngenta with more precautionary points (10) than any of its other herbicide products (from one to eight – see Annex 2). Even when handling and applying the diluted formulation, the user of Gramoxone is required to use: protective gloves, tight-fitting safety goggles, respiratory mask with filter. Information for UK users from Syngenta warns that PPE should be certified to appropriate standards.[10]

Restrictions in the European Union require governments to pay particular attention to operators using knapsack sprayers, and do not allow knapsack or handheld applications in home gardening 'neither by amateur nor by professional users'[11]; conditions in most developing countries could be compared to household use: with operators often untrained, but applying with a knapsack sprayer, and generally a stronger formulation.

The conditions required in the US, Germany and the European Union are not found in developing countries.

The survey areas and dealers

The surveys were carried out in farming areas in China, Indonesia and Pakistan. Interviewers established whether paraquat was sold and the formulation available. In all areas the stores

interviewed offered for sale Gramoxone manufactured by Syngenta. The stores visited appeared typical of those in the area. Dealers were asked for the most common uses of the Gramoxone product that they sell.

China

The survey of 12 stores took place in five different regions in Yunnan province: Baoshan (one), Simao (five) and Kunming (six). The store in Baoshan was both a wholesaler and retailer in the Longyang district of the city. In Simao the five were retailers of agricultural materials or owners of a private store. In Kunming, Chenggong county, the six were wholesalers and retailers. Two other villages were visited, Qujing and Dali, but were not included in the survey as the dealers did not sell paraquat. A significant number of pesticide sellers were established in each area: 16 in Baoshan, eight in Simao, and 80 in Kunming and the stores interviewed were typical of these.

The product available in all the stores was Syngenta Gramoxone 20% A.S., produced by Syngenta (Nantong) Crop Protection Co Ltd. The formulation contains the blue-green warning dye, an emetic and strong smell, though this information is not on the label. None of the traders had received training about paraquat from the manufacturer, but the local Plant Protection Station of the government provides training for dealers over time. Two were authorised by Syngenta to sell their products: the store in Baoshan and one of the Kunming stores. All the interviewed dealers and stores were legally registered to sell pesticides under Chinese Laws. Dealers' knowledge of the product was limited, and one in Kunming considered the product to be non-toxic.

The survey indicated that paraquat was widely available in rural communities. Farmers use it when growing vegetables, maize, rice and other field crops as well as on fruit plantations, particularly grape and banana production. In rice and horticultural production it is sprayed on average once a year. In Simao paraquat is used by small scale farmers living near the city, usually on vegetables. It is used also in tea, coffee and sugar cane production some distance from Simao city. In Baoshan area it is used to prepare planting of broad beans and rice, and in coffee, banana, sugar cane production and some other fruit plantations. In Kunming it is mainly used to prepare for vegetable and flower production.

Indonesia

The survey of 12 shops took place in Java, in the City of Solo (one shop), East Java (three shops in Ngawi) and Central Java (two shops in Karanganyar, one in Sragen, two in Wonogiri, three in Sukoharjo). Eight of the traders could identify other nearby pesticide stores: in one case there were five other stores; in four cases three other stores; in one case two; and in two cases one other. All shops surveyed stocked Syngenta Gramoxone, produced by PT. Zeneca Agri Products – PT Syngenta Indonesia, one also stocked Gramoxone S. The products were sold in plastic bottles of 250 ml and 500 ml.

As a 'limited use' product under Indonesian law all paraquat products require the applicator to be trained and to strictly follow PPE recommendations. In fact, Gramoxone was sold freely by the dealers, and these restrictions were not conveyed to their customers.

While traders recognised the Gramoxone brand and could identify the manufacturer, only the largest trader in Solo city had undergone training by the manufacturer and held a certificate. Others knew little about the product paraquat, but brochures were available.

In Indonesia paraquat is generally used to kill weeds on rice fields as preparation for planting, and on dry lands before planting groundnuts or corn. For these purposes it is used once per planting season of around four months. It is used two to three times a year on sugar cane and cocoa plantations

Pakistan
The survey took place in three locations in the Punjab. Three of the stores were from two different locations in central Punjab, approximately 30 miles apart, which is mainly a rice-growing area. The remaining seven stores were in the cotton growing area around Toba Tek Singh, approximately 100 miles from the other three. In Pakistan paraquat is generally used as herbicide on potatoes and as a defoliant on cotton, and is sprayed once a season, that is two times a year, on these crops. The paraquat product available in all shops is Syngenta's Gramoxone 200 SL, a formulation of 200 gram of active ingredient per litre, or 18% active ingredient.

Reading the label: dealer awareness of precautions

The dealers were asked whether they had read the labels of the Gramoxone products they sold, and the interviewers checked the label instructions. They were asked as well whether they could interpret the pictograms on the labels, which provide additional information on precautions to take when using products. The understanding of these was uneven in the three countries: with little understanding in China or Pakistan, and reasonable understanding in Indonesia.

China
In China the advice on the label regarding PPE is: wear long-sleeved clothes, trousers and boots, waterproof gloves and goggles when diluting solution; when applying users should wear on long-sleeved clothes, trousers and boots. While dealers may read the label instructions if they are discussing a product with a customer, their advice is usually about the products to choose and how to use them.

There was almost no understanding of pictograms by the traders in the survey. Of the 12 asked, only one was able to give adequate explanations for most of the pictograms.

Indonesia
Six of the 12 shops surveyed in Indonesia said they had read the label and were quoted the advice given for PPE as: wear gloves, goggles, cover-all, boots and mask; one said he had not read it thoroughly but did quote the PPE correctly; one omitted to mention the need for a cover-all; and one said 'PPE was needed'. The remaining three had not read the labels and could not say what should be worn.

Eleven traders could explain some of the label pictogram meanings. Only one indicated that this had been covered in training with Syngenta. A further three said that the pictograms were easy to understand; six said they could explain a little or some of the pictograms; one indicated that he could not completely understand them and one said he could not explain them at all. Those most confident indicated that pictograms referred to safe working procedures, washing hands after use, and keeping chemicals out of the reach of children.

Pakistan
The dealers interviewed in Pakistan were not familiar with the label instructions without reading them. They were aware that paraquat was dangerous. The labels indicated that the user should wear gloves and glasses while mixing the solution to protect hands and eyes. The concentrate formulation should be mixed with at least 40 parts of water. The label indicated: the need for a 'safety jacket' during spraying; after spraying to take a bath and wash hair thoroughly, and wash work clothes before wearing again. It warned to avoid inhaling the spray, not to eat or smoke while spraying, not to spray in strong winds and to watch the direction of the wind so as to avoid polluting body and clothes. Precautions for the environment warned against pouring into water irrigation or domestic purposes; not to store or carry with food items or fodder; and not to take

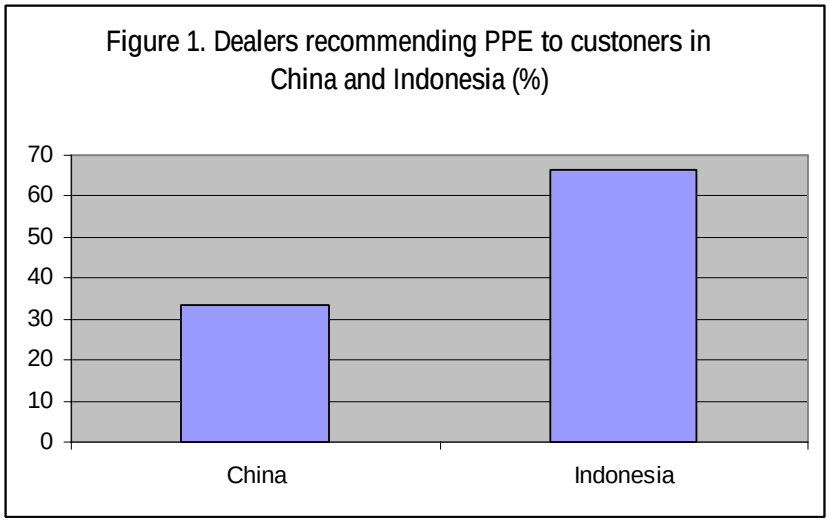
fodder from the field within 10 days of spraying or let livestock enter field before the spray has dried.[12]

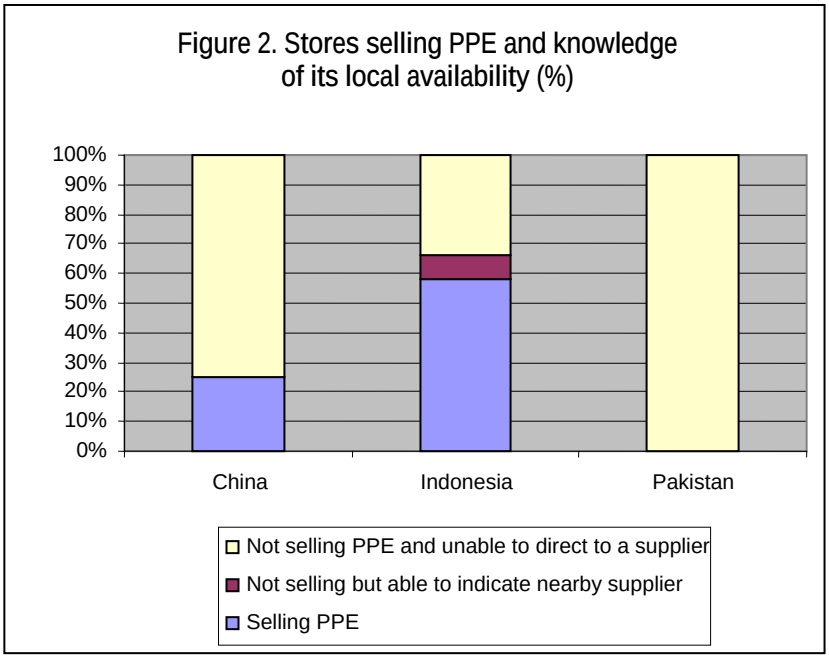
The pictograms on the labels are extremely small and difficult to read or understand, and the dealers were not familiar with their meanings. They consist of 18 warnings: Keep away from children; harmful for animals; wear gloves; wear goggles; wear apron; all body parts should be covered with clothes; cover head when spraying on tall plants; wear rubber shoes and clean after spraying; study label carefully; clean clothes after spraying; do not eat and smoke while spraying; take a bath after spraying; take care of nozzle and pressure of machine while spraying; bury or burn the empty bottles; wash machine after spraying. Three of the pictograms had no explanation in the brochure: one warning to rinse the eyes and two with unclear meanings that seemed to address how to spray.

Recommendations to use PPE and knowledge of its availability

The dealers were questioned on the advice they gave to their customers regarding PPE, and what items, if any, they sold or were available nearby. Where it was available, the interviewers investigated the quality and cost of the goods. They also enquired of the dealers what messages, if any, they conveyed to their Gramoxone customers about protection required to reduce the risks when applying the products.

Figure 1 shows that a number of dealers indicate that they suggest the use of PPE. There is a general correlation between those shops selling PPE and those recommending it. The information from dealers in Pakistan indicated that while they may tell buyers that the product is dangerous, they do not recommend protective clothing. Figure 2 shows that in most cases, with the exception of Indonesia, the dealers that are not selling PPE do not know where it can be purchased.





China

In China four of the 12 shops surveyed said that they advised customers to use PPE. Three of these, all in Simao, sold basic PPE of gloves, boots and in two cases an apron (see Table 1). The shops in Kunming and Baoshan neither sold PPE nor knew where it could be purchased. In Simao, two of the shops selling PPE indicated that such items of work clothing could be purchased from a hardware store (distance of 100-200 metres) and a supermarket (distance of 500-600 metres), and cited the availability of masks in pharmacy stores, however these stores were not in all the areas, for example none were in the surveyed market in Chenggong county of Kunming city. While it was not difficult to find standard quality work clothing, in the surveyed areas it was hard to access specialized PPE for pesticide application. Those wishing to purchase a full range of PPE would need to travel to a number of stores to equip themselves.

Indonesia

In Indonesia seven of the 12 stores selling pesticides sold some PPE, although the items available differed (see Table 1). One store, an authorised dealer, sold all items except the cover-all. The most common items in the other seven were gloves and masks, and five also sold boots. Some stores not selling items said that no customers asked for it, or that a nearby store sold the items. Of those not selling items, two did not know where they could be bought. One dealer could point to a shop selling PPE 100 yards from their store. The others pointed to stores some distance away: one was 5-7 km from the dealer, and four cited the large dealer in the city of Solo, a distance ranging 10-30 km from their shops. Although a higher proportion of shops in Indonesia sold some items of PPE, the quality of the gloves was poor, and not all of them stocked the full range of sizes, while the masks were poorly fitting.

Pakistan

None of the dealers in Pakistan sold any items of PPE, nor did they know where these items could be bought. Some dealers said that it might be available in Lahore, but could not supply a dealer name or an address. Gloves and masks are available in the medical stores, but are designed for medical hygiene and would be unsuitable for heavy agricultural fieldwork or effective against chemical inhalation. They were not assessed as expensive relative to the annual average income. Normally farmers do not use any type of PPE.

Table 1. PPE sold in interviewed shops in China and Indonesia

Area	Items sold by dealer	Sizes	Price
China (10 Yuan = US$1.30) (1)			
Simao (store 5)	Gloves, rubber	Small, medium, large	Yuan 3.50
	Boots	Range	Yuan 14.00
Simao (store 4)	Gloves	Small, medium, large	Yuan 3.00
	Apron / coverall	One size	Yuan 9.00
	Boots	All sizes	Yuan 15.00
Simao (store 1)	Gloves	Small, medium, large	Yuan 3.00
	Apron / coverall	One size	Yuan 8.00
	Boots	Range of sizes	Yuan 14.00
Indonesia (10,000 Rupiah = US$1.10) (2)			
Solo city	Gloves, rubber	All sizes	Rp 13,500
	Gloves, plastic	All Sizes	Rp 5,500
	Cloth mask	All sizes	Rp 2,500
	Boots, rubber	41,42	Rp 45,000
	Goggles	All sizes	Rp12,500
Ngawi, east java	Gloves		Rp 2-13,500
	Mask (large)		Rp 8,000
	Boots	39,40,41,42	Rp. 28-40,000
Ngawi, east java	Gloves	Small, medium	Rp. 8,000
	Mask		Rp. 8,000
	Boots	37,38,39,40,41,42	Rp. 33-38,000
Ngawi, east java	Gloves		Rp 8,000
	Mask (large)		Rp 8,000
	Boots, rubber	38,39,40,41,42	Rp. 30,000
Sragen, central java	Gloves		Rp 7,500
	Mask		Rp 5,000
Karanganyar, Central Java	Gloves, rubber	All sizes	Rp 13,500
	Gloves, plastic	All sizes	Rp 5,500
	Boots, rubber	Out of stock	
Karanganyar, Central Java	Gloves		Rp 10,000
	Mask		Rp 6,500
	Goggles		

(1) In China the PPE listed would be affordable by the farmers living in the communities near to the three cities surveyed; in poor areas these prices may be not affordable.
(2) In Indonesia the cost of PPE is expensive for small-scale farmers; the price of a kilogram of rice is Rp. 4,000.

Dealer training and advice they convey to customers

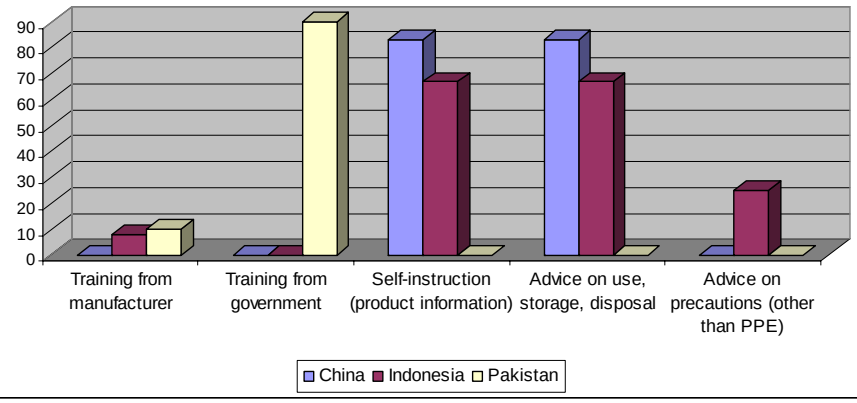
The traders were asked if they had received training from the manufacturer in order to enable them to provide advice about the product and whether they gave any advice to customers regarding application of paraquat. Figure 3 aims show the variation of training received and the kind of advice given. However the information is only indicative as some responses will necessarily be subjective, and dealers may not treat all customers in a consistent manner.

None of the traders in **China** had received training from Syngenta. Nevertheless 10 of these indicated they had learnt about the product themselves and gave advice to farmers. Generally the advice covered mixing and spraying; three provided advice on storage and disposal; one dealer advised on choosing paraquat because of its quick effect.

In **Indonesia** the store manager in one shop had been trained by Syngenta and is certified to sell paraquat products. Eight of the traders (67%) indicated that they offer information about handling of paraquat on dilution, mixing and spraying. They stated their intention to improve targeting and effectiveness and to minimise wastage and obtain good results. This information was supplied by the sales agents or distributor, or the dealers read the labels, brochures and leaflets and otherwise acquired the information themselves. Two of the eight indicated awareness of some precautionary measures: procedures for storage, mixing, spraying and disposal of empty containers; and another safety regarding mixing and spraying. Four traders said they believed that farmers knew how to use the product and the information required was printed on the label. One indicated that as a worker he would not provide advice, but if information was requested would ask the store manage to provide it.

In **Pakistan**, all dealers said they had received some training. The local divisions of the Department of Agriculture aim to provide approximately two weeks training for pesticide dealers, mainly covering products being sold. Eight of the ten had followed this training and one had followed a seven-day course. One of the dealers had received only one day, which may have been from the manufacturer. The manufacturers occasionally organise 'training' but this is usually for half a day discussing their products. Dealers do not give advice, though may sometimes discuss how to mix and use the product, or indicate that paraquat is dangerous.

Figure 3. Comparison of dealer training received and advice dispensed



Label recommendations and pictograms on Gramoxone products in the three study countries indicate the PPE to be worn when mixing and spraying. But in spite of this, and claims from a number of dealers that they recommend the use of PPE, the feedback from the same dealers and observations of the interviewers indicate that farmers in the areas concerned rarely wear the relevant PPE. In China the dealers indicated that the PPE is uncomfortable and inconvenient. Farmers' incomes are generally much lower than those living in large cities. While the farmers in this survey would be able to afford the PPE listed in table 1, other investigations carried out by PEAC have found that for poor farmers and those living in areas where economic conditions are generally poorer, farmers can buy some pesticides but cannot afford PPE. They also lack awareness of the need for PPE. Feedback from Indonesia suggests that PPE is not comfortable to wear, though certain farmers use masks.

Considering the life cycle of the product, researchers in China and Indonesia made general observations about reuse and disposal of the containers. In China two of the regions indicated that there was no disposal method for empty containers, and while not reused they are thrown away; there was no information about disposal from Simao. In Indonesia the empty containers are thrown 'anywhere' in the environment.

Condition of stores selling pesticides

Interviewers were asked to comment on the dealer premises in relation to general cleanliness, storage conditions, label conditions, availability of information for customers, safety posters. Some subjectivity is involved in this judgment, although the presence or otherwise of information warning of the risks of pesticides and use of PPE would provide measurable evidence

The survey in **China** found that the condition of most stores, including cleanliness, storage and labelling, was 'normal' to 'good'. However in two cases (one in Kunming and one in Simao) the store was not clean, and the storage condition in Simao was poor. None of the shops displayed information indicating risks associated with pesticides, the need for safety precautions or the use of PPE. Most had posters from the manufacturers advertising their pesticides.

In **Indonesia** the stores appeared to be adequate and clean, with items stocked in racks or cabinets and if other items were sold they were separated from pesticides. There were three exceptions: two of the stores stocked the pesticides near to fertilisers and seeds, and one stocked pesticides near food products and bottled mineral water. Most stores had the manufacturer's brochures about paraquat with instructions about application and PPE. No posters appeared to be available with general safety information and safe working practices.

Stores in **Pakistan** were generally in good condition. The shops displayed posters of the products they sold, some of which indicated the importance of such safety information as 'read the labels', but none displayed posters with health and safety information.

Discussion of findings

Paraquat is a hazardous pesticide whose handling and application require the use of PPE. This survey found that the majority of dealers in the three survey areas to do not stock the recommended PPE, and could not direct their customers to a suitable place to purchase it. The dealers in Indonesia were the best equipped of those studied, where seven of the 12 interviewed sold gloves and masks, and five sold boots. Nevertheless they do not stock all sizes, or the full PPE required. In a significant number of cases dealers who could not identify a shop selling PPE indicated that work clothes like gloves were available through a supermarket or DIY shop, or suggested that medical gloves could be bought in pharmacies.

The dealers and the survey teams observed that farmers and agricultural workers generally did not use PPE in their areas, suggesting that in addition to limited availability, it is either uncomfortable or expensive. The information from China suggested that PPE would be affordable by many of the farmers living near the three cities surveyed, but were not affordable in other areas. In Indonesia, the survey showing most stores selling PPE, it is regarded as expensive compared to income. In Pakistan PPE was assessed to be affordable by small-scale farmers in the area, but it was not on sale or available. The observations on affordability did not take into account such factors as: the quality of the PPE available; the need to regularly replace gloves and filters; or the need (recommended in the US) to discard clothing heavily contaminated with the product concentrate.

In the shops selling some PPE (mainly gloves, mask and boots), there was no awareness that gloves must be strong and impervious, that masks must have an effective filter, or that these items require regular replacement. Several dealers indicated that these items could be bought in a supermarket, in one instance suggesting that medical gloves were available in pharmacies, not recognising that the quality would be completely unsuitable for heavy agricultural work. For many of the farmers purchasing these products, and certainly for agricultural workers, these products are expensive and they lack awareness of their importance. Dealers are not aware of the importance of advising on PPE.

The detail of PPE specified on labels in the United States or Germany was lacking on the instructions in the countries surveyed. There are clearly 'double standards' between the requirements in developed and developing countries. No shops sold such PPE items as respiratory mask, mask filter replacements, goggles and impermeable aprons, with the possible exception of the large supplier in Solo, Indonesia. It seemed unlikely that farmers would make the effort to visit a range of shops, in most cases several kilometres from the dealer, to purchase these clothes.

Most dealers have not received training in the products they sell. They have limited knowledge and cannot give advice to their customers. The Chinese team concluded that while the product Gramoxone is widely distributed in rural areas of Yunnan province the dealers and consumers lack basic awareness of its hazardous properties, and of suitable PPE. The Indonesian team concluded that in the study areas "not many traders know or are knowledgeable about the paraquat products being sold in their stores. This includes both information about the properties of the active ingredient and the health consequences of using paraquat in an unsafe environment. The traders are not trained and have limited access to information about paraquat." In Pakistan eight of the ten dealers interviewed had undergone several weeks training in order to sell pesticides, but they were not able to provide detailed guidance on protection, or to direct their customers to a shop where they could purchase PPE.

Visual information on health and safety and reducing pesticide hazards, including on the use of PPE, was lacking in all areas. The shops commonly displayed posters from manufacturers about the products on display, but none carried general posters with information about the precautions to take when spraying pesticides, or demonstrating appropriate PPE.

Conclusion and recommendations

Article 3.5 of the Code of Conduct is addressed to all stakeholders.

The role of government is to ensure that products registered have been evaluated and that a risk evaluation takes into account the local conditions of use. Conditions are poorer than in industrialised countries, in terms of ability of pesticide users to protect themselves, shower after work, have access to regular changes of clothing, and have the appropriate knowledge, training, and access to PPE (Article 6.1.1). Many governments in developing countries lack the resources to implement regulations that they impose. For example the Indonesian government classified paraquat for limited use but has not enforced the restrictions and the product is freely available in rural areas for anyone to buy.

The pesticide industry has agreed to implement the Code of Conduct. Paraquat is a hazardous product, and a range of health problems are associated with exposure to the chemical. The label instructions on products in the surveyed areas, and likely in other developing countries, are less stringent than those in industrialised countries. This survey indicates the difficulty facing farmers and agricultural workers in acquiring the PPE specified on the label; and that there is no possibility of acquiring PPE specified on labels in industrialised countries. The areas surveyed were typical of the countries, and of many other developing countries. Under conditions where the standards established under the Code of Conduct are not met companies need to meet their obligations by withdrawing unsuitable products form sale.

The FAO is responsible for promoting the Code of Conduct and has oversight for its implementation. Greater efforts should be taken to monitor conditions of use and the availability of PPE in order to prevent sales of hazardous products, under poor conditions of use, and where the appropriate PPE is not available, affordable or practical to wear.

Recommendations to implement Article 3.5 of the Code of Conduct:

- Governments should take account of local conditions and protection of worker and farmer health when registering a pesticide, including in particular availability, affordability and practicality of required PPE. Pesticides that cannot meet the requirements of Article 3.5 should not be registered, and should be replaced with appropriate products or information and training to control pests without adverse effects under the local conditions of use

- Governments should ensure that pesticide dealers are registered and licensed as noted under Article 8.1.1 of the Code of conduct, and that they should: be trained; provide accurate information; sell PPE and/or display posters about necessary PPE and where it can be purchased locally; display posters on protection of human and the environment when applying pesticide

- Companies should meet their obligations under product stewardship to exercise responsibility for each product sold *'through to its ultimate use and beyond'*, which includes ensuring that all dealers selling their products are suitably trained and aware of the necessary PPE and hazard warnings, and that users are able to purchase and use suitable PPE

- Companies should take responsibility for withdrawing products from sale when the required PPE is not readily available or is uncomfortable and expensive

- The FAO should encourage governments to submit reports of monitoring (undertaken by government bodies, research institutes, industry, NGOs, traders organisations or others) of trading standards and availability of PPE for the local conditions of use from industry; monitoring reports should be collated and submitted to its Biennial Conference

Annex 1

Questionnaire for Pesticide Dealers and
Dealers of Personal Protective Equipment (PPE)

Part 1: interview with Pesticide Dealer

Date of interview

Name of interviewer / contact

Location of dealer (town, district, country)

Estimated number of other dealers in the area:

Name and address of dealer (for use of interviewer and analysis only, please indicate to dealer that anonymity will be respected and identities will not be revealed in any published reports)

1) What paraquat products do you sell?
Product name/s, manufacturer/s, Formulation/s sold (e.g. indicate mixtures; % of paraquat in formulations; whether the formulation includes a warning dye and smell)

1)

2)

3)

Authorised Syngenta dealer? Yes ☐ / No ☐

2) What PPE do you recommend to customers buying paraquat/Gramoxone (diluting, mixing, spraying)

3) Do the paraquat / Gramoxone products (focus on Syngenta products) that you sell recommend any PPE on the label? What are these recommendations? (Alternative: interviewer could ascertain this information from the products on sale – see note below on purchasing product / photographing labels)

4) Do you sell any PPE? If yes, indicate:

Equipment	Yes / no	Price	Size / sizes
Gloves			
Filter mask			
Respiratory mask			
Goggles			
Apron / other coverall			
Boots			

5) If PPE not sold, do you know where I could buy it? Yes ☐ / No ☐ …

If yes:
Location of PPE dealer

Distance from paraquat dealer

If no: interviewer please see Part 2

6) Could you explain what the pictograms on the Gramoxone label mean? (Interviewer: note answers for each pictogram – photograph labels and / or purchase bottle of Syngenta paraquat product. Add extra sheet for answer if necessary)

7) Have you had information or training from Syngenta about selling paraquat / Gramoxone products?

	Yes ☐ / No ☐
If yes: does this include (tick any that apply):	
Written information	☐
Information from sales person	☐ - No of hours / days ……
Training (indicate details below)	☐ - No of hours / days ……
Precautions to take when mixing or spraying	☐
Precautions to take on storage and disposal	☐
Other (please specify)	☐

8) Do you give customers advice when they buy paraquat?

	Yes ☐ / No ☐
If yes: does this include (tick any that apply):	
Information you received from the manufacturer	☐
Information you have learnt yourself about the product	☐
Precautions to take when mixing or spraying	☐
Precautions to take on storage and disposal	☐
Other (please specify)	☐

Interviewer to complete:

9) Comment on dealer premises: e.g. general cleanliness, storage conditions, label conditions, availability of information for customers, safety posters

10) If dealer sells PPE, comment on quality for items listed in table above (4) – especially of gloves, masks, boots:

Annex 2. Comparison of requirements for PPE and precautionary measures for paraquat and other herbicides sold by Syngenta in Germany

The table below shows different requirements for user protection in the instruction manuals* for herbicides sold by Syngenta in Germany (downloaded from the Syngenta Website www.syngenta.de 19 April 2007)

	Gramoxone Extra (Paraquat)	**Axial**	**Boxer**	**Callisto**	**Cirrus**	**Gardo Gold**	**Primus**	**Oratio**	**Reglone**	**Zoom**	**FUSILADE MAX**	**Dual Gold**	**Brasan**	**Mais-Banvel**
Avoid any unnecessary contact – misuse could cause damage to health	X	X	X	X	X	X	X	X	X	X	X	X	X	X
When handling the concentrate:														
Use protective gloves	X	X	X	X		X		X	X		X	X	X	
Use tight-fitting safety goggles	X	X	X	X		X			X	X			X	X
Protective clothing and shoes (boots)	X	X	X	X		X			X		X	X	X	
Apron (rubber)	X	X	X			X			X		X	X	X	
when handling and applying the diluted formulation														
Use protective gloves	X		X			X			X		X		X	
Use tight-fitting safety goggles	X													
Protective clothing and shoes (boots)	X		X			X			X		X		X	
Respiratory Mask with filter	X													
Special remark about the spray technique and about possible nosebleed and sore throat	X								X					
Total Requirements	**10**	**5**	**7**	**4**	**1**	**7**	**1**	**2**	**8**	**2**	**6**	**4**	**7**	**2**

Trade mark and corresponding active ingredient:
Gramoxone extra (Paraquat)
Axial (Pinoxaden)
Boxer (Prosulfocarb)
Callisto (Mesotrione)
Cirrus (Clomazone)
Gardo Gold (S-Metolachlor and Terbuthylazin)
Primus (Florasulam)
Oratio (Carfentrazon-ethyl)
Reglone (Diquat and Diquatbromide)
Zoom (Triasulfuron and Dicamba)
FUSILADE® MAX (Fluazifop-P-butyl)
Dual Gold (S-Metolachlor)
Brasan (Dimethachlor and Clomazone)
Mais-Banvel (Dicamba)

In addition to specific instruction manuals (Gebrauchsanleitung) Syngenta publishes a safety sheet (EG-Sicherheitsdatenblatt) with general indications (in most cases not differentiating between different active ingredients and diluted and undiluted formulations). In the safety sheet for most pesticides goggles, gloves, protective clothing and a respiratory mask (for high exposure) is required. A comparison of the safety sheets indicates that Gramoxone requires the highest protection standard of all herbicides. For more information about the personal protection the safety sheets refers to the instruction manual.

François Meienberg, 19.4.07

Annex 3. Research

China
Sun Jing, Deputy Director
Pesticide Eco-Alternatives Center (PEAC)
5f. Jiecheng Building, 540 Baiyun Rd., Kunming, Yunnan, P.R.China 650224.
Tel: 0086-871-5732769 Email: peac.paraquat@gmail.com
PEAC aims to reduce the adverse effects of pesticides in agricultural, urban and natural ecosystems in China and to promote ecological alternatives of pest control, so as to protect human and ecological health for sustainable development. The main activities relate to ecological and sustainable agricultural practices, and include farmer training, consumer education, protecting women's health, advancing alternatives and developing policy. Thanks to Cheng Xi, Wang Huajia, Chai Zhengqun, Li Wei, Li Qing, Chai Zhengqun, Yang Fang, Huang Jinfu and Song Guiyou, who gave support and helped to implement the survey in Kunming, Baoshan, Simao, Dali and Qujing.

Indonesia
Rossana Dewi R, Executive Director
Gita Pertiwi
P.O. Box 325, Solo 57103
Phone: 271-710465 email: gita@indo.net.id Website:www.gita.org.id
Gita Pertiwi works with local communities in below-poverty-line villages in Central Java. Its work helps to restore the fertility and productivity of agricultural land and local crops and enhance local food security. The targeted communities have benefited from plants with high protein levels.

Pakistan
Asim Muhammad Yasin
Interviewers: Amir Rashid, Sanaullah Anwar, Irfan Ali
Lok Sanjh
House 494, Stret 47, G-10/4 Islamabad, Pakistan
Phone: 00 9251-210-1043
lok_sanjh@yahoo.com; asimyasin786@yahoo.com
Website:http://www.loksanjh.org/
Lok Sanjh Foundation (LSF) is a Non Governmental Organization working with rural communities particularly with women farmers in Pakistan. The organization is registered under Societies Act 1860. It works in more than 70 villages in seven districts of Punjab, and with partners in Balochistan, Sindhand NWFP. Lok Sanjh Foundation aims at development and dissemination of pro-people, pro- poor, pro-women rural technologies for expanding choices for rural communities and augmenting rural incomes without harming social norms, local traditions and community food production system. Lok Sanjh promotes strategies for socially and environmentally sound agriculture

References

1 Food and Agricultural Organisation of the UN, *International Code of Conduct on the Distribution and Use of Pesticides*, Article 2, Terms and Definitions, Revised Version, 2002,
2 Food and Agricultural Organisation of the UN, *Guidelines for Personal Protection when working with pesticides in tropical climates, 1990*,
3 Isenring, R. Paraquat: Unacceptable health risks for users, Berne Declaration, Pesticide Action Network (PAN) Asia and the Pacific, PAN *UK*, 2nd edition, September 2006. http://www.evb.ch/en/p10285.html
4 Wesseling C, van Wendel de Joode B, Ruepert C, León C, Monge P, Hermosilla H, and Partanen T, Paraquat in developing countries, International Journal of Occupational Health 7(4), 275-286, 2001
5 Thiruchelvam M, Richfield EK, Baggs RB, Tank AW, and Cory-Slechta DA, The Nigrostriatal Dopaminergic System as a Preferential Target of Repeated Exposures to Combined Paraquat and Maneb: Implications for Parkinson's Disease**,** Journal of Neuroscience**,** December 15, 2000, 20(24):9207-9214
6 Ministry of Agriculture, Indonesia, 434.1/kpts/TP.270/7/2001 of 20 July 2001.
7 Brown R, Clapp M, Dyson J, Scott D, Wheals I, Wilks M, Paraquat in Perspective, Outlooks on Pest Management, December 2004 pp 259-267.
8 Isenring, R. op cit, pp 46-47.

9 US Environmental Protection Agency, R.E.D. FACTS, Paraquat Dichloride, Prevention, Pesticides and Toxic Substances (7508W), EPA-738-F-96-018, August 1997

[10] Syngenta UK website: http://www.syngenta-crop.co.uk/NR/exeres/938CD5E1-9CF6-4AFE-9193-58FBA9A9991A,frameless.htm

11 COMMISSION DIRECTIVE 2003/112/EC of 1 December 2003 amending Council Directive 91/414/EEC to include paraquat as an active substance, Official Journal of the European Union, 6 December 2003.

[12] Label of Gramoxone 200SL recorded by Francois Meienberg, Berne Declaration, in 2006, confirmed by Shahid Zia, Lok Sanjh Foundation, April 2007.

.