Hazardous pesticides and health impacts in Africa

Food & Fairness Briefing No.6

Suicide by swallowing pesticides is increasingly a concern for cotton farming communities, due to easy availability of hazardous products. PAN Africa documented 16 suicide cases in just 11 villages during 2002-2006. This man's teenage daughter attempted suicide but the hospital was able to save her. Velingara district, Senegal. Credit: PAN Africa.

Introduction

PAN UK's research with PAN Africa and other NGO partners during 2000-2006[1, 2, 3] has looked at patterns of pesticide use in smallholder communities in different countries and revealed high levels of dependency on pesticides, even in low value staple food crops. Despite rising costs, many smallholders' use of pesticides is increasing, mainly sourced through the flourishing informal market, which sells poor quality, often adulterated and unlabelled products. This briefing summarises the findings on the hazardous nature of pesticides most widely used by smallholders and data on poisoning incidence and health problems, with recommendations for taking action at policy and programme levels.

Do low levels of pesticide use mean low impacts?

Pesticide use in Africa makes up only 4% of the global pesticide market, with a very rough estimate of 75,000-100,000 tonnes of pesticide active ingredient used per year in the continent (compared to around 350,000 tonnes in Europe). Even compared with other developing countries, average pesticide use per hectare of cultivated land in Africa is very low: only 1.23kg/ha, compared with 7.17kg and 3.12kg for Latin America and Asia, respectively. These figures lead some policy makers to conclude that since the volume of pesticides used in Africa is so much lower than elsewhere, the risks and impacts must also be correspondingly lower.

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However, this ignores the hazards arising from the toxicity of the compounds used in Africa and serious shortcomings in handling practices, such as lack of protective equipment. Another mistaken assumption is that pesticide health and environmental impacts in Africa are mainly related to large-scale, commercial or plantation farms, while smallholder farming systems for food crops are generally viewed as low-input, with minimal or zero use of pesticides. It is true that pesticides tend to be used most intensively on African 'cash' crops, especially cotton, cocoa, oil palm, coffee and vegetables, yet many of these crops are grown predominantly by smallholders.

Trapped in hazardous practice

The research looked at farmers growing cotton, vegetables, pineapple, cowpea and mixed cereals and legumes in Benin, Senegal, Ghana and Ethiopia. We found that many farmers handle, apply, store and dispose of pesticides in ways that expose themselves, their families and sometimes consumers to serious risks. At least one WHO Class Ia (extremely hazardous) or 1b (highly hazardous) pesticide or toxic fumigant was in use in all the cropping systems, the exception being pineapple in Ghana. Class Ia and Ib products were most commonly used on vegetables, and farmers often spray up to a few days before harvest, so putting consumers at risk. Table 1. lists the nine most commonly used pesticides reported by case study farmers and their acute and chronic health and environmental hazards.

Most farmers do not use appropriate equipment or protective measures: in Senegal, only 44% of cotton farmers and 14% of vegetable farmers use protective clothing when spraying insecticides. Common work practices can add to the risk of using hazardous compounds: pineapple farmers in Ghana dip planting material in chlorpyrifos solution against mealybug pests yet rarely use gloves. As their hands usually have open cuts from handling spiny pineapple foliage, unprotected dipping increases the risk of chlorpyrifos being absorbed into the skin or bloodstream. When questioned, farmers explained that although they were aware of the health hazards, the main reason why they don't use proper protective equipment is that is expensive and often difficult to find.

In Benin, 81% of pineapple farmers and 43% of vegetable farmers interviewed reported that the effect of pesticides on their health was considerable or noticeable. In Senegal, 24% of cotton farmers and 20% of vegetable farmers had witnessed or heard of cases of pesticide poisoning. Ghanaian pineapple farmers described how spraying ethephon caused burning eyes and headache, especially if applied under hot sun. Two workers on a large pineapple farm had both experienced skin irritation after spraying insecticides, stomach problems after inhaling vapours and had been hospitalised with pesticide-induced illness for several days in one season. Farmers in Benin and Ghana growing cotton and cowpea reported the most regular ill health episodes after spraying insecticides, with symptoms including migraine, debilitation, stomach upset, skin and eye irritation, sore throat and coughing.

While these wide-ranging symptoms can be caused by many diseases, farmers highlighted that they were regular and predictable effects after spraying. Ghanaian farmers described a range of symptoms and intensity related to using different products:

• Endosulfan products raises body temperature, can give severe headache, stomach ache and serious debilitation (what farmers termed as 'feeling knocked down')

• Dursban (chlorpyrifos) exposure has similar effects to endosulfan without the debilitation but can also bring catarrh and skin rashes;

• Fenom C (profenofos +cypermethrin) causes immediate coughing and can produce burning sensation and itching, especially on delicate body areas.

Farmers described how exposure during spraying made them so weak and sick that they had to stay in bed for 2-7 days afterwards to recover. With several applications per crop, this meant losing between 15-20 days off work per season for cotton and cowpea farmers. Most farmers carried out some measures to try and mitigate some of the poisoning symptoms, mainly purchase of tinned milk drunk before or after spraying. For more severe poisoning episodes, they would buy paracetamol, traditional tonics or pay for saline drips or other treatment at local clinics. Regular sickness related to pesticide exposure thus costs farming households considerable sums of money, as well as time off work and lost productivity, estimated at up to US$90 per household (see F&F briefing no.2 on *Hidden costs of pesticide use in Africa*). Farmers viewed regular ill health from pesticides almost as a fact of farming life and felt powerless to change their situation. One young mother who suffered a miscarriage after inhaling pesticides on the family cowpea plots, said *"The pesticide does its job but it's the side effects we don't like. There is no option-we have to do this"*.

Active ingredient (chemical group)	WHO Class and acute hazards	Chronic and reproductive effects	Environmental hazards
1. endosulfan (organochlorine)	Class II Acutely toxic	Endocrine disruptor.	Very toxic to fish. Phytotoxic to some plants. EU Water Framework list of possible priority substances[1]. OSPAR Convention list for priority action[2] EU Dangerous Substances List II[3]
2. dimethoate (organophosphate)	Class II Acutely toxic Cholinesterase inhibitor	Endocrine disruptor Possible human carcinogen	Toxic to bees. Phytotoxic to some plants. EU Dangerous Substances List II. Potential groundwater contaminant
3. cypermethrin (synthetic pyrethroid)	Class II Mild eye and skin irritant. Possible skin sensitizer.	Endocrine disruptor Possible human carcinogen	Highly toxic to fish. Toxic to bees and aquatic invertebrates. Potential groundwater contaminant
4. chlorpyrifos (organophosphate	Class II Acutely toxic Cholinesterase inhibitor	Suspected endocrine disruptor Immune system abnormalities. Possible birth defects.	Highly toxic to fish and bees. High water pollution risk. Phytotoxic to some plants. EU Water Framework list of possible priority substances
5. fenitrothion (organophosphate)	Class II Acutely toxic Cholinesterase iinhibitor	Endocrine disruptor	Toxic to bees. EU Dangerous Substances List II
6. malathion (organophosphate)	Class III Acutely toxic Cholinesterase inhibitor	Endocrine disruptor. Suggestive evidence of carcinogenicity	Toxic to bees. Moderately toxic to fish. EU Dangerous Substances List II Potential groundwater contaminant
7. glyphosate (phosphonic acid)	Class III Slight acute toxicity Mild eye and skin irritant (due to co-formulant)	Suspected endocrine disruptor	Harmful to fish and aquatic life. Toxic to some soil microbes.
8. profenofos (organophosphate)	Class II Acutely toxic Cholinesterase inhibitor. Moderate eye and mild skin irritant		Toxic to fish and bees Potential groundwater contaminant
9. deltamethrin (synthetic pyrethroid)	Class II Acutely toxic Mild eye irritant	Endocrine disruptor Suggestive evidence of carcinogenicity	Toxic to fish and bees

Table 1.
Health and environmental hazards of most commonly
used pesticides reported by case study farmers in PAN UK research

Footnotes to table 1

1. Water Framework Directive 2000/60/EC. Its list of possible priority substances for cessation or phasing out of discharges to water bodies are still subject to review.
2. The 1992 OSPAR Convention for the Protection of the Marine Environment of the North-east Atlantic includes 14 chemicals for priority action, 12 of which have or had pesticide uses. Priority action list updated 2004.
3. Dangerous Substances Directive 76/464/EEC. List II substances have a deleterious effect on the aquatic environment, should be regulated by Member States to reduce pollution and are candidates for upgrading to List I hazard.
Sources:
The List of Lists. A catalogue of lists of pesticides identifying those associated with particularly harmful health or environmental impacts. PAN UK, London, updated Dec. 2005. www.pan-uk.org
PAN North America Pesticides Database www.pesticideinfo.org

Both these compilation sources are based on official hazard classifications by WHO, US Environmental Protection Agency, International Agency for Research on Cancer, EU, UK and German authorities.

Rural communities at risk

During 1999-2001 PAN Africa and the Beninois Organisation for Promotion of Organic Agriculture (OBEPAB) collected information on poisoning incidents by interviewing farm families in several districts in Senegal and Benin, along incident reporting guidelines developed by the Rotterdam Convention on Prior Informed Consent. Table 2. summarises data from the 703 incidents documented, analysed by gender and by age. On average, 16% of the 619 incidents in Benin were fatal and 23% of the 84 cases in Senegal.

Twelve different routes by which family members were poisoned were identified, of which application in the field accounted for 33% in Senegal and 24% in Benin. Contamination of food and re-use of empty containers for food and drink accounted for 57% of all cases in Benin and 86% of all fatal poisonings, showing how important this route is in putting families in danger (see briefing no.4 *Pesticide food and drink poisoning in Africa* for more details). Other routes included unsafe storage and inhalation in rooms, children playing with pesticides, confusing pesticides for other products, inappropriate use for treating headlice or ticks, as well as 67 suicide attempts and 2 cases of murder.

People often assume that poisoning risk is highest for those handling pesticides directly yet the data from Benin and Senegal shows that women and children feature significantly even though they generally are not the ones doing pesticide application. In Benin, children under 10 years old made up 20% and 30% of poisoning cases recorded in 2000 and 2001. High poisoning rates among women and children were also documented in Ethiopia, from statistics provided by the Amhara Regional Health Bureau for 2001 from hospital records. Women made up 51% of these 185 cases even though pesticides are almost exclusively sprayed by men in Ethiopia, while children 5-14 years old accounted for 20% of cases. Similar frequency of poisonings among women and children has been documented in recent studies in Ecuador[4] and in India[5], emphasising that pesticide-related ill health can seriously affect farm families and rural communities, yet government risk assessment generally only considers scenarios for male spray operators.

Widespread use of hazardous insecticides in the home, unsafe storage in kitchens and bedrooms, dangerous treatment of grains and beans and use of empty insecticide containers all contribute to these tragic figures. Washing pesticide-contaminated work clothing poses another risk. Using insecticides for home 'remedies' is especially dangerous- in Ethiopia, farmers used highly toxic insecticides to treat headlice, fleas and bedbugs, and even to try and cure open wounds, using malathion or DDT, sometimes with fatal results. Farmers explained that it was the poorest people who resorted to this potentially lethal 'cure'. Easy availability of such hazardous chemicals in rural areas contributes to increased suicide rates, particularly of women and teenage girls, mentioned as a growing worry by farmers in Ethiopia, and cotton farmers in Senegal and Benin.

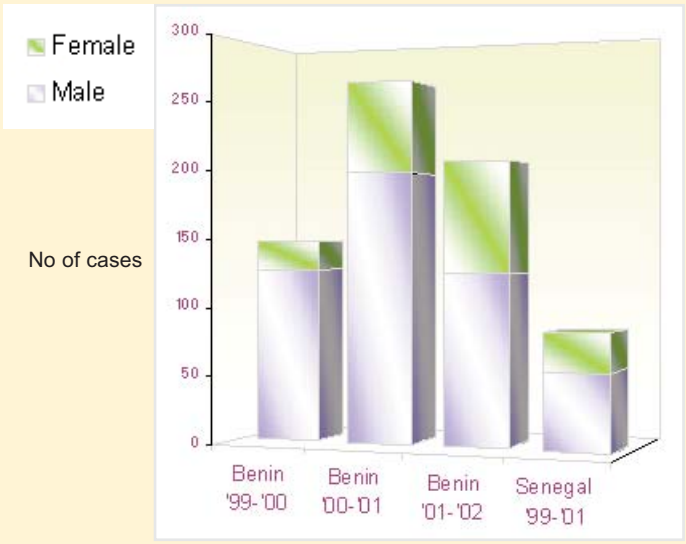

Table 2 Poisoning data by gender.

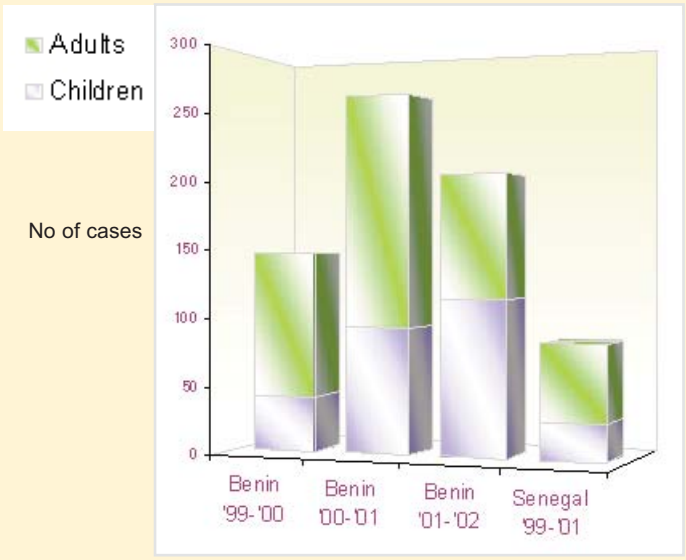

Table 2b - Poisoning data by age.

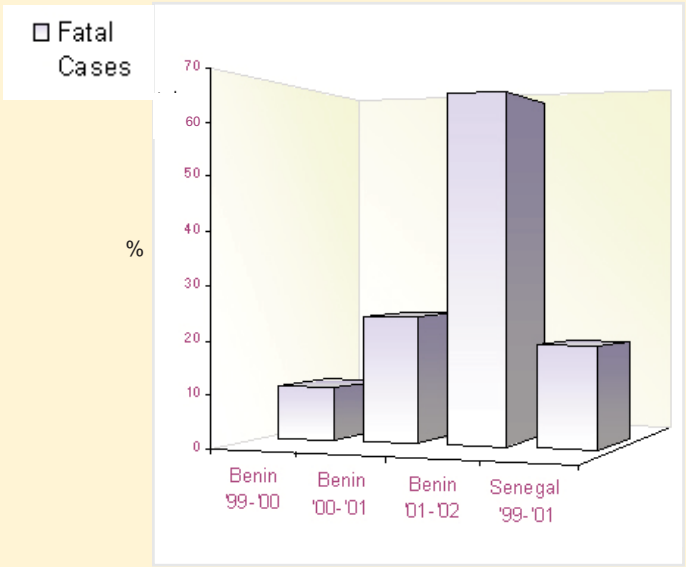

Table 2c - Number of fatal cases/total cases

Table 3. summarises data on specific pesticides responsible for poisoning incidents in Senegal and Benin. These show clearly the key role played by the insecticide endosulfan, responsible for 88% of fatalities in the 2000-2001 season in Benin, and the direct and harmful consequences of the decision to introduce it in 1999 for use by West African cotton farmers. Cowpea and cotton farmers in Ghana also pointed the finger at endosulfan as the main culprit for regular poisoning, along with chlorpyrifos, profenofos and lambda-cyhalothrin. In Ethiopia, acute poisonings were mostly linked with use of malathion and DDT.

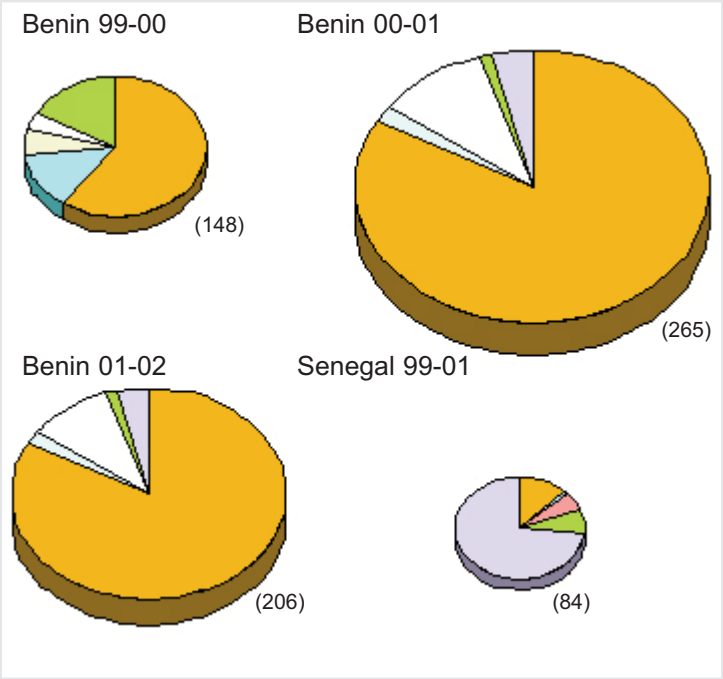

Table 3 - Products responsible for poisoning (Total Cases)

Active Ingredient Key

- **Endosulfan**
- cypermethrin + dimethoate (Sherpa, **Cystoate**)
- cypermethrin + chlorpyrifos (Nurelle)
- chlorpyrifos (**Dursban**)
- lambda-cyhalothrin + profenofos or cypermethrin (**Cotalm**)
- carbofuran + thiram + benomyl (Granox)
- Other named products
- Undetermined products

Products or active ingredients in bold were responsible for at least one death amongst this data.

What is striking from the data is the frequency of acute and fatal poisonings resulting from exposure to WHO Class II pesticides, indicating the huge problems associated with the use of these “moderately hazardous” chemicals under conditions of poverty and poor education. While government regulators, NGOs and growing sections of the food industry rightfully call for or take action to prohibit use of WHO Class Ia and Ib pesticides, the most acutely toxic to mammals, these findings draw attention to the need to consider Class II and even Class III compounds (e.g. malathion). Endosulfan is a case in point, where its persistence (it can remain active in soil, plants or food for weeks or months) combines with moderate toxicity and its widespread use in cotton-growing regions to represent a uniquely problematic risk profile. This is why PAN groups worldwide have called for a global ban on endosulfan, along with paraquat, a Class II herbicide, precisely because these compounds are documented to cause major health impacts. Similar conclusions on the serious problems with specific Class II pesticides were drawn by the Health Ministries in six Central American countries from an eight year poisoning surveillance programme[6]. They earmarked endosulfan, paraquat and chlorpyrifos among a region-specific ‘Dirty Dozen’ list proposed for regional banning. The remainder were Class Ia and Ib insecticides.

Farm families may be highly exposed to hazardous pesticides through unsafe storage practices. Cowpea farmer keeps her insecticides in the household grain store, Northern Region, Ghana.
Credit: PAN UK

The scale of pesticide-related ill health

There are virtually no estimates of the levels of pesticide acute poisonings or of chronic ill health impacts in African countries, as Health Ministries lack the resources to conduct surveillance programmes. Incident documentation by trained NGOs is therefore extremely valuable to fill this data gap and is welcomed by WHO and FAO experts working on pesticide health issues. PAN Africa is now training rural communities to carry out their own health monitoring in relation to pesticide exposure, in order to gather evidence of the levels of ill health.

OBEPAB's 619 incidents in Benin were reported from 77 villages in 12 districts in two cotton growing regions of Borgou and Alibori. Translating these figures into annual poisoning incidence terms, reveals a frequency estimate of 21.3 serious poisonings per 100,000 population in 2000-01 (the season with highest documented cases) and 11.9 per 100,000 in 1999-00 (the lowest). Fatality incidence per year ranged from 0.8 to 1.9 deaths per 100,000 people.

Calculations from the official figures from Amhara Regional Bureau of Health in Ethiopia give 1.1 poisoning cases per 100,000 population, for those attended at clinics and hospitals. Incidence figures could not be calculated from the information supplied by Ethiopian farmers. However, their recall of six pesticide ingestion suicides and four fatalities from using undiluted insecticides to cure open wounds or treat headlice in three villages with a population of 14,000, raises concerns about the potential scale of serious poisoning.

Regular ill health from pesticide exposure may not be as dramatic as serious poisonings but can be far more widespread. Cotton and cowpea farmers in Ghana estimated that 33-60% of economically active people in their villages were adversely affected each season after spraying pesticides. Although farmers were worried about the immediate effects in terms of losing days off work, they viewed the symptoms as temporary 'mild' poisoning. However, scientific studies provide growing evidence that regular exposure to neurotoxic and other pesticides can lead to chronic impairment of the nervous, immune, reproductive and hormone systems in humans. Children are particularly vulnerable as their organs are still developing.

Detailed research on pesticide-related ill health in smallholder farming communities in Ecuador[4] has highlighted the 'invisible' face of chronic exposure to hazardous insecticides, from low-level but cumulative effects on the nervous system, motor coordination and behavioural function. Levels and patterns of exposure to some of the insecticides were found to adversely affect farmer decision-making capacity to a level that would justify worker disability payments in developed countries. The regular episodes of ill health caused by neurotoxic insecticides described by African farmers could have similar consequences. Furthermore, the effects of pesticide toxicity and the body's ability to cope with this are influenced by general levels of health and nutrition. For many African smallholder families, malnutrition, poor sanitation and widespread infectious diseases, including malaria and HIV/AIDS, will make them less able to recover from pesticide poisoning (see Briefing no. 5 on the role of pesticides in suppressing the immune system).

Hazardous insecticides (endosulfan and monocrotophos in this case) are delivered to thousands of African cotton growing villages like this one in Senegal each season, without proper controls on their use and against the recommendations of the FAO Code of Conduct.
Credit: PAN Africa

Issues for policy makers, development agencies and the food and farming sector

The FAO Pesticide Code of Conduct (see briefing 3.) makes specific recommendations to governments on controlling hazardous pesticides and taking action to minimise health impacts. These include carrying out health surveillance, documenting poisoning cases, training health staff on treatment of cases and avoiding the use of pesticides which require the use of personal protective equipment, particularly for smallholders in tropical countries. It recognises that prohibiting the use of highly toxic Class I pesticides may be desirable.

In 2006, FAO acknowledged that existing controls on pesticides are inadequate and removing the most hazardous pesticides from the market is the only option to stem the tide of ill health in developing countries. It has prioritised a 'progressive ban on highly toxic pesticides' and is currently designing how this could be achieved and which pesticides to include beyond Class I categories[7].

- Responsible companies should take action on specific hazardous pesticides for phase out in their farms and by producers in their supply chains. Endosulfan, paraquat and chlorpyrifos deserve special attention among the Class II compounds.

- Food companies, NGOs and Agriculture Ministries should share experiences on phasing out hazardous pesticides and disseminate information in farmer-friendly formats.

- Donors should support NGOs to conduct community health monitoring and poisoning incidence research. Involving rural communities empowers people to be proactive in pushing for policy change on pesticide use.

- Local radio slots organised by NGOs with testimonials from affected families have proved effective in alerting farming communities to specific pesticide hazards and reducing poisoning incidence.

- Health Ministries should collaborate with local government, agricultural extension staff, universities, trade unions, farmer associations and NGOs to expand and strengthen poisoning surveillance.

- African pesticide regulatory agencies should prioritise and speed up registration of less toxic compounds, including biopesticides and botanical extracts, with donor support for regional registration schemes.

Unprotected spraying of hazardous insecticides by a farmworker on a tomato smallholding, Les Niayes region, Senegal.
Credit: PAN Germany.

References

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2. Williamson, S. (2005) Breaking the barriers to IPM in Africa: Evidence from Benin, Ethiopia, Ghana and Senegal. In: The Pesticide Detox: Towards a more sustainable agriculture, Ed. J Pretty, Earthscan, London, pp.165-180

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4. Cole, D.C., Sherwood, S., Crissman, C., Barrera, V. and Espinosa, P. (2002) Pesticides and health in highland Ecuadorian potato production: assessing impacts and developing responses. International Journal of Occupational & Environmental Health 8 (3) 182-190.

5. Mancini, F., Van Bruggen, A.H.C., Jiggins, J.L.S., Ambatipudi, A.C. and Murphy, H. (2005) Acute pesticide poisoning among female and male cotton growers in India. International Journal of Occupational and Environmental Health 11 221-232.

6. Rosenthal, E. (2005) Who's afraid of national laws? Pesticide corporations use trade negotiations to avoid bans and undercut public health protections in Central America. International Journal of Occupational and Environmental Health 11 437-443.

7. New Initiative for Pesticide Risk Reduction, FAO Committee on Agriculture, 20th session, Rome, 25-28 April 2007, ftp://ftp.fao.org/docrep/fao/meeting/011/j9387e.pdf

Further Reading

Briefings in the Food & Fairness series

1. Which pesticides are banned in Europe?
2. Hidden costs of pesticide use in Africa
3. The FAO Pesticide Code of Conduct: new responsibilities for food companies
4. Pesticide food and drink poisoning in Africa
5. Pesticides, immune suppression and HIV/AIDS
6. Hazardous pesticides and health impacts in Africa.

The Chemical Trap: Stories from African fields. PAN UK, 2007.
Living with Poison. Problems of endosulfan in West African growing systems. PAN UK, London, 2006. Available via http://www.pan-uk.org/Projects/Cotton/Resources/index.html#other

The Deadly Chemicals in Cotton.
A new report by Environmental Justice Foundationin collaboration with PAN UK, 2007.

PAN UK activities and publications with African partners in the African Stockpiles Programme and other work on pesticide impacts via
www.pan-uk.org/Projects/Obsolete/index.htm

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PAN UK's project Food & Fairness: changing supply chains for African health and welfare addresses issues of food safety, quality and environmental requirements in European markets and impacts on smallholder livelihoods in African horticulture and commodity crops. One theme is how food export, retail and processing companies could combine support for small and medium growers with efforts for pesticide residue reduction and safer pest management, as part of corporate social responsibility. Another is how to develop consumer demand and incentives for safer food and farming in African local markets.

For more information, please visit the PAN UK Food & Fairness webpages via http://www.pan-uk.org/Projects/Fairness/ or contact Stephanie Williamson, International Project Officer email stephaniewilliamson@pan-uk.org

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