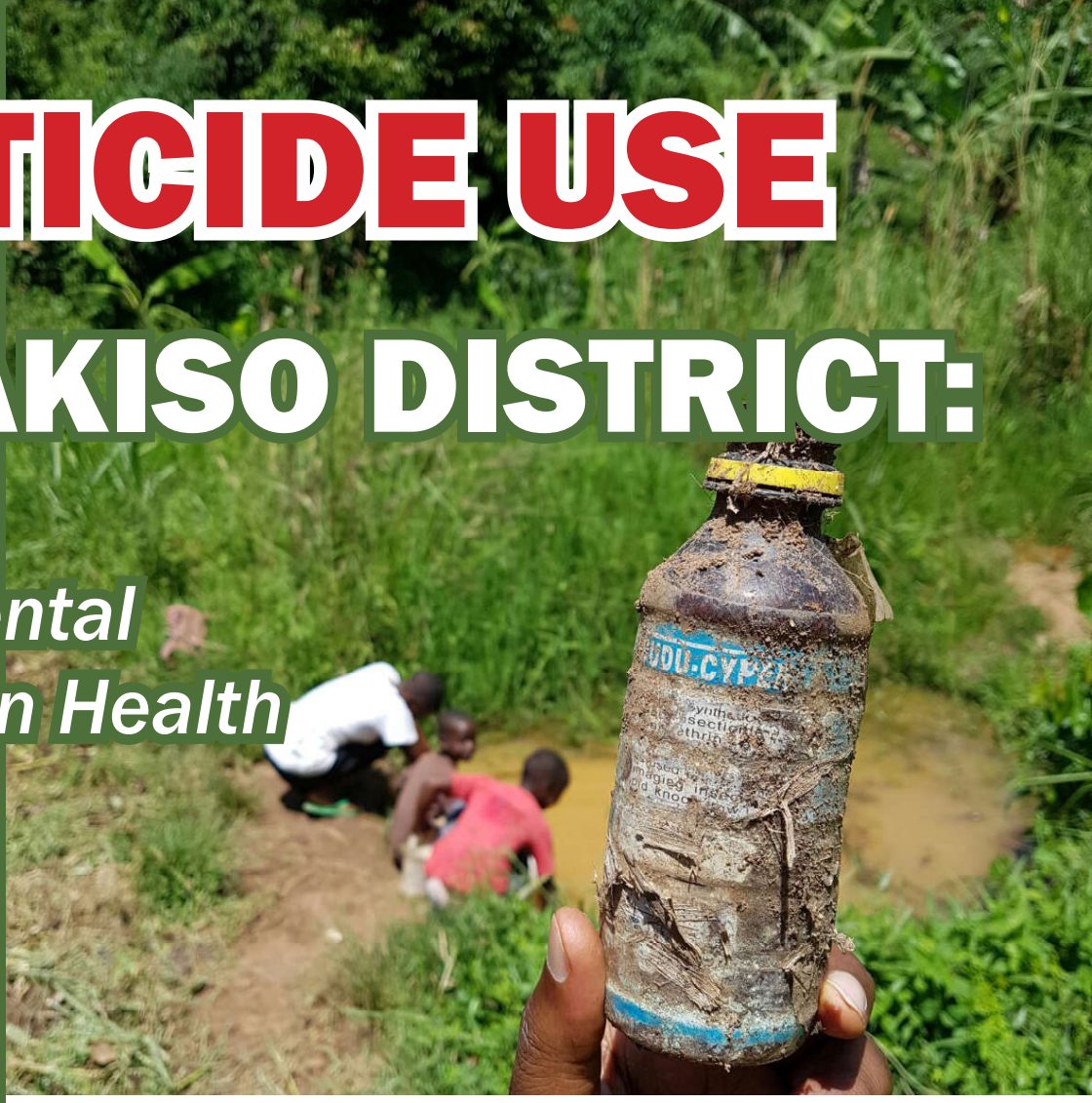
PESTICIDE USE IN WAKISO DISTRICT:

Effects on Environmental and Human Health



PESTROP Project

CONTACT DETAILS

Mr. Aggrey Atuhaire
Uganda National Association of Occupational and Community Health (UNACOH)
Phone: +256 754591136
Email: atuagrey3@gmail.com

Dr. Christian Stamm
Swiss Federal Institute for Aquatic Sciences and Technology (EAWAG)
Phone: +41 58 765 5565
Email: christian.stamm@eawag.ch

Dr. Mirko Winkler
Swiss Tropical and Public Health Institute (Swiss TPH)
Phone: +41 61 284 8339
Email: mirko.winkler@unibas.ch

Abstract

In this brochure, you find information about the results of the analysis of pesticides in drinking water and rivers in the year 2017, and some results on pesticide use and the corresponding health effects in farmers applying these compounds. This brochure also contains findings from a study conducted to better understand why people use or don't use equipment to protect themselves when applying pesticides.

These studies are part of the joint project "Pesticide Use in Tropical Settings (PESTROP)" carried out by Uganda National Association of Community and Occupational Health (UNACOH), Makerere University, District Government Analytical Laboratories (DGAL), Swiss Institute of Tropical and Public Health (Swiss TPH), the Swiss Federal Institute of Aquatic Sciences and Technology (Eawag), and the University of Bern.

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1

Environmental assessment: Residues of pesticides in rivers and drinking water

Figure 1. Stream water sampling.

What was done?

Between September and November 2017, water samples were taken at five locations along the streams of Mayanja river basin. Moreover, grab samples were taken every months at different drinking water sources (4 Boreholes, 4 fetch ponds and 2 springs) (Figure 2).

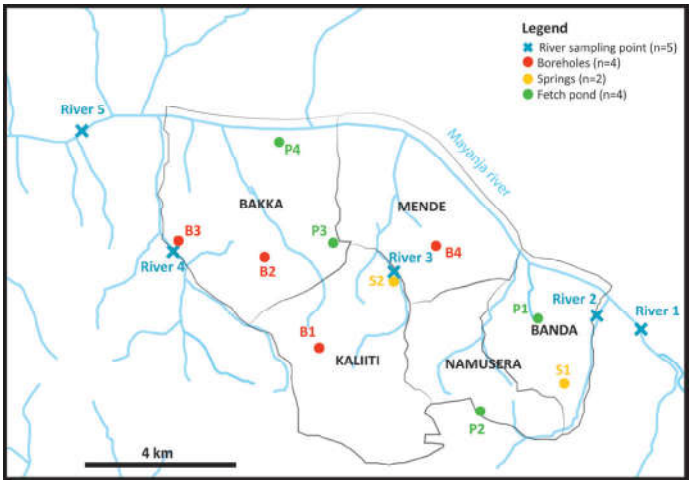

Figure 2. Sampling sites in rivers, streams, wells and boreholes in the Mende subcounty.

Results

Drinking water: In water samples of the boreholes, 21 different pesticides were found in low concentrations (< 30 ng/L). In spring water, only two pesticides were found below 10 ng/L. It seems, that the drinking water quality regarding pesticides was not of concern at these locations during the study period. However, it has to be taken into account that we did not test the water for pathogens.

Rivers and fetch ponds: Fourty different pesticides and transformation products were detected in the investigated Mayanja river catchment. Out of these, 32 were found in fetch ponds and 16 in the Majanga river and its side streams.

In the fetch ponds, 2,4-D and carbendazim were detected at levels up to 3 µg/L, which can be concerning for human health if this water is used for domestic purposes.

In the river, 2,4-D concentrations were the highest (up to 790 ng/L). The concentrations observed for 2,4-D, chlorpyrifos, cyhalothrin and deltamethrin pose risks for aquatic water organisms.

Handling of leftovers from pesticide application: Twenty percent of farmers using synthetic pesticides pour leftovers into the river or streams. Most other farmers pour it on their farm grounds. Both methods are risky compared to the use of specifically designated biological beds for pesticide residues.

What can be done?

- Only apply the recommended dose for each pesticide.
- Mixing of pesticides, washing of equipment and disposal of leftovers should be done only in specifically designated 'biological beds'.
- Apply the triple rinsing method for empty pesticide containers.
- Fetch pond water should not be used for domestic use such as cooking, washing food or clothes, or feeding of animals. Use water from boreholes or springs.
- Creation of buffer zones and drainages to prevent runoff into fetch ponds, boreholes, or rivers.

2

Exposure to pesticides and their effects on health of smallholder farmers in Wakiso District

What was done?

From September to November 2017, a study was carried out in the Wakiso sub counties of Mende, Masulita and Gombe with 302 smallholder farmers applying different pest management strategies such as the use of synthetic or organic pesticides.

The farmers were asked questions related to pesticide use, agricultural practices, family, home, and health condition. Tests were also applied to know their ability to concentrate and to remember things. After a successful first visit, farmers were invited a second time after two to three weeks. In both visits, famers gave a urine and a blood sample to determine pesticide residues. Most of the farmers also gave samples of hair and toenails, and their height, weight, waist size and blood pressure was measured (Figure 3).

Figure 3. Measuring blood pressure from a participant.

Results

Knowledge about risks of pesticides: Most farmers (90%) considered that pesticides couMost farmers (90%) considered that pesticides could be dangerous to their health. The majority of farmers (56%) said that family members wash the clothes used for applying pesticides, which could expose their relatives to pesticides and health risks that come with them.

Use of personal protective equipment: Gumboots, long-sleeved pants and shirts are commonly available among farmers (65-80%) but not always used when applying pesticides (30-65%). Eyes, airways, and hands are rarely protected when applying pesticides. Overall, access and use of personal protective equipment (PPE) is considered low (Figure 4).

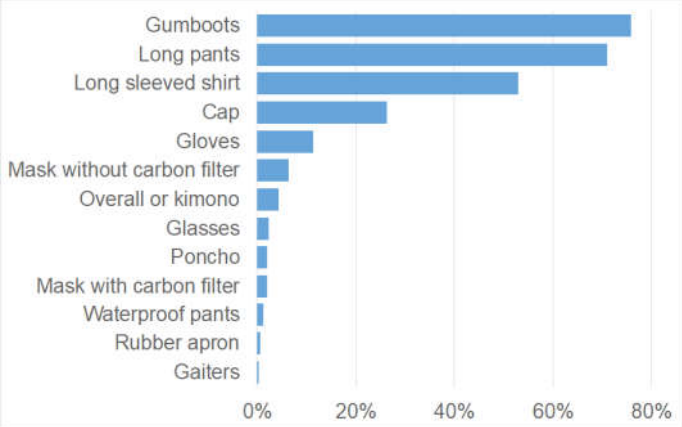

Figure 4. Distribution of the use of personal protective equipment in study population

Training in pesticide use: Only one in four (23%) farmers has received training in pesticide use, such as proper application techniques, storage, or safety procedures. Among the users of synthetic pesticides, the numbers are even lower (14%). Training is provided by NGOs or governmental agencies, but rarely by commercial suppliers.

Poisoning by pesticides: Only ten farmers (out of 302) self-reported an acute pesticide poisoning, but more than half of them (55%) reported feeling changes in their body or health within 24h of applying pesticides. Specifically, two out of three farmers (66%) applying exclusively synthetic pesticides reported having felt changes in their body or health after applying pesticides.

Acetylcholinesteraselevels: The acetylcholinesterase is an important element (enzyme) for the nervous system, whose activity decreases when people are in contact with high quantities of organophosphorus pesticides and some carbamates. The levels of this substance were measured in the blood samples of the farmers. The study found that almost all farmers (98%) had normal levels of acetylcholinesterase in their blood (Figure 5).

Figure 5. Blood sampling from a participant

Biomarkers in urine: For 50 participants, urine samples were analysed. Residues (biomarkers) of five different pesticides or pesticide classes were found in all urine samples, but in different concentrations. Higher concentrations of biomarkers for Mancozeb, 2,4-D, Glyphosate, Pyrethroids and Cypermethrin were found for those farmers who have used these pesticides in the week before (compared to non-users). A biomarker for Chlorpyrifos was also found in high concentrations, especially in those who used the pesticide over the past year. Chlorpyrifos concentrations were also higher in farmers who spray unspecified pesticides against bedbugs or spray pesticides on their cattle. (Figure 6).

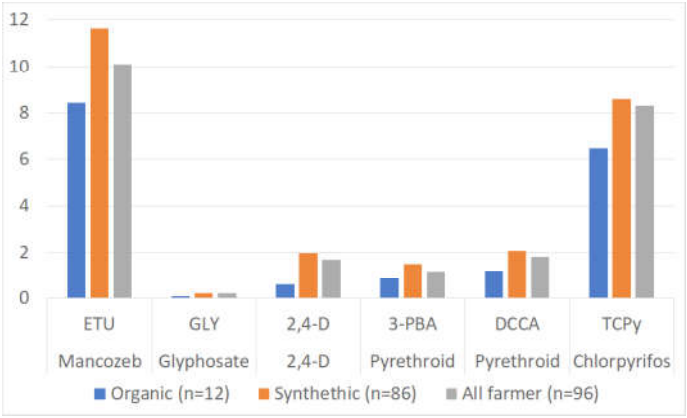

Figure 6. Distribution of pesticide levels in urine (ng / mL) of farmers in the study area by type of farm.

Neurobehavioral testing: Findings showed that there seems to be a connection between the application of synthetic pesticides exclusively and psychiatric distress, symptoms of depression, anxiety and somatization. Overall, the ability to concentrate and to remember things was consistently lower among Ugandan farmers when compared to farmers from other countries. It is, however, unclear whether this finding has anything to do with farming practices (Figure 7).

Figure 7. Testing of memory and attention

What can be done?

To reduce direct contact with pesticides:

- Setup warning signs during and after spraying in houses or the fields.
- Avoid entering the fields immediately after pesticides are applied.
- Ask the neighbours of the farm to close their windows during the pesticide application.
- Harvest the crops only after the withholding period indicated on the label of the pesticide product used (minimum time that must pass between the last application of pesticides and the harvest).
- Wash vegetables and fruits thoroughly before selling on the market.
- Wash vegetables and fruits thoroughly before consumption.
- Do not use agricultural pesticides for household pest control.
- Before pest control within the house, store away food items and clean kitchen utensils afterwards.
- For pest control within the house, also use personal protective equipment (PPE).
- Do not wash work-clothes with your other clothes.
- Use gloves when washing work-clothes.

3

Pesticide management: Differences in information need and search Figure caption:

What was done?

Among 50 smallholder farmers we conducted in-depth interviews to understand their need for information on pest management, and how they search, acquire and use it (Figure 8).

Results

We observed synthetic pesticide use to be the default pest management strategy, with its information providers being well-integrated into farmers' daily lives. Information on organic strategies, on the other hand, is available only rarely through external inputs. These external providers use information channels outside of the farmers' everyday lives and seem to lack an understanding of the needs of these farmers and their communities.

There were two reasons why farmers started looking for new information. One, when starting a new farming practice, and two, when something unexpected happened, such as arrival of a new pest.

The farmers used different information sources for different types of strategies. More sources were available for synthetic pesticides than for alternative strategies. While seeking information, farmers focused on information sources located within their communities. Farmers look for tacit and location-specific information that is orally transmitted from credible sources and is testable.

Farmers developed an information need upon starting a new farming practice or receiving information disrupting established behaviour, such as encountering new pests.

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What can be done?

We recommend

- Leveraging established information channels among pesticide users to promote safe use practices.
- Making information about organic and integrated pest management more continuously available in farmers' lives.

Figure 8. Interview at a farm.

4

Motivations and barriers for using personal protective equipment

What was done?

In a survey in 2018, 309 smallholder farmers, who were currently applying synthetic pesticides on their farms, were interviewed about their personal opinions and beliefs about pesticides and related topics. We wanted to know what farmers thought about using personal protective equipment disposal, what motivates them, and what keeps them from applying pesticides in a safe way. This information can guide intervention and training programs in the future.

Results

On average, men were using more PPE than women. Farmers who have received education on PPE or are members of farmer groups use PPE more often. This shows the value of trainings.

Farmers are aware of the health risks related to pesticide use and felt more vulnerable when using less protection; most believed in the effectiveness of protective measures showing high acceptance of protective equipment. Farmers did not express discomfort using the equipment under the given climate. Most farmers feel proud when using more PPE. Some farmers were not aware of the safety labels on pesticide containers, which can help to inform correct application and safe handling.

Most farmers did not see many others using full PPE (Figure 9). However, most felt that their family members (and other people they like) would approve if they used more protection. Additionally farmers give very high personal importance to PPE use. This shows that farmers are ready to adopt safe pesticide use.

Most farmers know where to buy new PPE. The cost for a full set of PPE is considered moderate, but needs some financial planning for the investment. Farmers were generally highly confident that they are able to correctly and consistently use recommended protective equipment in the future, if it were available.

What can be done?

- Attend farmer trainings whenever possible.
- Organize yourself in groups to share information and knowledge on safe pesticide handling.
- Listen to your close relatives, their opinion might matter.
- Be a role model and wear PPE. Use what you have whenever you can and create a positive image.
- Using protective equipment does not mean you are weak, it shows that you are protecting your health.
- Learn about available protective measures and pesticide container labels.
- Try to have more PPE available (e.g. by sharing between families or asking your local shop owner to provide them in stock).
- Save money to buy better PPE. It is an investment in your own future.

Figure 9: Pesticide residues on farmer's hands

5

Institutional assessment: protection of resources and policy coherence

What has been done?

We investigated existing public policies and property laws to understand whether and how water and occupational health are protected from agricultural pesticides. In an in-depth document analysis, we looked at the content of 30 policy documents (laws, regulations and action plans). We furthermore validated the content analysis with ten expert interviews (from government institutions, academia and civil society organizations).

Results

Protection of water: Policies exist to protect the aquatic ecosystem and drinking water (e.g., the Land Act, the National Water Policy, the Plant Protection and Health Act, the Water Act, the Water Resources Regulations, National Environment Act and the National Environment Management Policy) and nine out of fifteen refer to pesticides as a problem for the aquatic ecosystem and drinking water. Water is considered a common good, but property titles are not well allocated among the different users. Several policy measures are in place to protect water (e.g., water permits, financial disincentives for pollution of water bodies or the authorities' duty to inform about environmental issues). These measures target polluters in general, not specifically addressing farmers and their pesticide use as potential source of water contamination.

When talking to experts, they agreed. Their main concern lies in the fact that water quantity is prioritized over water quality (e.g., weak monitoring of water quality). They furthermore underlined that water management is still too centralized and that local ordinances to protect water bodies might be more effective to regulate farmers' pesticide use. Theses experts also stated that persuasive policy measures (e.g., awareness raising and informing about environmental issues) are not sufficiently implemented, which might also be the result of lacking financial resources at the implementing agencies.

Protection of occupational health: Several policies exist to protect occupational health from pesticide exposure (e.g., Agricultural Chemicals (Control) Act, the National Environment Act, and the Occupational Safety and Health Act). Pesticide exposure is generally considered a risk for occupational health. However, existing policy measures do not address farmers and farm workers directly, which means that this group does not enjoy the necessary protection from pesticide exposure.

When talking to experts, they agreed. They also mentioned that farmers do not have the right equipment and do not have professional training to apply pesticides safely. Agro-input dealers also play a critical role in safe pesticide use. The experts say they need to be trained better.

What can be done?

To protect water:

- Redefine property titles.
- Showcase the environmental problems related to pesticide to decision makers (with scientific evidence).
- Make policy measures more target group specific (farmers).
- Strengthen the local levels of government and enhance collaboration between local and national level.
- Strengthen government bodies responsible for implementation.

To protect occupational health:

- Increase number of inspectors to assure a safe working environment.
- More policy measures are needed to protect occupational health, and particularly farmers from pesticide exposure.
- Promote self-protection e.g. through persuasive policy measures (information campaigns and awareness raising).

Acknowledgements

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