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UNIVERSITY OF CAPE TOWN

Pesticide Discussion Forum:
2019 Summary Digests Compilation

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Introduction

This document is a compilation of the digests from this year's pesticide discussion forum sessions. For the year of 2019, 20 digests were disseminated to the forum participants. To locate the different digests, refer to table 1 (Table of Contents).

About the Pesticide Discussion Forum

The Division of Environmental Health (DEH) Pesticide Discussion Forum is a bi-monthly online seminar for pesticide regulators, resource persons and other interested persons in the field as well as students in the Postgraduate Diploma in Pesticide Risk Management (DPRM) course. The DEH is in the School of Public Health and Family Medicine at the University of Cape Town (UCT).

The Pesticide Discussion Forum was established in 2009. It aims to encourage in-depth discussion of issues regarding pesticides and the regulation of pesticides in low and middle-income countries. Regulators, students and resource people meet twice a month to discuss topics proposed by Forum members. The aim of the Pesticide Discussion Forum is to provide knowledge and support for managing pesticide risks and implementing risk reduction strategies as well as establishing a forum conducive to information exchange and learning.

The views of the Forum and opinions expressed in this publication shall not necessarily be taken to reflect the official opinion of the DEH, UCT and the participant's relevant organisations.

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Disclaimer

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2019 Pesticide Discussion Forum Schedule of Events

No	Date	Topic	Presenter	Chair
1	07 February	Regulation of Biocides	Stefanie Wieck	Bai Bittaye 2nd Year DPRM student
2	21 February	Training small holder farmers on pesticide handling and application	Chiatoh Maryben Kuo	Cebsile Dlamini 2nd Year DPRM student
3	28 February	FAO Registration Toolkit	Ivy Saunyama	Paul Mwambu 2nd Year DPRM student
4	14 March	Farmer field schools and pesticides	Raymonda Johnson	Hussein Abaker 2nd Year DPRM student
5	04 April	Pesticide Exposure and Health Effects	Samuel Fuhrimann	John Mwanja 2nd Year DPRM student
6	18 April	Understanding Pesticide Toxicity	Rina Guadagnini	Carron Naidoo Research Assistant
7	02 May	Environmental risk assessments and pesticides	Debbie Muir	Maguette Ndiaye 2nd Year DPRM student
8	16 May	Self-harm and HHP's	Michael Eddleston	Ginnel Ozaeta 1st Year DPRM student
9	30 May	Sticky pesticides and chemical application	Lawrence Malinga	Jane Mdwegele 2nd Year DPRM student
10	13 June	low-risk alternatives to HHP's in LMIC's	Francesca Mancini	Debbie Muir 1st Year DPRM student
11	27 June	Globally Harmonised System	Lennart Dock	Dominic Phiri 1st Year DPRM student
12	18 July	Rotterdam Convention	Mohamed El hady Sidatt	Jane Mdwegele 2nd Year DPRM student
13	01 August	Integrated Vector Management	Henk van den Berg	Pritchard Mukuwa 1st Year DPRM student
14	15 August	Biological Monitoring of Pesticide Exposure	Raphael Mwezi	Brian Hadebe 1st Year DPRM student
15	29 August	Glyphosates and their use	Debbie Muir	Charles Ssemugabo 2nd Year DPRM student
16	12 September	Using modern technology for pesticide application	Graham Matthews	Mphumelelo Mdlovu 1st Year DPRM student
17	26 September	Child labour and exposure to pesticides	Nadia Correale Jessie Fagan	Akpene Dougna 1st Year DPRM student
18	10 October	TBD	Sam Adu-Kumi	John Mwanja 2nd Year DPRM student
19	24 October	Challenges in managing empty pesticide containers in LMICs	Raymonda Johnson	Thembisa Majola 1st Year DPRM student
20	07 November	Biopesticides in Integrated Pest Management of the Fall Armyworm	Dennis Ndolo	Bianca Dlamini 1st Year DPRM student

Issue 01: Regulating biocides

Pesticide Discussion Forum Summary Digest

Issue 01 of 2019
Forum Date: **07 February 2019**

Regulating biocides

Lower and middle-income countries (LMICs) are currently experiencing increasing population size, increased urbanization and growing economies which now strive to increase food production to feed growing populations. Pesticide application rates are continuously on the rise to ensure the quick and inexpensive production of food. Despite the advantage of increased food production, pesticides have been known to cause damage to the environment and human health, negatively impacting agricultural production and reduced agricultural sustainability. In LMICs, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries through incorrect application techniques, poorly maintained or inappropriate spraying equipment, inadequate storage practices, and often the reuse of old pesticide containers for food and water storage. They often lack the knowledge for effective handling and application of pesticides which is essential for effective pest management and pesticide risk reduction. The importance of training farmers on effective handling and management of pesticides therefore must be emphasized.

About the Presenter

Stefanie Wieck is an expert in environmental risk assessment of biocidal products. She has a diploma in environmental engineering and currently works at the German Environment Agency, running the environmental risk assessment of biocidal active substances and biocidal products within Regulation (EU) 528/2012. To get in touch with Stefanie, you can email her at: stefanie.wieck@uba.de.

1. Is there a specific regulation on biocidal products in your country? If yes, how are they defined, how is the regulation designed, and which ministry oversees it? If not, are some product types regulated in other regulations?

Zambia: Biocides are regulated generally as pesticides under the Environmental Management Act of 2011. The definition retained in these pieces of legislation is for pesticide and not biocides.

Uganda: There is no specific regulation for biocidal products. However, there are regulations that support their regulation such as the Agricultural Chemical (Control) Act 2006, The National Land Use Policy of 2007, the National Bio-technology and Bio-safety Policy of 2003.

India: There is no specific regulations for biocidal products in India. Some of the non-pesticidal biocides, for example those used in preserving food articles are under the purview of the Food Safety Standards Act.

Malawi: There is no particular distinction between biocidal and plant protection products.

Gambia: There is no specific regulation for biocidal products. These products are covered by the Hazardous Chemicals and Pesticides Control and Management Act and its regulations.

Zimbabwe: There is specific legislation. Some biocides are however regulated by the general pesticide legislation.

South Africa: All our pesticides and biocides are listed under Act 36, the regulatory body for pesticide registration in SA. The trouble comes in when something is registered or insecticide control but then is also used for herbicide control as an adjuvant. We have an example when WETCIT Duo is used as both an adjuvant but also an insecticide, but at different dosages.

Tanzania: Certain biocides, such as disinfectants are not regulated under any act.

2. List risks from biocidal products that are important in your country. Are you aware of any incidents resulting from the (unregulated) use of these products?

Country	Product	Risks
Zimbabwe	Biocides in general	The contamination of water bodies, destruction of non-target insects and other organisms and poisoning of children and pets.
Swaziland	Blue death (active ingredient carbaryl) is used for killing ants.	The risk of food getting in touch with the applied product through improperly washed surfaces.
Zambia	Rodenticides are easily accessible (distribution unregulated).	They are used in most peri urban and rural areas without following use precautions and therefore cases of ingestion poisoning in children are common.
Uganda; South Africa	Creosote (wood preservative) for treating electricity poles, fencing for livestock and at times fencing off home compounds.	The chemical has health effects on humans (possibly carcinogenic).

Senegal	Chlorinated disinfectants and incense (a mixture of ash burnt herbs) are widely used.	All of these products use to pose the risks of acute and chronic inhalation, dermal toxicity and eye irritation. Chronic diseases may appear due to prolonged use of these products without a prior risk analysis showing whether or not they are toxic.
India	Chlorpyrifos is widely used as a wood preservative and for termite control.	The field level application for these purposes are not monitored and regulated. Anyone can buy and use the same. Another widely used product is chlorinated lime for water sanitation, anyone can buy and use it.
Tanzania	We have a wood treatment product (Tanalith) with ingredients: chromium, arsenic and copper oxide.	Arsenic and chromium are known neurotoxic chemicals.

3. Are you aware of similar regulations to achieve sustainable use of plant protection or biocidal products?

No: Zimbabwe; Swaziland; Malawi; Mauritania; Gambia; Senegal; Uganda; South Africa; India
Yes: Zambia.

Uganda: There is a deliberate effort to update and revise the law and regulations on pesticides in Uganda.

Zimbabwe: There is no specific regulation which regulates the use phase of biocidal products. Such a regulation will be very necessary in Zimbabwe so that groups using these products are protected and also so that they won't put citizens at risk.

Zambia: There are other pieces of legislation to achieve the sustainable use of plant protection products or biocidal products in Zambia such as the Food and Drugs Act, the Medicines and Allied Substances Act No. 3 of 2013 and the Public Health Act 295.

India: The insecticides act does address the need of labeling, training and use of protective gears, but poor implementation has been limiting the sustainable and safe use.

Senegal: Yes, this type of regulation is necessary for our country because of the problems linked to the use of biocides.

Swaziland: The Chemicals Management and Control Act should be the overarching legislation. There should also be regulations specifically addressing biocides, to ensure the sustainable and safe use of these chemicals.

Tanzania: Rodenticides and wood treatment products are conventionally covered by the Plant Protection Act. On the other hand, household pesticide products are registered as any other pesticide products, however they are not strictly regulated as they are considered less hazardous.

Gambia: There is no need to have a separate legislation for biocides, instead, it could be covered under our Hazardous Chemicals and Pesticides Control and Management Act 1994, which is currently under review.

"In Europe, plant protection products and biocides are treated differently because they are used in very different settings. Plant protection products mainly enter the environment directly while biocides are mostly (but not only) used indoors. This requires different risk assessment and risk mitigation measures"-Stefanie Wieck.

Resources and Further Reading

1. Legal text of Regulation (EU) 528/2012 concerning the making available on the market and use of biocidal products: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012R0528&from=DE
2. Information on the European Regulation 528/2012 on biocidal products: https://echa.europa.eu/regulations/biocidal-products-regulation/understanding-bpr
3. Information on environmental effects of tributyltin, a previous antifoulant for ships: https://www.umweltprobenbank.de/en/documents/selected_results/13744
4. Information on incidents with disinfectants in South Korea: Jong-Hyeon Lee, Yong-Hwa Kim, and Jung-Hwan Kwon: Fatal Misuse of Humidifier Disinfectants in Korea: Importance of Screening Risk Assessment and Implications for Management of Chemicals in Consumer Products. Environmental Science & Technology 2012 46 (5), 2498-2500. DOI: 10.1021/es300567j: https://pubs.acs.org/doi/10.1021/es300567j
5. Legal text of Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02009L0128-20091125&from=EN
6. Homepage of the European Commission on the sustainable use of pesticides: https://ec.europa.eu/food/plant/pesticides/sustainable_use_pesticides_en
7. Position paper of the German Environment Agency on the sustainable use of biocides: https://www.umweltbundesamt.de/en/publikationen/biocides-approach-towards-a-sustainable-use

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Issue 02: Safe Handling and application of pesticides and small holder farmers

Pesticide Discussion Forum Summary Digest

Issue 02 of 2019
Forum Date: **21 February 2019**

Safe Handling and Application of Pesticides and Small Holder Farmers

Lower and middle-income countries (LMICs) are currently experiencing increasing population size, increased urbanization and growing economies which now strive to increase food production to feed growing populations. Pesticide application rates are continuously on the rise to ensure quick and inexpensive production of food. Despite the advantage of increased food production, pesticides have been known to cause damage to the environment and human health, negatively impacting agricultural production and reduced agricultural sustainability. In LMICs, farmers face great risks of exposure due to the use of toxic chemicals that are banned or restricted in other countries through incorrect application techniques, poorly maintained or inappropriate spraying equipment, inadequate storage practices, and often the reuse of old pesticide containers for food and water storage. They often lack the knowledge for effective handling and application of pesticides which is essential for effective pest management and pesticide risk reduction. The importance of training farmers on effective handling and management of pesticides therefore must be emphasized.

About the Presenter

Maryben Kuo is an agricultural engineer with 7 years' experience working with nonprofits and the [illegible]ent. She currently works as an agronomist in the Ministry of Agriculture and Rural Development in [illegible]n. To get in touch with Maryben, you can email her at: marybenk@yahoo.com.

1. Who do you think should be responsible for training farmers on the safe handling and application of pesticides and why? Who is currently in charge of this in your country and who should manage this?

UK: Those selling pesticides should also be trained.

Zimbabwe: Pesticide dealers and companies should take responsibility for training farmers on the safe handling of pesticides, because they can easily access the latest research and can package these messages to farmers.

Tanzania; Senegal; Sudan; Gambia: The training of farmers should be the responsibility of the extension staff, the regulator and the agronomists.

Zambia; Cameroon: The Ministry of Agriculture should be responsible for training farmers on the safe handling and application of pesticides as it is one of its responsibilities to provide agriculture extension services to farmers.

Malawi: All those involved in the pesticide lifecycle should be equipped with knowledge on how pesticides should be handled from storage and use, to discarding empty containers. This is currently the task of the Agriculture extension workers.

Cameroon: The inclusion of pesticide training in the primary stage of education would be good.

Eswatini; Mauritania; Zambia; Sudan: It should be a collective effort, with multi-stakeholder involvement, such as international organizations, the pesticide industry, the application equipment industry, traders of pesticides, the food industry, NGOs, consumer groups and trade unions.

South Africa: No one will take responsibility unless training is legislated as a responsibility of one or several ministries. Secondly, "training" needs to be defined in legislation in order to standardize and have quality control. The Ministry of Education should be included for accreditation and standardization purposes. Otherwise anything can be classified as "training".

Uganda: Academia, i.e. accredited universities should train farmers on safe handling and application practices. They have hands on experience, practical skills and knowledge.

Togo: I think the pesticide industry should consider the health of farmers as part of their social responsibility

2. Would you say farmers knowledge of pesticide handling and application is sufficient to avoid the risks linked to inappropriate handling and application? Please give examples. How can this be improved

Country	Knowledge Level	How can it be improved?
Zimbabwe	*Insufficient*. For example, large numbers of farmers in Gokwe believe that washing your hands after pesticide application is optional. They also believe that "if you 'ingest' a pesticide and you don't get ill then the pesticide is harmless"	Training of these farmers by professionals from the Health Ministry is required.
Eswatini	*Insufficient*. some farmers, especially in rural settings operate pesticide spraying equipment and employ poor pesticide container management practices that involve the reuse of	The government should request technical and financial support to conduct smallholder trainings for

	pesticide containers for fetching and storing water.	farmers in areas where they have limited knowledge.
South Africa	*Insufficient. M*any farmers use *Tebuthiuron* for bush encroachers, it is a granular soil applied pesticide. The label will say 5-10 granules per stem and the farmer will throw out a handful, thinking the kill rate will be higher but all he is doing is creating environmental degradation that will last 30 years or more in the form of sterile patches.	Ban or restrict products being sold and are registered in the country according to ratified conventions, e.g. Annex III of the Rotterdam convention.
Gambia	*Insufficient.* This is attributed to the way they handle and apply pesticides.	This can be improved through effective continuous training
Uganda	*Insufficient*. This is attributed to the cases of pesticide exposure due to incorrect application techniques.	Vocational skills training in safe pesticides handling would do us good once specialized training needs have been identified.
Zambia	*Sufficient*. I would say it is somehow sufficient as we would see higher rates of pesticide poisoning if they were not.	The situation can be improved through training and education of the pesticide users.
Togo	*Insufficient*. Farmers are not able to assess the risk incurred for example in applying pesticide at inadequate times. The dose used is also a great issue.	Periodic refresher training, periodic evaluation of knowledge and skills in safe pesticide handling.
Malawi	*Insufficient*. Many small-holder farmers are illiterate, they often cannot read labels. There is also no use of PPE and no proper disposal of empty containers.	Chemical pesticide alternatives should be promoted.

3. In addition to improving small-holder farmer's knowledge on the safe handling and application of pesticides, what other actions could be taken to reduce risks linked to pesticide in your country? Explain.

Malawi; Tanzania; Zambia; Sudan; Senegal; Gambia; South Africa: I think the provision of alternatives to pesticides like biological control as well as crop rotation should be promoted.

Gambia: The reason most farmers do not read labels is because of their low literacy level, therefore I believe a simple booklet is needed written in local languages.

Belize: There needs to be joint collaboration between our institution and the food safety department in order test pesticide residues in produce being sold in the local market. We also need collaborative efforts with large farms to execute pilot projects to reduce the use of HHPs.

UK: The use of diagrams on labels is necessary.

South Africa: Incorporate the training of pesticide handling and application with occupational health and safety, first aid and basic firefighting.

Senegal: The use of Farmer Field Schools, funded by government to train and educate farmers.

Eswatini; Zambia; Uganda: Ban the importation of highly hazardous pesticides.

Zambia; Uganda; Gambia: Behaviour change is one of the key milestones that needs to be crossed to ensure compliance.

Mauritania: I think that pesticide residue limits in agriculture has to be regulated in order to the reduce risks linked to pesticide residues in food.

Uganda: Ensuring the provision of affordable and appropriate personal protective equipment to farmers.

Tanzania: Having agricultural and health policies that protects farmers from pesticide dangers.

"Regulation and enforcement play a very big role in reducing hazards caused by pesticides"-Maryben Kuo

Resources and Further Reading

8. https://www.researchgate.net/publication/295097801_Plight_of_Pesticide_Applicators_in_Cameroon_Case_of_Tomato_Lycopersiconesculentum_Mill_Farmers_in_Foumbot
9. https://www.youtube.com/watch?v=1Yi4IRNSc0o
10. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3108117/
11. https://cals.arizona.edu/apmc/docs/Health%20effects%20AZ_10_30_14.pdf
12. https://www.youtube.com/watch?v=Sr3N3Gg5slw
13. https://www.youtube.com/watch?v=gGMsNGXbr-Q
14. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409541/pdf/ijerph-14-00340.pdf

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Issue 03: FAO Pesticide Registration Toolkit

Pesticide Discussion Forum Summary Digest

Issue 03 of 2019
Forum Date: **28 February 2019**

FAO Pesticide Registration Toolkit

The FAO Pesticide Registration Toolkit is a decision support system for pesticide registrars in low- and middle-income countries (LMIC's). It assists registrars with the evaluation and authorization of pesticides. The Toolkit can best be described as a web-based registration handbook intended for day-to-day use by pesticide registrars and others. Practitioners working in pesticide management use the Toolkit to support several of their regular tasks, including finding various information such as pesticides registered elsewhere, Maximum Registration Limits, Highly Hazardous Pesticides (HHP's) as well as Public Health Pesticides.

About the Presenter

Ivy Saunyama is an entomologist by training with over 20 years' experience in sustainable pest and pesticide management. Ivy currently works as an Agricultural Officer with the FAO within the Pest and Pesticide Management Team. To get in touch with Ivy, you can email her at: ivy.saunyama@fao.org.

d van der Valk works as an independent consultant in pesticide management, pesticide risk assessment and ide registration and runs a consultancy, called Falconsult, based in the Netherlands. To get in touch with Harold, you can email him at: harold@falconsult.eu. mailto:Jharold@falconsult.eu

1. What are the three major challenges in regulation of pesticides faced in your country? Explain why these are listed.

Country	Top 3 Challenges	Why?
Uganda	Counterfeit products, poor conditions of use and poor management of empty pesticide containers.	Due to inadequate resources, there is a shortage of human resources to man the borders and carry out inspections and enforcement.
India	Pre-registration and post registration assessment is not happening as per internationally accepted guidelines and pesticide use is pesticide supplier driven.	Pesticides are not reviewed properly in light of scientific information and regulation staff are lacking.
Zambia	Labelling, packaging and illegal pesticides on the market.	Inadequate enforcement of legislation.
Togo	Post-registration management, control of pesticide imports and monitoring of ecological and health effects.	It is easier to buy un-registered pesticides and to use it at your convenience.
Eswatini	No accurate inventory of pesticide application and pesticide use and issues with phasing out of HHP's.	Relevant infrastructure and personnel are lacking and currently there is no unit within government that is responsible for pesticide registration.
South Africa	No formalized disposal schemes for empty containers, expired products or left-over products, pesticide advertising and un-registered products on the market.	Inadequate number of technical and experienced personnel available and limited operation funding.
Tanzania	Lack of adequate staff for registration procedures and political pressure to register certain pesticides, and insufficient or missing data being submitted.	The office of the registrar is understaffed, and more transparency is required in the registration process.
Zimbabwe	Pesticide advertising, illegal and unregistered pesticides on the market and outdated legislation.	A lack of resources limits the ability of pesticide regulators to be functional and cover the whole area of Zimbabwe where pesticides are used or marketed.
Belize	Outdated legislation, a lack of human resources and off-label use.	The legislation has not been revised since 2006.
Senegal	The absence of a single pesticide management policy, a high demand for exemptions (of unregistered pesticides) and problems with implementation.	There is a divided pesticide management structure based on different sectoral documents managed by different government structures.

"You can request training on the Toolkit from the FAO Pest and Pesticide Management Team. The email link is on the home page of the Toolkit. Just send a request (from your director) with justifications on why you need the training and how you intend to use the Toolkit.". -Harold van der Valk.

2. Have you used any of the guidance presented in the toolkit to address your issues? What kind of future activity do you believe this tool would be useful for in your organization?

South Africa: Certain information from the toolkit can be put on government departmental websites to provide additional information to regulators.

Uganda, South Africa: I used the toolkit for cross-checking information on products for registration. Recent research needs to be uploaded for reference use, however.

Zambia: I have used the tool kit to identify pesticides that are banned or restricted during the registration process. It can be used for in-country training of new officers as well.

Togo: From registration to risk mitigation, the toolkit integrates useful information from conventions related to pesticide management and registration undertaken by other countries.

Eswatini: I will use the toolkit to provide timely advice to sugarcane farmers who need to learn through markets which pesticides are banned or undesirable.

India: I have been using the HHP identification in the toolkit to identify the most problematic pesticides in India. In future, we are developing a publication on HHPs.

Cameroon: I have used different information for assessing HHP's when looking for data on pesticides.

Belize: After returning from the registration toolkit training in 2017, the Pesticides Control Board adapted the registration flow chart to the screening process for dossiers.

Tanzania: Dangerous pesticides have been identified through the toolkit assisting with scientific reviews and studies that have recently been conducted.

3. What kind of training is key for the use of the toolkit and what mechanisms are needed to make this guidance better known by stakeholders (especially experts in authorities)?

Senegal; Uganda: National or regional workshops should be conducted to sensitize and familiarize stakeholders (especially registrars) with the contents of the Toolkit and discuss how it can be used in their day-to-day work of pesticide registration and other related matters.

South Africa: I would like the name of the Toolkit to be changed as it can be very useful other practitioners who are not necessarily pesticide regulators.

Uganda, Zambia: An online training and or distance learning programme could be developed for the Pesticide Registration Toolkit incorporating different modules for different stakeholders.

Togo, Eswatini, Zambia: A national training is needed for countries where no one has been trained on the toolkit before.

Tanzania: Expertise training on risk assessments and the interpretation of health and environmental data, as well as the assessment of pesticides, is key for the use of the toolkit.

Belize, Zambia: Have the registration toolkit (or parts of it) incorporated into an application for phone use.

Eswatini, Zimbabwe: Practical training on how to use the toolkit for pesticide registration staff is important and regional training on the use of the Toolkit would be useful and cost effective.

Zambia, South Africa: Implement a training of trainer's approach so that capacity building is continuous, especially for new staff. This can be done through workshops.

India: Collaborative training with credible NGOs working in the field would have an added advantage in realising the objective of the toolkit. Making an FAO training for the toolkit mandatory for regulators would be also be helpful.

"It is enlightening and encouraging to note that the FAO Pesticide Registration Tool kit is used by various pesticide risk managers in their different capacities, even spanning public and private sectors, academia and civil society"- Ivy Saunyama.

Resources and Further Reading

15. FAO Pesticide Registration Toolkit web site: http://www.fao.org/pesticide-registration-toolkit/en/

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Issue 04: Farmer Field Schools and Pesticide

Pesticide Discussion Forum Summary Digest

Issue 04 of 2019
Forum Date: **14 March 2019**

Farmer Field Schools and Pesticide

Farmer Field Schools (FFS) consist of groups of farmers who get together to study a particular topic. FFS is vital to promote the use of new technologies in the agricultural sector. The topics covered can vary from conservation agriculture, organic agriculture, animal husbandry, and soil husbandry, to income generating activities such as handicraft. FFS also provides opportunities for practical learning by doing. It teaches basic agricultural and management skills that make farmers experts on their own farms. FFS is also a forum where farmers and trainers debate observations, experiences and present new information from outside of the community.

About the Presenter

Raymonda Johnson is an expert in entomology, pest and pesticide risk management. She currently works for the Ministry of Agriculture and Forestry in Sierra Leone as the Head of Crop Protection. To get in touch with Raymonda, you can email her at: raymonda.johnson@yahoo.com.

1. Do you have FFS in your country? What farmer field school approach are you using? If not, why not and what methods are you currently using to train small-scale farmers about pesticide risks?

Training Approach	Country	Description
Farmer Field Schools	*Tanzania*	It is used particularly in agriculture projects promoting conservation agriculture. However, pesticide use management and risks are not addressed through this.
	India, Senegal	FFS is used to promote IPM as a form of non-formal education and campaign activity to sensitise farmers on new techniques, tools and methods. Some non-governmental organisations (NGOs) also use FFS to promote non-chemical farming methods.
	South Africa	A pilot FFS project by FAO South Africa has been implemented recently. The *pairwise ranking approach* is used where farmers identify crops that can be used for treatment through acknowledging commodities farmers are interested in.
	Belize	FFS is being conducted specifically for onion and sugar cane growers in Belize.
	Uganda	Farmers are trained on several topics including risks associated with toxic pesticides. There is a joint effort toward its promotion by both the state (ministries, agencies, departments) and non-state actors (NGOs & CBOs, etc).
	Zambia	FFS is spearheaded by the Ministry of Agriculture, the Zambia Farmers Union and many NGO's. (E.g CABI has created a plant doctor's program).
	Sudan	Training are mainly targeted at enhancing cultural practices and pesticide application with very few tips or knowledge about pesticides risks.
	Zimbabwe	Lead farmers are identified and tasked to set up training demonstrations and field days.
	Togo	An NGO oversees training of trainer programs for FFS and helps with pesticide risk management.
Development projects	*Mauritania*	Training is low impact and, in most cases, implemented on a project basis with external funding. It does not address risks.
NGO training & Projects	*Eswatini*	Currently farmers are trained through Rural Development area programs and through some NGO projects.
Farmer Cooperatives	*Cameroon*	Farmers form associations and cooperatives which facilitate their training through staff from the Ministry of Agriculture and other projects.

2. Do you have pesticide and Integrated Pest Management (IPM) modules incorporated into your farmer field schools? Or do you have specific programs to train small-scale farmers on IPM approaches?

Yes: Cameroon, Togo, Senegal, Zambia, South Africa, Belize, Uganda | Lacking: Eswatini, Sudan, India, Zimbabwe, Togo, Mauritania, India

South Africa: IPM is part of the training given to farmers, for example one of the cooperatives in Bronkorspruit is practicing organic farming and has introduced the use of indigenous African vegetables.

Uganda: Pesticide and IPM modules are integrated into current programs. Currently, there are FAO and government of Uganda funded technical cooperation projects (TCP) on fall armyworm (FAW) management being piloted in 15 districts.

Zambia: FFS promotes sustainable agricultural intensification programs like IPM. Most cotton growers in the country are now practicing the IPM approach, due to its promotion by FAO.

Zimbabwe: Our approaches are usually commodity based e.g. training on tobacco enterprise which include tobacco agronomic practices and pest management, processing. We do not have specific programs dealing with IPM or pest management, however.

Eswatini: There is no formal or specific programme for small-scale farmers for IPM approaches.

India: The agriculture department simply organises meetings held by experts who theoretically discuss IPM approaches, but there is no formal training available to small-scale farmers.

Senegal: The approach by comparison of the different agricultural practices is used (conventional method and integrated pest production management)

Belize: FFS do have pesticide and IPM modules. For instance, the pesticide control board's trainers are responsible for training on responsible pesticide management.

Sudan: We have programs prepared by the extension service department of the Ministry of Agriculture to train small scale farmers on IPM approaches.

Togo: IPM is just a module within FFS, not a specific program.

3. Are farmer field schools or current farming programs an effective management of pesticide tool in your country? How could training be standardized and improved for small scale farmers in your country?

Uganda: Standardization should be in forms of enterprises. For example, agro-pastoral farmers should have a different curriculum from that of horticultural farmers and should also consider the agro-ecological zone in question.

South Africa: The Agripark program in SA has been effective. For example, it has a rural small holder farmer outreach and capacity unit which does primary production and extension services.

Zambia: FFS programs are a way of improving rural livelihood as it raises literacy levels which are currently low, especially in rural areas.

Cameroon: Maybe an evaluation phase can be added to training to see if farmers practice what they learn and improve on where they are lacking.

Senegal: Huge progress has been noted in vegetables, rice and cotton with the use of FFS with yield increases of up to 200%, found

Eswatini: It is important to include farmers input during the development of training materials.

Zimbabwe, India: Both the current state of FFS and the current farming practices are not effective in managing pesticides. Major improvements are required to manage pesticide risks well.

Sudan: Training could be standardized by involving universities and research institutions to participate in the development of training centres equipped with modern tools and technology.

Belize: The training conducted through the National Pesticide Certification Program (NPCP) is a top-down approach and not FFS. There still seems to be a gap between the knowledge and attitude of small-scale farmers, so practices are not effective.

"Training needs to be done for extension services, academia and farmers. There is need for us to incorporate FFS and pesticide risk management into our academic institutions"- Raymonda Johnson.

Resources and Further Reading

1. The Farmer Field School Approach – History, Global Assessment and Success Stories Background Paper for the IFAD Rural Poverty Report 2010, Arnoud Braun and Deborah Duveskog October 2008.
2. Sustainet EA 2010, Sustainable agriculture information initiative, technical manual farmer field school approach, GTZ/FAO,
3. Pesticide action network UK-supporting agro-ecological learning through farmer field schools.
4. Building resilient agricultural systems through farmer field schools, integrated production and pest management program (IPPM), FAO, Plant Production and Protection Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00153 Rome, Italy. ippm@fao.org
5. Bartlett Andrew, Aug 05 Case Study: IPM Farmer Field Schools- Farmer Field Schools to promote Integrated Pest Management in Asia: the FAO Experience1.

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This Digest was produced by:
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Carron Naidoo | Forum Administrator | carron.naidoo@uct.ac.za
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Pesticide Discussion Forum Summary Digest

Issue 05 of 2019
Forum Date: **04 April 2019**

Pesticide and health in Sub-Saharan Africa

Pesticide research studies are unevenly distributed across sub-Saharan Africa. Several hot spot areas with high spatial-density of research are identified, including central Ethiopia, upper White Nile basin, North-Eastern and South-Western South Africa, Benin and South-Western Nigeria. Large quantities of pesticide use due to agriculture development and malaria control contribute to the formation of those hot spot areas. Socioeconomic factors such as population density and income level may also influence the density and diversity of pesticide research in those regions. A wide range of pesticides is used throughout sub-Saharan Africa while only parts of them were assessed in the identified studies.

About the Presenter

Dr Samuel Fuhrimann is trained in infection biology and epidemiology (MSc) and environmental epidemiology (PhD), and is currently working as a Post Doc fellow at the University of Utrecht, in the Netherlands. To get in touch with Samuel, you can email him at: s.fuhrimann@uu.nl.

1. What do you see as the main limitations of the draft paper? What additional research would be needed in your view around pesticide and health in Sub-Saharan Africa to inform your work?

Country	Main limitations of study	Further research
Zimbabwe, Eswatini, Uganda, Zambia, Belize, Tanzania	The paper is only limited to articles published by PubMed, this excludes many other databases and grey literature.	Compare research with similar LMICs, elsewhere.
Sudan	The study has not covered all categories of pesticides used in Sub-Saharan countries, it mostly covers insecticides.	Additional studies on spatial distribution of pesticides in every country are required to assess and identify their impact on human health.
South Africa, Senegal, Mauritania	The time period that the studies were undertaken was 10 years but the time from exposure to data analysis to publication was very short (5 years for epidemiological studies).	Research studies on socio economic impacts from the use of pesticides are needed in sub-Saharan Africa.
Zambia	The main limitations are a lack of a standard approach in research designs to facilitate comparison across data.	Local post registration studies must be conducted for pesticides with limited available information to assess their impacts on humans and the environment under local conditions of use.
India	I think the main limitation is studies that do not specifically link a particular pesticide to a health issue.	Additional research should be focused on health outcomes as a result of exposure to particular pesticides.
Togo	Study location is selected randomly in later analysis. Selection criteria must be defined to clearly identify study locations, to minimize errors.	I think a regional project involving all countries should be done to overcome the limitations of technology and laboratory personnel or staff and to ensure reliable results.
UK	PubMed probably gave as good a sample as other sources, but most surveys fail to get a true assessment of exposure.	More efforts are needed in Africa to supply pesticides in a form that the user can apply the correct dose without spillage of the product on unprotected hands.

2. What are the main conclusions provided around pesticide and health in the study you selected? What was of interest to you and why?

Country	Study & location	Main conclusions	Personal interest
Uganda	Oesterlund et al, 2014: Uganda.	Unlike the practice in several other developing countries, small-scale farmers in Uganda do not use the most hazardous pesticides (WHO class 1a and 1b).	I am interested in the generational impact of pesticides on the selected population over a longer period (up to descendants).
Senegal	Tomenson and Matthews, 2009: multi-country.	The incidence of agrochemical-related incidents in some countries are high.	It demonstrates that exposure time to a pesticide is an important risk factor regardless of the toxicity of the pesticide.
Zambia	Mwanja et al, 2017: Zambia.	The research showed detectable residues in 63.3% of 30 tested samples out of which three samples (cabbage, tomato and orange) exceeded the Codex Alimentarius	The conclusion that farmers had limited knowledge, exhibited reduced waiting periods and there was limited monitoring and

		maximum residual limit (0.1 mg/kg).	regulation of pesticide use by authorities, was very interesting.
South Africa	Murray et al, 2018: South Africa.	The increased exposure of pregnant women in IRS programmes to DDT and its by-product DDE for malaria control may lead to an increase in blood pressure and subsequently an increase in hypertensive disorders.	The mothers are already under stress, so the risk of mother to child transmission of DDT and DDE is compounded and much higher than in developed countries.
India	English et. al, 2012: South Africa.	Exposure to hormonally active agricultural pesticides is associated with adverse growth and reproductive health of boys.	It attempted to collect data on pesticide exposure history as well as analysis on sex hormone concentrations, with sexual maturity development ratings.
Tanzania	Lekei et al, 2017: Tanzania.	Health care providers lack the adequate skills to diagnose and manage acute pesticide poisoning.	What interests me the most is how the lack of training of health care providers could worsen the acute poisoning situation.
Eswatini	da Silva, 2011: Zanzibar.	A high number of reported health symptoms were largely affected by gender and education level and the level of understanding of the handling and use of pesticides.	Poor understanding of the handling and use of pesticides appears to be a common finding in many pesticide research articles.

3. Are farmer field schools or current farming programs an effective management of pesticide tool in your country? How could training be standardized and improved for small scale farmers in your country?

Gambia: Subscribing to other publishing sites e.g. researhgate.net will help in keeping regulators up to date with current research on pesticides.

India, Zambia: A good resource to use to get up to date with published literature is UCT's, pesticide weekly mailer. A country-specific publication would also be very useful.

Sudan: I am aware of six articles that I had identified during my DPRM studies. I regularly use research articles for preparing pesticide screening trials for registration purposes.

Eswatini: Easy access to good research articles would be key. some of our institutions do not subscribe which then limits access to this useful evidence.

Zimbabwe: I am familiar with 11 articles from the provided list. I regularly use literature for preparing annual reports and citations for my own papers.

Sweden: Not all research articles are easily accessible, and many come with a charge.

Zambia: I was aware of 2 articles. I use research articles to provide literature and evidence on risk profiling for food, in my job.

Belize: Zero. We would more look at regulatory actions around the world rather than studies themselves. It only needs to start to be incorporated in decision making at the registration level.

Tanzania: I was aware of 5 articles. I often use research articles to support report writing with recent findings. **Mauritania:** Unfortunately, I was not aware of any of the publications from the provided list.

Senegal: I was aware of a few publications only because generally the research that I do is done in French, rather than in English.

Uganda: I was aware of 21 papers. I review literature every week to support my teaching as well as my PhD concept writing.

Resources and Further Reading

1. Wan, C. Spatial distribution of environmental and public health research related to pesticide exposure in sub-Saharan Africa: a systematic review. Draft paper

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Issue 06: Understanding Pesticide Toxicity

Pesticide Discussion Forum Summary Digest

Issue **06** of 2019
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'Understanding Pesticide Toxicity'

Pesticides are designed to kill undesirable living organisms, but the properties which make them efficient killers of undesirable pests also make them potentially hazardous for beneficial organisms and humans. They are linked with a range of adverse health effects, including cancer, neurological, respiratory and dermatological diseases. The Food and Agriculture Organisation (FAO) and World Health Organisation (WHO) in 2007 established that pesticides are considered Highly Hazardous if they meet some specific criteria. It is important to remember that Risk=Hazard (Toxicity) × Exposure. When we are estimating the risk of pesticide poisoning, it is necessary to consider the toxicity of the pesticide and exposure to the product. Pesticides can enter the body through the skin; by ingestion; or by inhalation. Different classes of pesticides can induce different effects.

About the Presenter

Rina Guadagnini obtained a degree in Biology in Italy and a PhD in Toxicology in France. She joined the Pesticide Action Network, UK in 2013 to collaborate on a project about migrant farm workers. Rina is co-author of the new FAO/Rotterdam Convention Secretariat toolkit on reporting incidents caused by Severely Hazardous Pesticide Formulations. To get in touch with Rina, you can email her at rina@pan-uk.org.

1. What obstacles are there in identifying and managing Highly Hazardous Pesticide (HHP's) in your country or countries you work in?

Zimbabwe: Wide spread illegal importation, formulation, manufacture and trade of pesticides and counterfeit pesticides.

Uganda: Weak enforcement may fail to identify HHPs on the market.

India: Currently there is no policy or legislative support for identifying and managing HHPs as per internationally accepted standards.

Malawi: We do not have a national framework that could allow the management of pesticides according to the life cycle approach.

Gambia: The major obstacle with regards to identifying HHPs is the limited knowledge of relevant stakeholders in using the FAO toolkit, most particularly the regulators.

Togo, Sudan: We do not have the technical equipment to carry out all the follow-up necessary for the identification of an HHP

South Africa: The list of HHP's are not readily available to the general person and the framework is not accessible. The risk assessments needed to categorise pesticides as HHP's are not used by everyone.

Tanzania: Despite the identification of HHP, no action has been taken as a risk reduction measure because these HHPs are registered as a sole pesticide to function in the intended use.

Zambia: The lack of a comprehensive surveillance system for pesticide poisoning is proving to be an obstacle in identifying HHPs in the country.

"It is not always easy to individuate HHPs because a list of HHP's is not readily available to the general public, but the PAN HHPs list could be a useful tool even if it includes only 300 pesticides"-Rina Guadagnini.

2. What mechanisms are in place (or not in place) in your country, or countries you work in, to report pesticide poisonings and to train health professions to recognize poisoning symptoms?

Country	Mechanisms & Training
Zimbabwe	Poison cases are reported to the police (suicides and other criminal activities) and hospitals.
Sudan, Zambia	There are no mechanisms for reporting pesticide poisoning.
Tanzania	Community self-reporting is a potential mechanism taken for data collection and reporting of pesticide poisoning and has presented encouraging results in Tanzania.
Uganda	The pesticide poisonings are reported and recorded at Health Centres II, IV and District referral hospitals, but there are no official mechanisms in place.
India	The current pesticide law mandates authorities compile and report pesticide poisonings from district

	levels which is then collated up to the national level.
Eswatini	As a party to the Rotterdam Convention the country has to report poisoning cases to the Secretariat through the environment authority, but currently this is not happening.
Belize	The Belize Health Information System (BHIS) is a database that doctors use to input the patience's data and when there is a pesticide intoxication, the public health inspectors (PHI) are alerted immediately via an automated email.
South Africa	A has 2 poison centres - 1 a government hospital (Tygerberg) and another independent poison centre - Griffon poison centre. The data is correlated to the Department of Health and also sent to Act 36 and DEA.
Senegal	We have a poison control centres in Senegal that manages pesticide poisoning among other poisoning cases. Incidents of pesticide poisoning are reported at this centre which has laboratories and trained staff who are locally recruited (doctors and nurses).
Zambia	Reporting of poisoning is done under the Health Management Information System which though is not adequate as it does not have follow-up action neither are there means and ways of identifying the specific pesticides implicated in the poisoning. I also feel modules in medical schools focusing on pesticides need to be introduced if they are not already there.
Gambia	There are no poison control centres, and most health workers are not sufficiently trained on diagnosing pesticide poisonings.

3. Is there evidence of health issues or incidents related to specific pesticide formulations in your country? If yes, have the national authorities taken any action, what action was taken?

Zambia: Yes, Dichlorvos. However, the Designated National Authority (DNA) has not taken any action due to lack of data to support for example, reporting to the Rotterdam Convention Secretariat to list a pesticide.

Togo: A number of pesticides were found (e.g paraquat) and actions have been taken to ban or restrict HHPs or find alternatives such as the use of biopesticides. To date, 33 import restrictions have been made in line with the Rotterdam Convention.

India: Monocrotophos 35EC. In response to a series of poisonings recently, the pesticide was temporarily banned. However, little much else has happened.

Tanzania: Yes, NINJA EC, with the active ingredient lambda-cyhalothrin. However, national authorities are yet to take any action.

Eswatini: The weevil tablet is used for committing suicide. the Ministry of Agriculture have tried without much success to limit access to the weevil tablet by introducing a permit system for its purchase.

Gambia: here have been recent incidents of poisonings from a product containing Dichlorvos (trade name is Sniper). The regulatory body had put a temporary ban on the importation and distribution of this product pending investigations.

Belize: Yes. Lorsban 40 SC (chloropyrifos). We are currently working on getting it on the National Restricted Use List based on the 8 criteria of HHPs.

Zimbabwe: Yes. aluminium phosphide tablets. The only action take was to limit their sale. But illegal trade of these substances defeats these mechanisms, anyway.

South Africa: Yes, paraquat. However, it is still registered in SA and I am not aware of any action that has been taken to informing the international conventions. Street pesticides are a major cause of pesticide poisonings, you can also still buy head lice shampoo containing Lindane in SA.

Sudan, Senegal: Yes. Endosulfan. It is banned as a result of a number of deaths.

Resources and Further Reading

16. FAO/WHO Guidelines on Highly Hazardous Pesticides: https://www.who.int/whopes/resources/9789241510417/en/
17. Pesticide Action Network list of Highly Hazardous Pesticides: https://pan-germany.org/download/pan-international-list-of-highly-hazardous-pesticides/?wpdmdl=412&ind=1553765289008
18. Phasing out Highly Hazardous Pesticides is possible!: http://www.fao.org/3/a-i4573e.pdf
19. Organophosphate Insecticides – EPAhttps://www.epa.gov/sites/production/files/documents/rmpp_6thed_ch5_organophosphates.pdf
20. Carol J. Burns & Timothy P. Pastoor (2018) Pyrethroid epidemiology: a quality-based review, Critical Reviews in Toxicology, 48:4, 297-311, DOI: 10.1080/10408444.2017.1423463 https://www.tandfonline.com/doi/full/10.1080/10408444.2017.1423463
21. Cimino, A. M., Boyles, A. L., Thayer, K. A., & Perry, M. J. (2016). Effects of Neonicotinoid Pesticide Exposure on Human Health: A Systematic Review. Environmental health perspectives, 125(2), 155–162. doi:10.1289/EHP515https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5289916/
22. Abreu-Villaça Y & Levin E.D. (2017) Developmental neurotoxicity of succeeding generations of insecticides, Environment International, Vol. 99, Pages 55-77, DOI:10.1016/j.envint.2016.11.019 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5285268/pdf/nihms833259.pdf

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Issue 07: Environmental Risk Assessments and Pesticides

Pesticide Discussion Forum Summary Digest

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Environmental Risk Assessments and Pesticides

Many studies have been conducted indicating the impacts of pesticides on the environment and the need for environmental risk assessments. Traditionally, ecological risk assessments (ERA) of pesticides have been based on risk ratios where the predicted concentrations of the chemicals are compared to the concentrations causing the biological effects. Studies assessing the ecological risks (ERA) of pesticides for aquatic organisms have been conducted as well as studies on deriving persistent indicators for sediment studies (OECD 308). It has been argued by many scientists that using population models in ERA can reduce the uncertainty and increase the value relevance of ERA. Mechanistic effect models (MEM) are useful in risk assessments at species and population levels as they make ecological risk assessments more relevant, more cohesive, less uncertain, more comprehensive and cost effective.

About the Presenter

Debbie Muir is a Specialist Programme Manager for the Department of Environmental Affairs in South Africa. She is responsible for the pesticide management and risk programme and the national biological control programme, among others. To get in touch with Debbie, you can email her at: dmuir@environment.gov.za.

1. Give examples of the environmental risk assessment data used in your country when registering and re-registering a pesticide to identify exposures and risks.

Country	Risk Assessments
India	The limit dose test & LD 50 slope test is conducted for acute avian toxicity, feeding tests during egg laying stage for avian reproductive toxicity. An LD 50 with a 95% confidence interval for fish after administering doses, LD 50 feeding tests for adult worker honey bees, and paper contact toxicity test as well as an artificial soil test is used for acute toxicity test for earthworms.
Eswatini	Pesticides are not registered in the country and there are no environmental risk assessment data available. Some of the data on pesticides which we use is from the national chemical profile which lists all the chemicals available, the quantities and its effects on human health.
Zambia	No specific environmental risk data are required to be presented during pesticide registration. Therefore, any supplied data by proponents is used by registration officers. The EU database and the ECHA website are also used for reference in cases where the data in the dossier are not sufficient.
Mauritania	As Mauritania is member of le comité Sahélien (CSP) des pesticides, we conform to the same environmental risk assessment data considered for CSP homologation dossier. These data are related to the toxicity effects on birds, reptiles and aquatic organisms.
South Africa	Examples of environmental risk data include toxicity to invertebrate and aquatic organisms.
Uganda	Most of the environmental risk assessment data are obtained from the European Union (EU/EFSA) and the Environmental Protection Agency (EPA) databases to aid decision making on pesticide registration.
Tanzania	Currently, regulatory authorities are using data submitted in the dossier by importers during registration to assess what environmental risks might be posed by pesticides. So far, no data are generated within the country, instead data is generated by EPA, ECHA and pesticide properties database (PPDP) are used often for counterchecks and updating.
UK	Companies must submit data to the chemical regulatory department (CRD) linked to agriculture and health, but before a pesticide is approved the data are also considered by an independent committee, now called the expert committee on pesticides.
Belize	The Pesticides Control Board does not do any actual risk assessments. Each section of the dossier is evaluated by different sectors.
Senegal, Togo	ERA is conducted under the common regulation CILSS according to two criteria: behavioural and fate studies of pesticides in the environment and the effects of the pesticide on non-target organisms.
Cameroon	Toxicity to aquatic invertebrates and the interaction of pesticide with soil and spray drift is examined.

2. Have programmes such as FOOTPRINT or other ERA modelling programmes been carried out in your country and what has the outcome been? If it has not been done, why not?

Yes: South Africa, Botswana | No: Mauritania, Eswatini, Senegal, Uganda, Zambia, Togo, Gambia, Cameroon, Belize.

South Africa: The department of environmental affairs is currently busy with environmental risk modelling using various risk layering with CSIR and WRC, it is

still however, in the early stages and it is based on the FOOTPRINT model.

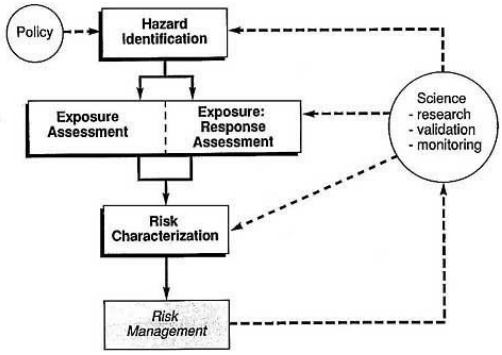
Eswatini: Environmental risk assessment programs for pesticides are not conducted in the country because pesticides were not regulated until recently due to a lack of legislation.

Zambia: FOOTPRINT or other environmental risk assessments have not been done in Zambia. Resource challenges (human and financial) are the possible reasons why it has not been done.

Mauritania: I am not aware of such programmes and I think that the use of this kind of programmes will need more funds and more trained staff.

India: Only recently country regulators started coming up with comprehensive guidelines for ecotoxicological studies. The lack of technical expertise and financial constraints would be the major reasons for not having such programmes.

Senegal: To my knowledge we do not have such programmes. But in my opinion, this should be possible because the type of data needed for its implementation is available.



3. Do you think toxicity to pollinators should be included as a mandatory criterion for environmental risk assessments required for registration? What would be the benefit of including this criterion in risk assessments?

Uganda: Yes. This would be beneficial in protecting bee farmers from experiencing heavy losses (in honey production) due to pesticide impacts on the bees. Also, other farmers need pollinators as well.

South Africa, Senegal, Belize: Yes. The benefits of including this criterion would be in crop production (this will increase food production), wild plants and boost the economy.

Zambia, Mauritania, Cameroon: Yes, bees are extremely important for food production and therefore, food security.

Togo: Pollination is one of the natural phenomena that maintain biodiversity. Scientific studies have identified the economic and ecological importance of natural pollinators. Regulation will reduce the effect of pesticides on pollinator populations.

Gambia: Toxicity to bees/pollinators is not a criterion of registration by the SPC/CSP in my country, but it should be.

Eswatini: Yes. there is growing evidence that pesticides such as neonicotinoids are very toxic to bees, they kill them, and they change their behaviour which has resulted in a decline in bee populations.

India, Gambia: Bee/pollinator toxicity data should be considered as indicative data for toxicity studies and so decisions on approvals of registering pesticides, should be taken in reference to this.

UK: I agree that a risk assessment should include bees, but application is also an issue. Sprays will disperse downwind especially if there is a high proportion of small droplets. What should be done is seed treatment to avoid a spray, but the formulation used on seed must stick on well.

"FOOTPRINT is a regional initiative that was based on GIS and mapping. It is still early days in most African countries with SA and Botswana leading the way for these programmes"- Debbie Muir.

Resources and Further Reading

1. Pesticides in South African waters: https://doiorg.ezproxy.uct.ac.za/10.2989/16085914.2012.666336
2. Environmental risk indicators: https://doiorg.ezproxy.uct.ac.za/10.2989/16085914.2012.666336
3. MEM model: https://doi-org.ezproxy.uct.ac.za/10.1002/ieam.1704
4. EPA quotient model: https://www.jstor.org/stable/2387204
5. Risk quotient method: http://dx.doi.org/10.1016/j.scitotenv.2015.07.099
6. New risk assessment approach: https://www.ncbi.nlm.nih.gov/pubmed/21414651
7. FOOTPRINT; http://dx.doi.org/10.1016/j.scitotenv.2008.08.017
8. Europe; http://www.efsa.europa.eu/en/publications/supporting.htm
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This Digest was produced by:
Prof Andrea Rother | Forum Moderator | andrea.rother@uct.ac.za
Carron Naidoo | Forum Administrator | carron.naidoo@uct.ac.za**Acknowledgement**: *Financial assistance from the Swedish International Development Cooperation Agency (SIDA), has been arranged by the Swedish Chemicals Agency (KemI)*

Issue 08: Self-Harm and Highly Hazardous Pesticides

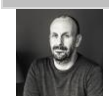
Pesticide Discussion Forum Summary Digest

Issue 08 of 2019
Forum Date: **16 May 2019**

Self-Harm and Highly Hazardous Pesticides

Over the last 20 years, Sri Lanka has reduced its suicide rate from around 56/100,000 to 17/100,00. In the decades following the introduction of pesticides in households through the Green Revolution, the suicide rate in Sri Lanka soared until it had one of the highest in the world. The remarkable reduction in total suicides (and also of moderate-severe occupational poisoning) was driven almost exclusively by pesticide regulation, with removal from agricultural practice of nearly all pesticides that were highly hazardous after ingestion and also highly toxic after occupational exposure. These bans had no apparent effect on agricultural output or costs. Other countries including Bangladesh and South Korea have had similar effects on their unintentional and intentional poisoning rates by effective pesticide regulation.

About the Presenter



Michael Eddleston is a Professor of Clinical Toxicology in the Pharmacology, Toxicology and Therapeutics Unit of the University of Edinburgh, and Consultant Physician at the National Poisons Information Service, Royal Infirmary of Edinburgh. To get in touch with Michael, you can email him at:

1. Which highly hazardous pesticides (HHP), according to JMPM criteria, are used in your country (or a country you work in) for agriculture or are of concern to you (explain why)?

Country	HHP	Why?
Zimbabwe, Uganda	DDT	It is a GHS class 1a. highly hazardous pesticide which is used for insecticide residual spraying.
Tanzania, Sudan	Fenthion	Fenthion is applied in a manner that jeopardizes people's health and the environment due to its aerial spraying.
Eswatini	Carbofuran	It is classified as a highly hazardous pesticide that has caused fatalities.
Zambia	Cyhalothrin, dichlorvos,	Concerns have arisen from the use of these HHPs, as there have been reported suicide and homicide cases and some of these pesticides have been found during post-mortems.
India	Monocrotophos	Monocrotophos is widely used for self-poisoning among rural communities.
South Africa	Brodifacoum	The use of Brodifacoum has resulted in the killing of cats, dogs and owls. It is freely available and easily accessible over the counter and it is not restricted.
Togo	Endosulfan, chlorpyriphos	Endosulfan and chlorpyrifos have caused acute and occupational poisoning. Occupational poisoning is more reported than suicides, however.
Belize	Paraquat	This is of high concern because it is still the number one chemical used for self-harm even though it is classified as "restricted use"
Gambia	Dichlorvos	This is commonly used by farmers and households and there have been reported death cases associated with its use as a household pesticide. There have also been reports of its uses in suicide cases.

2. Do you have any evidence about what the effects (either for agriculture or health) would be if these pesticides were banned in your country (or a country you work in)? (Please give examples, if available).

"if we can move towards a ban in one country, we can set up more robust prospective data systems that will allow us to be more confident in the effects seen."- Michael Eddleston.

Uganda: Suicides due to pesticide poisoning in Uganda are responsible for 63.3% and 25.6% of all poisonings in urban and rural areas respectively. banning of HHPs in Uganda would reduce the number of self-harm cases due to pesticides.

Zimbabwe: DDT which is used for insecticide residual spraying can lead into an increase in malaria incidence or a resurgence.

Zambia: The only example I can think of is the case of Mozambique who has banned the use HHPs. I'm certain most of the problems associated with HHPs must have been reduced.

Eswatini: Paraquat has been restricted by some sugarcane producers who are Fairtrade certified. They have managed to find alternative weed control measures and continue to produce sugarcane. this demonstrates that substitution can be effectively used and does not affect production.

South Africa: A pesticide can be banned however it does not guarantee that the won't be illegal use for

example Aldicarb is banned in SA, but you can get it in every corner in the informal market and very cheap

Sudan: A Fenthion ban will increase the Quellea bird outbreak and decrease cereal production as it is the only available registered pesticide for bird control.

Tanzania: A study indicated a strong link between mortality and HHP pesticide use, in terms of suicide. Therefore, banning these HHPs will reduce the mortality rate.

Zimbabwe: It seems very clear that studies are urgently required into alternatives of the most HHPs in current use. I see common ones across many countries in Africa and points towards regional collaboration and information sharing.

Gambia: There is currently a temporal ban on a dichlorvos brand called sniper, but studies have yet to be done on its effects in both agriculture and health.

Togo: In our developing countries, the ban on a pesticide does not usually stop its importation. Indeed, there are still fraudulent ways in which people involved in illicit trade tend to meet the needs. However, the ban on pesticides reduces the availability of the product and consequently the number of poisoning or suicide, if any.

3. What current systems are in place in your country (or a country you work in) that identify and regulate locally problematic pesticides? What other measures could mitigate these risks?

Uganda: We use the FAO/JMPM guidelines for registering HHPs. category 1a &1b pesticides are currently not allowed in the country.

Togo: The national pesticide management committee is in charge of collecting information on poisoning problems. There is a regional committee for pesticide registration (CILSS) and countries in West Africa often base their regulation on CILSS publications.

Sudan: We have ratified the Rotterdam, Stockholm and Basil conventions and are currently using WHO banning regulations for class 1 pesticides, also the registration system is following the guidelines of the FAO in all the steps of pesticides registration.

India: The measures that could mitigate risks could be banning all HHPs and problematic pesticides and replace them with non-chemical methods and agroecology.

Gambia: Pesticides are regulated under the Chemicals and Pesticides Control and Management Act which has provisions for reporting of problematic pesticides

Eswatini: We have just got the new Pesticide Management Act, which is meant to address these issues, it establishes an institution which will look into regulation of all pesticides including HHPs, however, it is not yet functional.

Tanzania: Problematic pesticides are regulated by posing restrictions on the sale and use of such pesticides. For instance, dichlorvos is restricted and only skilled personnel are able to use it.

South Africa: We have the enforcement section which is under Act 36 of 1947 (regulators) and all pesticides are registered using this Act. Measures to mitigate the risks would be to restrict HHPs to be applied by pest control operators only or banning as a final regulatory action.

"The key here is what systems are in place to recognise problems and feed this back to the pesticide regulator to make necessary decisions/changes."-Michael Eddleston.

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Pesticide Discussion Forum Summary Digest

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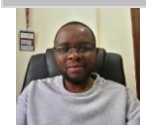
Sticky Pesticides to Reduce Toxicity and Chemical Application

Pesticides are often used to control pests and diseases. In most instances, the control is based on substances that are not only toxic to the pests but also to the environment. However, most of these pesticides do not stick well to plants and get washed away by rain or during irrigation. This results in an increased number of sprays to compensate for washed off pesticides. Less than 5% of sprayed pesticides stick to plant surfaces while the other 98% goes off to waste. Sticky pesticides have the potential to increase efficacy and reduce the volume of pesticides required to control pests. Sticky pesticides may further minimize the level of environmental contamination, which causes damage to agricultural land, fisheries, fauna, and flora. The pollution of soil and water bodies by pesticides used in agriculture can pose an important threat to aquatic ecosystems and drinking water resources.

About the Presenter



Lawrence Malinga works for the Agricultural Research Council – Industrial Crops in Rustenburg, South Africa as a Research Entomologist. In addition, he is the Secretary of the Southern and Eastern African Cotton Forum and a member of the International Cotton Advisory Committee. To get in touch with Lawrence, you can email him at: lawrencem@arc.agric.za.

1. Do you have any documented incidents of pesticide runoff in your country or a country you work in? (Please give examples). What mechanisms are currently used to avoid runoffs?

Country	Incidents of runoff?	Mechanisms
Zimbabwe	There have been a number of documented studies undertaken in the country.	To avoid a runoff, cultivation close to the stream bank (less than 30m from water sources) is discouraged, no direct application of pesticides of water surfaces is allowed.
India	There were reports that less than 1% of applied pesticides are reaching the target and the rest are released into the environment, contributing to pollution of soil, water, and ecosystems.	There are farmer practices of mixing crop protection adhesives with pesticides and applying it to crops.
South Africa	The Water Research Commission (WRC) has many reports showing evidence of pesticides and their metabolites in SA waters.	A reduction of aerial applications and tractor sprays in agriculture and the move towards MPV's (high pressure, low volume) and no mix pesticides and the implementation of no-spray zones.
Togo	The assessment of river water quality around fields is not systematic.	There are not really any mechanisms to reduce pesticide runoff, apart from sticky pesticides.
Belize	The Belize Water Services alongside the Ministry of Health have been running several water quality tests since 2005. No contamination has been found to date.	At the present moment, the only mechanism is the buffer zone of 60 feet from water bodies.
Mauritania	No documented incidents.	We instruct our spray team to avoid spraying when it may rain.
Zambia	There are several studies done to assess the effect of agricultural chemicals on surface water bodies, especially in the Kafue flats.	The Ministry of Agriculture requires that agricultural activities are done at least 50 meters away from a natural water body.
Senegal	I am not aware of documented incidents of pesticide runoff.	So far research is limited about solutions like sticky pesticides.
Uganda	Several studies have found organochlorine residues especially DDT and its metabolites in Lake Victoria waters.	Currently, farmers are encouraged to apply pesticides after the dew on the plant leaves has dried off, but before the afternoon rains, and to avoid spraying if it is highly likely to rain in a few hours within spraying time.

2. Do you know of any sticky pesticides that could prevent harmful runoff in your country or a country you work in? To what extent can sticky pesticides increase plant retention of chemicals?

Zimbabwe; Eswatini; Zambia: Sticky pesticides will not be easily washed off the crops by rain or any other substance. As such, they will stay on the crops for a long period, thus increasing effectiveness.

Zambia: The big challenge most African countries face is a lack of documented reports and research concerning soil and water body contamination through a lot of countries have incidences of soil and water bodies contamination.

Eswatini; Togo: There are no sticky pesticides, but the addition of adjuvants is common before spraying.

South Africa: None that I know of in SA yet. The use of bi-functional peptides and polymers could reduce the amount of pesticides used and increase the effectiveness of IPM.

Senegal: I am not aware of the use of sticky pesticides in the country. However, it has been reported in the literature that 98% of pesticides run off the plant in the first few seconds.

India: Conventional pesticides are used widely and to my knowledge, they are not sticky. Sticky pesticides may create a 10-fold increase in plant retention and is more cost effective, however.

Uganda: Super Gro is registered and has a wetting agent and adjuvant component. Sticky pesticides help to increase plant retention of chemicals by providing an increased possibility of the pesticides (i.e. active ingredients) adhering onto the leaf or plant surfaces and therefore, increases efficacy.

Italy: There are advantages to the use of sticky pesticides and their application efficiency. However, these are "hard to rinse" products and proper rinsing of these empty containers is a huge challenge, increasing the risk from re-using containers.

3. Do you foresee a high level of adaptation of sticky pesticides in your country or a country you work in? Do you think there is another technology which provides a better solution?

Mauritania: Adaptation to sicky pesticides in Mauritania will depend essentially on the cost and effectiveness and the effect on human health and the environment.

Togo: A high level of adaptation of sticky pesticides is currently difficult to envisage because there is a belief that the addition of polymers or peptides will increase the cost of pesticides.

Belize: I believe that if such technology is already incorporated within the pesticide without the use (and purchase) of another additive, it would be feasible.

Zambia: A high level of adaptation of sticky pesticides can only be achieved if the proper legislation is put in place. Legislation can be made in such a way that certain pesticides which have high incidents of runoff are only imported as sticky pesticides.

Eswatini; Zimbabwe: I think farmers would adapt to using sticky pesticides as opposed to other formulations if they are cheaper, easily available and effective.

Gambia; Uganda: I think there is a possibility of it being adapted as it will pose fewer hazards to human health and the environment and it will be cost effective as it reduces the amount of pesticides used by farmers. Biocides or bio-pesticides are other better alternatives to sticky pesticides, however.

South Africa: The use of sticky pesticides will allow for IPM and can reduce the need for pesticides as the second peptide can break down fungal spores thereby fulfilling the role of a fungicide.

"If proved to be successful, the sticky pesticides may create new opportunities for farmers, particularly smaller farmers who cannot afford the high amount of pesticides currently required to compete with other, bigger farms."- Lawrence Malinga.

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Issue 10: Alternative solutions to highly hazardous pesticides in LMIC's

Pesticide Discussion Forum Summary Digest

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Alternative solutions to highly hazardous pesticides in LMIC's

Finding alternative solutions to highly hazardous pesticides (HHPs) is a key risk mitigation option, but also one of the major challenges in the pashing out of pesticide products. While pesticide registrars play a primary role in regulating the use of hazardous chemicals in agriculture, finding alternative solutions is a collective effort that should engage all plant protection stakeholders, including extension, research, producers and industry. Guidance, concrete experiences and information on alternatives to HHPs are becoming increasingly available. The bans on pesticides like endosulfan and carbosulfan have shown that, if required, HHPs can be eliminated from agriculture without major economic disruption to the farming systems in low- and middle-income countries. The focus however needs to be on the long-term prevention of the pest problems and the consequential damage. Sustainable alternative solutions require integrated approaches, which are based on agroecological management principles and practices (e.g. Integrated Pest Management). Low-risk products like biopesticides and other green chemistry options can enhance the effectiveness of these approaches. This discussion is aimed at exploring the need, the challenges and the success factors in introducing alternative solutions to HHPs.

About the Presenter

Francesca Mancini is a tropical agronomist with over 20 years of experience in promoting sustainable, small-holder agriculture in Asia and Africa. Since 2000, Francesca has been working for FAO to reduce the use of pesticides on crops, and in particularly on cotton, and to promote ecological alternatives to chemical control. She has coordinated several pesticide risk reduction projects, which are aimed at strengthening the capacity of countries to reduce their reliance on chemical control and soundly manage pesticides. A key area of her work focuses on identifying and phasing out of HHPs from agriculture.

1. In your view, what circumstances justify investment in alternative solutions?

Health: HHPs have been shown to cause various irreversible life threatening health effects on humans such as cancer, birth defects and disruption of the endocrine system. Long-term human health hazards affecting over thirteen body organ systems and resulting in consequences like cancer, birth defects, reproductive issues, disruption of the hormone system, and damage of genetic material.

Application of pesticides: With the absence of/failure to access appropriate protective equipment in many farmers and users of pesticides, might end up risking the life of people. Application method of the pesticides that causing large exposure to human population and other non target organisms is also to be considered as the reason to justify the need for investing in alternative solution.

Environment: Environmental pollution and reducing bee populations from the use of neonicotinoids is also attributed to the use of HHPs. The contamination of environmental media such as our water resources , soil and air is already costing a lot in terms treatment and rehabilitation, so the best option is to arrest this problem now by moving to safer alternatives.

Honeybee: The toxic effects of HHPs to the pollinators justify investments in alternative solutions to save the pollinators lives in particular the honeybee. Highly toxic to bees, which are importance pollinators, and as such their use has serious implications on food production and security.

Regulation: Finding alternative methods will help stakeholders during post registration and phase out processes. Taking the case of bees for example, having alternatives that are not based on the use of pesticides will ensure food production and biodiversity through pollination, without reducing agricultural production. No laboratory equipment to test for residues even though there is a food safety department under the Belize Agriculture and Health Authority.

Suicide, abusing use of pesticides: When the use of a pesticide results in increased misuse or abused by way of being used for unintended purpose. E.g. the recent Fall armyworm incursion resulted in the increased use of methomyl in Eswatini and now we are starting to observe records of methomyl use in suicide.

Manage insecticide resistance: come up with effective pest control options as compared with the present. To have a wider choice of pest control options. To replace molecules which are no longer in production (even if thy are not banned). To come up with cheaper pest control options.

Phase out: Very important to invest in the new alternatives especially in the phase out of chemicals

2. What are the limitations of merely replacing HHPs with other pesticides? What are the strengths of an agro-ecological approach to pest management?

Limitations
Resistance: One of the limits is the danger of resistance, where by a pest can easily/quickly develop resistance to the replacement/ the safer alternative, therefore it is advisable to combine preventive approaches with direct interventions of pesticides i.e. IPM approach.
Lack of political commitment: Overburdening public health problems that leads to continuous use of HHPs; Lack of local scientific evidence to

Strengths
Dependence on external input; More resilient than monoculture; Reduction of producers' vulnerability.
Preservation and increase of biodiversity by cultivating a wider range of species and varieties in associations, rotations and sequences.
Maintaining healthy soil to enhance crop nutrition through integrated nutrient management and conservation agriculture

support the replacement of HHPs; Alternatives may not be as effective as the banned HHP; Political interest including companies using politicians to stop the banning of HHPs.
Cost: Obsolete stock need special attention and FAO has a programme to assist with disposal. It is a very expensive. Other pesticides may also come with other hazards, may be less efficacious and may be more expensive.
Low and high risk: Replacing one higher risk pesticide with a couple of lower risk pesticides could result to more risks that may be complicated to deal with. Replacing HHPs with other pesticides does not reduce the risk.
Lack of research: Limitation of replacing HHP's is due to Lack of research and and funding and a combine effort from the chemical industry, at times even the alternatives also pose health and environmental problems
Community buy-in: Replacing HHP with other pesticides could be limited by social acceptability of the new pesticide products. This may end up with increasing loopholes of unauthorized trade of pesticides.
Climate change: The ever-evolving nature of the pest population due to various factors such as the climate change, the natural selection which does/may make the presumed alternative pesticides lose their intended purpose quickly.

The strength lies in their capacity to recover from disturbances of extreme weather like drought, floods and resist attack by pests and disease
Agro-ecological approaches are not only a benefit in agriculture but to nature as well, such as promoting survival of insect pollinators and natural pest control
Farmers have basket of options which is essential for up-scaling agro-ecological approaches for pest management; Control measures may be useful to more than one pest species; Most control measures are multi-functional e.g. can improve soil health in addition to pest control.
Reduction of pesticides can result in increased level of production leading to greater profitability for farmers.
Improved health and food security.
The risk associated with the human, animal and environment is low compared

3. Can you describe some good examples from your country or region of sustainable alternatives and approaches to HHPs? What are the key success factors and strengths of these

Togo: Implemented a project entitled "project to support the governance of chemicals in Togo". The objective was to promote public health through support for the sustainable and rational management of chemicals in Togo and especially HHP and good practices in chemicals.

Zambia: Zambia is one of the participating countries that is looking at alternatives to insecticides for Malaria control. Conservation farming practices are widely being promoted by Government and NGOs and have shown to in improve productivity.The government of Zambia through the ministry of agriculture is running programs to encourage farmers to practice IPM through conservation farming

Tanzania: A very good example in Tanzania with sustainable alternatives to HHPs is the coffee farm by using green /organic farming owned by women entrepreneurs cooperative. This farming system produces a very suitable coffee, which access the external market due to its high quality. The key factors of success, is in in learning and be ready to change driven by self motivation for protecting the environment and their health.

Zimbabwe: DDT was the major insecticide for cotton pest control. When it was banned and replaced with other pesticides no significant yield losses were recorded. Pests were effectively controlled with the newer pesticides introduced.

Uganda: Environmental modification to reduce on the potential breeding grounds, personal protection from potential mosquito bites, early diagnosis and treatment of cases. Received full community participation and the combination of the use of ITNs, reduction of potential breeding areas for mosquitoes, timely diagnosis and treatment of cases. The use of onions to scare away pests is also practiced: monitoring pest population levels; combining two or more IPM methods, including biological controls where possibl and field hygiene.

South Africa: Registered two alternatives in 2018 to methyl bromide (Sulfuryl Fluoride, Vapourmate), VApourmate is used in agriculture. The South African sugar industry has developed an IPM for eldana control: proving to be effective as it entails habitat management involving the implementation of push-pull technology which involves intercropping plants which are more palatable to the borers thus driving them away from the sugarcane.

Eswatini: Some farmers in vegetable farming use the approach diversification of crops and intercropping. For instance, they grow onion or pepper intercropped with spinach. The onion has characteristics that fight off insects that would feed on the spinach. Another example of sustainable approach is the IVM approach used in the health sector for malaria control in an effort to use DDT less.

Senegal: IPPM program with FFS was launched in 2001, and made it possible to develop cabbage and green beans without the use of chemicals. As for the green bean export, it allowed a crop season without the use of pesticides. Good fertilization with compost and neem oil has been put in place at the beginning of cultivation.

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Pesticide Discussion Forum Summary Digest

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The Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

Chemicals are a part of everyday life. People of all ages, cultures and social conditions are exposed to chemical substances, mixtures, commercial chemical products (e.g. detergents, cosmetics, pesticides) and various chemical-containing articles (electronics, textiles, toys etc.) on a daily basis. Some chemicals, throughout their lifecycle (production, transport, storage, use, disposal), have intrinsic properties that make them hazardous to human health and the environment. To face this danger, and considering the extensive global trade in chemicals, an internationally, harmonized approach to classify and label chemical substances and mixtures has been developed at the global level. The **"Globally Harmonized System of Classification and Labelling of Chemicals (GHS)**", provides classification criteria for substances and mixtures by the nature (hazard class) and severity (hazard category) of the hazard as well as harmonized hazard communication elements, including package labels and safety data sheets.

About the Presenter

Lennart Dock holds a Ph.D. in toxicology from the Karolinska Institute and joined the Swedish Chemicals Agency (KemI) in 2002. He is currently a senior advisor at the International Unit of the Swedish Chemicals Agency. He is Head of the Swedish delegation at the UN Sub-Committee of Experts on the GHS and served as adviser to the Swedish Government during the EU council negotiations on the regulation implementing GHS in the EU legal system (the CLP Regulation).To get in touch with Lennart, you can email him at: Lennart.Dock@kemi.se

1. What is the current process for classifying and labelling pesticides in your country or a country you work in?

Zambia:. The GHS classification system is used (in the implementation stage) in conjunction with the WHO/FAO criteria on hazard classification. Pesticides labels have to be approved by the Zambia Environmental Management Agency, 2011 before it is allowed on the market.

Uganda: The GHS is used in addition to the WHO-2009. Registration and classification of pesticides is guided by the GHS system. The less hazardous pesticides are maintained in the chemical register and allowed for renewal or registration processes.

India: The Rule 19 of the Insecticide rules 1971 guides the classification of pesticides and labelling in India.

Eswatini: The Chemicals Management and Control Bill defines the process of labelling pesticides in the country. (which has a component on classifying and labelling of chemicals, which is GHS).

Togo: In Togo, we do not have official process for classifying and labelling pesticides. As Togo is a member of CILSS, I assume we adhere to its process of classification and labelling.

Belize: The Pesticides Control Board of Belize has its own Pesticides Labelling Regulations based on the 2004 WHO labelling system.

Gambia: Gambia has adopted The GHS but its implementation is very weak.

Zimbabwe: Pesticide classification is based on hazard class (as the GHS classification procedure).

South Africa: SA Department of Agriculture, Forestry and Fisheries or regulator are currently changing to the GHS system.

Tanzania: Pesticides are classified and labelled based on hazard, which adopted from WHO recommended classification of pesticides.

Senegal: The CILSS common regulation for pesticide registration is applicable to the classification, labelling, and packaging of pesticide formulations.

2. Has your country or countries you work in adopted GHS as legislation in any sector? Please provide details

Country	GSH adoption status: Yes / No / Partially	Explanation
Zimbabwe	Partially	Gradual adoption of the same labelling system and slowly classification of pesticides is being harmonized with the GHS system.
Belize	No	The Pesticide Control Board of Belize regulates pesticides. The Belize Agricultural Health Authority regulates fertilizers, veterinary drugs and pesticides. The Department of Environment regulates all other biocides.
Zambia	Yes	There is also a National GHS standard under the Zambia Bureau of Standards as ZS 708- GHS and it is adopted through the Environmental

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		Management Act No. 12 of 2011. All pesticides imported in the country should confirm to the GHS classification and labelling.
Uganda	Yes	Yes, in Uganda in addition to WHO-2009 we also accept GHS Labelling. Registration and classification of pesticides are guided by the GHS system. The standard GHS labels are adopted on product labels.
Eswatini	No	The Environment sector is developing the Chemicals Management Bill, which adopts GHS as a mandatory standard when enacted.
India	No	India has not officially adopted the GHS of classification on chemicals for management of chemicals.
Tanzania	No	All sectors to date are using other classification schemes without being stipulated in the respective legislations.
South Africa	Yes	Adopted by the Regulator in SA with regards to labelling of pesticides that are registered in SA and are being rolled out currently. DEA are in the process of adopting GHS into their pesticide and SHEQ policies.
Senegal	Yes	It is adopted in the Environmental Code as part of the management of chemicals considering the transport and storage that are not included the CILSS common regulations.
Gambia	Yes	The use of GHS classification is included in the current Hazardous Chemical and Pesticides control and management Bill 2019.
Togo	No	Togo in a UNITAR-funded study in 2015 made a national situation / gap analysis for the implementation of the GHS but it is not included in any legislation at the moment.

3. Does your country or a country you work in have a list of chemicals (particularly pesticides) classified based on hazard? If so, are the classifications legally binding?

Zambia:. Zambia does not yet have a list of pesticides classification but uses the WHO/FAO criteria for reference.

Uganda: Yes, especially for imported chemical products. Pesticides that are highly hazardous are neither permitted for registration nor renewal in the country.

India: Yes. This classification is based on rule 19 of the insecticide rules 1971 and is thus legally binding.

Eswatini: No, Eswatini does not yet have such a system.

Togo: No, Togo does not have a list of chemicals (especially pesticides) based on hazard.

Belize: Restricted use pesticides in Belize are legally binding under Statutory Instrument 91/1992 of the Pesticides Control Act (Chapter 181B of the Laws of Belize).

Zimbabwe: Yes, pesticides are classified according to hazard in Zimbabwe and this classification is legally binding.

South Africa: Yes. In SA, the classifications are legally binding.

Tanzania: Yes, Tanzania classify pesticides based on hazard and the classification is legally binding.

Senegal: Yes, the Sahalian Committee for Pesticides (SCP) authorized list of pesticides at the CLSS level is based on the WHO Hazard Classification.

Resources and Further Reading

1. Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Seventh revised edition Legislation Available at: https://www.unece.org/trans/danger/publi/ghs/ghs_rev07/07files_e.html
2. CLP Legislation Available at: https://echa.europa.eu/regulations/clp/legislation
3. The WHO Recommended Classification of Pesticides by Hazard. Available at: https://www.who.int/ipcs/publications/pesticides_hazard/en/
4. C&L Inventory. What is the Classification and Labelling Inventory?Available at: https://echa.europa.eu/regulations/clp/cl-inventory

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Issue 12: The Rotterdam Convention on the Prior Informed Consent

Pesticide Discussion Forum Summary Digest

Issue 12 of 2019

Forum Date: **18 July 2019**

The Rotterdam Convention on the Prior Informed Consent procedure for certain hazardous chemicals and pesticides in international trade.

The dramatic growth in chemical production and trade during the past three decades has raised concerns about the potential risks posed by hazardous chemicals and pesticides. Countries lacking adequate infrastructure to monitor the import and use of these chemicals are particularly vulnerable. In response to these concerns, UNEP and FAO developed and promoted voluntary information exchange programmes in the mid-1980s. FAO launched the International Code of Conduct on the Distribution and Use of Pesticides in 1985 and UNEP established the London Guidelines for the Exchange of Information on Chemicals in International Trade in 1987. In 1989, the two organizations jointly introduced the voluntary Prior Informed Consent (PIC) procedure into these two instruments.

About the Presenter

Mohamed El Hady Sidatt is an agronomist with over 27 years of experience in plant production and protection in Africa. Since 2009, Mohamed El Hady has been working for FAO to support the implementation of the Rotterdam convention in Africa and near east regions. Mohamed El Hady has coordinated several pesticides effects monitoring projects, delivered several training workshops aimed at strengthening the capacity of countries on chemicals management and compliance with the obligations of the Rotterdam Convention at national level

1. In your view, what are the main constraints on the implementation of the Rotterdam Convention in your country or in the country you work in

ZAMBIA: Support and financial resources in assessing and managing the risks posed by hazardous chemicals imported without PIC; Political will to support the implementation of the RC. There is pressure from certain sectors to use the HHP; Coordination among key stakeholders.

UGANDA: Weak systems, structures and understaffing under the Designated National Authorities (DNA). Limited finances to fund activities related to the convention and to conduct research to support the implementation. Existence of Porous borders where illegal entry of chemicals can take place.

INDIA: Adequate awareness about the PIC procedure and its implementation and its benefits. DNA lacks technical expertise and HR shortage to perform complete the mandate.

SWAZILAND: There is no clear institutional coordination on chemicals management. The difficulty is the wider stakeholders to understand their role and in turn contribute towards the success of the activities of the RC.

TOGO: Efficiency of implementation, well trained staff and finances are challenges.

BELIZE: Under staffing is the main constraint - to keep up the notifications and the regular day in and out work it would be good to have more personnel assigned to the registration & permits unit of the Pesticide Control Board.

GAMBIA: Importations without any PIC from the exporting country and expertise in assessing the risks posed by PIC chemicals to make inform decisions as to whether the chemical is accepted for import or not.

ESWATINI: Finance and the necessary infrastructures for implementation are constraints. There is no functional legislation that domesticates the RC, making it difficult to enforce its provisions and gathering relevant information for reporting purposes. Other contriants are difficulty monitoring chemical imports, training more officers from relevant institutions for the implementation of the RC and end-users are not aware of the implications of using some of the chemicals.

SOUTH AFRICA: Challenge is enforcement, the customs officials are not trained, lack of communication between the designated national authorities. Delay in the implementation of NIP on the management of HHPs, lack of human and financial assistance.

SENEGAL: The porosity of borders with the weekly markets for which it would be necessary to reinforce customs control. Availability of some information mainly for imported products due to weak communication between DNAs. Non-adoption of the GHS by all CILSS countries (regional registration scheme): many labels are not exploitable by users and could lead to unsafe handling.

PRESENTER SUMMARY: Constraints: lack of resources, capacity building of stakeholders, enforcement. The secretariat can support all parties on capacity building to better understand the obligations and to share responsibilities between national key stakeholders. Through specific programmes: address specific issues such as legal gaps, training of customs.

2. Is there any national coordination system to implement the Rotterdam convention or other MEAs in your country or the country you work in? Explain.

Country	Yes (Y) / No (N) / Partially (P)	Explanation
Zimbabwe	N	Not aware of any National coordination team for implementation of the convention.
Belize	P	Only in the event of projects like the Belize Chemicals and Waste Management Project are the MEAs under a national coordination system. After the projects are completed the coordination systems are not sustained. The focal point for the RC is housed at the Pesticides Control Board, Belize and the other MEAs are housed within Belize's Department of the Environment.
Zambia	P	Domestication of the BRSM Conventions. However, there is no formalized coordination mechanism in place. Coordination is by adhoc meetings: challenge is the lack of

		consistence and dedicated entity for the implementation. Coordination is done by the ZEMA: collaborate with other relevant agencies such as the ministry of agriculture and ministry of health.
Uganda	Y	There is a national coordination body for the RC and other MEAs and this is the NEMA under the Ministry of Water and Environment. NEMA coordinates MEAs for both Industrial chemicals and agricultural pesticides.
Eswatini	Y	Eswatini Environmental Authority under the Ministry of Tourism and Environmental Affairs is the DNA for Eswatini.
India	Y	The DNA or contact points of RC and other conventions are the Hazardous Substance Management Division under the Ministry of Environment. This division coordinates RC and other MEA process, implementation and communications.
Swaziland	Y	The country's environmental agency coordinates implementation of the activities of the Rotterdam Convention and other MEAs.
South Africa	Y	The co-ordination of the RC falls under Department of Environment, Forestry and Fisheries under the Branch Chemicals and Waste. It falls under the broader Chemicals and Waste Management Strategy which has recently been updated. The DEA our focal points) coordinates a Multi-stakeholder Committee on Chemicals Management that meets 4 times a year to review MEA's activities.
Senegal	Y	The national coordination system for implementation of the RC is the Commission for the Management of Chemicals, National Competent Authorities and the Sahelian Pesticides Committee (Regional Pesticide Registration Structure): controls and monitors the import, use, production and movement of harmful chemical, and dangerous substances.
Togo	Y	A focal point or contact appointed by the Ministry of the Environment, two national authorities, one for pesticides represented by the Ministry of Agriculture and the other for industrial chemicals represented in the Ministry of the Environment.
PRESENTER SUMMARY		It seems that a national consultation takes place in the country BUT important that each stakeholder knows their responsibility and a closer collaboration with others is crucial to implement the convention and other MEAs.

3 In which areas, does your country or the country you work in need support to implement and comply with the Rotterdam convention? Detail the support needed and why?

ZAMBIA: From continuous UNEP and the Swiss Government to undertake a project whose objective is to strengthen National Infrastructures, institutions and legal Frameworks. Enhanced technical support to develop systems for monitoring and reporting effects of pesticides and industrial chemicals on the human health and environment.

UGANDA: Technical assistance to develop institutional frame works to implement and comply with the RC, need for policy implementation support. Financial support; Uganda does not have sufficient resources to invest in implementation. well-trained personnel.

INDIA: Adequate HR and Financial support is inevitable. The DNA needs qualified and well-trained technical experts to undertake on RC implementation process. Further, there should be some SOP for collaboration between health and agriculture ministry

TOGO: Capacity building of the members of the national committee for pesticides in the decision-making process to register a pesticide according to its hazard.

MAURITANIA: Needs support in: Capacity building. Legislation and policy.

SOUTH AFRICA: Training on risk assessments would be great for staff in DAFF.

SWAZILAND: Need relevant training for personnel in the relevant institutions to help the implementation of the RC. Setting up of a chemicals/ pesticide registration system to identify and regulate chemical imports. Awareness Raising for end users, helping the country to domesticate the RC as a national primary legislation or secondary legislation.

SENEGAL: Technical assistance on supporting custom officers in implementing the RC obligations the exchange of information and awareness-raising among all stakeholders.

TANZANIA: Support on risks assessment to identify HHPs and FRAs, reporting and monitoring of banned and restricted pesticides. There is a need to train more people in pesticides and hazardous chemical management (including other stakeholders).

MAURITANIA: Information exchange.

CAMEROON: Applications is a problem.

Resources and Further Reading

1. Plant production and protection division: highly hazardous pesticides (HHPS)
2. http://www.fao.org/pesticide-registration-toolkit/tool/home/
3. The WHO recommended classification of pesticides by hazard
4. http://www.pic.int/Implementation/TechnicalAssistance/Overview/tabid/4105/language/en-US/Default.aspx

Disclaimer:

Disclaimer: The views and opinions expressed in this document shall not necessarily be taken to reflect the official opinion of the DEH, UCT, SIDA or KemI.

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Issue 13: Integrated Vector Management (IVM)

Pesticide Discussion Forum Summary Digest

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Integrated Vector Management (IVM)

Vector control is a major component in the control of vector-borne diseases, such as malaria, leishmaniasis and dengue. However, the potential for vector control is seldomly reached. IVM is a strategy, promoted by the WHO, to increase the efficacy, cost-effectiveness, environmental soundness and sustainability of vector control. IVM relies on functional inter-sectoral collaboration, evidence-based decision making and an integrated approach to implementation.

About the Presenter

Henk van den Berg works as visiting scientist at Wageningen University, The Netherlands, and consultant to UN organizations, on integrated approaches for control of agricultural pests and vectors of human diseases. Henk started working in the 1980s as agricultural entomologist in IPM projects based in East Africa, Southeast Asia and later on in South Asia. Since 2002, he is based in Europe, where focus has broadened towards public health. Since 2012, he is partner in a malaria control project in Malawi, where the impact of house improvement and larval source management on the transmission of malaria is studied in a randomized-control trial.

1. Identify positive elements of IVM (technical or non-technical aspects) that have become evident in your country or the country you work in and that could serve as case examples for other countries.

ZAMBIA: Communities are empowered with IVM knowledge to actively participate (some regions have no cases of malaria). Good collaboration between the ministry of health and other stakeholders, male sterile mosquitos released into the environment.

UGANDA: MOH working together with development partners since 2007: active participation in sensitization and mobilization of community members. Monitoring of insecticide resistance every after three months, distribution of insecticide treated mosquito nets.

INDIA: National Vector Borne Disease control Programme: the nodal agency for controlling vector borne diseases is trying to implement IVM components as part of its various vector control measures.

SWAZILAND: Participatory Ecological Land Use Management Swaziland network of NGOs improving the livelihoods of smallholder farmers and the sustainability of farming communites.

TOGO: Distribution of Insecticide treated mosquito nets before rainy seasons and strong inter-sectoral collaboration.

BELIZE: The malaria program at its peak in the mid 90's had over 10,000 cases and in 2018 we have less than 5 cases. Rotation of traditional larvicides to biological larvicides to insect growth regulators such as methoprene.

ESWATINI: Moving away from the reliance on DDT for vector control and opting for safer alternatives. Eswatini is introducing winter larviciding as means to reduce reliance on pesticides such as DDT.

SOUTH AFRICA: A malaria elimination strategic plan has been developed to achieve zero local malaria transmission in SA.

TAZANIA: Social mobilization and awareness raising through trainings. Government needs to establish legislations and national policies that will encompass and enforce the implementation of IVM in the country as an outstanding sustainable approach.

ETHIOPIA: Ethiopia developed Insecticide Resistance Monitoring and Management Strategy in 2016.

2. In your country or the country you work in, is entomological expertise and data shared between vector-borne disease control programmes, and other relevant stakeholders? Explain and indicate shortcomings in entomological expertise and capacity.

Countries that have: Yes: Uganda, Eswatini, India; **No**: Belize, Mauritania; **Partially**: Zambia, SA, UK, Tanzania

Country	Explaination	Shortcomings
Belize	Entomologists working in have been trained and work within agricultural industry.	Data is not shared with other agencies and is neither requested by local agencies.
Zambia	The National Elimination Center conducts vast range of entomological studies. Vector Control Technical Working group exists for stakeholder engagement where results from such studies are disseminated for informed decision making.	Inadequacy number of entomological expertise, medical entomology is not well developed.
Uganda	Under the Vector Control Division entomological expertise and data is shared between the different vector-borne disease control programmes with relevant stakeholders but not with the community.	Limited entomological expertise with majority of the entomologists (diploma level) and deployed at districts as vector control officers.
Eswatini	Data sharing between the National Malaria Control Programme and the Ministry of Health relevant stakeholders. Relying on technical assistance from WHO for entomological surveillance	Would benefit from addition of entomologists Limited entomological expertise.
India	Entomological expertise and data is shared between vector borne disease control programmes as we have a National Umbrella Programme.	Data is not always up to date and accessible for public, shortage of experts.

South Africa	most of the entomologists in the country are not vector specialists but look at biological control.	Poor salary of highly skilled entomologists in govt, limited funding in the research institutes, lack of financial, human and infrastructural resources hinder advancement research.
Togo	The National Malaria Control Program deals with malaria. No entomologist but benefits from the expertise of entomological researchers in national universities and sub-regions.	A panel of entomologists and epidemiologists to support the efforts of all national programs of vector borne disease is necessary.
UK	Most research at Imperial College relevant to IVM is now on GM mosquitoes.	
Tanzania	Shared entomological expertise (few available) on vector borne disease control programs with other stakeholders: through workshops and forums where different research works are posted and discussed.	no improved system that allows community access to resources/work due to poor communication.
Mauritania	Entomological data is still scarce	Not enough information about major vector borne disease dynamic and repartition.

3 How is insecticide resistance in disease vectors being managed in your country or the country you work in, and how could this be improved?

Country	How insecticide resistance is managed and improvements
Zambia	By discontinuing the use of resistant insecticide. There is an effective insecticide in use for malaria control or elimination. Implementation of other IVM for vector control is to and not only insecticides.
Uganda	National Malaria Control Programme: strengthening capacity in entomology, epidemiological surveillance, insecticide resistance monitoring, vector behavior. Improvements: Periodically testing for any development of insecticide resistance. Regular updating and sharing of a malaria map by the Malaria
Gambia	Insecticides resistance studies (for malaria vectors) done by the National Malaria Control Programme in collaboration with the medical research council through the establishment of tine last sites. National Malaria Policy IVM practices are implemented. Improvements: Resources need to be devoted to research and entomologists to improve resistance management.
Belize	Either outsourced or done in collaboration with institutions doing research in Belize.Improvements: Investment in the area of entomology, specifically ensuring that within the ministry of health there is a medical entomologist.
India	The vector management programmes recommend using different insecticides, which are approved for same in case of repeated applications. Improvements: Better environment management and source reduction in an ecologically sound manner to reduce insecticide usage.
Togo	A national health development plan until 2022: integrates the notion of resistance to products. Improvements: Reducing excessive use of pesticide in agricultural (registered and obsolete).
Eswatini	Eswatini National Malaria Elimination Strategy includes monitoring insecticide resistance through the use of 6 sentinel surveillance sites combined with training of personnel on proper guidelines on different aspects including malaria case management, diagnosis and microscopy.
Zimbabwe	Different pesticide groups are being alternated to manage insecticide resistance. Monitoring of insecticide resistance. Imrovements: Formal monitoring by more frequent testing.
South Africa	IRM Plan for malaria vector control: malaria directorate at DoH. Insecticide resistance is being managed by using different pesticides when resistance is detected.
Tanzania	National malaria control programs embrace monitoring of insecticide resistance at different (more than 35 districts) sentinel surveillance sites to ensure the resistance status is known.
Ethiopia	Insecticide Resistance Monitoring and Management Strategy in 2016. Developing a road plan and workshops on the implementation of insecticide resistance management strategy, collaboration among stakeholders.
Mauritania	No standard method for insecticide resistance in disease vectors

Resources and Further Reading

1. Ranson H, Lissenden N: Insecticide resistance in African Anopheles mosquitoes: a worsening situation that needs urgent action to maintain malaria control. Trends Ranson H, Lissenden N: Insecticide resistance in African Anopheles mosquitoes: a worsening situation that needs urgent action to maintain malaria control. Trends in Parasitology 2016, 32:187-196.
2. World Health Organization. Global Plan for Insecticide Resistance Management in Malaria Vectors. Geneva, Switzerland: World Health Organization; 2012.
3. Golding, N., Wilson, A. L., Moyes, C. L., Cano, J., Pigott, D. M., Velayudhan, R., et al. (2015). Integrating vector control across diseases. *BMC medicine, 13*(1), 249.
4. Chanda E, Ameneshewa B, Bagayoko M, Govere JM and Macdonald MB (2017) Harnessing integrated vector management for enhanced disease prevention. Trends in Parasitology 33: 30-41.
5. WHO (2017) Global vector control response 2017-2030. Geneva, World Health Organization

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Issue 14: Biological Monitoring of Pesticide Exposure

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Biological monitoring of pesticide exposure

Pesticides may cause unintended adverse effects on humans and the environment due to their nature that is designed to kill pest. Workers and individuals involved in the manufacture, formulation, preparation, packaging, transport, storage, mixing and application of pesticides are likely to have higher exposures to pesticides and therefore they are at higher health risks. Handling pesticides in a closed or poorly ventilated room aggravates more exposure through inhalation. Skin absorption is another important route of exposure. In order to protect workers or individuals from pesticide exposure, biomonitoring is carried out to detect early biochemical or physiological changes before these lead to reversible or irreversible health effects.

About the Presenter

Raphael J Mwezi is an expert on public health and Toxicology. He worked for the Ministry of Health in Tanzania. Currently he is working with the Tropical Pesticide Research Institute under the Ministry of Agriculture in Tanzania. He coordinated a number of projects in Tanzania involving Biological Monitoring (BM) human health pesticide exposure. He is a member of various international and national taskforce and committee on pesticide management.

Question 1: How does your country or the country you work in conduct BM of pesticides exposure? If your country does not conduct BM, why not and what are the overall gaps?

ZAMBIA: No. Main gap is lack of adequate resources (finance) and qualified human resource, financial and institutional challenges.

UGANDA: Not entirely. A few cases of pesticide poisoning are tested at the Government Analytical Laboratories and sent to the GAL by hospitals for further diagnosis or policy or court for investigations. Gaps include financial support for BM; limited resourceful personnel; infrastructural inadequacy; no guidelines or laws; lack of a legislation and regulations.

INDIA: No. Poisoning incidents and self poisoning cases level of acetylcholine esterase is used as the biomarker for diagnosis and medical intervention. The health care sector not addressing the issues in a way that is needed considering the agro-ecological and environmental conditions and various modes of occupations exposures.

ZIMBABWE:BM is done after every two years. Every person who is occupationally exposed is monitored mainly for OP and CoA. However, not everyone is being monitored and not every pesticide poisoning is being monitored as well.

TOGO: No. In cases where BM is done, it is within the framework of a research project. Gaps: Lack of adequate equipment for analyses; adequate personnel in the technical services; budgetary challenges. The sub-committee on toxico vigilance of the National Committee for Pesticide Management is not functional.

BELIZE: Partially**.** Only the banana industry does BM control for its workers and operators as a requirement by the auditors for certification approval. Pesticides Control Board only monitors that the tests are performed.

ESWATINI: No. The main reason could be that lack of capacity (financial and institutional). No law which enforces that industry does biological monitoring of pesticides exposures and effects.

SOUTH AFRICA: Employees working for a company and working with hazardous chemicals are required to have regularly medical BM. Gaps: agricultural falls through the regulatory cracks and commercial farmers do not conduct this monitoring of their employees; no adequate research on human exposure to pesticide.

TANZANIA: BM is mandatory for Large Scale farmers specifically testing the level of Acetyl Cholinesterase Enzyme for pesticide sprayers who handle OP and carbamates. Gaps are the lack; of toxicologists; inadequate laboratory capacity to analyses samples; indicators for routine monitoring; policy and guidelines for monitoring.

ETHIOPIA: GAP: During Insecticide Residual Operation for controlling malarial transmitting mosquitoes MoH does not monitor sprayers exposure to OP and carbamate pesticides using Cholinesterase inhibition testing.

MAURITANIA: BM of pesticides exposure is regularly conducted to monitor exposure level to pesticides, especially when OPs and carbamate are used for Desert locust control. A field test is conducted by using blood samples from all stuff members involved directly or indirectly in pesticides handling.

Question 2: What are the susceptible biomarkers for specific groups of pesticide exposure? Why is it important to understand what biomarkers are available?

SUSCEPTIBLE BIOMARKERS

- For OP pesticides acetyl cholinesterase is used a biomarker. Blood, urine sample, breath and even breast milk as susceptible biomarkers.
- BM include genetic factors (shows how we react to a pesticide when exposed) and other biological factors (lifestyle, health or nutritional stands).
- Acetylator phenotype (aflatoxin, aromatic amines). Deficient DNA repair (Xeroderma Pigmentosum (XP),
- Biomarkers are measurable indicators of the biolgical system or organism - presence of a chemical or its metabolites within biological specimens ,measured alterations in structure or function or identifiable genetic variations.
- Three categories of biomarkers have been identified: exposure, effect or response and susceptibility.

Ataxia telangiectasia (AT), BRCA. Deficient metabolism (P450 variants).

- Globally, the innovation of Rapid test to test specific biomarker for specific pesticide exposure is of a global challenge.
- Environmental biomarkers: soil, water, and air.

IMPORTANCE OF BIOMARKERS:

- Useful in measuring exposure and the extent of the disease in exposed people.
- Biomarkers indicate that an individual or population has been exposed.
- Biomarkers help medical experts in proper diagnosis and then designing the treatment protocol and required medical intervention.
- Biomarkers of exposure provide a measure of body burden of a chemical or its metabolite.
- Biomarkers are useful as they help measure exposure and disease progression in an affected person. There are also useful in toxicology and determining the toxicity of a substance.
- Help to identify the causal association.
- BM of OPs does depend on people being checked before exposure to determine what impact exposure has. It is important if a large proportion of farmers are using similar pesticide.

Question 3. In your country or the country you work in, do you have a policy, which enforces or relates to biological monitoring of human health pesticide exposure to be conducted? If not, what are your recommendations.

YES	POLICY
Zambia	The environmental management act and the subsidiary (licensing) regulations require that a person involved in the handling of pesticides undergo medical tests (not specific for pesticide exposure). Recommendation: collaboration with the industry for BM of human health pesticide exposure; focus on bio monitoring especially for vulnerable exposed groups.
Ethiopia	Proclamation to provide for the registration and control of pesticides: in relation to occupational safety one of the articles states that any employer who requires or permits an employee to work with pesticides shall provide the employee with periodic check-ups as may be prescribed by the MoA or MoH.
SA	Policy is limited to chemical workers and rarely has been applied to agricultural and domestic pesticide exposure mainly vulnerable communities. Government needs to revise the existing legislations on BM of pesticide exposure and strengthen research work on pesticide related exposure. Multi-sectorial collaboration for rich toxicological data and coordinated research among researchers to avoid duplication.
NO	**RECOMMENDATION**
Uganda	BM inclusion in the Agricultural Chemicals Control Act, 2006 and its attendant Regulations, thereafter sensitization and enforcement can be initiated. Need for development and implementation of this policy with a body corporate responsible for its implementation. Lobby for financial support towards it and streamlining for its operationalization and coordination.
Zimbabwe	Begin working towards drafting legislation, which relates to compulsory BM of human exposure. For a start FAO guidelines could be used for a start and as draft to this legislation.
Eswatini	Craft and include BM policy in the existing medical check up that every employee goes through especially individuals who work with pesticides. Ministry of Agriculture as part of the implementation of the Pesticides Management Act to collaborate with the MoH towards conducting training for policy makers to be capacitated on BM.
Gambia	Policy is not available and BM is not done for human pesticide exposure. For this reason, such a policy must be developed and implemented.
Togo	Create a task group or ad hoc committee to define the framework for setting up BM. It will not only be a question of defining the framework, but above all of proposing to the government the financial sources that will make it possible to shop equipment and to retrain the technical staff on BM.
Tanzania	Legislation that requires all occupational individuals working with pesticides in any case be it in farms, factories, selling and who work in specific operations such as IRS should be biologically monitored after some time (e.g six months). The code of conduct should be adopted as the guidelines to draft a new regulation regarding BM of pesticide exposure.
Belize	The Pesticides Control Board launched a 5-year strategic plan in 2017 to address all the legislation gaps identified throughout the survey but there is no governing policy or law to enforce such monitoring. As a start, we could use the FAO guidelines and also look into the guidelines the banana industry uses.

Resources and Further Reading

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This Digest was produced by: Tatum Louw (lwxtat001@myuct.ac.za) **Prof Andrea Rother** | Forum Moderator | andrea.rother@uct.ac.za **Acknowledgement**: *Financial assistance from the Swedish International Development Cooperation Agency (SIDA), has been arranged by the Swedish Chemicals Agency (KemI)*

Issue 15: Glyphosates and their use

Pesticide Discussion Forum Summary Digest

Issue 15 of 2019
Forum Date: **29 August 2019**

Glyphosates and their use

Glyphosate is a broad spectrum post emergent herbicide that is widely used in agriculture and horticulture to combat weeds that compete with cultivated crops. It is also widely used in the forestry industry for silviculture practices. Glyphosate was first introduced onto the global pesticide market back in the 1974 by Monsanto with the product Roundup but the use of Roundup surged by the late 1990's due to an ingenious marketing campaign by Monsanto – the introduction of genetically engineered/ modified (GM) seeds that could tolerate high doses of Roundup. So while the weeds around these crops died, the seeds grew unhampered resulting in a boom in the GM market and to increase the use of Roundup further, farmers were encouraged to use Roundup as a desiccant on their crops to dry out the crops, speeding up the time to harvest. Glyphosate strongly binds to soil and is regularly found in drinking water, our food, the air we breathe and the environment. Glyphosate and glyphosate based herbicides (GBH's) comprise more than 30% of the global pesticide market.

About the Presenter

Debbie Muir is a Specialist Programme Manager for the Department of Environmental Affairs in South Africa. She is responsible for the pesticide management and risk programme and the national biological control programme, among others. To get in touch with Debbie, you can email her at: dmuir@environment.gov.za.

What is the most important key aspect of interest between the Conclusions on the peer review of the pesticide risk assessment **(resource 1)** and the IARC glyphosate monograph **(resource 3)**? [Resource 2 gives a nice comparison of the two]. Which one would be more applicable to your country or the country you work in?

- EFSA and IARC monographs information deferred because of the IARC assessed glyphosate as well as glyphosate-based formulations while EFSA focused on the pure active substance of glyphosate.
- Both the assessments have identified data gaps, inconsistency in studies, and poor quality studies.
- One of the problems with different assessments is that often initially the active ingredient is tested alone whereas the end user buys a formulated product.
- From the two reports it can be noted that there is lack of concrete statistical data to correctly classify glyphosate.
- The mammalian toxicology in particular wheth glyphosate is carcinogenic to humans. The Key aspe of interest between the EFSA and IARC conclusions the lack of sufficient evidence that implicates glyphosa to cause cancer.
- Resource 3 supported classification of glyphosate Group 2A based on carcinogenic evidence experimental animals which could be operative humans as well.
- Both resources concluded that there was no enou evidence to classify glyphosate as carcinogenic humans.

CONCLUSIONS ON RESOURCE 1 AND TWO:

RESOURCE APPLICABLE TO COUNTRY: (RESOURCE 1) Pesticide risk assessment:
UGANDA;SENEGAL;ESWATINI; ZAMBIA,MAURITANIA **(RESOURCE 3) IARC glyphosate monograph:**
TANZANIA; BELIZE

2. Does your country or the country you work in use glyphosate detection methods? Please mention them and indicate if they are successful and why. If your country does not have a detection measure, is it worth having these methods or are studies from other countries being used?

Uganda: Yes The Government Analytical Laboratory (GAL) uses detection methods that can identify glyphosate. Another Internationally accredited laboratory Chemiphar also has capacity to detect glyphosate.

Zambia: The Toxicological Laboratory based at the Food and Drugs Laboratory and the laboratory does have the Chromatography equipment that is used for analysis of food and water samples. Other laboratories analyze environmental samples and detecting pesticide residue in them. However, there are challenges in laboratory analysis due to issues of capacity in logistical supplies and technical from the Laboratory staff.

Zimbabwe: Zimbabwe does not use glyphosate detection methods - it is worth using these methods to protect the human population.

Cameroon: Yes there is a method in Cameroon but not in the laboratory of pesticides analysis in another.

India: Glyphosate has been approved for use in India only on one crop, tea and MRL for glyphosate has been fixed only for one commodity, which is tea. There is a national programme for monitoring of pesticide residues in commodities and environmental samples in India however glyphosate is not there in the list of pesticides tested for.

Togo: We lack the equipment to do simple analyzes. By just referring to the equipment used reported in the articles, at this level, Togo would not be able to do this analyses.

Tanzania: We have Chromatography equipment for analyzing environmental samples and detection of pesticide residue in them. However, it is rare to detect glyphosate in the analyzed samples so far.

Eswatini: No. Having such measures would really be helpful so that even agricultural produce would be tested to prevent potential risks to consumers.

Belize: No glyphosate detection methods. However, the Pesticides & Water Quality study currently underway.

Mauritania: Glyphosate is not used in Mauritania, therefore its detection methods are not used here.

Gambia: No. However, the Food Safety and Quality authority do send samples out of the country for residue analysis of pesticides and other substances.

3. Will a ban of glyphosate and GBH's be practical or achievable in the country you live or work in and why? If not, provide alternatives.

Yes	Why
Zambia	Yes, if it is listed under the Rotterdam/Stockholm convention or other international ban to aid and support the ban. This has been found to be among the major caused of pesticide poisoning in the country and with well written policy briefs backed by research, such a ban is very practical and achievable.
Uganda	There is a supportive policy environment in Uganda. The health and environmental effects experienced by the final users buy-in.There are many sustainable agricultural methods of managing weds that Uganda is currently using,so effect of banning of glyphosates might not be felt.
Mauritania	If regulatory measures regarding the implementation of the bans and management of alternatives are done. Glyphosate bans could be put in place as the authorized list of pesticides in CILSS countries includes a various number of herbicides.
Zimbabwe	Banning of glyphosate would be practical and achievable because Zimbabwe does not use glyphosate-ready varieties which other countries are using. Glyphosate is not a key plant protection product for Zimbabwean farming.
India	Yes,because most of the farmers in India belongs marginal and small-scale farmers and industrial farming is not been set up in India it is easier for implementing such a ban. Several alternative non-chemical methods are still practiced in India for weed control including mechanical and manual weed removal as well as cultural practices.
Eswatini	A ban would be possible as long as there would be thorough inspection of imports to prevent entry of these pesticides. The ban would be achievable more so because it is not manufactured in the country. However, it may be difficult for eSwatini due to lack of firm conclusions from agencies. A restriction could be done by the different sectors/industries when they try to access markets.
Togo	Glyphosate and GBH should be banned. These kind of pesticide are used everywhere in country leading to fearful environment for those who are aware of risk. The product is effective for users and I think if it is noticed through scientific findings that is HHP it would be banned.
Gambia	Looking at the current reliance on glyphosate by many farmers, both small and commercial, banning it would be difficult unless alternatives are quickly introduced. We have a variety of herbicides on the market, problem is what would be good alternatives are generally very expensive. But glyphosate is generally cheap and quiet effective even though it is rumoured that some of the glyphosate is counterfeit because it just doesnt work on weeds. So much has and is being written on glyphosate, with the health implications linked to it, best is just to ban it

No	Alternatives
Tanzania	Strengthening regular inspection to ensure all unauthorized products are not available in the market. Strengthing inspection at the border entry to avoid importation of illegal products./pesticides Regional harmonization for registration of pesticides between neighbouring countries to avoid porous border control.
SA	The ban may not be effect now as immediate alternative to glyphosate in term of productivity and yield.It is currently reliable on small scale farmers especially in rural developing countries and less is known about its adverse effects(human and environmental). Reliance on imported glyphosate , monopoly by chemical companies(Bayer), lack of enforcement of pesticide regulations, inconsistency in the proper environmental and biological monitoring of glyphosate are some hiccoughs in tackling the banning of use of this herbicides.Alternative is find substitute pesticide that is less harmful to ecosystem and humans.
Belize	It could possibly become practical because of its effect on major exporting industries. But the linkage between this active ingredient and its health effects to the Belizean population will be a tremendous task. The way our government operates it to exportation than the effect it has to its people. However, this yes would definitely come after many deliberations (and possibly many years), in conclusion that would be a no.

Resources and Further Reading

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This Digest was produced by: **Tatum Louw**| Forum Administrator | lwxtat001@myuct.ac.za. **Prof Andrea Rother** | Forum Moderator |

Issue 16: Using modern technology for pesticide application

Pesticide Discussion Forum Summary Digest

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Using modern technology for pesticide application

To obtain good yields from the various crops, farmers are confronted with the need to control insect pests, diseases and weeds, which is why the pesticide industry has grown since the 1950's as more farmers have applied pesticides that provide quick action to reduce the damage to their crops. However, overuse of pesticides can result in pests becoming resistant and there is now more concern about the impact of pesticides on the environment. Rain can wash spray deposits off crop foliage and subsequently some of the pesticide contaminates rivers. While new technology of genetically increasing resistance of crops to certain pests can reduce pesticide usage, more needs to be done to optimise the application of pesticides when they are still needed.

About the Presenter

Graham Matthews began his career as a research entomologist, joining a team working on cotton insect control in Southern Rhodesia (now Zimbabwe) in 1958. He later moved to Malawi, but since 1972 has been based at Imperial College researching spray application technology and seeing pest problems in many different countries.

1: To what extent is guidance on how the pesticide should be applied, shown on the label, considered when deciding to register a Product in your country or the country you work in?

Uganda: Guidance on application is considered during registration of pesticides (control of Agricultural Chemicals Act, section 8). The submitted proposed label is reviewed before approval and one of the aspects to be reviewed is guidance on how the product is to be used.

Ethiopia: Leaflet would be folded and put under label or put in a pocket on the pesticide container) in connection to each product to be registered in Ethiopia.

Zambia: Labeling of pesticides is strictly regulated under the Environmental Management Act No. 12 of 2011. Before a pesticide can be registered in the country a sample label is submitted to the ZEMA for approval. The label must confirm to the GHS and other international guidelines developed by the UN-FAO.

Zimbabwe: It is mandatory for pesticide manufacturers to include information on how the pesticide is applied on the pesticide label. Without this information the pesticide cannot be registered.

Eswatini: Guidance provided on labels regarding how pesticides should be applied might of great value to pesticide users. Such guidance is not utilized for registrations of pesticide products since there is still no pesticide registration regime being enforced.

Mauritinia: The following guidance among others shown on the label should be applied when deciding to register a product.

Senegal: One of the countries subject to the CILSS common regulations for the registration of pesticides. It is described in the guide for approval that 2 dossiers must be submitted.

South Africa: When registering a pesticide the label, detailed information like the recommended dosages, number of application , withholding period , mixing instructions and resistance warning. The information is on the label, in only 2 of the official 11 languages.

Togo: Most of data required in pesticide dossier is available in pesticide container Label. One important piece of information that the Pesticide Registration Committee ensures is the dose needed for treatment and the label model is requested in the registration dossier. However, it should be noted that for the moment, the label is not available in the local language in the country.

India: The guidance on pesticide application given by the registration authority is entirely based on the label information provided by the industry as part of the registration dossier.

Tanzania: Guidance on pesticide application is somewhat provided on the labels of pesticide containers. During registration, it is mandatory for manufactures to submit a copy of labels for approval before being used - due to insufficient number of staffs or overlook it happens some labels do not provide enough information for the user.

2. What training and information is provided in your country or the country you work in on the complexity of applying biopesticides (e.g., formulation, timing of application)?.

Senegal: Extension service and the plant protection department provide essential training in pesticides application.

Uganda: Training is provided by the soil department in Makarere University. There is low use of biopesticides, limited and mostly in flower farms or commercial farms. Bio-pesticides are relatively new in Uganda and the training and information is provided by the technical staff from the Ministry of Agriculture, research and academic instructions.

Togo: Launched a pilot project titled: formulating and field-testing biopesticides, apart from this project which included a training component.

Mauritinia: Sometimes training sessions are organized on green muscle doses preparation, mixing and other aspects related of application rate and application methods against Desert locust.

India: No training is provided to users on the complexity of applying biopesticides. However, as a general guideline, promoters of biopesticides says to spray during evening.

South Africa: Training is mostly done through collaboration of the government departments and the research institutes and smallholder farmers , its generally on pesticides. Biocontrol products are probably less than 5%.

Zambia: The use of biopesticides is very low among farmers in Zambia and mainly by commercial and its handling and application is still being developed by the Zambia Agriculture Research Institute, pesticide marketing companies, and private agriculture research organizations. Need for more engagement with stakeholders before applications of these can commence.

Belize:They are treated the same as synthetic pesticides.

Eswatini: Information and training related to application of biopesticides is still not common. I would categorize biopesticides as being at grassroots. However, there are promising initiatives, such as one led by the Royal Science and Technology Park, which is towards strengthening capacity in various latest advancements which include biopesticides.

Tanzania: Biopesticides is still in its early stages. Some agriculture research institutes and NGO emphasize on the use of this, however, its development is very limited. Besides, registration of biopesticides is not yet to be done. There is no specific trainings conducted about the use of biopesticides, instead some dealers try to instruct their customers on how to use them during the purchase.

Zambia: Knowledge of biopesticide handling and application is still being developed, just as biopesticides are being promoted by the Zambia Agriculture Research Institute pesticide marketing companies and private agriculture research organizations. The use of biopesticides is generally still low among farmers.

Zimbabwe: There is no training focusing on application of biopesticides. Biopesticides could be mentioned in some general pest control trainings. Use of biopesticides is still at its infancy in Zimbabwe.

3. What is currently in place in your country or the countries you work in to move toward the use of more modern spray technology to reduce exposures and drift (e.g., drones)? If not, what would be needed to modernize spray technology?

Country	Currently in place
Zambia	There is a company promoting the use of drones for pesticide applications. They have been doing demos at some selected commerical farms and at the zambia agricultural research institution.
Cameroon	Use of manual sprayers and motors sprayers for small farms but big factories use small planes and tractor with big sprayers.
SA	A recent introduction of drone in KZN by DC Geomatics especially in sugarcane plantations has been praised as a success(Caboz,J .2019). Disadvantage is that not all sugarcane grows can afford and have access to the drone unless government intervenes

Country	Needed to modernize spray technology
India, Ethiopia	Not permitted in India except for emergency public health use of pesticides. In order to reduce exposures and drift a better option is to move away from chemical pesticides and depend on agroecology.
Uganda, Zim, Togo, Tanzania	Mainly the use of knapsack. Training on farmers knapsack sprayers on how they can be operated is needed plus a critical pool of local artisans for repairs or maintenance, farmers' literacy levels must rise to good percentages to comprehend and ease the adoption of this sort of high technology and flexibility in government policy or law in support.
Senegal	To modernize spray technology, devices should not be difficult to handle technically, should be adapted to our farms, the cost should also be low.
SA	The use of drones in SA requires a CAA license thus specialised operators. The registration of the application method would also need to change on the label which is a process governed by Act 36.
Estwatini	It would be advisable to make available in the market affordable versions. Assistance provided to institutions such as the Royal Science and Technology Park(training manuals that address tried and tested technologies).
Belize	Incorporated in law.

Resources and Further Reading

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Issue 17: Addressing Hazardous Child Labour and Promoting Safe and Sustainable practices in Agriculture by reducing the risks posed by pesticides

Division of Environmental Health | University of Cape Town | www.publichealth.uct.ac.za

Pesticide Discussion Forum Summary Digest

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Addressing hazardous child labour and promoting safe and sustainable practices in agriculture by reducing the risks posed by pesticides

Child labour is defined as work that engages children below the minimum age for employment; interferes with compulsory schooling; is hazardous; and/or is mentally, physically, socially or morally dangerous and harmful to children. Currently, 71% of all children labour is found in the agriculture sector and nearly half of all child labour globally is considered hazardous work. This includes the handling and use of pesticides. Children may be exposed to pesticides directly through mixing or application or can be exposed indirectly through work in fields where pesticides have been applied or at home, where pesticides are unsafely stored. Children may also face risks while accompanying family members to the fields, through pesticide drift or through the reuse or improper disposal of pesticide containers. Sometimes, even tasks that may seem harmless can put children in contact with pesticides (e.g. washing clothes that have been in contact with pesticides). As children's bodies and minds are still developing, they are especially susceptible to the potential toxic effects of pesticides.

About the Presenter

Jessie Rivera Fagan is an economist and child labour and younger youth expert working in the Decent Rural Employment team at FAO. She has been working for FAO for nearly 5 years and specializes in supporting policy, knowledge generation, capacity development and livelihoods support through programmes on addressing child labour in the agriculture sector and promoting safe and decent youth employment for the 14-17 age cohort.

Nadia Correale is a Social Protection and Community Development Specialist in the Rotterdam Convention Secretariat at FAO. Her main area of expertise is the occupational exposure to pesticides and the monitoring and collection of data on pesticide poisoning in rural communities with a huge field experience in different countries in Africa, Latin America and Eastern Europe. Prior to joining FAO in 2014, she worked in Spain, UK and Brazil in agroecology, social protection and community empowerment.

1. Part A: Which agricultural sector or local value chain is known to have a prevalence of child labour and well as high use of hazardous pesticides in your country or the country you work in? How are children exposed to pesticides in their work or household chores? **Part B:** What are the institutional challenges in the sector that lead to this issue?

COUNTRY	PART A	PART B
Zimbabwe	Tobacco, maize, cotton, gardening and enterprises; forestry and cattle heading. Children get exposed to pesticides when not being watched or during re-entry periods after pesticide application.	Commercial farms: shortage of labour and poverty among the citizens which pushes children out of school and seeks employment. Family farming enterprises: ignorance about the labour laws. Lack of free basic education.
Uganda	Fruit and vegetable growing and the sugarcane plantation/value chain. Pesticide drift when they follow their parents to fields, poorly disposed empty pesticide containers and used as toys, washing contaminated clothes of parents.	Lack of commercial applicators, lack of resources in terms of money to pay casual workers to perform tasks that are carried out by children. Food insecurity. Weak policy and enforcement on child labour.
Tanzania	Smallholder farming sector. Children are exposed to pesticides when assisting their parents in farming activities.	Little awareness and knowledge amongst communities regarding hazardous works. Poor livelihood forces to use children as the way of increasing their income.
India	Floriculture industry and seed production farms of cotton. They are mainly involved in harvest operations, sorting, and even also applying or assisting in pesticide application.	Adequate measures for poverty eradication at ground level are an institutional issue that drive parents to send their children for farm work.
Senegal	Herding cattle when seeding, harvesting and transporting the crop, fishing, farming, in the production of cotton, rice, peanuts, and mangoes.	Process of revising the labour Code is still on going in the National Assembly.
Ethiopia	Horticultural crop field and wheat farming. Children are exposed while they are helping the parents spraying activity	The ministry of Labour and Social Security. The legislation should prohibit the involvement of children in activities that involve pesticides, particularly in industries, agriculture and domestic work.
Eswatini	Farming where activities that involve pesticides application are done.	Lack of legislation that regulates labour conditions of children.
Zambia	Children are expected to participate in activities at home (mixing and application of HHP's). They are exposed from poor storage of pesticides, playing on pesticide contaminated sites and washing contaminated clothes.	Lack of man power to enforce the law on engagement of child labour in hazardous work and lack of education on the risks involved /exposure routes to pesticides. Lack of education and awareness programmes in the use of empty pesticides containers.
Mauritania	Rice agriculture.	No specific national regulation on children labour in agriculture.
Belize	In the 2000's it was in the Sugar Cane Industry. Child labour projects now are target small-scale farms.	The "Protect Children from Pesticides" campaign by Pesticides Control Board should form a joint task force with the Labour department.
SA	Seasonal labour with regards to fruit picking (children are used)	Labels written in 2 of the languages that are generally not spoken by the majority of the population of SA.

2: What do you consider is the best approach for tackling this issue in your country or the country you work in and who should be sensitize on this issue?

Uganda: Multifaceted approach that includes awareness creation, strengthening and enforcement of laws, and provision of social protection services.

Zambia: Restrict the availability of HHPs with to rural farmers; education parents on the use of pesticides by pesticide companies, cooperatives, NGOs and local leadership; enforcement of the law by the labor department on child. Drafting of policy briefs to policy makers highlighting the issue.

Zimbabwe: Raising public awareness (schools) on the risks, dangers and other negative effects of child labour especially among agricultural families. Children should not be allowed to mix or prepare chemical products, work or help their families

where pesticides are sold or assist in the transportation of pesticides.

India: Strict implementation of prohibiting child labour and rural poverty eradication (better livelihood economic activity). Banning hazardous pesticides in sector were child labour is employed. Policy makers especially parliamentarians to be sensitized for tackling the issue.

Tanzania: Improving livelihood is an important factor to ensure child labour is stopped. Providing education and awareness sensitization program are the best ways to tackle the problem. NGOs, government through the ministry responsible for children matter, pesticide authority, local government authorities should collaborate to awaken sensitization programs.

Eswatini: The ministry responsible for labour issues (Ministry of Labour and Social Security) needs to pass legislation that will regulate work that is done as part of customary practices. The legislation could also prohibit the involvement of children in activities that involve pesticides, particularly in industries, agriculture and domestic work.

Belize: A joint task force with the Labour department would be helpful when conducting these sessions. The labour department would have to mandate to "enforce" section 138 & 182 of the Constitution of Belize.

Mauritania: Capacity development, education and direct livelihood support to families can contribute for tackling children labour in Mauritania. Anyway, the implementation of child labour prohibition by the law only will not be possible

Presenters notes: Supporting livelihoods is key. If families remain poor than they may need their children to support work for their survival. Raising awareness is extremely important. Many families are simply not aware of the dangers of pesticides for them or their children (awareness raising in the education system).

3. Part A: What type of national programmes and policies are in place for addressing hazardous child labour and reducing pesticide exposure in agricultural sector in your country or the country you work in?
Part B: What are the stakeholders involved in your country or the country you work in?

COUNTRY	PART A	PART B
Zimbabwe	Stop Child Labour Programs: a bridge school that provided education and social services to former child laborers. National Action Plan: implements Basic Education Module: programme meant to keep children from poor families in school.	Ministries of Primary and secondary education and higher and tertiary education, Zimbabwe Congress of Trade Unions, ministry of social welfare, NGOs, and community leaders.
Uganda	The National Child Labour Policy; Orphans and Other Vulnerable Children Policy; The Universal Primary Education, 1997; The Children's Act Cap 59 (2000); The Revised Poverty Eradication Action Plan, 2004; Employment (Employment of Children) Regulations, 2012.	Ministry of Gender Labour and Social Development, Ministry of Agriculture, Animal Industry and Fisheries, local governments, employers' and workers' organizations, civil society and non-governmental organizations.
Tanzania	National policy: occupational laws and have been restricted the use of child as labour workers. Unfortunately, the policy and the law do not mention about working in agricultural activities.	Non-governmental organizations and international organization dealt with children's well-being.
India	There is a law that prohibits child labour, especially for children under 14 years of age irrespective of sector and additionally emphasis has also given for hazardous operations in any sector. No specific programmes in place for reducing hazardous child labour and reducing pesticides.	Government departments/ministries such as agriculture, rural development, Child and Women Welfare, Heath and Family Welfare, education, pesticide industry, NGOs, Child and Human rights organisations, farming community.
Senegal	Social programs to address child labour. Implement National Action Plan on the Prevention and Abolition of Child Labour.	Government (health , army ,interior, family ministries) NGOs, international body (ILO, FAO, UNICEF)
Eswatini	Govt developed an action plan towards the elimination of child labour (not been approved yet). Other programmes towards reduced use of pesticides include one by an organization called PELUM.	NGOs: PELUM. Ministry of Labour and Social Security, Ministry of Agriculture, Eswatini Environment Authority, and the office of the Director of Public Prosecutions
Zambia	National Employment Policy; National Youth Policy; Employment Act; Occupational Health and Safety Act; Environmental Management Act	Government Ministries: Ministry of Labour and Social Security, Ministry responsible for Environment, Ministry responsible for Health, Ministry responsible for Agriculture.
Mauritania	Same NGOs work for the protection of children and some of them are supported government programmes but these programmes are not specific for agriculture but it deals with all kind of children labour	Local NGO's are the most engaged in protecting children.
Belize	At the moment the Ministry of labour is operating with a draft Child labour Policy.	Ministry of Labour-Implementation and legislative enforcement; National Committee for Family and Children; Ministry of Education; Ministry of Health-ID Victims & Provide Medical Care.
SA	Labour Relations Act, employment equity act, various acts to protect children and child's Labour.	Governmental departments that regulate the acts in PART A.

Resources and Further Reading

Main publications:
1. E-learning course on "Pesticide management and child labour prevention"
2. E-learning course on "End child labour in agriculture"
3. The SHPF toolkit
4. Visual facilitator's guide: Protect children from pesticides!
5. Handbook on Monitoring and Evaluation of child labour in agriculture

Additional resources discussed:
6. http://www.unikassel.de/einrichtungen/fileadmin/datas/einrichtungen/icdd/Webportal/Publications/Decent_Work_and_Development/Child_Labour_and_Agriculture/child_labour___cocoa_plantation.pdf
7. http://www.ilo.org/ipecinfo/product/download.do?type=document&id=29655
8. https://campaign.worldvision.com.au/wp-content/uploads/2013/04/Forced-and-child-labour-in-the-cotton-industry-fact-sheet.pdf

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This Digest was produced by: **Tatum Louw**| Forum Administrator | lwxtat001@myuct.ac.za. **Prof Andrea Rother** | Forum Moderator | andrea.rother@uct.ac.za **Acknowledgement**: *Financial assistance from the Swedish International Development Cooperation Agency (SIDA), has been arranged by the Swedish Chemicals Agency (KemI)*

Issue 18: Neonicotinoids: Total Ban or Restriction for Indoor Uses Only in Africa?

Pesticide Discussion Forum Summary Digest

Issue 18 of 2019
Forum Date: **10 October 2019**

Neonicotinoids: Total Ban or Restriction for Indoor Uses Only in Africa?

Neonicotinoids (sometimes shortened to neonics are a class of neuro-active insecticides chemically similar to nicotine. Neonics act by blocking neural pathways and are systemic. Neonics pass into and spread throughout the plant tissue causing a plant to become toxic to insects consuming any part of it-including pollen and nectar, as well as plant residues. Therefore, non-target species (pollinators and predators, are also exposed. Neonicotinoids are the primary agent used on insect-treated seeds - when applied as dressing on plant seeds, significant parts of the active ingredient enter the soil and aquatic systems, broadening the potential exposure to non-target (including non-insect) species. As a result, this has knockdown effects on ecosystem services, such as natural pest control carried out by predators and parasitoids. Neonicotinoid use has been linked to a range of studies to adverse ecological effects, including honey bees colony and other pollinators (e.g. bumble bees, solitary bees, flies, beetles and butterflies) collapse disorder (CDD) and loss of birds due to a reduction in insect populations. Some scientific findings regarding the harm caused to bees by neonics have been conflicting and controversial. This is partly because bees exposed to normal levels of neonicotinoids do not immediately die. Some sources have proposed that neonicotinoids reduce a bee colony's ability to survive the winter. Most academic and governmental bodies agree that neonicotinoids have had a negative influence on bee populations.

About the Presenter

Dr. Sam Adu-Kumi's background is in chemistry and toxicology and works with the Environmental Protection Agency, Accra, Ghana, as the Director of the Chemicals Control and Management Centre and is the Registrar of Pesticides in Ghana. He is an international and national expert in sound management of chemicals and waste, serves as the Focal Person for the United Nations chemicals-related multilateral environmental agreements (MEAs)/Frameworks and Networks for Ghana, notably the Basel, Rotterdam, Stockholm and Minamata Conventions and SAICM. He effectively combines academic work and scientific research with his official public service functions. He is a part-time senior lecturer at the University of Ghana (Graduate School of Nuclear and Allied Sciences) and is an author/co-author of more than thirty (30) peer-reviewed scientific publications.

1. List any neonicotinoid insecticides approved for registration and currently used in your country or the country you work in. Indicate which of them neonics are being used/registered and for what purpose (indicate both outdoor and indoor usage).

Type of neonic pesticide	Country	Type of use
Imidacloprid	Uganda, Eswatini, Zambia, Tanzania, SA, Belize, India	Outdoor and indoor
Acetamiprid	Uganda, Eswatini, Zambia, Zimbabwe, Tanzania, Senegal, UK, Belize, India	Outdoor
Thiamethoxam	Uganda, Tanzania, Belize, SA, India	Outdoor
Clothianidin	Zambia, Tanzania, Belize, SA, Zambia, India	Indoor and outdoor
Nithiazine	Zambia	Outdoor
Thiocloprid	Tanzania, Senegal, UK	Indoor and outdoor
Nitenpyram	Tanzania	Outdoor
Lufenuron	Senegal	Outdoor
Dinetofuran	India	Outdoor

2: What is your opinion of a total ban versus severally restricting usage of neonicotinoid insecticides in your country or the country you work in; and give reasons for your answer

Uganda: Severally restricting usage of neonicotinoid in order to enable others uses like public health products such as for the control of mosquitoes, cockroaches, bedbugs, biting flies among other uses. Then for crop protection I would recommend total ban in order to protect the pollinators, the hive and foraging bees. Strong alternatives to neonics are still scarce and rare

Zambia: A total ban is the best option in a situation where readily available effective and affordable alternatives exist. Restricting use is however a more reasonable risk management strategy if no effective and affordable alternatives is available. Restricting usage to only authorized applicators can further help.

India: Given the conditions of use and as most crops are pollinated by bees, it would be better to ban them totally than making them severely restricted products. Further, many other insecticides can substitute these neonicotinoids.

Gambia: Imidacloprid and thiamethoxam are widely used outdoors and thus posed great risk to pollinators (bees).

Tanzania: There should be studies to indicate the effects caused by neonicotinoids in the country to support the decision of whether to ban or restrict the use of it. Since neonics are effective for controlling insects in crops, then alternative pesticides that are safer for pollinators and other insects should be developed.

Eswatini: I am against a total ban as severely restricting their use would be ideal and applicators trained on how to apply these pesticides. Restricting the use of neonicotinoids to areas where there are no effective safer alternatives are available.Other options like use of biopesticides should be searched.

Mauritania: Before thinking about restricting the use of neonicotinoids in countries where their use is essential to protect crops, we have to find adequate alternatives.

South Africa: There are currently many neonics registered in SA - 123 formulations - this will be difficult to ban or remove completely but restricting the use to SUP and formulations that do not impact bees and timing of sprays outside bee foraging season would reduce the impact on bees significantly.

Therefore, imposing a restriction to their used outdoors will reduced such risks.
Zimbabwe: There is a need to severely restrict the use of neonicotinoids and provide alternatives mainly for aphid control.

Belize: There would be a higher chance of getting the neonicotinoids to be severally restricted rather than banned for the simple reason that in Belize industry sits on the board and any drastic measure as such is beaten down.

3: Should there be a global action on neonicotinoid insecticides and what could the action look like (e.g. listing under the Rotterdam Convention on the Prior Informed Consent (PIC).

Yes

What should it look like?
New use of a neonic to control mosquitoes is welcome, but its use needs to be rotated so that it is not overused like the pyrethroids because overuse /lengthy periods of activity on a bed net inevitably results in mosquitoes becoming resistant. We need at least 3 modes of action rotated as Zimbabwe did with their acaricide rotation scheme.
Action is required to either ban outdoor usage in Africa entirely or severely restrict usage due to pollination issues.
Global action on how to use neonics with regards to bee foraging behaviour and seasons should be looked at first. New pesticides that have been suggested to replace neonics are looking like they might have impacts on bees. Banning neonic in Africa will be difficult to do but training around best practise around SOP would go a long way towards protecting foragers and pollinators.
Yes, as global action will force or motivate countries who are reluctant to act on this group of insecticides.
The global action on neonicotinoid is very important as it would help in restricting the unauthorized movement of these chemicals. The listing under the Rotterdam Convention on the Prior Informed Consent is the best way to restrict the movement and unauthorized purchases of these chemicals. Furthermore, restricting the amount of chemicals purchased by one organization is important. Only licensed institutions can be allowed to buy and distribute these chemicals.
Listing neonicotinoids under an MEA such as the Rotterdam Convention on the Prior Informed Consent would be a beneficial in order to trigger swift action towards prudent use of neonicotinoids and enhance the use of safer options among member countries.
Global movement against the use of neonicotinoid should be established to facilitate the decision made by countries. Individual country will fail to reach a concise decision, but through such movement will be easy to take action. Besides, it will speed up to conduct studies on their respective countries for decision making.
Listing neonicotinoid in MEAs is a good way to start action against them. However, multiple strategies including research, training, policy and their implementation need to be considered in the action plan.
The global action must be backed by further and intensive studies. There seems to be doubts about the issues around the impacts of neonicotinoids on our ecosystems. The listing under the Rotterdam Convention would be ideal because it allows for national decision making based on information shared between the importer and exporter.
A global action would be perfect since the effects are also transboundary. Most probably, taking the route of multilateral agreements such as the PIC would be ideal.
Global action is vital however, our countries lack capacity to enforce some of these measures
Countries and regions should come together to take global action on neonics. Firstly, countries must be knowledgeable of the SHPF reporting system since it is the beginning of getting it listed. Countries need to fit it into their planning and capacity building plan. It might seem like a heavy investment at first but in the longer run it will be fruitful
Presenters notes: Listing under the Rotterdam Convention is becoming a big issue. Due to the absence of voting when there is lack of consensus, parties particularly from our own Africa Region are refusing to accept listing

No

Reason
Global action should be delayed until convincing scientific based evidence on the neonicotinoids is cited by developed and developing countries with influence by the colony strength, landscape variation, the effect of bacterial and parasitic infection as alleged cause of morbidity and mortality has been excluded as cause of decrease in bird population. Prior Informed Consent should be applied on both exporting and importing countries and ecotoxicological risk assessment done on the pesticide prior to registration in the country by registration authorities. This can be used under restricted control to control pest on the fruitrees to minimize eradication of natural pests, decomposition, pollinators and natural predators. Exchange and sharing of information between developed and developing countries about current update research works, decisions by international conventions (MAE) on the management of CINs will promote shared responsibilities and environmental sound management of the pesticides. Developing countries should developed technical expertise , collect ecotoxicological data on neonicotinoids and correlate their research works with that of developed countries.

Resources and Further Reading

1. https://www.interacademies.org/48926/Assessing-the-Impact-of-Neonicotinoids-in-Africa
2. www.efsa.europa.eu/en/efsajournal/pub/3295 EFSA Guidance on the risk assessment of plant protection products on bees (Apis mellifera, Bombus spp. and solitary bees).
3. https://link.springer.com/article/10.1007/s11356-017-9240-x#Sec19

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Issue 19: Challenges in managing empty pesticide containers in LMIC's

Pesticide Discussion Forum Summary Digest

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Challenges in managing empty pesticide containers in LMICs

Proper and efficient management of pesticide containers (full or empty) requires great consideration and planning. Disposal of the leftover products from the container does not determine the end use thereof. There is thus still need for special management of that container. Proper handling, rinsing, storage and disposal of empty pesticide containers can avert future health, environmental and regulatory complications. There is still need for the development of guidelines to aid stakeholders in developing a management plan for empty pesticide containers and ensure vital information on the label directions a pesticide container is not empty until it has been properly rinsed.

About the Presenter

Raymonda AB Johnson is an expert on entomology, pest and pesticide risk management. Raymonda worked for the Ministry of Agriculture and Forestry in Sierra Leone. She has coordinated projects in Sierra Leone involving capacity strengthening of pest and pesticide management; development of policies and extension materials and facilitating pest and pesticide management in farmer field school. She is a member of various international and national taskforce and committee on pest and pesticide management.

1. Does your country have a pesticide advisory or national pesticide management committee? If yes, who are the members? What are the main functions of the committee or board? If no, why not?

Uganda: Uganda has an Agricultural Chemicals Board and an Agricultural Chemicals Control Technical Committee. The members include representatives of NEMA, Uganda National Drug Authority, Universities in particular Makerere, Faculty of agriculture , faculty of Science and faculty of veterinary medicine, National Forest Authority(NFA) Uganda National Farmers' Federation and a representative of farmers , Croplife Uganda, National Agricultural Advisory Services, National Agricultural Research Organization, ex officio members who include Commissioner Crop Inspection and Certification (Secretary/Registrar), Commissioner for Trade, a representative from Government analytical laboratory, Commissioner Crop Production, Commissioner Livestock and Entomology among others.

Zambia: There is no pesticide advisory or pesticide management committee in Zambia. All issues related to Pesticides management are Handled and managed by ZEMA through the Pesticide and Toxic Substance unit and the Waste management unit for the management of waste generated from PTS. There are other committees that may be viewed as proxies such as the Technical Working Group on Vector Control, and the different chemical advisory groups under ZEMA.

India: We have a Central Insecticide Board and Registration Committee (CIB&RC), which is an autonomous regulatory institution under the agriculture department. The members include designated high level officials from ministries of health, agriculture, chemicals and petrochemicals.

Togo: We have pesticide management committee. Members include, committee researcher , from ministries of environment, health, agriculture. Others members are from NGO etc

Mauritania: In Mauritania we have a draft of regulatory text for the creation of national pesticide management committee. The committee members are :Rural Development Ministry; The Ministry of environment; Health Ministry; Finance Ministry; Commerce Ministry; CSP national members.

Tanzania: We have Pesticide management committee named Pesticide Approval and Registration Technical Subcomitee (PARTS), that oversees the approval and authorization of the pesticides in the country. The main functions of such committee are, approving/disapprove the use of pesticides depending with information provided and risk assessment conducted concerning the pesticide.

Eswatini: We do not have a Pesticide Advisory Board, we are still working on putting up the relevant structures. However, the Pesticides Management Act, 2018, provides for the establishment of such, stating that members should include representatives from the Attorney General department, Ministry of Agriculture, Ministry of Health, Ministry of Commerce, Ministry of Finance, Environmental Agency, Farming Community, and Traditional Authority.

South Africa: Chemicals that are controlled by international conventions are the responsibility various government departments which resulted in the formation of the Multi-stakeholder committee on Chemicals Management. The National Department of Agriculture also governs Pesticide management and runs intergovernmental workshops to ensure policy collation between departments which interlinking legislation such as policies on waste management, stockpiling and empty containers (Basel, Bamako, NEMA), registration and use (DARDLR), human health (DOH), phytosanitary (DARDLR), NGO's.

Gambia: Chemicals and Pesticides Control and Management Board is responsible for registration of Chemicals and Pesticides, issue authorizations for import, export, sale, distribution, banning and restricting uses of certain pesticides and chemicals. A National Pesticides Management Committee which serves as the technical arm of the Board.

Belize: Our country has a Pesticide Control Board that regulates pesticides in country. When the legislation was drafted in 1988, the life cycle of a pesticide was not taken into consideration.

2: Why is it that many LMICS do not have an effective and functional National Pesticide Management Committee, which are well resourced by national governments? If your country has a board or committee, would you say it works well or does not work well in reviewing pesticide applications and toxicology data? Explain.

Why does LMICs not have effective and functional National Pesticide management committee
Financial resources: The problem in LMICS is usually lack of financial resources to establish effective and functional National Pesticide Management Committees as well as lack of technical staff in some cases. Lack of financial resources to build capacity, establish facilities for the management of empty pesticide containers and awareness-raising programs are some of the major problems faced by LMICs when it comes to the management of empty pesticide containers. Since they are still developing in most cases may not view this area as a priority hence these may not be given adequate resources from government budget which may result in such boards being ineffective
Political will: There is also a lack of political will. Authorities don't want to address these issues. Secondly, there is a problem of lack of adequate human resources to support this component. Many LMICs don't have effective national pesticide management committee

because of various factors such as Little/limited political will to support its functioning as a priority; Non-institutionalized boards; Non-functional, ineffective and or sometimes non-existent board in some countries.
Lack of information and expertise: Effective and functional National Pesticide Management committee should have enough and well expertise to undertake the review process of the pesticide application. Lack of information and resources to make an informed decision is among the challenges facing such committees. Reviewing pesticide application and toxicological data are not done properly due to lack of research findings for risk assessment of the pesticides. Besides, the composition of these committees is granted in the political way instead of technical expertise, and thus the decisions made lack effective perspective of pesticide management.
Industry: Further, industry also plays a huge role in preventing setting up of a nation authority for regulating or managing pesticides in a comprehensive way. The National authority in my country seems working in a manner they are supposed to do, but not upto the mark that is expected with in the light of scientific information and updated international regulatory sphere. Moreover, governments of politicians or policy makers should be courageous enough to strictly regulate pesticides in the interest of public health and well being of people.
Ineffectiveness: Ineffectiveness of pesticide management committees is a result of limited prioritization of pesticide issues in national agenda. Perhaps, most governments have limited understanding on why it is important to budget for pesticide issues. As a result, the bodies that have to institute the committees lack the resources and adequate support from government.
Lack of commitment: Such committees need human and financial resources witch are not always available in LMICs in addition to the lack of commitment of decision makers to the problem of pesticide.

Uganda: The Agricultural Chemicals Board and Agricultural Chemicals Control Technical. Committee works well in reviewing the pesticide applications despite the limited resources.

South Africa: has a national pesticide advisory committee referred to as Sapca(South African pesticide control association). Delay the registration of pesticides.

Gambia: There is a Chemicals and Pesticides Control and Management Board which is responsible for registration of Chemicals and Pesticides,

Ethiopia: Currently the Advisory board is not functional due to several factors. Instead, Registration experts under the Ministry of Agriculture are responsible for technical evaluation regarding pesticides to get registered in Ethiopia. Moreover there are inspectors dealing with pesticide inspection.

Yes: country has a committee and why it works or does not work

Zambia: does not have a National Pesticide Management Committee. All Pesticides matters are dealt with under the Zambia Environmental Management Agency.

Tanzania: Pesticide management committee named Pesticide Approval and Registration Technical Subcommittee), that oversees the approval and authorization of the pesticides in the country.

3: What is needed to establish or improve the functioning of these boards/committees in your country or the country you work in?

Belize, Suriname: For the board to function better, there needs to be an update on the current legislation.

Zambia: Political will and developing a road map for establishing a container management scheme within the whole country. Create an appropriate awareness program for container management. Improved financial resource allocation for operations i.e equipment, materials and staff remuneration.

Senegal: Technical assistance to help them set up these various committees in addition to a technical capacity building to ensure the members' full participation also are required.

Ethiopia: To improve the functioning of this committee is should be mandatory to enforce legislation and define a roadmap between country and financial partners.

South Africa, India, Cameroon: Capacity building and training for other departments other than Agriculture. Lack of transparency is also an important issue to be tackled.

Uganda: Need for increased funding to expand their activities for example to develop a roadmap and implement a container management scheme.

Tanzania: Reviewing the composition of such committees and change how long it should last. There must be enough budget for reviewing application process and the general pesticide management functions, including enough resources for risk assessment process.

Eswatini: Professionals such as those working in the Ministry of Agriculture and Eswatini Environment Authority should team up and develop a proposal address evidence-based propositions. I would suggest training, but most importantly the functioning of these boards should be sanctioned by law spelling out the functions, frequency for meetings and instances,

Resources and Further Reading

1. Food And Agriculture Organization Of The United Nations Rome, 1999 Guidelines for the management of small quantities of unwanted and obsolete pesticides
2. Pesticides and Container ManagementWorld Health Organization 2011 Report Of A Workshop 22–26 November 2010 Rabat, Morocco Capacity Strengthening For Sound Management Of Pesticides
3. CropLife International, September 2015. Roadmap for establishing a container management programme for collection and disposal of empty pesticide containers
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Issue 20: Integrated Management of the Fall Armyworm in Africa with special focus on biopesticides

Pesticide Discussion Forum Summary Digest

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Forum Date: **7 November 2019**

Integrated Management of the Fall Armyworm with a special focus on biopesticides

For the past few years, significant yield losses in maize have occurred in many countries in sub-Saharan Africa, due to damage by the invasive Fall Armyworm (FAW), *Spodoptera frugiperda*. Native to the tropical regions of the Western Hemisphere, the pest was noted for the first time in West Africa in early 2016. Since then its incidence has been recorded in all the countries in Sub-Saharan Africa, except for Lesotho. In July 2018 the pest was detected in India and by January 2019 it had spread to Bangladesh, China, Myanmar, Thailand, and Sri Lanka. Pest forecasts and modelling studies have shown significant likelihood of near global invasion of fall armyworm. Due to the significant crop damage caused by this pest, some countries resorted to the introduction or enhanced use of synthetic chemical pesticides, a development that has placed the economic viability of small-scale cropping systems at risk. There have also been concerns about the environmental and health impacts of some synthetic chemical pesticides. There is a need to explore IPM approaches, incorporating the use of biopesticides, which are generally considered safer to the environment and human health.

About the Presenter

Dennis Ndolo is an Entomologist and is the Group Leader – Biopesticides, at the International Centre for Genetic Engineering and Biotechnology. His research group supports the discovery, development, formulation and commercialisation of low cost, stable and effective biopesticides for use in Integrated Pest Management (IPM) programmes. One of his research activities focuses on development and formulation of biopesticides for use in fall armyworm IPM. Dennis has previously also worked as a Research and Development (R&D) Officer with Dudutech (a leading international biopesticides R & D company).

1. Are there any commercial biopesticides already registered for FAW control in your country or the country you work in? If yes, what are the challenges thereof?

Uganda: Not aware of any commercial biopesticides already registered for FAW control in Uganda. Some biopesticides have been registered but not for the fall armyworm control. At the initial outbreak period in Uganda (around early 2017), some farmers were mixing all kinds of concoctions including neem extracts and detergents control the pest..

Zambia: A Neem based biopesticide Nimbecidine is widely used in the control of FAW in conjunction with synthetic pesticides for resistance management. No problems have been reported with the use of Nimbecidine, it is said to be effective against FAW**.**

Togo: We are far from it in Togo. Actually farmers should be aware of biopesticides and the way it helps to reduce risks related to pesticides uses. Biopesticides are not considered as an effective way to fight against pest by farmer. They are not confident and government must make efforts to raise awareness among them

South Africa: Yes there are commercially available in South Africa When the panic struck, many emergency registrations were submitted to the NDA, including some HHP's. Biopesticides were not considered a priority for registration back in 2017 only later as they were considered a soft alternative.

Eswatini: There is Eco BB (Beaureria bassiana) which is available to farmers for use in controlling FAW. However, the common practice is to use synthetic pesticides. Please note too that Eswatini currently does not have an oerational pesticides registration systeem.

Belize: There is a neem based biopesticide registered in Belize for FAW however the farmers (the culture) is so heavily dependent on synthetic pesticides. I believe there are reports of possible resistance being (or has been) developed because farmers are not interchanging the MOA. Furthermore, there is not a specific unit within the ministry of agriculture that promotes or teaches IPM so other departments do the most they can to promote it but it is not enough.

Zimbabwe: Not aware of any registered biopesticides in Zimbabwe.

Tanzania: The only approved pesticides for controlling FAW are synthetic ones. No biopesticides have been registered for that purpose. However, there are some biopesticides available in he market for different pest control.

2: Part A: What are the main approaches that have been adopted for fall armyworm control your country or the country you work in? Furthermore what long-term strategies are currently in place? If there are none, provide suggestions. ANSWER PART B ONLY IF YOUR COUNTRY DOES NOT HAVE FAW: Part B: Are there contingency plans for fall armyworm control in your country or the country you work in? If not, what suggestions could you provide?

Uganda: The control measures are the use of selected conventional pesticides to contain the pest, established task forces at national and district levels to create awareness and ensure timely response to a case. Long term strategies include: Research into safe, effective and low-risked management options such as the use of biopesticides. A general change to IPM approaches like agroecosystem analysis where farmers are highly involved

Tanzania: So far, the government through the ministry of agriculture intervene to manage the fall armyworm invasion by mainly distributed tones of pesticides to farmers who areas have been seriously affected by such bug. IPM is mentioned to be feasible for controlling fall armyworm.

Belize: We have approximately 5 biopesticides registered for FAW. The ministry sets up Farmer Field School Trials to teach and introduce IPM to the farmers.

Togo: Biopesticides are not considered as an effective way to fight pest. Farmers are not confident in it, and government needs to to raise awareness.

in monitoring for early warning and timely management options.

Zambia: There is a government programme that supplies subsidised registered pesticides to rural peasant farmers and generally encouraging farmers to adopt IPM principles for FAW control during outbreaks. Sustainable measures is necessary to be put in place - including involvement of the community and farmers, research and investment in the management and prevention of such outbreaks.

Zimbabwe: The main approach which has been used in Zimbabwe is over the top spraying and/or drenching using synthetic pesticides such as lambda-cyhalothrin and use of pesticides granules such as ecoterex. Growers are also encouraged to burn previous year crop residues to reduce carry over risk.

Estwatini: The ministry conducts survaillence using pheremone traps to estimate the population levels. FAW was first detected in eastern Eswatini. Subsequent detection has been recorded in the north eastern part of the country. Isolated and once-off cases have been recorded in central and western Eswatini in young maize fields. In all cases the pest was positively identified by the National Plant Protection Officer, referred to the entomologist at the University of Eswatini and further diagnostics are ongoing.

South Africa: IPM strategy developed and adopted looking mostly at agroecology methods and biopesticides, with a move away from HHP chemical pesticides.

3: What do you consider to be the main gaps in biopesticide research and development especially in relation to fall armyworm control? How can these gaps be addressed?

MAIN GAPS IN BIOPESTICIDE RESEARCH	HOW CAN THESE GAPS BE ADDRESSED
RESOURCES: Lack of funding, expertise and skills are the constraints of developing biopesticide research.	Effective management plans that include allocating enough budget for research and trainings. Regulations should be put in place to ensure the effective management of the such research that aim to develop safer alternatives to synthetic pesticides and the control of FAW.
DATA: Much of the data has until recently been based on laboratory experiments. There is limited empirical studies that inform the management of fall army worm attacks.	Translating the data to the field and particularly the situation on small-scale farms. More research needs to be done to improve efficacy and encourage farmers to use them. Government should provide and/or request for funding to carry out extensive empirical research. Research is needed to understand various pests and vectors that might not be currently present, and also to understand the ways to control their effects using safer options.
FARMER BUY-IN: Bio pesticides and the notion of IPM has been around for a long time but there is still resistance to its implementation due to the insistence on using chemical pesticides. . Educating farmers on the benefits of the use of biopesticides is lacking.	Awareness to the farmers and the basic understanding of bio pesticides as it is not optimal to first develop the product and then try and sell it to a market.
INDUSTRY: Dependent on the industry to say "this is the product i believe you need".	The agronomist/researchers) recommending what is the most suitable approach to tackle any pest and not only FAW.
BELIEF: The general orientation and strong belief in conventional pesticides has blinded research options into bio-pesticides.	Government prioritise and invest in such research which would lead to availability of resources. Biopesticides would find wider acceptance if they can be formulated and applied in ways that farmers are already accustomed to.

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The **Division of Environmental Health** (DEH) Pesticide Discussion Forum is a bi-monthly online seminar for pesticide regulators and resource persons, as well as students in the Post-Graduate Diploma in Pesticide Risk Management (DPRM). Our aim is to provide support for managing pesticide risks and implementing risk reduction strategies. DEH is based in the School of Public Health and Family Medicine at the University of Cape Town (UCT).
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