



Food and Agriculture  
Organization of the  
United Nations



World Health  
Organization



# Detoxifying agriculture and health from highly hazardous pesticides A call for action



# Detoxifying agriculture and health from highly hazardous pesticides

## A call for action



INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD

Food and Agriculture Organization of the United Nations  
World Health Organization  
Rome & Geneva, 2019

Required citation:

FAO and WHO. 2019. *Detoxifying agriculture and health from highly hazardous pesticides - A call for action*. Rome.

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) or World Health Organization (WHO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO or WHO in preference to others of a similar nature that are not mentioned.

The views expressed in this information product are those of the author(s) and do not necessarily reflect the views or policies of FAO or WHO.

ISBN 978-92-5-132029-7 [FAO]

ISBN 978-92-4-151706-5 [WHO]

© FAO and WHO, 2019



Some rights reserved. This work is made available under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 IGO licence (CC BY-NC-SA 3.0 IGO; <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/legalcode>).

Under the terms of this licence, this work may be copied, redistributed and adapted for non-commercial purposes, provided that the work is appropriately cited. In any use of this work, there should be no suggestion that FAO or WHO endorses any specific organization, products or services. The use of the FAO or WHO logo is not permitted. If the work is adapted, then it must be licensed under the same or equivalent Creative Commons licence. If a translation of this work is created, it must include the following disclaimer along with the required citation: "This translation was not created by the Food and Agriculture Organization of the United Nations (FAO) or WHO. FAO/WHO are not responsible for the content or accuracy of this translation. The original English edition shall be the authoritative edition.

Disputes arising under the licence that cannot be settled amicably will be resolved by mediation and arbitration as described in Article 8 of the licence except as otherwise provided herein. The applicable mediation rules will be the mediation rules of the World Intellectual Property Organization <http://www.wipo.int/amc/en/mediation/rules> and any arbitration will be conducted in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law (UNCITRAL).

**Third-party materials.** Users wishing to reuse material from this work that is attributed to a third party, such as tables, figures or images, are responsible for determining whether permission is needed for that reuse and for obtaining permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

**Sales, rights and licensing.** FAO information products are available on the FAO website ([www.fao.org/publications](http://www.fao.org/publications)) and can be purchased through [publications-sales@fao.org](mailto:publications-sales@fao.org). Requests for commercial use should be submitted via: [www.fao.org/contact-us/licence-request](http://www.fao.org/contact-us/licence-request). Queries regarding rights and licensing should be submitted to: [copyright@fao.org](mailto:copyright@fao.org).

Cover photograph: Shutterstock



©FAO/Giulio Napolitano

While all pesticides can be dangerous when used inappropriately, highly hazardous pesticides are always of particular concern due to the severe adverse effects they can cause to human health and the environment. They constitute a relatively small share of all pesticides registered globally, and yet they can cause the most harm. With adequate investment in scaling-up alternatives, especially existing and new ecological options for pest control, these pesticides that pose unacceptable risk to humans and the environment can be phased out from agriculture and their risk reduced in the health sector by appropriate actions.



# What are highly hazardous pesticides?

**Synthetic pesticides are inherently hazardous, and among them, highly hazardous pesticides cause disproportionate harm to the environment and human health. There is particular concern in low-income countries, where highly hazardous pesticides cannot be used safely.**

**Highly hazardous pesticides** are defined by the Food and Agriculture Organization of the United Nations (FAO)/World Health Organization (WHO) International Code of Conduct on Pesticide Management (2014)<sup>1</sup> as pesticides that are acknowledged to present particularly high levels of acute or chronic hazards to health or environment according to internationally accepted classification systems such as WHO or GHS [the Globally

Harmonized System of Classification and Labelling of Chemicals] or their listing in relevant binding international agreements or conventions. In addition, pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may be considered to be and treated as highly hazardous. A full description of the eight criteria to identify highly hazardous pesticides can be found on pg. 22.

<sup>1</sup> The FAO/WHO International Code of Conduct on Pesticide Management (the Code of Conduct) is a voluntary framework to guide government policy makers and regulators, the private sector, civil society, and other stakeholders on best practices in managing pesticides throughout their lifecycle, from production, use to disposal.

# Facts on highly hazardous pesticides:

- **can be very toxic to humans.** For example, a fourth of a teaspoon of carbofuran or monocrotophos active ingredients can cause death if ingested;
- are **primarily, but not only, older generation, off-patent chemicals still readily available and in use in many low – and middle – income countries**, even when less hazardous alternatives have al-

ready been authorised (see “why highly hazardous pesticides are still used” at pg.11);

- **cannot be used safely in low – and middle – income countries where suitable** Personal Protective Equipment (PPE) for protection against highly hazardous pesticides is not available or not used because it is too expensive or too uncomfortable to wear;
- **have been phased out from agriculture in a number of countries** without affecting agricultural productivity;
- are **one of the most common means of suicide** worldwide, accounting for 15-20 percent of all suicides<sup>2</sup>;
- can be **found in local food systems and global food commodities** such as bananas, coffee and rice, but the most contaminated crops are fruit and vegetables.

Minimum requirement for PPE for mixing and filling spray tank with WHO class I and II pesticides includes overalls and boots, gloves, face- shield or goggles, apron and hood or hat and Respiratory Protective Equipment.



Wear gloves



Wear eye protection



Wear boots



Wear protection over nose and mouth



Wear respirator



Wear ear protection



Wear overalls



Wear apron

For more information refer to the FAO/WHO Guidelines for personal protection when handling and applying pesticides.

<sup>2</sup> Mew, E. J., Padmanathan, P., Konradsen, F., Eddleston, M., Chang, S.-S., Phillips, M. R., & Gunnell, D. 2017. The global burden of fatal self-poisoning with pesticides 2006-15: Systematic review. Journal of Affective Disorders. Elsevier B.V. Oxford, England.



# What are their impacts on sustainable development?

Highly hazardous pesticides cause adverse social, environmental and economic effects that undermine the achievement of sustainable development.

- **Health**

Every year more people die from (unintentional and intentional) pesticide poisoning than snake-bite. According to WHO data, an estimated 77,000 people died worldwide in 2016 from all forms of unintentional poisoning (WHO Public Health Impact of Chemicals: Data addendum for 2016<sup>3</sup>). The proportion of deaths due to unintentional pesticide poisoning is unknown due to limited data, but may be substantial. In addition, it was estimated that more than 155,000 deaths from self-inflicted injury involved pesticides in 2016.

- **Gender**

Women are particularly susceptible to adverse effects. Rural women are directly exposed to pesticides while

performing tasks such as mixing pesticides and refilling pesticide tanks or weeding in recently sprayed fields. In addition to acute pesticide poisoning, chronic effects on their reproductive health are a serious concern<sup>4</sup>.

- **Children and Child labour**

Over 60 million children are engaged in hazardous work in agriculture<sup>5</sup>. Pesticide exposure is one of the main hazards as it can severely affect the normal development of children's immune and neurological systems. Children can already be exposed and affected during their pre-natal phase. Physical abnormalities and accidental poisoning of children exposed to pesticides are re-reported in developing countries.

- **Biodiversity**

The use of highly hazardous pes-

<sup>3</sup> WHO, 2018

<sup>4</sup> Bretveld, R.W. et al., 2006

<sup>5</sup> ILO, 2010

ticides is predicted to result in substantial impacts on biodiversity and ecosystem functioning. It has specifically contributed to declines in the populations of birds, insects, amphibians and aquatic communities. Negative impacts of highly hazardous pesticides on aquatic and soilborne organisms and their beneficial functions on ecosystems are widely reported in scientific literature<sup>6</sup>.

• **Pollinators**

The use of systemic insecticides from the group of neonicotinoids negatively affect pollinator reproductive potential<sup>7</sup> and it has been linked, together with other interacting factors, to global declines in honey bees and wild bees, thus reducing their function as pollinators.

• **Water, air and soil**

Highly hazardous pesticides' contamination is found in surface and groundwater resources, and in soils worldwide, sometimes 30 years after their application<sup>8</sup>.

• **Food safety and international trade**

Pesticides, especially highly hazardous pesticides, residues in food are an important trigger of export rejections. The most 'non-compliant worldwide are fruit and vegetables. In 2016, the Food and Feed Safety Alert of the EU issued 222 notifications for pesticide residues, out of which 143 led to rejections<sup>9</sup>.

<sup>6</sup> TFSP., 2015  
<sup>7</sup> Woodcock et al., 2017  
<sup>8</sup> Levillain et al., 2012  
<sup>9</sup> EFSA, 2017

**The continued use of highly hazardous pesticides undermines the attainment of several Sustainable Development Goals (SDGs) because of their adverse effects on health, food security, biodiversity and other environmental negative impacts such as pollution.**



## Are neonicotinoids highly hazardous pesticides?

Neonicotinoids are the most widely used insecticides in the world. They are used as seed treatments or as foliar sprays on a broad range of crops. Due to their systemic action, they are absorbed through the roots of plants and translocated to their leaves, flowers and pollen. Recently, WHO has also prequalified certain neonicotinoid-based products for vector control (see details in the next section).

Although neonicotinoids are considerably less toxic to mammals than organophosphate and carbamate insecticides, their level of persistence in soil and water raises concerns. Substantial residues are commonly found in the environment, including in wildflowers. A rapidly growing body of evidence strongly suggests

**Exposed bees may die or have an impaired ability to forage for nectar, to learn and remember where flowers are located and to find their way home to the nest or hive.**



that the existing levels of environmental contamination are causing large-scale adverse effects on bees and other beneficial insects<sup>10</sup> and on insectivorous bird populations.

The need to severely restrict their use or mitigate their effects in agriculture and prevent future registration due to the high hazard they pose to the environment is gaining a large consensus. The European Union has already issued a complete and permanent ban on all outdoor uses of the three most commonly used neonicotinoid pesticides: clothianidin, imidacloprid and thiamethoxam (European Commission Implementing Regulation (EU) 2018/783, 2018/784, 2018/785, 2018).

In order to protect pollinators the Health Canada's Pest Management Regulatory Agency (PMRA) is cancelling many uses of neonicotinoids on crops that bees find attractive and is not allowing spraying of some crops before or during bloom. The PMRA's risk assessment has also found that seed treatment uses are acceptable, however, *it has made as a requirement the addition of label statements for all cereal and legume crops to minimize exposure of pollinators to dust during planting of treated seeds.* PMRA is currently

<sup>10</sup>Pisa, L.W., et al. 2015

## Use of neonicotinoids in malaria vector control

One of the neonicotinoids, clothianidin, is recommended and has been prequalified by WHO for use in indoor residual spraying for malaria vector control, although unlike its possible chronic effects against bees, it may not necessarily be toxic to humans or may not spill over to the environment when used in a disease control programme as it is applied to house walls inside the home with the aim of killing indoor resting mosquitoes.

evaluating whether the risk mitigation already put in place remains adequate, or if additional mitigation measures are required<sup>11</sup>.

## Use of highly hazardous pesticides for vector control in public health

In public health, much has already been done to eliminate the use or risks of the most hazardous pesticides. However, as a result of the relatively small market share for vector control insecticides within the global pesticide market, the invest-

ment into the development of alternative products for this market has been limited. In view of these constraints and limitations, the WHO Integrated Vector Management (IVM) approach promotes rational use of insecticides in vector control. Due to the nature of the interventions, which by and large consist of using the human host as an attractant and placing the insecticide either between the host and the disease vector or near the host and the vectors' resting places, rational use of insecticides by means of their targeted application is relatively straightforward in vector control when compared to other types of pesticide use. IVM promotes these principles to minimise the potential effects of insecticides on human health and the environment, and to reduce the selection pressure for insecticide resistance. The use of insecticides including some highly hazardous pesticides in vector control is critical to the prevention of transmission of vector-borne diseases and the health and wellbeing of populations impacted by these diseases. Where no alternatives exist, the controlled use of some highly hazardous pesticides, applied under the professional supervision of vector control services, need to be considered, as the public health benefits outweigh the risks associated with the targeted use of these pesticides.

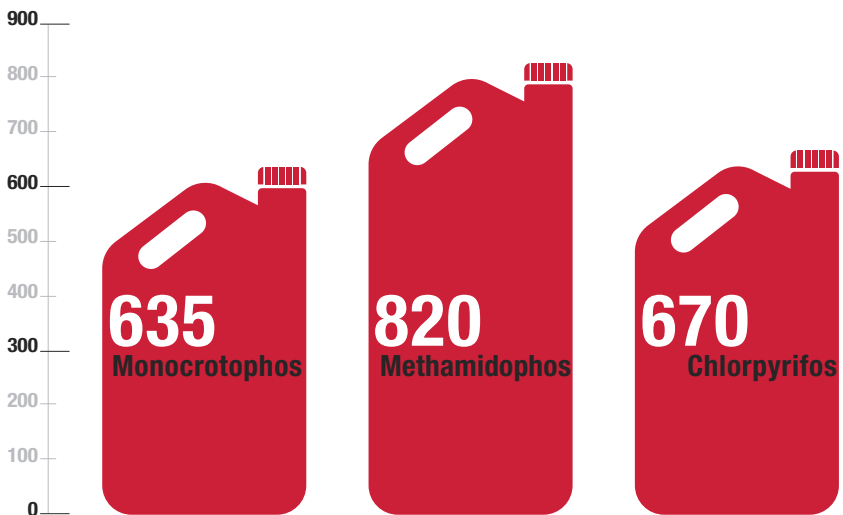
<sup>11</sup> <https://www.canada.ca/en/health-canada/services/consumer-product-safety/reports-publications/pesticides-pest-management/fact-sheets-other-resources/update-neonicotinoid-pesticides-2020.html>

# Why are highly hazardous pesticides still in use in low-and middle-income countries?

Several highly hazardous pesticides already banned in high-income countries are still used in low-and middle-income countries, where the risk of human and environmen-

tal exposure is, almost without exception, much higher than in those countries where they have been banned or severely restricted.

**Pesticides used by six top exporter countries on vegetables and fruit between 2012 and 2016 (metric tonnes active ingredient)**



Source: Data provided by Kynetec

Even though the awareness of and willingness to mitigate the risks posed by highly hazardous pesticides have grown tremendously in many countries, advancing with their restriction or phasing out requires addressing policy and structural challenges, such as:

- **Entrenched commercial interests** in maintaining the production, export and use of highly hazardous pesticides. An analysis of the implications for human rights of the management of hazardous pesticides can be found in the *Report of the Special Rapporteur on the right to food*<sup>12</sup>.
- **Unsustainable agricultural policies** that favour the expansion of input-intensive, commercial agriculture and the re-introduction of pesticide subsidies.
- **Failure to cost for externalities** (uncompensated costs including public health and environmental damages such as water contamination) into the pricing of pesticides which gives them a deceptive but significant price advantage over alternative (more sustainable) methods.

- **Limited capacity for pesticide risk assessment and monitoring:** the average number of staff working in the national pesticide registration authorities in low and middle-income countries is 3 as opposed to 700 in the United States of America or 150 in the United Kingdom<sup>13</sup>.
- **Insufficient independent scientific studies on health and environmental effects and science-policy interface** to support decision-making and regulatory action.
- **Inadequate investment towards innovative alternative solutions:** ranging from enabling regulations for biopesticides to the need to consolidate a market demand for innovative solutions.
- **Farmers' reluctance to innovation** because changes to farming practices are perceived as risky and consistent and reliable advisory services are not widely available.

Emergency responses to new pest outbreaks (e.g. Fall Armyworm) can increase the pressure to use highly hazardous pesticides upwards.

<sup>12</sup> The full report is available at [https://ap.ohchr.org/documents/dpage\\_e.aspx?si=A/HRC/34/48](https://ap.ohchr.org/documents/dpage_e.aspx?si=A/HRC/34/48)

<sup>13</sup> FAO survey 2013, data from 109 countries

# What are the alternatives?

**Agroecology** Agroecology is based on applying ecological concepts and principles to optimize interactions between plants, animals, humans and the environment while taking into consideration the social aspects that need to be addressed for a sustainable and fair food system. Agroecology underlies Integrated Pest Management (IPM) and is based on context-specific design and organization, of crops, livestock, farms and landscapes. It works with solutions that conserve above and below ground biodiversity as well as cultural and knowledge diversity with a focus on women's and youth's role in agriculture. Pest management in agriculture should fit into wider sustainability objectives and practices and avoid the use of products and methods that undermine them<sup>14</sup>.

**Biological products** Farmers can complement agroecological management practices with a range of registered biological products for pest control such as plant extracts, pheromone traps and microbial pathogens, depending on the actual pest situation and the availability of

effective solutions.

Some leading countries in Africa have adopted specific biopesticide legislation and engaged with commercial biopesticide companies to make biological control viable. Biopesticides in these countries are used in agriculture and forestry. Many other countries still lack the legislative framework, the commercial arrangements or the incentives to make biocontrol a large-scale reality.

**Green chemistry** Low-risk synthetic pesticides can be used as a last resort.

## **Integrated vector management**

This is a rational decision-making process to optimize the use of re-sources for vector control. The Integrated Vector Management (IVM) process is locally adapted and involves evidence-based use of vector control tools. The key intervention tools currently include use of insecticide-treated/long-lasting insecticidal nets, use of insecticides in indoor residual spraying and space spraying, use of bacterial or chemical larvicides, larvivoracious fish, and larval source management including environmental methods. For personal protection, repellents are recommended.

<sup>14</sup> FAO Agroecology website:  
<http://www.fao.org/agroecology/home/en/>

# Agroecologically based alternatives

Building on the principles of Integrated Pest Management (IPM), agroecologically-based alternatives to pesticides include farm and landscape management measures aimed at preventing pest outbreaks. These measures focus on the preservation of ecosystem services, including natural pest control and soil health (fertility, biological activity, structure, etc) and include for instance the management of riparian areas and natural habitats to augment the population of beneficial insects.

Sustainable  
farming  
systems

Good  
agricultural  
practices

Global biopesticide market to  
increase at a rate of

**16–17%**





**Pest  
Monitoring**

**Crop  
botany**

**Natural  
enemies**

**Low-risk  
chemical  
pesticides**

**Semiochems**

**Mircro  
organism**

**Fungi**

**Botanical**

**Bacteria**

**Virus**



©FAO/Luis Tatò / FAO 00168425

# What is being done?

## Three key steps in Pesticide Risk Reduction:

- 1. Reduce reliance on pesticides.** Determine to what extent current levels of pesticide use are actually needed. Make optimum use of non-chemical pest management and eliminate unjustified pesticide use.
- 2. Select pesticides with the lowest risk.** If use of pesticides is deemed necessary, select products with the lowest risk to human health and the environment from the available registered products that are effective against the pest or disease.
- 3. Ensure proper use** of the selected products for approved applications and in compliance with international standards.

Guidance on Pest and Pesticide Management Policy Development, 2010  
<http://www.fao.org/3/ca8116en/ca8116en.pdf>

The joint **FAO/WHO Guidelines on Highly Hazardous Pesticides** published in 2016 intend to help countries address the risks of highly hazardous pesticides following three key steps:

### 1 Identification

Countries analyse their pesticide registries against eight criteria (see back page) to identify which products are highly hazardous.

### 2 Needs and risks assessment

Countries assess the actual needs and benefits for these products and their risks to human health and the environment, taking into consideration available alternatives.

### 3 Mitigation options

Countries identify risk mitigation

measures. The most appropriate mitigation measures may be different for each highly hazardous pesticide and for each condition of use. A key enabling factor in mitigation is the availability of alternatives.

Countries have **several mitigation options** available to them in relation to highly hazardous pesticides ranging from **ending use, restricting use or changing formulations or conditions of use**.

Pesticides with an extremely high toxicity require a level of personal protection that cannot be ensured. In line with Articles 3.6 and 7.5 of the **FAO/WHO International Code of Conduct on Pesticide Management**, a complete phase out is the recommended mitigation measure for these products when countries are not in a position to handle them within risk margins that are considered as acceptable.

Pesticide regulatory authorities can be guided in this process by the **FAO Pesticide Registration Toolkit** which provides, among others:

- methods for hazard and risk assessment
- access to information on individual pesticides
- databases of registered pesticides around the world
- access to scientific reviews of pesticides

**Article 3.6.** Pesticides whose handling and application require the use of personal protective equipment that is uncomfortable, expensive or not readily available should be avoided, especially in the case of small-scale users and farm workers in hot climates.

**Article 7.5.** Prohibition of the importation, distribution, sale and purchase of highly hazardous pesticides may be considered if, based on risk assessment, risk mitigation measures or good marketing practices are insufficient to ensure that the product can be handled without unacceptable risk to humans and the environment.

FAO/WHO International Code of Conduct on Pesticide Management (the Code of Conduct)

The joint **FAO/WHO Guidelines for the registration of microbial, botanical and semiochemical pest control agents for plant protection and public health uses** (2017) provide additional guidance to facilitate the registration of alternative products.

## Global governance and policy dialogue

- In 2015, the **International Conference on Chemicals Management (ICCM4)** adopted a resolution that called for concerted action to address highly hazardous pesticides, with emphasis on promoting agro-ecologically based alternatives.
- WHO has developed a **Global Vector Control Response 2017–2030**<sup>15</sup> to guide global action.
- The **International Code of Conduct on Pesticide Management** and its technical guidelines are guided and supported by the **Joint Meeting on Pesticide Management**: an international panel of experts that advises FAO and WHO.

<sup>15</sup> <https://apps.who.int/iris/bitstream/handle/10665/259205/9789241512978-eng.pdf>



Myanmar has imposed restrictions on 19 highly hazardous pesticides.

Sri Lanka, Bangladesh, India, China have acted to identify and remove certain highly hazardous pesticides and the process is ongoing and iterative.



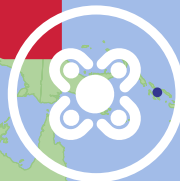
150 highly hazardous products out of more than 2 500 registered pesticides in Botswana, Mozambique, United Republic of Tanzania, Zambia and Zimbabwe have been identified.

## Regional collaboration and capacity building

- Capacity building programmes for pesticide regulators in 61 countries.
- Regional committees and networks of pesticide regulatory authorities established to strengthen collaboration and sharing of information.
- Regional guidelines for the harmonization of pesticide risk assessments developed to tighten risk assessments towards international standards.
- Dialogue with green commodity initiatives (banana, cotton, cocoa and coffee) ongoing to set a 'no use' policy of highly hazardous pesticides as a production standard.



Over 2 300 farmers interviewed in field surveys carried out as part of FAO-led projects. The conditions of pesticide use in all countries were likely to result in undue exposure, substantiating the need for immediate mitigation measures.



National multi-stakeholder platforms in place for the agriculture, public health and the environment sectors to cooperate, exchange information, design risk mitigation plans and facilitate solutions.

# What more can be done?

## The way forward

Despite the progress made, many highly hazardous pesticides are still in use under circumstances that pose unacceptable human health and environmental risks. Stepping up efforts to mainstream the sound management of pesticides into sustainable policies and initiatives is therefore an urgently required action to enable the achievement of Agenda 2030.

### Immediate actions

- **Identify, de-authorize and prevent future registration** of highly hazardous pesticides – for policy-makers.
- **Cancel the distribution and sales** of highly hazardous pesticides in countries where risk mitigation measures are insufficient to ensure that the product can be handled without unacceptable risk to humans and the environment (Article 7.5 of the International Code of Conduct) – for pesticide industry.
- **Combat illegal trafficking** through global and regional collaboration and stronger inspection and monitoring systems – for policy-makers.
- **Incentivize agroecological practices** and invest in the development of sustainable alternative solutions to highly hazardous pesticides – for agricultural producers, development partners and donor agencies.
- **Build a vibrant biopesticides market** – for private sector.
- **Invest in innovation and green chemistry** – for academia and donor agencies.
- **Improve risk assessment procedures for pesticides and pesticide-coated seed** to take into account possible impacts and cumulative effects, including sub-

lethal and indirect effects, on wild and managed pollinators as well as other non-target species.

- **Mainstream the implementation of the chemical conventions (Basel, Rotterdam and Stockholm) and sound pesticide management into policy and investment priorities** – for development partners and donor agencies.

#### Continued actions

- **Educate policy-makers and the general public** on the adverse effects of highly hazardous pesticides – for civil society.
- **Capacity building of pesticide regulators** to strengthen risk assessments – for governments, policy-makers and donor agencies.
- **Establish or implement pesticide residue monitoring** schemes – for policy-makers.
- **Monitor negative health and environmental effects** of highly hazardous pesticides to inform decision-making – for governments, civil society.
- **Expand green agricultural commodity market** – for private sector.

#### The Joint Meeting on Pesticide Management (JMPM)

The Joint Meeting on Pesticide Management (JMPM) has first recommended the 8 criteria on highly hazardous pesticides. The JMPM advises FAO and WHO on the implementation of the International Code of Conduct on Pesticide Management and prepares relevant guidance documents. It also reviews new developments, problems or issues requiring global attention pertaining to pesticide regulation and management. JMPM members are drawn from the two international expert panels: the FAO Panel of Experts on Pesticide Management and the WHO Panel of Experts on Vector Biology and Control.

- **Assist countries party to international conventions in achieving** national objectives and commitments – for signatories of international conventions.

# Criteria

FAO/WHO criteria to identify highly hazardous pesticides:

- 1 Pesticide formulations that meet the criteria of **Classes Ia or Ib** of the **WHO Recommended Classification** of Pesticides by Hazard; or
- 2 Pesticide active ingredients and their formulations that meet the criteria of **carcinogenicity Categories 1A and 1B** of the Globally Harmonized System of Classification and Labelling of Chemicals (**GHS**); or
- 3 Pesticide active ingredients and their formulations that meet the criteria of **mutagenicity Categories 1A and 1B** of the **GHS**; or
- 4 Pesticide active ingredients and their formulations that meet the criteria of **reproductive toxicity Categories 1A and 1B** of the **GHS**; or
- 5 Pesticide active ingredients listed by the **Stockholm Convention** in its **Annexes A and B**, and those meeting all the criteria in paragraph 1 of **Annex D** of the Con-vention; or
- 6 Pesticide active ingredients and formulations listed by the **Rotterdam Convention** in its **Annex III**; or
- 7 Pesticides listed under the **Montreal Protocol**; or
- 8 Pesticide active ingredients and formulations that have shown a **high incidence of severe or irreversible adverse effects** on human health or the environment



# Resources

The **FAO/WHO International Code of Conduct on Pesticide Management (2014)** and the associated **guidelines** for implementation:

<http://www.fao.org/pest-and-pesticide-management/guidelines-standards/faowho-joint-meeting-on-pesticide-management-jmpm/guidelines-tools/en/>

The **FAO/WHO International Code of Conduct on Pesticide Management: Guidelines on Highly Hazardous Pesticides (2016)**:

[www.fao.org/3/i5566e/I5566E.pdf](http://www.fao.org/3/i5566e/I5566E.pdf)

The **SAICM Strategy to address highly hazardous pesticides**:

[www.saicm.org/Portals/12/Documents/EPI/HHP%20strategy%20English.pdf](http://www.saicm.org/Portals/12/Documents/EPI/HHP%20strategy%20English.pdf)

**Addressing highly hazardous pesticides in Mozambique**, FAO (2016):

[www.fao.org/3/a-i5360e.pdf](http://www.fao.org/3/a-i5360e.pdf)

The **FAO Pesticide Registration Toolkit**:

[www.fao.org/pesticide-registration-toolkit/en](http://www.fao.org/pesticide-registration-toolkit/en)

The **FAO Agroecology Knowledge hub**:

[www.fao.org/agroecology/home/en](http://www.fao.org/agroecology/home/en)

**WHO** resources on sound management of pesticides are available at:

<https://www.who.int/teams/control-of-neglected-tropical-diseases/vector-ecology-and-management>

**Global Chemicals Outlook II**; From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development – Synthesis Report, UN Environment, 2019.

<https://www.unenvironment.org/explore-topics/chemicals-waste/what-we-do/policy-and-governance/global-chemicals-outlook>

# References

- **Arnold, T. et J. Parrent.** 2014. *Native pollinator observation and monitoring – Pilot Project*. Grey Bruce Centre for Agroecology. Ontario [http://gbcae.com/GBCAEdownloads/5\\_PollinatorMonitoring\\_FullReport.pdf](http://gbcae.com/GBCAEdownloads/5_PollinatorMonitoring_FullReport.pdf)
- **Bretveld, RW., Thomas, CM., Scheepers, PT., Zielhuis, GA., Roeleveld, N.** 2006. *Pesticide exposure: the hormonal function of the female reproductive system disrupted?* *Reproductive Biology and Endocrinology*, 4: 30. <http://doi.org/10.1186/1477-7827-4-30>
- **European Commission Implementing Regulation (EU) 2018/783, 2018/784, 2018/785,** 2018. This regulation amends Implementing Regulation (EU) No 540/2011 as regards the conditions of approval of the active substances imidacloprid, clothianidin and thiamethoxam.
- **European Food Safety Authority (EFSA)** 2017. *The 2015 European Union report on pesticide residues in food*, EFSA Journal, vol. 15(4):4791: 134 pp. Parma. <https://www.efsa.europa.eu/en/efsajournal/pub/4791>
- **Fox, J., Gullledge, J., Engelhaupt, E., Burow, M., et al.** 2007. *Pesticides reduce symbiotic efficiency of nitrogen-fixing rhizobia and host plants*. Proceedings of the National Academy of Science of the United States of America, 104(24), 10282-10287. <https://doi.org/10.1073/pnas.0611710104>
- **UN Environment,** 2019. *Global Chemicals Outlook II; From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development – Synthesis Report*. <https://www.unep.org/explore-topics/chemicals-waste/what-we-do/policy-and-governance/global-chemicals-outlook>
- **International Labour Organization (ILO),** 2010. *Accelerating action against child labour – Global Report under the follow-up to the ILO Declaration on Fundamental Principles and Rights at Work 2010*. <https://www.ilo.org/ipec/areas/Agriculture/lang--en/index.htm>
- **Levillain, J., Cattan, P., Colin, F., Voltz, M., & Cabidoche, Y. M.** 2012. How physical environmental factors and farming practices determine soil contamination by a persistent organic pollutant, chlordecone, in the French West Indies. *Agriculture, Ecosystems and Environment* 159 : 123– 132.
- **Mew, E. J., Padmanathan, P., Konradsen, F., Eddleston, et al.** 2017. *The global burden of fatal self-poisoning with pesticides 2006-15: Systematic review*. *Journal of Affective Disorders*. Elsevier B.V. Oxford, England.
- **Ntzani, E.E., Ntrisots, G.M.C., Evangelou, E. & Tzoulaki, I.** 2013. *Literature review on epidemiological studies linking exposure to pesticides and health effects*. EFSA Supporting Publications 10(10), 159 pp.
- **Pisa, L.W., Amaral-Rogers, V., Belzunces, L.P., et al.** 2015. *Effects of neonicotinoids and fipronil on non-target invertebrates*. *Environmental Science and Pollution Research*, 22: 68 [online]. <https://doi.org/10.1007/s11356-014-3471-x>
- **Van Lexmond, M.B., Bonmatin, J.-M., Gousson, D. & Noome, D. A.** 2015. *Worldwide integrated assessment on systemic pesticides*. *Environmental Science and Pollution Research*, 22(1): 1-4. <https://doi.org/10.1007/s11356-014-3220-1>
- **World Health Organization (WHO).** 2018. *The public health impact of chemicals: Knowns and unknowns – Data addendum for 2016*. Geneva, Switzerland. <https://apps.who.int/iris/bitstream/handle/10665/279001/WHO-CED-PHE-EPE-18.09-eng.pdf?ua=1>
- **Woodcock, B. A., Bullock, J. M., Shore, R. F., Heard, M. S., et al.** 2017. *Country-specific effects of neonicotinoid pesticides on honey bees and wild bees*. *Science*. Vol. 356, Issue 6345, pp. 1393-1395.

# Key partners in reducing pesticide risks



International and regional economic communities and organizations committed to sustainable agriculture



Academia and research partners working on strengthening pesticide risk assessment capacity



Civil society engaged in raising awareness and reducing the impacts of pesticides



Private sector committed to providing innovative solutions



Resource partners



**KEMI**  
Swedish Chemicals Agency



## Contacts

### **Food and Agriculture Organization of the United Nations**

<http://www.fao.org/pest-and-pesticide-management/en/>

Viale delle Terme di Caracalla

00153 Rome - Italy

### **World Health Organization**

<https://www.who.int/teams/control-of-neglected-tropical-diseases>

Avenue Appia 20

1211 Geneva - Switzerland

ISBN 978-92-5-132029-7



9 789251 320297

CA6847EN/1/12.19