



# **Highly Hazardous Pesticides Awareness Brochure**

**International Pollutants Elimination Network (IPEN)**

**SUSTAINABLE ENVIRONMENT DEVELOPMENT INITIATIVE (SEDI)**

**April, 2023**

## **Highly Hazardous Pesticides Awareness Brochure**

### **What are pesticides?**

Pesticides are agrochemicals that are used for crop protection. A pesticide is a substance intended to prevent, destroy, repel or control any animal pest or disease caused by microorganisms, as well as unwanted weeds [1]. Pesticides can also be used as vector control and agriculture control agent in public health programmes [2]. The group includes herbicides, insecticides, and fungicides. Pesticides may be used for crops on the field, harvested produce, agricultural commodities or animal feeds and fish and 2.1% of pesticides used in the world come from Africa [3]. The cost of labor, choice of pesticide application, and the promise of swift pest control have made the use of pesticides judicial or rampant all over the world [4]. A survey on pesticides usage in Nigeria indicated that about 15,000 metric tons annually of pesticides comprising about 135 pesticide chemicals marketed locally under 200 different produce brands and formulation were imported during 1983-1990 thus making Nigeria one of the largest pesticides users in sub-Sahara Africa [5].

More than 95% of the applied herbicides and 98% of insecticides reach non-target soil microorganisms than their target pest, as they are sprayed proportionately across the entire field, irrespective of the affected areas [6]. Hence, of the total quantity of applied pesticides, about 0.1% reaches the target organisms while the remaining quantity pollutes the soil and environment. In the early 1990s, the World Health Organization (WHO) estimated that there were 3 million acute pesticide poisonings a year worldwide, almost all in developing countries: 700,000 occupational; 300,000 accidental; and 2 million by intent [2]. There are 25 million occupational pesticide poisonings each year among agricultural workers in developing countries alone [7].

### **What are HHPs?**

Pesticides are inherently hazardous, and among them, a relatively small number of Highly Hazardous Pesticides (HHPs) cause disproportionate harm to environment and human health

including: severe environmental hazards, high acute and chronic toxicity [8]. Pesticides that appear to cause severe or irreversible harm to health or the environment under conditions of use in a country may also be considered to be and treated as highly hazardous”.

Stakeholder reflection on the failure of existing pesticide controls to reduce the incidence of damage to human health and environment led FAO and WHO to launch a new initiative for a progressive ban on Highly Hazardous Pesticides (HHPs) in 2006. The HHP initiative recognizes that WHO Class II pesticide active ingredients (‘moderately hazardous’ in terms of acute mammalian toxicity as determined in laboratory testing), such as endosulfan, paraquat and chlorpyrifos, can be as problematic in reality as the ‘extremely’ and ‘highly’ hazardous pesticides which make up WHO Class I. This conclusion is also drawn from PAN’s poisoning cases data in West Africa [9] and locust cost externality assessment in Senegal [10]. In 2009 PAN International published its ‘List of Highly Hazardous Pesticides’ as a contribution to UN discussions [11]. It provides a catalogue of the most harmful pesticides that is more comprehensive, and takes into account more potential pesticide hazards, than current listings by official bodies.

HHPs are considered to represent a fraction of all registered pesticides worldwide; in some cases as small as 6 percent (Southern African countries) while in other cases as high as 30 percent of the registered products [8]. They are still in use in many low and middle income countries because of inadequate regulation and monitoring and are primarily used in agriculture and in public health (DDT and Clothianidin) for malaria vector control, but also used in domestic gardens. They have been detected in air, water, soil, animals and humans and have been found in local food systems and global food commodities such as bananas, coffee and rice, but the most contaminated crops are fruit and vegetables. They can also cause loss of biodiversity, kill fish and birds and poison wildlife and should be progressively phased out by more sustainable alternatives.

### Most common HHPs in Nigeria

<b>Pesticides</b>	<b>Pesticide group</b>	<b>Effects</b>
Paraquat dichloride	It is used as a plant desiccant effective against grasses	Acute toxicity
Atrazine	Herbicide	Long term effects; environmental toxicity; toxic to termites
Acetochlor	Herbicide	Long term effects
Butachlor	Herbicide	Probable/ Likely carcinogen according to EPA
Propanil	Herbicide	Removed from PAN HHP list in 2013
Pendimethalin	Herbicide	Removed from PAN HHP list in 2013
Oxidaxone	Herbicide	Probable/ Likely carcinogen according to EPA
Alachlor	Herbicide	Long term effects; Listed in Annex III of the Rotterdam Convention
Glyphosate	Herbicide	Long term effects; toxic

		to bees
2,4-D	It is a selective post emergence herbicide used for the control of many annual broadleaf weeds	Removed from PAN HHP list in 2013
Aldicarb	Carbamate insecticide	Acute toxicity; environmental toxicity; toxic to bees; Listed in Annex III of the Rotterdam Convention
Cadusafos	Nematicide	Acute toxicity; environmental effects
Diquat dichloride	Herbicide Dessicants, defoliants and harmful killer	Acute toxicity
Lambda-cyhalothrin	Insecticide and acaricide	Acute toxicity; long term effects; toxic to bees
Fentin hydroxide	Fungicide	Acute toxicity; Probable/ Likely carcinogen according to EPA; Long term effects
Metolachlor	Selective pre-emergence herbicide	Removed from PAN HHP list in 2013
Parathion-methyl	Insecticide and acaricide	Acute toxicity; Listed in Annex III of the

		Rotterdam Convention
Procymidone	Fungicide	Long term effects; Probable/ Likely carcinogen according to EPA
Endosulfan	Insecticide	Acute toxicity; Listed in Annex III of the Rotterdam Convention; Listed in Annex III of the Stockholm Convention
Imidacloprid	Insecticide	Environmental toxicity; toxic to bees
Isoproturon	Systemic herbicide	Removed from the PAN HHP list since 2013
Heptachlor epoxide	Broad-spectrum insecticide	Removed from the PAN HHP list since 2011
Captafol	It is a protective, wide spectrum foliage and soil fungicide	Acute toxicity; long term effects; Probable/ Likely carcinogen according to EPA; Listed in Annex III of the Rotterdam Convention
Mancozeb	It is a protective fungicide, effective against a wide range of foliage disease	Long term effects

Benomyl	Eradicant fungicides	Long term effects; Listed in Annex III of the Rotterdam Convention
Lindane	It is used against sucking and biting insects	Long term effects; very toxic to bees; Listed in Annex III of the Rotterdam Convention; Listed in Annex III of the Stockholm Convention
DDT	Effective against wide variety of insects, including domestic insects and mosquitoes	Long term effects: Endocrine disruptor or potential endocrine disruptor, Probable/Likely carcinogen according to EPA; Environmental toxicity: Persistent in soil, water, sediment; toxic to aquatic organism; Listed in Annex III of the Rotterdam Convention; Listed in Annex III of the Stockholm Convention
Zineb	Protectant fungicide	Endocrine disruptor or potential endocrine disruptor
Malathion	Wide range insecticides used against aphids, red spider,	Long term effect; toxic to

	thrips and leafhoppers.	bees
Molinate	Herbicide	Long term effects
Methoxychlor	Insecticide	Environmental effects
Chlorotoluron	Post emergence herbicide	Long term effects
Carbofuran	Insecticide	Acute and environmental toxicity
Carbaryl	Insecticide	Long term effects and environmental effects
Folpet	Fungicide	Long term effects
Parathion	Insecticide	Acute toxicity and long term effects
Methyl bromide	Fumigant – Rodenticide and nematicide	Ozone depleting chemical according to the Montreal Protocol
Fenthion	Organic: non-systemic insecticide	Environmental effects: highly toxic to bees
Parathion	Organic: non-systemic insecticide	Acute toxicity; Listed in Annex III of the Rotterdam Convention
Hexachlorocyclohexanes	Fungicide	Long term effects; Listed



		in Annex III of the Rotterdam Convention
1-3-dichloropropene	Fungicide; nematocide	Long term effects: Probable/ Likely carcinogen according to EPA
Ethylene dibromide	Fumigant nematocide	Long term effects; Listed in Annex III of the Rotterdam Convention
2,4,5-T	Herbicides-hormone weed killer	Removed from PAN HHP list in 2013
Hexachlorobenzene	Acaricide	Acute toxicity; long term effects; highly bioaccumulative; Listed in Annex III of the Rotterdam Convention; Listed in Annex III of the Stockholm Convention
Monocrotophos	Insecticides	Acute toxicity; toxic to bees
Cyanazine	Pre and post-emergence herbicide	Removed from the PAN HHP list since 2013

Source [12]: PAN, 2016 - International List of Highly Hazardous Pesticides

## **Impacts of HHPs**

The impacts of the highly hazardous are divided into human health and environmental impacts.

### **Human Health impacts of HHPs**

1. Consumption of crops and plants grown under chemical pest control could cause health hazards to humans. This is especially common in the consumption of fruits and vegetables without proper washing for example, [13] reported the presence of paraquat residues in some commonly consumed vegetables in Abeokuta, Nigeria.
2. Application/Spraying of pesticides could cause physical discomfort in the absence of protective equipment.
3. It is also likely to cause skin burns when not wearing protective clothing in pesticide spraying.
4. Drinking water from sources contaminated by pesticide spraying adjacent to the resources, or overflow and drain of chemicals adjacent to drinking water resources.
5. Chemical pesticides could cause harm to the human health when drinking water polluted by pesticides and eating polluted animals and agro byproducts.

### **Environmental Impacts of HHPs**

1. *Impact on Aquatic Organisms*- Pesticide residues lead to deterioration of water quality, hence reducing the number of aquatic organisms.
2. *Water Pollution and Contamination*- Spraying pesticides adjacent to drinking water resources may lead to their contamination, and use of hazardous pesticides and wrong pesticides application approach could result to pollution of surface and underground water.
3. *Soil degradation/contamination*- Long-term excessive use of pesticides will cause higher pesticide resistance and pesticide residues in the soil which will cause soil contamination.
4. *Extinction of Non-Target Species*- Highly toxic pesticides may have impact on the non-target species (bees, natural enemies, etc.).

5. *Air Pollution*- Unsafe handling, application and disposal of pesticides products such as empty containers and obsolete products will cause air pollution.

6. *Soil fertility imbalance*- Pesticides cause imbalance of soil fertility which directly affects crop yield.

### **Effects of using specific HHPs**

There is certainty that the application of Endosulfan pesticide is moderately persistent in Ibadan soil and hinders availability of some soil nutrients [14]. There was 85% population reduction of nematode as a result of Endosulfan application. Total DDT and heptachlor found in Ibadan ground water exceeded the WHO limits for these chemicals in drinking water [15].

### **Unintended costs incurred in using HHPs**

The UN Food & Agriculture Organization (FAO) analyzed externalities caused by spraying high concentrations of organophosphate insecticides (mainly malathion and fenitrothion) for locust control operations in Senegal during the last outbreak in 2003 - 2005 [8]. It estimated external costs of over 8 million euros: 2.75 million for environmental costs; 2.5 million on human health; 2.1 million in agricultural production losses; and 0.7 million in damage prevention costs.

Unintended costs of using HHPs include:

1. **Increased cost of production:** The use of HHPs in agricultural farming systems leads to an increase in cost of production due to the fact that these pesticides are expensive.
2. **Maintenance cost:** maintenance of sprayers such as power driven models with motor and hand operated sprayers. Hand operated sprayers such as Lancet, Falcon, Knapsack, Motorized mist blower, Ultra Low Volume (ULV), and Electrodyne sprayers need to be maintained regularly through procedures like washing and oiling with light oil to prevent corrosion [16].

3. Cost of pesticide poisoning treatment: First aid for pesticide poisoning victims and hospital bills.
4. Cost of pesticide poisoning prevention: During spraying personal protective equipment (PPE) are worn to reduce contact with the pesticide. These include coveralls, long rubber gloves, goggles, respirators, rubber boots and waterproof hat. These PPE are usually expensive and increase the cost.
5. Environmental pollution: The use of HHPs causes environmental degradation and pollution [16].

## References

- [1] FAO and WHO, 1986. FAO Panel of Experts on Pesticide Residues in Food and the Environment and WHO Expert group on Pesticide Residues. Pesticides residues in food: Report of the joint meeting of the FAO Panel of Experts on Pesticide Residues in Food and the Environment and a WHO Expert Group on Pesticide Residues, Rome, 29 September – 8 October 1986. Rome: FAO.
- [2] WHO, 1990. The public health impact of pesticides use in agriculture. World Health Organization, Geneva.
- [3] Food and Agriculture Organization of the United Nations. 2019. FAOSTAT Statistical Database; FAO: Rome, Italy.
- [4] Bahadur, S., Verma, S.K., Prasad, S.K., Madane, A.J., Maurya, S.P., Gaurav Verma, V.K., Sihag, S.K. 2015. Eco-friendly weed management for sustainable crop production-A review. *Journal of Crop and Weed* 11: 181–189.
- [5] Osibanjo, O.; Ikem A.; Sridhar, M.K.C. and Sobande A. 2002. Evaluation of groundwater quality characteristics near two waste sites in Ibadan and Lagos, Nigeria. *Water, Air and Soil Pollution* 140 (1-4): 307-333.
- [6] Miller, G.T. 2004. *Sustaining the Earth*; Brooks/Cole: Monterey County, CA, USA; ISBN 9780534400880.
- [7] Jeyaratnam, J. 1990. Acute pesticide poisoning: a major global health problem. *World Health Statistics Quarterly* 43: 139-144.
- [8] FAO and WHO. 2019. *Detoxifying agriculture and health from highly hazardous pesticides – A call for action*. Rome.
- [9] PAN UK, 2008. Hazardous pesticides and health impacts in Africa. Food & Fairness briefing no. 6, London. Via <http://www.pan-uk.org/Publications/>

- [10] Leach, A., Mullié, WC, Mumford, JD and Waibel, H. (2008). Spatial and historical analysis of pesticide externalities in locust control in Senegal- first steps. Imperial College London, University of Hanover and FAO.
- [11] PAN Germany, 2009. *PAN International List of Highly Hazardous Pesticides* Via <http://www.pan-germany.org/>
- [12] Pesticide Action Network International, 2016. PAN International List of Highly Hazardous Pesticides - 12/2016.
- [13] Akinloye O. A.; Adamson I.; Ademuyiwa O. and Arowolo T. A. 2011. Paraquat toxicity and its mode of action in some commonly consumed vegetables in Abeokuta, Nigeria. *International Journal of Plant Physiology and Biochemistry* 3(4): 75-82.
- [14] Aikpokpodion, P.E., Lajide, L., Ogunlade, M.O., Ipinmoroti, R., Orisajo, S., Iloyanomon, C.I. and Fademi, O. 2010. Effect of Endosulfan on soil and root-knot nematodes in cocoa. *Journal of Applied Biosciences* 26: 1640-1646.
- [15] Osibanjo, O. and Aiyejuyo, A. 1994. Organochlorine pesticide residue in foodstuff of animal origin in Nigeria. *Bull Environ Toxicol* 54:460-464.
- [16] Ekeleme, I.Y. Dugje, F. Ekeleme, A.Y. Kamara, L.O. Omoigui, A. Tegbaru, I.A. Teli, And J.E. Onyibe. 2008. Guide to safe and effective use of pesticides for crop production in Borno State, Nigeria. 23 pp.