This article provides a state of play of the European Union (EU) agri-environmental indicator pesticide risk. It consists of a background description. The pesticide risk indicator should be based on an index of risk of damage from pesticide toxicity and exposure. The conceptual and, where appropriate, modelling framework underpinning this indicator needs however still to be developed. The pesticide risk article is part of a set of similar fact sheets providing a complete picture of the state of the agri-environmental indicators in the EU.

Main statistical findings

- Directive 2009/128/EC establishing a framework for Community action to achieve the sustainable use of pesticides states that all Member States shall establish a set of harmonised risk indicators. However, as these risk indicators have not yet been agreed, the work on this AEI has been put on hold for the time being, the logic being that identifying an additional indicator outside the work carried out within the framework of legislation would not be appropriate.

- More accurate risk indicators on pesticides need detailed and harmonised data on active ingredients’ use, on their specific profile with regard to the environment or human and animal health, and indications on the mode of application and dispersion/exposure rates. Homogeneous and comparable pesticide usage data for Europe are currently lacking, see AEI 6 - Consumption of pesticides, but Regulation (EC) No 1185/2009 concerning statistics on pesticides will improve the data availability for the future.

Indicator definition

Index of risk of damage from pesticide toxicity and exposure.

Measurements

The conceptual and, where appropriate, modelling framework underpinning this indicator needs to be developed.

Links with other indicators

- AEI 04 - Area under organic farming (see article Organic farming statistics)
- AEI 06 - Consumption of pesticides
- AEI 10.1 - Cropping patterns
- AEI 11.2 - Tillage practices
Context

Pesticide risk can be defined with reference to a specified endpoint (ecosystems, humans, stock of environmental resources). Although risk in a rigorous sense is not easy to define, many risk indicators can be computed and aggregated according to different logics and methods. Among other effort, two European projects have been developed to provide support on this topic:

- The European project Harmonised environmental Indicators for pesticide Risk (HAIR) provided an overview and conceptual framework for such indicators. The project provides tools for the calculation of the indicators at different scales. The results from the initial project has been updated to build a new, user friendly version of the instrument with a restricted set of robust and well documented risk indicators.
- Moreover, the FOOTPRINT project has been developing tools for the analysis of pesticide impact in Europe from field to national and continental scale.

Risk indicators presented in HAIR are in the form of exposure/toxicity ratios, i.e. a comparison of environmental concentrations of pesticides with threshold values implying potential risks. The HAIR project suggests also a framework for the integration of the different indicators, which needs to be performed in relation to a specific question (e.g. what is the trend of risks associated with the consumption of a specific crop?). The analysis tools provided by the two projects allow a representation of risks from a given spatial and temporal distribution of pesticide usages.

The indicator of pesticide risk proposed here refers to aquatic and soil ecological risk, and builds on the concepts developed in the HAIR and FOOTPRINT projects. It aims at providing a synthetic representation of pesticide risk in Europe using the limited information available; it is computed as a weighted sum of exposure-toxicity ratios for all chemical classes used in Europe, under conservative assumptions. The approach can be extended to human health risk as well as other endpoints, in a straightforward way.

Policy relevance and context

The relevant policies are described in the chapter Policy relevance and context of AEI 6 - Consumption of pesticides.

In an effort to harmonise the calculation of predicted environmental concentrations (PEC) of active substances of PPPs in the framework of EU Directive 91/414/EEC, the European Commission initiated a Forum for the co-ordination of pesticide fate models and their use (FOCUS). FOCUS is based on co-operation between scientists of regulatory agencies, academia and industry. FOCUS has produced guidance for calculating pesticide leaching to groundwater, for pesticide persistence in soil and for pesticide loss to surface water.

Agri-environmental context

The agri-environmental context is also described in chapter Agri-environmental context of AEI 6 - Consumption of pesticides. Pesticides still represent one of the main pressures from agriculture on human health and ecosystems, though chemical substances placed on the market tend to be less and less harmful in response to the requirements of the directives and regulations in force, as they undergo more and more risk assessment. The persistence of pesticides in the environment tends to be reduced thanks to the gradual replacement of “old” chemicals, such as Lindane, Endosulfan and Trifluralin, with equivalents producing lesser impacts. However, to date no homogeneous and extensive assessment of risk conditions in Europe has been conducted.

The pesticide statistics regulation (Regulation (EC) No 1185/2009) has identified close to 500 active substances to be followed; usage data are reported for Europe grouped in almost 120 substance classes, some of

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which include a high number of chemicals with markedly different physico-chemical properties, hence fate and toxicity to humans and ecosystems. The environmental concentration of pesticides depends substantially on application timing and mode, climate and landscape parameters. Among other parameters, soil organic carbon content, the distance of the application site from water bodies, the presence of buffer vegetation, ambient temperature, and runoff and leaching rates play a major role.

The effects of pesticides on ecosystems have been characterized using toxicological properties of the chemicals for indicator species (fish, algae, aquatic invertebrates for water; bees and earthworms for terrestrial ecosystems; sometimes toxicity data for birds and mammals are also available). Also, a clear relationship has been highlighted between ecological structures and toxicity of water to Daphnia Magna\(^2\). Ecosystems may be significantly impacted by pesticides; however, impacts can be significantly reduced when landscape patterns support habitats that can provide recolonization. Research has highlighted that, for instance, the presence of forest in the catchment upstream of a river impacted by pesticides correlates to increased resilience of aquatic communities.\(^3\)

**See also**

- Agri-environmental indicators (online publication)

**Further Eurostat information**

**Publications**

- Agriculture, forestry and fishery statistics — 2016 edition (Statistical book)
- Agriculture, forestry and fishery statistics — 2015 edition (Statistical book)
- Environmental statistics and accounts in Europe - 2010 edition
- Food: from farm to fork statistics - 2011 edition
- The use of plant protection products in the European Union: This publication reports on the used quantities of pesticides from 1992 to 2003 based on data of the European Crop Protection Association.

**Dedicated section**

- Agri-Environmental Indicators

**Other information**

- Commission Communication COM(2006)508 final - Development of agri-environmental indicators for monitoring the integration of environmental concerns into the common agricultural policy


- Agri-Environmental Indicators, see:

Corresponding IRENA Fact sheet 20

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External links

- European Commission

- DG Agriculture and Rural Development
  - Pesticides
  - DG Environment

- Chemicals
- DG Environment and Food Safety

- Biocidal Products
  - Pesticides

- European Food Safety Authority - Pesticides
- European Crop Protection Association

Notes