**Questionnaire for non-governmental stakeholders to inform her report to the 34th Session of the Human Rights Council**

**Response by HELVETAS Swiss Intercooperation,** [**www.helvetas.org**](http://www.helvetas.org)

Helvetas is one of the largest Swiss development cooperation organisations active in 30 countries in Latin America, Africa, Asia and Eastern Europe. Pesticides are an important issue in our work with smallholders. We support civil society organisations to address pesticide issues (e.g. in Laos) and facilitate conversion to more sustainable production methods such as organic farming. In 2015 and 2016 Helvetas organized a series of international events to address the topic of reducing pesticide use and risks through de-polarized discussions among key stakeholders, including farmers, scientists, policy makers, businesses, civil society organisations and consumers (see [www.helvetas.ch/pesticides](http://www.helvetas.ch/pesticides)). The briefing paper “[Reducing pesticide use and risks - What action is needed?](http://assets.helvetas.org/downloads/briefing_paper_pesticide_reduction_including_conclusions.pdf)[[1]](#footnote-1)” summarizes the conclusions of these events. It comprehensively covers most of the topics addressed in the questions below and lists relevant literature sources. The responses to this questionnaire therefore build on our field experience as well as the conclusions of pesticide specific stakeholder events involving more than 300 persons.

**1. The use of pesticides has had detrimental effects not only on the environment but also on human health, both from direct and indirect exposure. What are the successful and unsuccessful measures taken by Governments and businesses to prohibit, ban, restrict and phase out pesticides that are harmful to human health?**

More and more countries, both industrialized and developing, are phasing out highly hazardous pesticides. Developing countries and emerging economies are often not able to ensure safe handling of hazardous pesticides, with severe impacts on human health and environment. A majority of farmers and farm workers does not use adequate protective gear and is not likely to do so in future. Phasing out of highly hazardous pesticides (HHPs) is therefore absolutely necessary also in these countries. However, many developing countries are still facing various constraints to the effective enforcement of their regulatory systems. Available financing and human resources for the control of pesticides are very small. Despite official adoption of the FAO/WHO International Code of Conduct on the Distribution & Use of Pesticides in 1985, there is evidence from the field that, especially in developing countries, pesticides still pose a serious threat to human health and the environment.

The international conventions (Rotterdam and Stockholm conventions) provide a useful framework for phasing out highly hazardous pesticides, but are not sufficiently effective due to the veto option by individual countries. Even if pesticides have been identified to fulfil all criteria for HHP, they therefore not always get listed under the conventions. Understandably, manufacturers of HHPs often protect their business interests by taking significant influence on decision makers. It is therefore important to ensure that decisions are taken in the best interest of society.

Food processors and retailers can enforce that suppliers comply with existing laws and codes. In addition, they can go a step further by imposing additional restrictions, e.g. prohibiting pesticides included on the list of highly hazardous pesticides of the Pesticide Action Network (PAN). They can and should conduct regular residue tests in order to ensure compliance with their set requirements, and inform their suppliers on the results of these tests.

A key problem, however, is that the distinction between hazardous and non-hazardous pesticides is questionable. There is plenty of scientific evidence that pesticides that are officially deemed safe can have substantial chronic impact on human health even if exposure is limited to uptake in food (see references in “[Reducing pesticide use and risks - What action is needed?](http://assets.helvetas.org/downloads/briefing_paper_pesticide_reduction_including_conclusions.pdf)”). While most industry-financed research suggests that pesticides imply few health risks if they are properly used, there are numerous scientific studies published in renowned journals that point out serious health hazards. Various studies concluded that pesticide exposure is a significant additional risk factor in many chronic diseases such as several types of cancer, Parkinson’s disease and Alzheimer’s disease. There is circumstantial evidence that exposure to pesticides is associated with disruption in the immune system and hormone imbalances which may increase the risk for obesity, diabetes, autoimmune diseases, reproductive problems and food allergies. Other studies found that chronic low-level exposure to certain pesticides may be related to adverse effects on brain functioning, including changes in attention, speech, sight, memory and emotional aspects. Though there are inherent problems in conducting large-scale experiments and directly assessing causation of these human health problems, the statistical associations between exposure to certain pesticides and the incidence of some diseases are compelling and cannot be ignored. Measures taken by governments and businesses therefore not only need to address phasing out of pesticides classified as highly hazardous, but also reduce overall pesticide use.

**2. Do you believe that is possible to shift from industrial agriculture systems to agro-ecological methods?**

A gradual but progressive shift from industrial agriculture systems to agro-ecological methods is definitely feasible. There is ample evidence that the currently predominant systems are not sustainable and that a paradigm shift is needed and is possible (see [IAASTD report](http://www.unep.org/dewa/Assessments/Ecosystems/IAASTD/tabid/105853/Defa)). With the SDGs addressing agriculture and food systems we have a globally agreed framework of objectives where we need to be heading to. There are various reports and initiatives that provide guidance on how this transition can take place (e.g. the iPES Food report “[From uniformity to diversity](http://www.ipes-food.org/images/Reports/UniformityToDiversity_FullReport.pdf)” and the [Sustainable Food Systems Program](http://www.unep.org/10yfp/Programmes/ProgrammeConsultationandCurrentStatus/Sustainablefoodsystems/tabid/1036781/Default.aspx)).

More than 2 Million organic farmers have demonstrated that it possible to profitably produce healthy food in agro-ecological systems without using any synthetic pesticides. While at global level yields in organic crops and systems tend to be 10-18% lower than in conventional agriculture (mainly due to non-application of synthetic fertilizers), there are many examples particularly in tropical regions where they contribute to improved food security and nutrition. Obviously, it will not be feasible to entirely convert global agriculture to organic farming in the near future. But the integration of agro-ecological methods in conventional systems allows significantly reducing the use of pesticides - without affecting yields or increasing production costs. What we need in order to reduce pesticide use is a combination of several measures (from simple to more far-reaching ones):

* Applying good agronomic practices that achieve healthy crops and prevent build-up of pest, disease and weed pressure (soil fertility management, crop rotation, timely tillage, appropriate irrigation, precision farming etc.).
* Growing crops appropriate for local conditions and using resistant varieties.
* Applying integrated pest management based on preventive measures and economic thresholds.
* Using biocontrol and natural pesticides instead of synthetic pesticides (the biocontrol sector has seen dynamic developments in recent years, see <http://www.ibma-global.org/>
* Re-designing farming systems and management practices based on agro-ecological principles.
* Converting to organic management.

Shifting to more sustainable agriculture in order to reduce dependency on pesticides is not only a matter of production technologies. There is a consensus that pesticide use reduction also requires a set of changes in value chains and in the policy environment. Three factors are required to work together (see figure below): availability of and know-how on alternatives, increasing demand for low-/no-pesticide products and conducive legislation and policies.



Pesticide use reduction therefore is a joint responsibility that cannot be burdened on the farmer alone. It positively influences public goods and reduces costs currently borne by society. Therefore, the investment of public funds for pesticide reduction is justified. It also is in the interest of the private sector as it can result in competitive advantage or offer new business opportunities. Investments of the private sector in the development and promotion of alternatives (such as biocontrol and organic farming) is crucial. Pesticide use reduction will only succeed if there is collaboration among different kinds of stakeholders, particularly of stakeholders along the value chain from producers to consumers.

**3. Some particularly exposed or vulnerable groups such as children, pregnant women, farmers, farm workers, indigenous peoples and migrant workers, are at greater risk to the effects of pesticides due to higher exposure or increased sensitivity. Please explain the efforts undertaken by Governments and businesses to prevent and mitigate detrimental impacts of pesticides on the health of these vulnerable groups.**

Current efforts to protect these vulnerable groups are clearly insufficient. For vulnerable groups directly exposed to pesticide application measures are limited to safe use guidelines such as wearing protective gear and waiting periods before harvest. However, in many countries the lack of information, unavailability of protective equipment and its impracticality in hot and humid climates result in low adoption rates. The protection of vulnerable consumer groups like children and pregnant women is limited to the definition of maximum residue levels (MRLs) in food and drinking water. Even if they are observed (which often is not the case particularly in developing countries) the residue levels pose severe risks to these vulnerable groups (see studies mentioned below).

**4. Is there any study that has been conducted by your organization using disaggregated data to differentiate and detect impacts on above mentioned vulnerable groups?**

We are not a research institute, but we analysed and compiled relevant literature on this topic (see references in “[Reducing pesticide use and risks - What action is needed?](http://assets.helvetas.org/downloads/briefing_paper_pesticide_reduction_including_conclusions.pdf)”). We found various studies among farmers, farm workers and their families that showed increased incidences of several types of cancer, such as lymphatic and blood system, lip, stomach, prostate, brain, testes, skin cancers and soft tissue sarcoma. Unborn and young children are in particular vulnerable to pesticide exposure due to the high rate of growth and complex development processes, the higher dose per body weight and the lower level of detoxifying enzymes compared to adults. Children themselves employed in agricultural work, as often the case particularly in developing countries, are particularly vulnerable to the toxic effects of pesticides. Numerous studies reported for children exposed to high levels of pesticides a delay in their cognitive development, behavioural effects and birth defects. A study in California, US, found that high levels of organophosphorus pesticides in mother’s urine were statistically associated with poorer intellectual development and deficits in working memory in the children when they reached 7 years of age. These cognitive effects occurred in children whose mother’s urine had levels of organophosphate pesticides that were near the upper end of the range typically found across the general US population. Another study reported that children with higher urinary pesticide levels, mainly from diet, were more likely to be diagnosed with attention deficit/hyperactivity disorder (ADHD). Moreover, some persons have an inherent genetic susceptibility to the health effects of pesticide exposure and are therefore likely to be more at risk than others.

**5. States have an obligation and businesses a responsibility to implement the right to information on hazardous substances. How are Governments and businesses ensuring that pesticide users and consumers are informed of the hazards and risks of pesticides used in food production?**

There is a general lack of information and awareness on pesticide issues that needs to be addressed. Many farmers are not fully aware of the negative effects of pesticide use and on the availability of alternatives. The same is true for consumers, retailers, policy makers and even for scientists. It is therefore important that fact-based information is compiled and disseminated.

Unfortunately, most governments are still playing down the hazards and risks of pesticides used in food production, stating that the regulations and procedures in place are sufficient to ensure that all legal and appropriate use of pesticides is safe. The agrochemical industry, food processors and retailers have a strong business interest not to raise awareness on the hazards and risks of pesticides among users and consumers, since this may affect their business models. Fortunately, non-governmental organizations such as the Pesticide Action Network PAN, Greenpeace and WWF provide consumers with information related to pesticides that also take into account critical scientific studies and field-level evidence. At the same time they point out possible mitigation measures and alternative options. Publications like “The Myths of Safe Pesticides” by Andre Leu contribute to awareness raising by processing peer-reviewed scientific research in a way that it is understandable by consumers.

Consumers may be generally aware of the risks of pesticides, but not always of the consequences of their choices. Consumers are rarely aware that the impact of pesticide use on producers in the South is far worse than the impact on consumers in the North. They should be made more aware of the health risks associated with unsustainably produced food for the involved farmers and farm workers. There is a need for more awareness raising among consumers with regard to what is “good food” - a product that is safe, healthy, nutritious, good for the environment and good for those who produce it, but not necessarily visually perfect. This information needs to be brought to a wider public in order to induce change. New alliances are needed to achieve this raise in awareness. Governments, science, the health sector, the food industry, the water sector, environmental groups and media should join forces for this task. One should not scare people, but inform them, show alternatives, and motivate them to ask and pay for good food. At the same time one should abstain from calming down consumer fears with regard to pesticide risks.

Awareness also needs to be raised among decision makers in different fields and sectors. As indicated earlier pesticide reduction is a joint responsibility and requires that all stakeholder pull in the same direction. Fact-based information on pesticide issues and on ways to reduce pesticide use and risks needs to be conveyed to scientists, government offices, public health and consumer organisations, the management of relevant companies, investors etc. This will help scientists to integrate pesticide related issues and the search for alternatives into their research agendas, that governments design and implement conducive policies, that companies address pesticide issues in their supply chain policies and use opportunities for alternative business models, and that investors include pesticide issues in their investment decisions. It also helps to strengthen the link between farmers, consumers, private sector, civil society and governments. Fortunately everybody is a food consumer and therefore directly concerned also as an individual.

**6. Please provide your views on good practices by Governments and business to assess, monitor, prevent and mitigate the risks of exposure to hazardous pesticides, and what further steps could be taken. Answers may focus on systems present at the national, regional and/or the global level.**

See answer to question 1.

**7. Gaps and weaknesses in international and national regulatory systems allow the use of pesticides that are unsafe, even when used legally and per instruction, on the market. Please provide examples of regulatory gaps (e.g. flaws in the registration process of pesticide products, lack of rigorous testing and safety standards, and lack of full disclosure to the public) and good practices in building effective protection frameworks governing the production and use of pesticides.**

Pesticide legislation and registration offers possibilities for regulating the availability and use of pesticides. The use of dangerous products can be banned or restricted to certain crops, users or circumstances. Current practices for pesticide registration are complex and already cover acute toxicity of single active ingredients fairly well. However, commercially available pesticide formulations may contain substances that increase the toxicity of the active ingredient. So-called inert ingredients in pesticide formulations that enhance the effect of the active ingredient can also cause substantial health effects. In addition, metabolites of active and inert ingredients can be of even higher toxicity than the original substances. Metabolites of ingredients and synergistic or additive effects with other pesticides or with substances naturally occurring in food items may increase the impact of pesticide exposure. Regulatory practices need to be based on the latest findings, also taking into consideration the results of independent published research. International codes and conventions and regional collaboration on legislation and regulation processes provide valuable guidelines for continuous improvement.

The toxicity of active ingredients is currently assessed based on studies provided by the manufacturer. These studies are kept confidential for reason of competition. Weighing risks against benefits, however, are not only technical but also political decisions involving values. The underlying information therefore needs to be transparent. Transparency is also needed with regard to who is involved in decision making so that conflicts of interest can be ruled out. At EU level data related to the toxicity of active ingredients are now being published in an online database, but regulatory authorities agree that there is still scope for improvement. The book “The Myths of Safe Pesticides” by Andre Leu identifies gaps in the regulatory system and provides recommendations on how to close them.

Governments have the opportunity and power to make budget allocations on the enforcement of pesticide legislation, for monitoring of pesticides residues in food and drinking water, and for research into the side-effects of pesticides use. Even in countries where strict registration processes are in place and farmers apply pesticides as prescribed, multiple pesticide residues are found in food and water bodies. The effects of pesticide residues are difficult to accurately assess due to the large number of active ingredients and commercially available pesticide formulations, the even larger number of metabolites, and the synergistic effects of multiple residues. While many studies are performed for the registration of a new pesticide more research is needed to close certain gaps particularly in order to better assess the long-term health and environmental risks related to pesticide exposure.

**8. Please provide examples of successful efforts (supported and incentivized by Governments) to reduce the use of pesticides in agricultural food production, including ecological methods of pest control and agro-ecology.**

Public health policies may address pesticide residues in food and drinking water, and risks associated with the storage, transport and disposal of pesticides. Environmental policies on water quality, nature conservation and biodiversity can also influence the availability and use of pesticides. In addition there are financial instruments to provide incentives or disincentives for certain practices in crop production. This could be pesticide taxes or import tariffs, but also financial incentives for the development and use of alternative pest management approaches and products, and support for the local manufacture of such products. Pesticide-use fees or pesticide taxes may be used to finance the development of alternative pest management practices and subsidize their adoption. Equally important is to address factors that foster unnecessary pesticide use, such as pesticide subsidies, pesticide application recommendations by agricultural extension services or possible conflicts of interest affecting regulatory authorities, research and extension.

In 2009 the European Union Commission passed a directive that requires all member countries to adopt National Action Plans (NAPs) to set up their quantitative objectives, targets, measures and timetables to reduce risks and impacts of pesticide use on human health and the environment and to encourage the development and introduction of Integrated Pest Management and of alternative approaches or techniques in order to reduce dependency on the use of pesticides. In 2013, the Pesticide Action Network (PAN) Europe has undertaken an analysis of all the NAPs that Member States have developed to comply with the EU Directive. They concluded that Member States’ ambition to reduce pesticides use is extremely low due to:

* Lacking quantitative objectives, targets, and clear timetables for pesticide use reductions;
* Recycling what is already mandatory from other EU policies, without proposing new actions;
* Indicators for pesticide use reductions or conversion towards more use of non-chemical techniques are replaced by ‘soft’ targets (number of training hours, number of guidelines developed, number of certificates issued) unable to measure the effective change.

Two countries stand out as progressive examples with regard to pesticide reduction policies: Denmark and Sweden.

**Denmark** introduced its first pesticide reduction plan in 1986 to protect the ground water that is consumed directly without any purification treatment. Since that time, Denmark has banned specific pesticides when it was proved that they reached ground water. In 1999, an expert committee prepared a report on reduction of pesticide use. It recommended a reduction goal implemented through a three-pronged strategy: covering spraying-free zones, organic farming, and general use reduction through new technology and better farming practises. The recommendations, however, have only partly been implemented, and the goal has still not been reached. Nevertheless, the early introduction of a pesticide policy has led to the result that Danish products (especially fruit and vegetables) have residue levels of pesticides below the EU average today. In July 2013, Denmark introduced a pesticide tax on insecticides linked to environmental and health hazards.

**Sweden** has the overall objective of becoming a non-toxic environment. The Swedish National Action Plan contributes to this objective by further expanding on this goal through the following objectives:

* Concentrations of pesticides in surface and ground water should be close to zero;
* Pesticide residues in vegetables grown in Sweden should be low and not pose risks to the consumer;
* Development of sustainable farming systems, which includes alternative methods and techniques, will be developed and applied to a greater extent in order to reduce the dependence on chemical pesticides, as well as a specific target for organic agriculture.

In Switzerland, a National Action Plan for reducing pesticide use and risks is currently under development and will hopefully be among the positive and progressive examples.

The development of national action plans to reduce pesticide risks is an important opportunity for reducing externalities and for promoting alternatives. They can enhance enforcement of existing legislation and define additional measures. It is important, however, that action plans include binding and measurable reduction targets as well as milestones to get there. Targets need to be acceptable to stakeholders and reachable (e.g. tolerable residues instead of zero residues). If the emphasis is on incentives for alternatives and improved practices rather than on economic disincentives for current practices the action plan is more likely to meet with broad acceptance. Voluntary restrictions by the private sector may enable faster results than only trying to impose restrictions. The main aim should be to advance alternatives through a combination of regulations and incentives.

If external costs of pesticide use are integrated in their sales price they become less economical compared to alternatives. Their use therefore will decrease to some extent, as experience in Denmark has shown. A pesticide tax is therefore a worthwhile tool to internalize and minimize externalities of pesticide use. However, to be effective, the tax needs to differentiate between levels of toxicity or hazard. The income generated through the tax should be used to support alternatives and to cover the costs related to monitoring activities. Where pesticides still receive subsidies or beneficial treatment like lower value added tax rates their removal are a necessary first step. As pesticide use is relatively inelastic to price increase, taxes would need to be substantial in order to have an effect. This may affect political acceptability of introducing a pesticide tax. Rewarding the non-use of pesticides with a subsidy or introducing payments for environmental services may be politically easier to introduce.

There is a consensus that more public research is needed in order to advance the design of better farming systems and the development of alternatives to synthetic pesticides. This requires that research programs are focused on areas where pesticide reduction is crucial, and that sufficient funds are made available. As we have seen earlier breeding of resistant varieties is of high importance for pesticide reduction and should therefore receive sufficient attention. The registration and market introduction of improved varieties requires substantial efforts that are worth supporting. Governments could also provide funds for the required testing and registration of alternative means such as biocontrol and the use of botanical preparations.

As elaborated earlier it is important that vocational education and training integrate the transmission of knowledge on agro-ecology and on alternative pest management options. In most countries governments play a crucial role in agricultural education and training and therefore should ensure that this happens. It is equally important to strengthen advisory services to farmers that are independent from the agro-chemical industry. Advisory systems should avail of modern information and communication technology to transmit knowledge and information to farmers. Early pest and disease prognosis systems, for example, are an important element in effective advisory systems.

In organic farming systems the amount of active ingredients applied is greatly reduced compared to conventional systems. An increase in areas under organic farming would therefore significantly contribute to the objective of pesticide reduction. It is therefore desirable for society as a whole that the demand for organic products increases. Similarly, an increase in market share of products from integrated production or of products meeting sustainability standards would contribute to reduce pesticide use. Governments can provide incentives to convert to organic farming or integrated production or can demand that products meet certain minimum standards. Public procurement of organic, integrated or sustainability labelled produce can also contribute to raising demand for low- and no-pesticide products, and set important signals.

**9. Please share any information regarding court decisions or on-going litigation in relation to the detrimental effects of pesticides, in particular in relation to the right to food.**

Since this is not within our area of expertise we cannot provide an answer to this question. However, although not an official court case, we consider the Monsanto Tribunal held from 14-16 October in The Hague as of interest for reviewing existing legislation with regard to pesticide use and risks. In this civil-society organized Tribunal Eminent judges heard testimonies from victims, and will deliver an advisory opinion following procedures of the International Court of Justice. See <http://en.monsantotribunal.org/>

**10. Please provide any additional information you believe would be useful to understand challenges confronting Governments and businesses in their efforts to prevent and mitigate adverse impact of pesticides on human health, right to food and the environment.**

Today there is a consensus among a wide range of stakeholders that pesticide use needs to be gradually reduced to a level that is effectively required to ensure crop production, and that risks of pesticide application need to be reduced as far as possible. Stakeholders include consumers and their organisations, farmers and their organisations, scientists from various disciplines (agriculture, plant breeding, food safety, health, economy, ecosystems science, ecotoxicology, aquatic science, food systems, corporate social responsibility etc.), food brands, processors, retailers, public health organisations, water suppliers, investors, government offices (agriculture, economy, environment, veterinary and food safety), beekeepers, biocontrol suppliers, environmental and social advocacy NGOs, development cooperation organisations, and UN organisations. This provides a strong mandate to policy makers, value chain actors and to civil society to take appropriate measures.

**Consumer expectations concerning residues**

Pesticide use and risk reduction is a necessity because most consumers expect that their food and environments are free from pesticide residues. Surveys show that a majority of consumers are concerned about pesticide residues. In this sense there is currently a disconnection between market offer and consumer demand. Consumer demand should be a key determinant for producers, retailers and policy makers.

**Understanding why pesticides are used**

Farmers do not apply pesticides without reason but in order to ensure productivity, to manage entrepreneurial risks and to compete in the market in terms of quality and price. Even if farmers apply good agronomic practices like crop rotation they are confronted with the challenge to control pests, diseases and weeds in sensitive crops and under difficult weather conditions. Pesticide use is often cheaper and more effective than using alternatives like biocontrol or mechanical pest and weed management. Traders, retailers and consumers expect cheap and visually perfect products. These requirements, however, are disconnected from the expectation that products shall be safe for health and environment.

**Loss of diversity in farming systems**

The amount of pesticides needed to protect crops depends on the robustness of the farming system. If crops are cultivated in locations that are not suitable to their requirements, they are more susceptible to pests and diseases. Over the past decades diversity in farming systems has been greatly reduced in terms of crops and varieties grown as well as in natural habitats. The result is a loss of eco-system services like natural pest control through predators and a loss of soil fertility, both affecting the robustness of the farming system. In order to succeed with pesticide reduction it is therefore essential to bring diversity back into agriculture. This involves moving away from monocultures of single varieties, increasing diversity of crops and natural habitats, but also increasing the genetic diversity of cultivated varieties.

**The legacy of established crop varieties**

Over the past decades crop breeding has focused on yields and other output-oriented factors, but has mostly neglected selection for resistance. Robust traditional varieties have often been replaced by high-yielding ones that respond well to chemical inputs but are susceptible to pests and diseases. As most seed companies are now owned by agrochemical companies, seed providers have limited interest in developing robust varieties. Moreover, consumers are used to and prefer the established varieties and are reluctant to accept new, more robust ones. Robust varieties, however, are an essential element in the design of farming systems that rely less on pesticides.

**Role of agro-input providers**

The current business model of the agro-input industry is still based on selling pesticides. As the development and registration of pesticides requires large investments it is currently difficult to reach consensus on the objective to reduce pesticides or to phase out HHPs. Due to their marketing power and their role in extension, agro-input manufacturers and traders have substantial influence on farming practices. Most of them have ventured into developing and offering biocontrol and other alternative pest control methods. With their control over a large part of the seed market they also have a unique position in the development of robust varieties. They could therefore become an important driver in the development of more robust varieties, alternative pest control inputs and modern technology for precision farming.

**Lack of information and awareness**

There is a general lack of information and awareness on pesticide issues that needs to be addressed. Many farmers are not fully aware of the negative effects of pesticide use and on the availability of alternatives. The same is true for consumers, retailers, policy makers and even for scientists. It is therefore important that fact-based information is compiled and disseminated.

**Addressing trade-offs**

When pursuing pesticide reduction it is important to openly address possible trade-offs. It is most critical to de-couple pesticide use and long term yields. Pesticide use reduction is not a reasonable option for a country if it coincides with substantial reduction of yields and increased import from places where pesticides are used indiscriminately. Pesticide reduction also needs to be compatible with the need to secure farm incomes and to keep production risks low. There are also possible trade-offs between pesticide reduction and other objectives like soil conservation (no-till farming may require herbicide use) and reducing greenhouse gas emissions (mechanical weeding may require more energy) that need to be openly discussed.

**Reducing the reliance on pesticides**

It is widely accepted that we need to reduce reliance on pesticides for agricultural production in order to reduce unwanted side effects (see chapter 4.2). At the same time it is clear that pesticide use cannot be phased out entirely in the near future. Most of our current agricultural systems depend on pesticides for their productivity, for various reasons (see chapter 4.3). In order to reduce this dependency the design of farming systems needs to be revised to some extent. However, a step-wise reduction of pesticide use is feasible already within the current production systems and with the knowledge, technologies and alternatives available today. Experience across the world shows that pesticide use can be reduced considerably without unduly reducing yields or increasing costs of production.

**Reducing the risks of pesticides used**

Given that reducing the reliance on pesticides is the most crucial step, the remaining pesticide use needs to happen in a way that risks are maintained as low as possible. This requires that hazardous pesticides are replaced with less hazardous ones. It also requires that pesticides are used in a way that the risks of negative impact on health and environment are minimized. Adherence to user instructions, use of protective equipment and observation of buffer zones and waiting periods need to be ensured.

**Reducing externalities**

There is a large body of scientific evidence that the current use of pesticides has unwanted side effects on human health and environment. These externalities are particularly grave in some developing countries and emerging economies because of the widespread use of highly hazardous pesticides, the low level of awareness on risks and the lack of protective equipment. But even in countries where strict registration processes are in place and farmers apply pesticides as prescribed, multiple pesticide residues are found in food and water bodies. The effects of pesticide residues are difficult to accurately assess due to the large number of active ingredients and commercially available pesticide formulations, the even larger number of metabolites that are sometimes more toxic than the original ingredient, and the synergistic effects of multiple residues. Ecosystems as well as human beings are highly complex and we struggle to understand all the effects of pesticides, in particular the long-term effects of multiple residues.

**Applying the precautionary principle**

In practice it is very difficult to duly assess the risk of pesticides submitted for registration. The long-term risk of pesticides tend to be underestimated as the knowledge and awareness for negative effects usually lags behind. When e.g. DDT was introduced it was considered a major improvement until unwanted side effects became evident. Once hazards are proven the phasing-out of registered pesticides still may take several years. More research is therefore needed particularly on the long-term and synergistic effects of pesticides on health and environment. In the absence of full information the precautionary principle requires that pesticides are not permitted to be used if scientifically robust studies indicate unacceptable risks, and that action is taken to reduce overall pesticide exposure. The risk associated with specific pesticides also needs to be re-assessed if they are widely used, thus exposing a large number of people and a wide range of ecosystems.

**Reducing and internalizing external costs**

The unwanted side effects of pesticide use causes substantial costs to society. These costs include health costs (of both acute and chronic effects), costs of adverse effects on ecosystems and their services (e.g. loss of beneficial insects, pollinators and wildlife), drinking water treatment costs, losses in aquaculture and fisheries, and costs of greenhouse gas emissions during pesticide manufacturing. Due to methodological difficulties and lack of data it is extremely difficult to quantify external costs of pesticide use. Estimates are in the range of US$4-19 per kg active ingredient, or $19-106 per ha cropland (1). With some 3.5 billion kg applied worldwide, this would suggest annual costs of $10-60 billion, for a market size of $45 billion. However, these estimates do not account for the health effects of chronic exposure to pesticides described earlier. If only a small fraction of the occurrence of certain diseases like cancer, dementia, diabetes and behavioural disorders can be attributed to pesticides, their external costs would be far higher. These external costs are not (yet) reflected in the market price of pesticides.

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1. http://assets.helvetas.org/downloads/briefing\_paper\_pesticide\_reduction\_including\_conclusions.pdf [↑](#footnote-ref-1)