

THE PROBLEM

Soil pollution can result in a loss of soil function, making it important to minimise contamination by chemicals and other pollutants. Some crops and crop varieties are more sensitive to pollution than others, with pollution generally affecting crop quality (and health) more than crop yield. Specific soil amendments and liming can alleviate contamination and certain crops can withdraw some pollutants from soil through phytoremediation.

Pollutants can enter soil via two pathways:

1. Point pollution, where pollutants enter the soil from a single source, often during a contamination event. These sources are usually easy to identify and as a result, easier to prevent.
2. Diffuse pollution, where pollutants enter soils over wide areas, often over extended periods of time. This often occurs due to the application of fertilisers and pesticides in farming and it is difficult to identify individual sources.

How does soil pollution affect soil function?

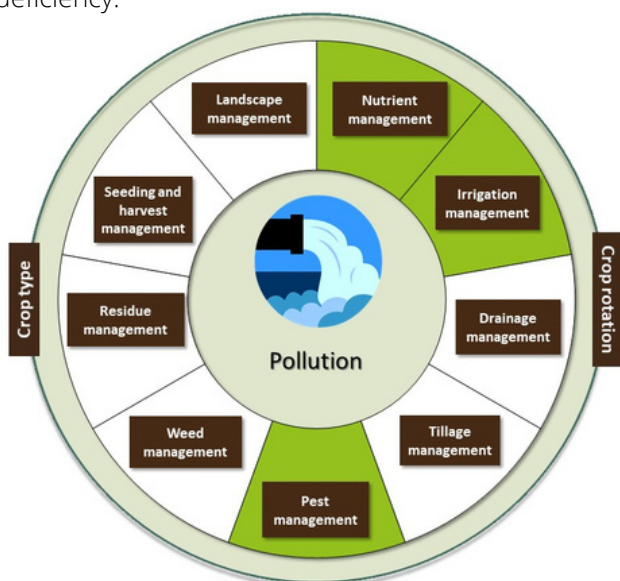
- Reduced productivity which results in less soil biomass, thus affecting the soil's ability to support plants
- Disrupted storage, filtering, and transformative functionality, affecting the cycling of nutrients needed by plants
- Decline in soil biodiversity due to the reduced activity of enzymes, micro-organisms and plants as a result of contamination
- Physical and cultural environment for humans and human activities.
- Soil contaminants may also limit the biodegradation of organic matter and may cause nutrient imbalances and deficiency.

HOW CAN SOIL-IMPROVING CROPPING SYSTEMS PREVENT & REMEDIATE SOIL POLLUTION?

Pollution-specific SICS may involve the following three mechanisms:

1. Changes in inputs
2. Substitution
3. Redesign

The first mechanism relates to a drastic lowering of pollutant inputs (and to withdrawal of pollutants with harvested crops through phytoremediation, where possible). The second mechanism involves soil amendments which stimulate the biological breakdown of organic pollutants, and/or the lock-up of pollutants in soil in a less mobile and less toxic form. The third mechanism involves the growth of crops that are less sensitive to pollutants and/or the change of food and feed crops to bio-energy crops and set-aside land. Certain crops are called hyperaccumulators, i.e., these crops accumulate pollutants in the plant tissue, or degrade or render pollutants in less harmful contaminants.



SICs component	Basic principle
Nutrient management	Prevents the application of excess agrichemicals which contaminate soils
Integrated pest management	
Smart irrigation	Minimises delivery of pollutants to the soil
Phytoremediation	Withdraws pollutants from the soil



Nutrient management is a key way of preventing soil pollution. Over-applications of nutrients including organic manures, phosphate, nitrate, potassium and applications at inappropriate times (e.g., during wet weather) can result in soil contamination. This is costly to farmers as the nutrients they've paid to apply may become unutilised by crops and result in soil health problems.

Variable rate applications of nutrients can both reduce pollution risk by only using the nutrients required by the soil. This is also beneficial for farmers due to the cost savings of using the optimal amount of nutrients.

PEST/WEED MANAGEMENT



Plant protection products (or pesticides) are used to control populations of unwanted pest insects, plants, fungi and other organisms. Farmers rely heavily on these chemicals, however, when they are applied inappropriately or in excess, they can cause the contamination of soil.

Integrated pest management and targeted applications can help to reduce the amount of chemicals applied, thus reducing pollution risk.

IRRIGATION MANAGEMENT



Many countries use irrigation to enable them to grow crops on marginal land. Extensive irrigation can increase the risk of soil contaminants moving deeper into the soil profile. In addition, irrigation sometimes uses groundwater which may be contaminated with various pollutants.

Using an integrated approach to irrigation can reduce the delivery of contaminants. In addition, growing the 'right crop on the right soil' can reduce reliance on irrigation.

PRIORITY CROP TYPES FOR REMEDIATING POLLUTION



Certain crops can withdraw some pollutants from soil, through the process called phytoremediation, a process now widely accepted as a cost-effective environmental restoration technology. Phytoremediation is an alternative to other, more invasive engineered approaches for removing pollutants, many of which are destructive to other aspects of soil health.

Phytoremediation can also increase crop yields due to the additional biomass generated by having less polluted soils. It does not, however, have guaranteed benefits for soil salinity.

Crops grown across Europe which are effective phytoremediators include biofuel crops (e.g., oilseed) and some fodder crops.

Further information about the process of phytoremediation is available [here](#).