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Examples of environmental characterization, scientific limitation: lack of knowledge on the quantity transferred to food plants and on the concentration mechanisms of the edible part

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It is estimated that 20% of population (6,700 persons) is employed in the agricultural sector inside the Sacco river SIN perimeter.



Until now, reclamation has concerned only the most contaminated soils inside the industrial area.

The dilution of contamination and the wide extent of the entire affected area makes the soil removal **not feasible**



How to use the agricultural land?

The passage of HCH isomers to animal and plants can be significant due to bio-concentration mechanisms.



As the accumulation mechanism in fodder and food **is not known**, the Commissioner responsible for the SIN management has limited the use of agricultural areas and **has banned** the use of **all** local forage.



according to the principle of maximum caution

Knowledge is still scarce on the type of agriculture that can be continued near the Sacco River respecting the food safety



One of the food most sensitive to the β -HCH concentration is **milk** (as proven by analytical evidence)



About 220 animal farms, mainly of cattle and sheep are reared inside the SIN perimeter (1.160 and 860 heads of cattle and sheep). (National Animal Registry, 2019)

The interdiction of the riparian areas to grazing and crops led to

serious consequences in the economy

The agricultural and livestock management in polluted areas **highlighted** the need to explore in more detailed way, the ability of plants to interact with polluted soils and adsorb pollutants

Example of characterization

As indicated by:

Environmental Ministerial Decree 1 marzo 2019, n. 46

“**Health Risk Assessment** verifies that the concentrations in the soil are compatible with the crop system or with livestock.”



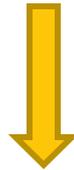
“If a risk situation is ascertained, the areas for agricultural production and breeding have to be secured and remediated.”

Example of characterization

As indicated by:

Environmental Ministerial Decree 1 marzo 2019, n. 46

“When the contamination threshold concentrations (CSC) is exceeded, a **risk analysis** must be conducted”



CSC, for agricultural soils = 0.01 mg/Kg for HCH isomers (β , α , γ).

Example of characterization

As indicated by Legislative Decree 152/2006

“the first value (CSC) must be considered as an attention value, after which a characterization must be carried out “

and

The study of the passage of contaminants in the fodder is part of this phase

a second value (CSR) must be assessed, that identifies the acceptable contamination levels after which safety and / or remediation interventions must be set

Example of characterization

The studies on the passage of contaminants in the fodder are part of the risk assessment



they allow to determine the real risk threshold concentration (CSR) in the soil above which the safety of cultivated fodder and crop is not guaranteed

Lack of information:

Specific studies on the ability of already present crops to assimilate HCH isomers from soil are still missing but are strongly requested

cultivation of food-plants could be a valuable alternative to poplars plantations to guarantee an income to inhabitants when food safety can be ensured

For example:

Farmers along the Sacco river (within 100 meters from the banks) have been forbidden to sell **walnuts** due to the principle of maximum precaution (in the absence of other data)

a subsequent study on ***Juglans regia*** grown near the river on highly contaminated soils that were used for walnuts production has revealed that the HCH alpha and beta isomers are absorbed by the branches and leaves but not by the edible kernel. (Battisti et al. 2017)

Similar studies are requested on valuable plants that can guarantee a profit for farmers as well as phytodepuration of the soil

Juglans regia produces very valuable wood for the industry and manufacturing sectors, which is appreciated as much as the edible nutmeat.

Furthermore, the wood of these trees, when cut, would be exported from native soil to enter the manufacturing industry; this would result in the removal of the contaminants from the soils.

CONCLUSION

It is crucial to increase our understanding of the interaction between environmental contamination and all plant species, paying particular attention to food plants and their edible portions.

The pre-existing food crops can continue to guarantee a profit to the farmer and at the same time provide phytoremediation when they are properly planned and managed and the food safety guaranteed.

The inedible contaminated portion can help phytoremediation when it is removed from the soil



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Thank you!

Questions welcome

Thanks to Sabrina Battisti