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**OPINION OF THE SCIENTIFIC COMMITTEE ON TOXICITY, ECOTOXICITY AND THE ENVIRONMENT (CSTEE) ON**

**“HEAVY METALS AND ORGANIC COMPOUNDS FROM WASTES USED AS ORGANIC FERTILIZERS”  
(FINAL DRAFT REPORT B4-3040/2001/325284/MAR/A2)**

**Adopted by the CSTEE during the 41st plenary meeting  
of 8 January 2004**

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## Terms of Reference

The CSTEE, on the basis of the examination of the report on “Heavy metals and organic compounds from wastes used as organic fertilizers”, in particular its chapters 8 and 9, is invited to examine the following issues:

1. Is the CSTEE satisfied that the study has considered the relevant bibliography pertaining to the presence of heavy metals and organic compounds in biowaste? Is such bibliography sufficient and complete for the purpose of the study?
2. Can the report be judged as an acceptable basis for the Commission in order to be able to propose the appropriate threshold levels for potential pollutants in materials produced from biowaste taking into account long-term soil quality?
3. If the CSTEE disagrees on any of the assumptions, reasoning and conclusions of the report, the CSTEE is invited to elaborate on the reasons for this divergence of opinion and make suggestions on how the report could be improved.

## INTRODUCTION

Given the considerable amount of Municipal Solid Waste (MSW) that are produced within the EU (about 200 millions tonnes in 1999), the issue of waste management strategy in Europe is crucial. The CSTEE, in several instances, has already produced opinions on various aspects of this topic:

- [http://europa.eu.int/comm/food/fs/sc/sct/out74\\_en.html](http://europa.eu.int/comm/food/fs/sc/sct/out74_en.html)
- [http://europa.eu.int/comm/food/fs/sc/sct/out162\\_en.pdf](http://europa.eu.int/comm/food/fs/sc/sct/out162_en.pdf)
- [http://europa.eu.int/comm/food/fs/sc/sct/out63\\_en.html](http://europa.eu.int/comm/food/fs/sc/sct/out63_en.html)
- [http://europa.eu.int/comm/food/fs/sc/sct/out83\\_en.html](http://europa.eu.int/comm/food/fs/sc/sct/out83_en.html)
- [http://europa.eu.int/comm/food/fs/sc/sct/out114\\_en.pdf](http://europa.eu.int/comm/food/fs/sc/sct/out114_en.pdf)

In the framework of its background work for presenting a proposal for a Directive to the European Council and Parliament, DG Environment has commissioned two consulting offices to prepare a report on “Heavy Metals and Organic Compounds from Wastes Used as Organic Fertilisers”.

Between 30 and 40% of MSW consists of food and garden wastes, along with another 20 to 30% of paper and cardboard waste, it is therefore up to 70% of MSW that can be considered as biodegradable. In this context, the authors of the report have considered the followings as output material intended as organic fertilisers or soil amendment:

- Compost from source separated collection schemes:
  - ✓ Bio Waste Compost (BWC) from organic household waste including kitchen waste
  - ✓ Green Compost (GC) from garden and park waste material.
- Compost from mixed Municipal Solid Waste (MSWC) or from the stabilised organic waste fraction produced by Mechanical Biological Treatment plants (MBTC).

The CSTEE considers the quality of the report as very heterogeneous and highly variable; some parts of it are indeed, valuable, others far less. Some good ideas exposed in the introduction section are not developed afterward. The report suffers from ambiguous statements that need to be either clarified or deleted. The use of “*Potential Toxic Elements (PTE)*” synonymously to “Heavy Metals” is both too restrictive and misleading. The same stands for “potential pollutants” which appears in question 2, the meaning of “potential” needs to be clarified. In addition, there are a lot of typing mistakes and approximations that hinder the report and make its reading difficult.

The CSTEE supports the need, underlined in the report, of a definition for: “Compost”, which should distinguish bio-compost from sludge and fertilisers and that can be acceptable by all Member States.

One should be very careful, if not cautious, before considering the results of this study on a global scale for Human Health, keeping in mind that, apart from the use of compost as fertiliser, there are numerous other possible sources of exposures to Heavy Metals (HM) and Organic Pollutants (OP) considered in this context.

## QUESTION 1

***Is the CSTEE satisfied that the study has considered the relevant bibliography pertaining to the presence of heavy metals and organic compounds in biowaste? Is such bibliography sufficient and complete for the purpose of the study?***

The CSTEE deems that the study has not sufficiently considered the relevant bibliography pertaining to the presence of HM and OP in biowaste.

The CSTEE feels that the report relies too much on existing review reports and does not sufficiently make use of more original and recent original published data.

- ✓ A very low limited number of the references are from international reviews. The quotations made in the report are mainly from in-house (national) works. It could have been made a better use of the relevant and reliable data that have been published elsewhere.
- ✓ Information on the use of several products is not updated and does not represent specifically the European situation. For instance, the selection of OP seems to be based mostly on reports from Andersen (2001), and Erhardt and Prüe (2001) for sewage sludge and soils respectively. The data quoted as presented by Adriano (2001) are merely copied from former reports: Kabata-Pendias and Pendias [1984], Fergusson [1990].
- ✓ There are too many quotations (around 15) to personal communications along with a few anonymous and unpublished data that makes the information impossible to get.

Consequently, due to an insufficient bibliography search together with a limited use of the relevant available literature, the CSTEE considers that the report does not present a sound scientific rationale for the selection of pollutants.

The CSTEE considers that the selection of the relevant OP must be better justified. In addition, the criteria for the selection of pollutants should depend on the raw material used for compost and therefore, the relevant compounds are expected to be different from one compost to another. Thus, pesticides and biocides are especially relevant for Green Compost and the specific substances that are worth considering in this context can be identified from the list of authorized products for each type of vegetal residue.

Biowaste compost contains not only the organic chemicals found in food (including additives and preservatives), but also residues that are present in the non-edible part of food. Therefore, the CSTEE considers that pesticides used in post-harvest treatment for vegetables and fruits (potatoes, citrus, bananas, ...) can be relevant. These products are at present subjected to regulation and it is possible to determine which chemicals could represent the highest risks.

Only raw foods are considered; that cooking (heating) can deeply alter the concentration and distribution pattern of various pollutants, (e.g. PAHs, PCBs, dioxins...) is ignored and not even discussed. The CSTEE deems that this should have been, at the least, quoted.

Compost from MSWC can contain all kind of organic chemicals intended for consumers' use, while compost from biological treatment plants will contain mostly those chemicals with a potential for binding to sludge and that are released through the sewer.

The report contains many unexplained shortcuts that impaired the scientific background and usefulness of the document. For instance:

- ✓ dioxin (which is the name of the only 2,3,7,8 Tetrachlorodibenzo-p-dioxin) seems not to be included within PCDD/F (p.23), elsewhere in the text it is written dioxins, this is a major source of confusion if the precise meaning of each word is not stated.
- ✓ As recognized by the authors (but this is questionable) there is a confounding in the expression of results presented together in a single table (table 2-8: for PCDD/PCDF on a dry/fresh matter, or per g. fat, in addition, the congeners assayed are not specified). Similarly, it is not said which congeners have been assayed in the data presented in table 2-9 and 2-10 for PCB and PAH, respectively. In the absence of these indications, these data must be considered of no value if not dangerous to use.
- ✓ The statement "*The contents of all other xenobiotics in BWC and GC are extremely low and give no rise to any question with regard to compost quality (Fricke and Vogtmann, 1993)*" is not supported. In this regard, information are lacking on the nature, the detected concentration and the ecotoxicological threshold considered by the authors for each substance. This information is essential to clarify the statement and to check if the assumption published in 1993 is still valid ten years later.

## QUESTION 2

***Can the report be judged as an acceptable basis for the Commission in order to be able to propose the appropriate threshold levels for potential pollutants in materials produced from biowaste taking into account long-term soil quality?***

The CSTEE considers that the study does not rely on sufficiently sound science so as to represent an acceptable basis for the Commission in order to be able to propose the appropriate threshold levels for pollutants in compost produced from biowaste.

## **A - The selection of pollutants is not appropriate:**

### **1. Criteria used for selection.**

In addition to the persistence, bioaccumulation, and bioavailability characteristics of the substances (and of their by-products such as metabolites, reaction and degradation products), other relevant criteria for the final selection and assessment of pollutants are:

#### √ *Presence in the compost (as end product).*

- Occurrence in the material used for composting.  
It is not acceptable that the assessment relies almost entirely on metals, OP being excluded. Toxic OP should necessarily be considered either individually or by grouping. It must be considered that for chemicals under positive EC regulation, such as pesticides, a significant part if not all the required information can be obtained from the information presented for registration.
- Generation from metabolism.  
The issue of pertinent metabolites is not properly addressed whereas it is well known that some among them are more toxic than their parent compounds. The issue of metabolism should include transformation in the environment.
- Occurrence during compost processing.  
Given their usual alteration or production throughout the compost-producing technology several OP are particularly relevant. An investigation of OP with a high likelihood to represent a significant risk in the different types of composts should be conducted. HM can also be subject to chemical alterations as well during compost processing.

#### √ *Relevance of selected compounds.*

The report concentrates on OP that are widely distributed in the environment. Because most of them are either already banned or strictly regulated, the relevance of these chemicals is limited. Also the issue of relative contribution of compost use to the total release of a given chemical in the environment should be considered.

### **2. Omission.**

Pharmaceuticals and biocides which represent significant sources of pollutants in MSW have been omitted as well as cosmetic products, detergents, brominated flame retardants ...

## **B - The definition of “Soil quality” is not sound:**

The CSTE considers that the scientific rationale for the characterisation of “long term soil quality” is neither presented, nor discussed, nor justified. In chapter 3, limits and threshold values selected by different EU countries and regions are presented. Significant differences can be observed, but they are not discussed in the report. Human Health standards and analytical determinations of pollutants seem to have been considered in some cases as appropriate, whereas results of ecotoxicity tests and the ecological status of the soil do not appear as informative and worth being considered. This is contradictory to the current understanding and driving forces in EU for the assessment of the ecological status of the different compartments of the environment: water, air and soil.

In chapter 9 of the report, the authors consider the German Precautionary Values for the Protection of Soil as the references without providing any actual sound justification of their choice and discussing why OP are excluded right away. This leads to a proposal that only cover heavy metals and does not present any rationale for the selection of the protection values. Additional information on the general principles for the selection of the German values has been made available to the CSTE later on after submission of the terms of reference but neither the raw data nor the derivation of each value is included. Therefore, the CSTE cannot provide a scientific assessment on the quality and relevance of the protection values used in the report.

### **C - Leading soil 'standards' used for calculation do not integrate EU soil diversity:**

The CSTE recognizes that there is no available EU definition of "good soil", nevertheless the authors should have discussed this more thoroughly. The value of the chosen standards will determine the amount of contaminants acceptable in compost used as organic fertilizer. The authors of the report proposed to use the German soil 'standards' as the leading ones for the calculations of limit values of pollutants in compost. Due to local soil conditions, which are largely variable among Europe (this is acknowledged in the report), other standards are in force among EU member states.

The CSTE deems that the point of the limited relevance of the standards selection, as regards its possible general extrapolation to soils in Europe, is not adequately discussed in the report and that alternatives are not proposed. In this connection, the usefulness of the questionnaire that has been sent to various national experts (scientists and representative of administrative bodies) in the EU should have been more clearly presented.

### **QUESTION 3**

***If the CSTE disagrees on any of the assumptions, reasoning and conclusions of the report, the CSTE is invited to elaborate on the reasons for this divergence of opinion and make suggestions on how the report could be improved.***

The information presented in the report on the potential environmental hazards related to the presence of pesticides and organic pollutants in wastes used as organic fertilizers is scarce and mostly limited to a restricted number of chemical pollutants. The CSTE recognizes that pesticides (over 100 registered active substances) and organic pollutants (over 30,000 substances imported or produced by the chemical industry in significant amounts and a large list of non-commercially produced pollutants) represent a very "complex universe". However, the CSTE deems that the report does not cover adequately this issue and that a risk assessment of some OP should be included.

Different concepts to regulate permissible input of chemicals or metals in waste or fertilizers to soil are presented in the report. The first one states that each input should not affect the existing levels in soil and therefore lead to consider the mass balance of the compounds. The second concept aims at setting permissible levels that are derived from NOAELs/NOECs derived from experimental toxicity data. The two concepts result in very different permissible values.

The authors should better justify the reasons supporting their approach based on maximizing the supply of organic matter through the use of compost. In addition, the report would benefit from a more thorough synthesis and stronger conclusions. As it stands, the discussion provides neither an answer nor the tools for risk managers to take informed decisions.

Because in-depth assessment of OP is time consuming, and available data are limited, the CSTE considers that monitoring needs should be restricted to organic chemicals with the highest likelihood to

exceed human health and ecotoxicological thresholds. In order to identify these relevant OP, that is to say those that could be present in a sample taking into account the origin of the raw material and the processing conditions, the CSTE suggests to set a decision-making scheme.

With a view to derive threshold limit values for relevant metals and OP (pesticides, feed and food additives, pharmaceuticals ...) in the framework of sustainable use of compost and having regard to soil quality, an appropriate methodology should include the following information:

As regards the selection of pollutants:

- ✓ The list of relevant pollutants should not be restricted to HM and a few OP. An exhaustive pre-selection of candidate substances should be conducted on the ground of both their use patterns and the raw material employed for each type of compost. This list of the entire candidate chemicals based on their likelihood of presence should be done for each different types of compost.
- ✓ Persistence/transformation of the substances during the composting process (bio-transformation, biodegradation) are factors worth considering. During the process, which includes physical and biological treatments, pollutants may undergo variations in their chemical forms which frequently result in modifications of their bioavailability. In this context, it is necessary to have data on the following characteristics of the substances once in contact with soil:
  - persistence after spreading of the compost and potential for accumulation in the different parts (roots, leaves, grains,...) of vegetables together with information on bio-transformation, biodegradation and bio-availability of the parent substance,
  - persistence together with bioaccumulation, and bioavailability of the by-products (metabolites, reaction and degradation products) that are frequently formed from the native substance following interaction with soil. This may be due to soil characteristics: pH, quantity and type of organic matter, presence of sand, clay, humidity/dryness, salinity.

As regards the data needs on pollutants:

- ✓ The secondary contamination of the water compartment from pollutants released from the Compost should be evaluated through knowledge on the leaching and drainage potential leading to both surface and groundwater contamination,
- ✓ Collection of toxicological and ecotoxicological data on parent compounds and relevant (according to toxicological and ecotoxicological and bioavailability criteria) metabolites and by-products possibly produced either during the composting process or following spreading on soil. For chemicals under positive regulation, such as pesticides, additives or pharmaceuticals, a significant part or even all the required information can be obtained from the information presented for registration. Other EU databases such as those related to HPVC or IUCLID can provide information on other chemical compounds.

As regards the methodology for deriving threshold values:

In order to justify the selection of standards by risk managers, tools for making informed decision should be more adequately justified after having decided or presented arguments relying on either scientific background or cost/benefit analysis.