Session 4
Roundtable discussion on sludge use
The point of view of the European Union on national associations of water suppliers and waste water services (EUREAU)

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Waste water operators views on reviewing the sewage sludge in agriculture directive 1986

Introduction

With implementation of the Urban Waste Water Treatment Directive 1991 the amounts of sewage sludge available for use in agriculture and other land applications have increased. At the same time we have more experience than ten years ago of implementing the sewage sludge directive 1986 in Agriculture. Considerable advance in the scientific understanding of the effects of using sewage sludge in agriculture and other land applications were made. Operators accept that in the light of these developments it is time to review the standards in the directive.

Sewage sludge is an inevitable result of man's activities. Fortunately it contains constituents organic matter, nutrients, sulphur etc. - that can beneficially be used to help sustain and indeed improve agricultural productivity and the environment by, for example, providing organic matter to help prevent the erosion of soils. In reviewing the Directive the Commission must ensure that the controls are practicable and affordable, maximising these benefits of using sludge on agricultural and other land.

EUREAU asks that the new directive in preparation should take on board the following points from the view of operators of waste waters and sewage sludge treatment systems.

Responsibility

EU Ministers gave waste water operators the responsibility of the application of the Urban Waste Water Treatment Directive 1991 to collect and treat waste waters from the society and to deal with the resulting sludge, to use the sludge, if possible, in agriculture. This responsibility for sewage sludge can only be fulfilled if the quality, and the regulatory conditions are applied, that is the only way to make sludge...
acceptable for agriculture. Although wastewater and sludge treatment processes can provide a satisfactory biological content, the levels of metals and other non-biodegradable substances are in most cases outside of the operators' control. It is therefore imperative that the EU when setting standards in a revised Sewage Sludge in Agriculture Directive does not jeopardise the operators' ability to use sewage sludge in agriculture as it is advocated in the 1991 Directive. Standards need to be based on a proper scientific risk assessment and to remain within the capability of waste water operators to achieve.

Do not force the operators to do what they cannot do!

Principles

The need for an integrated approach of Directives

EUREAU believes that an integrated approach should be applied to protect the environment with controls that are appropriate to the risk and that are fully enforced. Controls over industrial discharges have led to a reduction of metals and other pollutants discharged to sewer. If the already high quality of sewage sludge has to be improved further, other inputs particularly form diffuse sources, including residues from products used at home, have to be dealt with. This should be tackled in a separate directive. If domestic sources are not tackled in the directive, but in national legislation, the free market could be disturbed. Prevention by source control is very important to maintain and improve even more the high quality of sewage sludge.

Common regulation

Sewage sludges, animal manures, organic wastes and inorganic fertilizers should be subject to similar controls. Of all these products, sewage sludge is well researched and controlled. Most countries lack regulations for other materials, although very occasionally the sewage sludge regulations or parts of them are applied. A key point for any material being applied to agricultural land should be the hygienic quality. Animal manure utilised on land is generally not treated. Large numbers of pathogens may be present.

Risk assessment

Since mid-1980's, when the directive was formulated new knowledge about the right level of heavy metals and organic micro-pollutance have been developed.

A more uniform and comprehensive approach is needed to regulate the use of sewage sludge in agriculture based on risk assessment. The method used for risk assessment has to be described. There are large differences between risk assessments for agricultural use in sewage sludge in European countries and in the USA. Even within EU countries there are large differences in national legislation, reflecting different acceptance and assessments of risks.
Confidence has to be created for all stakeholders

The use of existing quality and environmental management systems to safeguard and develop the sludge quality should be encouraged and stimulated to give confidence in the product. A quality system has to be based on good operational monitoring. If the process gives a product that can be certified as acceptable for agricultural or other land uses, the sludge should be named "biosolids".

Ways and/or methods to stimulate the formation of local groups with representatives from farmers, treatment plant owners, environmental authorities and industries could be developed with the aim to build up confidence for the management and control systems on site. Keypoints should be transparency, voluntary participation, acceptance of the principle of sewage sludge use in agriculture, and minimal bureaucracy.

Quality of sludge

Heavy metals

There have been numerous studies of the heavy metal content of soils and their potential uptake by crops and animals. These studies indicate that the standards in the current directive generally provide an adequate margin of safety against adverse health or environmental risks in both the short and long term: Changes to any limit for a parameter should be fully justified. Heavy metal levels in sewage sludge have fallen substantially over the last fifteen years as industrial discharges to sewer have changed in amounts and composition and as controls have increased. Since many of the metals now found in small amounts in sewage sludge originate mainly from diffuse sources, the wastewater operator is not able to control their input. The effect of unrealistic limits on sewage sludge would therefore give the operator no alternative than to use non-agricultural outlets, notably incineration. EUREAU insists that heavy metal limits are based on available scientific data to maintain the beneficial effects such as improved soil structure that sewage sludge provides to agriculture and the environment.

Organic contaminants

From the available scientific data there are no examples of concentrations of organic contaminants in foods linked to the agricultural or other land use of sewage sludge that cause any problems. The operators remain convinced that limits for organic contaminants are not necessary from a scientific point of view.

Microbiological content

EUREAU accepts that sewage sludge needs to be carefully managed and controlled to reassure the agricultural and food industries and consumers that its use in agriculture is not a pathway for pathogens to enter in the food chain. Although no hygienic
problems have been documented or are likely when sludge is used and handled in accordance with the existing directive, we accept that microbiological risks have to be dealt with in the revision. Wastewater, and residues from its treatment, does contain viruses, bacteria, parasite eggs etc. Mobility of people between different areas of the world has increased, with the potential to introduce different amounts and new types of micro-organisms into wastewater systems.

The controls need to be pragmatic reflecting the facts that describing some treatment processes would stifle innovation and development of new processes and that monitoring of individual micro-organisms is difficult, usually unnecessary and expensive. The logical way is to require the wastewater operator to achieve during wastewater and sludge treatment, a reduction in numbers of micro-organisms as measured by a suitable indicator such as E. Coli. The choice of treatment and operating conditions would be left to the operator to decide, providing that he was able to demonstrate that these achieved the required reduction.

Any regulation over pathogens would need to be supported by prescribed sampling and analytical procedures.

**Analysis of heavy metals**

The method and interpretation of analytical methods must be clear. The methods can be standardised by CEN TC 308.

Frequency of analyses, average and maximum values must be described and also standard.

**Cost efficiency**

Prevention of pollutants at source will usually be the most cost-efficient way of protecting the quality of sewage sludge and ensuring its beneficial use in agriculture and other land applications. More must be done to tackle diffuse sources e.g. in new directives and to demonstrate that the costs of action are reasonable for ensuring the environmental and agronomic benefits from the continued use of sewage sludge in agriculture.

The cost of measuring, analysis, sludge treatment and use or disposal could increase significantly with the new directive. Additional management costs associated with quality assurance, independent auditing, certification etc. must also be considered. All these costs will be need to be reflected in the price, of providing the waste water service and therefore must be realistic to ensure their acceptability and affordability by the customer.

New investments must have a reasonable lifetime and not be subject to short term changes in regulatory standards.
The point of view of the European farmers

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The use of sludge in agriculture cannot be pursued in a long term way until a social debate takes place.

Today everybody has his own ideas about an “ideal agriculture”. Therefore, it is necessary to know if sludge use on farms has a place in this agricultural model...

There is a lack of coherence between the citizen’s attitude and the consumer's attitude... even if they are the same person!

Farmers’ unions think that we must have this debate now, even if some of our partners say that farmers are exaggerating the situation. But if we do not discuss it and there is a futur crisis (pollution, human’s health,...), farmers will be alone accused of having endangered consumer's health.

Why do I say consumers and citizens are incoherent?
- We have the example of “non-something” products (GMO, pesticides, chemicals...) ➔ they have an added value even if the quality is not always better;
- The search for new selling criteria to distinguish products and to assure consumers after food scandals is leading food industries and retailers to produce guidelines banning sludge use. This is directly affecting the farmers’ decision because they are searching added value or they just want to be sure of selling their products...

If the European Commission is trying to improve sludge use and sludge acceptability, why is this same sludge forbidden in biological production?

Will the same thing happen with the new sustainable agricultural model?

Proposals

Sludge management is not an agricultural problem but as we are part of society we must have an opinion on this subject.

We propose that European and national authorities work progressively in three different areas:
- scientific approach, proving safety of the sludge, working on improving controls for water treatment systems,
• agronomic level, we should analyse legal questions and responsibility problems, also the relationship between farmers and land owners about the use of sludge (is it a fertilizer or waste?) and also the financial warranties if pollution or accident occurs. Finally, we should improve knowledge on technical recommendations to insure that sludge is used in good conditions (should not we have a code of good practice with specific recommendations as with the “nitrates” Directive?).
• social debate, to be sure that sludge use is accepted by consumers otherwise we must stop using it in agriculture.

We all know that subjectivity plays a large part in the consumer choice but we cannot avoid this debate.

I would like to remind you of the new recommendations of Agenda 2000 that strengthen the links between farmers and consumers on one hand and improve sustainable farming on the other hand. So we must ask the society if sludge use is totally compatible with these guidelines.

This debate should be improved at European and national levels but essentially at local level. Perhaps workshops about this subject should be organized with more time for discussion?

To conclude I would like to stress that farmers’ unions need a social agreement about using sludge in agriculture and it is important to share the responsibility with society.
The point of view of the European food industry

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The food and drink industry guarantees consumers that its products are safe, wholesome and of high quality. This means that it takes care that agricultural practises, including the use of fertilisers, are innocuous both to the environment and to consumers’ health.

Consequently, CIAA considers that research on the quality of sludge and their effect on soil and farm products should continue. Any research should include risk assessment and a cost benefit analysis. But, whatever the conclusions of scientific studies are or will be, the food and drink industry has to take into account the opinion of the consumers regarding sludge landspreading. The issue is partly rational but mostly irrationnal. Therefore, a good and transparent policy of communication is essential.

The food and drink industry considers that given their diversity, the regulatory framework for the various categories of by-products and sludges intended for landspreading should be:

• Effective: control procedures have to be implemented to ensure the safety and quality of the land. Compliance with the regulations has to be supervised.
• Appropriate: control methods and purification processing techniques should be related to the potential risks
• Precise: no possibility of confusing categories.

Finding outlets for sludge is not easy. For example disposal using incineration is costly and has an adverse impact on the environment. In areas where the content of organic matters in soils is low, landspreading of sludge has a highly positive effect on the structure of soils. However, one needs to be cautious of the long term consequences which could result from such a practice being carried out in an uncontrolled manner as it could have an adverse effect on soil and on products. The optimal choice has to be made locally according to scientific, environment and socio-economic parameters.

It is essential to implement recovery options for sludges which are first of all safe for human and the environment, and also economically viable. This should take account of the results obtained all over the European Union so as not to cause any barriers to trade or distorsions of competition.
The point of view of an environmental NGO

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A general overview – form wastewaters to waste materials?

Scientific environmentalism has always undertaken the challenge of social and technological development, provide it is sustainable. We cannot put a cork on the bottle of anthropic behaviours and activities. Waste and by-products can be reduced, indeed - this is one of the major challenges of sustainable development - but not fully eliminated. This means that we have to deal with those waste materials, and try to find for them a suitable, effective application, wherever possible, according to their prevalent features and potential beneficial effects. On the other side, this has to deal with potential risks and has to be kept under control both at the treatment stage and/or at the application stage, if the outlet of the treatment is not a “safe” product, yet.

Sewage and wastewater treatment are to be envisaged as a fundamental improvement in control of water pollution and sanitation; their steady development in next years will be one of major challenges, above all in many urban areas. We have to mention, by the way, that some metropolitan areas (namely Milan, some 1,300,000 inhabitants) still have not any wastewater treatment plant, and their “pollution load” flows through rivers as far as the seas. Therefore, sludge amounts are forecast to increase in next years, luckily I would say. As we solve a pollution problem, taking “pollutants” away from wastewater, the next problem occurs, I mean: how to manage waste products stemming from sewage treatment?

In general, we could say that for organic waste materials land application is by far a more suitable option than landfilling or incineration, as land application takes into account potential benefits of organic matter in cultivated soils. But as soils constitute, on their own, an “open” environmental section, full with relationships to water, vegetables, and the food chain, some caution must be applied and potential hazards have to be investigated together with beneficial effects.

Beneficial effects of land application of organic waste materials

We shall not go much in details about general agronomic features and performances of organic matter. The hypothesis itself of land application of organic waste
materials, either composted or not, reminds us the role of organic matter; the use of manure has historically been a cornerstone in a balanced approach to farming; the need for organic matter as the basic fertiliser has been recently claimed back by movements, programs and strategies aiming at sustainable farming (eg. Organic Farming movements).

We just would like to mention briefly the importance of organic matter in order to withstand desertification and to avoid the loss of soil fertility. Desertification is becoming a big threat above all in Southern Regions due to climate change; but also in intensive cropping situations, where chemical fertilisers have substituted manure since a long time (eg. Northern lowlands in Italy), the percentage of organic matter in the soil dropped dramatically to below 1.5%, whereas a 2% limit value is considered to be the borderline between fertile and unfertile soils.

What we have briefly outlined fully matches with the hypothesis of beneficial use of organic matter, including organic waste materials.

**Potential risks: heavy metals, organic pollutants, pathogens, nitrogen release**

Many Institutions and researchers have been focusing for a long time upon some major risks to be evaluated when land application of sludge is envisaged as a way to get a beneficial use from waste material; among others, we should mention such hazards as:

- Supply of Potentially Toxic Elements (PTE), as heavy metals (HM) and organic pollutants (OP)
- Massive release of nitrogen to the groundwater
- Pathogens dwelling upon decaying faecal substances

Both from an environmental and a sanitary viewpoint, beneficial use must thus be ensured through a control of PTE, through sanitation and through the evaluation of nitrogen release as compared to the root uptake and the capability of soil to keep it in place.

**Undesired social and agronomic side-effects: odours, soil oxygen uptake, nitrogen release**

Moreover, some undesired side-effects have to be considered, even though they do not strictly belong to the category of environmental and sanitary “risks”.

First of all, spreading of biomass must avoid potential nuisance, as people more and more frequently ask for an “odourless life” even in the countryside.

As for agronomic side-effects, beneficial use must avoid such shortcomings as massive oxygen uptake – linked to mineralization of not completely stabilised organic matter – that would lead in turn to anaerobic layers inside soil profile (that is
addressed in pedology as the “gleysation” effect, recognisable through the colour turning grey-blue). In such respect, supporters of organic farming have long promoted “aerobic stabilisation” of biomass – including manure - before application to the soil. Stabilised and well humificated organic matter shows a very little oxygen uptake that could thus be balanced by oxygen diffusion through the soil pores. Moreover, stabilisation at soil level could end up in some damage to plant physiology, as it temporary leads to intermediate metabolic by-products (namely, ammonia, volatile fatty acids, etc.) that have a more or less marked phytotoxic effect.

**Conditions to ensure “beneficial use”: application of waste and products**

In order to be “beneficial”, application of sludge to crops must try to avoid such effects as described above, otherwise it should just be considered as a *disposal on soil surface*, and the issue should be thoroughly managed accordingly; namely, accepting that farmers should be paid for hosting disposal (that is the case very often, for the time being); this means a temptation for them to use sludge beyond any reasonable balance to agronomic need and soil situation (that frequently cannot be considered by regulations, e.g. when a further supply of organic matter is available at single site due to manure production); in many situations, in the end, this helps raising a diffident attitude towards those farmers accepting sludge.

We would rather build up a most different scheme, in which the use of sludge gets effectively regulated in order to be undoubtedly “beneficial” and farmers are not paid for its application; this would in turn allow sludge to play an effective role in substituting – at least partially - other fertilisers, and organic matter could take over again the traditional primary role in soil fertilisation.

**The need for stabilisation and the importance of composting**

Under many standpoints, it comes out the need for stabilisation. Proper stabilisation might yield a storable product, that can be manipulated. It strongly reduces odour production; biomass looses its faecal features, therefore hindering potential regrowth of pathogens, and heat release related to aerobic metabolism enables pasteurisation. Nitrogen gets transformed into more stable, slow-release forms and its overall compliance with natural uptake gets much higher. Under the concurrency of many co-metabolic effects, organic pollutants can be mineralised and/or degraded to harmless compounds.

To be really effective, and get independent from time/space varying conditions of land application, stabilisation has therefore to be thoroughly applied. “Proper” stabilisation has to produce permanent effect. In this respect the loss of faecal features (i.e. the change of biochemical features) is a need. Hence, the mere loss of moisture (thermal drying) and chemical sanitation (liming) *cannot be considered as equivalent to*
biological stabilisation, though they could be regarded as pre- or post- treatment to be eventually added to biological treatment.

We want to underline that soil, groundwater, health and environment prefer biological, aerobic stabilisation (i.e. composting) eventually accompanied by first-stage anaerobic digestion in order to recover metabolic energy in the shape of biogas. Through aerobic biological treatment, organic matter enhances positive features and permanently looses worst side-effects related to the application of fresh waste biomass. When combined with quality control (regarding heavy metals and organic pollutants) of incoming sludge, composting is really able to turn permanently a waste material into a product; this is of utmost importance, as a valuable product is generally paid for, thus withdrawing it from hazards related to improper management of waste materials that happen to get a fee to be land-spreaded.

The paradox: improving sludge (and other waste biomass) through composting to send it to landfill...

Often the regulatory approach has not been consistent with what we have just outlined. We refer to regulations allowing the use - under controlled conditions - of sludge with poor grade quality limits. Frequently, Member States have issued, in parallel, regulations about composted products, asking for a much higher quality; in such cases composted products can be used and marketed according to good agronomic practice, with no further regulatory step, and this is pretty obvious.

The paradox is that in most Member States regulations about composting do not consider a “second quality” composted material available for controlled land application, similarly to laws regulating sludge application. In such situations, sludge producers and hauliers do not consider composting as a feasible treatment option, due to the fact that end products stemming from sewage sludge seldom meet stringent limit values for composted products; composted sludge should therefore go to landfill, whilst sludge chemically or thermally treated can be land-spreaded! By the way, the same applies to many other organic waste materials such as slurries from animal breeding: undoubtedly aerobic stabilisation (composting) should significantly improve features of the biomass; but after composting it should undergo much more stringent regulations. We have to bear in mind that no one wants to try efforts and spend money and time to go thereafter to landfill.

This paradox should be considered when regulating sludge and compost. Regulations should
• either give preference to composting as a suitable treatment before controlled sludge application
• and/or regulate a “second quality” composted material stemming from sludge (and slurries, as well) to be used for controlled farmland application; according to effects we already outlined, sludge - once biologically stabilised - should perform better than chemically or thermally treated sludge at least as for the status of organic matter and for the loss of faecal features.
Such a regulatory approach could withdraw the main hindrance to the use of composting as an effective method to improve agro-environmental conditions of sludge application to soil.

**Farmers’ behaviour: leading or exploiting the strategy?**

Sludge application on farmlands gives farmers a chance to play a meaningful role in a sustainable development of farming. Such a chance can be either usefully managed or poorly wasted.

Sludge application as a beneficial activity must consider best agronomic practice (balanced supply of nutrients, use of stabilised organic matter), and avoid potential risks (noteworthy supply of heavy metals and organic pollutants, release of nitrogen to the groundwater, use of organic matter that still has not lost its faecal features). When thus managed, such a practise could effectively contribute to the recovery of the role of organic fertilisation, and therefore improve biological activity of soils, keep its long-term fertility, prevent pollution from overloading of chemical fertilisers, cut down the use of pesticides thanks to improved resistance to plant diseases in organic soils, etc.

Farmers that recognise beneficial effects of well-stabilised, humificated organic matter are *leading* the strategy, indeed. Those just hosting the use of sludge on their fields, as they get paid for, are *exploiting* the strategy: in such case, when regulation allows ineffective treatments, economical conditions draw the attention of farmers even to worst sludge, provide its use is paid for by producers/hauliers.

Here lays the answer to the frequent question: do people want farmers to use sludge? From our viewpoint, it depends on *what* sludge and *the way* it has been treated. In the end, we could say *it depends on the economic driver of sludge application*: if the driver is a fee paid to farmers for sludge application, the system is not able to distinguish between well and poorly managed sludge. Definitely, the driver has to become more and more frequently the *agronomic value of organic matter*: once it has been well sanitised and stabilised, *composted* organic matter could give a technical benefit to soil fertility and cropping conditions. Regulations should help this condition to build up.
The point of view of the European local authorities

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The Council of European Municipalities and Regions (CEMR) presents a local view in the discussion of sewage sludge:

1 New legislation with higher standards can be helpful for a better use of sludge. But the standards have to be transparent, coherent and must be integrated in a waste management strategy. The legislation should be varied and innovative enough, to take account of different local geographical circumstances and not only look for one form of the use of sludge.

2 The limits set up in a new framework these must be acceptable not only from an environmental point of view. There must be a compromise between ecology and economy in
   - thereshould values
   - the timetable set up for implementation
   - the mechanisms of control (how often, by whom, how much).
Controlling has to be concentrated on local relevant parameters, depending on the drainage area, i. e. the special sewage water content. To repeat the words of Mr. Kraemer: “The devil is in the detail!”.

3 The municipalities call for
   - clear rules for the execution of the law
   - enough time to implement a new regulation on a local level
   - a stable framework for the public operators, who deal with sewage treatment, to avoid stranded investment
   - legal, safe disposal.

4 We know, there is no single solution. We have to tackle the problem of pollution at its source by preventing it. But for sewage sludge use in agriculture we also have to take into consideration the background concentration of the soil. The German experience in composting shows that a stricter regulation can be combined with a voluntary solution for quality control of the producers. We got a higher quality and better acceptance of the product, and deregulation within a clear defined self-control mechanism of the compost-producers.

5 Benefits and disadvantages of new regulations have to be clear in terms of environment and prices. But the option cannot only be the use of sludge in
agriculture. A comparison of different forms of use (agriculture and horticulture, incineration, co-combustion) with the same criteria is also helpful. There is also a need for the definition and description of the prices the producers have to pay for the use of different options! Hygienisation as a part of a new sewage sludge regulation may be helpful if you look only to the use of sludge in agriculture. But if you burn the sludge, such regulation is not necessary, i. e. too expensive.

6 If we look at the soil as a whole we have to ask for an integrated environment approach. This of course is hard to achieve. But why should we not present as a first step a paper that regulates sewage sludge, compost and animal fertilizer together?