European Landowners Organisation

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SPREADING OF SEWAGE SLUDGE ON AGRICULTURAL LAND

SUMMARY

Since the end of 1998, the dumping of sewage sludge at sea has been banned, resulting in increased pressure on the authorities to investigate other methods of sludge disposal, including spreading on agricultural land. Under the right conditions sewage sludge can act as a soil improver. However, landowners may face risks if they accept sludge on their land. Moreover the spreading of sludge on agricultural land raises issues of liability. In view of this a number of policy recommendations are made, with a view to protecting landowners' interests.

INTRODUCTION

1. This paper has been prepared to inform the ELO Policy Group of recent developments regarding the spreading of sewage sludge on agricultural land. The purpose of this paper is not to offer a European-wide solution to the problem of sewage sludge. Such an approach would in any case be impossible, as the situation in the various Member States differs widely. This is due first of all to the fact that the ban on the disposal of sewage sludge at sea does not pose a problem of the same magnitude to all Member States, as some do not or only hardly dispose of their sewage sludge at sea while others, such as France or the UK, have customarily done so.

2. Another difference is due to the different legal and commercial regimes in place in Europe. In France, sludge is regarded as a waste; in the UK, its role as a soil improver is recognised. These diametrically diverging views have implications on the way transactions with sludge are viewed and conducted.

3. For these reasons, the ELO cannot prescribe to the various organisations how to deal with sewage sludge. What this paper does do, however, is to present a technical analysis of the problems raised by the use of sewage sludge on agricultural land, and suggest some safeguards for landowners, should they wish to spread sludge on their land.

LEGISLATION BACKGROUND

4. Approximately a dozen Directives affect sewage policy, including 86/278 on the use of sewage sludge in agriculture, 75/440 on surface water abstraction, and 76/464 on dangerous substances. However, the principal impact has been from the Urban Waste Water Treatment Directive 91/271 and the Bathing Water Directive 76/160, which resulted in the EU agreement to ban the dumping of sewage sludge at sea from the end of 1998. The ban has resulted in increased pressure on the authorities to investigate other methods of sludge disposal: these include land fill, incineration and spreading on agricultural land. The latter is often the most economically viable, and seen in some EU countries as the "Best Practicable Environmental Option".

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5. A review of the 1986 EU Directive 86/278 on "the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture", will be proposed in the next 18 months (1998-2000). It will then be at least two years before the review is finalised. This may result in stricter legislation on sludge treatment before spreading and more demanding non-statutory Codes. Currently, the Directive allows the spreading of untreated sludge if it is injected or worked into the soil. Many EC countries however, choose to adopt a more cautious approach to sludge treatment and use. For example: in the UK, the Government is committed to phasing out the spreading of untreated sludge on combinable crops and animal feeds crops by 2002, and on all other crops by 1999. In Germany only treated sludge can be applied to agricultural land, and sludge treatment is strongly recommended in Sweden.

ADVANTAGES AND DISADVANTAGES

6. Sewage sludge can act as a physical and chemical fertiliser by increasing the organic matter of soils, helping to prevent soil erosion, and improving the soil's water-holding capacity. In addition it can increase soil chemical fertility by adding valuable plant nutrients such as sulphur and magnesium which are often deficient in soils. As a result some authorities are encouraging landowners to accept sewage sludge, promoting it as a soil improver: in some EU countries sewage sludge is allowed to be spread on land if it will result in "benefit to agriculture or ecological improvement".

7. On the other hand, landowners may face risks if they accept sludge. Under some circumstances, sludge can contaminate soil with pathogens, heavy metals, and organic contaminants. Sludge application in certain conditions can lead to eutrophication of water courses and, given that it contains pathogens, there is the risk of personal injury. Further, it can also impact on food safety and thus depreciate the value of land. These risks have led to investigation into issues such as: different methods of treating the sludge to ascertain which method is the safest in terms of human health; the beneficial effects of sludge for the soil; the potential pollution risks that may arise; and any long-term effects that sludge may have.

TECHNICAL CONCERNS

8. The current potential problems associated with sewage sludge are:

   - **Pathogens** – these include, salmonella, human viruses such as Hepatitis A, parasitic nematodes, worms and parasitic protozoa such as Cryptosporidium, and E-coli

   - **Heavy metals** – these include, zinc (Zn), copper (Cu), nickel (Ni), cadmium (Cd), and lead (Pb)

   - **Organic contaminants** – these include, dioxins, polychlorinated biphenyls (PCBs), volatile organic compounds

METHODS OF SLUDGE TREATMENT

9. The following treatment methods for sewage sludge were collated by an independent inquiry in 1996 by the UK Royal Commission on the "Sustainable Use of Soil". They represent the current state of research on what is an on-going investigation.

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Pathogens and Viruses.

10. **Pasteurisation (heat treatment)**, typically for 30 minutes to an hour at 70°C or 4 hours at 55°C effectively destroys most bacterial and viral pathogens and the eggs of helminths (a group of parasitic worm-like invertebrates including the beef tapeworm).

11. **Mesophilic anaerobic digestion** in the temperature range 25-40°C this is the most common method of treatment. It is not particularly effective at removing viruses or parasite eggs, although protozoan cysts are said to be rendered non-viable within 24 hours at 37°C. Retention periods are commonly about a month at 30°C.

12. **Thermophilic anaerobic digestion** occurs at temperatures of 55-60°C and therefore offers the benefits of pasteurisation as well as making digestion quicker than the mesophilic process. Whereas the eggs of ***Ascaris*** spp. (helminths) can survive mesophilic anaerobic digestion, they are destroyed by thermophilic digestion or by heating at 55°C for 15 minutes.

13. **Thermophilic aerobic digestion** can operate autothermally (that is by generating its own heat) at temperatures of 60°C and above. It is the used for the pre-treatment and partial stabilisation of sludge before the use of mesophilic anaerobic digestion. When the processes are used in series the retention time is 1-2 days aerobic followed by 15-20 days in the anaerobic stage.

14. **Lime stabilisation** of sludges is a relatively simple and effective method of achieving temporary stabilisation and high degree of disinfection; some soils could gain additional benefit from the lime content of the product. Lime stabilisation at pH 12 for at least 2 hours leads to a significant reduction in bacterial indicator organisms; it seems less effective against some viruses (for which process times longer than 12 hours are required) and against parasites.

15. The **irradiation** of sludges is being investigated in the USA and Germany, sometimes in combination with air or oxygen or together with heat treatment. The radiation doses used at operational plants in Europe kill ***Salmonella*** and other pathogenic bacteria but may be less effective against parasites' eggs and viruses. **Microwave treatment** has also been proposed as an alternative sludge disinfection method.

16. Research on the fate of ***Cryptosporidium*** oocysts in sewage sludge concluded that **mesophilic anaerobic digestion** at 35°C for a period of 4 days followed by 14 days storage of the digested sludge kills oocysts. The report recommended that higher temperature processes, including **thermophilic aerobic digestion** and **pasteurisation** should be employed if it is suspected that sewage sludge is contaminated with ***Cryptosporidium*** oocysts.

17. It can be concluded from this comprehensive assessment of treatment methods that there is not one method that removes the risk of pathogens completely. The risk that a sludge poses to land can be assessed by the treatment it has undergone.

Heavy metals

18. In some respects heavy metals are more of a concern than pathogens, mainly because it is virtually impossible to remove them by ordinary treatment methods, and secondly because once they are in the soil they can remain there indefinitely. The main method of dealing with them is **at source**. Heavy metals form the basis of many industrial and household products. Of most concern are zinc and copper; copper piping is found in houses, especially in new housing developments and zinc is present in many domestic goods. It is not clear what the long-term side effects of heavy metals will be, consequently there is extensive research into their accumulation in soil.

19. The EU Directive 86/278 adopts a two-pronged approach by specifying ranges of concentrations of metals which Member States are required to use as the basis for:

- setting limit values for metals on soils which must not be exceeded as a result of using sewage sludge;
- controlling the amounts of metals added to land as the result of using sewage sludge.

Annex A compares the limits on soil concentrations of some heavy metals at pH 6-7 in 6 European countries.

Organic contaminants

20. Sludges may contain a wide array of organic compounds, with diverse physio-chemical properties. Organic compounds applied to land in sewage sludge may be removed by **volatilisation**, **biodegradation** and **abiotic processes**, **leaching**, **plant uptake** and **removal during harvest** and **transfers to grazing animals**. Volatilisation is the most important loss-pathway for many substances, including volatile organic compounds, chlorobenzenes and PCBs. Investigation is being carried out by Lancaster University (UK) into the long-term accumulation of organic compounds. This includes air-monitoring, and soil-air and air-grass exchanges. In addition, the transfer of organic contaminants to milk and their uptake by plants and animals are being researched on sludge-amended soil. New compounds that may enter sludge are also being investigated. It must however be remembered that concentrations of organic pollutants are normally greater in atmospheric deposition than are ever present in sludge.

21. Organic contaminants, a relatively new phenomenon in sludge, are not required by the Directive 86/278 to be monitored either in the sludge or the receiving soil. However, in some Member States, such as Germany and Switzerland, the accumulation and transfer of organic compounds has received more attention: Germany have set limits for dioxins/furans, polychlorinated biphenyls and total organohalogen compounds in sewage sludge.

LANDOWNERS' CONCERNS AND POSSIBLE SOLUTIONS

22. With regard to the treatment of sewage sludge, the economic cost of treatment adds a further element of complication: the methods which may most effectively treat sewage sludge may not, in practice, be cost-effective for the water companies. This raises wider economic and social problems of financing the cost of the disposal of waste: should the water companies – which in many countries are private – be made to pay for the full cost of the most technically advanced purification of sludge? Should this be financed in part by the State, which has imposed the ban on the disposal of waste? Alternatively, should landowners who spread sludge on their land be remunerated for the service they provide to the country? All these issues are currently being debated throughout the EU.

23. Whatever the answer, given the potential risks associated with the spreading of sludge landowners should be aware of, and anticipate, the potential problems raised by this practice. It is clearly fundamental that the sludge should be treated effectively, and that suppliers of sludge accept liability for any loss, including economic loss and damage associated with the spreading of sludge.

24. In the UK, the CLA are in the process of finalising a "**model contract"** for spreading sewage sludge on agricultural land, for use by the water companies and landowners. The contract will provide a starting-point for negotiations between landowners and water companies – it will not cover every single detail. It does however provide a worthwhile indemnity for owners. Further, an important concession has been obtained in that the landowner should be made a party to an agreement between a water company and a tenant (even when the tenancy agreement does not ban the tenant from applying sludge), enabling the landowner to benefit from the water company's indemnity. The contract will represent a significant advance on "handshake" agreements.

25. However, the situation is not the same in other Member States, where the landowners' right to be made party to an agreement between the sludge producer and the tenant is limited, and/or the landowner is held liable for problems which may occur in the future. In France notably, the sludge producer is held liable only until the sludge is spread, and there is considerable reluctance to limit landowners' liability. Since their liability is unlimited, landowners are unwilling – to say the least – to accept any form of spreading of waste on agricultural land. For French landowners, a solution along the lines agreed in the UK, taking due account of liability issues – which should not rest with the landowner – would be a step towards resolving these problems.

26. An added concern in many countries is that buyers may refuse to take produce which has been grown on land spread with sludge. To overcome this, in the UK Water UK, representing the water industry, has reached an agreement with the British Retail Consortium on the continued safe application of sewage sludge to agricultural land. Between them protocols for the use of sludge by buyers of produce have been agreed. This has included a "**Sludge Matrix**" setting out whether or not sludge can be applied to land to be used for growing various crops, and suggested time gaps between application and harvest (see **Annex B**). These developments will provide extra security for UK farmers and landowners who accept sludge, in the present and in the future.

27. In addition there is concern over changing regulations for sludge in that the spreading of sludge under today's standards may under future regulations be seen as unacceptable, resulting in the land being classed as contaminated.

SUMMARY

28. To summarise:

i. The most adequate safeguard against the inherent risks from both the landowner and consumers point of view must be to have a legislative requirement that the sludge is treated to the highest standard that is reasonable before it is even offered for disposal to land. The onus must be on the supplier of the sludge to monitor and treat it effectively.

ii. The position with regard to heavy metals is one which requires close monitoring by Government agencies as to both the long term effects and whether limits on levels in sludge should be reduced to take these into account.

iii. As a precautionary principle, EU levels for organic contaminants in sewage sludge must be set, and research into their potential to accumulate and transfer to plants and livestock (and thus to humans) must continue. Governments in Member States must maintain a watching brief on the presence of new contaminants in sewage sludge which may affect its continued use on agricultural land.

OTHER ISSUES

29. Sludge is not the only waste of concern. The (amended) EU Framework Directive on Waste 91/156 allows certain other types of non-agricultural wastes to be spread on agricultural land such as blood (from abattoirs) and paper pulp without a waste disposal licence. The only requirement these wastes have to fulfil is to "benefit agriculture or ecologically improve the soil". Monitoring of the soil or waste is not a requirement. Sludge is the only waste which entails an obligation to monitor both soils and sludge when spread on agricultural land. Moreover, it follows that soil tested after sludge applications may include pollutants from other sources, but the sludge will be held accountable. The CLA is considering developing similar model contracts to cover the spreading of other wastes on farmland in the near future.

RECOMMENDATIONS

30. The ELO needs to lobby the European Parliament to agree more and stricter regulations on the levels of pollutants in sewage sludge and the treatments required to remove pollutants prior to sludge spreading on agricultural land.

31. Landowners should ensure that suppliers accept liability for any economic loss or damage associated with spreading sludge on their land. In some Member States this will entail significant legislative changes. Efforts should be made to negotiate a pan-European model contract which could be used in all EU countries. Contact between the ELO and the EU representative body for water companies or authorities could assist here.

32. The authorities which supply sludge to farmers and landowners should also be encouraged to discuss with the retailers' associations the preparation of a pan-European protocol for the spreading of sludge, similar to the matrix in **Annex B**.

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