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Summary

Purpose

This briefing pack provides information for stakeholders and the public about the recycling of treated sewage sludge, commonly known as biosolids, to agricultural land. The information covers regulatory and statutory requirements, treatment of sewage sludge, scientific research and the benefits of using biosolids in agriculture.

The main points in the briefing are:

- 1 Biosolids have been used safely in agriculture in the UK, Europe and US for over forty years.
- 2 Biosolids contain a range of plant-available and soil-extractable nutrients useful in agriculture.
- 3 The use of biosolids improves soil structure, drainage and available water capacity and so benefits agriculture. Relevant research references are included in the briefing pack.
- 4 Application of biosolids to agricultural land is a safe and sustainable option, recognised as the Best Practicable Environmental Option in most circumstances by the EU and UK Government. A wide range of stakeholders who are involved in the regulatory control, research and use of biosolids, support the option. Letters of support are included in the pack.
- 5 Biosolids are the most researched and well regulated of organic materials applied to land. Biosolids form about 2% of organic materials used for this purpose with sludge from industrial sources and animal manures comprising 4% and 94% respectively.
- 6 Current controls on the recycling of biosolids to agriculture is covered by the 1986 EU Sludge Directive (86/27/EEC) implemented in the UK through the Sludge (Use in Agriculture) Regulations (1989) supported by a Code of Practice. Biosolids are also recycled in accordance with the 'Safe Sludge Matrix.' This agreement goes beyond the current regulatory requirements and as a result all untreated sludge has now been excluded from use on food crops. This voluntary agreement is being incorporated into new UK regulations due early next 2004. It has also seen the introduction of sludge treatment processes being managed using Hazard Analysis and Critical Control Points (HACCP) principles. Further revisions to the 1986 EC Directive are also expected.
- 7 The Water Industry's investment in sludge and wastewater treatment has continued to increase with a resultant improvement in the quality of the treated wastewater and biosolids produced.

To assist stakeholders we have included in this briefing pack detailed responses to typical questions asked in relation to application of biosolids to agricultural land.

Recycling biosolids to land

Background

Treated sewage sludge, also known as biosolids, has been recycled to agricultural land for many decades in the UK, Europe and the US. This is recognised as the Best Practicable Environmental Option (BPEO) in most circumstances, adding plant nutrients and humus-forming material to enrich the soil, and is supported by the UK government and European Commission. In the UK over 1 million tonnes (dry solids) of sludge is produced every year of which about 55% is recycled to agricultural land. This represents about 2% of the total quantity of organic material being applied to land with 94% being animal manure and slurry, and the remaining 4% other industrial wastes.

Regulatory framework

Recycling sludge is a regulated activity. Current controls are based on a 1986 EU Directive (Sludge Directive 86/278/EEC) which was implemented in the UK in 1989 through the Sludge (Use in Agriculture) Regulations. Some aspects of recycling to land are also controlled under the Waste Management Licensing Regulations (1994).

The regulations are supported by a Code of Practice which details all aspects of sludge recycling to land, setting application rates, information requirements and guidelines for best practice. Revisions to the Regulations are expected to come into force in early 2004 and will be introduced by the Department for Environment, Food and Rural Affairs (Defra) for England and the Scottish Executive and National Assembly for Wales for the devolved administrations. These amendments will introduce microbiological limits for the final biosolids product, formalise the record keeping and introduce hazard analysis and critical control point procedures to ensure improved quality control. The relevant environment agency will enforce the regulations, with a statutory duty to undertake audits of compliance with process standards and will continue to audit recycling operations.

Safe Sludge Matrix*

A voluntary agreement, the 'Safe Sludge Matrix' has been in place throughout the UK since 1999. The agreement, made between Water UK representing the UK water and sewerage operators and the British Retail Consortium (BRC), anticipates the revision to the Sludge (Use in Agriculture) Regulations 1989 and has influenced the on-going revision of the EU Sludge Directive.

The Safe Sludge Matrix included inputs from the environment agencies, Defra and the Food Standards Agency (FSA) with intensive consultation with other stakeholders such as the National Farmers Union (NFU), Country Land and Business Association (CLA), food manufacturers and food processors.

The matrix requires strict controls on the quality of sludge and the correct procedures to be adopted for its application to agricultural land used to grow food crops. In addition the use of untreated sludge on land growing food crops was phased out in December 1999. The water industry has made a substantial investment to meet the objectives of the matrix and the controls are being applied ahead of the requirements of the revised regulations. The matrix provides robust safeguards for all stakeholders – farmers, food retailers and processors and consumers.

*To download a copy of the Safe Sludge Matrix go to www.adas.co.uk/matrix

Scientific background

There has been extensive and continuing research into the use of sludge on agricultural land over the last forty years. In particular considerable additional research has been conducted in order to underpin the provisions of the Safe Sludge Matrix and the proposed standards in the revised Regulations.

The work confirms that any risk to the food chain or the environment from recycling treated sludge to land is exceedingly small provided it is carried out in accordance with the Regulations, the Code of Practice and the Safe Sludge Matrix. In addition there has been no instance in the UK in which a link has been established between the controlled application of sewage sludge and the occurrence of disease in the general population through food or water contamination. All research reports are in the public domain and are available if required. The results from on-going research will also be published.

Conclusions

Recycling biosolids to land is a controlled and well-regulated process and provided the controls are followed presents minimum risk to humans, animals and the environment. The recent development of the Safe Sludge Matrix and the forthcoming new Regulations provide additional safeguards for a process that has been strictly controlled in the UK since 1989. Recycling biosolids to land is a sustainable option, utilising its beneficial properties by providing nutrients and organic matter for soil and plants. It is supported by the Government at a National and European level.

The development of the new Regulations and Safe Sludge Matrix involves a wide range of organisations representing different stakeholders to provide everyone with the reassurance that recycling biosolids to land in line with the controls does not place public health at risk.

Contributors

The organisations listed below have contributed to the content of this briefing note:

ADAS

British Retail Consortium

Country Land and Business Association

Department for Environment Food and Rural Affairs

Environment Agency

Food Standards Agency

Forum for the future

National Farmers Union

Scottish Agricultural College

Scottish Environment Protection Agency

Scottish Executive

The Natural Step

Water UK

UK Water Industry Research Ltd



SCOTTISH EXECUTIVE

Biosolids – safe, sustainable solutions for agriculture

Background

Biosolids, the treated form of sewage sludge, have been in use in UK, US and European agriculture for over forty years. A safe, sustainable, highly regulated and environmentally sound solution to the increasing challenge of waste disposal, biosolids recycling represents approximately 2% of organic material applied to land in the UK. The practice is recognised as the Best Practicable Environmental Option (BPEO) in most circumstances by the EU and UK government.

The treatment process

Sewage sludge is produced from the treatment of wastewater and consists of two basic forms – raw primary sludge (basically faecal material) and secondary sludge (a living ‘culture’ of organisms that help remove contaminants from wastewater before it is returned to rivers or the sea). The sewage sludge is transformed into biosolids using a number of complex treatments such as digestion, thickening, dewatering, drying and lime stabilisation.

Benefits of treatment

The treatment process reduces the water content of the sewage sludge, reduces its ability to produce gas and renders it virtually free from harmful organisms. The resultant biosolids are therefore easily transportable, less odorous and almost 100% pathogen free. Some treatments also reduce the amount of waste, as the solids content of biosolids is lower than that of raw sludge.

The final product

Biosolids can be produced in cake, granular, pellet or liquid form and are spread over land before being incorporated into the soil or injected directly into the soil by specialist contractors.





Sustainable solutions

Prior to 1998, sludges were disposed of at sea, in landfill, incinerated or recycled to land. Disposal to sea is now banned and all biosolids used in agriculture are quality assured and treated to new prescribed standards. Each route has its particular merits and drawbacks as the following table indicates:

Outlet	Cost to customer	Environmental sustainability	Public perception
Landfill	Medium	Low	Low (least desired)
Incineration with energy recovery	High	Medium	Low-Medium
Recycling to land	Medium	High	High (desired goal)

Application to agricultural land is the most sustainable, environmentally beneficial and economically viable option for biosolids. There has been some negative perception about its use in agriculture, which this leaflet addresses. Disposal to landfill does not have a long term future and incineration with energy recovery is an expensive option which can attract adverse public reaction. Whilst under some circumstances these options are appropriate neither of these routes is normally the best environmental option; nor are they sustainable answers to a challenge that will only increase with time.

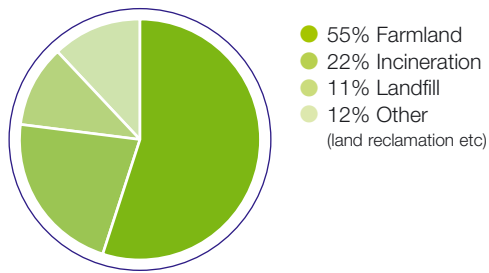
Use in agriculture

The 690,000 tonnes of biosolids recycled annually make up just 2% of total organic waste material going to land. The remainder of organic material applied to land comprises animal manure and slurry (94%) and industrial waste (4%). The regulatory framework governing the safe use of biosolids is significantly more rigorous than that which controls the recycling of animal or industrial waste, although tighter controls on these materials are being considered.

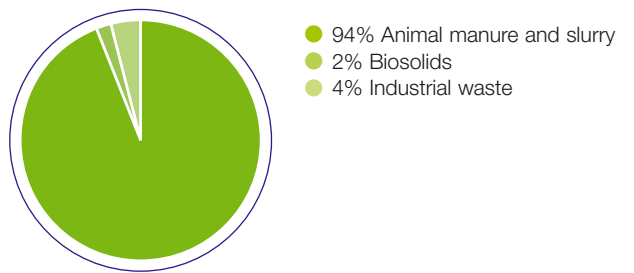
Benefits to soil

Biosolids contain plant-available nutrients and organic matter useful in improving soil structure, drainage and available water capacity. They are good sources of nitrogen, phosphorus and sulphur and contain magnesium and various trace elements. Biosolids can (and do) replace the need for other fertilisers – in the UK over 80,000 hectares are beneficially treated with biosolids annually.

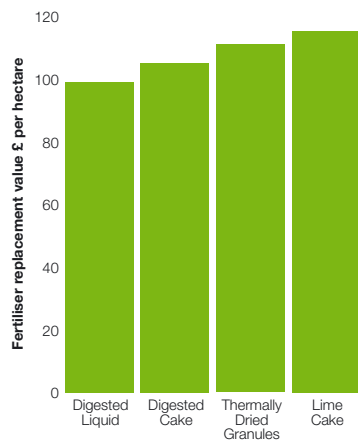
Outlets for sewage sludge in the UK 2000



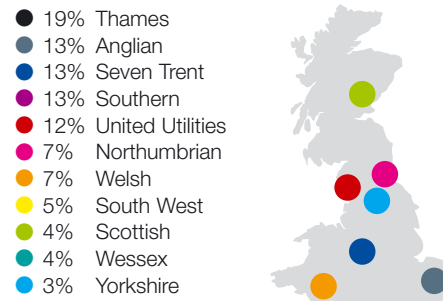
Organic material to agriculture in the UK 2000



Nutrient value of biosolids



Biosolids recycled to agriculture*



* % of total UK biosolids recycled to agriculture

Research & regulation

A highly regulated industry

Recycling sewage sludge is a highly regulated process. Current controls are based on a 1986 EU Directive (Sludge Directive 86/27/EEC) and the UK Sludge (Use in Agriculture) Regulations supported by a Code of Practice and Hazard Analysis and Critical Control Points (HACCP) management practice. An important part of the regulatory regime is the incorporation of the Safe Sludge Matrix into UK Regulations, surpassing the current regulatory requirements of the European Union.

The Safe Sludge Matrix

The Safe Sludge Matrix was developed to ensure the highest possible standards of food safety and to provide a framework that gives all food industry stakeholders confidence that biosolids recycling to agricultural land is safe. It is an agreement between Water UK representing the 11 UK water and wastewater operators and the British Retail Consortium (BRC).

The agreement incorporated input from the Environment Agency, the Department of Environment, Transport and Regions the views of the Ministry of Agriculture Fisheries and Food, (now combined as Defra) and followed a year of consultation with the National Farmers Union, Country Landowners Association, food manufacturers and processors.

Years of research

Biosolids and sewage sludge have been recycled to land throughout the UK, Europe and the US for many years and extensive international research has been carried out over the last 40 years. As a result, we understand more about the potential risks associated with biosolids recycling than any other organic material going to agricultural land.

Recent collaborative research

A three-year, £1m microbiological R&D project has recently been completed by the water industry. As a result, the industry has:

- Developed analytical procedures for determining human and animal pathogens in biosolids;
- Determined the fate of pathogens during treatment of biosolids; and
- Established with a risk assessment methodology that biosolids recycling does not place public health at risk.

Crop group	Untreated sludges	Conventionally treated sludges	Enhanced treated sludges
Fruit	X	X	✓
Salads	X	X (30 month harvest interval applies)	✓ (10 month harvest interval applies)
Vegetables	X	X (12 month harvest interval applies)	✓
Horticulture	X	X	✓
Combinable & Animal Feed Crops	X	✓	✓
Grass and forage		* Deep injected or ploughed down only + No grazing in season of application	
Grazed	X	X + 3 weeks no grazing & harvest interval applies	✓ 3 weeks no grazing & harvest interval applies
Harvested	X	✓	✓

✓ All applications must comply with the Sludge (Use in Agriculture) Regulations and Code of Practice.

X Applications not allowed (except where stated conditions apply).

A world class sustainable solution

The recycling of biosolids to agriculture is the most highly researched and regulated of all organic material applied to land. Provided controls are adhered to, it offers the minimum risk to the environment and public health.

No recorded ill health

The organisations involved in the regulation of processing and application of biosolids to agricultural land acknowledge that there are groups still seeking reassurance that recycling presents no threat to human health or the environment. Some stakeholders have acknowledged 'faecal aversion' – an unease associated with the consumption of foodstuffs that at some point in the production chain have been exposed to land fertilised with biosolids.

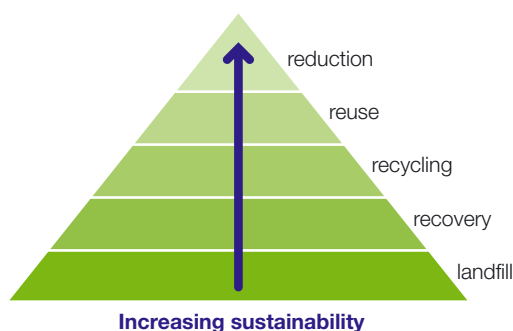
In fact, there has never been a recorded outbreak of human ill health in the UK as a result of the practice of recycling biosolids to land. The practice is supported by the majority of stakeholders, the European Commission, the UK Government and environment agencies. A large amount of authoritative information is available to anyone who wishes to find out more. Contact details for organisations that have an interest in the beneficial recycling of biosolids and who have contributed to the research and regulation of the industry are listed at the back of this leaflet.

Investment for a sustainable future

The United Kingdom is a world leader in the recycling of biosolids to land. It is an environmentally sustainable recycling solution surpassing the merits of other disposal options as illustrated by the sustainability hierarchy below. The water industry is currently investing £450 million to improve treatment and management practices so that stakeholders can have confidence in biosolids recycling.

The way forward

With the continuing support of Government, environmental groups, regulatory bodies, retailers, farmers and consumers, biosolids recycling will help contribute to national recycling targets and set the standards for recycling organic material to agricultural land. It is a safe, sustainable solution that benefits us all and will benefit generations to come.



28 March 2002

Pamela Taylor,
Chief Executive
Water UK
1 Queen Anne's Gate
London
SW1H 9BT

Our ref: 14957

Dear Pamela Taylor

Thank you for your letter of 1 March about the recycling of biosolids (sewage sludge) to agricultural land.

As you know, this is the route which the Government supports as being the best practicable environmental option. There are, of course, safeguards which need to be observed and these are currently set out in regulations and in the Safe Sludge Matrix which Water UK has developed with the British Retail Consortium. The Food Standards Agency has indicated that it considers that the application of sewage sludge to agricultural land should not present any unacceptable risks to food safety, provided that it has been carried out in accordance with these requirements.

The work the water industry has done to raise standards through negotiation and agreement with the other parties involved is something I very much welcome. I know that the delay in reflecting the new, higher standards in revised regulations has been of concern but I understand that the legal issues are now resolved. My officials will be keeping closely in touch with yours about the new timetable for consultation on the draft regulations and the accompanying revision of the code of practice.

I also understand that the industry has been funded through the AMP3 process for the cost of upgrading sludge treatment processes to meet the new standards set out in the Matrix and in the revised regulations. I should be interested to learn of the progress being made with this upgrading.

I know that you and your members have been working hard to ensure that retailers and others who are the customers for crops grown on land treated with sludge are fully informed on the merits of this route and of the safeguards which are applied. I have asked my officials to assist in this process and, in particular, to see how we can best contribute to your discussions with the spirit drinks industry and others who may have reservations about using crops grown on land treated with sewage sludge. We will also continue to work with Water UK to ensure that the controls which are applied are the result of sound and up to date scientific research.

Yours sincerely

Margaret Beckett

DEFRA

Department for
**Environment,
Food & Rural Affairs**

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020 7238 6903 / 5421

Pamela Taylor,
Chief Executive
Water UK
1 Queen Anne's Gate
London
SW1H 9BT

11 October 2002

Dear Ms Taylor

Sludge (use in Agriculture) Regulations

Thank you for your letter to Michael Meacher of 31 July reaffirming the water industry's support for the recycling of sewage sludge to agricultural land and explaining your concerns about the delay in making revised regulations.

The Government shares your view, as stated in the Waste Strategy 2000, that recovering value from sewage sludge through spreading on agricultural land is the best practicable environmental option in most circumstances. The alternative routes for the disposal of sewage sludge and incineration are seen as not cost effective or sustainable options. The agricultural use of sludge brings saving of several million pounds in fertiliser costs and the organic matter added improves soil structure, its workability and water holding capacity.

As you know the Sludge (Use in Agriculture) Regulations 1989 (SI 1263) as amended in 1990 (SI 880), impose controls on the application of sludge to agricultural land to prevent the accumulation of heavy metals in the soil and to prevent bacteriological contamination of crops. These controls are supplemented by a non-statutory Code of Practice and the 'Safe Sludge Matrix' drawn up in 1998 by Water UK and the British Retail Consortium. The Food Standards Agency has indicated that it considers that the application of sewage sludge to agricultural land should not present unacceptable risks to food safety, provided that it has been carried out in accordance with the requirements currently set out in the regulations, the code and the Matrix.

The Government has confirmed in various statements, that it will reflect the tighter standards established by the Matrix in revised regulations. I realise you are anxious that progress should be made on this and I am sorry that the consultation exercise on the revised regulations has been delayed.

We hope to issue the consultation paper in the very near future and I have asked officials to let you know as soon as we have a firm date.

Yours sincerely

Elliot Morley

Ms, Pamela Taylor, EUREAU
Ms Hubert Brunet, EFAR
Ms Dominique Pin, FEAD

Brussels, 9.4.2003
PMA/Ir/A:19339/D:5636

Dear Mrs Taylor, Dear Messrs Brunet and Pin,

Thank you for your letter of 28 February 2003 on the revision of the Sewage Sludge Directive could hinder the use of sludge in agriculture as an organic fertiliser. Far from it. In the recently adopted Communication "Towards a Thematic Strategy for Soil Protection" (COM(2002) 179) the Commission stresses the need for long-term protection of our soils from all threats. In particular, the problem of a decline of organic matter levels in certain types of agricultural soils subject to intensive crop production has been highlighted. Although the use of sewage sludge alone certainly cannot solve such a problem, it can make a contribution.

Our aim in the revision of the Sewage Sludge Directive will be to strengthen the provisions and the controls applied to sludge so that the professional operators (farmers, food industry, retailers) as well as the public at large can be reassured that we have a modern, up-to-date and effective piece of legislation to protect our environment. The objective is to increase the quantity of sludge that is used on land in a sustainable manner.

I take note of your concern about the psychological effect that the indication in the Directive itself of guideline values for heavy metal concentrations up to the year 2020 could have. Although these values would only be indicative and subject to periodic revision, there is indeed a risk that public pressure could make them the de facto statutory limit even earlier and compromise the objective of maximising recycling.

I assure you that due consideration will be given to your concerns and to the comments that have been provided in recent years on the working documents before we finalise our proposal.

Yours sincerely

Margot Wallström

nabim statement on the application of biosolids to agricultural land used to grow food crops

nabim has had regular discussions with Water UK, representing the water and wastewater service providers in the UK, over the last 18 months about the use of biosolids on agricultural land used to grow food crops, establishing that only 2% of total agricultural land is treated with biosolids. Water UK has provided us with re-assurance about the processes in place to regulate and control the production and use of bio-solids and has kept us informed of additional research being carried out to assess and minimise any food safety risk to consumers. Conformity with the safe sludge matrix, agreed by a number of organisations in the food chain, including the BRC, and endorsed by government departments is integrated into the requirements of cereal assurance schemes such as ACC under which our members purchase grain. nabim has therefore advised members that it does not currently see the need for the exclusion of grain grown on land to which biosolids have been applied in accordance with codes of practice. We believe that current research publications (such as the risk assessment for sewage sludge) and the revision of the Sludge (Use in Agriculture) Regulations 1999, which appear likely to enshrine the safe sludge matrix in law, will help to reinforce confidence that reasonable practice is pursued.

So far as nabim is aware, no member currently excludes the use of biosolids on land used for growing wheat, unless this is used for specific markets, such as infant food manufacture. We do not anticipate any change unless the current degree of public and customer acceptance is undermined. Naturally, we are looking forward to further re-assurance from the water companies, but we believe they are doing what they can to provide this.

Biosolids – questions and answers

What will the water industry do with non-compliant sludge?

Non-compliant sludges, which fail to meet microbiological standards, will be segregated and treated separately from compliant product. A range of options and possibilities may be considered. The material may be returned to the start of treatment process and re-processed; it may be subjected to an alternative treatment process (e.g. lime stabilisation); it may be sent for incineration, energy recovery or disposed of in landfill. Non-compliant sludges may also be recycled onto land used for non-food crops in compliance the Guidelines for the Application of Sewage Sludge to Industrial Crops. Non-compliant sludge will not be applied to land growing food crops.

Why is the Water Industry still applying untreated sludge to agricultural land?

The agreement, which allows untreated sludges to be applied to land used for non-food crops until 31 December 2005, provides additional barriers and safeguards to ensure that the risks of microbiological contamination of food crops from untreated sludges are negligible. It also allowed time for the Water Industry to gain the necessary planning consents and to invest an estimated £450 million in improved treatment facilities agreed under the AMP3 programme. This investment will be completed during 2005. The quantity of untreated sludge is rapidly diminishing and represents less than 7% of sludge recycled to agricultural land.

Although it is accepted that untreated sludges have negative aspects, such as odour and stability problems when compared with treated sludges, there is evidence that recycling untreated sludge to land can provide additional benefits to the soil and water environment compared to digested sludges. The benefits arise from the fact that untreated sludge has a higher concentration of organic matter and is a better source of slow release nitrogen. The nitrogen is largely held in the organic fraction rather than in the liquid phase and compared with liquid digested sludges is potentially less prone to leaching losses.

Without the agreement, and until the investment is completed, this valuable resource would be lost, since untreated and non-compliant sludge would otherwise need to be landfilled or incinerated.

What is an industrial non-food crop?

Under the agreement reached with the British Retail Consortium (BRC) and other stakeholders, including Defra and FSA untreated or non-compliant sludges can only be applied to land on which Non-food crops are grown under contract for industrial uses. The list includes Short Rotation Coppice (SRC) (e.g. Willow and Poplars grown for biomass); Miscanthus grown for biomass; High Erucic Acid Rape (HEAR) grown for High Erucic Acid Rape Oil (HERO); and Hemp grown for fibre.

Untreated sludges cannot be applied to land used for other crops grown for industrial uses such as industrial double low oilseed rape, linseed and flax since some of the crop material could normally enter the food chain.



What are the fertiliser requirements of these industrial crops?

Biomass crops such as Short Rotation Coppice (SRC) and Miscanthus have modest fertiliser requirement therefore applications of biosolids should be tailored to meet crop needs. In general this is likely to mean that even outside the new Nitrate Vulnerable Zones (NVZ) areas, the current practice of applying rates supplying 500kg/ha total nitrogen from sludge, would be outside the guidelines of good agricultural practice as it would exceed the crop rotational requirements. NVZs will restrict cake applications to around 25t/ha and liquids to around 180t/ha, traditionally double these rates have been applied. There is, however, some trials data which suggests nitrogen leaching losses in Willow and Miscanthus crops are lower than from bare land, even when double the recommended amount of manure was applied.

HEAR, on the other hand, has a relatively high fertiliser requirement and benefits from the nitrogen, phosphorus and sulphur found in biosolids.

How much untreated sludge is still being applied to industrial crops?

During the 2001 calendar year the application of untreated sludge to land used for industrial crops amounted to around 7% of the total sludge applied to agricultural land. This figure will reduce as more capital schemes are completed under the AMP3 investment programme. Figures for the total acreage of agricultural land involved are not readily available but as sludge in general is only applied to around 2% of agricultural land in the UK the area receiving untreated sludge will be around 0.1%.

Many companies have already phased out the application of untreated sludges to agricultural land.

How can we be sure that there will be no effect on food crops grown in the rotation from the use of untreated and non-compliant sludges?

All sludges currently applied to agricultural land are applied in accordance with the Sludge (Use in Agriculture) Regulations and the Code of Practice for the Agricultural Use of Sewage Sludge (and the equivalent Scottish, and Northern Ireland legislation). These regulations and the statutory code of practice ensure that applications to agricultural land are strictly controlled and that all applications are auditable and fully traceable. All land is tested prior to application and all heavy metal additions are modelled to ensure that levels remain with safe levels as set out in Regulations.

The industrial cropping agreement also provided additional safeguards in the form of extended harvest intervals. In the event of agricultural land being used for the production of food crops the following time intervals between the application of untreated or non-compliant sludge and the harvest of a subsequent food crop must be observed:

- 18 months for combinable and animal feed crops
- 30 months for vegetable, grass and forage crops
- 48 months for salad, horticultural and fruit crops

These harvest intervals offer a significant additional precautionary time interval over and above the typical pathogen, survival periods recorded in field. Such studies indicate that numbers of viable bacterial pathogens, such as E.coli, decline to background levels within 3 months and even under winter conditions 6 months is believed to be sufficient to reduce risk to negligible levels. A research project commissioned from WRc-NSF also confirms that even for a root crop, such as potatoes, grown immediately following the application of untreated sludge, the risks of adverse public health impacts are minute.

It should also be noted that between 1989 (when the EU Sludge Directive was implemented in the UK) and 1999 (when the Safe Sludge Matrix was implemented), untreated sludges were routinely applied to agricultural land growing a full range of crops with just a 10 month statutory harvest interval. There are no reported cases of public health outbreaks associated with sewage sludge recycling activities undertaken in accordance with the Sludge Regulations.



What controls are there on the application of untreated sludge to industrial crops and how can we be sure that no product enters the food chain?

Any sludge applied to industrial, non-food crops grown on agricultural land is done so in accordance with the Sludge (Use in Agriculture) Regulations and the Code of Practice for the Agricultural Use of Sewage Sludge (or equivalent regulations in Scotland and Northern Ireland) and is fully auditable and traceable. The relevant environment agency (i.e. the Environment Agency, Scottish Environment Protection Agency (SEPA) or Northern Ireland Agency) will be enforcing the regulations and this will cover both treated and untreated applications of sludge.

The Water Industry ensures that ALL farmers growing such non-food crops have a contract with an approved industrial end user that guarantees that any crop grown on the land does not enter the food chain. In fact none of the permitted crops have any food uses.

The Water Industry has also drawn up protocols and agreements with approved processors or agents which specify how any by-products are to be dealt with.

The protocols and agreements drawn up by the Water Industry must ensure that the practice of trading of Industrial equivalents is totally avoided. [This is the process whereby a UK Merchant trades an equivalent tonnage of industrial crop with another EU member states such as Germany, thereby avoiding the need to actually process the UK grown crop for an industrial end-use.]

Why has Switzerland chosen to ban the use of sewage sludge on agricultural land and shouldn't the UK do the same?

The UK has reviewed the scientific evidence and concluded that provided the requirements of the Sludge (Use in Agriculture) Regulations and the Code of Practice for the Agricultural Use of Sewage Sludge (or equivalent regulations) and that the provisions of the Safe Sludge Matrix are followed then recycling to agricultural land represents the Best Practicable Environmental Option (BPEO) in most cases.

The Food Standards Agency has confirmed that the recycling of treated biosolids to agricultural land does not pose an unacceptable risk to food safety and enables the recovery of nutrients and organic matter worth at least £8million per annum in fertiliser replacement value. The recovery of such value will also reduce the rate of depletion of natural resources such as rock phosphate.

On grounds of sustainability there is, therefore, a powerful reason why recycling and recovery of such nutrients should be retained.

The situation in Switzerland has not arisen as result of an adverse risk assessment based on scientific evidence but from a powerful lobby against recycling of biosolids.

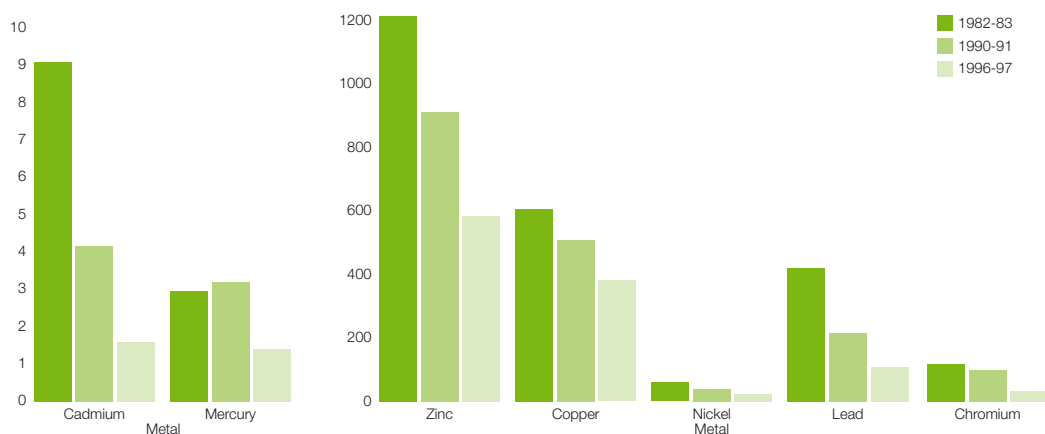
What about the health risks from endocrine disrupters?

It is acknowledged that the presence of endocrine disrupting substances in waste streams is of potential concern. These include synthetic hormones (such as contraceptive pill residues), surfactants, biocides and other persistent substances. Work in the UK has demonstrated that estrogenic effects can sometimes be detected in fish living downstream of sewage treatment works and this is clearly of potential concern when looking at the impact of wastewater treatment effluents in the aquatic environment.

However, evidence from the Institute of Environmental Health and the Environment Agency published recently suggests that endocrine activity in biosolids may not be an issue due to the tight binding of these substances to the solid fraction, coupled with the speed of breakdown that occurs. Research is continuing in this area.

What about health risks from heavy metals?

The Water Industry in partnership with the environment agencies and Government has been targeting the reduction of heavy metal inputs at source and has been very successful in reducing heavy metal concentration in biosolids. Levels of cadmium and lead in particular have been dramatically reduced.



Heavy metal additions to land are strictly controlled and biosolids may not be applied in circumstances where the addition would lead to the advisory soil limits being exceeded. The advisory limits are based on extensive research and plant uptake studies and already contain a safety threshold. All applications are audited by the relevant environment agency.

Calculations indicate that based on typical heavy metal concentrations in sludge and average background soil levels, the first limiting substance is likely to be zinc. Based on a typical biosolids application supplying 250kg nitrogen per Ha it would take 76 annual applications to raise the metal limits for zinc in an average rural soil to the limit values. This figure is over 1000 for chromium.

Applying sludge as a source of phosphorus can in fact, result in less cadmium being applied to the land than an application of rock phosphate, derived fertilizer.

It should also be noted that in certain circumstances heavy metals such as copper are also essential trace elements.

Are dioxins and PCBs in sludge a problem for agriculture?

I understand that they have been an issue for the US Environmental Protection Agency (USEPA)? The very tight environmental controls now imposed on manufacturing processes, have resulted in reduced emissions of dioxins, furans, PAHs, PCBs and other organic compounds. As a result we have seen very significant reductions in the amounts present in sewage sludges over the past 10 to 20 years (up to 80% reduction for some categories of compounds).

EPA announced on 17 October 2003 that it has made a final decision not to regulate dioxins in land-applied biosolids. After five years of study, including outside peer review, the Agency has determined that dioxins from this source do not pose a significant risk to human health or the environment. Further details on dioxins may be obtained for the USEPA website at <http://www.epa.gov/opptintr/pbt/dioxins.htm> <<http://www.epa.gov/opptintr/pbt/dioxins.htm>> . (Source: USEPA website)



What about the health risks from pharmaceutical products?

There is no evidence to suggest that any pharmaceutical products or their derivatives that may be found in biosolids are linked to any adverse environmental or public health impacts. In addition most pharmaceutical products are inherently biodegradable and thus would not be expected to remain intact during wastewater/sludge treatment or after the application of sludge to land.

What about radioactive materials?

The issue of radioactive releases to sewer has been looked at by the Environment Agency and the Government and was reported as part of a MAFF Radiological Safety and Nutrition Division R&D seminar 3-4 March 1999. The project title and number were "Radioactivity in food due to liquid disposals from non-licensed sites" RP0441. The work was undertaken by Dr Ansi Venter of QuantiSci, now Enviros.

The Nuclear Installations Act 1965 established the Nuclear Installations Inspectorate (NII), which licenses sites that handle large amounts of radioactive material e.g. nuclear fuel. Other sites that handle radioactive materials, such as hospitals are not licensed by the NII but instead they are "authorised" by the relevant environment agency (Radioactive Substances Act 1993). Authorisations are given by these agencies for ceiling limits for disposal. The limits are related to the capacity of the disposal route to accept the discharge. In practice premises do not discharge up to the limits of their authorisations.

The Food Standards Agency has made conservative assessments of many wastewater treatment works and to date has found none that it considers poses a risk to the food chain if the biosolids (sewage sludge) were recycled to agricultural land.

How is the detail of the Safe Sludge Matrix and the industrial cropping guidelines communicated to and enforced on farms/farmers?

The Water Industry in effect enters into a contract with a farmer to supply biosolids. This contract requires the Water Industry to fulfil its obligations and duty of care under the various regulations and also requires the farmer to meet his obligations, in particular with respect to harvest intervals and crops grown in rotation. The relevant agencies audit the application of sludges to agricultural land and will check to ensure that the farmer has been advised of his obligations; however at the end of the day it is the farmer's responsibility to ensure that he complies with his obligations.

Many operators insist on signed contracts with farmers particularly where untreated sludge is being applied to agricultural land. The revisions to the Code of Practice for the Agricultural Use of Sewage Sludge will stress these obligations more clearly.

Will the water industry implement a standardised auditable system from sludge treatment the field?

The Water Industry has introduced a system of operating its treatment centres based on Hazard Analysis and Critical Control Point (HACCP) principles. These HACCP plans are unique to each treatment centre, but are drawn up in a similar format; they are lodged with the relevant environment agency and are fully auditable.

These plans are then linked to the compliance database and provide an auditable trail from treatment to field operation.

The water industry has produced a HACCP Guide for the water industry which outlines all of the controls in place on sludge treatment and biosolids recycling.

UK Water Industry Research (UKWIR) Briefing – Sludge

UKWIR provides a framework for the procurement of common research programme for UK water operators on 'one voice' issues including sludge.

Value to operators

- UKWIR sludge research has helped to underpin scientifically the 'Safe Sludge Matrix' agreement with food retailers (www.adas.co.uk/matrix) without which the outlet to land could have been lost. Finding alternatives quickly (which also involves competition for equipment, expertise and finance) could have cost the industry £billions – not withstanding the loss of the known benefits for agriculture
- Improved data on metals, pathogens and organics in sewage sludge are now available to support the agricultural outlet – countering misinformation/perceptions and enabling comparisons with other materials put to land
- UKWIR research on the proposed revision of the EC Sludge Directive has identified the implications for the industry, especially for compounds that the industry should view as a priority and also where the investment is best allocated for the longer term
- The research has been a major influence on revisions to UK Regulations and Codes of Practice and is influencing the content of the revised Sewage Sludge in Agriculture Directive (for example the analytical procedures for pathogens and organic contaminants)
- Long-term collaborative research with Defra and the Environment Agency means the findings are thorough and acceptable to all parties, ensuring consistent regulation based on sound science.

Other benefits from the research

- The industry gained good publicity from its positive approach in the collaborative project to allay concerns about current sewage and sludge treatment spreading the potential serious waterborne 'potato brown rot disease'
- Food processors and retailers are now fully aware that the practice of applying animal manure and other materials to land needs better management and control.

Organic material recycling and other outlets

Organic material recycling to land
(1,000 tonnes dry solids per annum)*

Sewage sludge routes
(1,000 tonnes dry solids per annum)**

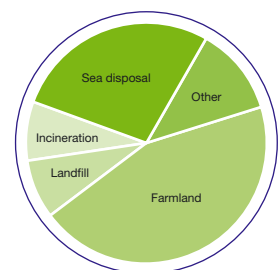
Type	Quantity	Proportion	Type	Quantity	Proportion
Farm animal	21,000	91.7%	Agricultural land	610	54%
Food industry	600	2.6%	Incineration	250	22%
Paper industry	520	2.3%	Land reclamation	55	5%
Sewage sludge	430	1.9%	Landfill	125	11%
Sugar industry	200	0.9%	Dedicated sites	45	4%
Vegetable/ food processing	70	0.3%	Other	45	4%
Other	70	0.3%	Sea	0	0%
Total	22,890	100%	Total	1,130	100%

* estimates for 1996 for UK

** estimates for 1999-2000 for UK

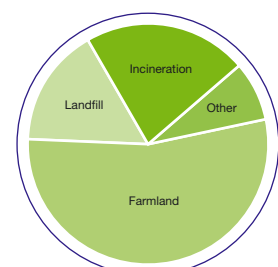
Organic material disposal outlets

1996-1997 (1,115,000 tonnes dry solids)



Sewage sludge routes

1999-2000 (1,130,000 tonnes dry solids)



- The fertiliser value of biosolids can now be quantified, enabling the farmer to assess additional fertiliser needs more accurately, reducing his costs and avoiding excessive nutrients damaging the environment
- A suite of analytical procedures has been developed, enabling more reliable measurements and more precise biosolids application
- Pro-active research on emerging issues is enabling the industry to develop better methods of detecting such chemicals as organic contaminants in water, sewage and treated sludge and the environment as a whole
- Novel ways of utilising water treatment sludges (aggregates, bricks etc) mean that they may now be considered as a resource rather than a waste for disposal
- UKWIR Technology Transfer workshops ensure impacts from one project are properly fed into other projects and that results are appropriately disseminated to all stakeholders
- In October 2001, Environment DG of the EC and UKWIR jointly organised a conference – “Researching the Sludge Directive” at which outputs from key research projects were presented to an international conference
(www.europa.eu.int/comm/environment/waste/sludge/conference.htm)

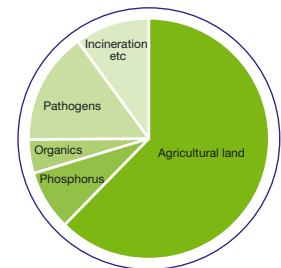
Cost of programme

UKWIR investment in sludge research since 1994 is £4.88m (including committed research), matched by £3.9m from collaborators

- £3.03m on the effects on crop yields resulting from sludge application
- £0.40m on the impact of phosphorus from the use of sewage sludge
- £0.22m on the impact of organics from the use of sewage sludge
- £0.73m on pathogens in sewage sludge
- £0.50m on incineration, water treatment works sludges etc

UKWIR investment on sludge research

(including future commitments)
Total since 1994 – \$4.88m



Supporting research reports on biosolids and soils

Ref	Title
95/SL/02/1	The Significance of Sewage Sludge as a Source of Phosphorus Loss from Agricultural Land to Surface Waters: A Literature Review
Contractor	ADAS
Author	Dr P Withers
96/SL/03/1	Identification of Priority Organic Contaminants in Sewage Sludge: Two volumes: Volume 1 containing main report and Volume 2 being the appendices
Contractor	Lancaster University
Author	Prof K C Jones
97/SL/04/1	Pentachlorophenol (PCP) and Chloranil as Sources of PCDD/Fs to Sewage Sludge and Sludge Amended Agricultural Soils
Contractor	Lancaster University
Author	Prof K C Jones
97/SL/06/1	The Content and Fertiliser Value of Sulphur and Magnesium in Sewage Sludge
Contractor	ADAS WRc
Author	Dr P J A Withers Dr S R Smith
98/SL/06/2	Review and Status of Current Methods for the Detection of Verocytotoxic Escherichia Coli, Salmonella Enteritidis PT4, Salmonella Typhimurium DT104, Shigella Sonnei and Campylobacter Jejuni in Treated and Untreated Biological Effluents
Contractor	CAMR Porton Down
Author	Dr C W Keevil
99/SL/06/3	A Survey of E.coli in UK Sludges
Contractor	Hyder Utilities
Author	Dr Nick Humphrey
99/SL/06/4	E. coli in UK Mesophilic Anaerobically Digested Sludges
Contractor	Dr Nick Humphrey
Author	Dr Nick Humphrey

Ref	Title
99/SL/08/1	Beneficial Effects of Biosolids on Soil quality and Fertility – Literature Review
Contractor	ADAS WRc
Author	Dr R D Davis Dr J Hall Dr D Riddel-Black
99/SL/09/1	Recycling of Water Treatment Works Sludges
Contractor	CES Limited
Author	Dr Andrew Simpson
00/SL/02/5	The Environmental Impact of Phosphorus from the Agricultural use of Sewage Sludge – Final Reports
Contractor	ADAS
Author	Dr P Withers
02/SL/04/2	Organic Contaminants in Sewage Sludge Applied to Agricultural Land
Contractor	Lancaster University
Author	Prof Kevin Jones
00/SL/06/5	Methods for the Detection and Enumeration of Pathogens in Biosolids
Contractor	CAMR
Author	Kevin Brown Dr C W Keevil
02/SL/06/6	Pathogens in Biosolids – The Fate of Pathogens in Sewage Treatment
Contractor	Leeds University Aqua Environment CAMR ADAS University of Southampton Thames Water W S Atkins
Author	Dr N Horan
03/SL/06/7	Pathogens in Biosolids – Microbiological Risk Assessment
Contractor	WRc
Author	Dr P Gale



Contact details

A wide range of stakeholders have an interest in biosolids recycling and are involved in the regulatory control, research and use of biosolids. Some of the main organisations are listed below.

ADAS

Woodthorne
Wergs Road
Wolverhampton
WV6 8TQ
www.adas.co.uk

British Retail Consortium

Second Floor
21 Dartmouth Street
London SW1H 9BP
www.brc.org.uk

Defra

Water Quality Division
Ashdown House
123 Victoria Street
London SW1E 6DE
www.defra.gov.uk

Environment Agency

Rio House
Waterside Drive
Aztec West
Almondsbury
Bristol BS32 4UD
www.environment-agency.gov.uk

Food Standards Agency

Aviation House
125 Kingsway
London WC2B 6NH
www.food.gov.uk

Home Grown Cereals Authority

Caledonia House
223 Pentonville Road
London N1 9HY
www.hgca.co.uk

Nabim

21 Arlington Street
London SW1A 1RN
www.nabim.co.uk

National Farmers Union

164 Shaftesbury Avenue
London WC2H 8HL
www.nfu.org.uk

Scottish Agricultural College (SAC)

Environment Division
Auchincruive
Ayr KA6 5HW
www.sac.ac.uk

SEPA

Corporate Office
Erskine Court
Castle Business Park
Stirling FK9 4TR
www.sepa.org.uk

Water UK

1 Queen Anne's Gate
London SW1H 9BT
www.water.org.uk

UK Water Industry Research Ltd

1 Queen Anne's Gate
London SW1H 9BT
www.ukwir.org.uk