



Recycling of Biosolids to Land



Recycling of Biosolids to Land

Contents

• Summary.....	3
• Recycling biosolids to land.....	4
<input type="checkbox"/> Background	
<input type="checkbox"/> Regulatory framework	
<input type="checkbox"/> Safe Sludge Matrix	
<input type="checkbox"/> Scientific background	
<input type="checkbox"/> Conclusions	
<input type="checkbox"/> Contributors	
• Biosolids – safe sustainable solutions for agriculture	7
<input type="checkbox"/> Sustainable solutions	
<input type="checkbox"/> Research and regulation	
<input type="checkbox"/> A world class sustainable solution	
• Letters and statements of support	13
from Elliot Morley, Minister of State for Climate Change and Environment	
from Paul Leinster, Director of Operations (in the absence of Barbara Young), Environment Agency	
from Stavros Dimas, Commissioner for the Environment, European Commission	
from Agricultural Development Advisory Service	
from the Royal Society for the Protection of Birds	
from the Soil Association	
from Surfers Against Sewage	
from the Sustainable Organic Resources Partnership	
• Biosolids – questions and answers	20
• UKWIR Briefing – Sludge	24
• Supporting research reports on biosolids and soils.....	26
• Contact details.....	28



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, the US and other parts of the world 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 safe and sustainable and recognised as the Best Practicable Environmental Option in most circumstances by the EU and UK Government. A wide range of stakeholders involved in the regulatory control, research and use of biosolids, support the practice. Letters and statements of support are included in this pack.
- 5** Biosolids are the most researched and well regulated of organic materials applied to land. Biosolids form less than 5% of organic materials used for this purpose with sludge from industrial sources and animal manures comprising over 90%.
- 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' (1999). This agreement goes beyond the current regulatory requirements and, as a result, all untreated sludge has been excluded from use on food crops. This voluntary agreement is being incorporated into new regulations, however the water industry has been working to the expected requirements of the revised regulations since January 2002. Sludge treatment process control using Hazard Analysis and Critical Control Points (HACCP) principles was also introduced in January 2002. Further revisions to the 1986 EC Directive are expected within the next 5 years.

- 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, the US and other parts of the world. 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 62% is recycled to agricultural land. This represents less than 5% of the total quantity of organic material being applied to land with over 90% being animal manure, slurry, and other industrial wastes.

Regulatory framework

Recycling sludge is a highly regulated activity. Current controls are based on the 1986 EU 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 (amendment & related provisions) Regulations 2005 and the Waste Management Licensing Amendment (Scotland) Regulations 2003 and 2004.

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 and accompanying Code of Practice 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. Defra and the Scottish Executive have been working to put in place the new regulations since 2002 and the water industry have worked to the expected requirements of the revised regulations since January 2002.

These amendments will introduce microbiological standards for the final biosolids product, formalise the record keeping and introduce hazard analysis and critical control point procedures (HACCP) to ensure improved quality control. The UK Environment Agencies will enforce the regulations, with a statutory duty to undertake audits of compliance with process standards and will continue to audit recycling operations. The regulations will make statutory the existing controls that the industry voluntarily adheres to. The whole of the UK industry is compliant with the Safe Sludge Matrix and HACCP requirements, with internal audit and compliance procedures. These statutory controls will provide an added measure of security, with the regulator having specific enforcement powers to ensure compliance with the treatment and process control standards.

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 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





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 less than 5% 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 volume of waste.

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.





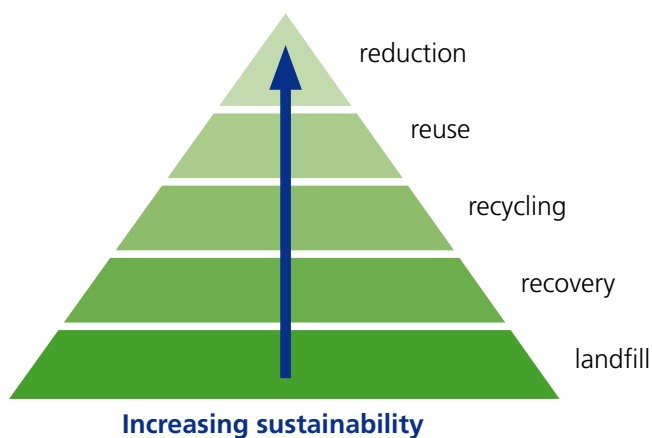
Sustainable solutions

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 although preferable to landfill is a relatively 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 fully sustainable answers to a challenge that will only increase with time.

The use of biosolids in agriculture is consistent with the Government's requirements to increase the amount of material that is recycled (Government's Waste Strategy 2000) and helps fulfil the requirements of the Landfill Directive in progressively reducing the amount of biodegradable wastes that are disposed of to landfill.





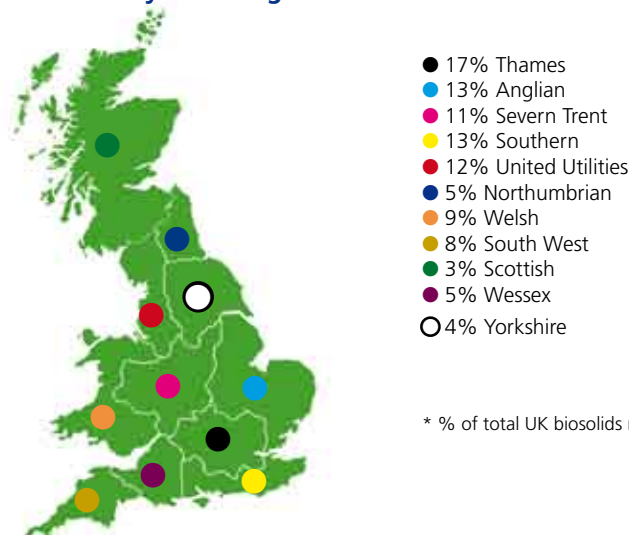
Use in agriculture

The 820,000 tonnes of biosolids recycled annually make up less than 5% of total organic material going to land. The remainder of organic material applied to land comprises of animal manure and slurry and industrial waste. The regulatory framework governing the safe use of biosolids is significantly more rigorous than that which controls the recycling of animal or industrial waste.

Benefits to soil

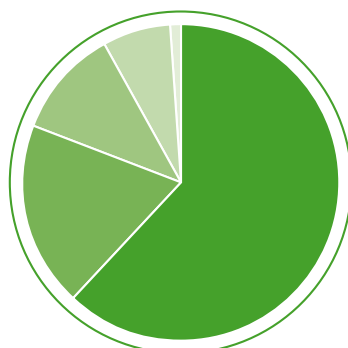
Biosolids contain plant-available nutrients and organic matter useful in improving soil structure, drainage and available water capacity. They are good sources of nitrogen, phosphorus and sulphur and contain magnesium and various trace elements. Biosolids can and do replace the need for other fertilisers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

Biosolids recycled to agriculture*



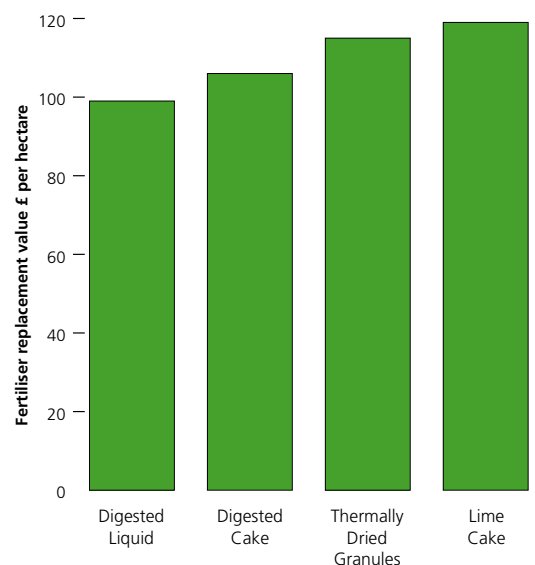
* % of total UK biosolids recycled to agriculture

Outlets for sewage sludge in the UK 2004



- 62% Agricultural land
- 19% Incineration
- 11% Land reclamation
- 7% Other (including compost, industrial crops)
- 1% Landfill

Nutrient value of biosolids





Research & regulation

A highly regulated industry

Recycling sewage sludge is a highly regulated process. Current controls are based on a 1986 EU 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. The Safe Sludge Matrix has been the driving force behind the UK adopting the highest standards of treatment for sewage sludge recycled to land, 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 Agencies, the Department of Environment, Transport and Regions and 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.

As a requirement of the Safe Sludge Matrix, sewage sludge is treated by processes to generate conventional or enhanced biosolids products which are suitable for recycling to agricultural land. Conventional treated sludge has been subject to a defined treatment process and standards that ensure at least 99% of pathogens have been destroyed. Enhanced treated sludge will be free from Salmonella and will have been treated so as to ensure that 99.9999% pathogens have been destroyed.

Crop Group	Untreated sludges	Conventionally treated sludges	Enhanced treated sludges
Fruit	X	X	✓
Salads	X	X	✓
Vegetables	X	X (30 month harvest interval applies)	✓
Horticulture	X	X (12 month harvest interval applies)	✓
Combinable & Animal Feed Crops	X	✓	
Grass and forage	X		
Grazed	X	X	✓
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)




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.

Collaborative research

Extensive research has been carried out on biosolids recycling over many years, including government sponsored work, which considered all aspects of the scientific basis for biosolids recycling to land. 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.



A world class sustainable solution

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

Health considerations

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. The water industry has invested over £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.

Letters and statements of support



Nobel House
17 Smith Square
London SW1P 3JR

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

2nd March 2006

From the Office of the Minister of State for Climate Change & Environment
Elliot Morley MP

Dear Pamela

The Use of Sewage Sludge in Agriculture

Thank you for your letter of 22 December. I am pleased to provide a statement outlining Government policy which supports the continued use of treated sewage sludge (biosolids) as a fertilizer on agricultural land.

The Government considers that recycling of treated sewage sludge to agricultural land is the Best Practicable Environmental Option (BPEO) in most circumstances. The practice aligns with the principles of the waste hierarchy of reduction, re-use, recovery and then disposal. Recycling to agricultural land also brings considerable benefits including positive effects for the fertility, workability, structure and the water holding capacity of the soil.

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 by Water UK and the British Retail Consortium. On the basis of advice from the independent expert Advisory Committee on the Microbiological Safety of Food, the Food Standards Agency has indicated that it considers 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.

I can confirm that we intend to reflect the tighter standards established by the Matrix to which the industry is working in revised regulations. I am grateful for the contribution Water UK has made to the development of these regulations.

Yours sincerely

Elliot Morley



Our ref: BSY/CAH/0406-71-9069

Ms Pamela Taylor
Water UK
1 Queen Anne's Gate
London
SW1H 9BT

Date: 27 April 2006

Dear Pamela,

Biosolids Briefing Pack

Thank you for your letter of 27 March.

The Environment Agency believes that in most cases recycling to agricultural land represents the Best Practicable Environmental Option for managing treated sewage sludge (biosolids) arising from sewage treatment. The addition of sludge biosolids to agricultural land benefits the soil in the form of nutrients and organic matter that would otherwise have to be supplied through alternative fertilisers and soil conditioners.

It has been estimated that the equivalent of 1.3 million tonnes of dry solids of sludge is produced each year in England and Wales a by-product of sewage treatment. This is predicted to rise to 1.6 million per year by 2010 due to higher treatment standards and increasing numbers of connection to the sewerage network. On average 62% of the existing sewage sludge produced is recycled to agricultural land as biosolids with the remainder going for incineration or landfill and onto land reclamation or restoration projects.

We believe recycling sludge biosolids to agricultural land, is therefore, important as part of a sustainable solution to managing biosolids

Yours sincerely

Paul Leinster

SIGNED BY PAUL LEINSTER, DIRECTOR OF OPERATIONS
IN THE ABSENCE OF BARBARA YOUNG



STAVROS DIMAS
MEMBER OF THE EUROPEAN COMMISSION

B-1049 BRUSSELS
TEL. (+32 -2) 298 20 00

Ms Pamela Taylor
Chief Executive
Water UK
1 Queen Anne's Gate
London SW1H 9BT
United Kingdom
Brussels, 02.02.2006
A(2006)30 -D(2006)61

Dear Ms Taylor,

Thank you for your letter of 20 December 2005 concerning the Commission's policy as regards the application of treated sewage sludge on to land.

As indicated in the Thematic Strategy on the prevention and recycling of waste, the Commission intends to revise Directive 86/278/EEC on sewage sludge in 2007.

The Commission's intention is to propose guidelines on sustainable practices for the application of treated sludge on to land. In this context, it may also be assessed if the scope of the revised directive could be broadened to other non-hazardous sludges and to applications other than in agriculture.

As stated in the letter of Ms Wallström of 9 April 2003, our aim in the revision of the Sewage Sludge Directive will be, on the one hand, to encourage the sustainable use of properly treated sludge and, on the other hand, to enhance the controls applied to sludge in order to guarantee that both its professional users and the larger public increase their confidence in the environmental protection guaranteed by the Directive.

I would also like to assure you that the revision process of the Directive will be accompanied by a broad consultation of all interested stakeholders.

Best wishes

Yours sincerely

Stavros Dimas



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

ADAS is a leading research-based consultancy working in the agriculture, horticulture, food, environment and international markets. We undertake research and consultancy work on behalf of Government Departments, commercial companies and other organisations through a network of research centres and regional offices throughout Britain.

We believe that the recycling of biosolids (treated sewage sludge) to agricultural land is the best practicable environmental option in most circumstances, working within the bounds of the "Sludge Use in Agriculture Regulations" and the "Safe Sludge Matrix" (www.adas.co.uk/matrix). Recycling to agricultural land completes natural nutrient cycles and enables farmers to improve the economics of crop production, and to improve soil quality and fertility through the addition of valuable organic matter. Also, recycling to land can make a contribution in reducing greenhouse gas emissions, compared with land filling, and will therefore make a contribution to UK climate change policies.

We do recognise that the recycling of biosolids (and other organic materials) to land may give rise to public concern. However, we believe that the "Safe Sludge Matrix" agreement has gone a long way towards addressing any concerns. Biosolids products are valuable organic fertilisers for beneficial use by farmers.



The Royal Society for the Protection of Birds (RSPB) statement on the application of biosolids to agricultural land used to grow food crops

The RSPB believes that biosolids have a small but important part to play in solving the problem of nutrient over-supply within the UK as a whole. At present, nutrients contained in the waste organic materials from agriculture and human activity are not adequately recycled back to plants which need these for their growth. Instead, too great a proportion of these nutrients find their way into watercourses causing pollution, poor water quality and negative impacts on wildlife. Chemical fertilisers are then used to replace these lost nutrients further adding to the nutrient over-supply problem.

The RSPB is also calling for the issue of nutrient over-supply within agriculture systems to be addressed by government. Without an adequately funded programme, a timetable for delivery and focus on nutrient surpluses, we fear that the UK will not be able to achieve favourable conservation status for Natura 2000 sites, Water Framework Directive obligations or Public Service Agreement target for Sites of Special Scientific Interest in England.

The RSPB recognises the beneficial properties that biosolids have in returning nutrients, needed for plant growth, and organic matter to soils for the growth of crops and for gardens.



The Soil Association statement on the application of biosolids to agricultural land used to grow food crops

The Soil Association believes that recycling treated sewage sludge (biosolids) to the land is an important component of sustainable farming. It would enable the closure of the nutrient cycle, an important principle in organic agriculture. At present, organic standards do not permit the use of biosolids



due to the potential or possible presence of contaminants. We are therefore keen to see the widespread adoption of the control of pollution at source and, if necessary, specific treatment methods so that in the future organic standards may allow the use of biosolids. This would be a significant step in the development of organic farming.



Surfers Against Sewage (SAS) statement on the application of biosolids to agricultural land used to grow food crops

Surfers Against Sewage (SAS) believe that, when carried out in accordance with the relevant legislation and guidelines that protect the food chain and the environment, the application of sewage sludge to land is an acceptable and beneficial practice. The natural cycling of nutrients and organic matter contained in the sludge represents a sustainable management route, avoiding the need for chemical fertilisers in the areas where sludge is used. SAS thus fully support the use of treated sludge on agricultural land, when used in accordance with the relevant legislation and the guidelines that are in place.



The Sustainable Organic Resources Partnership (SORP) statement on the application of biosolids to agricultural land used to grow food crops

The Sustainable Organic Resources Partnership (SORP) has been established to support and promote the safe use of all recycled organic matter in sustainable ways.

Our future depends now, more than ever, on protecting our atmosphere and using our resources wisely. Food must be produced with the least environmental impact and the least cost. Soil needs to be fertile to sustain agriculture. Organic matter produced during the conduct of our lives can fulfil some of these needs and hence should be regarded as important resources. Biosolids produced from wastewater treatment, are amongst those resources and, when used properly, are a rich addition to soil fertility and should be welcomed by the community.

The revised Code of Practice and Regulations are a very useful demonstration of the responsible approach being taken by the regulators and water industry and will help to make biosolids services safe, sustainable and welcome.

SORP is very pleased to endorse the recycling of biosolids to land and applauds the work of Water UK to maintain this practice.



Biosolids – questions and answers

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

All biosolids 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. 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 within safe limits as set out in the Regulations.

Non-compliant sludges, which fail to meet microbiological standards, will be segregated and undergo further treatment separately from the compliant product. A range of options and possibilities may be considered. The material may be returned to the start of treatment process and reprocessed; it may be subjected to an alternative treatment process (e.g. lime stabilisation) or it may be sent for incineration, energy recovery or disposed of in landfill. If suitable land is available it may be recycled prior to growing industrial (non-food) crops. This practice is regulated under the Waste Management Licensing (amendment & related provisions) Regulations 2005 and the Waste Management Licensing Amendment (Scotland) Regulations 2003 and 2004

What about health risks from heavy metals?

The control of heavy metals was the principal goal of the 1986 EU Sludge Directive (86/27/EEC) and the existing Sludge Regulations. Metals are deemed to be the main potentially toxic elements (PTEs) of concern when sludge is being applied to land, hence the regulatory controls require consideration of both the immediate application and the cumulative effects of sludge addition. The process is tightly regulated, with the water industry obliged to take extensive sludge samples to demonstrate that the metals levels are safe. This is enforced by the regulators under the existing statutory regime.

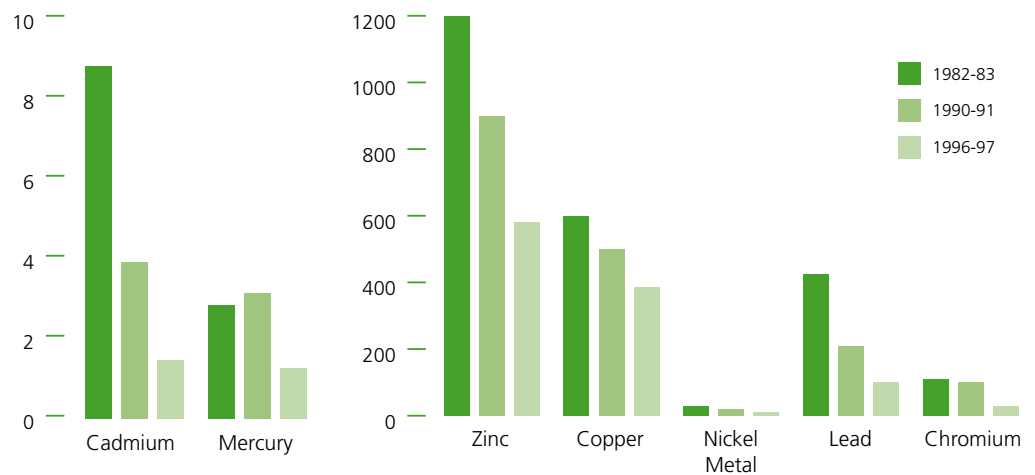
The Water Industry in partnership with the environment agencies and Government has been targeting the reduction of heavy metal inputs at source and has been very successful in reducing heavy metal concentration in biosolids. Levels of cadmium and lead in particular have been dramatically reduced over the past 10-15 years. The metals in sludge are being reduced year on year with tighter effluent controls.

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 incorporate 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 number increases to over 1000 for chromium. It should also be noted that in certain soils the presence of heavy metals such as copper (i.e. essential trace elements) can be beneficial.



Levels of cadmium, mercury, zinc, copper, nickel, lead and chromium (mg/kg ds)



Are dioxins and PCBs in sludge a problem for agriculture?

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).

The US Environmental Protection Agency (EPA) announced on 17th October 2003 that it had made a final decision not to regulate dioxins in land-applied biosolids. After five years of study, including outside peer review, the EPA has determined that dioxins from this source do not pose a significant risk to human health or the environment.

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 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 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 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 biosolids to agricultural land and will check to ensure that the farmer has been advised of his obligations; however, ultimately, it is the farmer's responsibility to ensure that he complies with his obligations.

Many operators insist on signed contracts with farmers. The revisions to the Code of Practice for the Agricultural Use of Sewage Sludge will stress these obligations more clearly. In Scotland, further information on good farming practice is provided by the Scottish Executive Environment and Rural Affairs Department (SEERAD) in the form of the Code of Practice for the Prevention of Environmental Pollution from Agricultural Activity (PEPFAA). This code has recently been revised by SEERAD in consultation with stakeholders such as Scottish Environment Protection Agency and NFU Scotland, and is available from the Scottish Executive.

How do applications of biosolids to land fit in with Cross Compliance?

Cross Compliance is an outcome of reforms to the Common Agricultural Policy (CAP) and it requires a change in how farmers are awarded their Single Farm Payment subsidy. Payments to farmers under the CAP are now dependent on the achievement and maintenance of baseline standards on environmental and public health, animal and plant health, and animal welfare.

Cross compliance came into force on 1st January 2005 and The Sludge (Use in Agriculture) Regulations 1989 and Nitrate Vulnerable Zones Action Programme are included in Cross Compliance as a Statutory Management Requirement (SMR). As part of this the EA/SEPA will have to report the outcome of their inspections to the Rural Payments Agency (RPA), in Wales to the Rural Inspectorate Wales (RIW) and in Scotland to Scottish Executive Environment & Rural Affairs Department (SEERAD). Being found to be 'non-compliant' could result in a reduction in the farmer's CAP payment.

Water companies and their contractors supplying biosolids to farms operate under the Regulations, the Code of Practice and the Safe Sludge Matrix thus assisting farmers to meet the requirements of Cross Compliance*.

**For further information on Cross Compliance visit www.crosscompliance.org.uk*

Has the water industry a standardised auditable system for sludge treatment?

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. The purpose of the guide is to show the unified approach being adopted by the water industry and demonstrate due diligence to associated food supply chains.

**To download a copy of the HACCP guide go to www.water.org.uk*



Why are the regulations being amended?

The Government announced in 1998 that it would incorporate the provisions of the Safe Sludge Matrix into the Sludge (Use in Agriculture) Regulations. Although further reassurance on the safety of recycling has been provided by the voluntary Safe Sludge Matrix, the revisions to the regulations will give statutory force to these requirements. Further reassurance will be provided through monitoring and enforcement of the regulations by the Environment Agencies.

Why have the regulations been delayed?

Defra has been working to put into place the revised regulations since 2002 and the last formal consultation on the Regulations ran from October 2002 to January 2003. This delay has been mainly due to legal problems in finding a mechanism for a charging scheme to enable the Regulator to recover the costs it incurs in enforcing the revised regulations.

What risks are associated with industrial waste/roadside run-off entering the wastewater treatment process?

Sludges from different sewage treatment works differ in character and composition according to the origin of the sewage and the type of treatment processes employed. The occurrence of potentially toxic elements (PTEs) in sewage sludge arises principally through domestic, road run-off and industrial inputs to the sewerage system in the UK. High loads of PTEs can cause problems at the sewage treatment works, impacting on effluents discharged to surface waters and biosolids recycling to land.

Industrial effluents are in fact strictly controlled through trade effluent consents and these inputs now represent a relatively small proportion of total metal discharges to sewers. The main inputs now come from diffuse sources such as road run-off and household use (e.g. copper pipes).

What are the odour impacts from biosolids?

Sewage works inevitably generate odours from time to time and these can be unpleasant for those living in the vicinity. These can be (and are) minimised and specific odour controls can be applied to certain processes. Recycling biosolids to land can also generate odours however these are usually of short duration, until the material has been incorporated into the soil.

UK Water Industry Research (UKWIR) Briefing – Sludge



UKWIR provides a framework for the procurement of a 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 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

- 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)

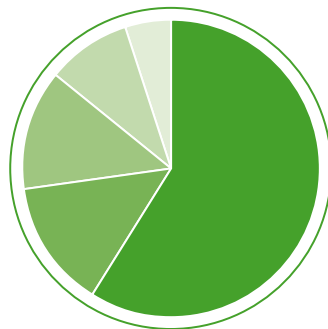
Cost of programme

UKWIR investment in sludge research since 1994 is £5.14m (including committed research), matched by £3.9m from collaborators

- £3.03m on the effects on crop yields resulting from sludge application
- £0.47m on the impact of phosphorus from the use of sewage sludge
- £0.24m on the impact of organics from the use of sewage sludge
- £0.74m on pathogens in sewage sludge
- £0.67m on incineration, water treatment works sludges etc

UKWIR investment on sludge research (including future commitments)

Total since 1994 - £5.14m



- 59% Agricultural land
- 14% Pathogens
- 13% Incineration etc.
- 9% Phosphorus
- 5% Organics



Supporting research reports on biosolids and soils

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



Ref	Title
99/SL/08/1 Contractor Author	Beneficial Effects of Biosolids on Soil Quality and Fertility – Literature Review ADAS, WRc Dr R D Davis Dr J Hall Dr D Riddel-Black
99/SL/09/1 Contractor Author	Recycling of Water Treatment Works Sludges CES Limited Dr Andrew Simpson
00/SL/02/5 Contractor Author	The Environmental Impact of Phosphorus from the Agricultural use of Sewage Sludge – Final Reports ADAS Dr P Withers
02/SL/04/2 Contractor Author	Organic Contaminants in Sewage Sludge Applied to Agricultural Land Lancaster University Prof Kevin Jones
00/SL/06/5 Contractor Author	Methods for the Detection and Enumeration of Pathogens in Biosolids CAMR Kevin Brown, Dr C W Keevil
01/SL/08/2 Contractor Author	Beneficial Effects of Biosolids on Soil Quality and Fertility ADAS, SAC, WRc Prof. Brian Chambers, Dr, Fiona Nicholson.
02/SL/06/6 Contractor Author	Pathogens in Biosolids – The Fate of Pathogens in Sewage Treatment Leeds University, Aqua Environment, CAMR, ADAS, University of Southampton, Thames Water, W S Atkins Dr N Horan
03/SL/06/7 Contractor Author	Pathogens in Biosolids – Microbiological Risk Assessment WRc Dr P Gale
03/SL/01/4 Contractor	Effects of sewage sludge applications to agricultural soils on soil microbial activity and the implications for agricultural and long term soil fertility ADAS, RothamstedResearch, WRc
Author	A Green Blue-Print for Sewage Sludge Disposal - A Survey of Public Attitudes to Sewage Sludge Disposal in South-West England M Davies – Surfers Against Sewage www.sas.org.uk



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
55 Whitehall
London SW1A 2EY
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

Scottish Executive

SEPA Sponsorship & Waste Division
1-J (N) Victoria Quay
Edinburgh
EH6 6QQ

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





1 Queen Anne's Gate
London SW1H 9BT
Tel: 020 7344 1844
www.water.org.uk

March 2006