The use of a national communication program to secure future biosolids outlets in Norway

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Abstract: Norway is among the leading countries in the world regarding the quantity and quality of treated sludge (biosolids) recycled to agriculture. However, for nearly 3 years ago the Norwegian Farmer’s Union requested a scientific risk assessment of the use of biosolids for agricultural purposes. Considering the scepticism towards use of biosolids in agriculture in the neighbouring countries and possible impacts on domestic market mechanism, it cannot be taken for granted that agricultural outlets will continue to be the main recycling route in Norway in the future.

To meet these challenges the Norwegian Water and Wastewater Association (NORVAR) has developed a national communication program in order to enhance mutual confidence and information transfer between the major stakeholders. The main objective of the program is to promote public acceptance and confidence in the utilitarian value of recycled biosolids. The program was implemented in 2005 as a 3 year program period and comprises objectives, strategies and measures respectively.

Experiences indicate that implementing the communication strategy will play an important role in securing biosolids recycling routes in Norway in the future. The paper will give a brief presentation of the program, experiences, results achieved, challenges and the way forward.

Keywords: Biosolids recycling; communication strategies; legislation; organic pollutants; quality assurance systems

REGULATIONS AND CURRENT USE OF BIOSOLIDS

The beneficial use of treated sludge (biosolids) is carried out under the guidance of the Norwegian Food Safety Authority utilising regulations concerning the use of organic derived fertilisers. (Ministry of Agriculture, Ministry of the Environment and Ministry of Health and Social Welfare Regulation of organic derived fertilisers, 2003). The regulations comprise standards of general treatment, heavy metal standards, management practise, operational standards, monitoring, record keeping and reporting. It is the policy of the Norwegian Food Safety Authority to prevent pollutionary, sanitary and hygienic problems associated with the disposal of biosolids and to encourage municipalities and biosolids practitioners to beneficial recycling of the product.

Norwegian authorities have not found the necessity of imposing specific requirements on organic pollutants in biosolids. Instead, the regulations contain a general requirement where producers of biosolids are responsible for the quality supplied and that biosolids do not contain organic pollutants, pesticides, antibiotic or other organic substances which may present health and environmental hazards associated with the use of the product.

National investigations of the matter carried out during the last 15 years have revealed low, and of significance, declining levels of organic pollutants in biosolids from the large wastewater treatment plants. This is mainly due to fact that the Norwegian Pollution Control Agency has phased out the use of certain pollutants in industry. In addition, Norway has very stringent regulations on the use of biosolids and many years of experiences with stabilisation and hygienisation requirements for biosolids applied to land.
Treatment requirements

In order to achieve the high percentage of biosolids recycling, stringent standards have been set for the content of pathogens, and the control of odour nuisances has been given high priority. Therefore, stabilisation and disinfection (hygienisation) of all biosolids are required prior to land application. In addition, biosolids must be ploughed-in when applied to arable land. When biosolids are used as an ingredient in a by-product, the requirements apply to both biosolids before mixing as well as to the final mixture. More details concerning the treatment requirements are given by Paulsrud & Nybruket (2007).

Use of biosolids

The current approved applications for treated sewage sludge are basically within agriculture mainly for the production of cereals, fertilisers derived from biosolids, soil conditioners and growth media. Approved applications are shown in Table 1.

Table 1. The Norwegian Safe Biosolids Matrix

<table>
<thead>
<tr>
<th>Application</th>
<th>Are biosolids allowed to be used?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation of cereals for the production of animal feed</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Cultivation of cereals for human consumption</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Cultivation of vegetables and potatoes</td>
<td>Yes</td>
<td>Min 3 years after last spreading</td>
</tr>
<tr>
<td>Cultivation of soft and hard fruits</td>
<td>Yes</td>
<td>Min 3 years after last spreading</td>
</tr>
<tr>
<td>Grazed grassland and horticulture</td>
<td>Yes</td>
<td>Min 3 years after last spreading</td>
</tr>
<tr>
<td>Private gardens, parks, playgrounds etc.</td>
<td>Yes</td>
<td>Only if biosolids are used as a part of a soil mixture (maximum 30 volume percentage)</td>
</tr>
<tr>
<td>Green areas:</td>
<td>Yes</td>
<td>Where a top soil is to be established but where no vegetable or animal feed crops are to be produced within 3 years of application. (Mainly land reclamation, industrial areas, road sides, green recreation areas, top soil at landfill etc)</td>
</tr>
</tbody>
</table>

- Biosolids: Sludge that undergoes recommended treatment processes which are capable of stabilizing the sludge to prevent offensive odour and virtually eliminating any pathogens which may be present in the original sludge. Recommended treatment processes are described in Novar’s facts sheet no. 6

- Approved applications assume that the quality requirements in the regulations for the use of organic derived fertilisers are met. The quality requirements are described in the Norwegian Food Safety regulations for the use organic derived fertilisers

- Background to the regulations and requirements are clearly set out in Novar’s facts sheet no. 3

- The quality control on the sludge treatment sites are systematically done by process monitoring and frequent sampling and analysis of the content of nutrients, heavy metals and microbiologic compounds. All biosolids producers have to provide users with declarations/ information about the nutrient and heavy metals content

- All wastewater treatment plants are obliged to prepare a Quality Assurance System as a part of the regulations for the use of organic derived fertilisers.
The current use of biosolids is shown in Figure 1.

Although agriculture plays the main recycling outlet in Norway there is great variation between areas of the country owing to the production and use of animal manure as a fertilizer. In some counties, there is a net surplus of animal manure, relative to available land, leaving no room for adding another source of organic material and nutrients. In these regions, alternative disposal routes are required for biosolids. The most readily available alternative outlets are considered to be within green areas.

Future restrictions on landfilling of organic waste and the forthcoming implementation of the new EU regulations concerning animal by-products, not intended for human consumption, will have a large impact on food waste and animal waste management. Due to national aims on expanding the role of biomass as a green energy source, there is a growth of interest in treating wet organic waste in existing digestion facilities. This may in turn lead to an increasing number of digestion facilities where food waste, commercial waste and manure are treated separately or combined with sewage sludge.

The future pressure on available farmland will continue to increase and it is therefore of vital importance to secure future agricultural outlets as well as developing new innovative outlets.

THE NORVAR’S COMMUNICATION PROGRAM

Renewed focus on food safety has further increased the pressure on the agricultural sector and biosolids recycling. The Farmer’s Union and the Federation of Norwegian Agricultural Co-operatives (FNAC), the organisation responsible for co-ordinating all the major food industry companies in Norway, requested a scientific risk assessment on the use of biosolids on agricultural land to be carried out by the Norwegian Food Safety Authority.

This matter may have links with the situation in Denmark where the ARLA Foods Company has launched a ban on the use of sludge on agricultural land due to claims that current practice is not sufficient to address the risks related to agricultural recycling of sludge. Similar conditions exist in Sweden where the Swedish Federation of Farmers recommended their members stop using sludge in 1999 because of concerns over the quality of sludge. However, no evidence of pollutant transfer to the food chain from the authorised use of biosolids has so far been put forward in these Scandinavian countries or in other countries.

The request from the Farmer’s Union and the FNAC was accepted by the Norwegian Food Safety Authority, and the risk assessment will be carried out by the Norwegian Scientific Committee for Food Safety with the focus on both inorganic and organic pollutants in biosolids. The results are expected to be available in 2008. Even though the scepticism towards use of biosolids in agriculture appears to be limited, it has been a key issue for the Norwegian Water and Wastewater Association (NORVAR) to address this matter and focus attention on communication measures for biosolids recycling and controlling pollutants in industrial effluents (National Biosolids Partnership. NBP EMS Communications Brochure, 2006).
However, when considering the market mechanisms, the main positions, attitudes and constraints on the use of biosolids by different stakeholders, it is difficult to predict the future position of biosolids recycling to agriculture. Despite the application of biosolids to agricultural land still being considered a safe and sustainable option, it cannot and should not be taken for granted that agricultural outlets will continue to be the main recycling route in Norway in the future.

To meet these challenges NORVAR has developed a communication strategy in order to enhance mutual confidence and information transfer between the major stakeholders (Nybruket, 2004). The main objective of the strategy is to promote public acceptance and confidence to the utilitarian value of recycled biosolids. The strategy document was developed in 2004 as a 3 year program period and comprises objectives, strategies and measures respectively. A schematic presentation of the main elements of the program is shown in Figure 2.

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**Figure 2. NORVAR’s Communication Program**

The main elements which are given priority comprise:

- The establishment of a national forum for the use of biosolids within agricultural and green areas respectively. Each forum is established under the direction of NORVAR and is made up of representatives of the major stakeholders, authorities, customers and the biosolids producers.
- The development of a HACCP based pathogen control program for the destruction of infective eggs of parasites.
- Contribute to the preparation of quality assurance systems in the form of supporting information, product specific guidelines for the use of sludge derived products as well as long - term control systems.
- Investigation and monitoring of organic pollutants in the sludge and prepare a guidance for tracing and controlling pollutants in industrial effluents.
- Each Forum will collect and exchange information, promote research and by publishing results will make information widely available.

All projects within biosolids recycling are embodied in the communication program which serves as an umbrella project for activities related to communication on biosolids recycling.

**ESTABLISHMENT OF MEETING PLACES ETC.**

In this context emphasis has been given to the description of the establishment of a Forum for use of biosolids within agriculture and a Forum for green areas as these measures form the most important part of the communication program. Both groups were established on the same basis in 2005. However, it must be added
that much efforts have been made in preparing and editing adequate and intelligible information about biosolids towards different stakeholders both in the form of regular newsletter and through NORVAR’s Web site.

The establishment of a national forum for biosolids use in agriculture

The forum is made up of representatives from the Farmer’s Union, the Federation of Norwegian Agricultural Cooperatives, the Norwegian Food Safety Authority, the Norwegian Pollution Agency, the Ministry of Environment and NORVAR members.

The pre-runner of this forum was a group established in 2002 by NORVAR together with representatives from the cereal’s industry and the National Agricultural Inspection Authority. This co-operation was established for the preparation of a number of independent, non-biased fact-sheets on the use of biosolids in agriculture in general, and for cultivation of cereals in particular. Independent national experts in various disciplines (pathogens, organic and inorganic contaminants, plant health, resource issues etc) were asked to collate existing data and produce the material, which was then discussed and agreed upon in the group and among all the members at the final session. The aims of the new national Forum are as follows:

- To establish a forum where the major stakeholders within the food chain related to production, treatment and use of biosolids for agricultural purposes can discuss and share experiences.
- Collect and exchange information, promote research, publishing results and making them widely available
- Establishment of a joint database of knowledge about the use of biosolids within agriculture. This does not necessarily mean that different stakeholders are supposed to interpret knowledge and act in the same way, but that all agree upon where such information/knowledge can be found.
- Identify and discuss gaps of knowledge in order to ensure that the stakeholders become acquainted with approaches to problems and that measures are implemented respectively. This can either be joint measures or measures implemented under the direction of each member.
- Develop and maintain recommended standards and protocols for safe recycling of organic material and nutrients in biosolids.

Most of the work within the Forum has focused on presentations and discussions about organic pollutants in biosolids and risks associated with the use in agriculture. An important part of this work has been to provide background material for the risk assessment which is in the course of preparation by the Norwegian Scientific Committee for Food Safety. The background material includes results from national and international investigations of known and new organic pollutants in biosolids as well as international risk assessments associated with the use of biosolids on agricultural land.

Furthermore, case studies of the use of biosolids in agriculture have been arranged for authorities, agricultural organisations, biosolids producers et al. in order to demonstrate the beneficial recycling of biosolids and to enable them to make the best use of benefits and avoid risks.

The establishment of a national forum for biosolids use within green areas

The forum is made up of representatives from the major stakeholders comprising the Norwegian Food Safety Authority, The Directorate of Public Roads, the Norwegian Association of Forestry and Landscaping, landscape gardeners and biosolids producers and practitioners. Other experts are asked to attend the meetings depending on the need and the topics to be discussed. The aims are very similar to the aims of the Forum for biosolids use in agriculture. The key findings so far can be summarised as follows:

There is lack of knowledge to the utilitarian value of recycled biosolids among landscape gardeners and other potential users. Furthermore, it also appears that biosolids practitioners and producers have different understanding of important parameters associated with application of the products. It is also evident that scepticism towards the use of treated sludge is often linked to a lack of basic knowledge about biosolids and communication on biosolids use.
The fertilizing effect and agricultural properties of different kinds of treated dewatered sludge has been thoroughly investigated during the 1990’s, and the producers have been able to provide reliable guidelines for the application of treated sewage sludge in agriculture. Knowledge concerning other market outlets and how different products such as thermally dried products are suited for such outlets has however so far been limited (Tornes et al., 2005). This is especially the case for growing media and soil improvers as low quality products may lead to poor crop growth or plant damage. At the worst, such damages can lead to loss of confidence to the products and biosolids recycling in general.

The most urgent challenge for application of biosolids within green areas are related to method of analysis for determination of available plant nutrient and minerals in biosolids as well as providing adequate information and guidelines depending on type of biosolids and application of the products. In addition, priority will also be given to the promotion of new demonstration projects for application in golf courses, road constructions, forestry etc.

**CHALLENGES AND THE WAY FORWARD**

Satisfactory quality assurance systems are of vital importance for market acceptance of sludge derived products and to ensure consistency and conformity with the regulations. In Norway all wastewater plants are obliged to prepare a Quality Assurance System as a part of the regulations for the use of organic derived fertilisers.

In line with different levels of sludge processing in various areas of Norway, the status of quality assurance shows large differences and many plants have not started on this work. There is a clear message from stakeholders that a long term control system is needed and that recycling responsibility is not just about providing a quality product, but also about providing a quality service. Those involved in regulation, treatment and recycling of biosolids need to ensure that minimum standards are consistently achieved and that best practices are applied and followed across the country.

In the longer term NORVAR aim to incorporate the results from the communication program in a joint policy document comprising tools such as codes of good practice for biosolids recycling.

A considerable amount of mineral fertilisers, growing media and soil improvers used in agriculture and green areas are imported to Norway. A large proportion of these products are based on peat due its content of stable organic matter. However, environmental and economical benefits can be obtained by using biosolids and other organic residuals in these products. It is therefore important for NORVAR to promote co-operative trials and demonstration projects between different stakeholders in order to develop mineral fertilisers, growing media and soil improvers based on biosolids, compost and other organic residuals as alternative base organic material content.

Considering emission of climate gases from the agricultural sector and the growing world wide shortage of both phosphorous and peat there is a need to place these issues on the local and national political agenda. It is therefore the aim of NORVAR to focus on the beneficial recycling of biosolids in agriculture and green areas by involving the authorities, scientists, chemical suppliers and others in this matter.

There are potential synergies with other waste streams for use in the treatment of sludges and there is a need to explore this with other stakeholders and encourage regulators to start considering revisions of legislation in line with the market situation, development of technologies and application of the products. This is especially the case for co-digestion facilities where manure and wet organic commercial waste are treated together with sewage sludge as well as the products and applications within agriculture and green areas.

Biogas will play an increasing role in the production of energy based on renewable resources. Biogas can be produced from locally produced resources (wet organic waste) and converted to the beneficial production of electricity and heat. Alternative purification of biogas to natural gas standards and its distribution in the form of biomethane through established natural gas systems are likely to be future key processes driving advances in biogas technology. In both regards, the biogas enjoys clear advantages over many renewable energies.
There is an increasing interest in using biosolids in forestry in the Scandinavian countries. Comprehensive trials with thermally dried pellets in Sweden, Norway and Finland have demonstrated that biosolids can significantly increase the forest productivity without any environmental consequences providing that the amounts are appropriate to the need of the trees. This is important as reforestation in northern areas may become increasingly dependent on nitrogen supply to meet its future nutrient demands. In particular, thermally dried products may therefore provide an important alternative to mineral fertilisers in developing commercial forests as well as future demand for energy forestry and the reduction of carbon dioxide emissions.

CONCLUSIONS

The establishment of the Forum for biosolids use within agriculture and the Forum for green areas has revealed a genuine willingness to resolve outstanding issues and work positively together. The meeting places should therefore be regarded as a start of this very important communication process. Many useful contacts have been made, new perspectives have been shared and discussed and a number of other stakeholders will be involved in resolving outstanding challenges. By working together the identified challenges for the future can be jointly resolved for the benefit of the whole community.

So far much effort has been made on organic pollutants and risk assessment, and the next step is to focus on measures required to promote biosolids as a beneficial resource. In this context, priority will be given to establishing confidence with the beneficial recycling of biosolids within agriculture since this is considered likely to lead to public acceptance and confidence within green amenity outlets etc. In this respect, NORVAR look forward to receiving the results from the risk assessment on the use of biosolids on agricultural land which is in progress under the direction of the Norwegian Scientific Committee for Food Safety. This is considered to be a very important contribution to supporting and strengthening the confidence towards agricultural biosolids recycling.

It is also important that the influential approach adopted with appropriate authorities is based on holistic environmental thinking that combines synergies and results from successful demonstration projects in order to convert the views of the authorities and politicians to look upon biosolids as a resource and not a waste.

In this context it is important to establish guiding principles that will help promote and support the positive synergy between the sustainable management of soils, renewable energies and the responsible recycling of organic residuals. This is particularly challenging in the forthcoming implementation of new regulations and amendments of current regulations.

REFERENCES


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