The use of sewage fertiliser products on arable land– requirements from the farmers' perspective

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Abstract

The aim of this paper was to discuss farmers' requirements for using sewage products as fertilisers on arable land. A questionnaire followed up with interviews was used in a watershed area close to Stockholm. The study also included calculations of the cost to farmers of handling different sewage products. Farmers were most interested in source-separated human urine and precipitated septic tank sludge originating from on-site treatment. A high concentration of plant nutrients was important for farmers, as well as good hygiene quality of the product and a low content of heavy metals. However, the most important factor for farmers was that the expenses for e.g. collection, transporting, storage and spreading were covered.

Introduction

In Sweden, interest is growing for small-scale and source-separating wastewater systems from which the sewage products can be recycled as fertilisers in agriculture. One reason for this is the recommendation from the Swedish Farmers' Organisation (LRF) not to use mixed sewage sludge from conventional wastewater treatment plants on arable land. The Swedish food industry is also very reluctant to buy agricultural products grown on fields fertilised with sewage sludge. Several environmental systems analyses have also found that source-separating systems are more environmentally friendly than conventional (e.g. Bengtsson *et al.,* 1997; Kärrman *et al.,* 1999; Jönsson *et al.,* 2000). Local recirculation systems also decrease the need for transportation, and thus air emissions. However, finding arable land on which to spread the products has been identified by urban authorities as a serious obstacle to the introduction of systems for recycling the sewage products from on-site treatments. This problem also remains for sewage fertiliser products acceptable to the food industry.

Why is there such a low demand from the agricultural sector for these sewage fertiliser products? What are the requirements of farmers as regards the systems and the sewage fertiliser products? How can systems, in which for example farmers act as entrepreneurs, be designed? In order to answer these questions, a study was performed in the watershed area of 'Oxundaån' close to Stockholm (Sjöberg, 2003). In this area, which includes five municipalities, different projects aimed at improving the water quality have been initiated. As 90% of current on-site treatment plants in this area are considered to be operating insufficiently, the urban authorities concerned have an interest in alternatives to the current wastewater systems.

Methods

Initially, a questionnaire was sent out to all 180 farmers in the area, involving 6800 hectares of arable land. Answers were received from 50 of the farmers, corresponding to 70% of the arable land in question. Eleven of the farmers were further selected for interviews, based on their interest in taking part in future systems for recycling of sewage fertiliser products. These interviews were organised in a semi-structured way consisting of both quantitative and qualitative parts. In both the interviews and the questionnaire, questions were posed concerning farm production, as well as farmers' attitudes towards different sewage products originating from on-site treatment and their willingness to act as entrepreneurs within these systems. The on-site sewage systems considered were urine separation, blackwater separation, chemical precipitation in the septic tank, package treatment systems and filter beds. These products were selected as they give a high reduction in nitrogen and/or phosphorous and enable a high degree of recirculation. Information on the different systems was sent out to the farmers beforehand. The study also included calculations of the costs relating to the handling of different sewage products; i.e. transportation, storage and spreading operations.

Results and discussion

More than 50% of the farmers were positive towards the use of sewage products from the neighbourhood. Five of these, holders of 1100 hectares in total, were highly interested in starting a closer cooperation with the community by handling and using different sewage products as fertilisers. These 1100 hectares correspond to the area required for spreading urine from 16 000 individuals, precipitated septic tank sludge from 25 000 individuals or blackwater from 16 000 individuals. The most interesting fertiliser products from the farmers' perspective were source-separated human urine and precipitated sewage sludge from septic tanks originating from on-site treatment (Fig. 1).

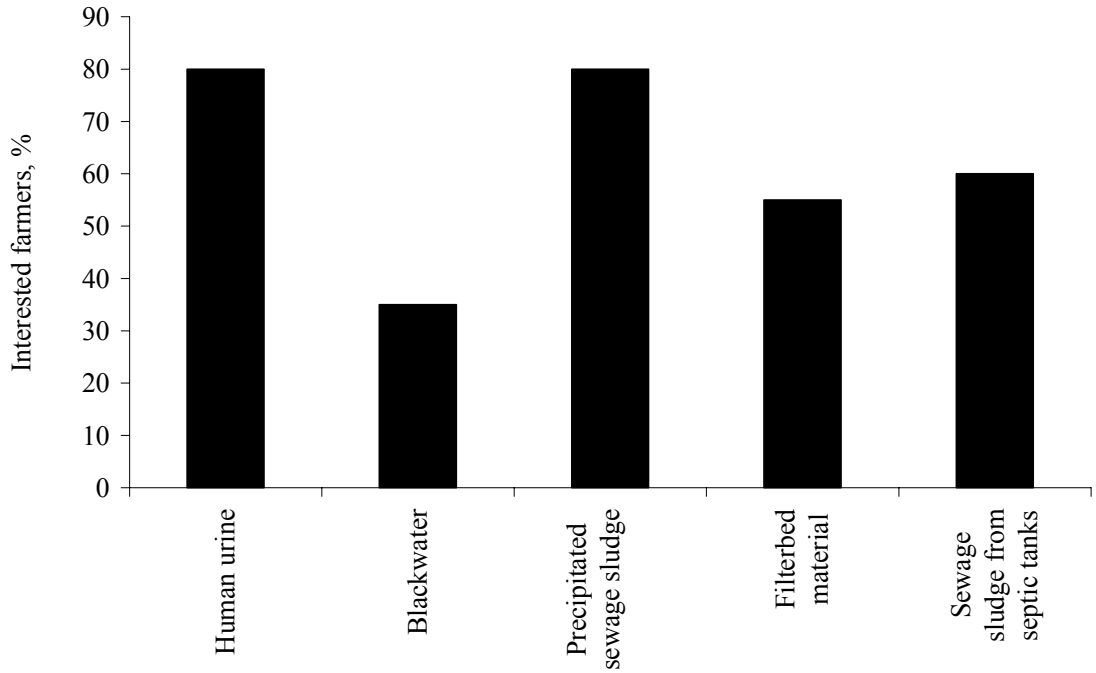

Figure1: Degree of interest of farmers in different fertiliser products from on-site sewage systems.

A high concentration of plant nutrients was a key issue for the farmers. The main advantages with source-separated human urine were its high content of available nitrogen and the fact that the spreading could be extended in time, since it can be spread both before sowing and in the growing crop. A phosphorus-rich product, such as precipitated sewage sludge from septic tanks, could on the other hand be spread during less busy seasons, e.g. the autumn, which can minimise the risk for soil compaction. Both source-separated human urine and sewage sludge from septic tanks involve relatively small volumes to handle, compared with e.g. blackwater, a fact that was also highlighted as important by the farmers. However, different machinery is required for handling different products depending on the characteristics of the products.

Good hygiene quality of the product was pointed out as important, as well as a low content of heavy metals (Fig. 2). According to the farmers surveyed, the amount of heavy metals in sewage products must be low enough not to give rise to an accumulation of these in the soil. In cases where the farms were situated close to residential areas, possible odour during the spreading operation could be another obstacle.

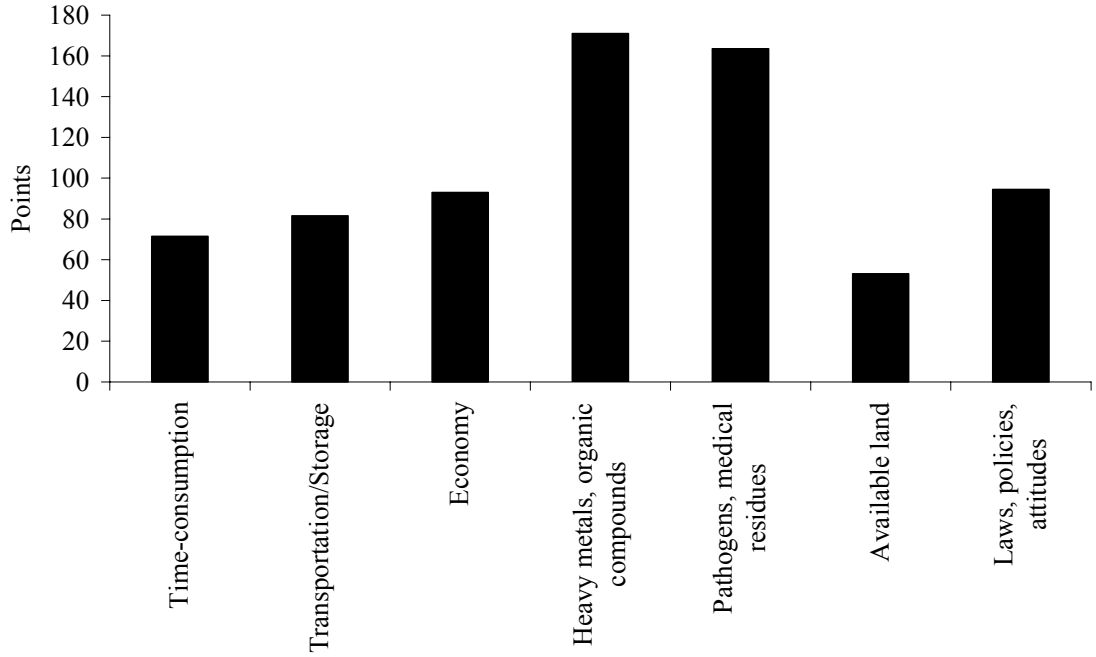

Figure 2: The evaluation of factors regarded as obstacles for using sewage products from on-site sewage systems among the farmers who responded to the questionnaire. The points came from a ranking system where the highest points were given to the alternative regarded as the most difficult obstacle.

Utilising plant nutrients in sewage products is more interesting for farmers specialising in crop production than for farmers specialising in milk and meat production, as those often already have a surplus of plant nutrients on their farms. Existing spreading equipment on farms handling manure might, however, be an economic and practical advantage for animal farms. From an environmental point of view, sewage products should be used on farms specialising in crop production, as the plant nutrients in sewage products can replace mineral fertilisers on such farms.

The farmers stressed the importance of acceptance for these sewage fertiliser products from the food industry as well as the authorities and neighbours. It is therefore an advantage if the farmers or the farmers' organisations become involved in an early stage of the planning of such

systems. Some farmers wanted the responsibility for the whole chain, including collection, storage and spreading, while others only wanted to let their land for spreading the products.

However, an absolute prerequisite for the farmers' involvement was that the expenses for e.g. collection, transporting, storage and spreading should be covered. Today, it is not unlikely that the cost of the spreading operation will in itself exceed the value of plant nutrients in the sewage products. Spreading under poor soil conditions might also give severe soil compaction. For urine, the economic value of the plant nutrients corresponds approximately to the cost of spreading concentrated urine, without any flushwater mixed in. In this study the cost of collection, storage, sanitation and spreading of source-separated urine was 120 SEK per person and year. The corresponding cost was 1100 SEK for blackwater and 200 SEK for precipitated sludge. The value of the fertiliser products was between 5 and 22 SEK per person and year. Although the farmers surveyed said that lack of time was an obstacle today to becoming involved in sewage fertiliser recycling, they would consider making other priorities if the economic compensation was high enough.

Conclusions

- Farmers interested in using sewage products as fertilisers can easily be identified by strategic methods.
- Several different sewage fertiliser products might be of interest for agriculture. The machinery required for handling the different products differs depending on the characteristics of the product.
- Farmers seem to be most interested in source-separated human urine and precipitated septic tank sludge.
- The quality of the sewage product regarding e.g. hygiene and heavy metals must be high and guaranteed through continuous analyses.
- It is important to involve farmers and other actors, e.g. the food industry, at an early stage when planning new recycling wastewater systems in an area.
- The sewage products represent an economic value corresponding to their concentration of plant nutrients. However, in most cases the farmers must be compensated for the costs related to e.g. collection and transportation and even spreading.

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