

CHAPTER 3

PROBLEM STATEMENT

3.1 CONCLUSIONS FROM THE LITERATURE REVIEW (CHAPTER 2) RELEVANT TO THIS THESIS

From the literature review in chapter 2, a number of important points are of relevance to the further development of this thesis. These are summarised in the following paragraphs.

The primary aim of sanitation is to prevent the transmission of excreta-related diseases. However, with all sanitation systems there is a risk of disease transmission related to the handling or use of the end product. Therefore, even a well functioning system could enhance pathogen survival and lead to an increased risk of disease transmission for those handling the end products or consuming crops fertilised with them. A greater understanding of pathogen die-off in dry sanitation systems is required where handling and/or use of excreta are expected.

Relying on treatments recommended for faeces is a simpler method of ensuring hygienic safety than monitoring by the analysis of microbiological parameters. Different treatment options are possible for ensuring a hygienically safe fertiliser product. Further research, especially concerning inactivation of microorganisms in faeces under different environmental conditions, would be valuable for establishing guidelines on handling and using faeces in a safe manner.

The discussion in the literature review showed that pathogen destruction in dry sanitation systems, particularly in the vaults of urine-diversion (UD) toilets, is mainly dependent on storage time, pH, temperature, humidity, moisture content, organic content of the faecal material, and type of bulking agent added. With these types of systems, some handling of faecal material will always be necessary, not just to empty the vaults and dispose of the material, but also in cases where it will be used for agricultural purposes. It is thus of utmost importance to ensure that the material is safe to handle. This implies that the primary treatment in the vault should, as far as possible, ensure the required level of safety.

While much research has been carried out internationally into pathogen destruction in the vaults of UD toilets, the same cannot be said of South Africa. There is also a wide range of results and conclusions, with recommended storage times varying from six months to two years. There is currently a variety of design and construction methods in this country, and also a number of different types of prefabricated commercial systems on the market. Many of these have been seen to be deficient in various respects, and very often communities are not sufficiently instructed in the proper operation of the toilets. The result is that the country is littered with thousands of poorly conceived and implemented UD toilets. It is also evident that safety aspects of excreta handling have not been given sufficient thought, with vault designs that do not allow sufficient storage space or where the faecal material is very difficult to remove, for example. Design and operational

guidelines are required in order to assist practitioners in these and other respects. Proper regulation of project implementation, which is currently lacking, is also necessary to ensure a uniform (high) standard of toilet design and construction, as well as safe management of excreta, especially faeces. The lesson that has been learned with the proliferation of the prefabricated commercial UD toilets is that there has been too much emphasis on a “quick solution” rather than quality.

While the current (July 2007) number of UD toilets in South Africa is estimated to be more than 60 000, the technology is yet to be generally recognized and accepted by many local authorities and communities. With various examples of poor implementation in evidence, a single outbreak of gastro-intestinal illness in an area served by these toilets will be sufficient to tarnish the image of a basically good sanitation technology. It is essential to gather more information concerning the safety of handling faecal material collected from the toilet vaults, so that sound recommendations can be made concerning optimum vault size, storage period, etc. in order to ensure that the material is safe to handle and either dispose of or use for agricultural purposes.

Sound management practices could play an important role in reducing the health risks involved in emptying the vaults of UD toilets and the disposal or further use of faecal material. From the public health viewpoint, it is necessary to reduce, as far as possible, the risk of handling faecal material. To do this, a better understanding of the factors influencing pathogen die-off in the vaults is required.

Ecological sanitation faces specific challenges to counteract pathogen transmission in the handling of faecal material and in its use on agricultural land for food production. With dry handling of the faeces, as in UD systems for example, primary treatment has moved to the household instead of being part of a centralised system. This is an important difference from a barrier perspective. To ensure the necessary safety against pathogen transmission, therefore, it is essential to have simple installation, handling and management guidelines (Jenssen et al 2004).

However, there is still very little agreement on the actual storage period required in order to achieve the reduced pathogen limits required by e.g. the South African guidelines. No research at all has been carried out in South Africa on this subject. Implementing agencies engaged in UD sanitation projects, and in particular the technical and social staff involved, need to be aware of the specific design and operation criteria for UD toilets, not only where use of faecal material for crop growing is proposed but also for routine handling and disposal of the material. There is currently a lack of awareness of the important issues in South Africa, and information and guidelines on UD toilet design and operation are urgently needed by practitioners.

3.2 FOCUS OF THIS THESIS

The focus of this thesis, therefore, is to investigate the efficacy of various methods aimed at enhancing pathogen destruction in the vaults of UD toilets, with the aim of (a) establishing the best combination of factors/methods, in particular the vault storage period required, and (b) producing guidelines for the construction, operation and regulation of these systems. The various factors influencing pathogen die-off have been set out earlier in this thesis and these will be examined in more detail using actual faecal material extracted from working UD toilets. The overall purpose of the research is to establish safety criteria for handling of faecal material from UD toilets. Urine will not be considered any further as its relative safety for handling and agricultural use has been established.

The above investigation into pathogen die-off in UD toilet vaults is fully detailed in chapter 5. It is preceded, in chapter 4, by a description of an agricultural field trial carried out with the purpose of establishing the pathogen uptake by spinach and carrots grown in soil amended with ecosan biosolids. This trial was carried out to establish whether there is a risk of contamination of certain food crops when using unstabilised faecal material. The guidelines referred to are contained in chapter 6.