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Sustainable wastewater management in the European Union

Identifying the existing regulations and guidelines regarding small-scale on-site wastewater management, particularly concerning the safe reuse of the source separated wastewater streams in the agriculture



Sanna-Mari Kuisma

The Hague University of Applied Sciences

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Student number: 20050718

Supervisor: Mrs. K.C.M. Triest



THE **HAGUE**
UNIVERSITY
OF APPLIED SCIENCES

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Executive Summary

The scope of this paper is safe and sustainable sanitation in agriculture. Specifically, the idea of the paper is to find out the existing regulations and guidelines concerning a sustainable wastewater management in the European Union (EU), regarding small-scale on-site wastewater management, and particularly regarding the safe reuse of the source separated wastewater streams in the agriculture. These are identified, first, on the EU level, and second, on a national level. As specific countries for the purpose of studying national legislation three European Union Member States, namely Finland, the Netherlands and Sweden are studied. Furthermore, a part of the study is dedicated to the World Health Organisation's (WHO) Guidelines for the safe use of wastewater, excreta and greywater. In that part, it will be seen whether the Guidelines could contribute in formulating guidelines for the EU.

The findings of this study show that currently sustainable sanitation is not fully possible in the European Union, and in order to allow this, the European Union has to modify its legislation in the future. The WHO Guidelines could help in formulating new legislation for the EU.

Preface

This study concerns safe and sustainable sanitation in the European Union – a topic highly contemporary, as the United Nations has dubbed 2008 the International Year of Sanitation. This year has seen many conferences on sanitation. In order to get a nice kick off for this study, I participated in one of them: the High-Level Policy Dialogue on EU Sanitation Policies and Practices in Brussels, partly organised by my thesis provider Women in Europe for a Common Future (WECF). During the conference, and also while conducting the study, I learned a lot about sustainable sanitation. It helps making the world a better place for us all by contributing to the Millennium Development Goals (MDG's), set by the United Nations. Especially MDG 7 is covered: sustainable sanitation aims to bring safe drinking water and improved sanitation to people in need while maintaining the ecological balance of the most vulnerable areas of the world.

I have conducted this study as part of my internship for WECF, an international network of women's and environmental non-governmental organisations, which has offices in the Netherlands, Germany and France, but which is active throughout Europe – and especially in Eastern Europe, Caucasus and Central Asia. Besides being a project assigned to me by the WECF, this study is also a final thesis – the ultimate test of skill before obtaining a bachelor's diploma from The Hague University of Applied Sciences, HEBO.

I am grateful to WECF both for having been able to finish my internship at their Utrecht office, and for having been given a very interesting research to conduct. Thus, I hereby want to thank all my WECF colleagues for making my internship and research as pleasant as it was.

Especially I want to thank Mrs. Margriet Samwel and Mrs. Claudia Wendland, for without them I would not have been able to write this thesis. Furthermore, I want to thank Mrs. Annemarie Hekkers for being my mental support at the office. Thank you goes also for my supervisor at HEBO, Mrs. Kitty Triest, for she helped me through some very rough patches during my internship. A final thank you goes to Benoît: thank you for being my patient proof-reader!

Happy reading!

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Abbreviations

EU	European Union
IFOAM	International Federation of Organic Agriculture Movements
UNICEF	United Nations International Children’s Fund
WECF	Women in Europe for a Common Future
WHO	World Health Organisation

Glossary

Population equivalent	As defined by Directive 91/271/EEC, population equivalent “means the organic biodegradable load having a five-day biochemical oxygen demand (BOD5) of 60 g of oxygen per day” (1991, Art. 2(6))
Ecological sanitation	Also: ‘ecosan’. A way of sanitising human excreta that is not harmful to the environment. The idea is to recycle all nutrients from excreta for example in agriculture
Safe sanitation	A system of wastewater management in a way that prevents environmental pollution and focuses on safe reuse/recycling of wastewater streams and nutrients
Waste water	Impure water that can originate from private dwellings, as well as from businesses and industries
Septic tank	Small-scale sewage-treatment system, that can be used especially by private dwellings
Human waste	Human excrement: urine and faeces
Sewage sludge	The partly solid residue that is left over from waste water treatment
Safe reuse of human excreta	Using human excreta as fertiliser in farming in such a way that no environmental or health risks can be caused during application, or by the consumption of fertilised products by humans or animals.
Pit latrine	A hole dug in the ground, which is used as an alternative for a conventional toilet

Chapter 1: Introduction

Safe sanitation is not only a problem in developing countries, as one might think. Over 20 million citizens in the European Union do not have access to a safe sanitation. Furthermore, even having a safe toilet connected to a septic tank or a sewage system, does not mean that the wastewater is adequately treated.

According to data from 2000, 34% of the wastewater in Europe is not treated at all or is insufficiently treated (WHO/UNICEF, 2000, p. 19). Even though also large cities are affected, most of the citizens lacking safe sanitation options live in rural areas, many of them in villages with less than 2,000 inhabitants. In many areas of the European Union, satisfactory centralised water supply and sewage systems are unaffordable. In these areas, people are often left to take care of their own water management and sanitation systems, and the quality of it depends on the skills and the money these people have at their hands. Often the solution is a simple pit latrine. This is not a good solution: pit latrines often end up seeping pollutants from the pits to the nearby areas, polluting both the soil and water. WECF has seen many bad examples of this, during numerous projects in Central and Eastern Europe.

In those small rural communities where the population density is low, the costs of connecting to the water supply and sewage systems might become intolerably high. Often these regions with low population density are also poor. This is why the people do not have the capital to invest in extensive sewage systems, nor do they have the technical capacity available to build and maintain them.

Today there are ample inexpensive and ecological sound alternatives for the conventional sewage systems, and these alternatives would cut the current wasteful water use. An option for modern wastewater management is de-centralised sanitation, including so-called “sustainable wastewater management”. This idea holds that the wastewater, urine and faeces human beings produce are considered a resource and will be sanitised on the spot. Source separating systems allow, for example, the collection of human urine and faeces separately from other wastewaters, which are then sanitised and reused separately in agriculture. There are several studies done (Pradhan S.K., Nerg A.M., Sjöblom A., Holopainen J.K., Heinonen-Tanski H., 2007; Drangert, J-O., 1998; Winblad et al., 2004), which confirm that urine is a good fertiliser, and agriculture would greatly benefit from the nutrients retrieved from it. According to Heinonen-Tanski and van Wijk-Siebesma (2005), the amount of excreta that a person produces annually can be used to fertilise “250 kg of cereal” – that is enough for a years supply of cereal for one person (p. 403).

Whereas there are some binding regulations on wastewater, it does not mean that it effectively covers all the European Union regions. Quite the contrary: for example Article 3 of the Urban Waste Water Directive only calls for an urban waste water collecting systems for those agglomerations that have a population equivalent (p.e.) of more than 2000 (Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, 1991). This means that settlements with p.e. smaller than this

have no binding obligations from the EU's part to wastewater treatment. This means that the member states will have to take their own initiative to secure sufficient wastewater treatment in these areas. Often this is not done, which leaves the small agglomerations to handle their own affairs, and as it was said before, they often lack the finances and/or the technical skill to do this. Additionally, there are no regulations for source-separating systems for the sanitising procedures of human excreta, and furthermore, on EU level, there are no regulations on the safe reuse of human excreta in agriculture nor are there regulations on the safe reuse of human excreta in (organic) farming. Especially in the case of decentralised, source separating treatment- and reuse systems, additional regulations are needed both on the EU-level, and on national levels, to stimulate a safe management and reuse of wastewater and human excreta. Such additional regulations could be based on the WHO Guidelines for the Safe use of Wastewater, Excreta and Greywater.

Central Question

The central question of this research report is “What are the existing regulations and guidelines concerning a sustainable wastewater management in the European Union, regarding small-scale on-site wastewater management, and particularly regarding the safe reuse of the source separated wastewater streams in agriculture?” In this paper, an answer will be given to the central question in my final paper. Thus, the existing regulations and guidelines concerning a sustainable wastewater management in the European Union, regarding small-scale on-site wastewater management needs to be researched. Furthermore, the possibility for allowing safe reuse of the source separated wastewater streams in agriculture must be studied. Since the European Union (EU) consists of sovereign states, it can be expected that each state has its own ways of managing its wastewaters and to regulate agricultural systems. This is why, in order to make a conclusion on EU-level, I first needed to study some of the member states. To narrow down the research, and to make it more specific, I chose to study the following countries: Finland, Sweden and The Netherlands. I chose these specific countries because I wanted to show that in the EU, there are already states that have advanced safe wastewater management systems that make use of the recycling possibilities of wastewater in agriculture, or at least they have started with pilot projects in this field.

Furthermore, I have chosen 11 specific sub-questions that have to be answered in order to be able to answer the central question.

Sub-questions

1. Are reports available of relevant earlier research on sustainable wastewater management in the European Union, regarding small-scale on-site wastewater management including a safe reuse of the source separated wastewater streams in agriculture?
2. Are human waste, human urine or human faeces considered as a resource/fertiliser suitable for recycling purposes in the agriculture on EU level? Which regulations and /or directives are related to this issue?
3. What is the status quo of the Sewage Sludge Directive 86/278/EEC and the planned Directive for organic waste/compost and where and what are the linkages to human waste?
4. How can the use of human waste, human urine or human faeces be implemented in the regulation for organic farming (EU Bio label)?
5. Does the IFOAM (International Federation of Organic Agriculture Movements) have some binding regulations on the use of human excreta in organic farming?
6. Which regulations or directives have to be changed in order
 - a. to include small communities in the wastewater directive?
 - b. to consider waste water as a resource?
 - c. to focus on the properties of the flow-off of the wastewater instead of on the treatment procedures?
7. What are the regulations on small-scale/on site wastewater management in the different EU member states, such as Finland, Sweden, and the Netherlands?
8. Are there any EU Member States which allow a safe re-use of human excreta in agriculture? If yes, are there guidelines for sanitising processes and quality of the materials?
9. Are there any regulations on the management of pit latrines in the EU member states?
10. Are there regulations on the reuse of human excreta extracted from the pits of the outdoor latrines in the EU member states?
11. How could WHO guidelines for the safe use of wastewater, excreta and greywater be implemented on the EU-level?

Questions 2-6 and 8 are answered in Chapter 2. Chapter 3 will provide answers for questions 7, 9 and 10. Question 11 is covered in Chapter 4.

1.1 Explanation of research methods

The majority of the research was conducted as desk research. Ample literature and material was available during the research. Due to the nature of the topic, a large part of the information has been made available online. The Internet proved to be an excellent tool for finding information. Other literature was so-called traditional print literature.

For some questions and points experts were contacted, to get a better insight into the topic. Sadly, not many of the experts contacted responded. However, those who did, provided excellent information, and insights, and were extremely helpful.

A great deal of earlier research has been conducted on sustainable wastewater management in the European Union; however, it is often very technical and focussed only on one or two countries. This is why a great deal of text comparison had to be done, in order to find satisfactory answers to each research question. Some of the questions were left unanswered, however, as there was either no information available in a translated version, or the information simply did not exist.

For some of the research questions I could find no definite answers. During the research no proof was found for

- a) the possible regulations in the management of pit latrines; or
- b) on any regulations on the reuse of human excreta extracted from the pits of the outdoor latrines in the Member States.

Similarly, I was unable to find a satisfactory answer to the question on which regulations or directives have to be changed in order to focus on the properties of the flow-off of the wastewater instead of on the treatment procedures.

Chapter 2: Legislation regarding human excreta use in agriculture

2.1. Overview of the chapter

To find an answer to the question “What are the existing regulations and guidelines concerning a sustainable wastewater management in the European Union, regarding small-scale on-site wastewater management, and particularly regarding the safe reuse of the source separated wastewater streams in the agriculture?”, it is necessary to study European Union legislation. In addition, in this chapter, relevant legislation for three European Union Member States are studied. I chose to first look at EU legislation, and then at the legislation of each specific country.

2.2. Legislation conventional farming on an EU level

In the European Union, there is as of yet no legislation on the use of human waste, urine or faeces in agriculture. However, the EU has legislation regarding for example agriculture and fertilisers that has to be considered. The regulations and directives relevant to this question on a European Union level are the following:

I. Regulation (EC) No 2003/2003 Of The European Parliament And Of The Council of 13 October 2003 relating to fertilisers

The 2003 regulation relating to fertilisers lists, in its Annex I, those substances that may be used in agriculture as fertilisers. According to its Article 14,

A type of fertiliser may only be included in Annex I if: (a) it provides nutrients in an effective manner; (b) relevant sampling, analysis, and if required, test methods are being provided. (c) under normal conditions of use it does not adversely affect human, animal, or plant health, or the environment. (Official Journal of the European Union, 2003, Regulation (EC) No 2003/2003 Of The European Parliament And Of The Council of 13 October 2003 relating to fertilisers)

Hence, it has to be studied in what way human waste, urine and faeces would provide nutrients. There are already numerous studies, all confirming that human excreta contains large quantities of nutrients, exploitable in agriculture (Yadav, K. D. V. S. 2007; Morgan, P., 2003; Pradhan, S., Nerg, A., Sjöblom, A., Holopainen, J., & Heinonen-Tanski, H., 2007). Most of the essential nutrients are present in urine (Yadav, K. D. V. S., 2007, “Source Separation Technique for Recovery of Nutrients from Human Excreta”). As the regulation stipulates that the use of human waste, urine and excreta should not be hazardous to humans, animals or the environment, also this has to be proved. When using human

waste, urine or excreta in agriculture, there are, of course, certain safety precautions that have to be taken care of. This should not be a problem, however, as the World Health Organisation (WHO), has developed guidelines that, if followed, would greatly diminish any risks caused by the using or handling of human excreta in agriculture.

II. Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture

Even though this Council Directive rules over the use of sewage sludge in agriculture – not actually human urine and excreta - it is important as it gives some suggestions as to what a new regulation on the use of human waste, urine and faeces in agriculture could look like. This directive recognises the benefits that can be obtained from the use of sludge in agriculture (para 11). Here the question is, whether the benefits of applying sludge match the benefits that would be obtained from human waste, urine or faeces. Article 5 of the Directive stresses that “Member States” can only use sludge in agriculture when “the concentration of one or more heavy metals in the soil” is under “the limit values” that are stated in Annex I A to the Directive (Council Directive 86/278/EEC Art. 5). In human excreta, especially in source-separated human urine, the found levels of metals are regularly below the limit values of this directive. This is also confirmed by Jönsson (2001), according to whom studies have found the levels of heavy metals in urine to be “below the detection limits” (“Emissions and resource usage” section, para 3).

Council Directive 86/278/EEC Art. 6 (a), demands that sludge has to be “treated before being used in agriculture”. This would most probably also apply to human waste, urine and faeces, if the legislation at some point would allow their use in agriculture.

Finally, Article 7 lies down that the use of sludge is not allowed in certain situations, on:

- (a) grassland or forage crops if the grassland is to be grazed or the forage crops to be harvested before a certain period has elapsed. This period, which shall be set by the Member States taking particular account of their geographical and climatic situation, shall under no circumstances be less than three weeks;
 - (b) soil in which fruit and vegetable crops are growing, with the exception of fruit trees;
 - (c) ground intended for the cultivation of fruit and vegetable crops which are normally in direct contact with the soil and normally eaten raw, for a period of 10 months preceding the harvest of the crops and during the harvest itself.
- (Council Directive 86/278/EEC Art. 7)

These seem reasonable guidelines, which are also applicable for human waste, urine and excreta use. The WHO guidelines for the Safe Use of Wastewater, Excreta and Greywater also lay down similar procedures for them.

So what is the status quo of the Sewage Sludge Directive 86/278/EEC and the planned Directive for organic waste/compost and the linkages to human waste? The purpose of this directive is to control “the use of sewage sludge in agriculture in such a way as to prevent harmful effects on soil, vegetation, animals and man” (Council of the European Communities, 1986, Art. 1). Human urine and faeces are not covered anywhere in this directive, however, the directive deals with sewage sludge, coming from sewage plants that treat for example “domestic” and “urban waste waters” (Council of the European Communities, 1986, Art. 2). Thus, now it is possible by EU law to spread sewage sludge on fields, and so use the sludge in agriculture, instead of, for example, dumping it into waters. However, the current legislation does not allow the spread of human urine or faeces alone. A Swedish example shows that farmers have been mixing urine and faeces with the sewage sludge, and then spreading it on fields (Kvarnström, et al., 2006, p. 24). This, however, is wasteful, since spreading urine alone would recover a much larger portion of the nutrients, thereby providing farmers with much more potent fertiliser.

III. Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC)

This directive is important, as it is concerned with the water pollution resulting from animal discharge use in agriculture, and from “the excessive use of fertilisers” (Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC), Para. 3). Article 2 of the Directive defines fertiliser to be a “substance containing a nitrogen compound or nitrogen compounds utilized on land to enhance growth of vegetation; it may include livestock manure, the residues from fish farms and sewage sludge” (Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC), Art. 2). Annex III, part 2 specifies that the maximum amount of nitrogen that can be spread per hectare is 170kg, although there are some exceptions to this rule.

This directive, as the other regulations and directives, does not include human waste, urine or faeces. Nevertheless, it does set some guidelines that need to be followed if the use of human waste, urine and faeces in agriculture would be allowed in the future.

2.3. Legislation on organic farming on an EU level

The legislation on organic farming differs somewhat from the legislation on conventional farming. Currently, the use of human urine and faeces in organic farming is not possible, as the Council Regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs, does not allow it. There might be room for change in the future, however, as the new regulation on organic farming differs considerably from the older one. The new regulation for organic farming (Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91) is meant to ensure that there are specific guidelines for organic farming. However, this regulation will only apply starting from January 2009. There are certain points and articles in the regulation that could allow the use of human urine and faeces in biological farming, even though they are not yet mentioned in the regulation. I will now discuss the two - the old and the new - legislations on organic farming in more detail.

I. Council Regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs

This regulation deals with food commodities (such as vegetables and crops) that are farmed organically. It thus applies only to organic production. The most important articles in this regulation are articles 6 and 7.

Article 6 refers to Annex 1 of the regulation, which lists all those substances that can be used “as plant-protection products, detergents, fertilisers, or soil conditioners” (Council Regulation (EEC) No 2092/91, Art. 6). Annex 1, part 2.1 dictates that “[t]he fertility and the biological activity of the soil” has to be either “maintained or increased”. Different types of methods to maintain or increase soil quality are mentioned in this annex, namely (a) “cultivating legumes, green manures or deep-rooting plants”, (b), “incorporating livestock manure from organic livestock production” (c) “incorporating” either composted or non-composted “organic material” to the soil. Human urine or composted human excreta are not mentioned here as substances that may be used. Furthermore, Annex 2 to the regulation lists all the products that may be used as fertilisers. Even though human urine or composted human excreta are not mentioned in this list, it is mentioned that “only vegetable and animal household waste” may be used in case household waste is used (Annex 2, part A).

Article 7, on the other hand, gives conditions as to the grounds on which new products could be added to the list of allowed substances. Art 7(1b) specifies that if new substances are to be included in the list of accepted substances, they need to be

essential for specific nutrition requirements of crops or specific soil-conditioning purposes which cannot be satisfied by the practices mentioned in Annex I, and - their use does not result in unacceptable effects on the environment or contribute to the contamination thereof. (Council Regulation (EEC) No 2092/91, Art. 7)

This article thus raises two important questions, both interesting for the future legislation on organic farming:

- 1) Can it be proved that human waste, urine and faeces are essential for specific nutrition requirements of crops or specific soil-conditioning purposes, which cannot be satisfied by the practices, mentioned in Annex I? The answer for this question is, simply put, “yes”. This issue was shortly touched on when the Regulation relating to fertilisers was discussed, and there the conclusion was made that human urine and excreta contains large quantities of nutrients exploitable in agriculture.
- 2) Can it be proved that agricultural use of human waste, urine and faeces does not result in unacceptable effects on the environment or contribute to the contamination thereof? This definitely is a point worth looking at, as it is quite likely that this question will also be asked when the new regulation on organic farming comes into effect. Also this question is indirectly already answered: if safety precautions - such as those provided for by the WHO - are followed, the possible risks caused by the using or handling of human excreta in agriculture would be greatly diminished

II. Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91

Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No 2092/91, is the new Council Regulation on organic farming. It shall come into force in January 2009, making the previous regulation on organic farming redundant. Even though the draft in its current form does not allow the use of human excreta in agriculture, with some changes, the regulation could eventually allow their use in biological farming. It is stated in the regulation that “organic farming should primarily rely on renewable resources within locally organised agricultural systems”, and that “[i]n order to minimise the use of non-renewable resources, wastes and by-products of plant and animal origin should be recycled to return nutrients to the land” (Council Regulation (EC) No 834/2007 of 28 June 2007, para 11). Furthermore the regulation reminds that “[t]he essential elements of organic plant production management system are... recycling organic materials” (para 13). Article 12(b) of the regulation stipulates that “the fertility and biological activity of the soil shall be maintained and increased by... the application of livestock manure or organic material, both preferably composted, from organic material” (Council Regulation

(EC) No 834/2007 of 28 June 2007). Organic farming is supposed to rely on “renewable resources”, as mentioned in paragraph 11 of the new Regulation on organic farming, and this matches human waste, urine and excreta use in agriculture (Council Regulation (EC) No 834/2007 of 28 June 2007). Reusing human waste, urine and excreta in agriculture is furthermore in line with paragraph 13 of the regulation, which calls for “recycling” in plant production. As Article 12(b) of the regulation allows the use of “livestock manure or organic material”, it does not actually exclude human waste, excreta and urine.

Article 16 of the regulation points out that the EU Commission “shall... authorise for the use in organic production and include a restricted list of the products and substances, which may be used in organic farming for the following purposes: ... (b) as fertilisers and soil conditioners” (Council Regulation (EC) No 834/2007 of 28 June 2007, Article 16, Article 1 and Article 1 (b)). Nevertheless, even though human urine or composted human excreta are not mentioned in this list, it is mentioned that “only vegetable and animal household waste” may be used (“Council Regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products”, Annex 2, part A). Thus, this needs to be changed in order for it to be possible to add source-separated human waste, urine and excreta in agriculture.

Adding sanitized human excreta to the scope of this regulation would allow the recycling of the nutrients from the excreta back to the soil, and this would completely comply with the fundamental idea of it. Adding sanitized human excreta to the scope of this regulation would also meet the terms of the International Federation for Organic Agriculture (IFOAM) guidelines, as well as the WHO guidelines in the reuse of excreta in agriculture.

Although not mentioned in either of the regulations, human urine and faeces are, as Strauss (2000) puts it, “a rich source of inorganic plant nutrients such as nitrogen, phosphorus and potassium and of organic matter” (“Human Waste (Excreta and Wastewater) Reuse”, p.4). All of them are essential in farming; hence using them in (organic) agriculture would benefit farming. Using human excreta in organic farming would also serve the idea of returning the valuable nutrients back to the land.

2.4. IFOAM's views on human excreta use in agriculture

It is also interesting to mention the point of view of IFOAM, the International Federation for Organic Agriculture. IFOAM does have guidelines for fertilisers and soil supplements, and they are stated in the “IFOAM Indicative List of Substances for Organic Production and Processing”. IFOAM does not directly deny or allow the use of human excreta in organic farming, but recommends that “[s]ource separated human excrement” should not be “directly applied on edible parts” of the plants (IFOAM, 2008, p. 1). However, the guidelines are not binding, but rather indicative.

IFOAM does not want to standardise organic agriculture in the sense that it would want to impose certain rules that all organic farms need to be certified. Rather, its point of view is that “[a]ny system using the methods of Organic Agriculture and being based on the Principles of Organic Agriculture is regarded by IFOAM as ‘Organic Agriculture’ and any farmer practicing such system can be called an ‘organic farmer’” (IFOAM, “Position on the full diversity of Organic Agriculture”, para 2). Nevertheless, according to IFOAM, the IFOAM Basic Standards, or IBS, “are a keystone of the organic movement” (IFOAM, 2008, “The IFOAM Norms”, para 2). The IFOAM standards, indeed, are widely accepted as the norm for organic farming.

According to a Commission of the European Communities Communication from 2006 (Thematic Strategy for Soil Protection), in general the amount of organic matter in the soils of the EU member states is low, even though there is an abundant offer of organic matter; one of them being source-separated human waste. As said by European Renewable Raw Materials Association, “[i]n the EU, organic waste accounts for around 38 per cent of municipal waste (2008, p. 4). “This amounts to... over 50 million tonnes of compost annually (in EU 25)” (European Renewable Raw Materials Association, 2008, p. 4). Clearly there is a connection here: the situation of the soil could greatly be helped by means of agriculture. Here source-separated human excreta would also be an excellent opportunity to recycle nutrients, in the lines of the current ideas of sustainability. The Thematic Strategy on Soil Protection considers “organic fertility... a key tool” in improving “agronomic and environmental functions of soils”, that presents “a powerful rationale to divert biowaste from disposal towards composting” (Favoino, 2006, p. 3).

To reduce the amount of landfilled biowaste, the EU developed the Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste. This Directive, according to Favoino's paper, “Optimising the C cycle: EU environmental drivers for biowaste”, “includes the key provision for landfilled biowaste to be sharply reduced within next years (up to 65 per cent in a 15-year time frame)” (Favoino, E., 2006, para 8). However, “the spreading of sludges including sewage sludges, and sludges resulting from dredging operations, and similar matter on the soil for the purposes of fertilisation or improvement” is not currently included in its scope (Art. 3(2)). This is why a new directive should be developed for organic waste and compost, allowing the use of a) sewage sludge, as well as b) source separated and sanitised human excreta. According to the European Renewable Raw Materials Association (2008), a new “Biowaste Directive would serve to clarify and harmonise EU

law, and give a significant boost to separate waste collection” (p. 4). Separate waste collection is a serious issue, as throughout Europe, says Favoino (2006), “there is a pressing need for organic matter to be applied to the soil” (p. 2). Nevertheless, understandably, policy review is complicated, and reaching unified detailed legislation is possibly not the best option when it comes to the EU of 27 member states, each unique. Hence, the Commission has decided that the member states are allowed (within a certain number of choices) to decide which means they deploy when treating biodegradable waste. The rather new proposal for a Waste Framework Directive demands the “Member States to include these choices in their national waste management plans” (European Commission, “Biodegradable Waste” section, para 2.). Furthermore, the Member States need to consider how their option “for the management of biowaste” adds “to the environmental objectives defined in the Directive” (European Commission, “Biodegradable Waste” section, para 2.). According to the web site of the Commission, the Commission will re-examine the issue in 2010, when the Thematic Strategy on waste prevention and recycling will be reassessed (“Biodegradable Waste” section, para 6).

Conclusion legislation EU

All and all, the EU legislation does not take into account the possibility of recycling and using human excreta in agriculture. Furthermore, my research shows that there currently is no legislation or regulations on the management of pit latrines in any of the EU member states, nor for the excreta that could be extracted from them. This is a real problem, and shows that there is a real gap in the EU sanitation legislation, as for example in Eastern European countries, pit latrines are commonly used as a mean of sanitation. According to Margriet Samwel, “this [lack of regulations and legislation] makes the big gap in the legislation [and the neglecting of] the problem in the EU...clear” (M. Samwel, personal email, August 28, 2008.).

Nevertheless, all the relevant legislations, with minor changes, could open up the doors for human excreta use. The positive list of fertilisers mentioned in Regulation relating to fertilisers should in the near future also include other waste streams, so that recycling of the nutrients from excreta to the fields could be made possible. The sludge legislation and the Nitrates Directive, with minor change in wording, should be changed, so that the precautions set for sewage sludge and other fertilisers would also apply for source-separated human urine and faeces. Furthermore, it should be considered whether the EU would be willing to harmonise their regulations so that they would be on the same line with the International Federation of Organic farming, which already would allow the use of human excreta in organic agriculture.

2.5. Legislation on national levels

To make a conclusion about the legislation of some of the Member States, I decided to study three European Union Member States. I had to restrict the selection to only three due to time and language constraints, and to prevent the study from becoming too lengthy. As my three countries to study, I chose Finland, the Netherlands and Sweden. In contrast with the findings of previous research, in my study I found The Netherlands to be the country with the strictest regulations, whereas the legislation in Finland and Sweden seems to be more lenient. It would have been ideal to get an example from a new European Union Member State, as a comparison between countries with more and less advanced systems would have been a wonderful addition for the study. However, it proved to be much too difficult to find translated legislation from the new Member States.

As can be expected, the legislation regarding agriculture differs in all the member states. Furthermore, none of the member states has legislation directly covering human excreta, urine, or faeces use in agriculture. Nevertheless, this does not mean that legislation cannot be studied to get a view on the possible addition of human waste, urine and faeces use in agriculture. In many cases, it is important to look at, first of all, the legislation on nature conservation, secondly the legislation on agriculture and fertilisers. In addition, legislation regarding (waste) water is often relevant. I, however, chose to discuss the legislation in a separate chapter. The information on this can thus be found in chapter 3.

2.5.1. Legislation in Finland

In Finnish legislation, there are no mentions of the idea of returning the nutrients of human excreta back into nature. In addition, as on an EU-level, Finland has no special legislation relating directly to the use of human waste, urine or excreta, thus there is also no legislation relating to the use of it in agriculture. This is why we have to study the legislation that could be used to determine whether it would be possible to reuse human excreta in agriculture in Finland. The relevant regulations/directives in Finland are:

I. Lannoitevalmistelaki 29.6.2006/539 (Act on Fertiliser products)

The Act on Fertiliser Products does not specify exactly of what origin fertilisers are supposed to be. This is why it can be said that this legislation loosely allows the use of human waste, urine and excreta in agriculture as fertiliser.

Chapter 1, Article 4(1) of the Act defines a fertiliser product to be “fertilisers, liming products, amendments, substrates and those by-products that are used as fertiliser products as such” (Lannoitevalmistelaki 29.6.2006/539, Chapter 1, Article 4(1)). Article 4(2) further stipulates that “those materials and products which are meant to advance the growth of plants or to improve crop quality and whose effect is based on plant nutrients or on other substances useful for plants, humans or

animals” are fertilisers. Because not further specified, the “by-products” and “other substances” referred to in this act could be considered to be of human origin as well. The general requirements for fertilisers, mentioned in Chapter 2 Article 5 of the Act, do not place further restrictions to human waste, urine and faeces use in agriculture. As long as the fertilisers are “of homogenous quality, safe and suitable for the purpose”, it is acceptable to utilise them (Lannoitevalmistelaki 29.6.2006/539, Chapter 2, Article 5). Additionally, the fertilisers used,

need to fulfil the requirements set in the Regulation relating to fertilisers (2003/2003 EC); in the Regulation laying down health rules concerning animal by-products not intended for human consumption (1774/2002 EC); and in this law [Act on fertiliser products], and the regulations set by virtue of this law. (Lannoitevalmistelaki 29.6.2006/539, Chapter 2, Article 5).

It should, however, be made sure that if human waste/urine/faeces is used in agriculture, no danger should be brought to human or animal health or to the environment. Thus, the amount of harmful substances needs to be controlled to be sure of the safety of the possible fertiliser. Naturally, the use of human waste/urine/faeces should not violate any EU regulations.

II. Ympäristönsuojelulaki 4.2.2000/86 (Environmental Protection Act)

The Environmental Protection Act does not directly prohibit the use of human waste and excreta in agriculture. To protect the soil from pollution, Article 7 simply stipulates, “[w]aste or other substances shall not be left discharged on the ground or in the soil so as to result in such deterioration of soil quality...” (Ympäristönsuojelulaki 4.2.2000/86, Article 7). Thus, it should be made sure that the use of human waste, human urine or human faeces as fertiliser would not deteriorate the soil, or otherwise harm the environment. Furthermore, Article 8 of the Act rules that the ground water should be protected from pollution. This act also concludes that it is the Government who stipulates by decree on, for example, the “quality of the environment and emissions” (Article 11), and on the “methods, equipment, buildings and structures needed to reduce emissions from agriculture... and on environmental protection requirements related to the location of activities” (Article 12(1)). The Ministry of the Environment can “stipulate by decree on equipment and methods for treating sewage from water closets and other household sewage, on sealed gullies, and on the use and maintenance of this equipment, on soak-aways and removal of sludge, giving special consideration to national water protection objectives” (Article 18). Furthermore, municipal councils can “issue general regulations pertaining to the entire municipality or a part thereof that concern other activities that are not subject to a permit under this Act or to notification under Articles 61, 62 or 78, or that are not part of the Defence Forces' operations” (Article 19). These activities can include “environmental protection requirements regarding the location of activities outside local detailed plan areas” (Article 19(3)), and

“areas where conducting wastewater into the ground, a water body or channel referred to in chapter 1, Article 2, of the Water Act is prohibited due to special pollution risk” (Article 19(4)). Finally, Article 20 rules, “[t]he Ministry of the Environment is in charge of general steering, surveillance and development referred to in this Act. Within its territory, the regional environment centre steers and promotes the execution of duties referred to in provisions issued in this Act and under it, enforces these provisions and exercises its right to defend public environmental interests in decision-making based on this Act” (Article 20).

III. Valtioneuvoston asetus talousjätevesien käsittelystä vesihuoltolaitosten viemäriverkoston ulkopuolisilla alueilla (Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks) 11.6.2003/542/2003

Finland has a Government Decree stipulating that when wastewater is treated in areas with no sewer networks, it has to be made sure that “the environmental loading generated by domestic wastewater” is “reduced by at least 90 per cent for organic matter (BOD7), at least 85 per cent for total phosphorus and at least 40 per cent for total nitrogen, compared with the load in untreated wastewater” (Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks 542/2003, Article 4). Furthermore, the same Decree maintains that a description about the wastewater system needs to be made available. This will make possible an evaluation “of the environmental loading” caused “by the wastewater” (Article 6). Appendix 1 to the Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks lists the methods and equipment which can be used in wastewater treatment systems. It does not directly forbid the use of urine tanks when treating urine. In fact, it allows a so-called “package plant” to be used as means to treat wastewater (Article 5). The package plant “can be a physical, chemical or biological system”, or even a “combination” of each (Article 5).

Nummelin (2006) remarked that “the aim of the new wastewater treatment regulations is to cut down the nutrient discharges from single-family homes and to improve general environmental hygiene” (para 1).

2.5.2 Legislation in the Netherlands

Currently in the Netherlands, it is not by law allowed to use human excreta in agriculture (Mels, A., 2008, p. 2). If, for example farmers want to use urine as fertiliser, according to Mels (2008), “permission from the local authority has to be sought because urine is not on the official list of permitted fertilisers” (p. 18). Furthermore, irrigation with domestic wastewater is regarded as discharging it into soil, which is also prohibited in the Netherlands. Other rules and regulation relevant in the Netherlands are:

I. Meststoffenwet (Fertiliser law) of 27 November 1986

The fertiliser law in the Netherlands rules on topics related to fertilisers, such as the safety of fertilisation, as well as soil protection etc. In addition, it discusses the safe amounts of nitrogen and phosphorus that can be spread on agricultural fields. Even though this law does not yet apply to fertilisers from human origin, it is interesting for this study to see what the general regulations for fertiliser use in the Netherlands are. Generally, in the case of using fertilisers from animal origin in the Netherlands, the law stipulates that one cannot spread more than 170 kg of nitrogen per hectare on the field (Meststoffenwet, Art. 9). However, this amount can also vary, “depending on the crop, the applied agricultural practices, the ecological characteristics of a body of water and characteristics of the soil”, and whether the soil consists of “clay, peat soil, sand or loess” (Meststoffenwet, Art. 10(2)). The allowed amount of phosphates in fertilisers, in 2008, is 85 kilograms of phosphates per hectare of arable land (Art. 11(2)). The amounts for 2009, and the years following that year, are still unpublished; nevertheless, they can be expected to stay the same as in 2008. These are thus the guidelines that would also apply for human excreta, granted it would be allowed to use it in agriculture as fertiliser.

II. Uitvoeringsbesluit Meststoffenwet (Decision implementing the Fertiliser Law)

In the Netherlands, it is allowed by law to use sewage sludge in agriculture, sewage sludge and being suitable fertiliser products according to Article 5(1) of the Decision implementing the Fertiliser Law. However, also compost, by Article 5, is suitable for agriculture, although it is not further mentioned of what origin the compost may be. Other fertilisers than sewage sludge and compost should not be “wholly or partly derived from waste or residues”, unless it is the opinion of the Minister [of Agriculture that there are] no agronomic and environmental objections that such substances be traded as fertiliser or be used in the production of fertilisers” (Art. 5). Article 6 stipulates that it has to be made sure that whenever fertiliser is used, it should either offer nutrition for the plants or improve the soil, and furthermore, it should not have any “harmful effects on the health of humans, animals or plants or the environment”. Regarding the nutrients, the Decision rules the following:

organic [fertilisers] that are primarily designed to deliver primary nutrients [should] contain at least one of the following nutrients in the indicated minimum quantity, expressed in weight percentages:

- A. [fertiliser], for the supply of nitrogen: Nitrogen (N) total: 0.5;
- B. [fertiliser], for the supply of phosphate: Phosphate (P₂O₅) total: 0.5;
- C. [fertiliser] intended for the delivery of potassium: potassium (K₂O) soluble in water: 0.5. (Uitvoeringsbesluit Meststoffenwet , Art. 12(1))

Even though urine is not specified as a liquid fertiliser in the Fertiliser law or in the Decision implementing the Fertiliser Law, it is interesting to mention here how Dutch law rules on liquid fertilisers: according to Article 12(2) of the Decision implementing the Fertiliser Law, for fertilisers meant for the supply of either nitrogen, phosphate or potassium, the amount of the nutrients (N, P₂O₅ or K₂O) should be 0,5 weight percentage.

The Decision implementing the Fertiliser Law also has special articles regarding sewage sludge and compost. For sewage sludge the following rules are set: Article 16 of the Decision insists that “[s]ewage sludge [is] treated by biological, chemical or thermal means, through prolonged storage or any other suitable method, which lead to the die-off of most of the pathogenic organisms present in the sewage sludge” (Uitvoeringsbesluit Meststoffenwet, Art. 16(1)). Furthermore, “at least fifty weight percent of sewage sludge needs to feature organic matter of the dry matter or have a neutralizing value of 25 based on the dry matter” (Art 16(2)).

III. Besluit van 1 december 1997, houdende regels betreffende het op of in de bodem brengen van dierlijke meststoffen (Besluit gebruik dierlijke meststoffen 1998) (Decision on the use of animal manure)

The Decision on the use of animal manure - as its name says - is a piece of legislation that covers the use of animal manure in agriculture. Although it obviously does not include them yet, the rules that it sets for animal manure use could in the future be applied also for fertilisers of human origin.

According to Article 1(a) of the Decision it is “prohibited to use fertilisers”, unless they satisfy the rules set in Chapter III of the before mentioned Decision implementing the Fertiliser Law (Besluit gebruik dierlijke meststoffen, Art. 1(a)). Article 1(b) prohibits the use of sewage sludge and other organic fertilisers if it is not “sampled and analysed” (Art. 1(c)). Furthermore, the review values set for soil regarding the use of sewage sludge, mentioned in Annex III¹ are not exceeded” (Art. 1(b)). Article 1(d) sets further restrictions in the use on sewage sludge and other organic fertilisers. According to it, “it is prohibited” to use them on:

¹ Annex III is available from: www.wetten.overheid.nl

- A. grassland: during the period of grazing
- B. land which is used for the cultivation of fodder: less than three weeks before the harvest;
- C. land used for vegetable or fruit planting, with the exception of fruit trees during the growing of the fruit vegetables respectively;
- D. land which is earmarked for the cultivation of vegetables or fruits, usually in direct contact with the bottom and are consumed raw: less than ten months before the harvest and during the harvest. (Besluit gebruik dierlijke meststoffen, Art. 1(d))

Aside from the previous regulations Decision on the use of animal manure also stipulates that “the total amount of animal manure and compost, expressed in kilograms of phosphate, [should not consist of more] than 20 kilograms phosphate per hectare per year” (Art. 2(3)). Furthermore, for croplands “no more than 85 kilograms of phosphates and 170 kilograms of nitrogen” should be spread on the soil “per hectare per year” (Art. 2(4)). Finally, Article 4(1) stipulates that it is only allowed to fertilise the soil in the period between February 1 and August 31.

2.5.3. Legislation in Sweden

Source-separated human urine is currently used as fertiliser in Sweden due to the amount of nutrients it contains (Mels, 2008, p. 18). According to Anna Richert Stintzing, Sweden is using urine in agriculture under the sludge legislation (A. Richert Stintzing, personal e-mail, August 22, 2008). “There is no problem with this, as long as... the best practices in agriculture specifying spreading times for manure, protective distance to watercourses etc” are followed (A. Richert Stintzing, personal e-mail, August 22, 2008). Also Kvarnström et al. (2006) confirm this: “[f]rom a legal perspective, the use of urine in the home garden is allowed, but the local environmental authority may pose conditions to the urine use, e.g. on size of the “productive” surface in the garden available for urine spreading” (p. 38).

The relevant regulations/directives regarding excreta use in Sweden are:

I. Kungörelse med föreskrifter om skydd för miljön, särskilt marken, när avloppsslam används i jordbruket (SNFS 1994:2) (Announcement of regulations on the protection of the environment, especially the soil, when sewage sludge used in agriculture)

http://www.naturvardsverket.se/Documents/foreskrifter/nfs1994/SNFS1994_02k.pdf

According to this regulation, it is allowed to use sewage sludge in agriculture. Article 1 even goes on to say that “the... use of sewage sludge is encouraged”, granted it is used properly. Regarding phosphorus, this law stipulates that the maximum amount of phosphorus that is allowed to spread on arable land depends on the phosphorus class of the soil itself. Annex A rules that each time sludge is

spread, “the maximum amount of phosphorus that can be spread per hectare in phosphorus class I and II is 250 kg, respectively 160 kg phosphorus per hectare of land in phosphorus class III-V” (Kungörelse med föreskrifter om skydd för miljön, särskilt marken, när avloppsslam används i jordbruket, Annex A). Furthermore, Article 6 demands that “[w]astewater sludge should be treated before being used in agriculture”, or otherwise it needs to be “worked down [into the soil] at the latest within a day of the deployment” (Kungörelse med föreskrifter om skydd för miljön, särskilt marken, när avloppsslam används i jordbruket, Art. 6). However, there are strict rules on what kind of produce sludge can be used on. According to Article 7 it cannot be used on “pasture”, or “on land with crops of berries, potatoes, root crops, vegetables or fruit”. Exception from this are fruit trees, due to the sludge not directly touching the fruits themselves. Furthermore, if sludge is used on land which will be used for harvesting crops, it needs to be spread ten months beforehand.

II. Miljöbalk (SFS 1998:808) (The Swedish Environmental Code)

The Swedish Environmental Code means to promote both the health of the Swedish citizens and the well-being of the Swedish nature. The Environmental Code defines wastewater to mean, “discharge water, sewage or other liquid impurities” (Chapter 9, Article 2(1)). So, also waters discharged from toilets are considered to be wastewater. The Environmental Code considers discharging wastewaters “onto land or into water areas or groundwater” an “environmentally hazardous activity” (Chapter 9, Article 1). Nevertheless, it does not prohibit this. If the Government considers the release of wastewaters into nature particularly dangerous, it might decide to prohibit that action (Chapter 9, Article 4). Furthermore, according to the Code, “[t]he Government may provide that” that discharging wastewaters onto soil “may not be undertaken without prior permission or notification” (Chapter 9, Article 6). Thus, a permission is needed for any such activities.

Conclusion Legislation on a National level

According to Wendland and Richert Stintzing (2008), currently none of the EU member states directly allow the re-use of human urine in agriculture (Europe’s Sanitation Problem: Sustainable, Affordable and Safe Sanitation for citizens in the European Union – impossible?). The use of urine in the EU member states, note Wendland and Richert Stintzing, is only allowed “with exceptional approval” (2008, p. 2). This has been already mentioned in this paper to be the case for, for example, Sweden. Just as in Finland, in Sweden there are no restrictions on the reuse of human excreta in people’s home gardens. According to Richert Stintzing, in Sweden several municipalities even support this as “it means they [do not] have to handle it” (A. Richert Stintzing, Personal e-mail, August 22, 2008). Although it is discussed in further detail in Chapter 3, it is good to mention here that in the Netherlands, until recently, it was not possible to use human excreta even in home gardens, as all

kinds of discharging into soil was regarded illegal. The situation has changed, however, and discharging from private households is now allowed.

According to Richert Stintzing, a new legislation is on its way in Sweden. This new legislation is going to substitute the current legislation on sludge. According to her, the coming legislation is going to “use more modern terminology such as ‘wastewater fractions’, [and] ‘source separated’, instead of just ‘sludge’” (A. Richert Stintzing, Personal e-mail, August 22, 2008). Furthermore, it will make it easier to reuse human excreta as it will “include all wastewater fractions”, and it “will set limit values for heavy metals and organic substances” (A. Richert Stintzing, Personal e-mail, August 22, 2008). According to Richert Stintzing, it is impossible to know at what point the legislation will appear, as “it has been on the way for a long time and is now stuck on the table of the Environmental Board, civil servants” (A. Richert Stintzing, Personal e-mail, August 22, 2008). In the other two countries studied, there are no rumours about forthcoming legislation changes.

Eeva-Liisa Viskari mentions a problem that possibly hinders legislation change in Europe: “urine and faeces are *thought* to be comparable to sewage sludge - with all the heavy metals and other toxins (pharmaceuticals etc.) polluting the agricultural land and food” (E-L. Viskari, 2007, “ECOSAN and ecological farming”, para 3). Thus urine and faeces use should be discussed more openly, so that both the citizens and the decision makers would learn about the facts relating to this topic.

Chapter 3: Small-scale/on site wastewater management in EU Member States

In this section, a closer look on the regulations that different EU Member States have regarding small-scale/on site wastewater management will be taken. The countries discussed in this chapter, are the same as the countries used in the previous chapter: Finland, the Netherlands and Sweden. I will also give recommendations on how to implement small-scale/on site waste management in the EU member states discussed in the previous chapter, by discussing the current state of waste/sewage systems/facilities in each country.

3.1. Regulations for small-scale/on site wastewater management in Finland

Finland is a country of countless holiday homes. Traditionally the sanitation facility at a holiday home is a dry toilet – a toilet that has no flush, and thus uses no water. Finland is also dubbed the land of thousands of lakes, and not for nothing; there are over 187, 000 lakes in the small country. That is why it is extremely important for the country to have thorough legislation concerning wastewater management, to prevent water pollution.

3.1.1. Toilets in Finland

According to Finnish law, “in” or “in the immediate proximity” of each “dwelling”, “there has to be an appropriate toilet” (Terveydensuojelulaki 19.08.1994/763, Art. 30). According to the same article, “a toilet has to be placed, constructed and kept in order in such a way that it does not harm the health of those visiting it or staying in its vicinity”. Furthermore, a toilet needs to have sufficient ventilation (Terveydensuojeluasetus 16.12.1994/1280, Art. 14). This means that no smells should spread to other spaces than the toilet. The Health Protection Act also stipulates that in case of a dry toilet, it “has to be situated on a solid foundation in such a way that the toilet does not cause health harm due to smells, domestic water or the contamination of the soil” (Art. 14). In case composted, “the toilet waste needs to be composted so that it does not cause smells, and that it does not contaminate the soil or the domestic waters and thus cause health harms” (Terveydensuojeluasetus 16.12.1994/1280, Art. 13).

3.1.2. Connections to sewers in Finland

As stated by Sanna-Leena Rautanen, in Finland almost one million people live in areas without public sewage systems (2002, p. 5). Furthermore, most of the dwellings on sparsely populated areas are left to cope without public sanitation (Rautanen, 2002, p. 5). Rautanen (2002) also confirms that on sparsely populated areas water management and development is essentially left completely to the “voluntary action” of the inhabitants (p. 5). According to Kärkkäinen, Santala, Kujala-Räty and Kaloinen (2008) “[i]f a property is situated in the domain of a waterworks plant, the property has to

join the plant's water pipes and sewers, unless there has been a special exemption from this" (p. 2). The following cases can give room to an exemption, according to the Water Services Act 119/2001 (Vesihuoltolaki):

- In case it would be too difficult or expensive for the dwelling owner to connect the property to a waterworks
- In case an exemption would not endanger the "economical and appropriate management of water supply services" in the locale of the waterworks
- In case the dwelling to be granted the exemption has enough "household water which meets the requirements", or "in case rainwater and drainage water from the foundations of a property exempted from connection to a sewer intended for the removal of rainwater and drainage water from the foundations can otherwise be" properly eliminated (Article 11)

3.1.3. Dwellings outside the sewer networks in Finland

Finland has special legislation for dwellings situated outside the sewer networks. This legislation stipulates that

[t]he environmental loading generated by domestic wastewater must be reduced by at least 90 per cent for organic matter (BOD7), at least 85 per cent for total phosphorus and at least 40 per cent for total nitrogen, compared with the load in untreated wastewater. (Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks, Article 4(1))

Nevertheless, "a municipality, with its own environment protection decrees, may insist on more strict or lenient refinement measures according/pursuant to local conditions" (Kärkkäinen, Santala, Kujala-Räty and Kaloinen, 2008, p. 3). At the property, each property owner should have a "report on the wastewater system" (Government Decree on Treating Domestic Wastewater in Areas Outside Sewer Networks, Article 6). Furthermore, according to Article 9 of the decree, every property owner should have "up-to-date use and maintenance instructions" for the property's wastewater maintenance system. This decree came into force on January 1, 2004. All the dwellings built after this date must adhere to it. The properties that existed before the entry into force of the decree must comply with the demands by 2014 the latest (Kärkkäinen, Santala, Kujala-Räty and Kaloinen, 2008, p. 2).

3.1.4. *Outlook on waste management in Finland*

In Finland, the use of dry toilets and urine diverting toilets is thus authorised, as long as the safety and cleanliness requirements are not compromised.

There are many options as to how small-scale/on site wastewater management can be handled in Finland. It can be done so that toilet waste and greywater is separated:

- using a dry toilet and separating greywaters; or
- guiding toilet waters to a closed wastewater treating unit and separating greywaters (Kärkkäinen, Santala, Kujala-Räty and Kaloinen, 2008).

Furthermore, it is possible to treat all wastewaters together by

- saturating them into ground;
- filtering them through soil; or
- using small-scale local water purification plants (Kärkkäinen, Santala, Kujala-Räty and Kaloinen, 2008).

The vast amount of dry toilets and separating toilets offer Finland a wonderful opportunity. The country could use the waste produced by these toilets by utilising them in agriculture. Perhaps a national service picking up and treating the waste could be set up, from where the waste would further be distributed to farms to be used as fertiliser.

It is worth mentioning that the future plans for wastewater management in Finland include adding properties of sparsely populated areas in central wastewater systems, “taking cost-efficiency and ecology into account” (Vienonen, S., 2007, p.9). However, Mattila has remarked that there is “a real need of on-site sanitation in Finland for technical and economical reasons” (Mattila, H., 2003, p. 67). He explains that because the country’s “population density” is so low (approximately “17.3/km² for the whole country”, and approximately “11.7/ km² outside of the capital area”), setting up “centralised” wastewater treatment plants is often excessively complex and costly (Mattila, H., 2003, p. 67).

3.2. Regulations for small-scale/on site wastewater management in the Netherlands

The Dutch legislation regarding wastewater management is completely based on sewer systems. Even though there are no separate regulations for, for instance, composting or separating toilets – it does not mean that in the Netherlands, there are no regulations for small-scale/on site wastewater management.

3.2.1. Toilets in the Netherlands

Currently the Dutch rely heavily on conventional sanitation. The contemporary “approach” is based on “the WC, sewer system and wastewater treatment” (Bijleveld, 2003, p. 21). In the Netherlands the idea of separating toilets, where urine and faeces are collected separately, is rather a new concept. According to Mels (2008) this concept was first introduced in a “woon-zorgcomplex” (a kind of an old people’s living settlement) in the municipality of Meppel, only three years ago, “in 2005” (p. 18). Furthermore, some office buildings currently already have separating toilets, and additional plans to introduce separating toilets to regular dwellings exist (Mels, 2008, p. 18). Repka points out that due to the many problems that emerged during a pilot project, conducted in Utrecht, “it is now difficult to gain new permits for composting toilets” in the Netherlands (2005, p. 36). However, Mels (2008) reminds that “one of the current” innovations in the Dutch waste chain is the separation of streams at the source” (p. 13).

Regarding legislation ruling on toilets in general, some of them are regulations concerned about the disposal of sewage and excrements. The Decision on Constructions (Bouwbesluit) from 2003, rules that in every building there needs to be a facility for removal of sewage and excrements (Art. 3.31). Article 3.33 of the same Decision stipulates that there has to be facilities both for the evacuation of effluents and excrement, and furthermore, there needs to be a connection close to a waste apparatus.

3.2.2. Connections to sewers in the Netherlands

The creation and preservation of the sewer systems is the duty of the Dutch municipalities. This is stipulated by the Environmental management Act (Article 4.22). According to Mels, “most Dutch cities” have been connected to sewage systems “for over 50 years” (2008, p. 5). The sewers are hence old, but even the age of the sewers has not lead to more that “sporadic” restoration projects (Mels, 2008, p. 11). Nevertheless, changes need to be made to the Dutch sewer system in the future; renovations and replacement of the old sewage pipes are going to be necessary. Currently, says Mels (2008), “many sewerage schemes have insufficient evacuation capacity”, and this leads to too high overflow frequencies and to local discharging of unpurified effluent to often vulnerable surface waters” (p. 11).

The Dutch Environmental Act rules over waste substances in the Netherlands. Article 10.2 of the Act stipulates that it is not allowed to discard “waste substances” by landfilling them or otherwise

placing them on or under the ground or incinerating them outside an establishment”. However, on 15 November 2007 a decision was made to exclude private households from this Article. The decision has been in force since January 1, 2008. On the grounds of Article 2 of the Decision regarding the discharge of household wastewaters (Besluit lozing afvalwater huishoudens), discharging wastewaters from private households onto or into the soil is allowed. Article 10.30 of the Environmental Management Act prohibits the discarding of wastewater “by putting them in a facility for the collection and transport of wastewater”.

3.2.3. Dwellings outside the sewer networks in the Netherlands

Data from 2003 shows that only 3% of the Dutch citizens are not connected to urban wastewater collection systems (Bijleveld, 2003, p. 22). This is mostly people living in rural areas of the country. In principle municipalities are, according to the law, supposed to make sure that all dwellings are connected to the sewer systems. However, in some cases, this is too expensive. In these cases, special rules apply. Article 10.33 of the Law on municipal water responsibilities (Wet gemeentelijke watertaken) stipulates that even though municipalities are responsible for the “collection and transportation of municipal wastewater”, separate sanitation systems are not prohibited, as long as they do not damage the environment (Wet gemeentelijke watertaken, Art. 10.33). Furthermore, if the Mayor and the aldermen request it, regions outside the urban areas, or regions where the p.e. is less than 2000, will be exempted from the municipal water services.

Even though Article 10.2 of the Dutch Environmental Act prohibits discarding waste by inserting them in the ground, on 15 November 2007 a decision was made to exclude private households from this. The decision has been in force since January 1, 2008. On the grounds of Art. 2 of the Decision regarding the discharge of household wastewaters (Besluit lozing afvalwater huishoudens), discharging wastewaters from private households onto or into the soil is allowed. Article 2(3) of the Decision regarding the discharge of household wastewaters grants an exemption for discharges from private households. However, it should be made sure that the pathogens from the wastewater do not infiltrate into groundwater (Besluit lozing afvalwater huishoudens, 2007, Art 3). Article 7(1) of the Decision stipulates that “wastewater from domestic households” should not be “discharged into soil, if the distance to the nearest sewer or wastewater treatment plant, to which connections can be made, is less than 40 meters” (Besluit lozing afvalwater huishoudens, 2007, Art. 7(1)). The Regulation regarding the discharge of household wastewaters (Regeling lozing afvalwater huishoudens) from 2007 demands that when wastewater is drained, the “drainage infrastructure” should be a “septic tank” (Art. 1(A)). According to Article 3 of the same Regulation, it should be made sure that

- A. the discharged water from the drainage infrastructure in the infiltration facility is not in direct contact with groundwater,
- B. the infiltration facility causes no nuisance, and
- C. adverse effects on human health are preventable. (Regeling lozing afvalwater huishoudens, Art. 3)

As Carel de Villeneuve from the Dutch Ministry of Public Works, Transport and Water Management (Ministerie van Verkeer en Waterstaat) put it during a sanitation conference organised by WECF, as reported in an upcoming WECF publication,

“[t]he number of inhabitants and their distance to a sewer system defines the obligation to connect or to have an individual treatment system. The type of system depends on the situation, the sensitivity of the surroundings, discharge in soil or surface water. Several systems such as septic tanks, compact systems, sand infiltration and constructed wetland are being used. Their construction needs to be supervised and certified”. (WECF, 2008, p. 13)

3.2.4. Outlook on waste management in the Netherlands

The Netherlands has no guidelines for human excreta use in agriculture. A research conducted in the Netherlands by Martin Bijleveld (2003), found out that not many regular people in the Netherlands have knowledge of ecological sanitation (p. 35). Furthermore, “sanitation and talking about the toilet is still a taboo” (Bijleveld, 2003, p. 5). What is interesting is that Bijleveld found out that many people do not think that the recycling excreta in agriculture would be a compelling motivation for ecological sanitation. Nevertheless, Bijleveld reports that Dutch people would be willing to reconsider their sanitation options, if the situation was urgent, “for example from [an] environmental point of view”, such as saving water (p. 35). Marketing sustainable sanitation to the Dutch should thus be based on environmental incentives.

There is also good news for Dutch people living outside sewage networks: discharging wastewaters from private households onto or into the soil is now, as of January 2008, allowed by the legislation. This could well mean that private households in the Netherlands could start using human excreta as fertiliser or soil conditioner in their home gardens.

3.3. Regulations for small-scale/on site wastewater management in Sweden

In Sweden the Law on public water services (*Lag om allmänna vattentjänster*) has now surpassed the previous similar law, namely the Public Water and Wastewater Plant Act (WWA). The Law on public water services was issued on 18 May 2006. The idea of the law did not change as far as also the current law stipulates that municipalities are responsible for the proper arrangement of both water supply and the treatment of wastewaters (Art. 3; Art. 6). However, officially the law also allows privatised sanitation (See Art. 9). Nevertheless, according to Ottoson, Nordström and Dalhammar “[m]ore than 90% of Swedish inhabitants have their wastewater treated in municipal wastewater treatment plants” (Removal of micro-organisms in a small-scale hydroponics wastewater treatment system”, p. 443).

Although not in force anymore, the WWA was, in its time, able to hinder the large-scale switch to onsite sanitation systems. As the regulations did not change on a large scale after the law was updated, this can still be the case. Johansson and Kvarnström argued in 2005 that the WWA was a “powerful tool”, as “it [gave] the municipality the right to compel people to connect to a centralized system and the right to charge both a connection fee and yearly fees” (p. 5). This raises some questions as to whether the municipalities would be willing to allow a great fraction of their citizens to separate from the public wastewater systems, as in this case the municipalities would lose a large part of their incomes.

Then there is also the Planning and Building Act (*Plan- och byggförordning*, SFS 1987:383). Some mention this piece of legislation when sustainable sanitation is discussed in the context of Sweden. This Act allows the Swedish municipalities to develop their own infrastructures (Article 2). Johansson and Kvarnström (2005) go to say, however, that the Act is “seldom used by the planning sections of Swedish municipalities for steering the use of water resources and in strategic planning of sanitation” (p. 5).

3.3.1. Toilets in Sweden

In Sweden it is possible to use both conventional flush toilets and for example urine diverting toilets. According to Ridderstolpe, currently there are about 135000 urine-diverting systems in operation in Sweden (in Bodík and Ridderstolpe, 2007, p. 68). Even though not yet very popular with the Swedish general public, urine diversion toilets, according to Kvarnström et al. (2006) are an option that the Swedish Environmental Protection Agency is seriously taking into account “as a possible option when planning for future investments to meet new legislation and environmental goals” (p. 32). Currently, urine-diverting toilets in Sweden are becoming slightly more popular, especially because using them helps to diminish the vast problems that Sweden faces with eutrophication of its water bodies (Kvarnström, E., et al, 2006).

3.3.2. *Connections to sewers in Sweden*

Even though all the “urban areas in Sweden are connected to municipal wastewater treatment systems”, as is confirmed by a Nutek²-paper (2006), there are numerous rural dwellings that are outside the municipal services (Nutek, 2006, p. 1). According to Nutek, around half a million Swedish homes and the same amount of holiday homes “are not connected to the municipal sewage system” (2006, p. 3).

3.3.3. *Dwellings outside the sewer networks in Sweden*

“According to water and water- and sewage systems rules, an individual is not forced to join its sewage to the municipal water and sewage network if he or she does not want it. This is true even if his property is within the reach of the general water and sewage plants”. (Rent-Vatten, “Vad säger lagen?- Avlopp – Sverige”, para 10). Furthermore, dwellings outside the municipalities, thus outside the sewer networks, mainly are obliged to take care of their own sewage. In Sweden, “[p]eople living in the countryside are served with onsite treatment, mainly infiltration and sand filter systems” (Bodík, I. and Ridderstolpe P., 2007, p. 84). Even though it also applies in general, when it comes to individual wastewater treatment systems, according to Chapter 9, Article 7 in the Swedish Environmental Protection Act, wastewater should be diverted, and treated in a way that will not cause any harm to either human health or the environment.

According to Article 13 of the Regulation on environmentally hazardous activities and health protection (Förordning (1998:899) om miljöfarlig verksamhet och hälsoskydd), a permit is needed for setting up a sewage device to which one or more toilets are connected. Whenever a new connection is set up, a municipal committee needs to be notified.

3.3.4. *Outlook on waste management in, Sweden*

As said earlier, in Sweden urine is used in agriculture under the sludge legislation. Richert Stintzing says that “[the] authorities are aware of the gap regarding terminology in the existing legislation, and are introducing new legal framework which will use more modern terminology, i.e. wastewater fractions, and specifying which fractions are possible, for example urine, blackwater, filterbed materials etc.” (A. Richert Stintzing, personal email, August 24, 2008).

² Nutek, the Swedish Agency for Economic and Regional Growth. More information on Nutek can be found from the following web site: <http://www.nutek.se/sb/d/113>

Chapter 4: WHO Guidelines for the safe use of wastewater, excreta and Greywater

“In 2006 the World Health Organization published its new Guidelines for the safe use of wastewater, excreta and greywater. Together the Guidelines offer a safety framework, and minimum requirements for the safe use of wastewater, excreta and greywater in agriculture and aquaculture” (Kuisma, S-M., 2008, “Guidelines for the safe use of wastewater, excreta and greywater”, para 1). This chapter looks at how the WHO Guidelines could be implemented on the EU-level.

4.1. Implementing the WHO Guidelines on the EU level

As mentioned before, the World Health Organisation has come up with Guidelines that, when followed, will diminish the risks caused by human excreta use in agriculture. “Risk management”, according to the guidelines, “requires an assessment of the health risks at key points of the excreta and greywater use process” (WHO, 2006, p. 26). The guidelines set procedures for health protection for “local communities, workers and their families and for the consumers of the fertilised products” (WHO, 2006, p. xvi). It also gives guidance for, for example:

- treatment – how to treat excreta in order to gain the best quality product in the safest ways possible?
- crop restriction – what kind of plants to cultivate?
- application – when to apply excreta, and how much time needs to elapse “between fertilisation and harvest, in order to allow die-off of remaining pathogens”?
- hygiene – how to, for example, “handle” food fertilised with excreta?

The guidelines offer several options as to how human excreta can be handled and treated in an ecological way. The extremely positive point in here is that the guidelines do not clash with current EU-legislation. Rather, the guidelines complement them, and give decision makers and citizens more options on how to treat the otherwise wasted excreta. However, using the framework that the WHO Guidelines offer as a tool, it can be seen that the current EU-legislation is not comprehensive enough, as it does not directly “govern excreta... use” (p. 145). Thus, new, or at least radically updated legislation is needed. According to the WHO, the legislation should not be too “detailed and specific”, and focus should be “on the functions that sanitation services should provide” (WHO, 2006, p. 147).

The Guidelines could be worked in the current legislation. For example, Regulation (EC) No 2003/2003 Of the European Parliament and Of the Council of 13 October 2003 relating to fertilisers would benefit from the health protection measures given in the Guidelines.

Chapter 5: Conclusions, Recommendations and Outlook

Could human waste, urine or faeces really be suitable to use in agriculture? If tradition can be considered an evidence for this, the answer is “yes”. Throughout the centuries, people have been using human urine and excreta in agriculture all around the world, starting from ancient china and Rome to 19th Century Europe (Shiming, 2002; Bracken, Wachtler, Panesar and Lange, 2007). According to Drangert (1998), “most of the excreta was returned to agriculture before 1900” (p. 201). In addition, it has been verified that human urine and excreta are indeed technically suitable for use in agriculture.

So what changed? It was not until the arrival of the conventional waste water systems that human excreta became something that should be collected, sent away and then released to rivers and lakes. Bracken, Wachtler, Panesar and Lange, in fact point out that when put into work in the 19th century, the ‘modern’ sewer system was an “emergency solution”, that “engineers have continued to try and perfect” for the past 150 years. Even though it was a convenient solution at its time, and even though it has certainly improved the hygienic situation indoors, conventional sanitation seems outdated and is becoming a problem today.

Aside from not being very economical (using human excreta in agriculture would save the production costs of industrial fertilisers), for many conventional sanitation is unaffordable and unreachable: over 20 million citizens in the European Union (van den Bossche, C., 2008, “Access to Safe Sanitation – a Right for all EU citizens”, para 7), and 2.6 billion people worldwide (figure from 2002) do not have access to safe sanitation (WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation, 2005).

Furthermore, releasing poorly treated - or often non-treated - human urine and faeces into water bodies is disastrous for the environment. We are now starting to see the effects, as the phosphates and nitrogen, especially from untreated sewage, are causing eutrophication of water bodies (Centre européen d’Etudes des Polyphosphates, 2007). This is becoming an alarming problem, which needs to be solved sooner rather than later. This is where the topic of human excreta becomes interesting. Human excreta is, simply put, a very smart choice for fertiliser.

Implementing human excreta use in agriculture would solve, ultimately, quite a few large-scale problems that not only the EU, but also the whole world, is facing today. Currently, according to the website of Worldometers³, the world’s population is about 6,6 billion people. The projections of FAO, the World Food and Agricultural Organisation, are that by 2030 the earth will host a whopping 8,3 billion people (FAO, “World agriculture 2030: Main findings”, para 1). How will we feed all these people? By 2030, world cereal production will have to be increased by a “billion tonnes” (FAO, “World agriculture 2030: Main findings”, para 6). As phosphorus in nature is limited – Rosemarin (2004) has estimated that we will run out of phosphorus in 130-260 years – and more crops need to be fertilised, human excreta offers a fantastic solution. Instead of using chemical fertiliser, human urine

³ For the website of Worldometers, go to: <http://www.worldometers.info/>

can be used for this purpose. This will save water and energy as urine contains nitrogen, phosphates, and other essential substances needed in agriculture.

So what is holding us from going back? Studying current European Union legislation reveals that human urine and faeces are not mentioned anywhere as potential fertilisers or soil amendments. Nevertheless, only the soon-to-be-repealed Council Regulation (EEC) No 2092/91 of 24 June 1991, does not allow human urine and excreta use in agriculture. This is why is best to look at, as Johansson and Kvarnström put it, ““what is not strictly prohibited” rather than “what is specifically allowed”” (2005, p.42). Thus, as legislation is not prohibiting human excreta use in agriculture, it can be assumed that in this case, it is allowed to use it agriculture, at least on a small scale, as long as the restrictions and limitations set for other types of fertilisers, such as animal manure, are followed. This idea is deducted from Johansson and Kvarnström’s study in which it is suggested that in case legislation is ‘loose’, a change in legislation is not necessarily needed, but instead what are needed are “merely changes of interpretation or the enforcement of existing laws and rules” (2005, p. 43). Thus, as we want to allow ecological sanitation, the only thing needed “is to avoid mentioning technologies in legislation/regulation, but rather to focus on criteria that the sanitation services should provide”.

To answer the research question, “What are the existing and needed regulations and guidelines concerning a sustainable wastewater management in the European Union, regarding small-scale on-site wastewater management, and particularly regarding the safe reuse of the source separated wastewater streams in the agriculture?”, legislation both on EU level and on national levels was studied. It was found out that there are currently regulations that allow the use of source separated wastewaters, and if modified, would also allow the safe use of source separated human excreta. However, human urine and faeces are not in the scope of the current legislations.

Apart from the fact that EU legislation quite directly ignores the possibility of human waste, urine and faeces use in agriculture, it also seems that the media has not been paying much attention to the issue either, at least not in European context. Articles sometimes cover source separating sanitation and the safe reuse of wastewater or human excreta, but often this happens when water and sanitation problems in, for example, Asia or Africa are discussed. Nevertheless, this is an important issue in Europe and in the European Union as well. This lack of media coverage on the issue of human excreta use in agriculture has possibly created a situation where the public does not actually know about the possibility of safe reuse of human excreta in agriculture (and ecological sanitation) and thus cannot demand for its implementation, neither on EU-, nor on state level.

Esther de Lange, a Dutch MEP, pointed out that it is also hard to get people interested in a topic like this because of the unappetising nature of it (E. de Lange, personal interview, May 24, 2008). The question that needs to be asked, according to de Lange, is “do people want it?” (E. de Lange, personal interview, May 24, 2008). Once the answer to that question has been established, an action plan can be formulated. The shape of the action plan completely depends on how people feel about ecological sanitation (ecosan). Whatever people’s feelings are, it is very likely that ecosan needs

to be 'marketed' to the public: they need to understand why it is necessary to start eating produce fertilised with human excreta and start using diverting toilets, when in the past they managed with conventional methods. Thus, it is important to be on the lookout for ways with which it is possible to arouse public interest to the topic. According to the WHO, "consumers want products that are durable and will not cost a lot to operate and maintain" (2006, p. 5). Furthermore, for comfort reasons, conversion to ecosan should not be too laborious.

Positive issues such as the benefits for the economy, health, hygiene and the state of the environment should be highlighted. Education can also have a factor in summoning up positive attitudes over excreta use in agriculture. Getting to know about excreta use at a younger age and being subjected to it regularly makes the topic easier to comprehend and less of a taboo. Furthermore, the earlier children are taught about the health risks, the less chances there are of excreta-related disease outbreaks in the future. Regarding the implementation of ecological sanitation it should be said that it is very important to look at the values and norms of each of the Member States. As the situation in all member states is different, it would be unreasonable to think that ecosan could be implemented in all of them for the same reasons. People's attitudes towards ecological sanitation should be studied, and marketing should be based on this.

To conclude, there is hope for ecological sanitation in Europe. Even though excreta use in agriculture has not yet been included in legislation, the WHO Guidelines certainly have opened a door for future legislative changes. The time is now: due to the recent enlargement rounds, EU received millions of new Eastern European citizens, millions of them lacking safe sanitation. 2008 being dubbed the international year of sanitation, what could be a more convenient time to draw attention to the issue and properly open up the political agenda for ecological sanitation?

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