

With this newsletter LeAF (Lettinga Associates Foundation) aims at informing the reader on its projects, courses and other activities performed in the field of implementation of environmental protection and resource conservation technologies

Inside this issue

- ① Successful Sanitation Challenge in Wageningen
- ① Using urine as fertilizer for energy crops
- ① ORBIT 2008 update
- ① Biological treatment of truck cleaning wastewater
- ① First MOBISAN® unit in Wageningen
- ① Pathogens and biogas
- ① Upcoming events

Dear Readers,

Halfway this UN International Year of Sanitation, LeAF can clearly feel the effects of the increased interests in both anaerobic technologies and (new) decentralized sanitation concepts. On the other hand, LeAF also feels the effects of the shortage of trained people available for the labor market. We sincerely regret the departure of Adriaan Mels, head of our Desar group, who accepted a job offered by Vitens Evides International from September onwards. Adriaan joined LeAF in 2001 and we got to know him as a dedicated, reliable and very pleasant colleague. LeAF's stimulating position in the field of decentralized sanitation is mainly the result of Adriaan's efforts for which we deeply thank him. Adriaan will continue to work on capacity building through Vitens Evides International's work in Water Operator Partnerships. We wish him all the best in this new career and we are pleased to know that Adriaan will continue to cooperate with us in several projects.

Hetty Jaspers joined LeAF as management assistant. She started in January and already proved her value amongst others during the organization of the Sanitation Challenge. Ljiljana Rodic-Wiersma assists LeAF in the field of solid waste management (e.g. ORBIT congress) and we are in the process of contracting a new junior researcher / consultant. And since LeAF wants to keep its position in the area of sanitation, we are looking for a successor of Adriaan.

But for now it is good to have a break. On behalf of LeAF I wish you very pleasant holidays.

Marjo Lexmond
Managing director

A successful Sanitation Challenge in Wageningen

Together with the departments of Environmental Policy (WU-ENP) and Environmental Technology (WU-ETE) of Wageningen University and TTIW Wetsus, LeAF organized the "Sanitation Challenge: an International Conference on new Sanitation Concepts and Models of Governance" under auspices of IWA. The conference took place in Wageningen on May 19-21, 2008, in the beginning of the UN International Year of Sanitation. The main target of the organizers was to bring the different stakeholders involved in research, development and implementation of (new) sanitation technologies together and to facilitate the discussion on potential solutions both on the technological as well as on the social level.

The conference turned out to be a perfect platform for discussion for the approximately 120 participants. Process and environmental engineers, urban developers, sociologists and architects from all around the world attended this conference. Around one third of the delegates originated from outside Europe, namely Africa and Asia. Of the remaining 80 participants 40 are living in the Netherlands.



James Okot Okumu from Uganda

Photograph: Gert Spaargaren

The main issues addressed in the 50 oral presentations during the conference were "How to provide appropriate sanitation for billions of people?" and "How do we make the Western toilet-, sewer- and treatment systems more sustainable?". Neither new technologies nor new governance methods alone will provide the answers to these questions.



During the plenary sessions several speakers addressed issues related to sanitation. Martin Kropff, rector of Wageningen University, stated that sanitation is a nice example of the mission of WUR 'Science for Impact'. Grietje Zeeman (WU-ETE/LeAF) presented an overview of available decentralized (new) sanitation concepts and applications and underlined that there may be significant differences in the objectives of "new sanitation" for developed and developing countries. Gatze Lettinga promoted sustainability as a guiding tool for the concepts dealing with sanitation and reuse. Ralf Otterpohl (TUHH, Germany) discussed the concepts that have been successfully applied and the areas that need further development. Aleid Diepeveen (TTIW Wetsus) organized the "business" session "Sanitation Technology for developing countries: Business or Charity?". With Frederik Claasen (Microwater Facility) as chair, delegates discussed the role of business in achieving the Millennium Development Goals (MDG).

During the closing ceremony Gert Spaargaren (WU-ENP) and Jules van Lier (LeAF/WU-ETE) summarized the congress:

- Decentralized sanitation has proven itself in pilot and demonstration projects. Considerable investments are needed to gain the trust of consumers, farmers and the establishment.
- Technological challenges for both the developed and the developing countries lie in the integration of the treatment of urine and grey / black water on the one hand and the reuse of water and nutrients in e.g. agriculture on the other.
- For Western countries the challenge lies in the development of new treatment technologies for specific wastewater streams.
- Transport of concentrated waste streams, like fecal matter and urine, needs to be further developed. Vacuum systems for collection and transport have proven themselves useful at several places in Europe.
- Social sciences play a big role in formulating models of governance, gaining the trust of end-users and the spatial implementation of sanitation infrastructure.

The proceedings of the congress with (full) papers of the oral presentations and extended abstracts of the poster presentations are available for €25,- excluding shipping costs. Please send an e-mail to leaf@wur.nl and mention "Sanitation Challenge proceedings" in the subject line. The powerpoint presentations are published on the congress website: www.sanitation-challenge.wur.nl/UK.

Using urine as fertilizer for energy crops

Urine contributes 80% of the nitrogen and 45% of the phosphate to the total amounts in domestic wastewater. Separate collection and treatment of urine is interesting, because it can reduce both

nutrient loads to treatment plants and electricity requirements of treatment plants. Moreover, urine also contains most of the pharmaceuticals and hormones excreted by humans.

Within a project commissioned by STOWA, LeAF, WU-ETE and Grontmij investigated the feasibility of separate collection and subsequent use of urine as a fertilizer for energy crops at the demonstration site Anderen in the Province of Drenthe, The Netherlands. The main research question was whether the pharmaceuticals present in urine have any risk of reaching the groundwater when urine is being applied to the field at this location.

When pharmaceuticals are brought to soil they can be removed by sorption and / or biodegradation. The fate of pharmaceuticals was investigated by biodegradation and sorption tests and by soil column experiments.

For the purpose of this study eight pharmaceutical compounds were selected with different therapeutic modes: acetylsalicylic acid, bezafibrate, carbamazepine, clofibrate, diclofenac, fenofibrate, ibuprofen and metoprolol. All compounds demonstrated a moderate to high sorption to soil, whereas 6 out of 8 compounds proved to be biodegradable.



The main conclusions of this research are:

- The risk of groundwater contamination by the selected pharmaceuticals due to fertilization with urine at the demonstration project Anderen is very low (negligible) in the first 50-100 years.
- In the long run Carbamazepine is a risk because it was found not to be degradable while it will likely be used by the people at the project location in Anderen. The research also showed that Carbamazepine is strongly adsorbing to soil and will only reach the groundwater at full saturation of the soil. Based on the research results and realistic indications of the concentrations in urine it is estimated that this will take at least a few hundred years.

For more information please contact Adriaan Mels (adriaan.mels@wur.nl) or Katarzyna Kujawa-Roeleveld (katarzyna.kujawa@wur.nl)

ORBIT 2008 update

As mentioned in LeAF letter no. 8 the biennial conference ORBIT 2008 "Moving Organic Waste Recycling towards Resource Management and for the Biobased Economy" will take place in Wageningen on October 13-15, 2008. This conference will be hosted by Wageningen University and Research Centre and is organized by LeAF. LeAF is also acting as the chair of the scientific part of ORBIT 2008. ORBIT 2008 will deal intensively with organic residues including biowaste. The more traditional subjects of composting and anaerobic digestion will be presented together with various matters dealing with technology and product quality. New aspects like the complex issues of sustainable energy recovery from biomass, organics as feedstock for the bio-based economy, the carbon competition and the need for a strategy for the preservation of the humus content in soils world-wide will also be addressed.



Compost

(Source: www.wikipedia.org;
Photograph Kessner
Photography)

The organization of ORBIT 2008 specifically aims to deal with both management and research issues; i.e. concepts like Cradle to Cradle will be discussed but also new research results will be presented. Another aim is to introduce societally relevant and sometimes controversial issues and to provoke and facilitate discussion between experts (e.g. use of biomass as fuels or food).

The program comprises 5 parallel scientific and best practice sessions on the following topics:

- Organic waste policies and strategies in the EU
- Developing countries issues
- Sustainable resources management
- Life Cycle Assessment
- Climate change
- Composting
- Anaerobic digestion
- Compost use and benefits
- Renewable energy from biomass and biorefinery
- Waste management and carbon finance / trade
- Status and trends in European biowaste management
- Special session for practitioners

The organization has accepted around 220 abstracts for oral and poster presentations. The program for the congress is more or less complete. Professor Michael Braungart, one of the

initiators of the Cradle to Cradle Design concept is a confirmed key-note speaker.



Kitchen and garden waste

(Source: www.wikipedia.org)

The deadline for registration is August 31, 2008. More information can be found on the conference website www.orbit2008.de where also the program of the conference can be downloaded.

Biological treatment of truck cleaning wastewater

LeAF is able to carry out different laboratory experiments. One of the projects that is currently running deals with the transformation of fat in wastewater. This project is carried out to assist in the design of an innovative anaerobic wastewater treatment system that aims at maximization of the biogas production from wastewater. The reactor concept is currently tested at the tank cleaning company ITC transport B.V. (Reek, The Netherlands). The system, BIOPAQ[®]-AFR (Anaerobic Flotation Reactor), is a new reactor concept of Paques bv (Balk, The Netherlands). The bacteria in the anaerobic reactor grow in flocs and are kept in the reactor by an integrated flotation unit. Effluent is pumped out of the unit from underneath this floating layer and the anaerobic flocculated sludge remains in the reactor. A full scale reactor will be operational in autumn of this year. ITC is the first company to test the new system. Paques bv believes that in the future the new technology can be applied in amongst others the food industry.

ITC cleans trucks and tankers used for the transportation of food stuffs. Currently, fats in the cleaning water are removed and the water is released into the sewer system. The fats are disposed off separately. The new anaerobic system transforms both dissolved and suspended components of the cleaning water into valuable biogas. The energy generated with a Combined Heat Power plant (CHP) that will be implemented in the system at ITC, can subsequently be used for e.g. heating of the cleaning water for the trucks and tankers. The effluent of the Biopaq[®]-AFR will be treated in a secondary treatment to enable re-use of the water in the cleaning process.

This research is sponsored by SenterNovem within the InnoWATOR program. LeAF is carrying out laboratory tests to determine the biodegradability of the fatty compounds in the

influent. ITC, WU-ETE, and Paques bv are the other project partners.

More information on the laboratory tests:
Miriam van Eekert (miriam.vaneekert@wur.nl)

First MOBISAN® unit in Wageningen

The Mobisan®, a new sanitation concept, was especially developed for slums and other areas with high population densities (e.g. refugee camps). During the Sanitation Challenge the first demonstration unit was placed in front of the congress centre. The Mobisan® was developed by Landustrie Sneek, Vitens-Evides International and LeAF. The first demonstration project will take place in a slum with 600 inhabitants in Cape Town, South Africa in close cooperation with the local Water Service Department. In slums the need for appropriate sanitation is enormous, but the situation is complex because of the “temporary” nature of the areas and the absence of infrastructure. The Mobisan® unit is a sea container containing a series of toilets and a small room for the care-taker. Faecal matter and urine are processed in the unit itself by drying and mixing of the mass with manual power applied at the outside of the unit. The products of this treatment may be applied at the site as irrigation water and fertilizers. WU and TTIW Wetsus were involved in the development of this new technology and the Partners for Water program of EVD is cofinancing the demonstration project.

More information: Adriaan Mels
(adriaan.mels@wur.nl)

Pathogens and biogas

The number of digestors in the Netherlands is growing and up to now almost all of the biogas is used to generate electricity via combined heat power plants (CHPs). The current Dutch government wants to increase the portion of sustainable energy to 20% of the total amount in 2020. This aim can not be achieved without using more “Green Gas” in the existing (natural) gas network. Green gas (Groen Gas) is biogas that is upgraded to natural gas quality.

A few factors will have to be taken into account when the natural gas network will be supplemented with upgraded biogas. The Dutch “Platform Nieuw Gas” formulated a number of issues in her report “Vol gas vooruit. De rol van Groen gas in de Nederlandse energiehouding” (a Dutch report about the role of Green Gas in the Dutch energy system). Among these were the variability of the composition of the biogas, its energy content and the possible risks for public health. Not much is known about the public health risks. Pathogenic microorganisms could reach the end user of the gas after transport of the pathogens from the digester into the gas and into the gas network. On request of SenterNovem LeAF made an inventory of this

risk and the risk of survival of the pathogens after transmission into the biogas during the upgrading to “Green Gas” and its subsequent use. This inventory of risks was solely based on a review of available literature data. Analysis of biogas or laboratory experiments were not conducted within the framework of this study.



(Source: www.wikipedia.org)

The focus of this study was on pathogenic viruses, bacteria, protozoa and fungi. Some examples of pathogenic microorganisms discussed are the FMD-virus (although this virus is not directly pathogenic for humans), Enterobacteria, e.g. *Escherichia coli* and *Salmonella*, *Campylobacter*, sporeforming bacteria, and *Cryptosporidium* and *Giardia*. From the data available it was hard to make a quantitative analysis of the risk of transmission of pathogens from the biogas during digestion of manure and other biowaste. There are many variables to consider. Nevertheless, it was possible to determine some critical parameters in the whole process of using manure and other biowaste for Green Gas production.



E. coli

(Foto: NIAID)



Giardia lamblia cyste

(Foto: CDC / Janice Carr)



The report contains only a first inventory of the risk of the presence of pathogenic microorganisms in processed biogas from digestors that are treating manure and other biowaste. From the literature review and some preliminary calculations one may conclude that the number of pathogens (like *E. coli* en *Salmonella*) that end up in the biogas is too low to pose a risk for the end user for household purposes. Leakages in the (natural) gas network could result in exposure of employees of the gas network companies to pathogenic microorganisms. The information available on the influence of the methods for upgrading the gas on pathogen survival is limited. As a result, the possible inactivation during upgrading or transport of the biogas could not be taken into account. The report also identifies possible treatments that will reduce the risk of exposure to pathogens for the end-user, like hygienic pretreatment, longer retention times in the reactor or filtration of the biogas. Neverthe-

less, there are still issues that need to be explored before a more thorough evaluation of the risk of pathogen exposure for the consumer and gas network personnel can be made. Currently, there is not enough information available on the fate of some (unidentified) viruses, *Campylobacter* spp., sporeforming bacteria, protozoa and fungi and fungal spores during digestion. In addition, more insight on the effect of the digestion of manure of diseased livestock is required.

The complete report (in Dutch with an English summary) can be downloaded from the SenterNovem website.

http://www.senternovem.nl/duurzameenergie/publicaties/publicaties_bioenergie/inventarisatie_van_het_risico_van_transmissie_van_pathogenen_uit_biogas.asp

More information Miriam van Eekert
(miriam.vaneekert@wur.nl)

Upcoming events

October 13-15, 2008, Wageningen, The Netherlands

Orbit 2008

Moving organic waste recycling towards resource management and for the biobased economy

More information: www.orbit2008.de

October 28-29, 2008, Wageningen, The Netherlands

TopCursus Bodem (in Dutch)

November 10-13, 2008, Merida, Mexico

International course on design, operation and maintenance of UASB reactors (in Spanish)

Colophon

LeAF (Lettinga Associates Foundation) is an independent knowledge centre working on the development and implementation of sustainable environmental protection technologies with the aim of (re-)utilisation of valuable compounds in waste and wastewater and the improvement of the quality of life of people living in countries in transition. LeAF has close ties with Wageningen University and one of its aims is to bridge the gap between research and practical application. LeAF does not receive donor funding and earns its income from projects related to applied research, consultancy tasks, organisation of courses, biological tests, etc.

Twice a year LeAF will distribute this LeAF Letter amongst its clients, relations, and others interested in environmental technologies for waste and wastewater treatment.

If you would like to receive this newsletter on a different e-mail account, or if you wish to subscribe someone else for this service, please send an e-mail to leaf@leaf-water.org. If you wish to be removed from this mailing list, you can send an e-mail to the above mentioned address with the subject 'remove from LeAF Letter list'.