



LeAF Letter

Number 12, March 2010

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

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Dear Readers,

The world is facing many challenges and LeAF takes up its share. Having identified and set our goals towards both industry and society, LeAF continuously seeks to reduce the use and to stimulate the reuse of resources like water, energy and minerals. Not only for the rich, but also for the poorer part of this world.

For the industry we try to realize our aims by performing consultancies and providing advice, performing desk and feasibility studies, making (conceptual) designs for treatment systems or characterizing the potentials or risks of waters and wastes via (biological) tests.

For the society we develop and implement appropriate sanitation systems, we stimulate capacity building by creating networks and offering courses and trainings, and we provide project management for projects that fit within our scope.

In this respect I would like to inform you on two important changes in our organization. As of November 1st 2009, Dr. Henri Spanjers started to work for 2 days a week in education and research for Delft University in the group of Prof. Jules van Lier. The other 3 days, he continues to be LeAF's team leader in the Technology group. Furthermore, we are pleased to announce that LeAF's group on Decentralized Sanitation has found itself a new team leader: Dr. Jan Weijma. From April 1st onwards, Jan Weijma will be working for LeAF for 3 days a week. For the other 2 days, he will continue his work for the Sub-department of Environmental Technology, for

which he is working on the development of innovative environmental technologies.

Having secured our network within the academic world, we will continue to offer high quality services to our clients.

In addition to the changes indicated above, we also like to inform you on some other changes in our team. Jana Bartackova, who was involved in our laboratory work, returned as planned to her home country Czech Republic. We are looking for a new laboratory researcher. Davit Castellano, who finished his work for LeAF on the first MobiSan project, is now looking for ways to continue his work on mobile sanitation in such a way that he can combine his job with a PhD position at Wageningen University.

This LeAF Letter is meant to highlight some of our recent projects, but we also would like to draw your attention to the Call for proposals for the Lettinga Award 2010 and to some courses which are scheduled or developed.

We hope you will enjoy reading this issue.

Marjo Lexmond
Managing director

Jan Weijma – Team leader Decentralized Sanitation

An introduction naturally starts with a name; mine is Jan Weijma, age 42. After my MSc Chemical Engineering at the University of Groningen I entered the Sub-department of Environmental Technology of Wageningen University, where I was taken by the passion for anaerobic technologies during my PhD study, with Gatze Lettinga as my promoter. In the following 7 years I worked for the company Paques BV on the development and implementation of innovative environmental biotechnologies, for industrial as well as municipal wastewater treatment. During that time I encountered a lot of technological and technical knowledge in the field, but often this was rather scattered. It was the challenge to make the successful mix of practice, science and technology and to find and motivate the people who can





contribute to this. This will be my dedication at LeAF too. Our society is gaining momentum on the way to sustainability, with a transition aiming at renewable energy, reusable water and recyclable elements, amongst others P and N. Themes on which the Sub-department of Environmental Technology works intensively already for a long time, with LeAF as treasurer of the acquired academic knowledge and experience especially on anaerobic technology and decentralized sanitation, and with the aim to channel these treasures into everyday practice. From the 1st of April I will take fully part in this process, and I hope I can introduce myself to you in a more personal way in the near future. Of course, do not hesitate to contact me if you would like to discuss opportunities with me earlier.

Jan Weijma (jan.weijma@wur.nl)

Lettinga Award 2010 - Call for proposals

Focus on enhancing the efficiency

The world faces an urgent need to reduce the use and increase the reuse of natural resources. The anaerobic process has considerable potential in this respect. The focus of the Lettinga Award 2010, a prize of 25,000 euro, is on improving the efficiency of anaerobic treatment. This could be achieved by technological improvements, new treatment concepts, breakthroughs due to increased knowledge on microbiology, enhancement of degradability, etc. The proposed innovation is of course meant to improve the overall sustainability of the system.

If you have an excellent idea, please submit your proposal before May 15th 2010. Check out our website: www.leaf-water.org for the proposal form and more details.

The Lettinga Award is an initiative of the Lettinga Foundation and Dutch companies active in the field of sustainable, anaerobic, technologies. *Biothane Systems International* is the main sponsor of the Lettinga Award 2010. In addition, funding is provided by *Colsen bv.* and *LeAF*.

For more information contact Darja Kragić Kok (darja.kragic@wur.nl).

NEWEN – the first year in short

The first year of the NEWEN project (Netherlands and Western Balkans Environmental Network) was successful. Workshops, courses, fieldtrips, regional meetings and MSc studies took place in the Western Balkan countries and in the Netherlands during this period.

Thirteen students from the Western Balkan have been awarded a NEWEN fellowship and started with MSc programmes in Environmental Science and/or Environmental Management at Dutch institutions.



Some of the recent project activities include:

- the Hazardous Waste Management Course, held on 21-25 September 2009 in the Netherlands (organized by Unesco-IHE);
- a Workshop on Regional Cooperation for Development and Restoration of Ecological Networks in the Western Balkan Region, held on 19-20 October 2009 in Macedonia (co-organized by University of Skopje, University of Prishtina and Wageningen International);
- an online Course on Technology selection for sanitation and municipal wastewater management in the Western Balkan (organized by Unesco-IHE), currently in progress.
- the NEWEN day – a meeting for students who are currently doing their MSc studies at different Dutch Universities, held on 15th of February 2010 at Unesco-IHE in Delft

Upcoming events include:

- a regional Workshop on Lake Pollution Management in the Western Balkan to be held in Tuzla, Bosnia and Herzegovina, 8-9 March 2010. The workshop is co-organized by Wageningen University (the Environmental Systems Analysis Group), Unesco-IHE and the University of Tuzla.
- Training of Trainers on Curriculum Development for Environmental Science Education; to be held in Wageningen, 17 - 21 May, 2010. This event is organized by Centre for Development Innovation, Wageningen University.

The NEWEN project is financially supported by the Dutch Ministry of Foreign Affairs through the *Regional Programme on Environment Western Balkan* of the Embassy of the Kingdom of the Netherlands in Belgrade. LeAF is coordinator of the project.

For more information about the NEWEN activities you can visit www.newenproject.org or contact Darja Kragić Kok (darja.kragic@wur.nl).

New sanitation in Westland

In 2009 STOWA (Foundation for Applied Water Research), SIGN (Foundation for Innovation in Greenhouse Cultivation) and Waterboard Delfland financed research on implementation possibilities of New Sanitation in Westland. This research was performed by a consortium consisting of LeAF, Elannet, Landustrie and Royal Haskoning. For several reasons it was assumed



that the Municipality of Westland, known for its intensive greenhouse cultivation, offers chances to implement new sanitation concepts.

For this research active contacts have been established with local stakeholders to investigate the opportunities and threats. In due time the outcome of this research will lay the foundation for the decision making regarding possible implementation of New Sanitation (or its elements) for the new to built residential area 'Het Nieuwe Water'.

The link with the greenhouse agriculture was an important motive to start this project. The greenhouses are leaders in implementation of decentralised water techniques. They are also consumers of fresh water and nutrients, which could be recovered from the local water chains. As such the possibilities to reuse wastewater, mainly in a greenhouse sector, was the main objective of this study.

This research resulted in the setting and global comparison of six configurations (scenarios) for domestic water management, focussed on a specific implementation in Westland. The plans are to accommodate 1200 houses with a high percentage of floating structures and restructuring greenhouse areas. To work out the scenarios a range of potential wastewater treatment techniques was defined. The scenarios were compared to each other in terms of costs.

The report (soon available via the STOWA site and as a hard copy) summarises the results obtained so far. Some conclusions can be relevant for the specific situation studied in this case but can be also extrapolated onto other set-ups.

More information: Katarzyna Kujawa-Roeleveld (katarzyna.kujawa@wur.nl)

Improved sanitation at Sincobile high school, Mpumalanga province, South Africa

The International Inkomati Cooperation Programme aims to promote sustainable use of the Inkomati Basin water through improvement of sanitation issues. The programme is funded by the Royal Dutch Embassy in Pretoria, and a twinning agreement between the regional water authority Waterboard Groot Salland and Inkomati Catchment Management Agency, including the Nkomazi Local Municipality supported by the Association of the Netherlands Municipalities (VNG International) with the Municipalities Zwolle and Dalfsen. Within this programme LeAF has assisted in developing an improvement plan for sanitation for one of the schools in the region.

Sincobile Secondary School is situated in Mpumalanga province, block C, Komatipoort, 35 km from the Mozambique Border, and 30 km from the Swaziland border. It was established in 1998 and caters for children from the farms and informal settlements. The school has 970 students (amongst them are 92 orphaned and/or vulner-

able children) and 37 educators. The area is very hot and dry can reach temperatures as high as 37 degrees Celsius in summer.



Image of the yard of the Sincobile High School

The school has at present insufficient sanitation. The existing toilets, in high number and in good condition, are not in operation because of insufficient and discontinuous water supply for flushing. There are three septic tanks (also not in operation) with a total volume of approximately 90 m³. The students make use of just a few pit latrines.

The programme also plans to establish a supervised food garden in order to enrich the pupils diet with fruits, vegetables and herbs. The sanitation concepts which focus at resource recovery are currently being worked out. The following elements of sanitation improvement at Sincobile are considered:

- (partial) urine diversion, storage and reuse for the school garden;
- anaerobic digestion of concentrated black water for biogas generation;
- utilisation of biogas for cooking purposes, instead of wood;
- rainwater harvesting for irrigation of the school garden;
- hand washing facilities with reuse of wash water.

For more information contact Katarzyna Kujawa-Roeleveld (Katarzyna.Kujawa@wur.nl)

Higher methane yields during digestion

The economics of digestion systems for sludge, manure or other biomass may become more attractive when more methane can be generated from the same amount of biomass or when the methane formation can be increased through the addition of cosubstrates.

LeAF participated in a project of Sustec funded by ROB-SenterNovem in The Netherlands. The project aimed at the development of an effective pretreatment technology resulting in an improved availability and degradation of the organic matter in digestible biomass. The project focused on



Ladies cooking a meal for the students



the digestion of secondary sludge of domestic wastewater treatment plants, manure and other (co)substrates. The results were used by Sustec to further develop their TurboTec® concept for the pretreatment of biomass (refer to www.sustec.nl for more details).

Firstly, a literature review was carried out to assemble available knowledge on biomass pretreatment methods for increased methane formation with a focus on the effect of mechanical, thermal, chemical (addition of acids or base), and thermochemical methods on different digestion substrates. Laboratory testing revealed that the effect of thermal or thermochemical pretreatment strongly depended on the nature of the biomass. Pretreating manure at 120°C led to an increase of the methane production from pig manure with 12 to 37% (based on dry matter), whereas the same pretreatment doubled the methane production from cow manure. Pretreatment of secondary sludge resulted in 34-38% more biogas and 41-48% more methane. The effect of pretreatment could be more pronounced in a full scale installation because the microorganisms will be more adapted to the incoming substrates.

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

Managing water scarcity: Intelligent Tools and cooperative strategies (MAI-TAI)

The EU Coordination Action project MAI-TAI, "Managing water scarcity: Intelligent Tools and cooperative strategies", started in April 2007. The project deals with integrated water resources management in China and India, and focuses on one sub-river basin in each country. Both "state of the art" technologies and practices, and local (including indigenous) technologies and practices are being looked at. LeAF has the lead of work package 2, investigating the innovation potential of state of the art technologies and practices. Since the start of the project several different case studies have been carried out in the areas of domestic, agricultural and industrial water use and pollution in the Yongding river basin in China, and the Bandi river basin in India. Different technical, cultural and managerial aspects of water use and pollution were investigated, and the constraints for implementation of new technologies and practices are being identified.

Contact Iemke Bisschops for more information: iemke.bisschops@wur.nl or visit the project website: <http://www.project-mai-tai.net/>

PAO course on new sanitation systems

This year stichting Post Academisch Onderwijs (PAO) organizes a course on new sanitation systems (in Dutch), entitled: "*nieuwe sanitatiesystemen, een perspectief voor de 21e eeuw?*" (new sanitation systems: a perspective for the XXIst century?). The course gives an overview of latest

developments in new sanitation concepts, insight and knowledge on applied techniques for collections, transport and treatment of urban wastewater streams within these new concepts and it offers the possibility to discuss knowledge gaps and development perspectives. Grietje Zeeman en Katarzyna Kujawa from LeAF will be the course leaders.

The two-day course is to be held on the 30th and 31st March in Wageningen.

For more information visit the PAO website: <http://pao-tudelft.nl>.

LeAF lab - an update

In the past years LeAF has carried out a variety of laboratory studies to test the treatability of wastewaters, digestability of specific waste streams, activity of sludges, and biodegradability of specific compounds. Since laboratory testing is one of the specialities of LeAF we like to think along with the client to come up with the best laboratory set up to obtain high quality results. Results of these tests are used to evaluate the performance of waste or wastewater treatment plants and as part of the decision-making process for the selection and design of the most appropriate technologies for treatment of a specific waste or wastewater stream.

In most cases the testing is tailor made and batch tests as well as continuous reactor tests are possible. We collaborate with the sub-department of Environmental Technology and therefore, we have access to analytical equipment for a wide variety of parameters and access to microscopes.

Examples of recently carried out tests are given below:

Biodegradability of wastewater from industries both under anaerobic or aerobic conditions.

Wastewaters may be valuable sources of energy provided the right conditions are applied. Also, biological treatment, anaerobic or aerobic, may



be more suitable for wastewater than at first thought. (Simple) pre-treatment methods may largely increase the biological treatability of a wastewater. LeAF is able to assess the biodegradability of wastewater constituents under a variety of conditions. These studies may be combined with a desk study.

Biogas production from solid waste or wastewater.

What is the maximum amount of biogas (and/or methane) that is produced from a certain waste stream, e.g. from a prospective cosubstrate for



the digestion with manure. LeAF uses a standard inoculum for these tests that will render a maximum production of gas. The biogas production can also be assessed in larger scale CSTR reactors. LeAF is also able to deal with large numbers of samples for biogas production batch tests.

Activity tests and toxicity tests

How active is the anaerobic or aerobic sludge or how active are specific groups of bacteria in the sludge? Anaerobic bacteria are in general more sensitive towards toxic compounds. With a standard anaerobic sludge or with any sludge that the client would like to evaluate the toxicity of wastewaters or specific constituents in a wastewater can be evaluated.

Assessment of the stability of digestate from digestors.

Often the digestate still contains valuable energy which is released in the form of methane when the appropriate conditions are applied. LeAF is constantly trying to improve the quality system for these digestates. In this way we can provide our clients with information on the performance of their digester.

The biodegradation of xenobiotic compounds in contaminated soil.

To evaluate the possibilities of in situ biological remediation of contaminated soils and/or groundwater we can assess the biodegradation of specific compounds in soil under anaerobic or aerobic conditions.



For more information on any of the tests mentioned above or for other laboratory work you may require, please contact Miriam van Eekert (miriam.vaneekert@wur.nl) or Iemke Bisschops (iemke.bisschops@wur.nl).

New e-course on the conceptual design of anaerobic wastewater treatment systems

In close cooperation with Wageningen Business School LeAF started the development of a new e-course (MSc level). With this course we aim to provide the participants with the knowledge needed to develop or evaluate a conceptual design for the anaerobic treatment of wastewater. We target a broad audience from engineers that want to refresh their knowledge to policy makers that want to know more about anaerobic treatment. After the course you will be able to make basic calculations needed for a design. Also, we will provide knowledge about e.g. the underlying microbiological processes and the laboratory

testing. The course will not go into detailed design issues like diameters of piping needed or costs of building materials. Your progress will be evaluated through exercises, questionnaires and cases in the program. The participation fee is not defined yet, but the aim is to keep the costs low to allow all interested people to participate. If funding can be found to develop the e-course, only running costs are to be charged, approximately 100 – 200 euro's.

At the moment we are developing the course and it may still take some time before we can start taking in participants. However, we are currently making an inventory of possible participants. If you are interested to participate in such an e-course, please let us know by sending an e-mail to Miriam van Eekert (miriam.vaneekert@wur.nl).

In that way we will be able to keep you informed on the progress. We may also invite you then to participate in a first pilot of the course, free of charge.

Anaerobic Treatment - one week course in Wageningen – pre announcement

LeAF is planning to offer a one week course on Anaerobic Treatment in the fall of 2010. Venue will be Wageningen, the Netherlands. The course will include topics like: microbiology and biochemistry of anaerobic wastewater treatment, design principles for UASB reactors, activity tests, start up and sludge granulation, operational problems and recovery of reactor functionality and introduction to modelling of anaerobic digestion. Costs will be around 1000 euro per participant.

If you are interested or like to have more information, please contact Darja Kragić Kok (darja.kragic@wur.nl).

LeAF website updated

The LeAF website has been updated and improved. You might have noticed that something was going on, because unfortunately the site was not available for a few days. We apologize for any inconvenience this may have caused.

Good to know

For our contacts in the Netherlands (in Dutch): Innovatievouchers.

Met een innovatievoucher (aan te vragen bij Agentschap NL - voorheen SenterNovem) kunt u een onderzoeksvraag voorleggen bij een kennisinstelling. Er zijn vouchers ter waarde van €2500 en €7500. LeAF is binnen deze regeling erkend als kennisinstelling. Meer informatie is te vinden op: www.senternovem.nl/innovatievouchers/



LeAF publication list 2009

Reports accessible to the public

Kujawa-Roeleveld K., Grotenhuis T., Kragic Kok D., Schuman E., Jacobi J., Mels A., Zeeman G. (2009) Sorption and biodegradation of pharmaceutical compounds in soil - Application of urine as a natural fertiliser for energy crops. STOWA project 'Anderen - Anders Plassen'.

Kujawa-Roeleveld K., Zhang J., Mels A., Jacobi J. (2009) Sorption and oxidation of selected pharmaceutical compounds from separately collected human urine. Case: Sleen, De Schoel, separated collection of urine from a point source and treatment for removal of pharmaceutical compounds. STOWA project 'Sleen - De Schoel'.

Timmerman M., van Riel J.W., Bisschops I., van Eekert, M. (2009) Optimaliseren van mestvergisting. Animal Sciences Group, Wageningen UR

Wortel N.C., Koetse E., Kujawa-Roeleveld K. (2009) Zuiveren van brongescheiden urine - Verwijdering van medicatie en hormoonverstorende activiteit. STOWA project 'Sleen - De Schoel'.

Articles

Okutman Tas D., Karahan Ö, Insel G., Övez S., Orhon D. and Spanjers H. (2009) Biodegradability and denitrification potential of settleable COD in domestic sewage. *Water Environ. Res.*, 81, 715-727.

Taş N., van Eekert M.H.A, Schraa G., Zhou J., de Vos W.M., and Smidt H.. (2009) Tracking functional Guilds: Dehalococcoides spp. in European River basins contaminated with hexachlorobenzene. *Applied and Environmental Microbiology*: 75(14): 4696-4704

Taş N., van Eekert M.H.A, de Vos W.M., and Smidt H. (2009) The Little Bacteria that Can – Diversity, Genomics and Ecophysiology of "Dehalococcoides" spp. in Contaminated Environments. *Microbial Biotechnology*: doi:10.1111/j.1751-7915.2009.00147.x.

Warmenhoven J.W. and Spanjers H. (2009). TOC based control of anaerobic reactor treating wastewater from a fruit juice packaging factory. Accepted for *Wat. Sci. Tech.*

Conference contributions

Miriam H.A. van Eekert, Iemke Bisschops, Maikel Timmerman, Grietje Zeeman, 2009. Methane from biomass; an efficient use of byproducts. SENSE symposium: Innovative Techniques for a sustainable environment. 19-20 February 2009. Wageningen, the Netherlands.

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 all around the world. 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'.