# LeAF Letter

**Number 4, December 2005**

**With this newsletter 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**

Dear readers,

Time flies, when you are busy. It is already over a year ago that we sent you the third LeAF Letter. It is not that we have nothing to inform you about. On the contrary, LeAF has been involved in numerous projects and activities all over the world. In addition, we want to make public some important changes within our organization. And therefore, we are back to you with this LeAF Letter no. 4. We hope you will find this issue worth reading. Furthermore, we would like to use this opportunity to wish you all a Merry Christmas and a very Happy and Peaceful New Year.

Marjo Lexmond
Managing Director

**Inside this issue**



## Changes within the organization of LeAF

2005 has been an interesting and successful year. After a difficult period in 2004, LeAF has proved to be able to combine its idealistic motivations and activities with a sound financial management. The future looks positive. Below you will find an overview of changes within the LeAF group so that you know whom you can contact in 2006.

LeAF, employees and board members, December 2005

*Who joined?*
Lucas Seghezzo has joined LeAF as senior consultant. Gatze Lettinga has supervised Lucas during his Dissertation work at Wageningen University for which Lucas received the DOW Dissertation Award in October this year. Lucas is now focussing on the implementation of sustainable anaerobic technology and on dissemination of his extended knowledge of these processes.

Gabi Stiebe has recently joined LeAF as a laboratory assistant where she is responsible for the anaerobic tests. Gabi has been trained in Germany and worked with Prof. Seyfried at the University of Hannover.

*Who left?*
In May 2005 Sjon Kortekaas, project leader, has left LeAF to take up the opportunity to become a full time scientific advisor at the Board for the authorisation of pesticides (CTB) in Wageningen, the Netherlands.

Wybke de Mes, management assistant, has left LeAF by the end of August to be able to deal with her increased duties for graduate school Nethur, Utrecht University, The Netherlands.

*What changed?*
Jules van Lier has been appointed as professor at Wageningen University from October 1st. With this appointment, Jules has been discharged from his duties as Director of LeAF. Jules continues his work for LeAF as Scientific Advisor.

Marjo Lexmond has taken over Jules managing tasks and has been appointed Managing Director per October 1st 2005.

Henri Spanjers will start on February 1st 2006 for the next two years as a part time professor at Ghent University, department of Applied Mathematics, Biometrics and Process Control. During these two years, Henri will continue to work for LeAF for 2.5 days per week.

*What remained the same?*
Grietje Zeeman, Adriaan Mels and Iemke Bisschops continued to work with LeAF.
And of course what also remained is our undiminished and strong motivation to implement the sustainable anaerobic technology wherever we think it is useful.

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## Jules van Lier appointed as professor

The Academic Board of Wageningen University has appointed the Director of LeAF, Dr. Jules van Lier as professor at the sub-department of Environmental Technology at the same university.

Prof. Dr. van Lier in Jordan

The field of expertise of the part-time position is, not very surprising, “Anaerobic Wastewater Treatment for Reuse and Irrigation”. The coming years Prof. Jules van Lier wants to widen the application potentials of anaerobic treatment for both industrial and domestic wastewaters with the aim to close water and resource cycles. In industries the emphasis is put on the more harsh conditions that are occurring because of reduction in water intake and closure of internal water loops. The challenge with domestic sewage lies in the direct coupling of the wastewater treatment system with agricultural reuse schemes. Also here attention will be paid to climatic areas which are yet not served by anaerobic treatment systems. “With this appointment we want to consolidate the anaerobic expertise at our department”, says Prof. Cees Buisman who took the position of Prof. Lettinga in 2004. In addition to the universities obligations Jules will continue his work at LeAF as scientific advisor.

Contact Jules van Lier for more information, jules.vanlier@wur.nl

## Boosting in-situ biodegradation

Anaerobic bioremediation of soil and groundwater is a proven technology to clean-up sites that are contaminated with chlorinated hydrocarbons. LeAF and P&J Milieuservices BV are cooperating in a project to apply a novel technique to improve the biodegradation of these contaminants. The technique is based on an anaerobic bioreactor in which specific bacteria are grown, and that are subsequently injected into the soil to accelerate in-situ biodegradation.

P&J Milieuservices BV, an independent consulting company specialized in soil research and groundwater purification, was awarded a contract by a regional real estate company to clean-up the soil and groundwater of a former industrial site in Ede, The Netherlands. The site is contaminated with a number of chlorinated hydrocarbons including 1,2 – dichloroethene. Typical of the site is the presence of an organic peat layer from which the contaminants are only slowly released, leading to unacceptable long natural biodegradation times. The project involves extraction of groundwater from several extraction wells and pumping to the above-ground anaerobic reactor. Under anaerobic conditions degradation of the chlorinated hydrocarbons occurs through the process of reductive dechlorination. This is a step-wise process of chlorine atom replacement with hydrogen via oxidation-reduction reactions. The process requires carbon sources that serve as electron donors. For this purpose a sufficient amount of easily degradable substrate is also added to the reactor.

Because the bacteria are retained in the reactor the process allows the development of a microbial population that is well adapted to the degradation of the contaminants. After treatment the reactor effluent is reinjected into the soil via a number of injection wells. Because part of the microbial population is released purposely to the effluent a continuous inoculation of the zone around the injection wells is maintained, thereby creating an enhanced natural in-situ biodegradation. Even though using the bioreactor accelerates the decontamination process, the complete remediation of the site is expected to last several years. During these years the process will be carefully monitored and optimised.

Filling the reactor with anaerobic sludge in December 2005

Contact Henri Spanjers for more information, henri.spanjers@wur.nl

## Course: source separated collection, transport and treatment of household wastewater

On November 17th and 18th LeAF organised a course on source separated collection, transport and treatment of household wastewater for the foundation of Post Academic Education (PAO). Thirteen presentations covered the different topics of concern when introducing new sanitation concepts based on source separation. Topics included (bio) technological aspects like anaerobic treatment of black water, nitrogen and phosphorus recovery and conversion technologies, fate of natural and synthetic hormones in biological systems, but also project management needed for the realisation of new sanitation concepts and fitting

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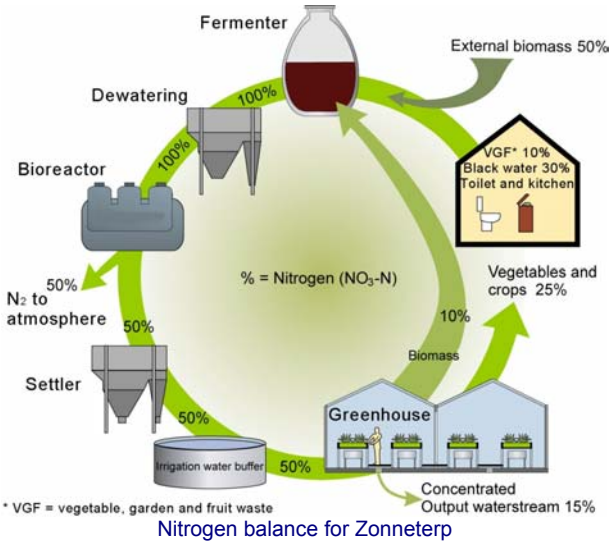
these in the building environment. Prof. Dr. H. Jönsson came from Sweden to share his knowledge on the separate collection of urine, already widely applied in Sweden. The participants received the course very well.

Contact Grietje Zeeman for more information, grietje.zeeman@wur.nl

### State Secretary Van Geel welcomes Zonneterp

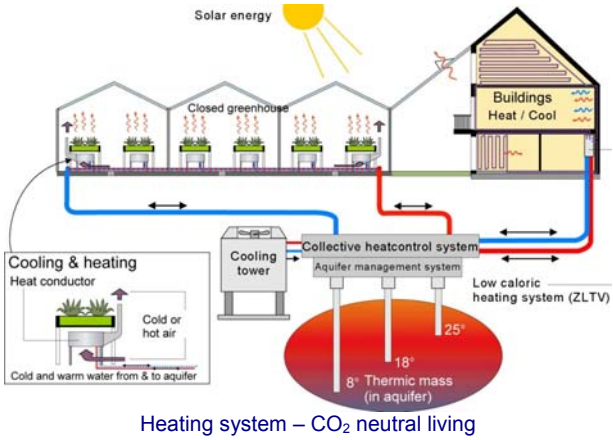
A report describing The Zonneterp has been welcomed by State Secretary of the Ministry of VROM (Dutch ministry of housing, spatial planning and the environment), Mr. Pieter van Geel, on 11 November 2005. The 'Zonneterp' is a design for a neighbourhood that provides for its own energy, biomass and water supply. Basic elements of the design are an energy-producing greenhouse, a settlement of 100 houses and an anaerobic digester.



Nitrogen balance for Zonneterp

Greenhouses in The Netherlands receive more solar heat energy than they need. In conventional greenhouses the excess heat is removed by opening windows. Recent innovative greenhouse designs store the excess heat in deep aquifers through a sophisticated system of heat exchangers and pumps. The stored heat is used for warming the greenhouse during the nights or in winter. Exergy balances show that there is sufficient energy left to heat a block of houses.

The 'energy-producing greenhouse' has been the starting point of a design for a self-sufficient neighbourhood that closes water and nutrient cycles at a decentralised scale. In this design black water and green household wastes are anaerobically digested. The produced biogas is burned and the combustion gases are used as $CO_2$ fertilizer in the greenhouse, while the combustion energy is used for power generation and tap water heating. The grey water of the households is purified and supplemented with nutrients of the black water flows and is used for irrigation purposes within the greenhouse. Greenhouse plants evaporate the irrigation water, while using the nutrients. The vapour condenses and is collected. The collected water is of very high quality and serves as household tap water after a proper quality control.



Heating system – $CO_2$ neutral living

The State Secretary expressed his appreciation for the idea to close energy, $CO_2$, water and mineral cycles through a combination of houses and greenhouses. He offered the support of the Ministry to look for up-scaling possibilities for this approach.

The Zonneterp design is made by a consortium consisting of LeAF, Fiwihex, Kristinson Architects, Elannet Cyber Company, IIUE and Rabobank Nederland. It is described in a report of the Innovatienetwerk Groene Ruimte. A pdf-file of the report is downloadable at: http://www.zonneterp.nl, more information about the Innovatienetwerk can be found at: http://www.agro.nl/innovatienetwerk.

Contact Adriaan Mels for more information, adriaan.mels@wur.nl

### Knowledge transfer activities: courses on anaerobic wastewater treatment

In the passed year, LeAF co-organized various courses on anaerobic wastewater treatment:

1) In November 2004 a two-day workshop in the UK addressed a full day to the anaerobic treatment of industrial wastewater while a second day was fully dedicated to the anaerobic treatment of solid wastes and slurries. The UK, in contrast to many other European countries, is far behind with respect to the implementation of anaerobic treatment systems. Prejudice, fear from the unknown, lack of cooperation between universities and industries as well as governmental legislation were recognized as limiting factors, With regard to the latter it was mentioned that burning biogas (as energy source) is still considered as "waste incineration", subjected to special licenses and governmental regulation. Legislative changes are absolutely required in order to benefit from all the potentials that anaerobic treatment may offer. The Pontypridd workshop was attended by 50-60 participants.

2) From 12-19 December 2004, a course on Anaerobic Sewage Treatment was organized in Surat, Gujarat, India. The course was attended by 35 participants consisting of field professionals, scientists, and governmental responsible persons. The course was organized TIFAC - Centre of Relevance & Excellence in Environmental Engineering in Surat, India, with whom LeAF has a long-term cooperation on educational activities.

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3) From January 16-19, 2005, a course on the anaerobic treatment of industrial wastewater was organised in Amman, Jordan, in cooperation with the Royal Scientific Society (RSS). The course dealt with the various aspects of anaerobic industrial wastewater treatment ranging from applied biochemistry, applied microbiology, reactor technology, and case studies. Special attention was given to the anaerobic treatment of olive mill wastewaters.

4) From February 26 - March 1, 2005, a course on anaerobic treatment of industrial wastewaters was given at the Research Institute of Petroleum Industries (RIPI) in Teheran, Iran. The course was preceded by a Dutch-Iranian 1 day workshop on the state-of-the-art of anaerobic treatment in Teheran. The workshop was introduced by Mr. Vakili,President of RIPI, and Mr. H.J. de Vries, Netherlands Ambassador in Teheran. During the course, special attention was given to anaerobic treatment of chemical wastewaters such as purified therephthalic acid (PTA) wastewaters.

Participants of Anaerobic Course at RIPI

Contact Jules van Lier for more information, jules.vanlier@wur.nl

## Capacity building for local environmental management in Colombia

LeAF is currently participating in a project coordinated by Alterra, a research institute at WUR, to strengthen capacities in the Technological University of Chocó (UTCH), Colombia. The project is funded by NUFFIC through The Netherlands Programme for the Institutional Strengthening of Post-Secondary Education and Training Capacity (NPT). In June 2005, Lucas Seghezzo was sent on a 10-day mission to Quibdó, the capital of the Chocó region, to build on previous missions by Jules van Lier where the bases for cooperation were established.


Environmental management in Quibdó requires urgent attention

Activities included (a) help define a graduate program on environmental sanitation; (b) update and strengthen the graduate program on environmental engineering; (c) assess a proposal on a specialization on basic sanitation; (d) assess the proposal for a water laboratory for teaching, research, and extension; and (e) advise on the design of a pilot plant for solid waste management. Additional advice and training was given on methodologies for environmental impact assessment to reinforce an on-going study commissioned to UTCH by the Colombian government to assess the environmental feasibility of a highway that would go across highly sensitive and contested land.

The mission was the first of a number of planned visits and was very fruitful to provide an overall picture of the local setting and start concrete actions. Local students and staff are very committed and enthusiastic about the project and the prospects for a successful outcome are very high.

Contact Lucas Seghezzo for more information, lucas.seghezzo@wur.nl

## This year's LeAF publications

In 2005 LeAF co-workers have published a number of reports and articles on a variety of subjects. A publication list for this year can be found in the appendix to this LeAF-letter and on our website, http://www.leaf-water.org.

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**Colophon**

Lettinga Associates Foundation is a non-governmental, not for profit organisation that does not receive donor funding. The foundation earns its income from projects related to applied research, consultancy tasks, organisation of courses, biological tests, etc.

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

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## LeAF publications 2005

The Internet addresses refer to sites where the publication can be downloaded or ordered, or where more information can be found.

### Reports

- Mels A., Kujawa K., Wilsenach J., Palsma B., Zeeman G., van Loosdrecht M. (2005). Afvalwaterketen ontketend, Perspectieven voor afvalwatertransport en -zuivering in de 21ste eeuw. STOWA-rapport 2005-12, Utrecht. (http://www.stowa.nl)
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- Bisschops I., Spanjers H. and Keesman K. (2005) Automatic detection of exogenous respiration end-point using artificial neural network, 2nd IWA Conference on Instrumentation, Control and Automation for water and wastewater treatment and transport systems, Busan, Korea, May 29 - June 2, 2005.
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- Mels, A., Otterpohl, R., Zeeman, G. (2005). Water cycle more integrated in built environment - Paradigm shifts in wastewater management, Sustainable Building, issue 01 - 2005 (http://www.ue.wur.nl)
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- Seghezzo, L., Cuevas, C.M., Trupiano, A.P., Guerra, R.G., González, S.M., Lasci, M.J., Carmona, C.S., Figueroa, M.E., Tejerina, W.A., Zeeman, G., and Lettinga, G. (2005). Sewage characterization as a tool to assess the technical feasibility of anaerobic treatment in UASB reactors. Proceedings VIII Latin American Workshop and Symposium on Anaerobic Digestion, 569
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- Spanjers H., van Lier J.B. (2005) Instrumentation in anaerobic treatment - research and practice. 2nd IWA Conference on Instrumentation, Control and Automation for water and wastewater treatment and transport systems, Busan, Korea, May 29 - June 2, 2005.
- Tejerina, W.A., Carmona, C.S., Seghezzo, L., and Cuevas, C.M. (2005). Anaerobic biodegradability of tannery wastewater. Proceedings VIII Latin American Workshop and Symposium on Anaerobic Digestion, 570
- Vashi, A., Seghezzo, L. et al. (2005). Sustainability criteria for the comparison of sewage treatment technologies - A pilot-scale study in Indian context. International Congress on Environmental Management (ICEM 2005). Hyderabad, India, October 28th-30th.

### Other

- Seghezo, L., Zeeman, G., and Lettinga, L. (2005). Anaerobic sewage treatment. In: The Encyclopedia of Water, Lehr, J.H., ed., John Wiley & Sons, Ostrander, USA. (http://www.wileywater.com/Encyclopedia.htm)
- Spanjers H. (2005) Chapter 6: Treatment scenarios. In: Optimal management of wastewater systems. Report European cooperation in the field of scientific and technical research - Environment, COST Action 624, EUR 21522, ISBN 92-898-0006-2. (http://bookshop.eu.int)

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