LeAF Letter

Number 14, December 2011

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,

In April 2011, LeAF moved to her new location on Wageningen UR campus together with the department of Environmental Technology of Wageningen University. In addition to several offices and meeting rooms, we are now equipped with the state of the art research facilities, suitable for a wide variety of experimental environmental research, including safe operation of dangerous compounds. By now we are fully settled and everything is running again. We have expanded our laboratory setup by a series of CSTRs that allow us to perform continuous reactor experiments.

The new laboratory facilities

However, a new building alone is not enough. It's the people involved that make it work. It is therefore my pleasure to announce that we have been able to attract two young researchers to our team. On November 1st Erik Reichman has started as research assistant to support the laboratory staff. Erik combines his work for LeAF with a similar job at the Wageningen UR departments of Environmental Technology (ETE) and Aquatic Ecology and Water Quality Management (AEW).
And from coming January 1st onwards, Tiemen Nanninga, recently graduated from the International Land and Water Management MSc programme, will reinforce LeAF to work on the implementation of reuse of water in agriculture. In addition, we believe that Tiemen will be able to contribute to an increased participation of stakeholders involved in the early stages of project development but also in the implementation stage.
Apart from strengthening the skills, knowledge and manpower of our team, Erik and Tiemen will also play an important role in replacing Darja Kragic Kok and Iemke Bisschops who will be on maternity leave in the first 4 to 5 months of 2012.

There are many things that can be said about the future in these uncertain times, but I would like to wait for a couple of months till we have more clearly defined our targets for the longer term. For now I wish you, on behalf of the entire LeAF team, inspiring moments during the Christmas days to come and optimism and endurance for 2012; the year in which LeAF turns 15.

Marjo Lexmond
Director

Developments New Sanitation

Netherlands

In the past year, the interest in New sanitation (see box) further increased in the Netherlands. Municipalities and other public authorities, water boards and companies increasingly realize that New Sanitation is an alternative to be considered seriously. The reasons to implement New Sanitation become more and more compelling such as the high degree of sustainability, and the possibility of lower costs. The highlight of 2011 was undoubtedly the opening of the

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new sanitation system for 250 houses in Sneek, the Netherlands on November 18th by Prince of Orange Willem Alexander (check *www.waterschoon.nl*). Moreover, there was the construction of the new sanitation facilities in the new NIOO-office building in Wageningen and in the Villa Flora office in Venlo.

In addition, new projects were put in motion, for schools, new housing areas, a business park, a hospital and a rural area. Situations with their own specific characteristics and sanitation solutions, and where practical application and further development often go hand in hand. For clients, such as housing corporations, municipalities, water boards and companies, LeAF carried out technological and financial feasibility studies, investigated the reuse potential of New Sanitation products, gave guidance to pilot or demonstration studies, brought parties together and provided them with adequate information, or searched for additional funding. We expect that these activities will lead to an increased implementation of New Sanitation in 2012.

Developing Countries

Helping to improve sanitation in developing countries is one of our idealistic goals. Given the very different setting of this kind of projects, the approach is also quite different than for new sanitation projects in the Netherlands. An example of this is the project Safi Sana, described elsewhere in this LeAF letter. The reuse of valuable nutrients in agriculture is explicitly investigated within this project. This part of the cycle closure deserves generally much more attention, also in future projects. LeAF aims to achieve this and also to strengthen our role for improved decision making process in the sanitation domain, especially by involving end-users and authorities much earlier in the process of selection of appropriate technologies.

Also in 2012, there will be a lot to do. If you would like to learn to assess the possibilities and opportunities of New Sanitation for your projects, than the Dutch PAO course “Nieuwe Sanitatie”, scheduled for May 2012, may be an good occasion (see also the announcement elsewhere in this LeAF Letter).
For more information about New Sanitation in the Netherlands contact Jan Weijma (*jan.weijma@wur.nl*). For more information about New Sanitation in developing countries contact Katarzyna Kujawa (*katarzyna.kujawa@wur.nl*).

What is New Sanitation?

In New Sanitation, energy and raw materials (fertilizers, water) present in domestic sewage are optimally recovered for sustainable, local (re-)use. New Sanitation does not involve one technology or a fixed combination of technologies, but the technology choice depends strongly on the scale, environment, end-users involvement, organization and management. LeAF has the knowledge and experience to help implementing New Sanitation into practice.

Synergy municipal sewage and animal manure treatment

Sustainability is important for the wastewater sector, which is reflected in recent developments in wastewater collection and treatment. New Sanitation, recovery of nutrients energy production from wastewater and waste sludge treatment are well-known examples of this. Also within livestock farming sustainability has become an issue, partly because of the strict manure regulations. Looking at this similar development the question was raised whether combined treatment of animal manure and sewage at a municipal WWTP offers opportunities for the recovery of energy and nutrients present in these waste streams. In a feasibility study, “synergy opportunities” are described and a number of promising situations are explored in detail, both technically and financially. Both sectors were involved in financing the project, represented by the Dutch Foundation for Applied Water Research (STOWA), water board Waterschapsbedrijf Limburg and the Product Board for Livestock and Meat (PVV). Executors of the project were LeAF and Wageningen UR Livestock Research. Additionally, the water boards Waterschap de Dommel, Waterschap Vallei en Eem en Waterschap Rijn en IJssel were involved in this project.

The report is public and can be downloaded from the website *www.stowa.nl*. Please, contact Jan Weijma *(jan.weijma@wur.nl*) for more information.

SOURCE: Simultaneous remOval of hUman and veteRinary pharmaCEuticals

The SOURCE project aimed at the combined treatment of the liquid fraction of pig manure and human urine with special emphasis on recovery of phosphorous as struvite and removal of nitrogen and phar-

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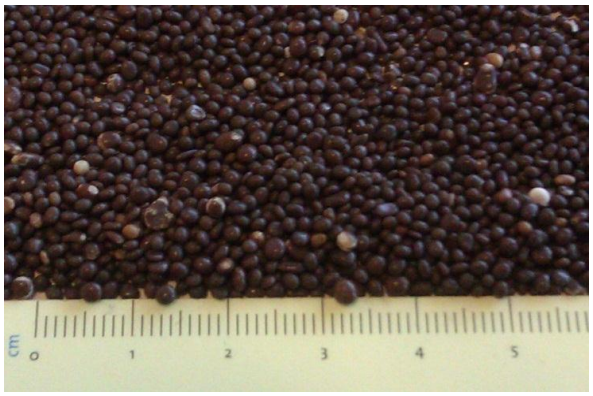
maceuticals. All this with the aim to reduce emission of the pollutants to the environment. This project was initiated by water board Aa en Maas, ZLTO, the province of Noord Brabant, the ministry of Economic Affairs, Agriculture and Innovation, and Stowa (Foundation for Applied Water Research). The project was carried out by MMWWM, Grontmij, Nuresys, Logisticon and LeAF. LeAF was involved in the interpretation of the results of the pilot plant and in the writing of parts of the final report.



Struvite produced in the SOURCE pilot

To assess the SOURCE concept for combined treatment of the liquid fraction of manure and human urine a pilot plant was started up in 2010 at the wastewater treatment facility “Land van Cuijk”. The treatment process consisted of an aerobic step to remove COD/BOD, followed by recovery of phosphorous as struvite and removal of nitrogen in a DEMON reactor. In addition tests were carried out to assess the possibilities for removal of pharmaceuticals via ozone treatment of the DEMON effluent. Furthermore, the fate of antibiotics present in the manure-urine matrix during treatment in the SOURCE pilot was assessed.

The results of this research project are encouraging. Phosphate and nitrogen were efficiently removed from the manure-urine matrix and neat struvite granules were produced. In preliminary tests pharmaceuticals were removed from the manure-urine matrix by ozonisation. Different groups of antibiotics were removed during treatment in the SOURCE pilot. A business case showed that the SOURCE concept may be able to compete economically and environmentally with other methods of manure treatment.

The final report of the SOURCE project will be made available (around the 2nd week of December 2011) to the public via *www.aaenmaas.nl*.
For more information contact Miriam van Eekert (*miriam.vaneekert@wur.nl*).

New wastewater treatment process is piloted at WWTP Scheemda

Water District Board Hunze en Aa's started with testing a new wastewater treatment process, developed by consultant and engineering firm DHV, at the municipal wastewater treatment plant of Scheemda, in the northeast of the Netherlands. In the process nitrogen and phosphate are removed from the wastewater and concentrated into a reusable product. The new technology furthermore saves costs and energy. The pilot test will last 6 months and is carried out by a consortium consisting of water board Hunze en Aa’s, Stowa, LeAF, HITC, NedMag, Waterschap Noorderzijlvest en de Technical University Delft.

The new wastewater treatment process removes nitrogen as gaseous ammonia. Ammonia then is used as fuel in a modified fuel cell for generation of electricity and heat. In this way sustainable ‘yellow’ energy is generated from urine and municipal wastewater.

The technology also recovers phosphate as a high-value commodity for the production of amongst others food and fertilizer. The project is financially supported by AgentschapNL from the Innovation Program Water Framework Directive from the Dutch Ministry of Infrastructure and the Environment.

For more information contact Jan Weijma (*jan.weijma@wur.nl*).

LeAF involved in Sanitation Ventures project

Worldwide it has been recognized that it is important that people have access to reliable and affordable ways of (on-site) sanitation. Pit latrines are commonly used for sanitation in developing countries. However, the costs of emptying a pit latrine or building a new facility are high and, besides, the exposure of people to diseases via excreta should be reduced. In 2009, the London School of Hygiene and Tropical Medicine received a $4.8 million grant from the Bill & Melinda Gates Foundation for a 3-year project to increase the knowledge on decomposition in pit latrines, of which little was known until then, and to tackle the mysteries around the filling rates of these sanitation systems.

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Pit latrine in Asia (not included in the study)

The main aims of the Sanitation Ventures project are:

- to increase the knowledge about pit latrines in general and factors that determine the filling rate (design, usage, environment, decomposition rate). For this purpose, a range of pit latrines in Tanzania and Vietnam is studied,
- to develop solutions to control and decrease the filling rate (i.e. accelerate decomposition),
- to come up with innovations in on-site sanitation that are longer-lasting and more affordable than existing methods.

The project is carried out with partners from leading universities and research institutes around the world. Within the framework of the Sanitation Ventures project, LeAF carries out biodegradation tests to assess the intrinsic and maximum biodegradation capacity of the pit latrine material under aerobic and anaerobic conditions.

Biodegradation tests with pit latrine material

For more information on the project you can visit *www.sanitationventures.com* or contact Miriam van Eekert (*miriam.vaneekert@wur.nl*).

Safi Sana chain: from waste to product. Pilot project in Ashaiman, Greater Accra Region Ghana

In 2010, a pilot-project in Accra (Ghana) was started to test the entire Safi Sana business concept. Safi Sana adopts a 'waste reuse concept', collecting and treating the waste from the Communal Service Blocks in order to produce valuable end-products for the local market. By linking the business model for sanitation services with waste re-use, Safi Sana aims to sustainably 'close the material loop'. The use of waste as a valuable input into the production system, rather than a costly output, becomes a driver for new sanitation – helping to solve the problem of local nutrient shortage and offering an alternative for high-cost energy. The Safi Sana formula is designed to be commercially self-sufficient and operated by local partners.

Safi Sana toilet block at Ashaiman, Accra

The pilot-project involves the construction of a treatment site in Ashaiman constituency, located at Greater Accra Region, and testing the model in a local context. The small public toilet (2 seats), for the local workers and the community (60-100 visitors per day), is used on a commercial basis to cover all the running cost. Currently, the toilet waste with an optimised volume of flush water, together with slaughter house waste (unborn manure) and market waste are treated by two fixed-dome type digesters of a total volume of 16 m^3. The inlet, outlet and biogas quantity and quality are being monitored in terms of various relevant macro-parameters. The digested slurry is currently tested for its potential to generate an alternative liquid and/or solid fertilizer, to map the need and local demand specifications necessary to compete with traditional methods in the local agricultural sector. To obtain an 'ideal' fertilizer in terms of composition and form, and additionally, free of pathogens and odours, a variety of technologies, process conditions and additives are being tested.

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Co-digestion of mixes takes place in dome-digesters underneath the ground

To define the required digester input composition, the preferred waste treatment process and the technical requirements for an optimal production of energy and fertilizer - the following activities are being conducted:

- a market analysis to define the preferred energy and fertilizer product and market entry strategy,
- a mapping of waste systems to aid resourcing, and define waste mixes,
- a study of the technical treatment processes in the context of Accra,
- a 'proof of principle' by field-testing in Accra,
- a test of the business and roll-out strategy.

LeAF is one of the partners in this project together with Safi Sana Foundation, IFDC, KNUST, BNARI, GIDA and Safi Sana Ghana Ltd. Financing comes from Partners for Water, IFDC and Safi Sana Foundation. LeAF co-coordinates demonstration research on the biogas production from various mixtures and digestate post-treatment to produce safe organic fertilizer.

For more information contact Katarzyna Kujawa (*katarzyna.kujawa@wur.nl*). For more details you can also visit www.*safisana.org*.

Renewable energy database system for East Africa

LeAF, Ghent University and Moi University are developing a biogas database system that can serve as a freely accessible and well-coordinated one-stop data center for a wide clientele of renewable energy in Kenya and the East African region. The first phase of the REDSEA project, funded by Hivos, aims at the definition of the database variables for selected feedstock flows in Kenya.

Kenya, being an agricultural based economy, produces vast amounts of organic residues such as corn stalks, rice and wheat straws, tea and coffee waste, sugar cane, banana and barley residues, sisal and cotton wastes as well as other forest residues. The energy potential presented by these bio-wastes is yet to be fully exploited in spite of the growing interest in biogas production. Consequently, most agricultural residues are wasted in the farms through burning or uncontrolled decay thus leading to nitrogen leakage and eutrophication in the surrounding water bodies as well as contributing to odor and greenhouse gas emission through the release of volatile and unburned hydrocarbons.

Biogas technology has the capacity to economically and sustainably convert the vast amounts of bio-waste in Kenya to renewable energy thus substituting (especially in the rural sector) the non-sustainable conventional sources of energy. Besides, the digestate is a valuable stabilized soil amendment.

Nevertheless, the implementation of the biogas technology in the country on a large scale has continued to be hindered or slowed down by a number of constraints such as economical, technical, social-cultural, institutional, political and informational factors. While each of the constraints has its unique influence, the apparent lack of structured information is deemed to be one of the major bottlenecks for successful adoption of biogas technology. The lack of a coordinated flow of information and understanding of this information results in poor decisions and it exacerbates the entire biogas technology barriers, thus strongly contributing to the low adoption, assimilation and sustenance of renewable energy technologies in the country.

Biogas plant in Kenya

Hence, there is a clear need for a concerted and coordinated approach to provide the necessary biogas technology information that can inform decision makers, besides facilitating in monitoring and evaluating trends, promotion and raising awareness pertaining to the accruing benefits and re-

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sultant impacts. To this end, a database system containing important information and data on agricultural residues and their biogas potential can serve as a one-stop source of information.

The concept is based on a structured use of anaerobic co-digestion as a means of producing biogas from agricultural organic residues including animal manure and crop residues. Specifically, the short term target of the project is a phased development of well-structured data variables suitable for a multilayered database system on biogas energy in Kenya, whereas the long-term target is to develop and extend the database to other feedstock as well as other regions in Africa. The project will entail developing data variables suitable for a database system capable of hosting data on biogas and selected feedstock flows in Kenya. Such data will facilitate characterization as well as prediction of production for biogas in order to identify the inherent prospects and potential impacts of the technology in the country. Consequently the project will incorporate a baseline review and analysis of the existing biogas feedstock in the country.

For more information contact Henri Spanjers (*henri.spanjers@wur.nl*).

Course announcement: ´Principles of Anaerobic Wastewater Treatment' - April 2012

After a successful edition this year, LeAF offers the course on Principles of Anaerobic Wastewater Treatment in April 2012 again. The course will provide the basic concepts on anaerobic treatment of municipal and industrial wastewaters, with a special focus on UASB (Upflow Anaerobic Sludge Blanket) technology. Some of the topics that will be addressed are:

- evaluation of wastewater characterization,
- microbiological and biochemical aspects of anaerobic treatment,
- anaerobic reactors - applied technologies,
- UASB design considerations,
- Laboratory studies/tests.

The course, consisting of 3 lecture days and a field visit on the 4th day, will be held from April 23-26, 2012 in Wageningen, the Netherlands.

If you are interested or would like to have more information, please visit *www.leaf-water.org* for the preliminary programme and registration form or contact Els Schuman (*els.schuman@wur.nl*).

Group picture course March 2011

Agenda Courses 2012

- April 23-26: **Principles of anaerobic wastewater treatment**, organized by LeAF *(see above for more information)*.

- May 22-23: **Nieuwe sanitatiesystemen: een perspectief voor de 21e eeuw?** (in Dutch), organized by Stichting PAO in cooperation with LeAF. This course provides an overview of the possibilities and latest developments of New Sanitation, and gives insight on the applied technologies. It is scheduled for May 22-23. For more information visit: *www.pao.tudelft.nl*

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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.

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