SCIENCE, NETWORKING AND ENVIRONMENTAL EDUCATION

- In Clean Rivers to Healthy Baltic Sea –project

Sami Luste & Dick Blom & Hanne Soininen (ed.)

MAMK
University of Applied Sciences

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julkaisut@xamk.fi

Authors

Mikkeli University of Applied Sciences
P.O. Box 181, 50101 Mikkeli, Finland, E-mail: firstname.lastname@mamk.fi

Dick Blom
Russian expert, M.Sc. (Tech.), Mikkeli University of Applied Sciences

Sami Luste
Project Manager, Ph.D, Mikkeli University of Applied Sciences

Tuija Ranta-Korhonen
Russian expert, M.Sc., B.Sc. (Tech.), Mikkeli University of Applied Sciences

Hanne Soininen
Steering group member, M.Sc. (Tech.), Mikkeli University of Applied Sciences

Anne-Marie Tuomala
Senior lecturer, M.Sc.,MBA, Mikkeli University of Applied Sciences

Arto Sormunen
Senior lecturer, Ph.D, Mikkeli University of Applied Sciences

Maria Zhaurova
Project assistant; Mikkeli University of Applied Sciences

MTT Agrifood Research Finland
FI-31600 Jokioinen, Finland
Lönnrotinkatu 3, 50100 Mikkeli, Finland,
E-mail: firstname.lastname@mtt.fi

Harri Huhta
Research manager, M.Sc. (Agr.), MTT Agrifood Research Finland

Ekaterina Petruneva
Research assistant, M.Sc. (Tech.), MTT Agrifood Research Finland

Preface

The present publication is a cross-cutting summary from the main activities of the "Clean Rivers to the Healthy Baltic-Sea (LugaBalt)" –project (ENPI CBC 2007-2013). The project was carried out within the EU programme of South-East Finland – Russia ENPI CBC 2007-2013 and it was co-funded by the European Union, The Russian Federation and the Republic of Finland.

The Publication consists of several articles and it is compiled by the Mikkeli University of Applied Sciences (Mamk). The emphasis of the articles is on the project activities of the Finnish partners (Mamk and Agrifood research Finland; MTT). These contents are related to the reduction of nutrient run-offs and emissions from the agriculture, waste management in rural areas and sanitary.

The present publication is not meant to be a comprehensive study of the results or description of the LugaBalt-project, but with the help of the few examples, participation in the discussion related to the discharges from the rural areas of St. Petersburg and their effects on the condition of the Baltic Sea.

The LugaBalt-project brought together the Finnish and Russian farmers, scientists, municipal authorities, service providers and also school children and students. Also, the publications of the project are further utilised by these target groups when the work for the safer environment, sustainable primary production and waste management such as for the fruitful co-operation will be continued and applied in practice.

On the behalf of the both Finnish partners, Mamk and MTT, we want to say thank you for all of the LugaBalt-project's partners and the stakeholders of the project for the great co-operation and determined consensus to reach the common objectives. We look forward to the future projects to come.

In Mikkeli, Finland, on 3 November 2014

Writers

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Lugabalt–project: Finnish – Russian co-operation to improve the environmental quality of the Luga-river

Sami Luste & Harri Huhta

"Clean Rivers to the Healthy Baltic-Sea (LugaBalt)" is Finnish - Russian environmental project carried out in 2012–2014. The project was financed by the ENPI CBC 2007–2013 program (0.68 Mio €). The partners of the Luga-Balt-project were: Administration of Luga Municipal County (Lead partner); North-West Research Institute of Agricultural Engineering and Electrification (SZNIIMESH) of the Saint Petersburg State Agrarian University; Regional Public; Organization "Association for Assistance of Field Research and Development of Rural; Agrifood Research Finland (MTT); Mikkeli University of Applied Sciences (Mamk); Cattle farm Partizan; Committee for Agroindustry and Fisheries Complex of Leningrad region.

There were two main aims that LugaBalt-project was built for:

1. The reduction of the nutrient loads to the Baltic Sea from rural areas (to a level close to natural).
2. The development of the co-operation between Russian and Finnish officials, scientific, educational and non-governmental organizations, as well as enterprises of the different ownership forms, for the protection of the Environment, to improve the quality of life and to protect water sources and the Baltic Sea.

The Baltic Sea is a specific marine area. Its characteristic features, such as weakness of the tides, temperature variations, high nutrient contents of the sediments, low salinity and shallowness of the water makes it sensitive to changes when compared to many other marine environments. At the moment, the biggest threat of the Baltic Sea is the accelerated eutrophication caused by the human activities. Yearly around 600 000 tons of nitrogen and 30 000 tons of phosphorus end up to the Baltic Sea. The highest nutrient loads from the Baltic Sea States are derived from Russia. The population, industry and agriculture that are developed to the edges of the rivers, such as Luga river

running to the Baltic Sea are load the Gulf of the Finland and the whole Baltic Sea area. The activities of the LugaBalt-project focused on the rural areas of the south-west Russia, where the largest emission sources are the agriculture and livestock.

The efforts of the LugaBalt-project activities to reduce the nutrient discharges to the Baltic Sea can be seen as a part of a larger global entity which aim at a socially-, environmentally- and economically sustainable solutions. These three dimensions werealso strongly present in the activities of the LugaBalt-project.

The 31 activities of the LugaBalt-project, related to living, waste management, agriculture and water chemistry, were divided into the work package of management, environment, agriculture and social issues. The activities inside the work packages consist of technical and financial analysis, laboratory studies, environmental monitoring and several meetings of the different level actors from the Finnish and the Russian side. These activities produced information to control and to improve the state of the Luga-river, not only via the technical implementations and methods developed but also via the development of the framework structures and information supporting the decision making of the agricultural entrepreneurs, investors and local authorities.

Moreover, one of the most important contributions of the project was the networking of the Finnish and Russian partners and stakeholders. The aim was to familiarize Russian project partners to Finnish know-how and methods related to the environmental issues and vice versa. These networking activities were implemented via the visits to Finland and to Russia. The visits to the Finland contained networking of the municipal authors, scientists, farmers, service providers, school children and students. The study trips and networking of the school children were related to the one of the most important targets of the project - the environmental education. This way, the LugaBalt-project, such as all the other environmental projects, contributed to the slow change of the common attitudes and social awareness.

The articles of the present publication describe the activities of the Finnish partners via the cases presented in the articles. At least the headlines and the abstracts of the full articles are given also in Russian.

Mamk's articles are related to the two main tasks of Mamk. The first of the main tasks is related to the analysis and estimate of the municipal waste management in Osmino. The aim of the assignment was carry out a strategic analysis of the main fractions of the municipal waste produced: scrap, plastics, wood and organic wastes. The most essential fraction of these are plastics that is characterized to be the main fraction of the illegal landfills near Osmino.

The second main tasks of Mamk is preliminary planning of the farm-scale biogas plant to the case-farm Partizan. The assignment consisted of a techno-economic examination and preliminary planning of a biogas plant. The idea was to outline the factors related to the planning of the farm-scale biogas plant that can also be 'copied' on other farms in the area. Moreover, also the waste water treatment in the rural areas of St. Petersburg is discussed separately in the third article produced by Mamk.

Fourth and fifth articles of Mamk contribute to the Finnish - Russian co-operation in the field of the networking such as environmental education during and after the LugaBalt-project (picture 1). Moreover, the environmental education is the most essential tool to reach the long term aims to the clean Baltic Sea.

PICTURE 1. Russian students are travelling to the National Park Linnansaari in Rantasalmi during their visit in Finland 2014 (picture by Tuija Ranta-Korhonen)

MTT's articles are related to the implementation of the activities from the work package of agriculture. Both articles give facts and basic examples of the geographical, demographic and agricultural features in the South-Savo Region. The importance of South-Savo as a popular resort area, and the importance to protect water bodies against nutrient leakage are described. Organic farming as a trend of specialization in the region is introduced (picture 2). Rules and the basic legislation which regulates environmentally friendly animal husbandry are introduced, and several links to the Internet are given. The operators and decision makers in the Luga region will hopefully find some similarities between our regions and possibilities to apply some experiences achieved among the Finnish partners as well.

PICTURE 2. Project study trip 2014 to an organic vegetable farm in Haukivuori, South-Savo (pictures by Harri Huhta)

ПРОЕКТ ЛУГАБАЛТ; ФИНЛЯНДСКО-РОССИЙСКОЕ СОТРУДНИЧЕСТВО ДЛЯ УЛУЧШЕНИЯ ЭКОЛОГИЧЕСКОГО КАЧЕСТВА РЕКИ ЛУГА

Сами Лусте и Харри Хухта

“Чистые реки в здоровое Балтийское море (Луга-Балт)” – это финляндско-российский проект в сфере окружающей среды, осуществляемый в 2012-2014. Проект финансируется программой ЕИСП ПГС 2007 – 2013 (0.68 млн. €). Партнерами проекта Луга-Балт являются: Администрация Лужского муниципального района (ведущий партнер); Северо-Западный научно-исследовательский институт механизации и электрификации сельского хозяйства (СЗНИИМЭСХ); Санкт-Петербургский государственный аграрный университет; Местная общественность; Организация ”Ассоциация содействия полевым исследованиям и развитию сельских территорий”; НИЦ сельского хозяйства и продовольствия Финляндии (MTT); Университет прикладных наук Миккели (Mamk); племенное хозяйство «Партизан»; Комитет по агропромышленному и рыбохозяйственному комплексу Ленинградской области.

Для проекта Луга-Балт были поставлены две основные задачи:
1. Снижение биогенных нагрузок в Балтийское море от сельских территорий (до уровня, близкому к естественному).
2. Развитие сотрудничества между российскими и финляндскими представителями огранов государственной власти; научными, образовательными и некоммерческими организациями, также как компаниями различных форм собственности для защиты окружающей среды, улучшения качества жизни и защиты водных ресурсов и Балтийского моря.

Балтийское море является особой морской территорией. Такие характерные черты Балтики как слабые приливы и отливы, колебания температур, высокое содержание биогеных веществ донных отложений, низкая соленость и мелководность делают море чувствительным к изменениям при сравнении его со многими другими морскими средами. В настоящий момент самой большой опасностью для Балтийского моря является ускоренная эвтрофикация, вызванная человеческой деятельностью. Ежегодно примерно 600 000 тонн азота и 30 000 тонн фосфора поступают в Балтийское море. Наивысшие биогенные нагрузки из стран региона Балтийского моря приходятся на Россию. Население, промышленность и сельское хозяйство, которые развиты по берегам рек, среди которых Луга, втекающих в Балтийское море, оказывают нагрузку на Финский залив и всю акваторию Балтийского моря. Мероприятия проекта Луга-Балт сфокусированы на сельских территориях юго-запада Ленинградской области, где наибольшими источниками эмиссий являются земледелие и скотоводство.

Попытки мероприятий проекта Луга-Балт по снижению эмиссий биогенных элементов в Балтийское море могут быть рассмотрены как часть более крупного глобального подразделения, направленного на социальные, экологические и экологически устойчивые решения. Эти три размерности также сильно присутствуют в мероприятиях проекта Луга-Балт.

31 мероприятие проекта Луга-Балт, которые относятся к управлению качеством жизни и отходов, сельскому хозяйству и гидрохимии, разделены на следующие рабочие пакеты: управление, окружающая среда, сельское хозяйство и социальные проблемы. Мероприятия, входящие в рабочие пакеты, состоят из технического и финансового анализов, лабораторных исследований, экологического мониторинга, и определенного количества встреч участников на различных уровнях с российской и финляндской сторон. Эти мероприятия обеспечивают информацией по контролю и улучшению состояния реки Луга не только через техническую реализацию и развитые методы, но также через развитие рамочных структур и информационную поддержку в сфере принятия решения для сельскохозяйственных предпринимателей, инвесторов и местных представителей органов власти.

Более того, один из наиболее важных вкладов проекта было установление рабочих связей финских и российских партнеров и групп заинтересованных лиц. Целью являлось ознакомление российских партнеров проекта с передовыми финскими технологиями и методами, касающихся экологических проблем, и наоборот. Эти

мероприятия по установлению связей были осуществлены через поездки в Финляндию и Россию. Визиты в Финляндию содержали в себе установление связей с муниципальными властями, учеными, фермерами, поставщиками услуг и школьниками. Учебные поездки и установление связей школьниками были направлены на одну из самых важных задач проекта – образование в сфере окружающей среды. Посредством этого пути проект Луга-Балт, также как все другие экологические проекты, вносит вклад в медленное изменение общих установок и социальной осведомленности.

Статьи данных публикаций описывают мероприятия финских партнеров через кейсы, представленные в статьях.

Статьи Mamk относятся к двум главным задачам Mamk. Первая из основных задач относится к анализу и оценке управления муниципальными отходами в Осьмино. Цель задания - реализация стратегического анализа основных фракций произведенных отходов: металлолом, пластик, деревянные и органические отходы. Самой существенной фракцией из представленных является пластик, который охарактеризован как основная фракция нелегальных свалок около Осьмино.

Вторая основная задача Mamk – это предварительное планирование биогазовой установки на пилотном хозяйстве Партизан. Задание состоит из технико-экономического объяснения и предварительного планирования биогазовой установки. Идея состоит в установлении факторов, касающихся планирования биогазовой установки на уровне хозяйства, которая также могла бы быть «скопирована» для других хозяйств района. Более того, также очистка сточных вод в сельских районах на юго-западе Ленинградской области описывается отдельно в третьей статье, выпущенной Mamk.

Четвертая и пятая статьи Mamk вносят вклад в финляндско-российское сотрудничество в сфере установления деловых связей, среди которых экологическое образование в течение и после проекта Луга-Балт. Более того, экологическое образование является наиболее существенным инструментом для достижения долгосрочных целей для здорового Балтийского моря.

Статьи MTT касаются реализации мероприятий от рабочего пакета под названием сельское хозяйство. Обе статьи дают факты и основные примеры географических, демографических и сельскохозяйственных особенностей в регионе Южное Саво. Важность Южного Саво описана как со стороны популярного курортного района, так и со стороны защиты водных объектов от биогенных стоков. Органическое

Фото 1. Российские студенты на пути в национальный парк Линнансаари в Рантасалми в течение их поездки в Финляндию 2014 (фото - Туйя Ранта-Корхонен)

сельское хозяйство представлено как направление специализации в регионе. Представлены правила и основные законоположения, которые регулируют деятельность экологически безопасных животноводческих хозяйств, также предоставлено несколько интернет ссылок. Квалифицировнные рабочие и руководство в Лужском районе скорее всего найдут как некоторые сходства между нашими регионами, так и возможности для применения опыта, накопленного финскими партнерами.

Со стороны обоих финских партнеров, Mamk и MTT, мы хотим сказать спасибо всем партнерам проекта Луга-Балт и группам заинтересованных лиц проекта за отличное сотрудничество и установленный консенсус для достижения общих целей. Мы с нетерпением ожидаем будущих проектов.

Фото 2. Учебная поездка участников проекта на органическое овощеводческое хозяйство в Хаукивуори, Южное Саво (Фото Х.Хухта)

Waste management and rural areas – case Osmino: Plastic wastes

Sami Luste & Maria Zhaurova & Tuija Ranta-Korhonen

Solid wastes have become one of the biggest problems in global perspective and their proper management is one of the key factors to protect human health, environment from pollution and to preserve the natural resources. Problems related to the waste management are usually intensified in the rural areas where the questions of the economic viability, logistics and control of the waste management are much more difficult to solve when compared to the tightly built urban infrastructures.

The following article reflects and reviews the situation of the plastic waste management in Osmino against the waste management in EU and in Finland. The present discussion is related to the waste management activities of Mikkeli University of Applied Sciences (Mamk) in the "Clean Rivers to the Healthy Baltic-Sea (LugaBalt)" –project (ENPI CBC 2007–2013).

СИСТЕМА СБОРА И УТИЛИЗАЦИЯ ОТХОДОВ В СЕЛЬСКОЙ МЕСТНОСТИ - КЕЙС НАСЕЛЕННЫЙ ПУНКТ ОСМИНО: ОТХОДЫ ИЗ ПЛАСТМАССЫ

Лусте Сами, Жаурова Мария, Ранта-Корхонен Туйя.

Отходы из твердых материалов стали одной из самых больших проблем экологии. Сбор и утилизация отходов является ключевым фактором в защите здоровья населения, предотвращения загрязнения окружающей среды и защите и сохранении природных ресурсов. Проблемы переработки отходов, как правило, сосредоточены в сельской местности. Вопросы экономической выгоды, логистики, контроля и управления решаются намного труднее, чем в густонаселенных городских инфраструктурах.

Данная работа рассматривает сбор и утилизацию отходов из пластмассы в населенном пункте Осмино с точки зрения деректив Европейского союза. Пластмасса самый распространенный вид отходов на неофициальных местах сброса и хранения в населенном пункте Осмино и образует собою 30-80% от общей массы всех отходов. Эта работа одна из задач университета прикладных наук г. Миккели в проекте “Clean Rivers to the Healthy Baltic-Sea (LugaBalt) (ENPI CBC 2007–2013).

Waste management in EU

Legislation

The European Waste Framework Directive (i.e., Waste hierarchy regulation 2008/98/EC) has become an important regulatory driver and the starting point of the EU`s waste legislation.

The first objective of the Waste Framework Directive is to prevent the waste production. If it is not possible, the waste should be reused or processed to industrial raw material or recycled. If recycling is not possible for some reason, the waste can be incinerated and/or temporarily sited to wait the terminal treatment steps. The landfill deposition is the very last of all the options. To reduce the total amount of wastes is the main waste management objective of EU.

European commission sets the targets and aims for the waste management according the waste hierarchy model. However, EU member states are not directly told by the EU how to reach these targets. Each Member State devises national systems and regulations to reach the aims by the EU waste legislation. In Finland, the framework directive is implemented in the practice by the Waste Act 646/2011. The implementation of the waste act is staggered between the state authorities, municipal authorities and waste management companies.

Business potential

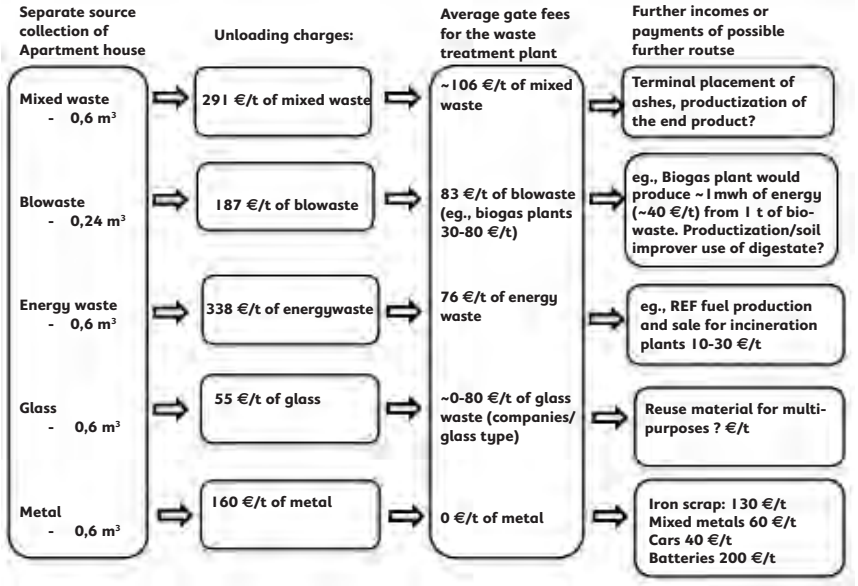
Utilization of the waste streams has been expected to have high economic benefits. Not only via supply of raw materials, but via creation of the new jobs. Recycling creates new businesses such as for transporting, processing and selling recovered materials as well as companies that manufacture and distribute products made of recycled materials (Picture 1; Picture 2). Solid-

waste management and recycling industries in EU have a turnover of around 140 billion € (i.e. 1.1% of the EU's GDP) and provide jobs for over 2 million people. If the member states are able to increase their recycling of wastes from the current 38 % up to 70 % (according to the 2008/98/EC) at least half a million new vacancies across the Europe will be created (EC 2010). Alone materials, which are sent to landfills annually in EU have been estimated to have commercial value of 5.3 billion € (EC 2010).

PICTURE 1. Waste Management in Finland; there are 35 municipal waste centres in Finland taking care of the waste receiving, storing, processing, utilizing, reloading and landfilling (JLY 2011)

Regulation

These economical and functional benefits and/or limitations are also used as a steering method to adapt implementation of the waste hierarchy into the practice (e.g. support systems, taxes and other positive/ negative economic regulation methods/ incentives). Also, the structure of the waste management and the related legislation are formulated to support the common targets and priority order in waste management. These structures are for example the producer responsibility to produce the waste management for some of the sold materials, the pawn systems and the guidance, steering and administration of the national authorities, such as the environmental centers and local environmental offices.



PICTURE 2. Indicative example of the average costs and prices (VAT 0 %) related directly to the management of the example waste fractions (JLY 2011)

The waste management costs in Finland with renewable waste fractions (e.g. card-board, glass, metal and biowaste) are notably lower or there is none when compared to the mixed waste. This is mainly because of the national waste tax which is collected only from the waste sited in the landfills. The waste tax is only dependent on the weight of the mater and it is currently specified at 50 € per ton of waste (Act 1126/2010; Picture 2).

Also the disincentives are possible. In case of the crude negligence or offence of Waste Act (Act 646/2011, Sections 60 and 62) fines are possible to be collected. For example, the waste collecting companies are able to collect extra handling payments if waste fractions are collected into the wrong containers. In the larger scale, waste management companies have terms of references and demands for their activities.

Waste management challenges in the rural areas

Nearly 16% of the Finnish population lives in the rural areas, when the corresponding number in Russia is about 27 %. The most common collected waste fractions from the rural areas in Finland are mixed- (landfill material)

and energy wastes. Biowastes are usually composted by the households when the other waste fractions (i.e. glass, metal, batteries) are delivered to the collection points (Table 1). The size of the payment varies according to the local tariff and the characteristics of the household.

TABLE 1. Prices of the district collection of mixed wastes for the summer residences and permanent settlements in the rural areas of Finland (JLY 2011)

Property	€/ apartment/ a		
	Avarage	Min.	Max.
Permanent, 1 inhabitant	78,9	36,4	175
Permanent, 3 inhabitant	117	51,9	240
Summer residence	53,8	13,5	191
Summer residence with compostor	48	13,5	112

The rural area has special characteristics in waste production that should be taken in to account when the waste management is organized. Seasonal fluctuation in the volume of wastes (i.e. seasonal wastes, summer cottages), bad quality of the roads and remoteness from landfills lead to the complexity of waste transportation and may increase the waste charges. Also, the large number of illegal dumps in the rural areas of Russia is problematic for waste collection and transportation. Generally the waste produced in the rural areas is the mixed municipal waste, mainly plastic packaging waste, of which recycling is quite complex.

The waste management legislation frameworks both at federal and regional level are usually for the densely populated built-up areas of Russia, not for the rural areas. Such parameters as low population density, big distances for waste transportation and high seasonal fluctuation of population lead to necessity of the appropriate waste management strategy. The waste management system develops at the municipal level and is based on the federal legislation. In many cases, the local governments do not have the sufficient funding or clear legal and regulatory framework for effective waste management in Russia. These difficulties are especially evident in the rural areas, such as the village Osmino, the pilot target of the LugaBalt waste management task (Table 2).

TABLE 2. Recognized bottlenecks in the general waste management in the village Osmino

Insufficient financing of the waste management system	The Residents of the apartment buildings pay for the waste management as part of the rent/ maintenance charge. Most of the residents of the detached houses do not pay waste management charge at all. Holiday homes and summer residents do not pay for the waste management at all.
Insufficient control	In legislation, there is no clear punishment for environmental violations or the punishments are insignificant. It is difficult to prove the actual happening of environmental crime and catch the offenders, which is result of the insufficient control structures.
Underdevelopment of the structures of waste management system	Collection and transport of waste is not organized properly. Also the waste management system is sized according to the amount of constant residents, and it is not able to take care of the growing amount of waste during the holidays and feasts. There are no structures that enable sorting at source and there are not possibilities to utilize different waste fractions.
Nonexistent environmental awareness	There are no knowledge and know-how about sorting at source, for example composting know-how has been disappeared.

based to the information collected in the LugaBalt-project

Russian legislation enables the municipalities to create and implement local waste management regulations and collection of the waste management charge from the summer residents but there is no mechanism for collection of charges. Moreover, the current approach does not allow to get profit from the waste. Thus, it is essential to enhance the collection of the waste charges and create sufficient collection mechanism. Size of payment should be defined in a way that ensures the work of waste management system and also allows developing it. Municipal waste management regulations should be imposed and then should be controlled that they are followed properly. For example detached house owners, such as summer residents should be obliged to conclude agreement with the local waste management company.

In The Principles of Russian Federation State Policy, the environmental development part intended the significant changes in the waste management. For the period to 2030, the waste management system should include the following facilities: separated waste collection, strict sanctions for improper disposal, and the ban on the disposal of waste suitable for recycling. According to the strategy, the regional and the local administrations are responsible for the implementation of technologies for processing and the minimization of the municipal wastes.

However, environmental awareness is the long term key factor for the development of the waste management and the increased care of the environment. At the moment there are ongoing several education projects from school children to local inhabitants and authorities. This work was also carried out by the LugaBalt-project.

Plastic waste – Case Osmino

There is no proper waste management system in Osmino. The village and its surroundings are bordered with several small unauthorized roadside dumps. The most common waste fraction in these illegal dumps is plastic which forms about 30–80 % of the whole amount of the wastes (data from the LugaBalt-project). The present section presents technically focused discussion of the plastic waste management possibilities in Osmino.

Collection and separation of the plastic waste

To reuse plastic waste, it has to be separated from other waste. Federal legislation provides the possibility of separate waste collection, but this system has to be organized at municipal level. Plastic waste can be separated in the collection places by people who produce waste, or later at waste sorting complexes. A separate collection of plastic in the collection point is more effective because this plastic waste is cleaner than plastic separated from mixed waste. It is important for recycling because the cleanliness of plastic waste affects the quality of recycled plastic.

Several less successful experiments of the separate waste collection have been conducted in the different regions of Russia. The main reason for these less successful pilots is generally expected to be the lack of the common environmental awareness and public knowledge about the aims of the waste management. The increase of the people knowledge on the proper waste collection may also lead to the decrease in the amount of municipal waste – including the plastic fractions.

Regulations

Tariffs play an important role, when the amount of waste is aimed to be reduced and/or waste recycling is maintained /optimized. Tariff regulation can also work as a strong financial incentive for people to recycle. For example to support the reuse, the management costs of the waste fractions ending up to the landfill should pay more than material ending up to the incineration. Also, the cost should be based on the amount of the waste produced.

Along with the tariffs, penalties are also important tools for regulation. According to the existing laws, penalty for the illegal landfill has to be paid by the offender. Thus, it is not efficient regulation tool because of the poor implementation of the controlling and large rural areas.

One of the most common plastic waste fractions in the illegal dumps is plastic bottles (data from the LugaBalt-project). One efficient solution that is widely applied in the EU, is the deposit and return system of the PET bottles. The holder of the end-of-life product is motivated to recuperate his deposit by bringing the bottle back to a designated collection point.

Transportation of plastic waste

The transportation and logistics has an important role to the economic viability of the waste management in the rural areas. The main parameters of the costs from the transportation of the wastes are the distance and/or the unloading frequency. The source separation system of various waste fractions is used widely in the Europe. However, it requires more transportation than the collection of the mixed waste fractions.

For the mixed waste collection, larger collecting containers are cost efficient in addition to the special garbage truck with a press. However, "AvtoBerkut", the local company licensed for the waste treatment and the disposal has already such a garbage truck (Luzhskaja Pravda 2011). In the rural areas, the waste volumes are usually small and the transportation distances are long, which supports the use of the flexible multi-chamber vehicles.

In case of the collection of mixed waste fractions, the logistics and the recycling of material could be improved by the post sorting and recycling facilities. After the sorting, a part of waste goes to recycling, and the other part goes to landfill. Sorted waste can be brought out by one special garbage truck, instead of two of three in the case of the unsorted waste. The average price of the described complex (~50m*50m tent with the 10 working places) is approximately 3 million rubles with the payback time of 3–4 years (Luzhskaja Pravda 2011).

One of the cost-efficient solutions for the economically efficient waste management may be the logistical use of the interim storages that are emptied with the optimized frequencies. Moreover, some recycling plants in the Leningrad region may provide free transportation for the certain amount of the sorted plastic wastes. This is co-supported by the characteristics of the plastic wastes. Plastic does not decompose or cause any odors, which enhances the flexibility related to the duration of the storing and location of the intermediate storage.

Landfills and incineration of plastic waste

There are no waste processing or incineration plants near Osmino. The main method for the waste treatment is the landfill disposal. However, there is not much space open for the waste loads of the near future. Due to the critical situation, the establishment of the another landfill to the region was planned. However, the project of the new landfill has not passed ecological expertise and was sent back for revision in 2013. Moreover, new landfill is planned to be built near to the existing landfill in the village Mshinskaya (100 km from Osmino), which will not solving the current problems in the remote regions like Osmino.

There is also another landfill near the town Slantsy (76 km from Osmino). Despite the shorter distance, the disposal of waste from the Osmino is more expensive. The reason for this is the difference in tariffs for waste disposal because the Slantsy and Osmino are situated in different areas of Leningrad region. The cost of waste disposal in the landfill of Slantsy is almost double (~840 rub/t) when compared to the price of landfill in Mshinskaja (~460 rub/t).

Since recycling as a material is not always possible option for plastics, energy recovery is the most common way to utilize the potential of the plastic wastes (Europlastic 2013). Moreover, the incineration of unsorted plastic waste as a part of municipal solid waste may be more efficient than recycling (Rosprirodnadzor 2012). However, there are no incineration plants in Leningrad region.

References

Act 646/2011. Waste Act. Finlex. www.finlex.fi/fi/laki/kaannokset/2011/en20110646.pdf.

Act 1126/2010. Jäteverolaki 1126/2010. Waste tax Act 1126/2010. Finlex, Ministry of the EC 2010. European Comission report on critical raw materials:
http://ec.europa.eu/enterprise/policies/raw-materials/critical/index_en.htm
Environment, Finland. http://www.finlex.fi/fi/laki/alkup/2010/20101126

Directive 2008/98/EC on waste, Waste Framework Directive. Official Journal L 312/3. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF

JLY, 2011; Jätelaitosyhdistys, 2011. Tietoa kuntien jätehuollosta - Kiinteistökohtaisen keräyksen jätemaksutiedot ja jätelajien vastaanottohinnat. http://www.jly.fi/jatemaksut2011.pdf

Luzhskaja Pravda, 2011. Poligon TBO v Smeshino zakryt. Kuda svoziť musor?

Luzhskaja Pravda N 61(16302), 04.08.2011

Plastic Europe 2013. Plastic – the facts 2013. An analysis of European latest plastics production, demand and waste data. WWW-document. http://www.plasticseurope.org/Document/plastics-the-facts-2013.aspx?Page=DOCUMENT&FolID=2 uploaded 14.10.2012 referred 01.08.2014

Rosprirodnadzor 2012. Obocnovanie vybora optimalnogo sposoba obezvrezhivanija tverdyh bytovyh othodov zhilogo fonda d gorodah Rossii. Moscow 2012. WWW-document. http://rpn.gov.ru/sites/all/files/documents/doklady/obosnovanie_vybora_optimalnogo_sposoba.docx referred 01.08.2014

Incentives and limitations related to the farm-scale biogas production possibilities - the cattle farm partizan

Sami Luste

Increasing prices of energy and mineral fertilizers have increased the interest of energy-intensive agriculture toward the higher self-sufficiency with respect to these inputs. The giant Russian farms with the diversified production strategies and tight logistics offers an interesting environment for the farm-scale biogas production and energy-self supplied farm systems. The present study describes the current material flows of the cattle farm Partizan and Partizan's possibilities to produce and to utilize the energy. Also indicative calculations for the economically profitable biogas production are presented.

СТИМУЛЫ И ОГРАНИЧЕНИЯ ВОЗМОЖНОСТЕЙ ПРОИЗВОДСТВА БИОГАЗА В МАСШТАБЕ ФЕРМЕНСКОГО ХОЗЯЙСТВА НА ПРИМЕРЕ ЖИВОТНОВОДЧЕСКОЙ ФЕРМЫ «ПАРТИЗАН».

Лусте Сами

Постоянно растущая стоимость традиционных источников энергии и минеральных удобрений увеличивает интерес энергозатратных сельских хозяйств к данному вопросу в целях повышения результатов самообеспечения. Крупные российские сельско-хозяйственные предприятия с многоотраслевым производством и компактной логистикой представляют большой интерес и возможности для биогазового производства и энерго –самообеспечающим системам. Данное исследование дает представление о имеющемся на сегодняшний день потоке сырья в ферменском хозяйстве по выращиванию крупного рогатого скота « Паризан», о его производственном потенциале, об эффективности использования энергии, а так же содержит индикативные расчеты экономической выгоды биогазового производства.

Introduction

Anaerobic digestion is a microbiological process during which organic material is stabilized and converted into methane-rich biogas and nutrient-rich digestate. This technology offers several advantages: controlled stabilization of organic material with minimized environmental emissions to air and water bodies, production of renewable energy and recycling of nutrients via utilization of digestate.

The Russian potential of the renewable energy resources is estimated to be about 30% of total primary national energy consumption. So far, the potential is practically untapped (< 1%). The size of the biogas resources could be descriped for example via the annual amount of organic wastes produced in Russia (> 600 million tons). The total biogas potential of these organic wastes is estimated to be over 31 billion m^3 of biogas with the total market potential of 650 billion Rubles (~ 13.2 billion Euros; Arcade consulting, 2012).

Increasing prices of energy and mineral fertilizers have increased the interest of farms toward the higher self-sufficiency with respect to these inputs all over in Europe. Russia has a significant biogas capacity in its large agro-industrial complexes. Cattle farms in Russia are large and streams of organic by-products from the farms are abundant. One farm may produce number of by-product fractions for co-digestion and the logistic built around the one farm is tight when compared to the centralized biogas plants of the several farms (Picture 1).

The share of the annual biogas potential from agriculture is estimated to be nearly 15 billion m^3 (Arcade consulting 2012) that is equivalent to the 10 billion m^3 of natural gas or > 32 000 GWh (1m^3 of biogas ~ 2.14 kWh) of power or over 140 billion kilometers when the gas is utilized in the traffic use (Banks 2013; Lehtomäki et al. 2007). The development of the biogas production in West-Russian farms is supported by the comprehensive gasgrid where the upgraded biogas can be fed instead of the natural gas. Moreover, according to the general scheme of gas industry, development of the annual natural gas production volume is expected to fall to 200 billion m^3 in 2030, and therefore, create the need for the alternative ways to fill the gap between the production and demand.

Sustainable economic viability departs from the functionality of the framework structures and the case specific planning of the biogas plants. At the moment, structures should be strengthened to take advantage of the high biogas potential located in the farms of Russia. These regulatory tools to create new business opportunities for the West-Russian farms are for example, financing possibilities (e.g. supports, loans), legislation, implementation and regulative controlling methods (e.g. tariffs).

PICTURE 1. In the small-size Finnish farms, biogas production is often implemented in the centralized biogas plants treating materials from the several different farms. This is also the case in the biogas plant of Juva treating cattle slurry, chicken manure and vegetable wastes from the food industry (picture by Hanne Soininen)

The present discussion is related to biogas activities of Mikkeli University of Applied Sciences (Mamk) in the "Clean Rivers to the Healthy Baltic-Sea (LugaBalt)" –project (ENPI CBC 2007-2013). The ultimate aim of the activity was to make the techno-economical study of the farm-scale biogas production in the cattle farm Partizan.

Materials and methods

The Calculations were made according to the average values from literature (Luste et al. 2012; Soininen et al. 2012; Wageningen University 2008), plant suppliers and Russian partners of the LugaBalt-project. The present article is based only for the present situation, when the techno-economical analysis has to regard the development of the material flows in future such as the characteristics of the various techniques from the various plant suppliers.

The materials of the case-farm

The example farm has 1 500 head of cattle, 300 swines and option to treat the manure from the local poultry farm (20 000 head of poultries). The biological methane (CH_4) production potentials (m^3/t volatile solids; VS) used in the calculations are average values from the literature. The total solid (TS) content of the feed mixture is 15.6 % (Table 1).

TABLE 1. Case-farm and the characteristics of the manures produced

The Case-farm	Descriptions
The total energy consumption of the farm	960 MWh /a
Price of the electricity	0,07 €; ~3,5 Rbl/kwh
The present amount of the animals	**Amount of manures (t/a)**
1 500 cows;	29 000
300 swines	220
20 000 head of poultries	200
Total feed	29 420
The Characteristics of the manures	**TS (%),VS % % TS, m^3 CH_4/t VS**
Cattle slurry	16 %, 85 %, 190 m^3 CH_4/t VS
Swine manure	15 %, 86 %, 410 m^3 CH_4/t VS
Poultry manure	34 %, 75 %, 420 m^3 CH_4/t VS

Biogas process

The values related to biogas process calculations are based to the mesophilic (~35°C) wet digestion processes in practice (Soininen et al. 2012). For example, thermophilic (~55°C) dry digestion process may have a few percentage higher electricity consumption and higher efficiency (Dry digestion is discussed in the techno-economical analysis of the LugaBalt-project). However, the present values are indicative (Table 2), and those in the scale of the variation have no effect on the analysis made in the present report. The biogas from the process is directed to the combined heat and power (CHP) -unit and the obtained electricity is utilized in the farm to replace the electricity bought.

The Case-farm utilizes only electricity bought (0,07 €; ~3.5 Rbl/kWh; Table 2) from the the national electric grid. Also, the heat needed in the farm is produced from the electricity purhaced. Thus, the following calculations focus on the production of enough electricity when the produced heat could be utilized back in the process, preliminary treatment for the materials and/or to replace the electricity used to the heat production in the farm. It should be noted that heat utilization instead of the electricity would also decrease the need of the electricity.

TABLE 2. Values for the biogas production and conversion to the heat and electricity via CHP-unit

	Values
Caloric value (MWh/m^3)	0,01
CHP-unit efficiency (%)	0,85
Heat (%)	0,5
Electricity (%)	0,35
Efficiency of the biogas plants based on its own production (%)	70
Portion from own consumption, electricity (%)	17
Portion from own consumption, heat (%)	83

Profitability

The profitability of the biogas production is reviewed via needed support levels for the investment for the profitable biogas production. The investment- and maintenance costs used in the estimates are based on the information collected from the operating biogas plants in Finland. The case specific solutions in the process (e.g. pre-treatment, process type, size), possibilities for various earning logistics and the utilization logistic of the end products are the primary factors affecting the investment costs of the plant.

The maintenance costs consist of the salaries of employees, transportation and up keeping of the technology. The estimated maintenance costs in Russia (10 000–30 000 € /a) depend highly of the needed logistic. The in used annual salary is ~200 000 Rub per worker. The examination period for the investment is 10 years and the rate of interest is 10 %.

Results and discussion

Material and energy

The described feed in mixture produces about 740 t m^3 CH_4 per year, which means grossenergy production of 7 400 MWh per year (Table 3).

TABLE 3. Electricity and heat production via CHP-unit

Parameters	Estimation
Methane [m^3/a]	741 388
Grossenergy [MWh/a]	7 414
CHP-net production	
- electricity [MWh/a]	2 595
- heat [MWh/a]	3 707
Consumption of the biogas plant	
- electricity [MWh/a]	378
- heat [MWh/a]	1 512
Energy for the own use or for the sale	
Electricity [MWh/a]	2 217
Heat [MWh/a]	2 195

The electricity yield from the biogas process (2200 MWh/a) is more than adequate for the own consumption of the case- farm (~ 1000 MWh/a) that could be covered with the biogas plant digesting only half (< 15 000 t/a) of the feed material available. This would decrease the investment costs and affect the profitability directly. However, plant with a higher capacity would leave space open for the possible new earning logics in future (e.g. sold electricity to the network or upgraded biogas to gas grid, co-digestion of energy rich materials, gate fees). These are not only depended on the development of the regulative frames but the case spesific environment and location of the biogas plant.

Due to the "semi-solid" characteristics of the local cattle manure (TS: 14–17%), TS content of the present feed mixture (~16 %) is over the minimum requirements for the dry digestion (TS > 15 %). The most common feed material TS for dry processes is 20-30% (de Baere 2005). TS content could be further increased by processing at least part of the manure (water separation, condensation, drying, heat treatment). In case of the wet processes, TS content of the feed should be diluted < 10% which could be implemented with the water circulation. In some cases, water addition to the process is not economically recommendable (Kuokkanen 2010). Dry digestion process may further increase the amount of electricity for the own use. However, the difference is estimated to be < 10%, when compared to the "extra energy" produced by the wet digestion process (data not shown).

Profitability

At the moment there are some supports that are possible to get for the farm-scale biogas projects in Russia. For example, the financial supports from the International Bank for Reconstruction and Development (40 %, if the investment > 1 million €; ~50 million Rub). The present calculations indicate the relation between the economical profitability and level of the support (Table 4).

TABLE 4. The minimum level of support for the profitable biogas production with the various investment- and maintenance costs, when all the produced electricity is sold (0,07 €/KWh)

Investment and maintenance costs	Financial support
Investment cost 2 500 000 €; Maintenance costs 30 000 €/a	> 68 %
Investment cost 2 000 000 €; Maintenance costs 30 000 €/a	> 60 %
Investment cost 1 500 000 €; Maintenance costs 30 000 €/a	> 47 %
Investment cost 1 000 000 €; Maintenance costs 30 000 €/a	> 21 %
Investment cost 2 500 000 €; Maintenance costs 10000 €/a	> 63 %
Investment cost 2 000 000 €; Maintenance costs 10000 €/a	> 54 %
Investment cost 1 500 000 €; Maintenance costs 10000 €/a	> 39 %
Investment cost 1 000 000 €; Maintenance costs 10000 €/a	> 9 %

It should be noted that also high amount of heat energy is produced via CHP-unit. Heat can be utilized in the material pre-treatments (Possible hygiene demands; 1774/2002/EC, heat treatment to intensify process and improve methane production; Luste 2011), higher temperature digestion process and to replace the electricity converted to the heat in the farm and/or for sale. For example, if 40 % of yearly energy consumption of the farm is replaced with the heat produced from the CHP -unit, more electricity could be sold to the markets with the 29 000–30 000 € (~1.5 million Rub) yearly extra income.

At the moment, the cattle farm Partizan has no possibility to utilize the energy produced outside the case-farm. Thus, the profitability of the biogas production depends on the relations of the electricity produced when compared to the purchasing price of the electricity (0,07 €/KWh; Table 5).

TABLE 5. The lowest level of the support for profitable biogas production with the various investment and maintenance costs, when produced electricity is only covering the consumption of the case-farm (1000 MWh/a; 0,07 €/KWh)

Investment and maintenance costs	Financial support
Investment cost 2 500 000 €; Maintenance costs 30 000 €/a	> 89 %
Investment cost 2 000 000 €; Maintenance costs 30 000 €/a	> 87 %
Investment cost 1 500 000 €; Maintenance costs 30 000 €/a	> 83 %
Investment cost 1 000 000 €; Maintenance costs 30 000 €/a	> 74 %
Investment cost 2 500 000 €; Maintenance costs 10000 €/a	> 84 %
Investment cost 2 000 000 €; Maintenance costs 10000 €/a	> 81 %
Investment cost 1 500 000 €; Maintenance costs 10000 €/a	> 74 %
Investment cost 1 000 000 €; Maintenance costs 10000 €/a	> 62 %

Conclusion

Despite of the high organic material flows in the cattle farm Partizan, the manure feasibility to the digestion process is not known. For the further planning, it should be confirmed that the digestion of the feed mixture is possible and there is no excess amount of microbially limiting materials present, such as antibiotics.

Due to the relatively high TS content of the cattle manure, the feed materials would be suitable for the dry digestion process as such, when it probably would need to dilute for the wet digestion process for the adequate mixing. Dry digestion would also compact the amount of the digestate that may decrease the logistic needs and cause less leaking emissions to the waterbodies.

All the biogas potential of materials available in the cattle farm Partizan (i.e. energy from the manure) can not be utilized in the farm at the moment. Thus, it is not profitable to build larger scale and higher investment cost biogas plant than to cover the own electricity need of the farm Partizan. From this point of the view, it may be reasonable to build rather small biogas plant to cover the primary electricity need of the farm. For example, the heat from the CHP-unit should be utilized to replace the electric heating. However in future, the need of the electricity in the farm may increase and/or it may be possible to sell energy/biogas to the network/gas grid. Thus, it would be important to select technique which is possible to be scaled up later with relatively low investment costs.

References

Abercade consulting company, 2012: Research publication WWW-document. http://abercade.ru/research/industrynews/8568.html.

Banks C., 2013. Anaerobic digestion and energy, Report of University of Southhampton Available in www-pages: http://www.valorgas.soton.ac.uk/Pub_docs/JyU%20SS%202011/CB%204.pdf.

European Parliament and Council (1774/2002/EC): Regulation of the health rules concerning animal by-products not intended for human consumption. OJEU.

De Baere L. (2005). Anaerobic Digestion of Solid Waste: State of the Art. Wat Sci Tech. 41: 283-290.

Kuokkanen P. (2010). Kananlannan ominaisuudet mädätyksen ja polton kannalta. Lappeenrannan teknillinen yliopiston julkaisuja, Lappeenrannan teknillinen yliopisto, Suomi.

Luste S. and Luostarinen S. (2011). Enhanced methane production from ultrasound pre-treated and hygienized dairy cattle slurry. Waste Manag. vol. 31, 2174-2179.

Soininen H., Ranta-Korhonen T. and Luste S. (2012). ESBIO-hankkeen loppujulkaisu, Energiaomavarainen maatila. Helsingin yliopiston julkaisusarja. Tilakohtaisen biokaasulaitoksen kannattavuuslaskenta osana maatilojen energiataloutta Itä-Suomessa, ISSN 1796-0649.

Lehtomäki A., Huttunen S., Rintala J., 2007: Laboratory investigations on co-digestion of energy crops and crop residues with cow manure for methane production: Effect of crop to manure ratio. Resour Conserv Recycl. 51: 591-609.

Luste, S., Soininen, H., Ranta-Korhonen, T., Seppäläinen, S., Laitinen, A., Tervo, M. (2012). Biokaasulaitos osana energiaomavaraista maatilaa. Mikkelin ammattikorkeakoulun julkaisusarja A: Tutkimuksia ja raportteja, ISBN 978-951-588-352-0

Wageningen University (2008). Standardised calculation methods for animal manure and nutrients. Statistics Netherlands: WWW-document. ttp://www.cbs.nl/NR/rdonlyres/424DD391-C1CB-4955-942F-D6C75BEBF630/0/2012c173pub.pdf

The Wastewater treatment in the rural areas of Russia

Tuija Ranta-Korhonen & Hanne Soininen

The present discussion is related to the waste and wastewater activities of Mikkeli University of Applied Sciences (Mamk) in the "Clean Rivers to the Healthy Baltic-Sea (LugaBalt)" –project (ENPI CBC 2007–2013).One of the primary objectives of the project is to decrease the nutrient stress that worsens the ecologic state of the Baltic Sea. The project's area of operation is Luga county in the Leningrad area. One of Mamk's missions in the project was to improve and observe the wastewater system in the Yaschera holiday home area.

The water management sector of Russia is generally in a bad state in many aspects and especially the wastewater systems in the rural areas need urgent improving. There is shortage of both good quality household water and sufficient wastewater treatment techniques. In addition, the legislation is often unfortunately incomplete. In order to improve the water management in Russia, attention should be paid to the wastewaters especially. This would have the biggest effect on the state of the Baltic Sea.

In the rural areas, most of the household waters come from their own wells. Wastewater is also often treated in a different kind of property-specific treatment systems. In Finland there are many different kind of water treatment solutions which fit in different kind of situations. Sufficient treatment power in water treatment systems is essential in order to reduce and prevent the euthropication of waters. Waste water treatment in the rural areas is currently topic of which Finland has a lot of experience. This experience can be used as advantage in co-operating with Russia.

ПЕРЕРАБОТКА СТОЧНЫХ ВОД В МАЛОНАСЕЛЕННЫХ РАЙОНАХ РОССИИ

Ранта-Корхонен Туйя, Сойнинен Ханне

Университет прикладных наук города Миккели принимает участие в проекте Clean Rivers to the Healthy Baltic Sea, который является

частью программы ENPI CBC, проходящей в отделении технологии энергетики и окружающей среды в 2012-2014 г. Одна из самых главных целей проекта-это уменьшение эвтрофикационной нагрузки на Балтийское море. Местом проведения проекта выбран Лужский район Ленинградской области. Одна из задач университета в данном проекте - это развитие очистительной системы сточных вод поселка Ящера Лужского района.

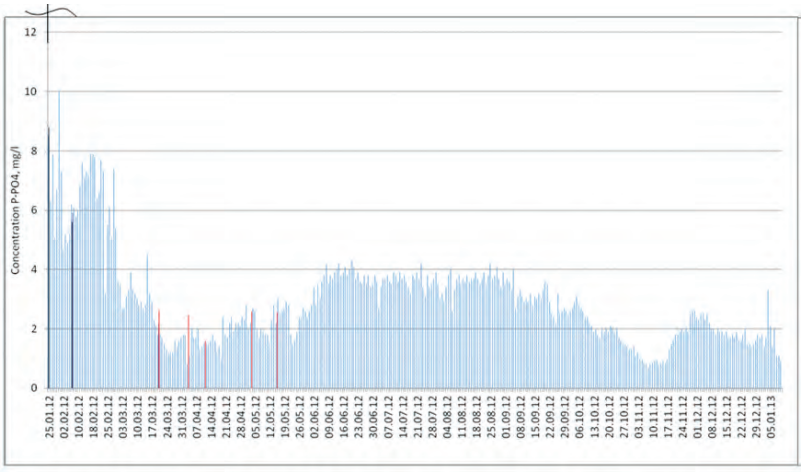
Российское водоснабжение требует улучшения во многих вопросах, но особенно обработка сточных вод в малонаселенных районах требует незамедлительного развития. Упущения есть как в подаче чистой воды, так и в технологиях по переработке сточных вод. К сожалению, в данном вопросе имеет место и несовершенное законодательство. Для развития водоснобжения в России в первую очередь надо несомненно обратить внимание на обработку сточных вод. Это повлияло бы на значительное улучшение экологического состояния Балтийского моря.

В сельских и малонаселенных районах воду используют в основном из своих колодцев. Обработка же сточных вод производится в индивидуальных очистительных системах самих объектов недвижимости. В Финляндии используются различные методы очистки, которые подходят для объектов разного назначения. Очистительная мощность водоочистительных систем играет одну из главных ролей в целях уменьшения или полного предотвращения эвтрофикации водоемов. Обработка сточных вод в малонаселенных районах очень актуальна на сегодняшний день и у Финляндии имеется богатый опыт в этой сфере. Пользу из этого опыта можно извлечь вместе с Россией в совместном межрегиональном сотрудничестве.

Wastewater and risks caused by them

Untreated household wastewaters containing organic matter such as phosphor, nitrogen and different microbes that come from human organic functions cause harm to both the environment and human health (SYKE 2007). Although 80-99% of microbes are perished in the treatment of wastewaters, the remaining amount is enough to cause a health risk when they end up in the right place (Suomen vesiensuojeluyhdistysten liitto). Especially viruses and bacterial spore formed by bacteria can stay in the environment, especially in the soil and groundwater for surprisingly long time, even months in that way causing long-term risk factor (Matikka ym. 2013, 16). In Russia, there have been many waterborne epidemics along the years (for example salmonella, typhoid and hepatites) that are in their part consequences of insufficient treatment of household water and wastewater.

A lot of nutrients end up in the Baltic sea through rivers that run down into the sea, for example the Luga LugaBalt-project's subject river. Nutrients come from different kinds of surface water leaching, agriculture, point sources and housing wastewaters of sparse population. In 2006 and 2007, local environmental officials examined water quality of Luga-river's by taking water samples from it monthly. By the examinations, water quality was considered bad. The samples contained limit-exceeding amount of heavy metals such as copper and cadmium. The examined samples indicated that the water also contains a lot of nutrients and the level of dissolved oxygen in the water was 5.7mg/l. Russian standards classified the river as contaminated. (Vodnyi fond 2007, 17.) The difference of contents of phosphate phosphor in the water in Luga-river is demonstrated in picture 1.

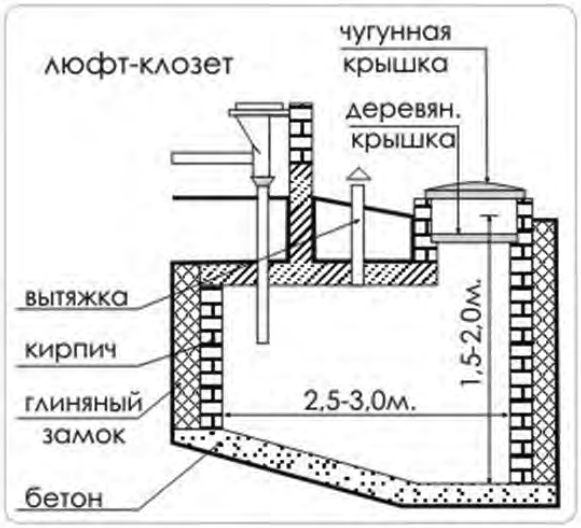


PICTURE 1. The difference of phosphate phosphor content (mg/l) difference in Luga-river (paraphrasing HELCOM2012)

Water treatment systems used in the rural areas in Russia

In Russia, the treatment of wastewater is controlled by construction norm- and order SNiP 2.04.03-85. According to it, houses and summer cottages located in rural areas which produce less than $1m^3$ of wastewater in a day, sufficient water treatment system is sewer trench or "Luft-kloset" as shown in picture 2 (SNiP 2.04.03-85). The simplest version of water trench is just a hole or pit dug in the ground covered with some kind of lid. According to the requirements the bottom of the trench does not have to be compressed in any way, so different kinds of compounds and microbes can transfer freely into soil and to ground water. The trench is occasionally emptied of the accumulated solid matter.

A bit improved version of sewer trench is a trench in which the bottom is compressed and then has a level of filter gravel. In this case, it is kind of primitive version of one part septic well. This kind of sewer trenches are found in a lot of houses across russia and apparently they are still being built. This situation is caused by retardation in legislation. Building order SNiP 2.04.03-85 is from 1985, when Soviet Union was still present and when the financial situation of local residents was lower and therefore houses and cabins built in that time have notably lower level of equipment. Also water usage habits were different then. (Builderclub 2009.)



PICTURE 2. Diagrammic picture of Luft-kloset (Kanalicaziya-expert 2012) Вытяжка = vent, Кирпич = Brick, Глиняный замок = Clay level, Бетон = Concrete, Деревян. крышка = wooden lid, Чугунная крышка = cast iron lid

The dry toilet as described in picture 3 is better option from environmental view point than sewer trench. The toilet tank is emptied when necessary with a suction truck. Grey wastewaters are usually not led into the tank as their treatment is organised in another way in the estate. According to different Internet-sites, closed tanks are also used in the rural areas to collect wastewater. There are also different kind of western estate-specific for sale, but specific information of how much they are used is not available. Naturally, different kinds of dry toilets are very popular (Kanalicaziya-expert 2012.)

The authorization of wastewater treatment systems in rural areas of Russia

The rural areas in Russia differ from those of Finland. One of the main differences is that the plots are usually small and estates are located close to each other, when in the rural areas of Finland minimum size of a plot is quite often 5000m^2. Practically, the Russian holiday home area is a separate conurbation located in the countryside.

In Russia, there has been quite "wild" practice in building to the rural areas for a long time. Cabin areas have been allowed to be built quite freely for example to an area zoned to agriculture, because the use of the area has been easy to change into allowing cabin building. (Baranovskaja & Vasiljevna 2010.)The areas of holiday homes have not required a building permit. Because building permit is not required, have the build cabins or their wastewater systems not been authorized by any kind. (Grebenjuk 2013a.)

At the moment there is a law preparation on the way which aims to control building in rural areas. If the prepared law is accepted, the cabin villages and cabins are possible to be legally built only to an area zoned to cabin building which are to be located in built-up areas or an area reserved for living purposes. Also building would require permission. The law is scheduled to take effect from the start of 2015. The law would also give a possibility to improve the state of wastewater treatment because building in built-up areas allows the estate to be connected into the municipal sewer system. (Baranovskaja & Vasiljevna 2010).

Case - Yaschera

Yaschera is one of the offshoots of Luga-river. The river and its shores are popular holiday spending areas and there are many holiday home areas located along the rivershore. Yaschera village contains 96 residential buildings in which about 300 people live in holiday season. In wintertime, only about 20 people live in the village. There is no concentrated water maintenance in the village so the village residents get their household water from wells. The estates are also not connected to municipal sewer system so every estate has their own water treatment systems. According to information told, the houses have mostly been equipped with sewer trenches where residential waters are led. (Grebenjuk 2013.)

Because there is no information of the real wastewater stress caused by human residence, the theoretical stress caused by residents has been calculated with stress levels in Finland's wastewater decree 209/2011. For calculating the stress, assumptions have been made that the 300 residents of the village are present for 4 months and for the rest 8 month, only local residents are present. The results of the calculation are presented in table 1.

TABLE 1. Yearly nutrient stress caused by Yaschera residence

Stress	BOD_7	P_{kok}	N_{kok}
Stress levels g/person/day	50	2,2	14
Summertime stress (kg)	1 800	79	504
Wintertime stress (kg)	240	11	67
Total stress (kg)	2 040	90	571

From table 1 we can notice that the yearly stress caused by residences is notably big especially what comes to solid matter. Also what is to be noted is that along excrement a lot of pathogenic microbes end up to the environment. Because the slots in the area are quite small and estates are located close to each other, there is a danger that the neighbor estate's nutrients and microbes from the sewer trench end up in another estate's sewer trench. Also Yaschera-river is quite shallow and low-watery and very sinuous river. In low-watery bodies of water, even a small amount of stress can have a notably high effect.

Improving water maintenance

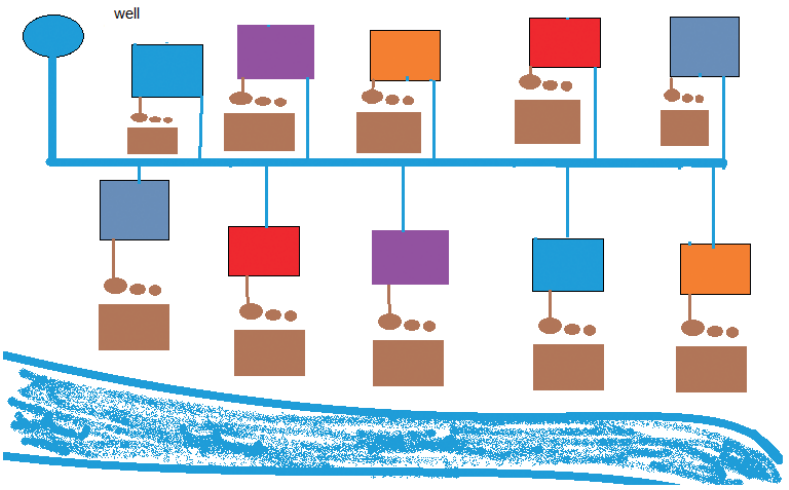
The water supply of the target area and the improvement of wastewater treatment systems can be viewed as scenarios. The scenarios are focused to view the financial costs and environmental effect of the proposed system. There are four viewed scenarios.

Water supply from drilled well and composting toilets

In the first scenario, water supplying is managed from drilled well and a dry toilet is used as toilet. In case the estate has only pumped water, there will be no need for separate grey water treatment. The water can be lead to for example a stone nest that is built for this use. If the estate however is equipped with pressurized water supplying system and there is for example dishwasher and laundry machine in use, a separate system must be built for treating gray waters. Grey water filter must be chosen with care by considering daily water usage and produced wastewater quality. Using the filter causes a little maintenance and use costs. The filter material has to be maintained and changed at times.

Water supplying from drilled well and ground filter field

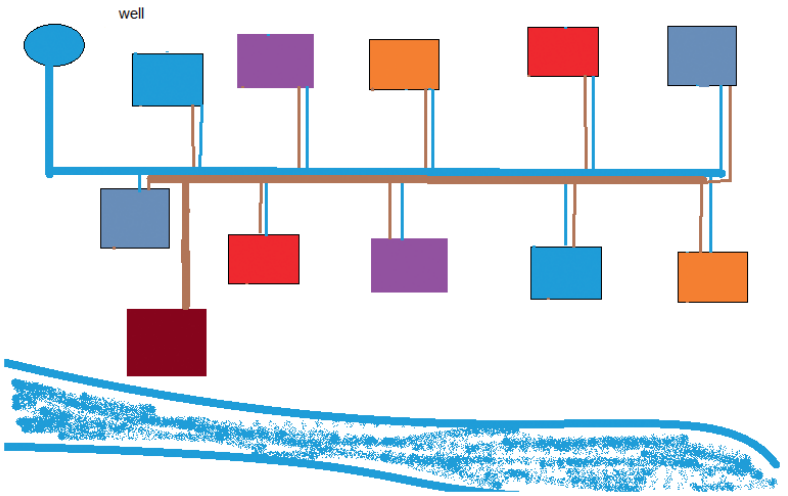
Another option for water maintenance would be communal drilled well for several estates and own ground filter field for each house (picture 3). According to researches, ground filter field meets the required result by Finnish law in treating wastewater, especially if the system has enchanted phosphor removal. Because Yaschera holiday home area is located along the river shoreline, extra attention should paid to removing nutrients.



PICTURE 3. Drilled well and filter fields (picture by Tuija Ranta-Korhonen)

Water supply from drilled well and a small treatment plant serving whole village

The next scenario combines water supplying from a single drilled well and wastewater treatment with a communal treatment plant (picture 4). There are many different sizes of small treatment plants regarding treating capacity. The treating solution of a single estate is not rational in Yaschera-case. There are so called communal treatment plants in the market which are used to cleanse the wastewater of several hundred residents.



PICTURE 4. Drilled well and treatment plant of the village (picture by Tuija Ranta-Korhonen)

Centralized water treatment

Last option to organize the water treatment is to centralize it. The distance between holiday housing in Yaschera and county capital Luga is about 16 kilometers. This distance would make it possible to centralize the water treatment so that clean household water would be lead from Luga to Yaschera and waste waters would be cleaned in Luga's central water treatment plant. In this option, the local load caused by waste waters would cease to exist in Yaschera.

Comparing the options

Property based cost approximations of water supply systems are presented in table 2 below. Outhouses and treatment of cleaning waters by absorbing them into the ground have been taken into account in this table. Additional option is a property based ground filter, which has an investment cost of about 5 600 euros.

Based on the done assessment, it would seem likely that the most economical and sensible solution would be to organize the water treatment of holiday living areas following the first option. In this option, clean household water would be acquired from shared drilled well, and the lavatory would be an outhouse. Nutrient load to waters and environment by lavatory waste could be practically removed by following the solution in this scenario.

TABLE 2. Estimated investment costs of property

Treatment system	Option, water is pumped into the property (€)	Option, if the water in property is drinkable and there is a lavatory (€)
Composting lavatory	300	300
Gray water filter	-	800
Total cost	300	1 100

Composting lavatory is ecological and economic option when built right. Building a working composting lavatory takes only a couple of hundred euros. In addition, nutrients in lavatory wastes can be collected with composting lavatories. Separated urine could be used as diluted fertilizer, and solid waste can be turned into ground improvement substance with post-composting. Required economic investments would remain low, particularly in situations where a property only have pumped water and composting lavatory. Lavatories installed indoors and pressured water supply system combined with gray water filter would bring more living comfort. Though by doing this, costs would increase a bit.

A problem with the scenario combining drilled well and ground filter field is that ground filter requires approximately 20–30m^2 building area. When properties are small and are situated next to each other, there is an additional risk that cleaned waste waters could end up adjacent property. Though it is possible to build the ground filter field so that it serves as waste water cleaning system for multiple properties. This way the costs for one property decrease notably. In practice, building a field that would serve the whole village would require a tremendous area, so this plan is not feasible in that scale. For one household this scenario is more expensive than other scenarios. Sludge from septic tanks could also provide to be a problem.

Small water treatment plant would be more competitive option with first scenario (table 3). Strong fluctuation of the town population could provide to be a problem for the operation of this plant option. This means that the load of the treatment plant would not be stable around the year which is crucial for upkeeping the cleansing power of the plant. The cleaning process of small water treatment plants is largely based on microbe activity, and microbes require nutrition and air for living.

Water treatment plants are usually equipped with sludge recycling function which is used to secure continued nutrition of the microbes. Current technical solutions make it possible to solve this problem. Small water treatment plant -option would enable the use of traditional water closet. Though treatment of the surplus sludge would probably cause some trouble in this scenario.

TABLE 3. Cost of the small treatment plant which serves the whole village

Treatment system	Investment cost (€)
Centralised water treatment system	75 000–85 000
Property based cost (100 properties in the system)	850

The weak point of the latest calculations could be that, Luga's central water treatment plant was built in the 1960's and its cleaning power is inadequate. In practice, nutrition load would only be transferred to another place overall there would be no improvement for the environment.

References

Baranovskaja, Natalia & Vasiljevskaja Julia 2010. Voina Dvortsam. Rossiskaja Gazeta 14.9.2010.

Builderclub 2009. Kanalicazija. Inzhenernye sistemy. www.builderclub.com/ statyi/ inzhenernye-sistemy.

Grebenjuk, Jelena 2013. Lugan kunnan jäte- ja vesiasioista vastaava virkamies. Sähköpostitiedonanto 13.2.2013.

Grebenjuk, Jelena 2013a. Lugan kunnan jäte- ja vesiasioista vastaava virkamies. Puhelinhaastattelu 20.3.2013.

HELCOM. www.helcom.fi /projects/ Archive/Balthazar en_GB/BALTHAZAR.

Jätevesiasetus 209/2011.

Kanalicaziya-expert 2012. Vygrebnaja Yama. www.kanalizaciya-expert.ru/ vygrebnaya-yama-172.

Matikka, Ville 2012. Haja-asutuksen jätevesien niukkaresurssiset käsittelykonseptit. Esitysmateriaali.

Suomen vesiensuojeluyhdistysten liitto. Opas jätevesien maailmaan.

SNiP 2.04.03-85. Kanalisatsija - naruzhnie seti i sooruzhenija.

SYKE 2007. Yhdyskuntien jätevesien orgaanisen aineen kuormitus Etelä-Savossa.

Zistaja voda 2010. Venäjän hallituksen asetus Zistaja Voda-ohjelmasta. Annettu 22.12.2010.

Vodnyi fond 2007. Vodnie resursi rek i ih katsestvo. Luonnonvaraministeriön julkaisuja.

Lugabalt networking in Finland

Tuija Ranta-Korhonen & Sami Luste & Dick Blom & Hanne Soininen

The present article describes the information change and networking during the LugaBalt-project (ENPI CBC 2007–2013) visits to Finland. The Luga-Balt-project aimed to improve water and environment conditions of the target areas in the south-west of Leningrad Oblast, such as to support the biodiversity of the nature. The main goal of this project was to improve the situation of the Luga-river by different means. Activities and studies related to living, waste management, agriculture and water chemistry were performed. However, one of the most important content of the project was the networking between the Finnish and the Russian partners and stakeholders, but also a prominent role of the environmental education of the school children. The aim of the visits was to bring people together and to familiarize Russian project partners to the Finnish know-how, methods related to the environmental issues and to the Finnish environmental education. These general purposes were implemented during the visits to Finland in 2013–2014.

ЛУГАБАЛТ – ПРОЕКТ / НАЛАЖИВАНИЕ КОНТАКТОВ – ОТЧЕТ О ПОЕЗДКАХ В ФИНЛЯНДИЮ.

Ранта-Корхонен Туйя, Лусте Сами, Блум Дикк, Сойнинен Ханне

Данная статья о деловых поездках в Финляндию в период проведения проекта “LugaBalt” (ENPI CBC 2007–2013), имеет своей целью рассказать о том, как проходил обмен информацией и налаживание контактов во время проведения совместного проекта. Цель данного проекта - попытаться улучшить на пилотных территориях юго-западной части Ленинградской области положение с качеством воды и окружающей среды, путем поддержания природного разнообразия и восстановление утраченного экологического баланса. Основная задача проекта - это путем использования различных методов и решений улучшить экологическое состояние реки Луга. Осуществлены мероприятия и исследования в области жизнеобеспечения, сельского хозяйства, сбора и утилизации отходов,

изучение состояния водных ресурсов. Хотя одной из важнейших задач проекта является налаживание контактов сотрудничества между финскими и русскими партнерами, немалую роль играет и проведение образовательных мероприятий школьников в сфере экологии. Идеей является познакомить российских партнеров с финским опытом и методами работы с ноу-хау в сфере защиты окружающей среды. Эти главные задачи были обозначены во время визитов в Финляндию в 2013–2014 годах.

First visit to the Finland; June 17th - 20th 2013

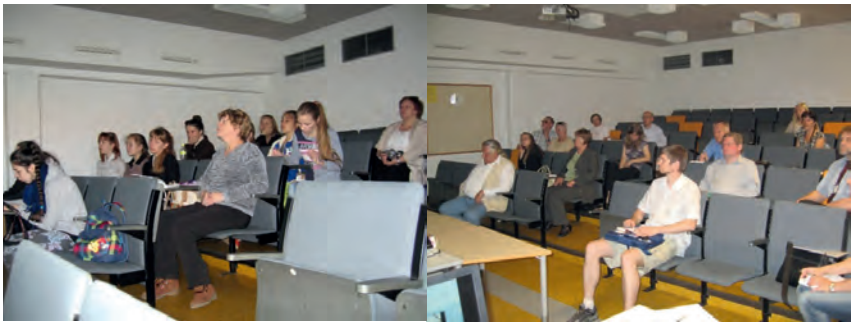
The first visit to Finland by the Russian project partners and the stakeholders was implemented during June 2013. Arrangements for the visit were done by the both of the Finnish project partners: MTT Agrifood Research Finland's and Mikkeli University of Applied Sciences (Mamk). The purpose of the visit was to collect information on the Finnish protection measures of the natural waters and also to learn about protection methods used in Saimaa and Kymi-River.

During the four days visit, the group visited the nature center Oskari in Rantasalmi South-Savo, Muumaa AY's organic milk farm in Mikkeli and in the Bioson Oy, the centralized biogas plant in Juva (picture 1). Bioson's biogas plant utilizes by-products from the agriculture (cattle- and chicken manure) and from the food industry (salad wastes). The process of the digestion is mesophilic wet process, which is also reviewed in the research activities of the LugaBalt -project.

The guests also made a business visit in Viljavuuspalvelu Oy and Mikkeli wastewater treatment plant in Kenkävero. Viljavuuspalvelu Oy is agricultural and environmental laboratory of which business covers from primary production throughout the food chain as well as environmental management and control needed for analysis services.

PICTURE 1. A visit to Juva Bioson Oy biogas facility (pictures by Hanne Soininen)

In addition, lectures were held for the Russian guests. The topics were related to the water and environmental protection in the rural areas. Moreover, lectures (Picture 2) about environmental permit procedure in Finland were held by Teemu Tuovinen from the ELY-center, implementation of the water management plans in Finland by environment designer Reijo Lähteenmäki from the ELY-center and introduction of project "Rae" by the Nature Management Advicer, Saara Ryhänen from the ProAgria of South-Savo.



PICTURE 2. Lectures that were held during the first visit to Finland (pictures by Hanne Soininen)

Second Trip to Finland; October 7th -11th 2013

The second visit of the Russian group was held in October 2013. During this trip the guests visited the waste management center Metsäsairila Oy (Picture 3) and got information the Mamk's environmental monitoring project called "OPEN". The OPEN monitoring system and the quality of the natural waters were reviewed in the sensor point of the river Läsäkoski that measures on-line the characteristics of the water. The OPEN monitoring orientation was performed by the project manager Johanna Arola.

PICTURE 3. A visit to Metsäsairila Oy waste center (pictures by Tatjana Minina)

Later on the day Harri Huhta MTT's research manager held a lecture about the role of the municipalities in the Finnish farms. Then the development of the coutryside was lectured by Kari Mikkonen the development manager from the city of Mikkeli. Pentti Seuri senior researcher from MTT gave a lecture about the European and Finnish farming subsidies. Mamk's Sami Luste project manager gave a lecture about the production of farm-scale biogas and the importance of input materials.

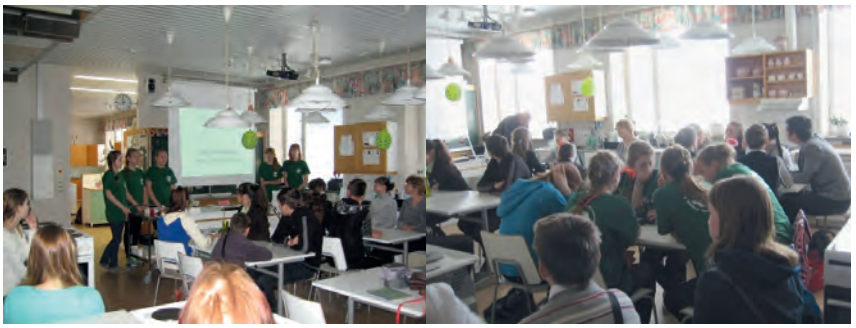
During the trip, Russian guests were also introduced to the biogas plant supplier BioGTS that plans and produces wet digestion plants, suitable for the present situation in the pilot farms. The guests also visited "KoneAgria"-exhibition in Jyväskylä. KoneAgria exhibition is the largest Finnish exhibition of the agricultural machinery and equipment. It has also the best possible platform to make contacts to the suppliers and specialists.

Third Trip to Finland; May 4th-8th 2014

When the first and second trips were about networking of the side groups, information exchange and substance around the project activities, the third trip was more about environmental education. There were over 20 students of the ages 14-17.

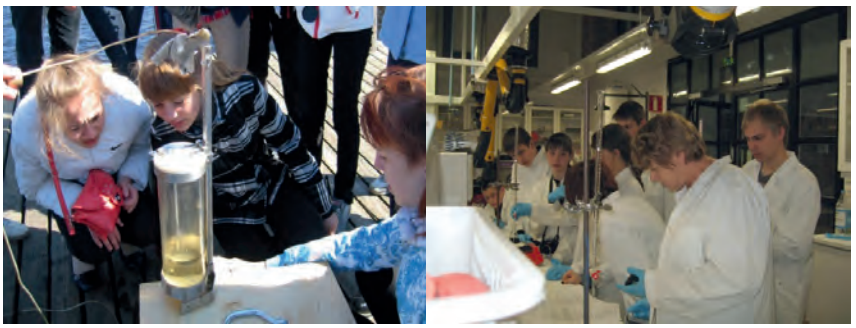
PICTURE 4. Travelling to the National Park Linnansaari in Rantasalmi (picture by Tuija Ranta-Korhonen)

During the trip there was a boat trip to the National Park Linnansaari in Rantasalmi, South-Savo (Picture 4). The students met Finnish students of the same age in the local "Urheilupuisto" school with the Russian language group students (Picture 5). Also, the following lectures were presented to the guests by the students of the Environmental Engineering in Mamk: Waste treatment, Wastewater treatment, Monitoring of natural waters, Recovery of nutrients from agriculture and Biogas.



PICTURE 5. Russian students meet the same age Finnish students in the local "Urheilupuisto" school (pictures by Tuija Ranta-Korhonen)

The Guests were also thaught to take water samples from the Urpola/ Pankalampi lake and the local river (Picture 6). The samples were also analyzed in the environmental laboratory of Mamk with the co-operation of the Finnish and Russian teachers and students.



PICTURE 6. Taking samples of zoobenthos in the local lake and river in Mikkeli (pictures by Tuija Ranta-Korhonen)

Agriculture and organic farming in south Savo Region

Harri Huhta & Ekaterina Petruneva

South Savo Region in statistics

South Savo is in many aspects a good example of the development of organic agriculture and organic food production in Finland. That is why it could be demonstrated to the Russian partners of the LugaBalt project as one case study. South Savo Region is not, in all matters, comparable with the Luga district in the Leningrad region what comes to the nature and climate conditions. During the project study trips, the Russian partners have visited several organic farms and other entrepreneurships in South Savo and other regions as well. Also many institutes have been visited.

The population in South Savo was 152 518 inhabitants on 1.1.2014 (Tilastokeskus 2014). The Population density is relatively small, only 10.7 persons/land km^2 (totally in Finland 17.9 /land km$^{2)}$ (Etelä-Savon Maakuntaliitto 2014). There are three small cities in South Savo (Mikkeli, Savonlinna and Pieksämäki), which have maximum of 55 000 inhabitants as well as several small municipalities. The share of total population of South Savo in these three cities is 72 %. The total area of South Savo is 19 130 km^2 of which the total land area is 14 260 km^2 (Maanmittauslaitos 2014). Forest is very typical land use in South Savo. Totally 12 400 km^2 (87 % of total land area; the largest in Finland) is covered by forests (Etelä-Savo 2011). Practically all the farms have more or less their own forest which forms an important part of their business and economy.

The total water area is 4 870 km^2 (25 % of the total area), respectively (Etelä-Savon ELY-keskus 2013). Lake Saimaa forms a major part of the total water area but there are thousands of small lakes and ponds in the region as well. This causes the fact that the total shoreline in South Savo is very long, even 30 100 km. This region is one of the most popular resort areas in Finland. Water in most of the lakes is clean and clear (Etelä-Savon ELY-keskus 2013), nature is attractive, distance from the Helsinki Metropolitan Area and other densely populated areas is short enough to collect large population of holidaymakers during summertime and more and more during the whole year.

The total number of summer cottages in South Savo is 48 000 (2013), which is the second largest number among all the regions in Finland (Tilastokeskus 2013). So it is legitimate to say that tourism and resorts are very important to the economy and life in South Savo. One of the main targets in the LugaBalt-project was to improve the conditions for resort in the environment of Luga River as well.

Agriculture in South Savo Region

Agriculture has traditionally been one of the key businesses in the region and it has offered quite a lot of employment. Small and middle sized farms have been and still are the most typical in South Savo. The total number of farms in South Savo has decreased during the whole 21st centrum from about 4000 to 3000 farms during 12 years (Etelä-Savo 2014). The number of farms and the field area available, ha/farm, in South Savo are both still below the average in Finland. Actually the farm size is the smallest of all the regions of Finland. The average field area in South Savo has increased from 20 ha/farm (in 2000) to 25 ha/farm (in 2012) (Etelä-Savo 2014). The size of the individual field plots is relatively small, and the distance from the farm center to them is growing simultaneously with the slow growth of farms. Both organic and conventional farming exists in South Savo.

Crop farming, milk and beef production, horse keeping and horticulture (open air vegetables) are more common in South Savo compared with the whole Finland. Although milk production is the main sector of agriculture, quite many milk production farms have been closed or converted to other production, from 1400 (2000) to less than 600 farms (2012) (Etelä-Savo 2014). The number of heads per farm has increased and the total amount of milk produced has stayed quite stable simultaneously. The number of cereal production farms has stayed quite stable, about 750 farms. Horticulture, special crops farming, beef production, other animal production and have all decreased during recent years (picture 1).

PICTURE 1. Red clover growing on an organic farm in South-Savo (picture by Harri Huhta)

The most typical agricultural products in South Savo are milk and beef, vegetables (carrot, cabbages, lettuce, onions) from open air field and berries (strawberry, currants). Due to the large share of milk and beef production, fodder crops like oats and barley as well as perennial and one-year leys are popular in field use. The main reason for this kind of distribution has been the natural and climate conditions, as well as the market demand, the EU and national subsidies targeted to support production and environmentally friendly agriculture. South Savo is an underproduction area of such important products like potatoes, eggs, pork and cereals like wheat and rye. Organic agriculture has relatively long been a growing sector in South Savo.

Even though milk is the most important agricultural product in South Savo, no dairy or any other milk processing industry or any remarkable slaughter houses are located in the region. Practically all the animal products are transported to other regions to be processed. There exist several mills, bakeries, salad processing facilities and other small foodstuff industry as well.

Agriculture is one of the main sources of nutrient leach to water in Finland. 45-55 % of the total load of nitrogen and phosphorus comes from these sources (Ympäristö.fi 2013). Industrial and municipal waste, and other point source waste are mainly collected and treated quite well in the municipalities of South Savo. The diffuse nutrient load to water bodies comes mainly from agriculture and cattle farming. It is very important to protect the lakes in South Savo from nutrient load and enhance the decrease of the total load.

Organic farming in South Savo

The term "organic farm" means actually a farm, which belongs to the official control system of organic production. Without this connection and an official agreement with the state, a farm/farmer cannot be called on organic farm, or any of its products as organic products. The control system is maintained by the Finnish Food safety Authority Evira (Finljandskoe Agentstvo Besopasnosti Prodovolstvija Evira, http://www.evira.fi/portal/en/ which organizes the control on every organic farm each year. The control focuses on the production system as a whole as well on the compliance with the detailed rules and orders of organic production provided by EU and national authorities.

The official goal of The Finnish Government for the share of organic agriculture is 20 % in 2020 (MMM 2012). There still is quite a gap to achieve this. In Finland, the number of organic farms in 2012 was 4 300. The total area of organic fields was 205 000 ha, respectively (9 % of total arable land) the growth was 7 % from 2011. The number of organic farms in South Savo as well as organically cultivated arable area has long been slowly growing. The number of organic farms in South Savo in 2013 was 256 (Etelä-Savo 2014, Evira). This represented 6 % of the organic farms in Finland. In South Savo,

the share of organic farms of all farms was bigger than average in Finland. The total area of organic fields in South Savo in 2013 was 9 386 ha (Etelä-Savo 2014, Evira). The prices of organic products for the producer, as well as the subsidies are somehow higher compared with those of conventional farming (for example Rintamäki 2011). An organic farm does not need, and is not allowed to buy inorganic fertilizers or pesticides, which normally save remarkable money for other investments and contribute to the higher labor costs in organic agriculture. For example the manual or mechanical weed control on vegetable farms needs quite a lot of labor.

What are the reasons for the leadership and the higher share of organic agriculture in South Savo compared with the other regions although South Savo by any means is not one of the strongest agricultural regions in Finland? The conditions for organic cultivation in South-Savo are favorable. Strong financial and intellectual efforts and input during the last three decades to research and develop projects as well as education of organic agriculture in South Savo have certainly been reasons to this long-term development.

Helsinki University Ruralia Institute (http://www.helsinki.fi/ruralia/ and http://luomu.fi/) MTT Agrifood Research Finland (https://portal.mtt.fi/portal/page/portal/mtt_en), extension service ProAgria South Savo (http://etela-savo.proagria.fi/), the regional authorities, and since 2013 the Finnish Organic Research Institute (FOR) (http://luomuinstituutti.fi/en/) as well as several other bodies have steadfastly and determined kept promoting organic agriculture in their strategies. Organic agriculture is still one of the most promising sectors to be specialized in for farmers. Already two generations of farmers have been educated to this knowledge-intensive production system in South Savo.

It must also be taken into account that the demand of organic and local food is growing among consumers. Opinion about the potential to help protection of environment, especially the water bodies and climate, by consuming more and more organic and local food, has rapidly increased although it is slightly more expensive. More and stronger evidence of these favorable effects of organic farming is available. This is true especially among the younger, highly educated generations. This development will hopefully create new markets for different kinds of direct connections between farmers and consumers without or only with minor involvement share of the very concentrated chain of industry and trade, which is typical in Finland.

There are as well some successful examples of industrial and commercial processing of organic food in South Savo, like *Krunex Ltd* (http://luomu.fi/tietoverkko/krunex-oyn-suurkeittio-avattu-juvalla/). During decades, certain investments have been done to process of milk, vegetables, bread, beef etc. Some of them have already been closed but anyway this will help the growth of demand and improve profitability of the farms.

The most important organic products from South Savo are milk, beef, berries (strawberry) and vegetables (carrot, onion, cabbage). There are also some small producers of special crops like medicinal and spice herbs, goose meat and other delicacies for small and specialized markets (picture 2).

PICTURE 2. Project study trip 2014 on an organic vegetable farm in Haukivuori, September 2014 (picture by Tatjana Minina)

The main challenges to be solved in organic farming in South Savo are mostly the same as on conventional farming, and the same as in other parts of Finland. They are primarily the low profitability and low investment potential, hard price competition on markets, difficulties to get labor for low-paid jobs, aging and retirement of the farmers combined with the lack of new and young farmers and other entrepreneurs and depopulation of rural areas. One specialty in South Savo is the fragmented structure of the farms, small field plots and lack of field generally. However, farmers on organic farms are on average younger, organic farms are larger and more profitable on average compared with the conventional farms.

Сельское хозяйство и органическое сельское хозяйство в регионе Южное Саво Хухта Харри, Петрунева Екатерина Александровна

НИЦ сельского хозяйства и продовольствия Финляндии MTT

Статистика региона Южное Саво

Южное Саво во многих аспектах является хорошим примером развития органического сельского хозяйства и производства продовольствия в Финляндии. Поэтому его можно продемонстрировать российским партнерам из проекта ЛугаБалт в форме одного кейс-стади. Регион Южное Саво не во всех отношениях может быть сравнен с Лужским районом Ленинградской области при обсуждении естественных и климатических условий.

СНИМОК 1. Регион Южное Саво (Региональный Союз Южного Саво)

Население Южного Саво составляет 152 518 человек (1.1.2014). Плотность населения относительно низкая, всего 10.7 чел./км^2 земли(в целом в Финляндии 17.9 чел./км^2 земли).

В Южном Саво находятся три небольших города (Миккели, Савонлинна, Пиексямяки), которые имеют максимум 55 000 жителей, также как и некоторое количество малых муниципалитетов. Доля от общего населения Южного Саво в этих трех городах составляет 72 %. Общая площадь Южного Саво составляет 19 130 км^2, из которых общая площадь земель 14 260 км^2.

Лесные угодья являются очень характерным землепользованием в Южном Саво. В целом 12 400 км^2 (87 % от общей земельной площади; крупнейший в Финляндии) покрыто лесами. Практически все фермерские хозяйства в той или иной степени имеют свой собственный лес, который формирует важную часть их бизнеса и экономики. 4.6 % от общей лесной зоны в Финляндии находится в Южном Саво.

Общая площадь водной поверхности составляет 4 870 км^2 (25 % от общей площади), соответственно. Озеро Сайма формирует важную часть от общей площади водной поверхности, но в регионе существуют также тысячи малых озер и прудов. Это является причиной того, что общая береговая линия в Южном Саво очень длинная, вплоть до 30 100 км.

Этот регион является одним из самых популярных курортных районов Финляндии. Вода в большинстве озер чистая и прозрачная, природа привлекательна, расстояние от Столичного региона и других плотно населенных районов достаточно короткое для сбора многочисленных отдыхающих в течение летнего времени, и все больше и больше в течение всего года. Общее количество летних коттеджей в Южном Саво составляет 48 000 (2013), и оно является вторым по количеству среди всех регионов Финляндии. Поэтому справедливо будет сказать, что туризм и места для отдыха очень важны для экономики и жизни Южного Саво. Одной из главных целей в проекте ЛугаБалт является улучшение условий для мест отдыха в природных условиях реки Луга.

Сельское хозяйство является одним из важных источников выноса биогенных веществ в водные объекты Финляндии. Промышленные и муниципальные сточные воды, и другие стоки от точечных источников собираются и достаточно хорошо очищаются в муниципалитетах Южного Саво. Рассеянная нагрузка по биогенным веществам на водные объекты в основном поступает от земледелия и скотоводства. Как защита озер Южного Саво от биогенной нагрузки, так и снижение общей нагрузки очень важны.

СНИМОК 2. Кормовой боб, растущий на органическом хозяйстве (Фото Х.Хухта)

Сельское хозяйство традиционно было одним из ключевых направлений бизнеса и предлагало достаточно много рабочих мест. Малые и средние фермерские хозяйства как были, так и остаются наиболее характерными в Южном Саво. Общее количество фермерских хозяйств в Южном Саво снижалось в течение всех 2000'х, от примерно 4000 до 3000 фермерских хозяйств в течение 12 лет. Количество фермерских хозяйств и площадь полей доступны, га/хозяйство, в Южном Саво оба показателя до сих пор ниже среднего по Финляндии. Средняя площадь сельскохозяйственных угодий в Южном Саво увеличилась от 20 га/хозяйство (2000 год) до 25 га/хозяйство (2012 год). Размер индивидуальных полевых участков относительно мал, и расстояние от центра фермеского хозяйства до них в настоящее время растет, одновременно происходит медленный рост фермерских хозяйств. В Южном Саво существуют как органическое, так и традиционное земледелие.

Земледелие, производство молока и говядины, коневодство и овощеводство (овощи в открытом грунте) наиболее распространены в Южном Саво, если сравнивать со всей Финляндией. Хотя производство молока является главным сектором сельского хозяйства, достаточно много фермерских хозяйств по производству молока закрылись или обратились к другому производству, от 1400 (2000) до менее чем 600 фермерских хозяйств (2012). Количество голов на хозяйство продолжает возрастать, и одновременно вполне стабильно

закрепилось общее количество произведенного молока. Число фермерских хозяйств по производству зерновых культур осталось достаточно стабильным, около 750 хозяйств. В овощеводстве, выращивании специальных культур, производстве говядины, другом животноводческом производстве в последние годы произошел спад.

Наиболее характерными продуктами Южного Саво являются молоко и говядина, овощи (морковь, капуста салат, лук) в открытом грунте и ягоды (клубника, смородина). Из-за высокой доли производства молока и говядины, кормовые культуры овес и ячмень, как и многолетние и однолетние травы, популярны в полевом использовании. Основной причиной для такого распределения были естественные и климатические условия, также как требования рынка и ЕС, и национальные субсидии, направленные на поддержку производства и сельского хозяйства, не оказывающего негативного влияния на окружающую среду. Южное Саво является недостаточным производственным районом для таких важных продуктов как картофель, яйца, свинина, такие зерновые культуры как пшеница и рожь. Органическое сельское хозяйство относительно длительное время было и остается растущим сектором в Южном Саво.

Даже если молоко является наиболее важным сельскохозяйственным продуктом в Южном Саво, там не существует даже одного производства молочных продуктов или любого другого молокоперерабатывающего предприятия, или каких-то заметных скотобоен. Практически все товары животноводства транспортируются в другие регионы для переработки. В регионе располагаются несколько мельниц, пекарен, предприятий по переработке и также другие небольшие продовольственные предприятия.

Органическое сельское хозяйство в Южном Саво

Понятие Органическое фермерское хозяйство на самом деле означает хозяйство, которое относится к официальной системе контроля органического производства. Без этой связи и официального соглашения с государством фермерское хозяйство/фермер не могут называть себя ни органическим хозяйством, ни любые свои продукты органическими. Система контроля поддерживается государственным агенством ЭВИРА, который организует контроль на каждом фермерском хозяйстве ежегодно. Контроль сфокусирован как на производственной системе в целом, также и на соблюдении установленных правил и требований органического производства, предоставленными ЕС и национальными властями.

СНИМОК 3. Производство экологически чистой говядины в хозяйстве Босгард в течение учебной поездки 2014 (Фото Е.Петрунёва)

Официальная цель финского правительства для доли органического сельского хозяйства - 20 % к 2020. Для достижения этого все еще существует достаточный пробел. В Финляндии количество органических фермерских хозяйств (2012) составило 4 300. Общая площадь органических полей была 205 000 га, соответственно (9 % от общей площади полей), рост составил 7 % с 2011. Количество органических фермерских хозяйств в Южном Саво, также как и органически обрабатываемых сельскохозяйственных угодий долгое время медленно росло. Число органических фермерских хозяйств в 2013 в Южном Саво составляло 256. Это отражает 6 % от числа органических хозяйств в Финляндии. Общая площадь органически обрабатываемых полей в Южном Саво в 2013 составляла 9 386 га. Цены на органическую продукцию, также как и субсидии каким-то образом выше по сравнению с ценами традиционного земледелия. Фермеру, занимающемуся органическим земледелием, не нужно покупать минеральные удобрения или пестициды, что обычно сохраняет значительное количество денег для других инвестиций, на более высокие затраты на рабочую силу. Например, для ручной или механической борьбы с сорняками на овощных хозяйствах требуется достаточно много трудящихся.

Какие же причины лидерства и более высокой доли органического сельского хозяйства в Южном Саво по сравнению с другими регионами, хотя Южное Саво никоим образом не является сильнейшим

из сельскохозяйственных регионов? Условия для органического выращивания в Южном Саво благоприятные. Внушительные финансовые и интеллектуальные усилия и инвестиции в течение последних трех десятилетий как на исследовательские проекты и проекты по развитию, так как и на обучение органическому сельскому хозяйству в Южном Саво определенно были одной из причин такого долгосрочного развития. Университет Хельсинки, НИЦ сельского хозяйства и продовольствия Финляндии MTT, служба по распространению опыта ПроАгрия Южное Саво, региональные власти, с 2013 НИИ органического сельского хозяйства Финляндии, также как и некоторое количество других организаций целенаправленно и твердо обеспечивали содействие органическому сельскому хозяйству в своих стратегиях. Органическое сельское хозяйство до сих пор является одним из наиболее перспективных секторов для специализации фермеров. Уже два поколения фермеров было обучено этой наукоемкой производственной системе в Южном Саво.

Было также принято в расчет, что спрос на органическую и местную еду растет среди потребителей. Знания о потенциальной возможности защиты окружающей среды, особенно водных объектов и климата при потреблении все более и более высокого количества органической и местной еды, даже немного более дорогой, резко увеличились. Все больше становятся доступны веские доказательства этих благоприятных эффектов органического сельского хозяйства. Это относится в особенности к более молодым, высоко образованным поколениям. Надо надеяться, что это развитие создаст новый рынок для различных видов прямых связей между фермерами и потребителями, без или только с незначительной долей очень концентрированной производственной цепочки и торговли, которая характерна для Финляндии. Также существует даже несколько успешных примеров промышленной переработки органической еды в Южном Саво. В течение десятилетий определенные инвестиции были сделаны для переработки молока, овощей, хлеба, говядины и т.д. Некоторые из них уже закрыты, но в любом случае это поможет росту спроса и улучшит прибыльность фермерских хозяйств.

Наиболее важными органическими продуктами из Южного Саво являются молоко, говядина, ягоды (клубника) и овощи (морковь, лук, капуста). Существуют также некоторые малые производители таких специальных культур, как лекарственные и ароматические травы, гусиное мясо и другие деликатесы для малого и специализированного рынка.

СНИМОК 4. Экологически чистая морковь, выращенная в Хаукивуори 2014 (Фото Х.Хухта)

Основные проблемы для решения в органическом земледелии Южного Саво в большинстве случаев такие же, как и для традиционного земледелия, и такие же, как в других частях Финляндии. Это, в основном, низкая прибыльность и низкий инвестиционный потенциал, сложная ценовая конкуренция на рынке, трудности с наемом персонала на низкооплачиваемую работу, старение и уход на пенсию фермеров в совокупности с отсутствием новых и молодых фермеров и других предпринимателей, снижение населенности в сельской местности. Одной особенностью Южного Саво является фрагментированная структура фермерских хозяйств, небольшие полевые участки и отсутствие полей в целом.

References

Etelä-Savo 2011. Etelä-Savo ennakoi. Tilasto- ja ennakointitietoa Etelä-Savosta. Metsätalous. http://www.esavoennakoi.fi/keskeset-toimiala_metsatalous

Etelä-Savo 2014. Etelä-Savo ennakoi. Tilasto- ja ennakointitietoa Etelä-Savosta. Maatalous. http://www.esavoennakoi.fi/keskeiset-toimialat_maatalous

Etelä-Savon ELY-keskus 2013. Ympäristön tila 2013 Etelä-Savo. http://www.doria.fi/bitstream/handle/10024/93990/Ymp%C3%A4rist%C3%B6n_tila_2013_ESA.pdf?sequence=2

Etelä-Savon Maakuntaliitto 2014. Pinta-ala- ja väestötietoja Etelä-Savossa kunnittain ja seutukunnittain1.1.2014. http://www.esavo.fi/

Maanmittauslaitos 2014. Suomen pinta-ala kunnittain 1.1.2014. http://www.maanmittauslaitos.fi/sites/default/files/alat_2014.pdf

MMM 2012. MMM:n suuntaviivoja luomualan kehittämisohjelmalle ”Luomu 20/2020”. http://www.mmm.fi/attachments/luomu/678W6W0V9/luomuohjelma_FINAL_nettiin.pdf

Rintamäki, H. 2011. Luomuviljatuotteiden hinnan muodostuminen. MTT Raportti 30. http://www.mtt.fi/mttraportti/pdf/mttraportti30.pdf

Tilastokeskus 2013. Kesämökkien määrä maakunnittain 2013. https://www.tilastokeskus.fi/til/rakke/2013/rakke_2013_2014-05-23_kat_001_fi.html

Tilastokeskus 2014. Maakuntien pinta-ala, väestö ja bruttokansantuote. https://www.tilastokeskus.fi/tup/suoluk/suoluk_vaesto.html#bruttokansantuote

Ympäristö.fi 2013 Ympäristöhallinnon yhteinen verkkopalvelu. Vesistöjen ravinnekuormitus ja luonnon huuhtouma. http://www.ymparisto.fi/fi-FI/Kartat_ja_tilastot/Vesistojen_ravinnekuormitus_ja_luonnon_huuhtouma

Environmentally friendly animal husbandry

Harri Huhta & Ekaterina Petruneva

The Ministry of Environment of Finland has published the guidebook for environmentally friendly animal husbandry in 2010 (Ympäristöministeriö 2010). According to the guidebook, one objective of nature protection actions is the good status of environment. The main emphasis in nature protection is based on preventive actions. The main specific objective is to reduce nutrient load to water bodies by reduction of fertilization and soil erosion, and by the development of more environmentally friendly cultivation practices.

The other goals are to reduce emissions to the atmosphere, and to promote biodiversity in agricultural areas. The main methods used are development of legislation simultaneously providing strong economical incentives to the farmers to protect their own and common environment.

The Environmental Protection Act (Ympäristönsuojelulaki 86/2000) of Finland provides the procedure for applying an environmental permission for all actions in animal husbandry. For example, for a certain number of specified animals on a farm or building a new cow house, a certain license will be needed.

Furthermore, the Nitrate Decree (Nitraattiasetus 931/2000) has provided rules for manure treatment and storages, manure and fertilizer application dose and timing, in the amounts of yearly applied Nitrogen kg/ha. The first state level objective was to reduce agricultural nutrient load until 2015 by one third from the level during the period 2001–2005. The long-term goal is to halve the nutrient loads from agriculture to the environment. The Nitrate decree is in process to be renovated.

To achieve the demanding objectives set, the effectiveness of utilization of manure will be increased and nutrient circulation intensified and better manure storage and treatment will be promoted. More over the use of bio-energy from manure and other biomasses will be explored, and other commercial options for manure treatment will be used.

The Baltic Sea Action plan (HELCOM 2007) sets certain goals to the environmental protection in animal husbandry. These are equal for every state around the Baltic Sea.

Environmental subsidies

The most important economic incentive for the farmers is the voluntary agro-environmental subsidies system of the EU which has been applied in Finland since 1995. More than 90 % of the farmers have committed to the environmental support system both to achieve better income and to protect the environment. The subsidies system is quite complicated and it includes several different methods to be chosen. It consists of 1) the obligatory basic measures for every farm, 2) some optional additional measures, and of 3) the voluntary specific support contracts. Every measure has its specific and confirmed price.

According to observations and continuous monitoring, the environmental objectives of the scheme implemented have, however, not been realized in desired pace. The goals for limitations in nutrient load from agriculture will not be achieved. New methods and a new subsidies system to reduce the nutrient load will be needed. They are constantly under research and development to be implemented during the next period.

Climate conditions and global warming – a new threat to the agro-environment?

The growing period (1981–2010) on the agricultural regions of Finland has been normally relatively short, 145–185 days (Ilmatieteen laitos 2010), and soil is mostly covered by snow over 3–6 months. However, the global warming will probably cause in many aspects totally new conditions for crop and animal farming, and certain new threats of growing loads to the environment as well. The need to mitigate these effects and to adapt to the changes sets growing challenges for agriculture in the future. It is notable that the climate conditions in the Luga district and Leningrad Region are quite similar to the conditions in Southern Finland.

Though only 9% of Finland's surface area is covered by arable land (2.24 million hectares), everything that is done there will have effects on the environment, water and atmosphere. Total area under cultivation in Finland is about 2.00 million hectares. About 80 % of the arable land is connected to the feed production for livestock.

Animal farms and their waste in Finland

Finland has approximately 15 000 animal farms which are mainly located in the South-Western and Western Finland (2012). This is the case especially concerning pig and poultry farms. Eastern Finland is very important region for milk production. In 2012 Finland had altogether 9 800 dairy farms, 3 500 beef cattle farms, 1700 pig farms, and 500 poultry farms (picture 1).

PICTURE 1. Animal farming may cause nutrient leakage to water bodies (picture by Ville Heimala)

However, structural change in agriculture is rapid and continuous. In 1995 there existed 99 964 active farms, and only 59 042 active farms in 2012 respectively. The number of livestock farms will be reduced in the future too while the average arable land area, number and productivity of animals per farm, as well as the need for area for animal manure application have to grow. Caused by this trend development, certain local and regional environmental problems will probably increase which demand better protection of the environment by development and implementation of new technology.

In addition to manure, typical waste from animal farms consists of dead animals, washing waters, waste water from human origin, septic tank sludge, used agricultural plastics and other packages, hazardous waste and other biomasses like contaminated or spoiled forage. All these would cause severe environmental problems without proper and regulated treatment.

Fertilization and manure utilization

Fertilizer use in Finland has significantly fallen during the last decade. Especially use of phosphorus fertilizers has fallen. The nutrients from manure are taken into account more effectively and precisely than earlier in fertilization plans and calculations. However, nutrient load from diffuse sources to water bodies unfortunately has not been reduced accordingly. The share of agriculture in the total nutrient load has even increased when all kind of point-source load has been reduced. In any case, animal farms have a key role in water protection from nutrient load (picture 2). This relates to the Baltic Sea, the river basins and lake districts as well.

PICTURE 2. Buffer zones help to keep water clean and promote biodiversity (picture by Ville Heimala)

Examples for some measures and methods which are set in different regulations in Finland, to provide better environmental protection on animal farms are:

• Space of manure and urine storage must be large enough for 12 months, including the space for raining if the storage is not covered and in addition, the other effluent fluids lead to the storage.

• The storage volume needed is regulated by animal species and by the type of manure and the type storage (slurry, dry manure, composting etc).

The field area needed for manure application per one animal is regulated as well based on the official calculations of manure production and the nutrient contents in manure, based on the calculation provided by ProAgria and MTT. A manure application plan is needed taking into account orders related to manure application on groundwater areas.

Numerous commercial technologies and methods are available on the market for manure handling, processing (aeration, extraction, fractionation, composting, biogas process, combustion, incineration, heat recovery etc.) transportation and application (spreading, injection). The main idea in manure utilization is to get the most of the manure applied to soil during the spring period.

The application should not be done later than the end of September. Outside the growing season, in October–April, application or spreading manure is not allowed because assessed nitrogen losses would be more than 90%.

The application on the surface of grassland is not recommendable for reasons of hygiene, if it is not possible to inject manure into the soil. All manure applied/spread to soil should be immediately mixed to soil by harrowing. The outdoor yards for cattle, pastures and grazing, as well as type of forage storages (silos and stacks) have a very specific role in nature protection. Pre-dried silage is more environmentally friendly than wet silage, recovery of effluent is necessary; yards covered with asphalt help in recovery.

Modern cattle farms use equal technology worldwide, in Europe and Finland, as well as in Russia. The standards and objectives for environmental protection should be as equal as possible. Nutrient content of manure has to be analyzed regularly and calculations for the nutrient balance on at least farm level have to be a normal and yearly part of fertilization planning.

Some or many of these measures could be applied and implemented in Luga district as well in order to get better environmental protection on cattle farms. Good results could be achieved if remarkable capital would be invested to new equipment in manure treatment, storages, transportation and applying during several years.

In the two projects “TEHO 2008–2011” and “TEHO plus 2012–2014”, operated by The Ministry of Agriculture and Forestry, The Ministry of Environment, The Central Union of Agricultural Producers and Forest Owners (MTK), and Centre for Economic Development, Transport and the Environment of South-West Finland (Центр экономического развития, транспорта и окружающей среды), a lot of practical and visual guidebooks

and internet material in Finnish for ecologically sustainable agriculture, farming and animal husbandry were produced. The focus was on water protection and maintenance of biodiversity. The material is very useful anywhere where the conditions are mostly equal or near it (TEHO plus).

References

HELCOM 2007. Helcom Baltic Sea Action Plan. Reaching good environmental status for the Baltic Sea http://www.helcom.fi/baltic-sea-action-plan

Ilmatieteen laitos 2010. Terminen kasvukausi. http://ilmatieteenlaitos.fi/terminen-kasvukausi

Nitraattiasetus. 2000. Valtioneuvoston asetus maataloudesta peräisin olevien nitraattien vesiin pääsyn rajoittamisesta http://www.finlex.fi/fi/laki/alkup/2000/20000931

TEHO plus. http://www.ymparisto.fi/fi-FI/TEHO_Plus/Hankkeen_esittely

Ympäristöministeriö 2010. Kotieläintalouden ympäristönsuojeluohje. Ympäristöhallinnon ohjeita 1/2010. 112 p. http://www.ym.fi/download/noname/%7B06778792-4DFD-4354-8E61-823AE1524B99%7D/37512.

Ympäristönsuojelulaki. 2000. http://www.finlex.fi/fi/laki/ajantasa/2000/20000086

Экологически безопасное животноводческое хозяйство

Харри Хухта и Екатерина Петрунёва

Министерство охраны окружающей среды опубликовало Руководство по охране окружающей среды для животноводческих хозяйств в 2010 году (Ympäristöministeriö 2010).

Согласно руководству, целью охраны природы является благоприятное состояние окружающей среды. Основное внимание в вопросах ее защиты уделяется предупредительным мерам. Целью охраны окружающей среды в сельском хозяйстве является снижение биогенной нагрузки на водные объекты через более целенаправленное и сниженное использование удобрений, предотвращение эрозии, и с помощью развития методов выращивания сельскохозяйственных культур. Основной целью является снижение биогенной нагрузки на водные объекты как через сниженное использование удобрений и предотвращение эрозии, так и с помощью развития более экологически безопасных методов выращивания сельскохозяйственных культур.

СНИМОК 1. Современный коровник в Калининградской области, Россия (Фото Х.Хухта)

Другими целями также являются снижение выбросов в атмосферу и способствование сохранению биоразнообразия в сельской местности. Основными используемыми методами являются развитие законодательства и одновременное обеспечение фермеров

существенными экономическими инструментами для защиты их собственной и общей окружающей среды.

В законе об охране окружающей среды (Ympäristönsuojelulaki 86/2000) Финляндии установлена процедура для подачи заявления на получение природоохранного разрешения на все действия в животноводческом хозяйстве. Например, специальная лицензия необходима на содержание определенного количества конкретных животных в хозяйстве или на строительство нового коровника.

Также директива по нитратам (Nitraattiasetus 931/2000) устанавливает правила по обращению с навозом и его хранению, дозу и сроки применения удобрений и навоза в количествах ежегодно применяемого азота кг/га. Первой целью было снижение нагрузки от сельского хозяйства к 2015 на треть от нагрузки в период 2001-2005. Долгосрочной целью является сокращение биогенной нагрузки на окружающую среду от сельского хозяйства вдвое. Директива по нитратам находится в процессе обновления.

Для достижения запрашиваемого набора целей эффективность использования навоза должна быть увеличена и усилена циркуляция биогенов, должны поощряться лучшее хранение навоза и обращение с ним, также как и исследование возможностей и эффектов использования навоза как источника энергии, и должны быть использованы другие коммерческие варианты по обращению с навозом.

СНИМОК 2. Современный накопитель для жидкого навоза крупного рогатого скота в Калининградской области, Россия (Фото Х.Хухта)

План действий комиссии по защите Балтийского моря (ХЕЛКОМ 2007) ставит также определенные цели по защите окружающей среды в животноводческом хозяйстве. Они одинаковы для каждого государства в регионе Балтийского моря.

Наиболее важным экономическим инструментом для фермеров является добровольная агро-экологическая система субсидий ЕС, которая используется в Финляндии с 1995. К данной экологической системе поддержки присоединилось свыше 90% фермеров как для достижения более высокого дохода, так и для защиты окружающей среды. Система субсидий достаточно сложна и включает выбор определенного количества разных методов. Она состоит из: 1) обязательных основных мер для каждого хозяйства, 2) нескольких необязательных дополнительных мер и 3) добровольных специальных соглашений по поддержке. Каждая мера имеет свою особую и утвержденную стоимость.

СНИМОК 3. Современные хранилища, сделанные из стали, для жидкого навоза крупного рогатого скота в республике Карелия, Россия (Фото Х.Хухта)

Согласно наблюдениям и непрерывному мониторингу, цели по охране окружающей среды при внедренной схеме не были реализованы в желательной мере. Цели по лимитированию биогенной нагрузки от сельского хозяйства достигнуты не были. Будут необходимы новые пути для снижения нагрузки. Они непрерывно находятся в стадии исследования и развития для введения в действие в следующий период.

Вегетационный период (1981-2010) сельскохозяйственных регионов Финляндии обычно относительно короткий, 145-185 дней, и почва в большей части покрыта снегом свыше 3-6 месяцев. Однако, глобальное потепление скорее всего создаст во многих аспектах полностью новые условия для растениеводства и животноводства, и таже определенно новые угрозы растущих нагрузок на окружающую среду. Необходимо уменьшить степень данных последствий и адаптироваться к массиву изменений для будущего сельского хозяйства.

Несмотря на то, что только 9% финской поверхности покрыто пахотными землями (2.24 млн гектаров), все что там сделано будет оказывать влияния на окружающую среду, воду и атмосферу. Общая площадь обрабатываемых земель в Финляндии составляет примерно 2.0 млн гектар. Около 80% пахотных земель связаны с животноводческим кормопроизводством.

СНИМОК 4. Современная технология для распределения жидкого навоза крупного рогатого скота в республике Карелия. Россия (Фото Х.Хухта)

В Финляндии находится примерно 15 555 животноводческих ферм, которые в основном расположены в юго-западной и западной Финляндии (2012). Это в основном свиноводческие и птицеводческие хозяйства. Восточная Финляндия является важным регионом для молочного производства. В 2012 всего в Финляндии находилось 9 800 молочных хозяйств, 3 500 хозяйств по производству говядины, 1700 свиноводческих хозяйств, и 500 птицеводческих. Однако, структурные изменения в сельском хозяйстве непрерывны. В 1995 существовало 99 964 активных хозяйств, и только 59 042 активных

хозяйств в 2012. Количество животноводческих хозяйств в будущем тоже будет снижено, тогда как средний размер пахотных земель, количество и продуктивность животных на хозяйство, также как необходимость площади для применения навоза должна возрасти. Вызванные развитием данного тренда определенные местные и региональные проблемы окружающей среды должны, вероятно, увеличиться, что требует лучшей защиты окружающей среды при помощи развития и внедрений новых технологий.

В дополнение к навозу, типичные отходы от животноводческих ферм состоят из мертвых животных, промывочной воды, сточных вод человеческого происхождения, отходов от отстойников, использованного сельскохозяйственного пластика и других упаковок, опасные отходы и другие биомассы, например испорченные или зараженные корма.

СНИМОК 5. Жидкий навоз крупного рогатого скота (40 т/га) внесен в почву в течение демонстрации в Маанинка, Финляндия (Фото Х.Хухта)

Использование минеральных удобрений было значительно снижено в течение последних нескольких десятилетий. Особенно было заметно снижение использования фосфорных удобрений. Биогенные вещества, содержащиеся в навозе животных, были учтены более эффективно и точно в планах по внесению удобрений. Однако, биогенная нагрузка от рассеянных источников на водные объекты к сожалению не была снижена равным образом, и доля сельского

хозяйства в общей биогенной нагрузке стала даже более заметной, как только точечная нагрузка была снижена. В любом случае, животноводческие хозяйства играют ключевую роль в защите водных объектов от сельского хозяйства.

Примеры некоторых мер и методов, которые установлены в некоторых постановлениях в Финляндии для обеспечения более благоприятной окружающей среды на животноводческих хозяйствах:

Место для хранения навоза и мочи должно быть достаточно большим для 12 месяцев, включая место на случай дождя, если хранилище не покрыто и, в дополнение, другие просачивающиеся жидкости ведут в хранилище.

Объем необходимого хранилища регулируется в соответсвии с видами животных и типом навоза, и типом хранилища (навозная жижа, сухой навоз, компост и т.д.)

Согласно официальным расчетам по производству навоза и составу биогенов в навозе на основании расчетов ПроАгрии и МТТ регулируется также необходимая площадь поля для применения навоза на одно животное

Необходим план по применению навоза, принимающий во внимание указания по применению навоза в зонах грунтовых вод.

На рынке доступно большое количество коммерческих технологий и методов для управления навозом, переработки (аэрация, экстракция, фракционирование, прцесс получения биогаза, сжигание, утилизация тепла и т.д.), транспортировки и применению (распределение, впрыск). Главной идеей в использовании навоза является максимальное получение от навоза, внесенного в почту в течение весеннего периода.

СНИМОК 6. Большое, современное силосохранилище для огромного количества силоса в Калининградской области, Россия. Стоки не наблюдаются (Фото Х.Хухта)

Внесение не должно быть совершено позже, чем в конце сентября. Вне вегетационного сезона, в октябре-апреле, внесение или распределение навоза не разрешено, потому что оцененные по директиве по нитратам потери будут больше 90 %.

СНИМОК 7. Высококачественное силосование в Ленинградской области, Россия (Фото Х.Хухта)

Внесение на поверхность пастбищ не рекомендуется по гигиеническим причинам, если невозможно впрыскивать навоз в почву. Весь внесенный на почву/распределенный навоз должен быть немедленно смешен с почвой боронованием. Наружные площадки для скота, пастбища, также как тип кормохранилищ (силосная башня и скирды) имеют очень важную роль в защите окружающей среды.

Предварительно высушенный силос является более экологически безопасным, чем сырой силос, восстановление вытекающей жидкости необходимо; заасфальтированные площадки, помогают в восстановлении.

Современные животноводческие хозяйства по всему миру, в том числе в Финляндии и России, используют одинаковые технологии. Стандарты и цели для защиты окружающей среды должны быть как можно более схожими. Содержание биогенов в навозе должно подвергаться анализу регулярно, и расчеты для баланса биогенов по крайней мере на уровне хозяйства должны быть нормальной и ежегодной частью плана внесения удобрений.

Некоторые или многие из этих мер могут быть применены и внедрены также в Лужский район для того чтобы получить лучшую защиту окружающей среды на животноводческих хозяйствах. Хорошие результаты могут быть достигнуты, если значительный капитал в течение определенных лет будет инвестирован в новое оборудование при обращении, хранении, транспортировке и применении навоза.

СНИМОК 8. Экологически безопасный коровник и фураж хорошего качества в Ленинградской области, Россия (Фото Х.Хухта)

В двух проектах “ТЕНО 2008 - 2011” и “ТЕНО plus 2012 - 2014”, осуществляемыми Министерством сельского и лесного хозяйства, Министерством окружающей среды, Центральным союзом сельскохозяйственных производителей (МТК), и Центром экономического развития, транспорта и окружающей среды юго-западной Финляндии, было произведено большое количество практических и визуальных руководств и справочных материалов в сети интернет для экологически устойчивого ведения сельского хозяйства, фермерства и животноводческих хозяйств. Основное внимание сфокусировано на охране вод и поддержании биоразнообразия. Материал очень полезен для тех, чьи условия по большей части аналогичны или близки к ним.

Double degree studies in Mamk

Arto Sormunen & Anne-Marie Tuomala

The double degree programme is based on the written agreement between the foreign partner university and Mikkeli University of Applied Sciences (Mamk), Department of Energy and Environmental Engineering. When you have studied three years at your home university, the fourth year will be carried out in Mikkeli. Your previous studies will be accepted as part of the degree and when graduating from Mamk, you will receive the Bachelor of Engineering Diploma. The exact study time and credits you should complete depend on your previous studies and work experience. We welcome you all in the Applied University of Mikkeli and wish you a happy stay in the city of Mikkeli.

ПРОГРАММА ДВОЙНОГО ДИПЛОМА В УНИВЕРСИТЕТЕ ПРИКЛАДНЫХ НАУК МАМК.

Сормунен Арто; Туомала Аннэ – Марие

Программа двойного диплома базируется на договоре между иностранным партнером-вузом и Отделением технологии энергетики и окружающей среды университета прикладных наук г. Миккели (Мамк). Если Вы учились три года в российском университете, четвертый учебный год у Вас есть возможность проучиться в г. Миккели. Ваши предыдущие курсы и экзамены будут зачтены и одобрены в часть Вашего диплома, полученного в Мамк. По окончании обучения в нашем учебном заведении Вы получите диплом Бакалавр инженерии «Bachelor of Engineering Diploma». Более конкретный срок и содержание обучения в нашем учебном заведении будут зависеть от Ваших ранее пройденых курсов, образования и опыта работы.

Добро пожаловать в университет прикладных наук г. Миккели!
Желаем Вам успешного и увлекательного учебного периода в нашем городе!

Introduction to the Double Degree

The Double Degree is always based on the written mutual agreement between your home university and the Mikkeli University of Applied Sciences (Mamk). The number of accepted students is also based on the annual negotiations of the partner universities. The volume of the environmental engineering diploma (BEng) studies at the Mamk is 240 ECTS (*European Credit Transfer and Accumulation System*) credits. Your studies in your home university compensate the main part of your degree studies at the Mamk, usually 150 credits, and the remaining part, 90 credits, are studied at the Mamk. These 90 credits include 45 compulsory professional studies (45 credits), a bachelor degree thesis (15 credits) and practical training (30 credits). In practice, it means that student will study three years at home university and the fourth year will be carried out in Mikkeli.

The Double degree programme in environmental engineering (BEng) provides the students with knowledge of technical possibilities for protecting and monitoring the environment, and the economically and environmentally best practises for an enterprise. In addition to the engineering studies, the programme offers the students an insight to international/national business environment. Our mission is to provide the highest professional expertise as well as applied research and development work for the needs of the working life. What we expect from you, is the knowledge of English language but the most important thing is your own willingness.

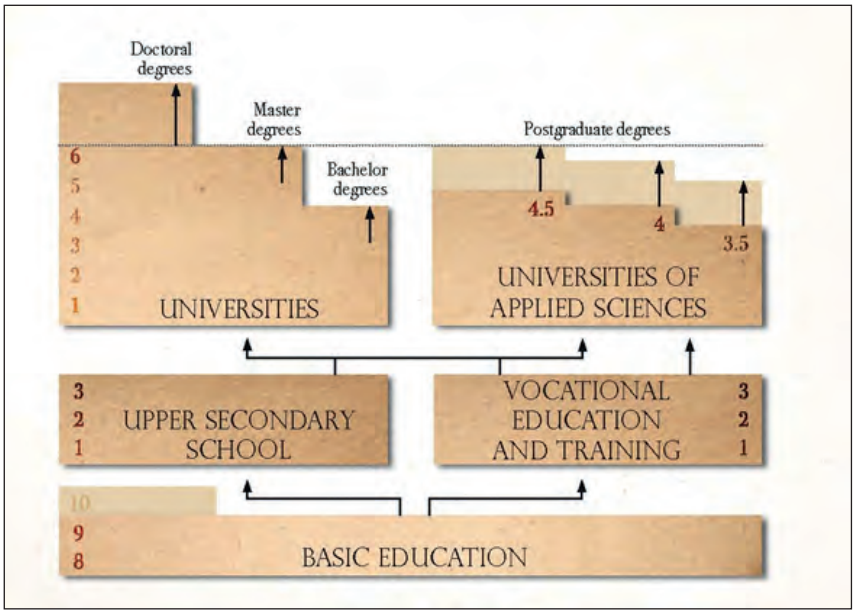
In Mamk, you have all those facilities that you need to gain the knowledge of environmental engineering field, and you can show those skills in the real working life. Mamk is very reputed; ranked to be the number one of Universities of Applied Sciences in Finland. Mamk engineering laboratories have high-quality equipment and good industrial relations and those facilitate the excellent practical exercises and similarly provide excellent topics for your theses.

Studying arrangement in Finland

In Finland, the government controls all educational institutes. All education is free by law regardless of national origin of students. There are 16 science universities and 26 universities of applied sciences in Finland. Finnish education system has many times ranked to the best in the world.

The Finnish higher education system comprises two parallel sectors: universities and universities of applied sciences (Picture 1). The universities emphasise scientific research and the teaching is based on theory. Universities of applied sciences/polytechnics are institutes of higher education based on the combination of theory and practise.

Mikkeli University of Applied Sciences offers you good services and facilities during your study period. Student organisations offer their members a variety of activities ranging from outdoor events to a movie club. There are versatile and good recreation possibilities in all two towns where our campuses are located. Due to Finland's location it is easy to visit towns in neighbouring countries such as Tallinn, Stockholm and St. Petersburg. Besides studying and activities, it is important to take care of well-being. For sure, studying and living in Mikkeli will be one of the best experiences of your life time and at free time you can explore pleasing city and country as well.



PICTURE 1. The Finnish higher education system (picture by Mamk)

Personal study plan and careers

A personal study plan is made for each student to ensure the completion of the graduation according to the rules of the degree. In other words, your previous studies will be accepted as part of degree. When graduating from the Mamk you will receive the Bachelor of Engineering Diploma. The studies usually take one academic year, from autumn period to spring period. The time depends on the study success and the completion of the thesis and practical training.

In this programme you will gain theoretical and practical expertise in environmental technology and management. During the studies, you will get good knowledge of technical possibilities for sustainable protection of environment

and have ability to find economically and environmentally the best practises for an enterprise. In practice, depending on your own backround and wishes, you can concentrate and get deep understanding on sustainable development, environmental technology or environmental management and economics.

Possible careers could be planning and organising environmental matters in a company, supervisory tasks, teaching and consulting. The students are coached for administrative or expertise positions either in public or private sector.

High-quality education

The Finnish Ministry of Education has awarded Mamk many times, for instance for its international activities, excellent cooperation with working life and extensive research and development work. Mamk has the Diploma Supplement Label granted by the European Commission. The Diploma Supplement facilitates applying for further studies abroad or pursuing an international career. The quality assurance system in Mamk is on a high level. We were among the first institutions of higher education in Finland to pass the evaluation by the Finnish Higher Education Evaluation Council.

Hence, the education system over here is very flexible and will suite to a wide range of people with different thoughts, visions and background. Further, we do not have tuition fees at all, and no plans to implement those in future. Expected students come partly from Finland and mainly from other countries.

Practical training and learning by doing

Practical training is compulsory part of the DD Environmental Engineering studies (Picture 2). It means that before graduation you have to gather in total 30 ECTS, which equals with 20 weeks (about 5 months) of working experience on the environmental engineering field (1 ECTS = 27 working hours). The practical training can be done in several parts. If you have experience before your studies in Mamk, bring the documents for the checking and acceptance. If your studies in your home university include practical training in environmental field that can also be accepted as a part of Mamk's practical training.

Practical aspect is very strongly connected to our studies. For example, in many of our courses, learning of new skills is done empirically through doing, either in our laboratories or in the co-operation with companies or authorities. The laboratory work is often done in small groups. The laboratory work illustrates and applies theories to practice.

PICTURE 2. Practical aspect is important part in your studies. Mamk has excellent facilities for that (picture by Mamk)

International Mamk

In Mamk, you are studying in an international group - we host about 300 foreign students every year. The Bachelor´s Degree Programmes in Business Management, in Environmental Engineering and in Information Technology are conducted completely in English. The international aspect of the studies is strengthened also by visiting lecturers. We also organise an International Summer Term which consists of intensive courses in English in different study fields. There are over 720 new students starting studies leading to a degree every year and the total number of students is about 4500.

Mamk collaborates with 200 international universities. You can enhance your language skills and get international experience by doing part of your studies in the partner institutions. You can also complete your practical training abroad.

Living in Finland and Mikkeli

The city of Mikkeli is the capital of the Province of Eastern Finland and it is situated by the Lake Saimaa having population approximately 50.000. The City of Mikkeli has good connections to eastern, southern and central Finland which gives great opportunities to local business and travelling. Diverse business in Mikkeli is based on forest and timber, information technology, food products, metal and tourism. Mikkeli University of Applied Sciences lies in the heart of Mikkeli city.

Housing for students studying at Mikkeli University of Applied Sciences is provided by Mikkelin opiskelija-asunnot Oy (MOAS). MOAS owns about 740 apartments, which approximately equals to 1100 residences. The rents for shared apartments are app. from 300 €/month and for single-room apartments from 385 €/month. According to Finnish standards for living you will need approximately 500 Euros per month, which includes food, rent, clothes and all other extra activities.

Not only for studies but freetime activities

There are many possibilities for spending active freetime in Mikkeli region. Mamk has gym and sports hall which students can use free of charge. In addition, there is a wide range of club activities in sports, music and arts. Joining any of these groups is one way to get to know students from other study fields. The activities are free of charge/affordable and attendance is easy. Those who are interested in bowling can practice at the bowling hall at the Main Campus.

In winter time, there are several possibilities for free time activities such as downhill skiing, cross-country skiing, skating and ice-hockey. There is also opportunity for swimming, riding and workout. Forest area near the student accommodation serves as running or skiing track depending on the season. In summer, students like hiking, fishing, swimming and canoening. Nice beach is located near the student accommodation. Sauna evening is a tradition among the summer term students.

International Club organises many activities both in summer and winter like Christmas parties and sauna evenings with the possibility to go swimming in a hole in the ice. A trip to Lapland has been organised many times and visit to Lahti ski games is organised on request. Especially tutor students will give you more information about sport possibilities and other happenings in Mikkeli and its surroundings.

Welcome to Mikkeli University of Applied Sciences. It is our pleasure to invite you to study in the motivating environment of Mikkeli University of Applied Sciences. This is a brilliant opportunity to get familiar with Finnish culture and simultaneously, acquire the high quality education. We welcome you all in the Applied University of Mikkeli and wish you a happy stay in the city of Mikkeli.

Visit the webpage (http://virtuaali.mamk.fi/mikkeli)

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