INNOVATIVE FOOD PRODUCTION
OF FISH AND VEGETABLES

HEALTHY ENVIRONMENTS FOR PEOPLE

SURPLUS ENERGY FOR BIOLOGICAL PRODUCTION

SSEC SWEDISH SURPLUS ENERGY COLLABORATION

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Program leader of Urban Food

Håkan Sandin

Horticulturalist , Msc in Horticulture
at the Swedish University

CEO, Program leader for SSEC, **http://sse-c.se**

Board member of the Refarm 2030, **http://refarm2030.se**

CEO of NAHC, **http://www.nahc.se**

CEO of my own company Håkan Sandin Consulting

Program leader of Urban Health

Bengt Persson

Agronomy Doctor, Landscape Architect LAR / MSA

Associate Professor, Department of Landscape Architecture, Planning and Management, SLU Alnarp, **http://www.slu.se/institutioner/landskapsarkitektur-planering-forvaltning/**

Deputy Program Manager SSEC, **http://sse-c.se**

Chairman of the BEUM Association, **http://www.beum.se**

Background

Excess heat becomes food and better habitats for people

How can we economically take care of the very large amounts of residual heat that are today cooled off in various industrial processes?

The heat lost in Sweden in various industrial processes is at least 150 TWh/year. This is as much energy as the total Swedish electricity consumption.

Our visions in SSEC also includes how we can utilize other unused resources (waste), such as food waste, other organic materials, industrial infrastructure, or industrial waste such as carbon dioxide and so on.

The objectives

"SSEC is a network that enables sustainable food production and better living environments through the use of residual heat and other unutilized resources."

Fish farming creates jobs in Ljusdal

Fish farming will be the first investment in sustainable food production in the industrial area Bränta i Ljusdal. This gives the village 20 – 30 new jobs with the possibility of many more in the long run.

The municipality of Ljusdal has signed a landmark agreement for a six-hectare area with Cibum AB (Ltd), a sister company of Blå Eken AB, which has a apartment hotel in Vemdalsskalet (A tourist resort in the Swedish Mountains).

The first stage of the investment is a circular fish farming (land-based so-called RAS* cultivation) of 2,000 tonnes, rainbow trout per year, which is estimated to employ about 20-30 full-time employees. Production is expected to start at the turn of the year 2018-2019.

Then further expansion is planned in several stages, which means that in the long term, it is estimated that hundreds of employees will be employed. The hope is also that a further processing of fish will take place in Ljusdal, says Martin Steen, CEO of Blue Eken and Cibum.

Ljusdal municipality and its industrial foundation NärLjus has been working for a few years to establish a center for the development of circular and environmentally friendly food production in Bränta in Ljusdal, focusing on vegetables and fish.

"We have studied several municipalities and found that Ljusdal has very good conditions and high competitiveness for this kind of facilities. Here is the driving force and other important factors such as land, water, energy and labor at competitive conditions. This enables long-term establishment of a whole cluster of different growers in Ljusdal", says Malcolm Sjödahl, Head of Business Development at the consultancy company Ramboll, which is the municipality's partner in the development of sustainable food supply in Ljusdal.

From the municipality, the joy is great that several years of work have now given a visible result.

"We hope that the investment currently underway will be followed by more. There is more land and resources. Such ongoing contacts with potential growers will be intensified and further developed. In keeping with the spirit of the times, the municipality is very pleased to be able to contribute to sustainable development over time while at the same time creating new jobs. In addition, this is entirely in line with the food strategy adopted by the Swedish parliament", says Lasse Molin (Moderate Party), chairman of the Municipal Executive Committee in Ljusdal.

*RAS

This is the collective name of the recycling technology used in modern land-based fish farming globally.

Aquaponic production of tomatoes and fish

HÄRNÖSAND
THE HIGH COAST
SWEDEN

In Härnösand, in the northern part of Sweden, you probably find Europe's largest (4000 square meter) true aquaponic production of tomatoes and fish. Developed from smaller scale during a 20 year period by Pecka Nygård. The company that has developed the basic idea to a larger scale is a company called Peckas Naturodlingar. The production is up and running today to produce 20 tons of fish and 200 tons of tomatoes annually, and there are plans for more. By 2021, the company aims to grow to 100,000 square meters around Sweden. A development that the municipality more than welcomes.

Härnösand municipality participates in the network SSEC (Swedish Surplus Energy Collaboration). A research and development program that works for a development to conserve natural resources in a better and smarter way. The network also gives companies in Härnösand the opportunity to be seen in global contexts and to gain valuable knowledge.

Härnösand's promise to climate change is to lead the way to the future of everyday life in Härnösand, aiming at a climate where people are in balance with the environment by 2045. One of several approaches to the Härnösand municipality's environmental and sustainability efforts is to create conditions for reducing climate impact from food consumption which this network can contribute to.

The city of Härnösand in the world heritage site High Coast of Sweden (one of UNESCOs World Heritage Sites), sea, forest and mountains join together and make up for impressive views

Foodhills builds food center in Bjuv

Foodhills takes over Findus plant in Bjuv from March 1, building an innovative food center for the production of future food.

"We want to realize Findus's thoughts of making Bjuv into the food's Silicon Valley. Our vision is to become a leader in Europe for circular food production and contribute to sustainable global development, "says Foodhill's chairman Bengt Persson.

Foodhills estimates that the new center can create at least as many new jobs as Findus employed at the closure.

Chairman of Findus Sweden, Peter Odemark, who stands behind the deal with Foodhills, is pleased that Foodhills takes over.

"With Foodhills as a new owner, there are conditions for realizing Findus's vision: the Food Valley of Bjuv Food, Comparison to the Silicon Valley of the Data and Technology Industry," he said. And it feels very good.

The agreement also opens for future cooperation between Foodhills and Findus.

"We are starting to collaborate in research and development, circular food chains and free warehouses and we work together for further cooperation," he says.

Foodhills will make extensive investments in Bjuvanläggningen to realize its vision. But will also invite other players.

"Foodhills wants to be a catalyst that, together with other companies, government, public actors and universities, stimulates innovation, knowledge development and employment in order to develop sustainable circular food production," says Bengt Persson. The goal is to become an international example.

Behind Foodhills vision is also the municipality of Bjuv and the Region of Skåne:

"Foodhills is now building a plant for circular food production in Bjuv, not only good for the municipality. It is also good for Skåne and Sweden. It gives increased employment, strengthens self-confidence and increases the competitiveness of Swedish food production. It is a work that is completely in line with Skåne's and Sweden's food strategies, "says Lennart Svensson, Regional Coordinator in Region Skåne.

For further information, see **www.foodhills.se** or contact:

Bengt Persson, Chairman of the Board Foodhills, tel: 0768 - 24 32 62

Peter Odemark, Chairman of the Board Findus Sweden, tel: +46 723 66 21 83

FOODHILLS

Findus

Pushing to develop the Swedish food industry

Energy efficiency is part of Veolia's DNA where we are focusing to help the industry and community to use the resources in the most optimal way. Today our research department consists over 330 researchers and above 250 pilot installations where we constantly are pushing the boundaries forward enabling us to further reduce the usage of fossil fuels, recycle energy streams and expanding our view to include a 360 perspective adding ways to optimize the usage of resources. #Livingcircular

Energy is critical for the Food & Beverage Industry where many manufacturing processes require thermal energy such as steam, hot water and cooled water. Veolia is the global market leader for the provision of environmental services to the Food & Beverage Industry. We have been operating energy systems in the Food & Beverage Industry for more than 15 years and are trusted by over 60 Customers to manage and improve the performance of their energy systems.

At Altia distillery plant in Finland we have optimized the energy cycle, but we are not stopping there. By including a circular approach we have also replaced the fossil fuel by utilizing the by-products originating from the production. Now towards zero CO_2 emissions and zero waste volumes.

Veolia group is the global leader in optimized resource management. With over 163,000 employees worldwide, the Group designs and provides water, waste and energy management solutions that contribute to the sustainable development of communities and industries.

Through its three complementary business activities, Veolia helps to develop access to resources, preserve available resources, and to replenish them. In 2016, the Veolia group supplied 100 million people with drinking water and 61 million people with wastewater service, produced 54 million megawatt hours of energy and converted 30 million metric tons of waste into new materials and energy. Veolia Environment (listed on Paris Euronext: VIE) recorded consolidated revenue of €24.39 billion in 2016.

VEOLIA

www.veolia.com

Food defense – Fish and vegetables throughout Sweden

A short intervju with Håkan Sandin

SSEC and Refarm are building a completely new food infrastructure of fish and vegetables.

The background is very simple, says Håkan Sandin.

“There is a huge demand and market for Swedish food. We import most of our eateries in Sweden, and our readiness for shutdown times is very low. We waste almost half of the energy we produce in our country, more specifically 150 Twh. We also waste half of all the food we eat and produce in Sweden”.

There is thus a great need for innovations. Food production in houses is part of the solution; new food infrastructure, new businesses and new production and environmental management systems, simply a food revolution, according to Håkan Sandin.

Håkan Sandin continous.

“We need both a large-scale, small-scale, sustainable, circular and high-tech development that takes care of all resources and outflows in society and transforms them into food or other utilities in an environmentally friendly manner”.

SSEC establishes new food infrastructure and new energyefficent companies throughout Sweden and develops sustainable circular production systems for fish and vegetables.

Refarm a Nordic organization educates our new food business in a nationwide education program in collaboration with the Swedish national Board of Agriculture and presents innovative fish and vegetable dishes with the help of Sweden’s good chefs.

SSEC SWEDISH SURPLUS ENERGY COLLABORATION

6 general results and effects

1. We create 10,000 new jobs in the food industry

- Through the use of residual heat and other unutilized resources.

- By stimulating increased production of fish and vegetables.

2. We stimulate increased production and distribution of Swedish food

- Primary production of Swedish raw materials.

- Production of ready-made food to consumers.

- Environmentally friendly packaging and logistics solutions.

3. We create the conditions for building a new industry of fish and vegetables

- We create demand for large amounts of heat, electricity and other resources.

4. We are helping to build new food infrastructure across the country

- Bjuv
- Malmö
- Oskarshamn
- Lund
- Ljusdal
- Hofors
- Härnösand
- Gävle

5. We take care of surplus resources in the community

6. We develop modular production systems

- Container-based.

- Demonstration plants.

- Research facilities.

- Industrial clusters for production of fish and vegetables.

ectogrid™ – A revolutionary concept for sharing surplus thermal energy

In modern cities there are enough thermal energy flows generated by human activity to provide the base for both heating and cooling of the entire city. Sharing surplus heat and cooling saves money – and the environment. The problem is the lack of solution that's fully enabling this. Problem is now solved. Now there's ectogrid™.

By connecting buildings and sharing the energy between them, all available energy flows will be used in an efficient way. One building needs heat and another building in the area needs cooling. When heat is produced, cooling is also generated, and vice versa. Today all this energy is released into the atmosphere or is recycled with inefficient and costly methods, says Dr Per Rosén, senior specialist at E.ON and inventor of ectogrid™.

Only one cool and flexible grid is needed, but it serves several purposes – distribution for both heating and cooling as well as for storage and flexibility which also makes more room for intermittent renewable energy.

ectogrid™ is a product and a patented technology, powered by and with heritage from E.ON, however the technology can be licensed by anyone interested in realizing an ectogrid™ system. And the concept is suitable for residential and all types of commercial buildings.

We match different needs of various buildings and processes and create a win-win solution, says Fredrik Rosenqvist, Innovation Director at E.ON.

ectogrid™ decreases both pollution and the energy consumption in a city, says Fredrik. This is a revolutionary technology that will help fight climate change and transform the energy market worldwide.

The ectogrid™ concept was discovered and incubated via E.ON's innovation accelerator programme :agile. More information about the concept can be found at: **www.ectogrid.com**

A continued focus on improving Swedish energy policy

Sweden's Minister for Policy Coordination and Energy, Ibrahim Baylan speaks to us about the importance of a sustainable Swedish energy policy

The goal of Swedish energy policy is: "to ensure, with as little environmental impact as possible, a secure electricity supply for companies and households at competitive prices."[1] We were fortunate to interview the country's current Minister for Policy Coordination and Energy, Ibrahim Baylan about his ambitions to make Sweden ahead of the game when it comes to implementing energy efficiency measures.

The interview kicks off when we ask the Minister about his goals for energy policy in terms of environmental impact and security of supply for companies and households. We also picked up from the conversation that the Government of Sweden's planned energy efficiency measures are both ambitious and exciting, as the Minister goes on to reveal.

"Energy should be sustainable, secure and affordable for all. Electricity in both the long- and short-term is something the Government of Sweden is making increasingly reliable and as such, we plan to move to 100% renewably generated electricity by 2040. There is an agreement from 80% of the Swedish Parliament to make this target the number 1 goal of the Swedish electricity system.

"Energy efficiency measures are essential for Sweden to achieve its energy policy objectives, which is the historical experience of the Government of Sweden. Normally, politicians focus on the production side, such as in the US where they are now focussing on coal. In

Sweden, we have focussed on wind and hydro power, so from our perspective, it is equally important to focus on energy efficiency. This is a proven cost-effective way to provide the industry and households with energy, without needing to increase the production.

"In terms of where Sweden is now compared to the 1980's – we have 25% more inhabitants and our gross domestic product (GDP) has grown by 100% – but we are using less energy and electricity today. This proves that it is possible to combine both the development of a modern welfare society and the decreased use of energy, a work which the Government of Sweden will continue to intensify."

Looking to renewable energy

The conversation then moves to the exciting plans the Government of Sweden has for investment in renewable energy, increased energy efficiency and climate advisory services.

"Sweden and the other Nordic countries, especially Norway are focussed on a path unlike many other countries, in that we have tried to implement a policy that doesn't choose technologies. The shared green certificate system is in place, which aims to support the development of renewable energy and as such, in June 2017 we set new targets in Parliament concerning renewable energy.

"We have also expanded the target for new renewable energy by 80% during the term of the current government. Sweden has ageing nuclear plants, so that is one of the main reasons why we are expanding such support. The shared green certificate system is supporting both hydro and bioenergy and it is consistently hitting its target, in a very efficient way. Consumers in Sweden are paying one-tenth of what those in Germany are spending, so we are very happy with the shared green certificate system here."

Minister Baylan then proceeds to outline the Government of Sweden's plans to achieve 50% more efficient energy use by 2030 and what measures are required around this. The Minister also lifts the lid on the increased support his

government is giving to solar power as a form of renewable energy.

"We tasked the Swedish Energy Agency to look at all the sectors of society to see what can be done and what kind of investments are required, from both the public and the private sectors. One example is a target that says we must change all lighting in Sweden by 2020, which will save the amount of electricity equivalent to a nuclear reactor. As the Minister for Policy Coordination and Energy in Sweden, I am very excited by this prospect of getting such concrete measures from relatively easy actions.

"The Government of Sweden has increased and implemented several kinds of support for solar energy, such as tax deductions, investment loans and support schemes as part of the shared green certificate system. We have also recently made it easier, by trying to simplify the administration around such assistance. The latest proposal we have presented to the Parliament will ensure that we the budget for investment support for solar power will increase by 800-900%.

"However, the problem is that we need electricity the most during the winter months. What will ensure that solar plays a big role in Sweden's energy system is utilising energy storage, so that we are not always dependent on the sun. Storage can take the form of heated water or batteries, and when it becomes truly cost-effective it will have potential to be a part of Sweden's future energy system.

"During the summer, our consumption of electricity is around 13,000 MW and that increases to 27,000 MW in the winter. The capacity we have for hydropower is around 16,000 MW – but while we do need investments in solar energy during the winter when there is less sun – if we store the excess energy collected during the summer and move it to other seasons then no other form of energy could compare with this."

This insightful and thought-provoking interview concludes with Minister Baylan sharing his government's goal to be the first totally fossil free welfare society in the world.

"There has been heated debate for some time concerning combining economic development with a sustainable way of providing energy. There has been tremendous development today concerning electrification, wave optimisation and the development of renewable power. In this vein, we are taking the first steps in terms of combining a strong economy with a sustainable way of providing our citizens and industries with more renewable energy.

"The Government of Sweden has set a target for the country to become the first totally fossil free welfare society. If you said this 5-7 years ago, then nobody would have believed you. Today, however, that is achievable with the best economic structures in place and I believe it is manageable for society and its citizens.

1 http://www.government.se/government-of-sweden/prime-ministers-office/ibrahim-baylan/

Image: © Kristian Pohl/The Government Offices

Ibrahim Baylan
Minister for Policy Coordination and Energy
Government Offices of Sweden
Tel: +46 8 405 10 00
http://www.government.se/government-of-sweden/prime-ministers-office/ibrahim-baylan/

Refarm is a new non profit NGO – a national network for an increased sustainable food production and Swedish self-sufficiency in order to give tens of thousands of new jobs, a resilient society and sustainable, high quality food. For example, industrial buildings or farm buildings across the country can be used as a resource in innovative fish and vegetable farming in urban and rural areas. Refarm has rapidly established itself as the leading national driving force behind small and medium-sized urban fish and vegetable production.

Together with SSEC we define the need and opportunities to increase the Swedish self-sufficiency of food radically. We do this by visualizing the farming revolution that is possible through new innovations, or old innovations in a new context, all across the country. Thanks to the Swedish Board of Agriculture and their work to realize the national food strategy we are able to continue this work, and for example introduce future fish in fine dining restaurants, schools and hospitals.

MEMBERS OF THE SWEDISH SURPLUS ENERGY COLLABORATION

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