Challenges for the New Rurality in a Changing World

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'Palopuro Agroecological Symbiosis'

A Pilot Case Study on Local Sustainable Food and Farming (Finland)

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***Abstract* – What could be a functioning food system model for a food secure and sustainable world? This project studies a pilot case – 'Palopuro Agroecological Symbiosis' (Palopuro AS) - for restructuring the food system in Palopuro village in the Finnish countryside. The project challenges the present linear, globalizing food chain and suggests a global network of localized cyclical systems. A local food cycle highlights reconnection of farmers and consumers, minimizes nutrient loss, and relies on local (bio)energy. This project investigates the cultural, social, political, ecological, and spatial changes to Finnish agricultural landscapes as a result of implementation of an ecological symbiosis. We use the term 'agro-ecological symbiosis' to describe the cooperation between producers, processors, other businesses, and consumers in an effort to build an integrated food system.**

Keywords: sustainability, rural development, metabolic rift (MR), renewable energy, food system

Introduction[4]

Industrial ecology (Graedel 1996, Graedel & Allenby 1996) is defined as a form of production in which the use of energy and material flows resemble those in natural ecosystems. Following this idea, Chertow (2000) suggested, by including the aspect of the spatial scale of the operation, that industrial symbiosis (IS) is an operation in which the partners of the symbiosis are located in geographical proximity, to allow for localized co-evolution. Metabolic rift (MR) is defined as an irreparable rift that affects all the interdependent process of biophysical and social metabolism (Foster 1999). We see IS as a biophysical model, which includes the social and ecological goals of closing MR. MR was originally conceived of as a social and cultural distancing, but has also been described as a biophysical phenomenon. "This process [of metabolic rift] also cleaves a biophysical rift in natural systems (such as nutrient cycles), leading to resource degradation at points of production and pollution at points of consumption" (McClintock 2010). An agricultural system cannot thrive under conditions of MR. The efforts to heal the rift constitutes a fundamental change to the socio- spatial arrangement of the rural landscape. In cooperation with the entrepreneur (in this case a farm, bakery, and other businesses in the area), stakeholders (local and regional administration, research institutes), and community members (direct consumers and villagers), we aim to analyse and develop an application of IS as a pilot case for closing the MR in the context of a functioning food system. We call this agroecological symbiosis (AS). AS stands as our model for a localized, energy and nutrient self-sufficient, cyclic food system integrated into the local community. The aim of this paper is to describe the conceptual model for AS, and to illustrate a case under development.

Background, Methods and sources

The pilot AS is situated in Southern Finland, approximately 50 km north of Helsinki, in Palopuro a rural community adjacent to the small town of Hyvinkää. The pilot is called 'Palopuro Agroecological Symbiosis' (Palopuro AS), which aims to produce local, organic food using bioenergy from local resources and recycled nutrients. This pilot is developed as a model that is hypothesized to MR and is sustainable in ecological, socio- cultural, and economic terms. Palopuro AS is the first of its kind in Finland. More detail about the case is available:
http://blogs.helsinki.fi/palopuronsymbioosi/english/

Knehtilä is an organic cereal farm (340 ha) at the center of Palopuro AS (for details of the farm see WWF 2015). Knehtilä has developed a network of several organic producers and processors. In the integrated system, the grain from the fields would be milled in Knehtilä, and baked into bread by Samsara Ltd, an organic bakery which will establish its operations on the grounds of the farm. The losses from milling and baking would be used as feed for hens in the neighbouring, 6,000 head, henhouse which is producing organic eggs for local sales and for use in the bakery. Biomass from green fallows in Knehtilä's organic crop rotation combined with the hens' manure and manure from local horse stables would be processed by anaerobic digestion. The result would be biogas, used for the drying and milling the grain, as well as for the ovens of the bakery. The rest of the gas would be processed and used to run the farm machinery and for local sale for use in passenger cars. The effluent, nutrient-rich produce from the digester, as well as the biochar (produced as by-product in making gas by charring) would be used as organic fertilizer and soil conditioner in the farm fields.

The future aim is that most of the products from the agroecological symbiosis will be sold locally and regionally. Currently all the involved players are selling a portion of their products directly to the customers. In addition, there is a farm shop at Knehtilä farm and at the henhouse, as well as several local food market days are organised annually. At the moment, the participating players in the Palopuro AS receive over 10,000 visitors a year. This is a significant increase to the level of visitors and community involvement prior to starting the process of instituting a system of AS. This number of visitors is also significant, given that the local area has a population of approximately 600 inhabitants.

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The shared goal is that with this system the biomass loops are closed and the cooperative is able to operate in a sustainable manner. As we evaluate the process of closing the biophysical loops, we will also evaluate the impacts on the social interactions of the key players and the local community.

We quantify the biophysical system of Palopuro AS in terms of (1) agricultural and food products produced, consumed and sold, (2) biomasses produced within, imported to, and exported from, (3) energy needed, energy sources, and energy saleable to the community or to the national grid.

We will examine the Palopuro project from a qualitative perspective through identifying and interviewing stakeholders and key actors. We will focus on (4) perceptions of the process of healing MR (5) administrative and institutional (regarding for example, funding, legislation, certification) issues, (6) demand for the products, and (7) business and industry partners with shared interest (such as, for example distribution channels for food products and bioenergy produced in the system).

We assess the (8) interests of the local community (the village, the town) in sharing the Palopuro AS, as customers and visitors, but also as participants in the local food system.

Results

The aim is to create a concept from the Palopuro AS pilot project which can be reproduced, initially, by other farms around Finland. Cooperation in this manner could be the answer to a sustainable and vibrant organic and local product sector in Finland.

The original ideas of the entrepreneurs driving this co-operative (locally recycling the nutrient flows generated in the production processes and fully utilizing the bioenergy potential in the biomass flows) are clearly feasible. By recycling the organic materials, minus the energy used for farming operations and for food processing, there is an inherent increase in productivity. Palopuro AS conserves natural resources and reduces nutrient loading to the Baltic Sea. Economic profitability for the entrepreneurs forming the AS is a sensitive variable for their decisions, but they also look to the wider economic and policy driven regulation of food and farming. In addition, social acceptance and support from the wider community are integral facets of a sustainable system. We have discovered the socio-cultural aspects of this project to be truly iterative, as new stakeholders and underlying social and political processes have been discovered at every step of the pilot project.

In addition to producing organic food, Palopuro AS will produce renewable energy from green fallows and manures (gross energy of 2,440 MWh). Local use of the energy produced will cover approximately 620 MWh. The total energy as automobile fuel will be 1,260 MWh, where the operating efficiency of a biogas plant is estimated to be 85 % and the purification of the biogas to traffic fuel 97 %. The amount of produced methane corresponds approximately the annual consumption of over 80 passenger cars. Another option is to use biogas in combined heat and power CHP production.

Conclusions

The research on this project is presently ongoing, to date, the conclusions we have reached have been empirical in nature. The qualitative aspects of the project will be expanded in future publication. With this in mind we herein present conclusions consistent with the quantitative aspects of this pilot project.

Once the bakery begins its operations on the farm, consumers will be able to become acquainted with the whole production chain. There will be the opportunity to see nutrient recycling in action and contribute to the social understanding of a system designed to heal MR. Biophysically the bakery and biogas production will affect the nutrient and energy flows in the symbiosis because of the changes in crop rotation. The ecological impacts need to be evaluated. There is potential for successful farm-scale biogas production in Finland. In addition to green manure fallows, grasses are grown without harvesting in nature management fields and buffer zones. In Finland the area of these grass production types was 177 000 ha in 2013. Niemeläinen et al. (2014) estimated that around 105 000 ha would be available for biomass harvesting. In farm scale biogas production like in Palopuro AS, it would also be feasible to harvest feed from the small field parcels increasing the total available biomass. Producing biogas from green manure fallows and non-cultivated areas is a sustainable way to produce bioenergy. At the same time nutrient use efficiency is enhanced in farms without cattle.

Combining the food processing, bioenergy production and cooperation between different stakeholders, including customers, will enable the more sustainable localized food system, which would also create new job opportunities in rural communities.

However, further co-development and additional participatory research is needed to assess all aspects of sustainability from both the biophysical and social perspective. With this project we aim to include the biophysical and social implications at every step of production and processing.

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