

## **Baltic Ecological Recycling Agriculture and Society (BERAS project) -A case of Juva milk system**

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### **Abstract**

The aim of the study was to determine the potential, impact and prerequisites of localization and enhanced recycling in a rural food system, illustrated by the case of Juva milk. An interdisciplinary scenario based on the increase of local, organic milk to 50% of milk consumption was created and the sustainability was compared, on the basis of the statistics and data collected from the actors, with the present milk system. The nutrient loads, farm and local economy, and using LCA interactions between the actors, and the constraints were studied farm and s. There is potential for localization, which promotes sustainability, of the Juva milk system through conversion to organic production of milk for local processing, increased recycling of nutrients between farms and from the demand chain, enhanced reliance on local energy and closer cooperation. This would decrease the nutrient loads to waters and enhance the local economy and partnership. Compensation for farms the income relinquished by reliance on recycling, and information for consumers are central prerequisites. The conclusions may be generalized for rural Baltic milk systems, although the structural challenges may often be greater.

**Keywords:** localization, recycling, food system, milk, sustainability

### **Introduction**

Food production has played a central role in rural vitality. Rural regions have, however, increasingly specialised in producing and exporting raw material for food production, while at the same time satisfying the local demand with food imported from outside the region. Therefore, the added value of input production, food processing and food distribution has moved to urban areas resulting in unemployment, removal and disintegration of social structures in rural regions. Similarly, recycling nutrients and carbon, between plant production and animal husbandry within the regionally specialised agriculture, and within the vertically distanced food system, has become difficult. This, besides the use of non-renewable energy for imported, industrially manufactured fertilizers and for long-distance food transportation, has increased the environmental hazards caused by food systems. In addition to the development tasks of recycling agriculture supplying local, organic food the BERAS project aims to find out, whether localization and increased recycling in Baltic rural food systems would enhance sustainability and especially decrease the nutrient load which is destroying the Baltic sea. This presentation focuses on this research task by half of one illustrative case, the Juva milk system. Does localization of milk in Juva enhance sustainability, what kind of localization is required, and what are the prerequisites?

## **Conceptual framework**

Food system is the conceptual framework which integrates the different organizational levels and different stakeholders focused on in the BERAS project. The food system includes here both the material, financial, social and value systems linked to food. It includes input production, agriculture, food processing, transportation, trade, consumption and waste management. Locality of the food system is seen as a relative concept, varying from the county to municipality level, whereby the Juva milk case represents the latter. The less and more local, recycling food systems are in this presentation compared by focusing on the milk subsystems of each. Due to the focus on rural food systems, localization (i.e. increased degree of locality; localization vs. globalization) is understood as an increased share of the local demand being met by local production based on local resources - not as a decrease in food export from the system. Recycling of organic matter is seen as a central means of localization of the inputs, and also a central motivation for localization of food systems.

The conceptual framework which integrates the different disciplines of the BERAS project is sustainability. The indicators for ecological sustainability are nutrient balances, N and P load to waters, gaseous emissions and use of non-renewable energy. The economic sustainability is studied on the basis of enterprise economy, local economy and environmental economy, and social sustainability by means of the quality and quantity of interactions in the food chain, farmers' possibilities to influence, justice of the division of benefits and vitality of local communities. A systemic concept of sustainability is applied, meaning that the challenge to improve sustainability is considered simultaneously in terms of the different dimensions.

## **Materials and methods**

Research in BERAS (2003-2006) is based on case studies of various food systems (Seppänen, 2004) including recycling organic farms in eight participating countries around the Baltic sea. Two food systems, one in Sweden, and one in Juva, Finland, are focused upon. The cases are studied as potentially good examples, the impact of further localization and improved recycling is investigated, and obstacles and alternative solutions identified. A conscious intensification of the interdisciplinarity (ID) of BERAS was initiated after the first third of the project. The Finnish team performed an ID pilot study to create a scenario on a local, recycling Juva milk system, as one illustrative example, and to learn more about the process and potential of ID. Milk was chosen on account of the existing local, organic milk chain, which makes the scenario relatively realistic. The ID process, with a great challenge for commitment and learning, was based on a classic generic model of an ID research process (Klein, 1990) and quality criteria proposed by Mansilla & Gardner (2003).

Juva is a rural municipality rich in lakes, with agriculture and forestry playing a vital role in its economy. It has 7500 inhabitants, half of them populating the central village with no agriculture. It is a pioneering municipality in terms of organic farming in Finland and has demonstrated spirited activity developing local food since the end of the 1990's, started by the local actors of the food chain and supported by the municipality. In Juva, 20% of the active field area is cultivated organically, a third of which on dairy farms, and an organic dairy. The organic dairy collects most of the raw milk from Juva and the rest from the neighbouring municipalities. It produces all liquid milk products except sour whole milk. The availability of local, organic milk is good and its origin is well-known in Juva. Of the liquid milk products

bought from retailers in Juva, below 2% originate the dairy. The corresponding proportion in the municipal institutional kitchens is somewhat higher, e.g. in the secondary school 4%.

A scenario of increasing the proportion of local, organic milk to 50% of the total milk consumption in Juva, combined with increased localization, recycling and increased use of local, renewable energy in the milk system, was created. This scenario was then compared with the present status of the Juva milk system. Farming, transportation, processing and consumption were taken into account. The scenario was based on the data collected from and analyzed three local, organic milk farms, from the organic dairy and other actors of the local milk system. The present dominating milk system was studied on the basis of the available statistics and data collected from the actors. The nutrient loads were investigated on the basis of the primary production balance which indicates the ratio between harvested nutrients and input nutrients from outside the system to crop production (Seuri, 2000), and using LCA. The impact on the economy of the case farms was investigated by linear programming. The gains and income forgone resulting from enhanced recycling and localization of N input were modelled, and the need for incentives to ensure the economic viability of farms was estimated. The sensitivity of farm activities to changes in prices and support were studied indirectly, e.g. on the basis of validity ranges. The quantity and quality of the interactions and obstacles for localization were studied on the basis of interviews with farmers and students. The consumption habits and constraints experienced for use of local, organic milk were also monitored (Hannula & Thomsson, 2004).

## **Results and discussion**

Two alternatives to cover an increase in consumption of the local, organic milk were considered both from the agricultural and processing viewpoints: compensation of the present level of production by more local production or an increase in production. Alternatives with increased recycling in agriculture and food system were also considered: to increase recycling within a farm, between the farms, and from the demand chain either in the present waste management system or after improvement. All the alternatives were preliminarily studied, and the scenario based on conversion to organic farming, increase in dairy production as well as recycling complemented between farms and from the improved waste management system, was focused on. Both current and new organic farmers would contribute to the increase in production. The choice was made, because this scenario coincided best with the aim to simultaneously increase sustainability in all of its dimensions, and was also realistic enough. Preliminary results of studies focusing specifically on the milk subsystems are presented.

On account of the relatively diversified agriculture and existing processing capacity and logistics, localization of the milk system would not require marked structural changes. An increase in the proportion of organic milk production would improve the nutrient efficiency and reduce the nutrient load, especially per area but also per product unit and overall in Juva. This is achieved by nutrient recycling within the agricultural system. There is still potential to enhance recycling further, which decreases the nutrient load. The highest potential is for increased recycling between farms, the next for recycling from processing and consumption back to agriculture, but recycling within the farms can also be improved. Recycling from the demand chain has least obstacles in rural systems with no industry and close vicinity of fields. Effective nutrient recycling causes, however, income forgone for farms due to the lost production increase by nutrients imported into the system in fertilizers and feed. The income forgone can be reduced by focusing on recycling between the farms instead of within farms, as well as recycling from the demand chain. There is, however, a need to compensation.

Localization of the milk system would decrease the requirement for non-renewable nutrient and energy sources. Reliance on local, renewable energy would be increased due to compensation of nitrogen (N) fertilizers by recycling and biological N fixation. There is also a high potential for increased use of local, untapped wood energy or biogas, especially in the dairy and for production of electricity at farms. The decrease in transportation would also reduce energy consumption. Increased reliance on local recycling, resources, processing and transportation which compensate import to and activity outside Juva, would increase economic activity in Juva being beneficial for the local economy in the sense of improved employment and public finance. This is true even if localized consumption would be satisfied through farm conversion instead of increased milk production at farms.

The primary production and processing sector of the organic milk chain is heavily based on community ties and trust between actors, whereas the marketing and consumption end of the chain operates mainly within market and hierarchic relations prevailing between actors. If the organic milk chain would increase by volume, this could occur in a context of farmers adopting the partnership as a mode of working in the chain, thus replacing the hierarchical and market relations present in the conventional primary production and processing. As far as consumers are concerned, the growth of partnerships on the level of realising the organic concept/idea would need to be exhibited more extensively than is currently the case.

Prominent challenges for localization and recycling, based on the results of actor interviews, were closer cooperation between the farms - an example of win-win relations between all the dimensions of sustainability, compensation of imported milk powder, berries and energy in processing with local production, and partnership with the marketing enterprise. Some consumers had specific dietary requirements or the price as constraints for use.

## **Conclusions**

There is potential for sustainable localization of the Juva milk chain through conversion to organic milk production for local processing, increased recycling of nutrients between farms and from the demand chain, enhanced reliance on local energy, and closer cooperation. This would decrease the nutrient loads to waters and enhance the local economy and partnership. Incentives to compensate the income forgone caused by efficient recycling is, however, a prerequisite. Information to consumers, e.g. on the basis of the present study, is a precondition for their commitment and partnership. The conclusions may be generalized for rural Baltic milk systems, although the structural challenges may often be greater.

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