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ENVIRONMENTAL IMPACTS OF ECO-LOCAL FOOD SYSTEMS

– final report from BERAS Work Package 2

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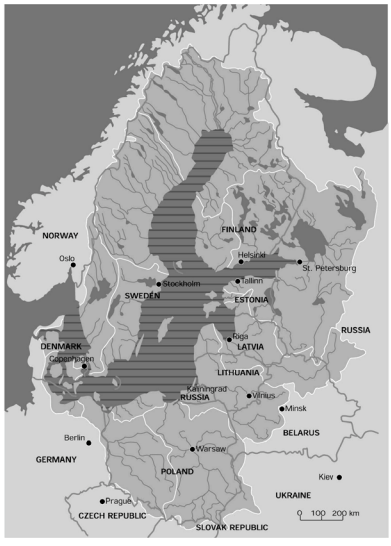

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evident if the nutrient balance evaluation considers not only the biogas plant but also the nutrient cycle of the farm organism over a whole crop rotation period. Not only the quantity but also the quality of the nutrients affects soil fertility, fodder quality and animal health and both need to be taken into consideration

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Possibilities for developing combined recycling and renewable energy production in Juva and Järna

The plant nutrients in food stuffs from agriculture end up in slaughterhouse wastes, domestic wastes (wastes from household and food industry) and sewage wastes. These three fractions contain 4, 3 and 2 kg N per capita and year and 2, 0.5 and 1 kg P per capita and year (Calculated from Magid et al. 2002). About 60 % of the nitrogen and 45 % of the phosphorus are in the liquid wastes residues mainly in the human urine fraction. Of the total phosphorus taken up by plants (20 kg P per ha) about 75 % can be recycled within the farming system on ecological recycling agriculture (ERA) farms if nutrients in manure are optimally utilized. However, 15 % of the P is found in the sewage fraction from human consumption. This could be re-circulated for use in agriculture through urine separation if the hygienic aspects can be taken care of in a secure way. Another 10 % of the P is found in slaughter wastes which could also be an important resource for the sustainable agriculture.

Two ways of local recycling of the solid fraction of biowaste, one of which is combined with the production of biogas, have been studied within the BERAS-project. Their goal is the safe recycling of nutrients, reduced emissions of greenhouse gases and reduced emissions of reactive nitrogen. One way is the central recycling at community level described above for Juva that often is combined with production of biogas and other energy recovering systems. However, centralised biowaste treatment raises problems with quality control and with the high risk of contamination from heavy metals, medicaments, and animal (including human) pathogens. For these reasons these nutrients are not allowed to be used on soil for food production.

The second option is to have a smaller-scale system with better opportunities to choose and control the material treated. An example of this is the recycling of food residues introduced in the small-scale biogas plant on Yttereneby farm in Järna described above. This small-scale biogas plant for use at farm level may be a better solution for recycling of nutrients from human food (local processors, ecological public kitchens and consumers) as it provides opportunities for effective control against contamination from pathogens and harmful substances. This technology was established as an essential link in the local ecological recycling system that at the same time reduces emissions of greenhouse

gases. Only organic residues from ecological farms, ecological small scale food processors and ecological consumers are used. Permission for this local recycling was obtained from the local government. Pathogens in the biowaste are destroyed by heating for one hour at 70 ^{0}C with the help of the energy from the biogas plant. For the farmer, the recycled nutrients from the food chain combined with the treated manure from the farm become a trustworthy and valuable resource. A further step would be to also use slaughter wastes from a local slaughterhouse. Receiving selected biowastes (as slaughter offals) from outside the farm also seems to improve the input material, increasing the biogas production. Gate fees could bring incomes to farmers.

On-farm biogas plant treatment in Juva could also support agriculture. A preliminary design for a biogas plant in Juva was developed in 1997 (Citec Environmental Technology, 1997). Nine food actors, waste producers and users of hydrolysis residuals were included in that design but of different reason it has not been built.

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