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## Socially Overlaid Networks as Key Actors in Green Energy Businesses in Rural Areas

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### 1 Introduction

For about two decades, sustainability discourse has been operating as a public discourse, stressing reformist and imaginary features of sustainable development (Dryzek, 1997; WCED, 1987). This discourse has its political ‘wing’, emphasising societal orientations for renewal of production and consumption towards sustainability at large (CEC, 1997, 1999; COM, 2001; European Parliament, 2002). Indeed, European food system seems to call for developmental measures, as one fifth to circa half of all categories of environmental impacts are caused by the food system (Tukker et al., 2006) and within this system, meat and dairy sector seem to be responsible to large extent for eutrophication and climate change (Weidema et al., 2008). To effect changes towards increased sustainability, the market has been suggested to operate as a level of playing field for sustainable food (Defra, 2010; HM Government, 2010). It is often interpreted as organic or local (CEC, 2004, 2008; Council Regulation (EC) No 834/2007 of 28 June 2007; Nordic Ecolabelling of Restaurants, 2009) but currently sustainable food is seen to embrace “contribution made by farming on sustainability, climate change, food security and development, biodiversity, animal welfare, and water scarcity” (CEC, 2008, 6). While most consumers do not seem to be willing to pay more for sustainable food, the “concerned consumers” (Weatherell et al., 2003) represent a principled orientation according to which there is more to food than price only (Seyfang, 2006; Weatherell et al., 2003). While communication of these aspects of sustainability seems to present a governance problem within the food system, farmers and manufacturers are already engaged in both organic production mode and various self regulation schemes representing more flexible and faster adjustment in a dynamic market environment (CEC, 2008). “Instead of seeing these demands as a burden, EU farmers have a real opportunity to turn them to their advantage – by delivering exactly what consumers want, clearly distinguishing their products in the marketplace, and gaining premiums in return” (CEC, 2008, 4). Self regulation initiatives regarding climate change and thereby greenhouse gas emissions of foods seem to present so far broad and miscellaneous applications of measurement, interpretation and communication practices (Usva et al., 2009).

Pressure towards more sustainable food systems seems to channel additionally through European Union energy policy. The Union has agreed to cut its greenhouse gas emissions by 2020 and to increase the share of energy from renewable sources in gross final consumption of energy to overall 20%; in Finland, this share was 28,5% in 2005 and the target share for Finland within this scheme is set to 38% in 2020 (European Parliament, 2009). The target level of final energy consumption in 2020 will amount to circa 310 TWh (Ministry of Employment and the Economy, 2008) of which 118 TWh will be renewable (Villa & Saukkonen, 2010). While heaviest demands regard forest sector as well as pulp and paper industry, only 4-5 TWh may originate in agriculture by promoting production of energy crops as well as use of agricultural by-flows and manure-based

bio-energy as biogas (Työ- ja elinkeinoministeriö, 2008, 49). Furthermore, the reject of biogas process replaces in principle for synthetic fertilizers, which conveys to further benefits in limiting greenhouse gas emissions and eutrophication (Kahiluoto, 2010). However, the biogas developments are significant as they represent new opportunities for economic viability for the struggling agricultural sector (Villa & Saukkonen, 2010). There are currently only nine farmer initiated biogas plants in Finland; the reasons for slow progress such as investment needs, technology demanding continuous follow-up, lack of suitable raw materials and (lacking) cooperation between farmers as well as low price of fossil fuels has been suggested (Kallio, 2010). Moreover, the feed-in tariff sets a scale limit for biogas plants - which will be rather high with additional environmental licence procedure - while the subsidies for farm-scale plants remain rather low (Interview with an energy expert of The Central Union of Agricultural Producers and Forest Owners, 2010). However, there is one nationally known multi-site biogas company established by a group of farmers (Kallio, 2010), signalling the opportunity for actors in this new business line.

In short, the quest for more sustainable food systems as well as climate and energy policies, under both competitive and volatile food and fuel markets, may be seen as drivers of utilization of biogas on farms. This paper asks what kind of orientations and local contexts allow biogas developments to flourish? Furthermore, how do farmers relate themselves to quest for sustainability and more specifically, to biogas developments? The paper focuses on farmer initiatives on biogas utilization in cases whereby the plant has been established, is being established and the establishment is a potential option within a span of a few years. The paper claims that development of a novel field needs to be understood from the point of view of the actors and their resource development in order to be properly promoted by policy approaches.

## **2 Methodology**

This qualitative study is based on focused in-depth interviews of actors engaged or engaging in biogas business (Table 1). The study approached well-know actors within the biogas business in south-west Finland and four of them were interviewed. The study also contacted farmers on a progressive agricultural region in south-east Finland on the basis of their registered employer status which was interpreted to refer to larger and more viable farms. Of the 11 interviewed south-eastern farmers -some of whom were pluri-active in other businesses as well - seven were currently engaged in biogas business or were planning to build a plant on their premises.

**Table 1.** Interviewed actors in established biogas business, in biogas business being established and actors planning to engage in biogas business and their positions within their activities

Actor groups	No of interviewees	Positions of interviewees
1. Established biogas business	4	Chair of board and pig farmer Executive director of biogas company Product expert of biogas company and grain farmer Plant executive of biogas company
2. Biogas business under establishment	4 (5)	Chair of several boards and organic dairy farmer of a joint farm Organic dairy farmer (Organic dairy farmer) Two conventional dairy farmers
3. Biogas business in plans	3	Executive director of butcher's and conventional pig and cattle farmer Executive director of a cake manufacturer Grain farmer and employee in the cake manufacturer

The interview guide dealt with their current business, joys, problems and future plans. The sustainable agriculture and energy strategy as well as their implementation on the business level were discussed, entailing possible partners in this endeavour. The interviews endured between one and a half an hour to two hours and were tape-recorded and transcribed verbatim.

The analysis of the interviews aimed to catch the interviewee's 'life-experience' regarding their work as positioned and relational (Mikkola & Seppänen, 2006; Schwandt, 2003) within the agri-food-energy supply chain, as constructed by them as part of their life story (Linde, 1993). The paper reports the progress within biogas businesses in condensed way (Kvale, 1996), combining points of view of several actors regarding the same business. These results are confirmed by previous interviews with a dairy farmer of the joint organic farm in 2003, presentations by the dairy farms' other partners at regional conferences in 2009 and public information currently available in local papers and the internet; there is community corroboration for the reported sequence of relations and events (Schofield, 2000). The paper presents these case studies as what may be the trend and what could be (Schofield, 2000) the future of biogas business as an elementary part of sustainable agriculture.

### 3 Results

#### 3.1 The first group of actors

*The established biogas business* had its early days in a young farmer who had an agricultural vocational education and who started to work in an agrimarket selling machinery to farmers. For the young assistant, there seemed to be inefficiency in the market system. Knowing the customers and their needs, the young assistant established with two other partners an agricultural machinery business which was operated from home by customers' orders. This business enlarged and during holidays, the farming family visited Lapland and as the locality seemed wonderful, the farmer bought a property to build a holiday cottage during the recession of 2000. This property was sold and the cottage business thrived. During these business developments, the farmer had a

conventional pig farm (operating from the Finnish point of view a large unit of more than 1000 pigs) could not comply with the manure spreading regulations, since the operations based on buying economical feed instead of growing it on the farm. This situation was shared with some 20 relatives and friends, all in pig farming in the south-western locality, and it was decided to digest the manure into biogas and fertilizes to be sold within the region. The technology was not well known, neither the funding options and subsidizes, but a municipal professional developer, employed at a regional industrial centre, dedicated himself to the project and looked for industrial plant offers and funding opportunities.

The plant was built close to the farm as an independent company. The original group of farmers was joined by another, smaller group of farmers, who also invested in the joint business. The plant did solve the lack of field area, to contingent extent the smell of slurry, but the planned horticultural business was not built next to the plant. This caused negative economic developments since not the heat neither the carbon dioxide could be sold to benefit the balance of the plant. However, the technology was realized to apply to treatment of sludge of wastewater treatment plants. The company made a tender and was awarded by a coastal town to build up a biogas plant for treatment of sludge on a continuous basis. The company hired an executive director, settled in capital region, and started to market both new plants to municipalities and refine the reject for green belt developments. The plant was profitable, but in need of continuous repair as the reject was rendered hygienic by temperatures causing corrosion in the pumping system. A big natural gas company bought a chunk of the biogas company, the aim of which was to specialize on processing biogas while the gas company was responsible for purifying the biogas and pressurize it into the gas network. The 'green' gas business and the 'brown' one found their mutual benefit in environmental reputation and increased technological competence. However, the gas sector did not succeed in getting the status of subsidized vehicle fuel for the biogas as in Sweden; the current volumes are relatively small and could encourage to the use of natural gas.

The farmer moved to chairman of the board and through the business developments, got favourable publicity as a creator of a new business concept who solved the slurry and sludge issue in sustainable way. The 'green' electric energy was sold into national grid, greenhouse gas emissions were decreased, the smell problems greatly relieved, and the phosphorus and nitrogen saturated agricultural soils received fertilization suitably low in nutrients. The plant received guests from all over world, particularly from Asia, due to its scale and design. Furthermore, the company got buying offers on a weekly basis, but rejected them to keep its integrity. The farmer, still active in pig industry, participates in various governmental, regional, industrial and research networks. Furthermore, he developed visions of agricultural development balancing between food and energy crop production, controlling nutrient run offs and simultaneously fertilizing fields according to their tailored needs by refined process rejects. The visions even reached to other industrial sectors, whereby research was started regarding the use of refined reject fractions as industrial chemicals. Finally, the economic commitments were heavy while the profits of expanding business were not yet satisfactory for the original group of owners. The personal and other people's stakes in the development reflected the high demands of continuous innovation, funding patterns and relational responsibilities.

### 3.2 *The second actor group*

*The biogas business being established* is a collateral development with a joint organic dairy farm and other local farms up to circa 16 partners, all of whom are not organic. The developments started in the joint farm, which was formed on the basis of life-long comradeship of three young organic farmers. They learned about and committed to the organic concept at a course organised by an extension service, where they calculated the nutrient balances of their farms and found out how much more they bought nutrients in as synthetic fertilizers and how much less they sold out in the form of milk and carcasses. As each of them was in the situation of rebuilding their cow houses, they decided to build up a joint unit on the premises of one of the group's member, who had a good location logistically. The business was profitable, work eased by labourers and more freedom was available due to sharing of shifts. They considered their co-operation extremely strong and each and every hour of work, performed on any of the fields or in the cow house or elsewhere, was marked down to avoid imbalances in performance. The book keeping was done in the cow house as well as a quality management system.

The dairy farmers' group bought the local dairy premises from a national company centralizing their dairy network and started their own organic dairy business, however, in marketing co-operation with the national company. Furthermore, the group could feed their stock with the feed grown by themselves with minor local additions; later, the group published joint offers to buy domestic protein feed. They got into co-operation with another group of farmers growing the protein feed, the price of which was agreed to fluctuate against economic fluctuations. The group also collaborated with rape seed growers and pressers, to get additional feed for stock. The chairman of the group also owned a logistic company transporting goods across the Finnish eastern border; however, he felt dedicated to organic farming and sustainable agriculture.

During nearly ten years, the farmers' group thought about nutrient run offs on their fields and self-sufficiency of energy supply for their operations. They asked consulting engineers for tenders of a biogas plant, after having learnt of a Finnish pioneer about the use of manure in electricity and methane production. The group developed the plans with a consultant, and found a partner in a horticultural business, which would buy the heat and carbon dioxide. They made progress as they were awarded a subsidy from the ministry of agriculture and forestry, environmental permit and building permit. They agreed also about (unequal) co-funding with a larger group of dairy farmers. Each farmer agreed to transport the manure from cow house to keep the process going on.

The group wanted to extend their energy businesses and they bought one the highest regional hills in order to build a wind power plant. Furthermore, the joint cow house concept was seen as a business opportunity to be extended to other localities where they had contacts with farmers and teachers of agricultural vocational schools. The marketing co-operation with the large national dairy co-operative came to a standstill due to economic contradictions; the organic dairy became the supplier of own brand products to two Finnish retail chains. The group is looking forward to communicate their marketing arguments about sustainability, due to biogas production and decreasing of greenhouse emissions and nutrient run offs of organic milk production.

### 3.3 *The third actor group*

*The biogas business being planned* was in the interest of farmers who had integrated forward within the supply chain. Both rural businesses realized that the sheer primary production of pork

and beef as well as grain could not offer livelihood and started to process the raw material they produced. One of the farmers processes and sells 'multi-locally' his products and the other manufacture cakes from fresh eggs and flour, selling them to retail and cafeteria chains in the capital region. The pork and cattle farmer started to enlarge the small farm he inherited by buying more fields to feed a growing number of animals. The farmer worked in a group of nearly ten others with whom he co-operated during summer season in carefully planned but flexibly arranged use of machinery on subsequently ripening fields, under contingent weather patterns and machinery problems. Furthermore, he started to slaughter and process the meats in order to sell them - not to retail chains, which was highly unprofitable for him - but to private customers from his refrigerated trading vans on local market places. His products became known due to their quality and high price; he adopted an upfront selling style towards his customers. The farmer had plans about building supply chains in local restaurants along highway network. Furthermore, energy saving was the keen interest on the farm, and particular parts of the carcasses were seen as latent raw material for biogas and energy production.

The grain producers were in the first place workers in a local turkey business, until its small scale and ineffectiveness led it to bankruptcy. The hit was hard for workers who also were farmers, but during a few weeks time the new business concept was clarified. They would grow grain to feed chickens and from the eggs they would bake spongecakes for further processing. Furthermore, since chicken manure was dry it contained more energy than for instance pork manure; chicken manure could be processed into biogas and electricity. The concept was suggested by a friend, who had during his long career developed into a bakery expert and consultant. The expert also organised the marketing meetings for the manufacturers, who were well able to sell their product by its quality. Continuous expansion, new machinery and personnel were needed in the business combining grain and egg production with cake manufacturing.

Both rural businesses were limited in their developments by the amount of work; the competence in bioenergy was rather low and they felt that they would need expert support or they could co-operate with others in its advancement. So far, both investments and technology were not known and therefore, the concrete plans were missing.

#### **4 Discussion**

The life stories show in all actor groups rather similar features in terms of trade development. The focal farmers shared active interest in learning, critical approach in and management of risks when developing their trade. The first group's focal farmer started as an employee in the local agricultural machinery trade but left his position to start similar trade by a new more efficient business concept. In similar way, the opportunity was seized in the holiday cottage market. The second group's farmers learned that organic would be more nutrient efficient and more productive for them; furthermore, they took the initiative to establish their own organic dairy by buying it from the large producers' dairy co-operative. The third group's focal farmers had moved on to process their products and market these directly to consumers or to rather exclusive buyers. It is suggested here that they featured entrepreneurial features in learning new things, creating new modes of activities and taking risks. Entrepreneurial characteristics are suggested to include social skilfulness; being active, understanding others' aims and 'fitting in' one's own aims in ways creating trust and proving one's reliability in continuous long-term relations (Mikkola & Seppänen, 2006). Socially skilful view on business emphasises profitability for both parties in long term; this

'other regarding' (Perrow, 1992) relation may build up to partnerships and network relations (Powell, 1990).

The focal actors were not developing their businesses independently but in their local networks; they were initially engaged in long-term social relations with their peers or other significant persons, such as extensionists or family members (Granovetter, 1985). The social relation enabled trusted and more open discussions, even when there were difficulties in one's livelihoods, to lead to new business concepts within the reach – according to the Vygotskian principle of zone of proximal development. Rantamäki-Lahtinen (2009) has paid attention to the crucial support for farming by trusted sharing of ideas in decision-making, reflecting importance of social ties. However, the networks represented particularly strong partnership ties as the parties invested in all cases a considerable amount of money in terms of their capacity in the joint ventures (Powell, 1990; Powell & Smith-Doerr, 1994). The first group's actors invested in new technology to continue their trade; the second group actors became 'sustainable' industrialists with marketing problems; the third group's actors took remarkable economic risks when starting to process the raw material they initially produced. The particular character of these networks can be described as socially overlaid as there were simultaneously both social and partnership ties active in the business (Mikkola, 2008). Furthermore, interestingly, the networks of the first group and the second one were open in the way that new members were taken along, if they were deemed as industrial and reliable (Mikkola, 2008). The third group's networks were not open to newcomers as the business concept was limited by market connections (Mikkola, 2008). The particular character of these networks was discernible against the one of strategic networks, in which social ties were not prominent and members' position within the networks was unstable, to be replaced by another more effective or 'fitting' business (Jarrillo, 1988).

The relation of all these actors to biogas stressed economic gains but also self-sufficiency in terms of external energy sources. The first group entered into biogas business due to regulative pressures. The second group based their developmental activities in more principled mode of food production which observed environmental sustainability in the first place. The third group was involved in developing a new business concept whereby 'meeting the consumer' and consumer satisfaction was most important for them. While the first and third group represented weak economic sustainability, the second group may be seen to ground their business in strong sustainability (Jacobs, 1999).

The actor groups were on the developmental path to loosen the grip of agricultural input industry of their trade, to some extent. They seemed to gain more independence by their networks offering social, creative and capital resources for business development in rural environments. However, downstream the supply chain the market relation was uncertain and could exhibit problems for these producers integrating forward within the supply chain. Having social ties with thousands of customers may secure one's position as a producer in a different way when compared to a market relation with one or two large customers; the dependency and continuity of farming are important aspects of business development. Therefore, it would benefit the farmers to have a more personalised relation with consumers, increasing their possibilities to develop communication with consumers. Consumer communication about sustainable dairy farming seems to be needed by the group of organic dairy farmers, as they represent advanced efforts for strong sustainability.

In promotion of biogas business in agriculture, not only market communication about sustainability would be needed, but education and relatively equal subsidies for the rural businesses when compared with energy industry. The extension sector has not been very progressive in Finland in new industries according to Snäkin et al. (2010), a view corroborated by this study. Biogas technology has been introduced commercially and a trade association has been established to support the developments. Furthermore, as energy policy focuses on large-scale energy sources and only mentions biogas production (Ministry of Employment and the Economy, 2008; Työ- ja elinkeinoministeriö, Energiaosasto, 2008), the significance of biogas production for farming industry as collateral support towards sustainability remains beyond visions – and subsidies. Particularly decreasing greenhouse gas emissions support climate policy and new fertilization options avoid nutrient leaching and reduce eutrophication, creating thus trans-sectoral benefits towards sustainability.

## 5 Conclusions

The study took a close view on biogas business developments in farming industry in Finland and reported ‘hands-on’ developments by three groups of actors: the first group having established biogas plants, the second group being establishing one and the third group planning to establish one. The study analyses the paths to biogas production and concludes that entry points to business vary. There are large scale conventional farmers restricted by environmental regulations, entering into promising and sustainable business; there are initially sustainable farming communities investing to advance their sustainability approach; finally, there are those deeply engaged in their processing and marketing businesses and experiencing difficulties to proceed in the new and weakly understood biogas business. Thus both weak and strong sustainability approaches may lead to rather similar solutions in advancing sustainable farming.

The paper concludes that socially overlaid networks of local farmers have been crucial in supporting the establishment of biogas businesses, and that social skilfulness may lie at the root of these developments. This finding supports the significance of social relations in rural areas.

The sustainability impact by farmer initiated biogas business developments, in terms of decreased eutrophication and climate change potential, increased energy efficiency and saving of fossil fuels as well as more self sufficient agriculture, would deserve more favourable attention by society at large. Particularly more funding by government, approved higher prices of sustainable food by consumers and focused educational efforts to serve farmers would benefit biogas business developments in rural areas. However, as this broad and profound understanding is still developing, the pioneers in biogas business seem to carry the risks of their progressive activities towards sustainability.

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