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Development of local and regional forest based bioenergy in Norway – Supply networks, financial support and political commitment

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ABSTRACT

This paper explores reasons of growth of new bioenergy firms in Norway. Norwegian authorities have a stated goal of doubling the use of bioenergy by 2020, as a way of developing the renewable energy sector and providing opportunities for rural employment. However studies shows that there are difficulties concerning the profitability in the sector. We approach the question from a supply chain perspective using a comparative case method. Five cases of local and regional forest based (wood chips) supply of heat in three regions were studied. The actors in the supply chains normally specialize in one or two stages in the chain and sell fuel and/or heat to municipal institutions and district heating plants. In all cases national financial support was important for releasing critical investments at various stages in the chains. Local political involvement was vital for the establishment of the chains, through influencing perceptions and ideas and through various techno-economical adaptations. Moreover, all focal actors in the chains were engaged in forest-related businesses and they benefit from using resources and obtaining income in different, related supply chains. Hence, they exploit “economies of scope”. The links across supply chains make it relevant to study them as supply networks rather than chains. This also has managerial consequences. The profitability in the chains seems still quite modest, but nevertheless they contribute in increasing the share of bioenergy in Norway. Actors’ exploitation of “economies of scope”, local political engagement and national instruments for financial support are important factors in this development.

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1. Introduction

Across Europe the bioenergy sector has developed rapidly, but unevenly [1]. Resource situation, policy aims and policy instruments as well as organizational structure in the bioenergy sector vary considerably between countries (see e.g. [2,3]). Bio-energy development is a key to the future energy balance, as

well as coping with climate change. Obtaining this requires viable supply chains for bioenergy [1,2,4]. This again depends on internal factors in the chains such as knowledge, technological choices, and organization, and on external factors such as policy and availability of other energy sources [5–7].

Historically the use of bioenergy in Norway has been in the form of wood-firing in houses and internal burning of wood

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residues in the wood industry [8,9]. Since the 1990s markets for sales of different types of biofuels and local and district heating has developed. A large share of the biomass used in district heating is waste, but the share of virgin biomass is increasing. By far most of the virgin biomass for energy comes from forestry and is used for heating. A few (larger) plants with combined production of heat and power (CHP) based on waste exist. Hence, bioenergy produced from secondary timber and logging residues is seen to represent an opportunity for production of clean renewable energy, while also bringing a source of income to rural communities [1,4,10–12].

There is a solid resource base for substantial growth in the production and use of wood based bioenergy. Less than half of the gross annual increment [13] in the productive forests is harvested [14]. However, it is stated that Norway's abundant access to renewable energy in the form of hydro-power and the dominating role of the petroleum sector have reduced the political emphasis on other energy sources such as bioenergy [7,15]. Yet, on the rhetoric level, there is no lack of support. Already in the 1990s policy documents stated that Norway could not rely solely on hydropower for its future energy supplies [16]. In 2008, Norwegian authorities specified a target to double the use of bioenergy by 2020, from 14 TWh to 28 TWh.

However, the fulfilment of this target may be difficult. A study of bioenergy firms in local heating centrals in Norway in 2007 showed that most firms made a deficit. The main reasons for this were high investment costs, electric heating without possibilities for water-borne heating in buildings, and low electricity prices [17]. The situation is not static though. First, the real price of electricity increased by around 30% from the 1990s to 2006 [18]. Since then, the electricity price has continued its upward trend with peaks both in the 2009, 2010 and 2011 winters [19]. Second, there is a willingness to provide economic support. This is mainly done through two public agencies: Enova is a national public institution established in 2000 owned by the Ministry of Oil and Energy. Enova provides information and decides grants to investments in renewable energy [20]. Innovation Norway is a public, national institution providing investment grants, loans and advisory services to among others farmers and rural firms [21]. In addition, as a temporary response to the financial crisis from 2008/9, Keynesian style policy instruments aimed at increasing public spending as well as activity in forestry was established in 2009. These included financial support for converting oil based heating systems to bioenergy and support for logging of wood aimed for wood chips, administered by the Norwegian agricultural authority [21,22]. Moreover, a new subsidy programme aimed at investments in local heating centrals was introduced in 2008.

Currently, the bioenergy sector is expanding and growing in Norway. It is timely, though, to ask, why this sector is expanding when the economy in the sector has been reported to be strained, despite several support programmes. In this article we investigate this topic by studying cases of local and regional supply of bioenergy. We must remark here that we did not choose this type of supply because it dominates in the Norwegian bioenergy sector. Large firms exist, e.g. in form of an increasing number of district heating companies established from the 1980s and onwards [23,24]. Many larger, often

urban district heating plants are owned by, integrated energy companies [20]. The regional forest owners' cooperatives deliver significant amounts of wood chips to district heating plants each year [9], and a large scale, global pellets producer, Biowood Norway, has newly been established [25].

The small-scale bioenergy supply chains – or rather, networks (see section 2) – are interesting to study of several reasons [1,4,26,27]. First, it exploits local forest resources, which may otherwise not be used. Second, such supply represents a new business opportunity for local farmers, forest owners, forest entrepreneurs and local wood industry. Third, local and regional supply is interesting for local government (municipalities) because it can improve energy supply security and reduce greenhouse gas emissions. Lastly, this type of supply is interesting because of the business organization forming around it.

With this as a background we selected five supply chain cases for study (see section 3). We analysed the characteristics and similarities of the supply chains, with regard to their regional context, structure, actors, and activities, some indicators of economic performance, as well as connections to other supply chains. We were also interested in the significance of local political backing and the influence of financial support instruments. The chains we analysed had, as mentioned, a local and regional basis, and were small and medium sized businesses [28]. Products such as fuel and heat were sold commercially. Internal supply of bioenergy (in companies and farms etc.) was not included in this study.

We applied a case study method. This approach opens opportunities to identify direct influences of external factors such as local politics [29] and financial support [7,30,31], and at the same time gives room for unexpected findings.

The specific aims of the paper were:

1. To describe and analyse structure, organization and actors in selected local and regional supply chains for heating based on forest resources. What are main characteristics of the chains? How do the chains resemble and differ in terms of organization and actors?
2. Identify and discuss factors that have had substantial influence on establishment of bioenergy heating and performance in the chains.

The article is structured as follows: In section 2 we review the concept of supply chain in relation to bioenergy and literature on factors affecting bioenergy development in Europe. In section 3 we account for material and method. The five cases are presented in section 4 and analysed in section 5. Conclusions are given in section 6.

2. Theoretical perspective and previous research

2.1. Supply chain as conceptual point of departure

One definition of supply chain is that it "consists of suppliers, manufacturing centres, warehouses, distribution centres, and retail outlets, as well as raw materials, work-in-process inventory, and finished products that flow between the

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