Business Models, Governance Structures and a Co-operative Form for Small-scale Forest Heat Production Set-ups

Thomas Rimmler, M.Sc. (For.)
Natural Resources Institute Finland (LUKE)

Preface

The paper is an outcome of the Baltic ForBio project, which aims to increase production of renewable energy in the Baltic Sea region by improving the capacity of public authorities, forest and energy agencies, organizations of forest owners and entrepreneurs, and forest advisory organisations for promoting the harvest and use of logging residues and small trees cut in early thinning. The Baltic ForBio project received funding from the EU-program Interreg Baltic Sea Region. The paper is a special version of the one presented as a supplement to the handbook prepared under the agenda of workpackage 2 “Cost-effective harvest methods”. Besides being more consise and readable for the practically minded, it is realigned as regards its contribution to workpackage 5 “Business models for small-scale forest bioenergy plants in rural areas”.

1. Introduction

To date there has been widespread empirical evidence that technologies for small-scale renewable heat production from residuous woody forest biomass are technically mature, financially viable and provide an attractive business opportunity for investors. As to private forest owners, bioheat production generates revenues from forest feedstock sales and adds value to their forest assets. Forest feedstock sales comprising residual trees and slashings from logging operations or silvicultural treatments contribute to the costs for juvenile forest stand improvements and non-commercial thinnings necessary to restore and develop stand structure and thereby to safeguard the future value of growing stock. This situation provides the motivation for this paper, which highlights the economics and organizational aspects of small-scale forest heat production schemes set up as a market-driven business by their owners. It provides insights about respective business models and governance structures as viewed against the background of the Finnish experience.
The paper outlines a generic business model for operating a small-scale collaborative forest heat production system generating value to investors, supply chain partners, and private forest owners. As to business model configuration, major strategic choices are decribed with respect to the heating scheme and the contracting model applied. Evidence is given about

how policy can be the driver for a new business model to emerge. The paper further singles out categories of forest heat production systems in technical terms and appropriate by size to be operated by private heat entrepreneurs either under single ownership or as a joint business venture.
The presentation draws upon business management and institutional economics as an explanatory framework for the role of social institutions – including contractual agreements and mechanisms of relational governance – in shaping economic behaviour. This approach moves the perception of the firm as a set of technological relations between the inputs and outputs of production towards a definition as a social institution and a set of contractual relations.
A co-operative organizational form has been demonstrated to be a convenient participatory model of organizing joint business activities. The paper therefore concludes with the presentation of the co-operative model as a legal form and structure of governance for a business model being set up to create stakeholder value from sourcing and processing local forest feedstock resources into heat energy to be transferred and marketed to consumers as a heating service. Although the goverance of risk is outside the scope of the paper, it shortly touches the issue of managing the risk of supply chain interruption.

2. Small-scale Forest Heat Production Systems

In technical terms, a forest heat production system consists of a heat boiler, an oil-fired backup boiler and a fuel supply infrastructure. In the case of a community heating scheme, the system comprises the pipework for connecting either a couple or more buildings of a site or for connecting sites located in a neighbourhood area. Heat boilers for multi residential, farm or industrial properties range between 40-400 kW. In the case of micro heating schemes (200 kW and below) boiler plant operation and maintenance are contracted to a concierge service provider while ownership stays with the property owner. These micro schemes typically comprise pellet heating systems. Central boiler stations feeding thermal energy into heating networks, either local or long-distance, range between 400-20.000 kW. Concerning co-generation technologies, harnessing forest biomass as feedstock for combined heat and power generation is not being viewed so far as a promising field of business operations by heat contractors and experts alike. Fuel property requirements have been among the barriers to the commercial deployment of gasification-based technology for use in small-scale CHP co-generation units.
Solid forest-based energy conversion technologies are in a state of high commercial readiness, which is widely confirmed by demonstrations in their actual operational environment. In order to avoid unnecessary risk, it is advisable not do embark on "unrealistic" non-commercial technologies (as the project developer may suggest). Vendor selection should rest on convincing evidence of the credibility of both, the technology (track record) and the vendor's service and support. Lenders are reluctant to finance non-legacy technology. Successful technology sourcing requires enabling capabilities for tendering and comparing possible technologies and vendors as to their technical and commercial terms of supply.

3. A Business Model for Small-scale Forest Heat Production

The concept of business model the paper draws upon offers a framework for a shorthand description of a commercial production system or business strategy, first, in terms of the economic value it creates, and the benefits thereby created to customers, owners, investors and other stakeholders. Further, it describes the set of activities and resources putting its value proposition into practice, and the way these are organized and used efficiently. A business model may serve as a guide to setting up a new business along the lines being already tested and verified. In the sense of an ideal type, a business model may illustrate "best-practice" behaviour.

A business model for operating a small forest heat production system creates value, first, by deploying primarily local forest feedstock resources. Such a system is delineated by the geographic location of resource supply. Local resources include besides natural resources also locally based technical and human resources. Its core technology is composed of a production system, where thermal energy is generated from the incineration of forest-based wood fuels. Its core activities comprise procuring primary energy inputs from forest feedstock resources and operating the heat production facility, possibly including heat distribution. Solid wood fuels, as the main primary energy source, are provided from local forest resources owned either by the heat supplier itself or purchased from other feedstock sources in its vicinity.

The production of wood fuel may be either controlled by the forest owner or organized by a contract agent. As to the social groups forming its constituent parts, it must be attractive for local people to embark on such an endeavour, especially non-industrial private forest owners and other private forestry stakeholders. As an ideal model setup, it should be a replicable scheme for rural micro enterprises suitable to exploit business opportunities in a local renewable energy market.

Important for the performance of a business model in terms of how well the use of the capabilities it employs is organized and managed besides the functioning and integration of technical processes are governance structures and social relationships as a framework guiding and enforcing business processes. The description of a business model may be appropriate to confine on a single business entity as the unit of analysis, if the activities and the linkages between them, which are of strategic importance for the model's performance, reside within its boundaries. As to a business model for small-scale forest-based bioheat production, where dependencies between independent network partners prevail, a broader system perspective is more appropriate. Regarding value creation, business models vary as to the scale and scope of the service they provide to customers as denoted by the respective heating scheme.

4. Heating schemes and Business Scale

A dichotomy of business models arises from separating heating schemes serving single properties of single clients from those providing service to a multitude of properties and clients, so called community heating schemes. These schemes are different in terms of the scale and scope of their business operations, with respect to the resources and capabilities

required, but also related to their governance structure and the business risk involved. Business models employing one or the other of these heating schemes vary also as to their main stakeholders.

A single-property set-up comprises usually a single building as the main structure heating service is provided for, a public school, a college building, a boarding school, a parish house, a care home or a greenhouse farm, as the case may be. A community usually comprises structures located across a township or neighbourhood, where setting-up a bio-heating system may be linked to area development or regeneration. A community heating scheme exhibits a larger business scope including the responsibilities to maintain an extensive heat distribution network. There is an enhanced demand risk of a declining customer base due to the different terms of contract.

In the case of a single-client single-property scheme, a single private or non-profit organisation is the host of the scheme and its main offtaker. The host is usually not the sponsor, that is, the equity provider of the scheme. The main stakeholder of the business model is usually a micro business under ownership of a single individual and established in the legal form of a sole proprietor. Multi-plant operation applies in either case as a strategy for exploiting scale economies and learning curve effects. As the venture espands in scale, operations are usually organized as a jointly owned corporate business entity, that is, a partnership.

5. Policy Triggering New Business Models

A new business model may emerge as a result of a policy change. The privatization of a publically owned heat supply system may be the outcome of a new policy aiming at competitive markets by restructuring and incorporating public utility ownership. Privatization can be used to attract venture capital to embark on the effort to accelerate the transition to renewable energy. Historically, in Finland heating has been a basic service that municipalities are providing to their citizens. Municipalities being urged to incorporate their market activities and to demerge ownership structure, privatization has been triggered by the decision of municipal councils aiming at outsourcing or incorporating their public services. Bailing out has been motivated also by the reluctance to commit public resources to infrastructure investments and modernization. The incorporation of a public service is essentially the definition of a new governance model to be performed by a private contracting agent.

6. Forest Heat Contracting Models

Concerning business models at the lower end of the scale described by a single-client single-property scheme, the micro business being the main stakeholder may be in the role of either the investor and asset owner or act merely as a contractual operation and maintenance service provider. In the case of a heating service contract, asset ownership may be retained by the outsourcing party, whereby the subject of the agreement between the purchaser and the third-party is limited to plant operation and maintenance services. Accordingly, using asset ownership as a distinctive feature, two varieties can be separated,

the full contracting model and the operation contracting model. In Finland, aside from pellets-based micro heating schemes operated by a concierge service provider, these contracting schemes, for a large share, are being operated as private ventures in the corporate form of a joint stock company or as a co-operative company under the ownership and the governance of local forest owners.
A special variation of a contracting model established widely on the renewable energy market, are arrangements, where the output of a production scheme is being sold on a long-term basis under the terms of a purchase power arrangement (PPA). Under a long-term PPA, a purchaser may be obligated to make fixed payments for available capacity or take-or-pay energy payments over multiple years. An offtake agreement secures the long-term revenue stream of a project and mitigates the cash flow risk and price volatility related to short-term or spot market sales. Without such an agreement, it could be difficult for a project to attract private investment finance. Contracting out of services to private third-party providers often antedates a tendering or bidding process.

7. Enforceability of Agreements

For a forest fuel supply chain, the assignment and the control of responsibilities of raw material and production service providers, is usually put into practice by contractual agreements, either in the form of purchase orders covering single business transactions or long-term contractual arrangements. A contractual agreement describes the commitments of the supply chain partners, including the final output user, who in the case of forest heat production, is the offtaker of the final energy product. The concerns a contractual agreement (supply contract) resolves are related to the transfer pricing of accomplishments and the respective volumes, timelines and quality standards. It further stipulates the liabilities of a party following a failure to comply with its commitment and the penalty payable for early termination or breach of contract.
The enforceability of a contract by lawful means, however, may neither be satisfactory nor even intended by the contracting parties. It is rare in practice that all the important commitments of a contractual agreement are governed by law or third-party arbitration. A contract that is intended partly or wholly non-enforceable by legal means or by arbitration of a third party, must rely on self-enforcement by some means. Important elements of self-enforcement are informal mechanisms. These are based on values, informal rules and trust in different forms related to expected social conduct. A contract which in some important aspects of performance is enforced by relational mechanisms is called a relational contract. A relational contract, per se, is an informal agreement governed by a set of unwritten codes of conduct that affect the behaviour of individuals within firms or between firms.
In the case of purchase orders covering single, limited and generally standardized business transactions, standard form contracts based on general terms and conditions, usually apply. Long-term comprehensive partnership commitments, which are customized and tailored to individual specifications, in contrast, are the outcome of negotiations between the contracting parties. These trade relationships always rely besides on legal means also on relational self-enforcement.

While some less important aspects of performance can be governed widely by relational incentives, others should not. Feedstock supply, for instance, is a critical factor for the viability of an investment into forest energy production such that safeguards are strongly adviced to evade the risk of supply chain interruption. Therefore, securing a supply commitment should always be legally enforceable.

8. Setting-Up a Corporate Business Structure

Before a conceptual business model design is ready to be put into practice, decisions are to be made with respect to its governance structure, that is, the contractual and organizational setup of its activities and trade relations. A governance structure shapes the economic behaviour of individuals with the intention to reduce uncertainty and risks, to provide proper incentives and to ensure the operational efficiency of transactions. As far as a business organisation is concerned, corporate governance is the entity of internal structures and rules defining the rights and responsibilities of its governing bodies and owners in reference to the various forms of interaction such as collaboration, authorization, control and the procedures of how conflicts of interest are resolved.

In conjunction with the setting-up of a business, a decision about its corporate structure is to be made. Legal forms set forth by commercial codes are collections of legal provisions regarding corporate governance for corporate business entities. Legal forms variate as to their regulations, whereby the goals, responsibilities and respective tasks for running an organisation are defined and assigned to its individual members and bodies called CEO, executive managers, board of directors, board of management, management committee, or board of trustees. They differ essentially also by the terms of corporate accountability of the organisation's executives towards its owners and shareholders. These basic structures may be developed in many ways to suit an organisation's needs.

Agreements concerning the commitments of the contracting parties in terms of long-term financial contributions and risk exposure must be enforced by integrating transaction relationships into a corporate governance structure of joint ownership, internal control and incentive mechanisms. This general rule applies also for contractual arrangements between the stakeholders of a forest energy production set-up. In the end, the appropriateness of a governance structure must be assessed in terms of the enforceability of contractual agreements, its ability to maintain a high intensity of incentives and to provide safeguards against opportunistic behaviour.

Integrating transaction relationships into a corporate governance structure is advisable in the case of strategic supplier dependency arising out of a transaction-specific investment. An investment is unique to a specific transaction relationship due to site or location specificity or the technical requirements that can be met only with specialized production assets. The risk of opportunistic behaviour may materialize as a hold-up cost imposed by the pricing behaviour of a supplier as the owner of a resource, which is needed in the productive process, but which is locally in short supply. Although a resource may not be in short supply, bargaining power may be high, because of high switching costs.

In the case of forest heat production, investments into physical assets comprise equipment for feedstock harvesting, processing and transport, and a boiler plant. While the physical

assets necessary for harvesting, processing and delivering forest fuels to the user's site are usually owned by separate legally independent machinery contractors, the boiler plant is usually owned by a legal entity, which is jointly owned and controlled by its shareholders. The fact that the physical assets needed to set up production are specific investments to some degree, is reflected in an ownership structure, which integrates critical trade relationships.
Corporate governance structures all rely on regulatory measures to enforce liability claims. But informal social rules are also an important ingredient of governance. Informal social norms by their impact on social cohesion are of substantial importance for group (corporate) performance because they are fundamental for building a shared vision and for reducing conflicts among stakeholders (relational governance). Strong group cohesion creates motivation, safeguards commitment to collective tasks and counteracts against opportunism. Means for strengthening social cohesion include preclusive and preventive measures, such as decisions related to the organizational form of governance, membership criteria, organizational participation, transparency and reward policy.

9. Governing the Risk of Supply Chain Interruption

For an investor it is good to realise, that the deployment of bioenergy resources bears considerable financial risks concerning the substantial upfront investments that it requires. A substantial share of the investments are technology and site specific. Decisions about technology, production site and plant layout, once they are made, are irreversible and determine the future expenses of operation, which mostly include fuel, operating and maintenance costs and financing costs. Resource risk evaluation specifically related to the utilization of biomass must include supply security considerations with respect to supply chain related sourcing conditions.
The performance of a forest energy production system, such as a woodchip-fired heat boiler plant, is most vulnerable to discontinuities in wood fuel supply. Discontinuities may unfold with respect to moisture content, uniformity (particle size), energy content and contamination (debris). Feedstock sourcing, processing and delivery cause an enormous part of the overall costs of production. Because of this, safeguarding the non-interrupted functioning of the feedstock supply chain at affordable costs and hedging against the financial risks involved, is a managerial concern.
Risk mitigation starts with pre-emptive measures to enhance the operating capacity of the supply chain to resist disruptions. Preventive measures are equally advised for dealing with the financial impacts of an interruption. A financial risk may be transferred or shared based on a release and indemnification clause to be included in a contractual agreement. After all contractual obligations are accounted for, the downstream energy supplier is ultimately liable for the financial loss incurred to the buyer of the energy produced. The respective liability is usually defined within the scope of an offtake agreement. Risk exposure should be evaluated and covered by a share of the surplus to be retained as a financial reserve and not to be paid out as a dividend to owners. If a feedstock supply chain fails, a feedstock user must seek alternative inputs to remain operational, either on the spot market, or by

permanently switching to a new supplier. Both ways impact on its cost structure and compromise its capacity to generate profits.

10. A Co-operative Model of Governance for Small Businesses

Integrating transaction relationships into a corporate governance structure may be costly, because of collective decision-making being not in the best interest of corporate owners. Inefficiency may relate to managerial opportunism and decreased incentives compared to competitive markets. The cost of incorporating transactions may be prohibitively high for a party, which perceives that delegating ownership rights to an agent comes along with threats arising from conflicting interests. As a governance structure, a co-operative lowers the threshold of collaboration in terms of collective ownership and governance. First, because a co-operative as an organizational form is not fully integrated, as compared to a hierarchical corporate structure. Second, a co-operative firm as a legal entity is democratically controlled by its members with each member being entitled to one vote regardless of his or her financial contribution. Third, the basic structure of a co-operative is rather simple. The members are the owners of the co-operative firm. Members also often have a close association with their enterprise.

Membership in a co-operative is acquired by signing a formal contract, on payment of a membership fee and on purchase of a share of voting stock. An owner's equity capital contribution can be paid either as an upfront contribution when joining the co-operative or as the share of the surplus retained at the end of each year. A member has the right to resign from the co-operative. A member may be expelled from the co-operative, if the member has neglected a duty ensuing from membership.

The patrons of a co-operative are those members and owners (member-owners), who in the case of a processing co-operative are also the suppliers of materials and production services to be used and processed by the co-operative. Renumeration to patrons is typically tied to their transactions with the co-operative and consists of a prefixed price to be paid for goods and services delivered as a first instalment and a pro rata bonus or "patronage refund", which is a cash payment to the patrons taken out from the co-operative's annual surplus earnings. Although members are entitled to a share of the co-operative's surplus, membership does not fix renumeration as a legally enforceable claim.

As to the net earnings distributed to owners, a co-operative may provide a legitimate way to reduce taxable income and to avoid double taxation. In some situations, government tax treatment may provide a co-operative with a considerable advantage as compared to other legal forms regarding the reduction and the balancing out of annual fluctuation in taxable income.

The difference between a co-operative and a non-profit corporation may not always be recognized. Both corporative structures can be used to build democratic organizations. They are each designed to limit profit maximization as a dominating motive and to create social benefit. One primary difference is that a non-profit organization cannot distribute surplus earnings to their members, while a co-operative corporation generally distributes profits based on members' patronage.

Ownership and governing rights of traditional co-operative societies is limited to their patron-members. There exists no individual ownership to the co-operative's equity and therefore no market for members to trade their shares at a price that reflects true co-operative value. Therefore, a traditional co-operative with their capital stock confined to voting stock does not attract investors aiming at a return to their investment. This may be a hinderance for start-up capitalization or an additional increase of equity capital. Voting stock is generally redeemed at par value by the co-operative, when a member resigns from membership. In such a case, investors may wish to issue other classes of stock with different par values and different redemption policies. Non-voting stock may be issued in exchange for these additional equity payments. A co-operative with mixed classes of stock is a distinct model with respect to both its attractivenees to external investors and to professionals with advanced managerial skills. Especially in the case of outside investors the available amount of capital and the degree of commercial thinking increases, which both are prerequisites for making a more developed business model feasible.

11. The Special Case of a Forest Heat Co-operative

A co-operatively governed forest heat production set-up can be characterized as a processing co-operative. In this specific case, patronage consists of forest feedstock supplies and wood fuel processing and logistical services provided by the co-operative's owners to their jointly owned heat production facilities, which may comprise one or several boiler plants. A processing co-operative is a form of vertical integration of subsequent technical steps of value production as well as of horizontal co-operation between suppliers otherwise organized as independent business entities. The members of the co-operative pool their resources and provide risk capital to invest in downstream processing assets, and to gain access to the capital market. The commodity offtake (heat energy) is produced, delivered and billed to the buyer by the co-operative. Such ventures are typically initiated by local stakeholders, foremost forest feedstock producers, with the aim to add value to their feedstock sales, and thereby to their forest property.

A processing co-operative is a not fully integrated (hybrid) governance structure, in the sense that the assets used by suppliers to provide raw materials or services, in contrast to the jointly owned processing unit, are owned individually. Specifically, in the case that forest asset owners are co-operative patrons, these remain independent economic agents. As by statutory provisions, shared ownership of production assets does not extend to the patrons' forest assets. The same provisions apply also to the other types of ownership of properties and assets. Their owners remain economically independent and do not merge their business activities or assets into one large firm.

In Finland, the patrons of forest heat production co-operatives comprise the following groups: private forest owners that use their woodlots to gain income from wood sales as the main or a supplementary source of personal income; contractors providing wood harvesting, wood chipping or transportation services either as a sole trader or as a separate legal entity; forest-owning farmers that use their woodlands as a supplementary source of income and self-employment.

Considering the transactions between forest asset owners and the co-operative owner of the processing assets, each forest owner delivers its supply directly to the processor and receives a uniform, bargained price. Instead of pricing purchases at production costs a market-based transfer pricing mechanism is applied to provide an incentive, i.e. motivation to seek efficiency gains. The price paid to feedstock sellers is exposed to a market price as far as the contract price of heat sales is regularly adjusted by a price index comprising a basket of fuels (e.g. woodchips, peat and light fuel oil) traded in the market at competitive prices. Therefore, forest owners still compete with another and are therefore subject to the high-powered price incentives of the market.

12. Group Cohesion as Safeguard for Continuity of a Co-operative Venture

The co-operative firm is facing an increasing risk of breaking up when the initial enthusiasm vanishes. Membership turnover may go along with a decline of members' similarity. Financial motives, prevailing among joining members, may give rise to free riding. This may deteriorate social behaviour. The leaving of high ability members may further weaken the co-operative's performance, which impacts motivation and performance as a reinforcing cycle. Strengthening group cohesion, getting visible as a strong experience of togetherness, counteracts behaviour motivated by selfishness, and thereby contributes to safeguarding continuity.
Cohesion among group members may arise from a mixture of underlying phenomena, such as interpersonal attraction, group identity, a sense of interdependence and responsibility. Factors such as members' similarity, group size and membership turnover, all easily observed and measured, offer means for conscious cohesion building. These factors should be reflected, for instance, in a co-operative's member recruitment policy, the rules of membership admission, and voting rights.
Preclusive measures in the forefront of group formation should tackle the main factors impacting group cohesiveness, mainly members' similarity and group size. Small group size, for instance, is more susceptible to social pressure and makes complicated incentive and monitoring schemes dispensable. Preventive mechanisms, such as exclusion, offer means to enforce co-operative behaviour after the organization has been set up. Often, the factors underlying cohesion work through enhancing the identification of individual members with the group they belong to, as well as their beliefs of how the group can fulfil their personal needs.

13. Beyond pure economics

When asking about the fit between an organization's behavioural attributes and the interests, claims and attitudes of its stakeholders, the question is about the legitimacy of the organization from the viewpoint of its stakeholders. Legitimacy, besides judicial legitimacy, means the state of acceptance of an entity's behavioural attributes, or the normative status it enjoys among its stakeholders. Legitimacy is rooted in norms, beliefs and culture. Thinking

about the success factors of co-operatives, one must reach beyond pure economics and give due consideration to these aspects making up a background setting as well. Therefore, these aspects should be addressed then thinking about how far legitimacy or lack of it contributes to the popularity of a co-operative governance model in a specific context.
Co-operatives capitalize on their pragmatic legitimacy for stakeholders, primarily users either consumers, producers, suppliers or workers, depending on the type of co-operative, who enjoy a privileged use of its services. Other stakeholders may give credit to co-operatives indirectly, for instance the local community who may enjoy economic and social benefits from the activities of the co-operative.
Most people probably have a positive opinion of co-operatives due to their democratic governance and community involvement, although less so as a for-profit corporate structure. Nonetheless, legitimacy has been a problem in some parts of Europe, where co-operatives are perceived as socialist-minded models inherited from the past. A sincere problem for co-operatives in many countries is poor knowledge. Co-operatives are not well recognized as a discrete organizational model but associated as a hybrid structure mixing up commercial and societal logics. This appears as a serious barrier to entry because many stakeholders are likely to be reluctant to support an organizational form that they do not know or understand. Such barrier may disable co-operatives from transforming their potential advantages into concrete opportunities.

Sources of information

Literature

Aghion, P. & Holden, R. Incomplete contracts and the theory of the firm: What have we learned over the past 25 years? Journal of Economic Perspectives, Volume 25, Number 2, Spring 2011. pp. 181–197

Alexander C., Ivanic R., Rosch S., Tyner W., Wu S. & Yoder J.R. Contract theory and implications for perennial energy crop contracting. Energy Economics 34 (2012) 970–979

Amit, R. and Zott, C., "Value creation in e-business," Strategic Management Journal, 22, 2001, pp 493-520

Borgen, S.O. Rethinking incentive problems in cooperative organizations. Journal of Socio-Economics 33 (2004) 383–393.

Brechemier, D. & Saussier, S. What governance structure for non-contractible services? An empirical analysis. 16 p. ResearchGate, uploaded January 2001.

Carroll, G.R. & Teece, D.J. (1999). Firms, Markets and Hierarchies: The Transaction Cost Economics Perspective. Oxford University Press.

Casadesus-Masanell, R. & Ricart, J.E. (2009). Working Paper. Harvard Business School. pp 43.

Chaddad, F. (2012): Advancing the theory of the cooperative organization: the cooperative as a true hybrid. Annals of Public and Cooperative Economics, 83(4):445-461.

Dessein, W. (2012) Incomplete Contracts and Firm Boundaries: New directions. A paper on a presentation prepared for the "Grossman and Hart at 25" -conference held in Brussels on June 24-26, 2011.

Hart, O. Firms, Contracts, and Financial Structure. The Review of Financial Studies, Vol. 9, No. 4 (Winter, 1996), pp. 1271-1277. Oxford University Press. Review by Milton Harris.

Huybrechts, B. & Mertens, S. (2014). The relevance of the cooperative model in the field of renewable energy. Annals of Public and Cooperative Economics, 85:2 2014 pp. 193-212.

Leih, S., Linden, G. & Teece, D.j. (2015) Business model and organizational design: A dynamic capabilities perspective. In: Business model innovation. The organizational dimension. Nicolai J. Foss & Tina Saebi (eds). Oxford University Press 2015.

Ménard, C. & Shirley, M.M. Handbook of New Institutional Economics. Springer 2008.

Okkonen, L. & Suhonen, N. Business models of heat entrepreneurship in Finland. Energy Policy 38 (2010) 3443–3452.

Okkonen, L. & Suhonen, N. Business models of heat entrepreneurship in Finland. Energy Policy 38 (2010) 3443–3452.

Pereira, J.R. (2016): Producer cooperatives: A transaction Ccst economic approach. In: F. Taisch, A. Jungmeister, and H. Gernet (Eds). Cooperative Identity and Growth. Conference Proceedings of ICCS 2016 in Lucerne. St. Gallen: Verlag Raiffeisen Schweiz, 528-536.

Riordan, M.H. & Williamson, O.E. Asset specificity and economic organization. International Journal of Industrial Organization. Volume 3, Issue 4, December 1985, Pages 365-378

Saussier, S. Contractual completeness and transaction costs. Journal of Economic Behavior & Organization Vol. 42 (2000) 189–206

Suchman, M.C. Managing legitimacy: Strategic and institutional approaches. Academy of Management Review. 1995, Vol. 20, No. 3, 571-610.

Suhonen, N. & Okkonen, L. The Energy Services Company (ESCo) as business model for heat entrepreneurship -A case study of North Karelia, Finland. Energy Policy61(2013)783–787

Zott, C. and Amit, R. Business Model Design and the Performance of Entrepreneurial Firms. Organization Science, Vol. 18, No. 2, March-April 2007, pp. 181-199.

Visits to seminars and meetings

North-Karelia Forest Heat Entrepreneurs' Day
Date: 6.4.2018
Place: Kontiolahti, Kotiseutukeskus
Host: North-Karelia Forest Centre

Finnish Machine Contractors' Energy Day
Date: 8.3.2019
Place: Helsinki
Host: Koneyrittäjien liitto (Finnish Machine Contractors' Association)

North-Karelia Forest Heat Entrepreneurs' Day
Date: 29.3.2019
Place: Kiihtelysvaara, suojeluskuntatalo (Suojapirtti)
Host: North-Karelia Forest Centre

Regular meeting of project managers under the Renewable Energy and Climate Programme
Date: 3.4.201
Place: Joensuu
Host: North Karelia Regional Council

National Heat Entrepreneurs' Day
Date: 25.-26.4.2019
Place: Tampere, Varala Sports Institute
Host: The Finnish Bioenergy Producers' Association

Expert interview

Dr. Lasse Okkonen
Lector, Expert on Renewable Energies
Karelia University of Applied Science
Date: 13.2.2019
Place: Joensuu
Host: The Natural Resources Research Institute Finland (Luke)
Mr. Urpo Hassinen
Senior Expert Advisor Forestry and Renewable Energy
North-Karelia Forest Centre
Date: 5.3.2019
Place: *Joensuu*
Host: F*innish Forest Centre*

Mr. Esa Kinnunen
Senior Expert Adviser Bioenergy, Senior Project Manager
North-Karelia Forest Centre
Date: 5.3.2019
Place: *Joensuu*
Host: F*innish Forest Centre*

Expert consultations

Dr. Jukka Korri
Renewable Energy Expert, Project Manager
Työtehoseura TTS - Assoc. for Vocational Education, Training, Research and Development

Mr. Hannes Tuohiniitty
Bioenergia ry - Association of Finnish Bioenergy Producers
Executive director, Sector manager
Chair Heat Entrepreneurship Network (Lämpöyrittäjyysverkosto)

Mr. Jaanus Aun
Managing Director
Estonian Private Forest Centre (PFC)
Date: 11.2.2020
Place: Tallinn
Host: Baltic ForBio WP2 Working Group Meeting

Mr. Jim Antturi
Forestry Expert
Työtehoseura TTS - Assoc. for Vocational Education, Training, Research and Development

Mr. Kim Blomqvist
Senior Expert Renewable Energy Technologies, Project Leader
Karelia University of Applied Science

Mr. Mikko Tilvis
Senior Expert Advisor Forestry and Renewable Energy
Pirkanmaa Forest Centre

Mr. Simo Jaakkola
Executive Manager
Association of Finnish Machine Contractors

Mr. Tage Fredriksson
Bioenergia ry - The Bioenergy Association of Finland
Sector manager
Chair Woody Biomass Energy Council (Puuenergiavaliokunta)

Mr. Timo Turunen
Supervisory Board Chairman ret.
Eno Energy Cooperative

Mrs. Aino Heikura
Senior Project Manager Renewable Energy and Climate Programme
North Karelia Regional Council

On-site visits and interviews of forest bioenergy entrepreneurs

Mr. Ilkka Lukkarinen
CEO Biowin Karelia Oy
Vaskela Heat Boiler Station
Date: 6.4.2018

Place: Kontiolahti

Mr. Pasi Kakkinen
CEO Metsäpasi
Date: 5.4.2019
Place: Lieksa

Mrs. Laura Hämäläinen
CEO Itä-Savon Lähienergia Oy
Date: 23.4.2019
Place: Kerimäki

Mr. Mikko Jauhiainen
CEO Ruutana Heating Oy
Date: 25.4.2019
Place: Kiuruvesi