Stakeholder management in Chilean biomass supply chains

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Abstract

The purpose of this paper is to evaluate stakeholder issues in biomass supply chains (SC) in emerging countries. Within this case study in Chile, a total of 39 semi-structured interviews were conducted with internal and external stakeholders of the biomass SC. The findings indicate that the political context and market structure is based on a free-market economy, where hardly market-interventions are in place. This rather supports market based transactions with low involvement, trust and collaboration among SC actors. The in-depth analysis of stakeholder management drives the comprehension of this into further details and links it to sustainability impacts.

Keywords: Supply Chain Management, Stakeholder Management, Sustainability

Introduction

Globally, around 1.4 billion people have no or limited access to electricity and 2.7 billion people rely just on the traditional use of biomass for cooking or heating (IEA, 2014; Kaygusuz, 2011). This inadequate access to modern energy services limits the economic and social development and the people stay in extreme poverty (Kaygusuz, 2011). Moreover most of the required energy is imported and this dependency may lead to a critical and fragile energy situation in emerging economies (Eurostat, 2014; Zborowski, 2014). While well designed bioenergy systems promise several benefits and solutions (Elghali et al., 2007), different social, environmental and economic issues along the SC can be identified (Gold & Seuring, 2011). For example, the question of competing land use between biomass production for food, material and energy is to be dealt with. Moreover, air emissions or noise pollution due to the transportation are a problem to be considered (Kerckow, 2007; Sharma et al., 2013). Additionally, the high complexity, caused by the engagement of several market segments and internal and external SC-stakeholders, such as regulatory authorities, citizens or nongovernmental organizations (NGO), enhance the spectrum of issues (Elghali et al., 2007; Ruf et al., 2001; Seuring & Müller, 2008; Sharma et al., 2013). These external pressures could lead to e.g. reputation loss as well as sanctions by governmental control (Ruf et al., 2001; Seuring & Müller, 2008).

Therefore, Chile provides an ideal setting for the research as it imports most of its energy in the form of fossil fuels, while the local biomass potential is poorly used. Yet,

this would allow reducing greenhouse gas emissions as well as creating local jobs, explaining the sustainability aspects of the research setting. Stakeholder theory as well as sustainable supply chain management (SSCM) are taken as the theoretical starting points for the research, where a particular contribution has been made by the framework put forward by Gold (2011) for bio-energy SCs. This is taken as a starting point for evaluating stakeholder issues in biomass SC in Chile. This is also of relevance as stakeholder issues are usually discussed against a European or North American background and data from emerging economies, including South America is still scarce. Taking all this into account, the following research questions can be derived:

- Which stakeholder related issues are evident and how are they managed in Chilean biomass supply chains?

Literature review

The purpose of stakeholder management is to consider their claims, demands and environmental impacts, related to operations of a company, and to include them in the strategic management to provide a sustainable success of the business by offering an effective decision framework connected to the claims of the stakeholders (Freeman, 2004; Kaler, 2006). Therefore, stakeholder management is of central relevance in sustainability management (Hörisch et al., 2014). This also holds for the successful implementation of SSCM (e.g. Meixell & Luoma, 2015). The current literature on biomass SCs and stakeholders is scarce and the most comprehensive framework has been proposed by Gold (2011). This framework is "selected" and modified to narrow the current study because the framework covers most frequently described bioenergy-SC stakeholders as well as challenges and benefits of bioenergy production in the literature.

Due to Gold's (2011) interpretation, SCM holds the central position while embedded in the broader stakeholder framework. On this basis, internal and external stakeholders as well as the related challenges, drawbacks and benefits of bioenergy are classified. The main targets of the management should be (1) to run the full SC efficiently and effectively while considering the stakeholders and their claims, as well as, (2) to minimize social, environmental and economical drawbacks.

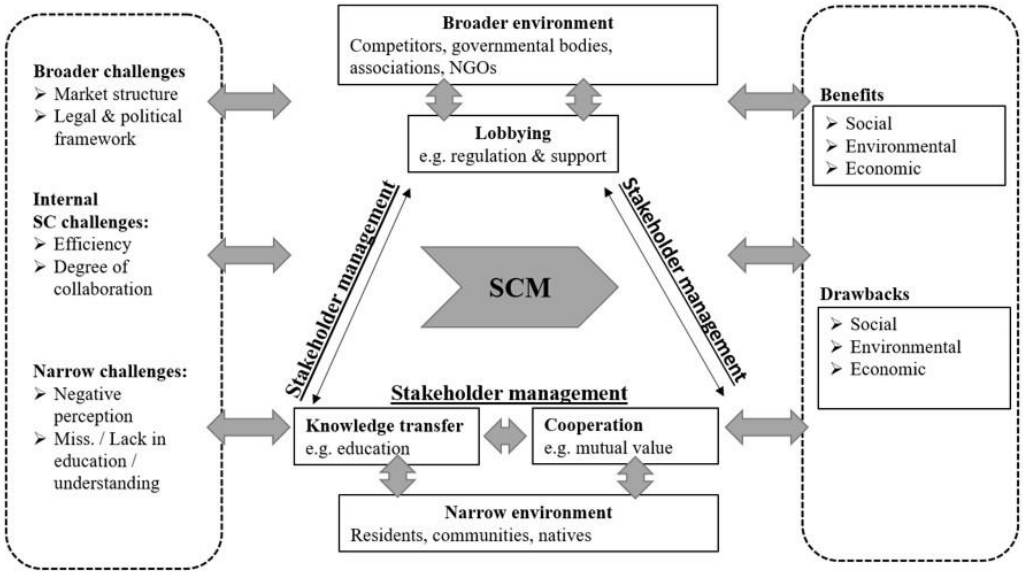

Figure 1: Bioenergy-chains between challenges, benefits and stakeholder claims (based on Gold 2011)

The ability of increasing the efficiency and effectiveness of the SC also depends on how the management "designs" and "organizes" the SC. Instead of monitoring or auditing instruments, Gold (2011) recommends a SC cooperation, which means that companies work together to achieve better performance instead of acting alone. Information exchange, training and capacity building (supplier development) and trust are preconditions of a collaborative culture. Consequently, the superior coordination, due to information exchange and trust, should prevent long transportation distances and oversized biomass amounts, which otherwise would result in increasing costs and emissions along the SC (Gold, 2011). Due to the described trust and commitment, a company can also attain collaboration with a supplier which can result in a replacement or at least reduction of auditing and monitoring instruments and may also lead to further cost reduction (Pagell & Wu, 2009). However, different SC actors could identify or misuse a relationship specific investment for opportunistic behavior and harm the rest of the SC parties (Gold, 2012).

For avoiding the opportunistic behavior or related risks, formal contracts are a weak solution, because it is nearly impossible to cover all forms of harmful phenomena by it (Dyer & Singh, 1998). Nevertheless, contracts seem to act sometimes as a precondition to form trust, and may be seen as a communication tool to symbolize an existing business deal. According to Gold (2011), the formal contract should be long term and combined with long-term cooperation relationships between the SC actors to share the same values and pursue one vision to guarantee fairness and long-term economic exchange.

However, establishing trust and commitment across the SC as well as avoiding pressure is difficult, and nearly impossible without internal and external stakeholder involvement (Meixell & Luoma, 2015; Yawar & Seuring, 2015). As a result of dealing with multiple stakeholders, their claims and inter-dependencies (supplier, NGOs, citizens or plant owners) (Elghali et al., 2007; Ruf et al., 2001) the stakeholder management "[…] *plays an outstanding role for bioenergy chains* […] *and thus ensuring their license to operate in the middle and long term*" (Gold, 2011, p. 455). Although competitors are not included in the framework of Gold (2011), other researchers described them as an important stakeholder group of a company (Freeman, 1984; Kaler, 2006).

As presented in figure 1, these main stakeholder groups can be divided into two groups, which are then explained further: (1) the broader political system (governmental bodies, competitors, NGOs and associations), and (2) the local environment (residents, consumers and citizens).

(1) Regarding the broader political system, the objective of the management should be to keep the broader license to operate by, for instance, lobbying. The stakeholders within this group determine the legal and political framework by passing laws, offering subventions or "providing" standards and certification for the bioenergy systems to reduce social or environmental impacts (Buchholz et al., 2009; Seuring & Müller, 2008). The management should recognize that, in general, the governmental bodies are interested in developing the local economy by creating jobs and income while investing in underdeveloped rural areas. Since bioenergy production creates more jobs compared to conventional energy sources, bioenergy may offer these benefits (Elghali et al., 2007). Additionally, the politicians and NGOs are concerned about further social and environmental issues (Buchholz et al., 2009). The use of minimal, but accepted standards (e.g. ISCC)) can underline the effort to minimize environmental impacts, for instance, GHG emissions, the exploration of land or the destruction of natural diversity (Elghali et al., 2007; Rajagopal & Zilberman, 2007).

(2) With respect to the local environment, the principle objective of the management should be to keep the local license to operate. The stakeholders within this group (citizens

or communities) are directly affected by or are afraid of challenges and drawbacks such as odor, visual "appearances", increasing traffic which also leads to noise and air pollution or the before mentioned other environmental impacts (Mayfield et al., 2007; Sims, 2002). This may force their resistance against bioenergy projects and therefore they form strategies against it (Steurer, 2006). Gold (2011) suggested "trust building transparency", "two-way communication" or "knowledge transfer" to the residents as well as to involve for example NGOs in early stages of the development of bioenergy projects. Additionally, involving the communities in the beginning of the planning phase of a bioenergy project may lead to a higher acceptance.

Research process / Methodology

Because of the in-depth understanding of a specific and real phenomenon by using different data sources to gain, inter alia, the knowledge for further interpretations and applicability (Hartley, 2004), the case study approach might be appropriate (Stuart et al., 2002; Yin, 2014). As suggested by Stuart et al. (2002), the entire process can be structured into five main phases as follows (1) definition of research question, (2) determining research instruments and field selection (3), data gathering, (4) analyzing of the data and (5) dissemination.

Step 1 and 2: Definition of the research question and research instrument

The research question helps to consider clearly what the aim of the research is and serves as a guide in the entire research process, as done at the end of the introduction.

Logistics and SC phenomena as part of the business environment are becoming increasingly complex (Coughlan et al., 2016). The bioenergy-SC in particular is dominated by these characteristics (Gold, 2011; Gold & Seuring, 2011). On the one hand, survey or experimental designs may be helpful to maintain maximum comparability in collecting data by using, for instance, highly structured formats. On the other hand, to analyse the bioenergy business environment, a flexible and dynamic research design to gain a first-hand understanding is necessary. Furthermore, the evidence of the case study value regarding the analysis of bioenergy-SCs can be clearly seen in other research projects such as McCormick & Kåberger (2007) or Buchholz et al. (2009) where the authors used the instrument of case studies and interviewed stakeholders and experts. In addition to that, Stuart et al. (2002) and Yin (2014) claim that qualitative research procedures also promise the opportunity to test an existing theory by using its theoretical propositions as a backbone for drafting the questions in the case study. Consequently, the empirical testing of Gold's conceptual work could be possible through an exploratory case study with a deductive and inductive approach. Therefore, qualitative techniques, for instance, semi-structured interviews embedded in a case study approach may yield a suitable frame for answering the research question by dealing with both their complexity and their dynamic.

Step 3: Field selection and data gathering

The research is based on extensive field work in Chile from November 2016 to July 2017. As mentioned before, semi-structured interviews were applied. The basic structure of the interview guideline was the modified framework of Gold (2011), extended by further literature sources and experts. In order to ensure that the questionnaire provided the expected richness of information, multiple drafting stages were held before. Firstly, the guideline was discussed and optimized and discussed with German researchers and experts from the biomass field. Secondly, experts from the Chilean bioenergy areas were consulted to review the question catalogue and to adapt it to local circumstances such as

cultural and language specifies of Chile. Finally, the questionnaire was pre-tested with the CEO of a sawmill in Chile, which produces energy from the production residues. After this pilot phase, the questionnaire was rolled out in Chile and slight modifications were made, based on the first experiences. The main objective was to interview representatives holding management positions and other powerful decision-makers in the bioenergy field. To enrich the data base, secondary data such as company reports or web sites were used to build up the base for the case study.

As suggested by Wolf (2011), newspapers and business magazines were used to identify possible interview partners in the context of bioenergy SCs. Additionally, institutions such as the German Chamber of Commerce Abroad (Deutsche Außenhandelskammer) in Santiago de Chile, universities or local researcher were helpful to get information and contacts. Every interview was conducted face-to-face by one researcher and audiotaped. While having the interviews, not every question was asked in the same structure as presented in the questionnaire, and when discovering a new aspect during the interviews, further questions were adapted. Additionally, notes of important information were taken. A total of 39 face-to-face interviews were conducted with all actors of the biomass supply chain as well as related stakeholders (see Table 1). The Three biggest companies (ARAUCO, CMPC and Masisa) and their SC from the local bioenergy sector are included in the data sample.

Table 1: Overview of the main categories and their distribution

Actor	**Number of interviews**
Producer of energy (P)	13
Biomass supplier (B)	6
University (U)	8
Government (G)	3
Association (A)	2
Consulting (CS)	4
Community (C)	3
	Total 39

Step 4: Data treatment and coding

The total duration of the interviews is 30 h 40 min, being equivalent to a total of 564 pages of transcripts. Internal validity is ensured by returning summaries of the interviews to the interviewees. The qualitative content analysis is used to evaluate the conducted interview material. Kassarjian (1977) stated that a content analysis should follow a clear and expedient operational structure. Therefore, a six-step content analysis based on the suggestions by Mayring (2010) is applied, where, in an abductive way the main frame of the coding system is derived from existing theoretical frameworks, which contributes to external validity, and secondly further (sub-) categories and/or items are later added. This yields a certain transparency for third parties and allows them to verify and replicate the analysis. For the analysing and coding process, the MAXQDA software is used. Several interviews were coded by two researchers, which improves the validity of the findings. The results are presented and discussed in the next section.

Results

The analysed work is classified according to the structure of the framework. At the internal, operations and supply level, typical aspects are the cost of using biomass as one

source of energy, but also extend to trust and collaboration along the SC, which are missing to a large extend in the Chilean biomass SC.

When *training and capacity building* as well as *information or capability exchange* are implemented, the focal firm, for instance, organizes courses to pass information about issues such as sustainability for ongoing SC-internal improvements.

Instead of *two-way communication* and *trust* to their suppliers, most of the experts reported a culture of *no cooperation* and clearly separates the different SC-parts, for instance, the biomass supply and the energy production, from each other. As one supplier said: "[…] *the energy business is ours, they said, the biomass production is your business. We* [as the focal company] *are working with the calorific value and you with the volume, therefore, this is the problem."* (B5). Consequently, the actors do not communicate with each other and can not use synergies or ideas for improving the entire SC performance.

In general, monitoring instruments, a highly hierarchical governance structure and biomass, characterized as a commodity type product, dominate the bioenergy-SC. On the one hand, few exceptions show a basic approach of a relational governance composition. One case demonstrates, that the win-win relationship between a bioenergy producer and a sawmill provided a sufficient feedstock supply without any contract. Also, one quarter of the interviewed companies use *mid-or long term-contracts* for having a stable and reliable supply or to have a stable demand of produced energy. On the other hand, *short-term* or *no contracts*, a dynamic biomass spot market and multiple suppliers hegemonize the relationship between the SC-actors. One interviewee, when we asked about long-term relationships to their supplier, put it this way "*No, I do not think that, I have the imagination that they are just suppliers which we need in the moment*." (CS3B). Despite this lack of efficiency, *cost of biomass* and *cost of transportation* are challenging the success of bioenergy business operations. Both are interdependent and influenced by the petroleum price.

Based on the case study, the legal system regarding bioenergy is weak or simply does not exist in Chile. Also, actors, who determine or influence the *legal and political framework* such as *governmental bodies* or *NGOs*, are less present than expected. As response to the question "If the government is influencing the SC with laws or norms?" one biomass supplier said: *"Like a tax inspector, yes, but as an actor which can impose something, no."* (B5). The underdeveloped legal system and the identified perception of the government may explain why *lobbying* and *associations* as instruments to be in contact with legal organizations are rarely used. While the government is not identified as an influencing actor by the SC-members, *competitors* – particularly the two biggest companies ARAUCO and CMPC – are frequently described as important stakeholders due to their market power. As one participant commented: "*They are pre-dominant, they set the standards / guideline, the market value of the product and the actors which are running the market* […]" (B5).

The case study shows, that residents and communities are directly or indirectly affected by bioenergy business operations due to increasing traffic or odour. The focal companies use a strategy of transparency for involving communities in the process of building new bioenergy plants, for instance, due to a study over the environmental impacts made by the project and an action plan for fixing it. Missing knowledge or education about the technology behind bioenergy, a common view amongst interviewees, leads to misinterpretations and therefore rejection of bioenergy projects. For instance, the steam, coming out of the energy plant, was put on a level with emissions such as smoke. Therefore, *two-way communication* and *knowledge transfer* are in use to invite communities to an open house day for demonstrating the process of generating bioenergy and for creating a discourse. At the economic dimension, income generation and cost

reduction, due to reducing the amount of energy which needs to be bought from external sources by producing own energy, might be a trigger for companies to run bioenergy plants. As one put in: "*The reason of installing / running a bioenergy plant was purely economic* […]" (B4).

Furthermore, bioenergy may protect non-renewable resources such as fossil fuels due to using biomass and emits less emissions compared, for instance, to carbon plants. As one interviewee said: "*Compared to the carbon energy plants, which we have a lot in Chile, they* [the bioenergy plants] *are better because it* [bioenergy] *is a renewable resource and in general emits less."* (P1C). Additionally, a common way to deal with harvest residues is to burn them on the field, which leads to both destructions of the micro climate and contamination / air pollution. By collecting the harvest residues, this can be avoided as well. From a social perspective, biomass energy projects promise to develop rural areas by creating directly new jobs or to build further infrastructure as well due to activities such as building schools or improving the health system, a standard instrument to gain the acceptance by the community. Based on the case study, the emissions are linked to the transportation from the biomass to the energy plant, "[…] *because all the trucks are running with diesel*" (P1B). Therefore, the destruction of streets due to heavy loaded trucks, which use the same "dirt"/unsealed roads, actually made for public traffic, is an issue as well. Also, noise, produced by the trucks, is a coded impact. Additionally, the removal of nearly all harvesting biomass from the forest may affect the nutrition of the land in a long-term perspective.

Discussion

The findings indicate short-term contracts and multiple suppliers without direct involvement in the entire business process. As Gold (2011) pointed out, these are adverse conditions for efficient bioenergy-SCs. According to Jones (1995, p. 426) "*a firm that keeps several suppliers "on line" competing for its business or that changes suppliers regularly is not indicating an interest in contracts built on mutual trust*". Therefore, the result neither trust nor two-way communication may explain the assignment of no cooperation among the interviews. Additionally, suppliers as well as energy producers indicate a monitoring strategy instead of trust and information exchange which may lead to inefficient allocation of resources (Pagell & Wu, 2009; Yawar & Seuring, 2015).

Disconnected SC-parts complicate the development of a bioenergy-SC and the exploration of unused potential. Due to being restricted to the upstream part of the SC, suppliers may be unable or unwilling to look beyond their business and to pass ideas of improvement to the focal company. Furthermore, the exploration and transportation, especially the transport distance, combined with the fossil fuel price determine the cost of biomass as well as the cost of transportation and therefore the competitiveness to other energy sources, which is in line with bioenergy-SC literature (Heinimö et al., 2008). When no substitutes or incentives are offered for a product such as bioenergy (Heinimö et al., 2008), companies may need to pay more attention to economic factors, for instance, the cost or the price of it. Although the common business model is to produce energy for the own consumption and to sell the surplus, the energy price is still challenging the profitability of bioenergy. However, apart from the two biggest focal companies and their SCs, other examples demonstrated that more cooperation may lead to a more efficient SC by offering, for instance, an adequate compensation for higher product quality or having a relational governance (Gold, 2011; Sims, 2002).

As presented by Heinimö et al. (2008) or Ruf et al. (2001), the case study shows also that citizens are powerful and definitive stakeholders, because they may be affected

negatively by bioenergy projects combined with the power to stop it and they have a stake in the business operations due to legal instrument (Freeman, 2010).

Previous studies have demonstrated that political authorities are important (Buchholz et al., 2009; Hörisch et al., 2014) and may be considered as key stakeholders due to having the power to determine the legal framework or impose penalties (Gold, 2011; Seuring & Müller, 2008). Even though *governmental bodies* are coded among the interviews, they are not regarded as being so important by SC internal experts as indicated in the literature (Rajagopal & Zilberman, 2007; Seuring & Müller, 2008). Despite that, Chile is characterized by a significant libertarian economy since the "Chicago Boys" have espoused profound deregulation, privatization and further free market policies (Silva, 1991). This may explain why experts from companies does not recognize governmental instances as relevant. Additionally, the results of the analysis indicate that competitors influenced the market strongly by having the power, for instance, to determine the purchasing price of biomass or to set standards (Freeman, 1984; Kaler, 2006).

While considering just challenges which may hinder a development of bioenergy projects until now, the case study identifies also drawbacks at the environmental and social dimensions produced by bioenergy. Within the case study, water, especially water shortage due to increasing consumption by the trees, as a challenge is assigned which is in line with related literature (Mabee et al., 2005). Due to removing a high amount of biomass from the forest which may lead to less fertility (Londo & Deurwaarder, 2007), soil degradation is possible as well. Even though other researchers identified deforestation as an issue (e.g. Gold, 2011; Masera et al., 2015), this case study does not mention it at all. It is difficult to explain this result, but it might be related to the circumstance that the bioenergy sector is using mainly biomass from forest plantation and not that much from native forests in Chile. Additionally, emissions are mostly related to the transport of the biomass which is in line with other researchers (Gold & Seuring, 2011; Mayfield et al., 2007). Therefore, the transportation distance is identified as a critical factor because of being related directly to increasing emissions and the outlined costs of transportation.

From an ecological point of view, the mitigation of the greenhouse effect by GHG reduction and the substitution of fossil fuels with bioenergy lead to a more renewable energy mix and protect also non-renewable resources (Buchholz et al., 2009; Gold, 2011). In addition to that, the item protection of micro climate / environment by collecting the biomass in the plantation instead of burning it at the field complete the current bioenergy framework. In terms of social benefits, the item development of rural areas has the highest frequency by creating, for instance, new jobs along the full SC, which was in line with the bioenergy-SC literature (e.g. Londo & Deurwaarder, 2007; McCormick & Kåberger, 2007). A further development of bioenergy acceptance might be achieved by social projects such as building schools or hospitals. Despite a more sustainable energy mix, using bioenergy is also related to energy security. In the case of Chile, the extension of bioenergy could also reduce the dependency on energy imports which are both costly and critical. All these benefits might be used by the bioenergy-SC for managing their stakeholders (Gold, 2011).

Further Research, limitations and research quality

The analysis has its limitations both on the theoretical as well as the empirical side. A more reflective approach on stakeholder management might yield additional insights. On the empirical side, the study shows the typical advantages and shortcomings of a qualitative study. The adaptation of the construct of generalisability from quantitative research has been questioned because of the small size of the data sample. Moreover, the findings from this research may support the generalisation across further qualitative

research, for instance, a cross-national comparative research (Hartley, 2004). As key actors, such as governmental bodies or NGOs, of the broader environment were non-existing or less active and the focal company was the customer itself, future research should analyse, on the one hand, how sustainability issues, especially from the social dimension, may be matched within the business operations. All three were identified as important pressure groups to give an incentive to be more sustainable to a company in other research (Seuring & Müller, 2008). Nevertheless, Coughlan et al. (2016) outlined the need for using more exploratory research methods to ensure methodological fit.

Therefore, the contribution of the paper is the in-depth analysis of stakeholder management in a setting in an emerging country. The theoretical basis of Gold (2011) is refined against this currently under-researched empirical field. This allows broadening the theory, thereby making a contribution to the still emerging research on stakeholder management in sustainable supply chains. The in-depth analysis drives the comprehension of this field into further details and links it to sustainability impacts.

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