CERTIFICATION ON SUSTAINABILITY IN THE BIOFUEL SECTOR: a case study on Brazilian ethanol

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Summary

This paper tries to identify under which conditions voluntary certification could be an answer to the governance of sustainability at global level. The study addresses the case of biofuel sustainability certification in Brazil and the role of the EU Directive on biofuels. The case study has permitted to identify and analyze some of these factors as the degree of dependence from foreign market, the policy environment, the structure of the supply chain, the benefits and costs associated to certification as well as some unintended consequences. The research has been conducted through a case study in the state of Sao Paolo (Brazil).

Keywords: Biofuel, certification, Brazil, EU, sustainability

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1. Introduction

As Olson (2000) has argued, the ability of mobile agents—roving bandits in Olson's terminology—to move on to unprotected resources can constitute an incentive to build conserving institutions. The effect of roving bandits can be explained by "tragedy of the commons," whereby a freely accessible (or open-access) resource is competitively depleted (Ostrom, 2009). In the globalized world, roving banditry is represented by the development of new markets so rapidly that the speed of resource exploitation can overwhelm the ability of local institutions to respond (Berks et al., 2006). Solutions to the ecological impact of globalization depend ultimately on changes in the behavior at local level but the problem needs to be addressed at multiple scale. One way to address social and ecological impacts of globalization is to develop institutions able to regulate the overexploitation of natural resources (Young, 2002). Following the failure of multilateral state-driven regulations, private non state regulatory arrangements are proliferating in many sectors characterized by growing levels of globalization through trade, both in manufacturing and in agriculture and other bio-based industries (Auld et al., 2008, Cashore et al., 2004).

Certification can be considered as hybrid system of governance between private corporations and representatives of civil society (Pattberg, 2005). Voluntary standards, certification initiative and labels are building a system of hybrid transnational governance where the regulatory power is not derived by the state but from their ability to build trust on information and offer price premiums when actions cannot be directly observed as actors are not close to each other.

Commodities are increasingly evaluated by process standards that relate to environmental and social conditions under which they are produced or traded. Since buyers or consumers cannot verify process standards, certification and labels are used to verify compliance and provide information. Voluntary certification schemes for timber, coffee, fisheries, and lately for biofuel feedstock, are examples of this pattern. When global supply chains exist, certification enables communication between different actors and with final users, from the local community level to the higher levels of social and political organizations, potentially leading to higher levels of cooperation in the management of common resources.

But how realistic is to rely on this response to the challenge of governance at global level? Certifications are not "panaceas" as their outcome depends upon the interaction of several variables, internal and external to the system that is regulated that affect the action of the actors involved in the governance system. Identifying these factors can help in predicting the likely success of certification, evaluate their realistic potential of this instrument and provide useful insight in designing such schemes.

This paper addresses the case of biofuel certification as a tool for regulating the impact of biofuel production on GHG emissions and on the use of natural resources. In the biofuel sector, as well as in other sectors where certification of sustainability is emerging, a large share of world's production is located in developing countries while developed countries account for the most traded purchases. Sustainability certification has arisen together with increasing concerns about the impact of large-scale production. These concerns mainly regard the effects in terms of the efficiency in pursuing greenhouse gas emissions savings on one hand, and other environmental and social issues linked to the change in land use, as the clearing of forests and food security on the other hand. Other concerns regard labor issues and land rights in regions where large plantations take place. Like in other industries as forest, fisheries and coffee, voluntary standards have emerged as response to public policy failure in implanting multilaterally agreed schemes. Inter-governmental organizations, NGOs, other public or private stakeholders are participating in various international initiatives on sustainable biofuels or biofuels feedstock.

2. The European Union Biofuel certification regime

The European regime on biofuels fixes mandatory national overall targets consistent with the objective of at least a 20 per cent share of energy from renewable sources in the EU gross final consumption of energy in 2020. At the same time, each member state shall ensure that the share of energy from renewable sources in all forms of transport in 2020 is at least 10 per cent of the final consumption of energy in transport. Irrespective of the provenance of the raw materials, energy from biofuels will be taken into account in measuring compliance with national targets and be eligible for any financial support provided by member states only if it fulfils the sustainability criteria set by the RED (Renewable Energy Directive)[1]. These relate mainly to GHG emission savings (estimated trough life cycle analysis) from the use of biofuels, which should be at least 35 per cent, compared with the corresponding fossil fuel that they displace. In addition, biofuels shall not be made from raw material obtained from land with a high biodiversity value or with a large carbon stock. The European Union does not directly check for compliance but relies on the recognition of private voluntary standards that are consistent with its own standard, transparent and independent. Seven private certification schemes have been approved by the EC on July 2011.

Considering the EU biofuel market as politically instituted market -as it would not exist without extensive policy intervention such as mandatory blending and subsidies – the EU biofuels sustainability regulation

[1] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

seeks to ensure that biofuels produced in the international market result in reduced GHG emissions and do not have adverse environmental impacts. The EU approach creates a transnational governance regime that includes States, non-governmental organizations and business in a hybrid regulatory model combining elements if private certification and public authority (Lin, 2011). This approach should avoid complains under the WTO, consolidates the private standard market but it poses serious concern about the legitimacy of the private standard schemes that are recognized because of potential rent seeking behavior by biofuel schemes operators. The relationships between actors can be analyzed adopting the principal agent framework developed in the delegation theory where a public actor (the principal) chooses to delegate certain regulatory tasks to a private actor (the agent) on the international level. Delegation is defined as a conditional grant of authority from a principal to an agent that empowers the latter to act on behalf of the former (Hawkins et al., 2006). The regulatory task involves monitoring and verifying complex and highly technical processes. There are several reasons why a principal choose to delegate: using the expertise that agents possess without incurring the costs of developing the expertise itself; higher efficiency of private actors with respect to public actors in carrying out governance; lower costs of cooperation by facilitating collective decision making. In conclusion delegation might enhance efficiency and effectiveness when accompanied by a complex of favorable conditions. The two main disadvantages of delegating to an agent are the reduction in the principal's autonomy and rent seeking behavior because of information asymmetry. This occurs when the agent pursues its own interest because the principal doesn't have perfect knowledge of agent's interests and actions. Some concepts in the delegation theory explain how a principal can minimize these risks. First the principal can withdraw the grant of authority anytime if it perceives that the cost of delegation is higher than the benefit. Second, the principal can set detailed rules than prescribe the agent's action (rule-based delegation) or can lay down broad principle and allow the agent to decide on details. While the first mechanism requires the development of the expertise that the principal wants to avoid to develop through delegation and introduce inflexibility in the system, the latter option requires accountability mechanisms to control the discretionary power of the agent. Regulators increasingly enlist the judgment of the private firms they regulate to achieve public ends. This trend derives from the fact that some policy goals cannot be easily pursued through traditional regulatory forms, considering the complexity of setting uniform rules and the difficulty and the costs and of monitoring the internal behavior of firms. Indeed, when regulators attempt to reflect the uncertain context in precise provisions, the proliferation of rules that follows, leads to uncertain and inconsistent application (Bamberger, 2006). Particularly in the field of environment protection and food safety regulators have enlisted the expertise and judgment of regulated parties themselves (Coglianese and Lazer, 2003). Specifically, regulators can mandate that private firms adopt internal procedures and assessment, constraining firm behavior during the production process. This approach can be useful specially when dealing with imported goods for which production regulation is not possible because of the lack of regulatory power in foreign countries. Transnational companies in the food sector are today recurring to this approach by adopting standards produced by NGOs or other multi-stakeholder initiatives. This behavior is

less costly and more efficient than developing their own standards, it allows them to access new niche lucrative markets and it helps in creating consensus on their action (Daviron , Vigneron 2011).

Setting sustainability standards for biofuels is a complex process for several reasons. This complexity explains the need for the Commission to delegate authority to scheme operators. Bioenergy can be produced by a large variety of feedstock and the number of market actors that have to be consulted can be large. This demands a governance system that is broad in scope and stringent in ensuring compliance with the standards. As bio-energy may be produced and traded anywhere in the world, trading patterns may become extremely complicated. Many differentiated standards could be required in order to accommodate the varying and unique ecological and socio-economic conditions of producing countries.

In the EU biofuel regulatory regime there is a double level of delegation: the first from the Commission to the partnership of recognized schemes; the second from these partnerships to third-party auditors. In both cases the key factor in reducing the divergence between principal an agent preferences is the need for the certification scheme to maintain legitimacy. Several factors are very important in promoting legitimacy (Bernstein, Cashore, 2007). First, certification schemes must compete with each other for credibility and recognition as their authority rests entirely on their moral legitimacy[2]. Building moral legitimacy depends upon the definition process and the underlying science, but also on the credibility of the certification and auditing in order to avoid cheating. Moral legitimacy is then strictly connected to the existing internal democracy and rules. The development and implementation of the standards must be inclusive, participated by all stakeholders and transparent in order to be recognized as legitimate and match external expectations. In achieving moral legitimacy the role of environmental and social NGO's is very central, as it has emerged by several studies on other bio-based industries as timber, coffee or fisheries. Pragmatic legitimacy requires instead that the benefit of participation in the schemes outweigh the costs. Benefits derive mainly by increased product price, better market access and defending market shares while costs are the direct cost of certification and the indirect costs linked to compliance with the standard. Considering that not all the actors are equally influential in the supply chain, the constituency and the relationship in the partnership governing the process of setting the standards and implementing the certification process is fundamental in determining the distribution of the cost and the benefit that derive from certification.

The EU regulation is a clear example of the Commission using market access to drive improvements in global environmental governance through raising the environmental standards in its trading partners. Considering this framework, there are two questions to which this paper aims to respond within the specific case of the Brazilian ethanol:

[2] As in Cashore et al. (2002), *moral legitimacy* reflects a ''positive normative evaluation of the organization and its activities. It rests not on judgments about whether a given activity promotes the goals of the evaluator, but rather on judgments about whether the activity is 'the right thing to do...'' while *pragmatic legitimacy* rests on the 'self-interested calculations of an organization's most immediate audiences', in which the material 'well being' of the legitimacy grantor is enhanced" (Suchman, 1995).

- Are the broad principles – as they are defined in the EU directive – consistent with the policy objective of pursuing a sustainable development of biofuel production in exporting countries?
- Are private certification mechanisms effective in pursuing sustainable biofuel production in those countries?

In order to answer these questions we developed a case study to assess how international markets, national policies and local factors interact to influence sugar cane producers to adopt certified sustainable production practices. The case study has been conducted in the State of Sao Paulo through semi-structured interviews with key stakeholders in the sugar cane industry, NGO's, government and external experts and complemented with extensive literature review and visits to mills that had achieved certification.

3. The Brazilian context

Brazil is the second largest world producer of fuel ethanol, with 27.6 billion in 2008. In the period 2000–2008, ethanol production in Brazil raised at annual average rates of 12.8%(MAPA, 2009). Internal consumption is projected to reach 35 billion l in 2015 and 50 billion l in 2020 (EPE, 2008), while exports – that were 5.1 billion l in 2008(MAPA, 2009) could increase up to 13 billion l by 2016 (UNICA). In the period 2000–2008 the growth of sugarcane production occurred at average annual growth rates of 9.9%, mainly due to the increased demand in ethanol. Currently sugar cane occupies 8.9Mha, (MAPA, 2009). The production of sugarcane is concentrated in the Centre-South region, and specifically, in the state of Sao Paulo where 58–63% of the national production of ethanol has taken place in recent years. It is estimated that there are about 72,000 suppliers in Brazil (UNICA), being about 14 thousand in the state of São Paulo. Due to the technological developments achieved both on the agriculture and on industry sides, average production yields have grown from 3,000 litres/ha/year (67 GJ/ha/yr) in early 1980s to 6,500 litres/ha/year (145 GJ/ha/yr) in 2005 (UNICA). Production yields based on conventional process can reach 8,000 litres/ha/year (178 GJ/ha/yr) in about 8 years or even 9,000 litres/(ha/yr) (about 200 GJ/ha/yr), in case ethanol production from hydrolysis of sugarcane bagasse would reach a commercial stage. Yields are higher in Centre-South region and are particularly higher in state of São Paulo (e.g., at least 82 t/ha in São Paulo, in 2006, vis-à-vis 74 t/ha for the national average). On average, yields grew more than 3% per year from 1975 to 1985 and 1% per year from 1986 to 2008. Since 1975 yields have grown almost 60% due to the development of new varieties and to the improvement of agricultural practices (IEA).

The main innovation towards the social and environmental sustainability of sugarcane has been the mechanization of the harvest with the phasing out of burning. Further improvements – both from an environmental and an economic point of view - could be achieved by higher efficiency in water use and changes in the transportation, by substituting transport on large trucks with pipelines from the storage facilities to the ports and by enlarging the surplus electricity production from sugarcane residues[3]. The

[3] Most of ethanol exported is shipped to the port of Santos, located in the state of São Paulo, relatively close to many ethanol distilleries. The distance between mills/distilleries and the ports and the shipping capacity are considered the main logistic

sugarcane – sugar and ethanol supply chain represent an important source of employment in the Brazilian economy. All together it involvers more than 1,1 million people and it has increased by 85% in the period 2000-2009. Because of higher efficient production and intensive usage of mechanization of agriculture activities, the Centre-South region produces about 90% of main products and accounts for 56.5% of job positions while 45,5% of the workers is located in the North East region of the country. Compared to other agro-industries in Brazil the sector shows better observance to labor and environmental legislation with a greater number of formal jobs in sugarcane sector (81,4% against 40% in the agriculture sector[4]), enjoys better working conditions, higher hare of adult workers with child labor decreased form 15 to 0,3% in the last 30 years. These changes have been the joint result of a set of favorable conditions as the are the results of direct sugarcane producers' concern, better law enforcement, market's requirements, associated to government social programs as Bolsa Familia and Bolsa Escola that condition public support to compliance with education requirements. Sugar and ethanol companies have invested in training and qualification and adopted social and environmental certification programs. These programs have been linked to the transformation associated with the prohibition of sugarcane burning that demands fewer workers (one harvester substitutes about 80 workers) and at the same time requires changes the worker's profile and consequent training and qualifying programs.

Besides foreign demand, domestic sales of ethanol have also been growing in Brazil. This has been allowed by a sharp increase of flex-fuel automobiles sales. Although direct subsidies provide by the Pro Alcohol program have been phased out, taxation on gasoline in Brazil is about twice higher than for ethanol, which is justified by the ethanol positive externalities.

First steps in ethanol sustainability certification started In Brazil in September 2007, by signing a bilateral agreement with Sweden finalized to boost ethanol trade and to foster increased collaboration between researchers and companies from both countries, with the aim of developing better and more efficient technologies for sustainable ethanol production. The agreement brought to the SEKAB Verified Sustainable Ethanol Initiative, which was developed by the Swedish bioenergy company SEKAB together with Brazilian ethanol producers. Through this initiative, SEKAB aims to supply verified sustainable ethanol from the Sao Paulo region of Brazil to the Swedish market. SEKAB identified several criteria as minimum 85 % reduction in fossil carbon dioxide compared with petrol, from a well to-wheel perspective; increased mechanization of the harvest; zero tolerance for felling of rain forest and for child labor, respect of rights and

constrains. Transportation of ethanol by trucks at large distances is not sustainable from economic, energetic and environmental points of view. Ethanol producers and TRANSPETRO – the logistic subsidiary of PETROBRAS – are investing in pipelines. TRANSPETRO estimates that logistics costs could represent 20% of the total cost of exporting ethanol, and that this cost could be reduced at least 50% with an optimized infrastructure (IEA, 2009). In addition, TRANSPETRO plans to expand by 2015 its capacity of ethanol exports up to 13 billion litres, from 2 billion litres in early 2009 diversifying transport modals (IEA).

[4] This figure reaches 95% in the State of Sao Paulo.

safety measures for all employees in accordance with UN guidelines; and ecological consideration in accordance with UNICA's environmental initiative.

Considering the costs that could arise from the adoption of different sustainability standards Brazilian sugar cane industry has concentrated its effort in one voluntary scheme, Bonsucro (Better Sugar Cane Initiative), specific for sugarcane. Bonsucro is a global multi-stakeholder association that involves sugar retailers, investors, traders, producers and NGOs. Bonsucro aims, in particular, to define globally applicable performance-based principles, criteria, indicators and standards for sugarcane production, promoting improvements in the key economic, environmental and social impacts of sugarcane production and primary processing. In order to achieve compliance with the Bonsucro Standard, 80 % of the indicators contained in broad principles, plus 80% of the criteria contained in the chain of custody chapter must be satisfied. In addition, there are a number of core criteria which must be fully satisfied as compliance with relevant applicable laws and ILO labor conventions, provision of at least the national minimum wage, impact assessment of sugarcane enterprises on biodiversity and ecosystems services and transparent, consultative and participatory processes that address cumulative and induced effects via an environmental and social impact assessment (ESIA) for new sugarcane projects. The Bonsucro EU certificate requires full compliance with the additional requirements of the EU directives. Bonsucro EU is one of the seven voluntary biofuel sustainability standards recognized by the EU Commission in the framework of the EU RED, with the exception of the requirements on grasslands.

Bonsucro has certified 14 mills in Brazil in the last year, belonging to five groups, corresponding to 3,4 % of Brazilian sugar cane area and 1,4 of world area. These numbers are increasing as all companies that have started to certificate have expressed their intention to certificate their entire production.

4. Implication of the definition of sustainability in the Eu RED for Brazil

In order to answer the first question we shortly analyze EU RED requirements with regard sustainability criteria that have to be taken into account for biofuels compliance with renewable energy obligations and the eligibility for financial support in member states. These criteria regard two main points:

- Greenhouse gas savings;
- Biodiversity, carbon stocks and peatlands

The greenhouse gas savings criterion does not pose any problem to Brazilian ethanol to which a default value of GHG saving of 71% is assigned. This value exceeds both the actual request of 35% minimum savings and the 60% level that will apply to facilities that start production in 2017 or later. Its worth to mention that all sugar cane mills and distilleries in Brazil are self sufficient in electricity as processing plants generates bioelectricity form the bagasse, the cellulosic residues after sugar cane crushing. In many case the excess of energy produced is sold to distribution grids and therefore allows the substitution of other carbon-intensive electricity. The supply of electricity is increasing rapidly following the adoption of the mechanized harvesting given the greater amount of biomass that is left on the fields.

With regard to the second point the directive identifies three types of land as having a high biodiversity value:

1. Primary forest and other wooded land with native species;
2. Land designed for the protection of nature;
3. Highly biodiverse grassland, with a distinction between natural and non-natural grassland.

The directive gives a definition of lands with high carbon stocks and peatlands and leaves the task of defining more precisely natural grassland to future regulatory action by the Commission that has performed a public consultation with stakeholders and expert on this issue[5].

With regard to Brazil, the definition of grassland appears to be as a very controversial one that could jeopardize the legitimacy of the EU approach followed in the RED. Indeed, the EU instead that setting the general goals has formulates a detailed specification giving a definition that lack clear scientific evidence and international agreement. In assessing that the Directive " should not have the effect of encouraging the destruction of biodiverse land", the Directive assesses a definition of highly biodiverse grassland close to the one that has been proposed in the Convention for Biological Diversity (CBD) but that has not been formally agreed and hence recognized as an international standard. Furthermore the directive proposes a distinction between natural and not-natural grasslands that is even more controversial and subject to interpretation. Considering that the EU legislation refers to CBD and that Brazil is a party in this convention and has implemented its own protected areas, using different criteria in absence of sound scientific support, could be challenged under article XX of GATT as discriminating. Brazilian authorities and stakeholders require on this issue the recognition by the EU of national initiatives developed with the same intent of protecting biodiversity as the Brazilian Agro-Ecological Zones (UNICA, 2010; Brazil, 2010)[6].

Furthermore, in its public consultation the EC has proposed a classification of grassland in the two categories of natural and non-natural, with the aim of restrict the criteria to use to identify highly biodiverse grassland. But still the identification of highly biodiverse grassland would be very difficult in countries like Brazil where huge territories are used to graze animals and the mere presence of human activity on an area of grassland should not be used as a proxy for determining whether a specific grassland is natural or non-natural (Bowyer, 2010). Sustaining Amazonia's or Cerrado's ecological diversity over the long run should require the retention of forest on private lands, as required by law, the expansion of the current system of protected areas, and a more rational utilization of already cleared and degraded areas in order to diminish the need to clear additional land. In the Cerrado, where deforestation has been proceeding at a higher rate than the Amazon, expansion of sugarcane at the expenses of pastures usually requires the cultivation of other crops as soybean for two years in order to restore soil fertility and structure and crop rotation is commonly used

[5] http://ec.europa.eu/energy/renewables/consultations/2010_02_08_biodiverse_grassland_en.htm
[6] ibid.

during sugarcane renovation. These practices, together with the widespread adoption of minimum tillage techniques, consent to increase the soil carbon content (Walter et al.2011).

The EU regulation does not consider social sustainability. Efforts to define social sustainability cover a large set of components including labor and human rights, land and resource rights, food security, livelihood impact and rural development (ILO, FAO, UNCTAD). Between the schemes approved by the EU in July 2011, only the ones developed through non profit multi-stakeholder associations as RSB or Bonsucro – that were developed prior to EU RED- cover social sustainability concerns, requiring compliance with national laws and regulation an international agreements as a general requirement. Other industry based schemes (Albengoa and 2Bsvs), that are global in scope, take a minimum compliance approach and do not include any commitment to social sustainability. Greenenergy, an industry-based standard that is also adopted in Brazil, requires legal compliance only with laws relating to sustainability criteria governed by the standard. To this extent Greenenergy has watered down its requirements next to the approval of the EU RED. Not having included social sustainability concerns in the EU RED could pose serious risk to the Eu contributing to lowering the bar instead than complementing commercial and civil society actors that are demanding voluntary sustainability certifications.

In conclusion, while on biodiversity side the EU requirements try to strictly regulate an uncertain context with the risk of inconsistent application, not demanding the enforcement of labor and social standard risk to invalidate efforts that are in place in producing countries with the risk of contributing to increase the size of non-sensitive markets.

5. Are private certification mechanisms effective in pursuing sustainable production?

To the extent many actors take decisions that are formally independent of each other but actually constitute an interdependent system of relations, characterized by contractual and cooperative undertakings, third party certification can be analyzed as polycentric system. Interactions occurring within and across different scales and levels, as for example between spatial, institutional, jurisdictional and management domains, can be addressed by boundary organizations that play an intermediary role between different arenas, levels or scales and facilitate the co-production of knowledge and solutions (Cash et al. 2006). Intersectoral partnerships between different societal domains – state, market, and civil society- are an example of such boundary institutions that can contribute to more sustainable global value chains. With regard to Brazilian production of sugarcane, sugar and ethanol such institution could be represented by the partnership built around the Bonsucro standard. This partnership affects mainly the production stage of sugarcane. It involves three types of actors. The first type is represented by NGO's where WWF acts for nature conservation interests and Solidaridad the development issues. Secondly it included sugarcane, sugar and ethanol producers both directly and through their association UNICA. Third it involves large buyers in the agro-food, energy and green chemistry sector. Northern governments engage in the partnership only in the context of development cooperation through their financial support to NGOs. The partnership is contributing to sustainable production in various ways: creating an arena to work on this issue, working directly with producers to

encourage sustainable production by means of production codes and standards regarding social and environmental issues and, finally, creating a market for sustainable products. The NGOs are often very active participants on partnerships and are responsible for the on-site work frequently also facilitating the relationship between participating business and farmers (Bitzer et al, 2008) In order to facilitate compliance the partnership offers assistance to producers. UNICA and Solidaridad, for example, have worked together in a program of retraining sugarcane cutters made redundant by mechanization of harvesting. Another example is represented by WWF is collaborating with the ethanol company ETH in a biodiversity preservation project linked to the expansion of sugarcane plantations in the Cerrado.

Ostrom (2009) develops a model that predicts that self-organization is feasible when perceived long term benefits of designing and enforcing new rules exceed short and long term perceived costs. Following Ostrom, some "design rules" associated with different degrees of success can be identified. Economic benefit of certification can come under a variety of forms: price premiums, increased market access, contract stability, lower price volatility. Besides real economic gains there are other reasons why firms chose to participate in voluntary regulations as anticipating future regulation, protect their reputation, gain exposure to practices that improve operations, signaling to consumers and partners (Matus, 2009). Certification costs are represented by the direct cost of certification and the indirect costs linked to compliance with the standard.

Building on previous study on sustainability certification on bio-based industries as forestry, coffee or fish (Cashore et al., 2004, Cubbage et Al., 2010, Ebeling et al. 2009, Raynolds et al.2007, Gulbransen 2009, Giovannucci et al. 2008)) it is possible to say that the success of sustainability certifications depends upon a set of micro, macro and policy conditions that affect the size and distribution of benefit and costs.

There are rather few empirical studies that have evaluated how these factors might promote or hinder the implementation of sustainability certifications and none of them on biofuels. The complexity of the systems that are regulated makes very difficult to evaluate how they respond. Socio-economic and ecologic systems need to be analyzed at different levels of scale and with a multiplicity of perspectives in order to take into account their complexity.

As evidence in other studies on sustainability certifications in bio-based industries (Cashore et al. 2004, Gulbrandsen, 2009, Raynolds et al. (2004), Ponte (2010)), the main factors affecting the benefit and the costs of certification and therefore determining its success in achieving a sustainable development of the industry are:

- Demand
- Legislation and policy in place and enforcement of laws
- Land tenure and ownership
- Structure of the industry

In this study I have examined the respective roles of market factors, institutional conditions and their interactions on the success of sugarcane sustainability certification.

5.1- Demand

Research on voluntary certifications in bio-based industries has shown that certification is strongly driven by demand. Countries that rely on sensible foreign markets are far more susceptible of searching for certification while where domestic markets prevail or exports are directed towards not sensitive markets suppliers are less interested in achieving certification (Cashore et al., 2004). Obtaining a sustainability certification is often a strategy for firms that want to increase their exports or defend their market shares on sensitive markets.

Brazilian ethanol exports were in 2008 about 19% of internal production, 30% of which directed towards the US and 27% towards the EU. Production is expanding in new areas in order to satisfy growing demand from the internal and external market. An additional boost to it just came from the recent phasing out of the US tariff on ethanol imports from Brazil that will strongly increase Brazil competiveness on that market. According to the US regime on biofuels, the Renewable Fuel Standard (RFS), Brazilian ethanol accounts as advanced biofuel. On the contrary, Brazilian competitiveness on the EU is lower because of the tariff. As a consequence, the EU market does not represent at the moment the most important driver for ethanol certification, although things might change in the future if the EU will liberalize its ethanol imports. Improved market access is reported for certified ethanol exports with reference to UK imports under the RFTO.

The demand for certified sugar cane comes essentially by two different sources: on one hand main sugar buyers as Coca Cola, Nestlé and Unilever are increasingly requiring certification - as well as ethanol buyers like Shell and BP - with the objective of protecting their reputation and avoiding boycott campaigns, following pressure from social groups statewide and internationally. Interviews have clarified that compliance costs exceed price premiums but, in any case, producers are starting to certify their mills in order to defend their market shares. On the other hand, new markets for certified sugar cane are growing associated to high value added products as the green plastic[7]. In this case price premiums are paid to producers. Brazilian sugar cane producers have devoted much attention to defend their reputation as a sustainable industry: UNICA has published a sustainability report in accordance with the G3 Guidelines of the Global Reporting Initiative (GRI) while around half of its associated mills have now their own GRI Sustainability Report. Sustainability practices concern both environmental and social challenges.

[7] One example is the company Braskem's green ethylene production based on sugarcane ethanol that launched the "I'm Green" label for use by various companies marketing products containing Braskem's green polyethylene. The core of the company strategy is based on the idea of "sustainable chemicals," including improved management of environmental, social and economic impacts that are a result of business activity,

While demand for certified sugarcane is indeed a driver for certification, the size of the market is still small, given the large share of the internal market for Brazilian ethanol production and the large presence of not sensitive market between Brazilian sugar importers.

5.2 Legislation and policy in place and its enforcement

When governments enforce laws, provide financial incentives for certified products, and provide land tenure security, public policies act as complement, enhancing the legitimacy of certification schemes and reducing the cost of compliance (Cashore et al., 2004). Strong public regulations are needed to hold the bar on social and environmental conditions, allowing private initiatives to raise the bar - providing that more socially and environmentally sustainable production is possible and desirable, in order to have the greatest impact (Raynolds et al. 2007).

In Brazil, sugar cane voluntary certification schemes are developing thanks to policy reforms imposing restrictive and controlled regulations. Considering that when fulfilling law requirements, sustainability principles and criteria are largely met, that major role for the third-party auditors is the verification of compliance with already established norms. In this context, certification partnership acts as a forum for consensus formation between actors.

Brazilian sugarcane industry is definitively gaining in sustainability thanks is to a complex of public regulations represented by:

- Agro-zones
- Forest code
- Law on sugarcane burning and harvesting

In particular the following regulations are determining the evolution of the sugar cane industry in Brazil and in the State of Sao Paulo:

SUGARCANE AGROECOLOGICAL ZONING: the Brazilian government has introduced the agro-ecological zoning in 2009 to delimit area where sugar cane, as well as other crops, can be produced. According to the zoning rule the maximum permitted land area for sugar cane amounts to 64,7 millions ha that is about 7.5% of the Brazilian territory (currently 0.9% of the area is used for sugarcane). Under the zoning rule:

1. Sugarcane expansion is not allowed in the most sensitive biomes – e.g. Amazonia and Pantanal;

2. Sugarcane expansion is not allowed on any type of native vegetation (*Cerrados, Campos*, etc.).

Interviews have clarified that the perspective of the EU ethanol market has been a driving force in establishing the agro-zone according to environmental criteria.

FOREST CODE: the Brazilian Environmental Legislation is based on the National Forestry Cod (Federal law 4771/65), which fixes a legal reserve of 80% for rural activities in the Amazon, 35% in the Amazonian Cerrado (savannas) and 20% in the other regions. Sugar cane plantation or other crops must guarantee at least a forest cover of native trees on an area at least equal to the legal reserve. The State of Sao Paulo has further special requirements on the maintenance of riparian forests. The implementation of riparian areas should enhance the protection of water sources and promote the restoration of biodiversity. The Brazilian Parliament has vey recently approved a reformed and very controversial law on the legal reserve. Opponents claim that the code will open the way to new deforestation while supporters, mainly linked to the agricultural lobby, argues that the changes will promote sustainable food production eliminating uncertainty. While provision on the legal reserve remain unchanged, the bill provides an amnesty from fines for illegally clearing trees before July 2008, although larger landholders would have to replant most of the cleared area or preserve the same amount of land elsewhere. This provision is considered needed in absence of evidence of forest clearing in the past and in order to set a starting point for severe enforcement of the code. What appears to be less sustainable is instead the reduction of the requirements on buffer zones near water bodies (from 30 to 15m of legal preserve).

BRAZILIAN NATIONAL POLICY ON CLIMATE CHANGE

The Act on Brazil's National Policy on Climate Change has been approved in 2010. The act specifies as the country will achieve its commitment to reduce greenhouse gas emissions by between 36.1% and 38.9% by 2020 from 1990 levels. Brazil plans to achieve this total emissions reduction target through actions in all sectors of the economy. The actions detailed in the decree to reach these goals include:

• Reducing 80% of deforestation in the Amazon

• Reducing 40% of deforestation in the Cerrado biome

• Increasing the supply of renewable energies

• Implementation of a "Low Carbon Agricultural Plan" that includes the recovery of 15 million ha of degraded pastures, improving the system of integrated farming, foresting and cattle raising by 4 million hectares, expanding direct seeding by 8 million hectares, expanding biological nitrogen fixation by 5.5 million hectares, expanding foresting by 3 million hectares, using new technologies to produce an additional 4.4 million cubic meters of animal manure annually.

FEDERAL LAW 11241 OF SEPTEMBER 2002 ON SUGARCANE HARVESTING: The law has progressively banned pre-harvesting burning of sugar cane plantations, an important source of air pollution and cause of significant health problems for sugar cane workers. This development has been made possible thanks to the introduction of mechanical harvesting (Moreira and Goldemberg, 1999, La Rovere et al., 2011). The law establishes the phasing out the pre-harvesting burning by 2021 in areas whose slope is below

12% - where mechanization is possible - and by 2031 in all areas. The Green Protocol, signed between the Sao Paulo Environmental Agency and UNICA, the association of sugar cane producers, is a voluntary agreement to end the use of fire in sugarcane harvesting and to protect riparian areas and has anticipated these deadlines to 2014 and 2017, respectively in the State of Sao Paulo.

The development of energy markets for sugarcane crops residues helped to advance technologies that were needed to harvest green cane and to collect these residues more efficiently, eliminating the need to burn before harvesting and using them in the cogeneration of heat and electricity (Moreira and Goldemberg, 1999).

Being highly compatible wit sustainability standard requirements, this regulatory body creates the premises for the success of certification helping in lowering compliance costs of certification. The final effect in Brazil depends much more on the level of enforcement of currents laws than on the need of extra legislation. Compliance can be considered sufficient and growing in Sao Paulo State and this, together with its relatively more advanced legislation, has a pulling effect on the rest of the country. While in Sao Paulo the enforcement can rely on the State authority, in the poorest state, as in the Amazon or in the North. East, characterized by a lower level of enforcement and weaker institutions, a growing effort of the Federal Government is needed.

Then public sector can also increase the efficacy of voluntary certification in achieving sustainability, working together with the private sector to provide training and support services for commodity producers, i.e. in building farmers cooperatives as an effective capacity building tool.

5.3 Structure of the sugarcane industry

The idea of global value chain work highlights the links between the two concepts of global organization of industry and value added chain (Gereffi et al., 1999). This framework stresses the relevance of coordination among firms (boundary networks) and of global buyers using the term of “buyer driven” commodity chain when buyers use explicit coordination to help create a highly competent supply-base upon which global scale production system can be built without direct ownership. In this vision, global buyers, as retailers, marketers and traders, exert a high degree of control over spatially dispersed value chains. In further work Gereffy et Al.(Gereffi et al., 2005) have proposed a typology of value chain governance, according to the spectrum of explicit coordination and network relationships. In this framework different levels of the three main determinants of global value chain governance, that are the *complexity* of information and knowledge transfer required to sustain a particular transaction, the *codifiability* of information such that it can be transmitted efficiently between the parties to the transaction; and the *capability* of suppliers in relation to the requirements of the transaction, give birth to different combinations of which five are likely to occur in the real world as governance types (tab1).

Table 1 Key determinants of global value chain governance

Governance type	Complexity of	Ability to codify	Capabilities in the	Degree of explicit

	transactions	transactions	supply-base	coordination and power asymmetry
Market	Low	High	High	Low
Modular	High	High	High	↑
Relational	High	Low	High	ǀ
Captive	High	High	Low	↓
Hierarchy	High	Low	Low	High

In the first case, transactions are easily codified, product specifications are relatively simple, and suppliers have the capability to make the products in question with little input from buyers, buyers respond to specifications and prices set by sellers. Because the complexity of information exchanged is relatively low, transactions are governed with little explicit coordination, through market linkages. At the opposite end, the *hierarchy* case describes the situation in which product specifications cannot be codified, products are complex, and highly competent suppliers cannot be found. In this situation lead firms are forced to develop and manufacture products in-house, managing complex webs of inputs and outputs and to control resources, especially intellectual property. Moving from market to vertically integrated governance, relationships between suppliers and buyers become bilateral, and are characterized by higher complexity, mutual dependence and hierarchical coordination. Suppliers and buyers coordinate on the quality of the product, the production process, the logistic, creating by this way new value chain relationships and competences. Multinationals that buy sugar or ethanol to export to western market tend to establish more regular contracts with suppliers whose systems become subject to regular monitoring ad audit. When economic actors are able to embed relevant information about quality in standards, certification or labels, they can achieve a change in the form of coordination of the supply chain in the direction of a more "hand-off" less hierarchical relationship (Ponte and Gibbon, 2005). In this case of industrial *conventions,* uncertainty about quality is solved through a third party who determines common norms and standards and instruments for inspection, testing and certification. If the quality requirements refer to civil society needs as in the case of the impact of a product on the environment it is possible to speak about civil coordination or convention. By doing so, trust become institutionalized in the certification rather than by a direct relationship between buyer and seller. The development of certification and auditing systems shifts coordination of the global supply chain from direct control to "control of control". Voluntary regulations are one way for firms to cope with the complexity of a global marketplace (Matus, 2009).

The sugar cane supply chain in Brazil is facing important changes since 2006 shifting from typical market based relationships to a value chain with a higher degree of coordination as new players are coming into action. Three main movements can be identified:

1. Large Brazilian producers are buying small and more fragile mills;

2. Trading companies and multinationals in the food industry are acquiring medium and large size groups;

3. Multinational companies in the energy business are buying participations in mill groups.

New players seem to be in search of product diversification, entrance in Brazil and new opportunities in commodity markets. Consolidation of the industry is characterized by increased concentration and growing share of foreign capital. Top 10 groups' market share moved from 24% to 34% since 2002/3 to 2010/2011 while foreign capital increased from 10 to 23%. One example of the process of concentration, verticalization and globalization is represented by the history of the group COSAN that, started as a family enterprise in the 30s', has evolved in the 80s' beginning its trajectory of fusions and acquisitions consolidating its position as player in the global market and starting to be quoted in the Brazilian Bourse (BOVESPA) in 2005. This strategy has permitted increasing returns to scale with the same administrative structure. In 2008 the group has changed its strategy by acquiring 100% of the capital of Essobras and affiliates active in the gasoline distribution and in the production and commercialization of lubricants, consolidating its position in the distribution sector, obtaining synergies in the rationalization of the logistic, optimizing stock management by reducing volatility in volumes and prices and, finally, reducing volatility in profits as result of a better combination of production, distribution and commercialization margins (Verdi et al., 2012). The next step in 2010 has been the joint venture between COSAN and Shell International with COSAN transferring to the joint venture all its mills, all the projects for the cogeneration of energy, the logistic and other activities while Shell transfer to the joint venture the Brazilian its segment of fuel distribution, its business in the aviation in Brazil and two companies that operate in R&D of biomass fuels, besides capital contribution. The aim of this strategy that has given birth to the group RAIZEN is represented by the creation of a global player in the sugar and ethanol market, characterized by the ownership of 23 sugarcane mills in Brazil with a processing capacity of 62 millions tons, that represents 9,4% of the country capacity, with the objective to open to the world ethanol market and to second generation technologies.

Increased complexity associated with compliance with social and environmental regulations has contributed to the reorganization process oriented towards vertical integration with leading buyers and exporters increasing own-land production at the expenses of purchasing sugar cane from small holders and large contract farmers. Value chain governance has been tightened via marketing alliance between mills, traders and buyers. The higher concentration process that has run in parallel in the sugarcane industry has facilitated this alliance. Large multinational buyers have had a leading role in promoting modernization and increasing the scale of sugar cane processing. Multinational buyers impose standards on the social and environmental sustainability of production similar at those applied in the EU and in the US. At the same time, public regulations in Brazil are constantly updated according to changes in European Union directives and other international public standards (Vieira 2006). However, the chain of custody is only required for producers and processors selling to premium markets (exports and green chemistry). In the traditional subsector, as transactions are price-driven and the price is a function only of the sugar content, specific investments in

labor and environmental protection, such mechanization and legal reserve, is less likely to lead to immediate returns.

At present 14 mills have been certified by Bonsucro. They normally belong to export-oriented, vertically integrated companies that use certification to respond to the demand of multinational buyers that operate on sensitive markets. For young companies that have recently bought mills, certification is also a way to homogenize practices and technology in different plants and increase their efficiency. The first mills to start certification are usually characterized by an already existing high level of compliance with social and environmental regulations. For these companies the higher cost is represented by the record keeping needed to proof compliance, especially with regard to the past, and the main changes – and associated costs- that are required are in the organization and management.

5.4 Land tenure and ownership

Land ownership and tenure affects the diffusion of sustainable environmental and social practices in sugar cane production in more than one way.

First, the industry structure with regard to land tenure contributes to determine the rate of investment in new technologies and practices and consequent land use changes. Second, indirect land use changes, especially those pushing the rangeland frontier in the Amazon and the Cerrado, could be limited regulating tenure regimes.

In Brazil three types of land tenure features can be identified with regard to sugar cane production: mills can own the land, can rent the land and can partly rely on outgrowers. In the last two cases, usually, contracts with the mills last five or six years that correspond to the sugar cane cycle. In the State of Sao Paulo these three forms were traditionally equally distributed, each one weighting one third of total sugar cane production. Recently these patterns are changing following the reorganization of the sector and the entrance of foreign capital. Foreign investors are showing various attitudes with some companies oriented towards outgrowers and others towards renting. According to some interviews mills are increasingly renting the land that they operate directly. A second option is that the outgrower is responsible only for the first part of the production cycle as the mill is in charge of the harvest. This evolution is linked to the costs of applying the green protocol and the forest code: mechanization is not affordable for small farmers as the minimum area that justifies the purchase of a machine is around 1000 ha or 100.000 tons and also the cost of forestation is estimated to be around four times the cost of planting sugar cane. While large landowners who rent the land usually are soya and corn producers, outgrowers are specialized in sugar cane. This explains why, if they cannot afford the required changes, they decide to sell, to rent their land or the mill become in charge of the harvest. Mills are continuously expanding their sugar production given the increase in sugar and ethanol demand and the need to maximize their efficiency. Considering that sugar cane field must be in a ray of 40-70 Km from the mill, there is increasing competition for the land in areas where several mills are present so that land prices are constantly increasing (around three times in the last five years). Some companies offer

technical assistance to farmers in order to close the gaps on sustainability requirements, mainly on agrochemicals use. When opting for new planting technologies, mills can decide to take over this phase, together with the harvest and transport, leaving to the farmer pest treatments and fertilization of sugarcane fields. In the new states where sugar cane is expanding the situation is rather different and large producers prevail.

If outgrowers accept to comply with the green protocol and the forest code, they can get higher prices for their production and more stable contracts. The State of Sao Paulo his helping small producers in financing part of the investment in mechanization and creating producers consortiums. This process requires the elimination of farm boundaries, planting the same varieties and homogenizing agricultural practices. While producers pay the cost of compliance with certification requirements, the mills pay the cost of the auditing. Some programs are in place to re-qualify producers to new activities.

According to our interviews the mills are certifying the sugar cane produced on the land that they manage directly (both owned and rented) and they regard to certification of outgrowers as a second step, which is considered necessary as the objective is to certify 100% of their production. The major obstacle in certifying outgrowers is represented by the compliance with the forest code, especially with regard to providing proofs of compliance for the past, considering that legal documents or remote sensing pictures are not available.

The agricultural frontier is expanding to new high biodiversity areas. Although in the last years there has been a drastic change and the deforestation rate is decreasing in Amazonia following the moratoria on soya, the Brazilian Cerrado, a large wooded savannah in Central Brazil, is experiencing a high rate of deforestation (Sawyer, 2008) with figures between 800.000 and 1.600.000 ha according to different estimates, with consequent loss of biodiversity.

The expansion of sugar cane in recent years has mostly (50%) occurred in the State of Sao Paulo and in the nearby central states of Goias, Mato Grosso and Mato Grosso do Sul. The expansion to these new areas is due to the availability of land at low price and adequate conditions for sugar cane production, first of all adequate topography for mechanized harvesting. In the State of Sao Paulo the expansion of sugar cane has occurred at the expenses of pasture lands and other permanent crops as oranges and coffee and temporary crops as soy and corn (Walter et al., 2011). Forest has not been displaced although part of new forest areas is homogenous-planted forests for industrial purpose as eucalyptus for pulp production. In the mean time also cattle herds have increased in State of Sao Paulo, therefore is difficult to establish a link between sugar cane expansion and ranching displacement to other forest areas as Amazonia where deforestation has occurred. Some studies (Lapola et al. 2010) estimate indirect land use changes that could occur in the future given projected expansion in biofuel demand. Nevertheless they agree that natural resources depletion is favored by weakness of the institutions, including land tenure, and low intensity of livestock production.

In Brazil the process trough that individuals show that they have a solid claim on land is squatting (Binswanger, 1991). The right known as *direito de posse* has been formally recognized since 1850, but goes back to colonial times. This right states that a squatter, or *posseiro,* who lives on unclaimed public land *(terra devoluta)* and has used it 'effectively' for at least one year and one day, has a usufruct right over 100 hectares. If the *posseiro* fulfills the condition of living on and effectively using the land *(cultura efetiva e morada habitual)* for more than five years, he or she has the right to acquire a title. Land can also be acquired by squatting on private land for a time without being challenged by the owner. In lands under federal control, up to 3,000 hectares may be claimed by using the *direito de posse* and the attendant administrative and regulative procedures. In this situation where property rights are insecure, forestlands can be considered as open access resources and deforestation as ownership establishment strategies (Araujo et al., 2009). Farmers choose between alternative land uses – forest exploitation, cattle ranching or agriculture – comparing their relative risk adjusted profitability. The risk of losing property rights in land affects landowners' choices: agents who face a risk of confiscation favor clear-cutting, agricultural land conversion and cattle ranching that yield immediate profits. Moreover, the mobility of livestock makes it easier to protect than fixed assets such as standing forests in case of confiscation episodes. After five years the land is usually sold to soy or palm oil producers. Regulating tenure regimes is the best option to reduce deforestation, assuming that current deforestation is, in large part, occurring at the hands of untenured deforesters who acquire tenure in the process (Cattaneo, 2001). In addiction, Brazil should support low-deforestation livelihoods for forest peoples and smallholder farmers, expand the law-abiding "responsible" fraction of the cattle and soy sectors, improve law enforcement introducing mechanisms for facilitating compliance with the 80% legal reserve obligation, and effectively manage protected areas. Indigenous groups and traditional forest communities have defended their perimeters from incursions by deforesters but have never received compensation for this enforcement service. Smallholder farms (up to 100 ha) established in forested or marginal lands that could shift to low-deforestation production systems. Support within the cattle and soy sectors for declining deforestation could be strengthened by identifying, rewarding, and expanding the pool of "responsible" producers striving to comply with the law and to practice good land stewardship (Nepstad et al., 2009).

6 Conclusions

The Brazilian sugarcane-based industry is going through a phase of deep transformation. New markets are emerging as the sucrose molecule and cane fiber are used in new materials applications besides sugar and fuels. Since the 70's when the Pro-Alcohol program was started the production of sugar cane has increased by eight times, and the total sugars supply by eleven times. Since 2006 the industry is facing consolidation with new actors coming in. Along this path, sustainability has been growing (Goldemberg et al., 2008; Walter et al. 2011)). This study has explained how a combination of industry structure, policy reforms, stricter laws enforcement, and changes in the export market, emerging markets for new products interact in Brazil have contributed to this result and the role played by third party voluntary certification schemes..

Although demand for certified sugarcane is growing, the development of sensitive markets is still not enough developed to widely promote certification. Price premiums are rarely perceived although other benefits as market access, increased portfolios of clients, higher efficiency, are evident. Low enforcement of environmental and labor regulations lowers the opportunity cost of getting certification. Nevertheless is evident that a pull-push action is going on in this direction from the interaction of market forces and public regulations. The EU RED has contributed in advancing this process creating a favorable environment for policy reforms and companies consolidation but it has not delivered its full potential because of two main factors. These are the size of competing market and the limitations derived by the definition of sustainability that is found in the directive. In both case barriers could be removed (i.e. the EU ethanol tariff) in order to open the EU market to imports fostering by this way the development of sustainable biofuel production worldwide and the fulfilling of EU commitments under the Kyoto Protocol at a lower cost. These difficulties reflect the fact that environmental and resource regimes operate at different level of scale and use different forms of knowledge, procedures and policy instruments (Young, 2006).

Balancing growth and sustainability still faces a number of challenges. The expansion of sugar cane areas could increase soil degradation associated with soil erosion and soil compaction. Preventing the deterioration of aquatic systems due to accelerated erosion and to the discharge onto surface waters of vinasse, characterized by high potassium and carbon content, rests on the enforcement of the forest code on riparian areas and of the new legislation created to ban the direct discharge of vinasse (Martinelli et al., 2011).

Increasing economies of scale and land concentration have meant that benefits of sugarcane ethanol production for small land owners have so far been limited and large farmers and industrialists have benefited more from the expansion of the industry (Peskett et al., 2007). Evidence from Brazil indicates that economies of scale in the size of plant used have been vital in bringing operating and capital costs below those of the feedstock and in making ethanol competitive against petroleum fuel. Selections of improved cane varieties (e.g. energy cane) and investment in irrigation have helped to improve yields but the benefits of these have mostly been felt on plantations. Land concentration and subsequent inequality is increasing with expansion of monocropping areas, reduction of sugar mill numbers, growth in foreign investment and land acquisition. The primary threat associated with biofuels is landlessness and resultant deprivation and social upheaval, as has been seen for example with the expansion of the sugarcane industry in Brazil (Worldwatch Institute, 2006; Dufey , 2006). Small farmers face several obstacles in trying to access supply chains. Large-scale and small-scale systems are not mutually exclusive and can interact successfully in a number of different ways. Some of the models for partnership between large-scale and small-scale enterprises include outgrower schemes, cooperatives, marketing associations, service contracts, joint ventures and share-holding by small-scale producers (Mayers and Vermeulen, 2002). Co-operatives operate in certain areas selling to Petrobras though a system of decentralized micro-distilleries (Wilkinson and Herrera, 2010).

Some benefits of certification are intangible as the strengthening of social capital and the improvement of community-cooperative governance structures. In this case study it has emerged certification's role in

generating significant attitudinal change and in creating a learning environment, raising awareness and disseminating knowledge on a holistic sustainability concept. Sustainability certifications do not constitute static system but governing arenas where learning, inclusion and adaptation occurs over time. Capacities of plantation managers and communities are improving due to certification requirements, reflecting on engagement outcomes and adapting practices based on prior learning (Dare et al. 2011). Moreover, efforts in one sector can spread to other commodities or markets as already happened for the Fair Trade certification.

More research is needed to understand which conditions increase the effectiveness of voluntary certification, the distribution of cost and benefits, and positive and negative unintended consequences.

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