

MATCH OR MISMATCH?

Biofuel sustainability standards and local producers' perspectives on sustainable feedstock production

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Abstract

Based on qualitative empirical data obtained in a global survey of Jatropha feedstock producers this research analyses producer perspectives on sustainability issues and action areas. More specifically, we assess in how far Jatropha producers share the understanding of sustainable feedstock production claimed by the Roundtable on Sustainable Biofuels (RSB) development. It can be seen that Jatropha producers' perceptions of relevant issues and fields of action for sustainability do not deviate substantially from the principles and practices suggested by the RSB. Based on our findings, we discuss potential pathways of diffusion of sustainability perceptions. Finally, we reflect on implications for the effectiveness (in terms of uptake by producers) of the RSB in governing towards sustainability.

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1 INTRODUCTION

The demand for biofuels and biofuel feedstock has increased substantially in the last decade. Main drivers for this development are subsidies, policy programs and mandates through which governments around the world have created demand for biofuel feedstock production. Energy security, climate change mitigation, and rural development are among the main reasons for the governmental engagement (Franco et al. 2010). While most of the biofuel consuming countries have also produced feedstock so far, increasing demand is outgrowing domestic capacities especially in developed countries (Lee et al. 2011). More and more often the growing demand is met by ‘outsourcing’ biomass production (Levidow 2012). Some developing country governments recognize the potential of biomass production as a source of income, an opportunity chance for diversifying their economies and attracting foreign investments (Mol 2010; Lee et al. 2011). Therefore they strategically support the development of biomass production (Dauvergne & Neville 2010; Lee et al. 2011). As a result, a “global integrated biofuel network (GIBN)” (Mol 2007, 303) emerged which integrates and allies producers, refiners, buyers, consumers, and financiers from North and South (Fortin 2011). This global market, however, is characterized by a decreasing “governability” (Mol 2007) through the governments that created them.

Much knowledge on detrimental effects of biofuel production is well-established (e.g. Solomon 2010; German et al. 2011; Johnson et al. 2012; Lüdeke-Freund et al. 2012), but global production chains challenge national state capacities and capabilities to safeguard sustainability (Mol 2007). Responding to growing evidence on detrimental effects of biofuel production and facing the governance challenges of a global market, Mol (2010) states, “the EU is arguably the most active, powerful and legitimate ‘state’ environmental authority for developing fair biofuel policies and legitimate regulation”. In the 2009 Renewable Energy Directive (RED) the EU came to rely on so called hybrid governance, i.e. state and non-state governance (Mol 2010; Bailis & Baka 2011) with the potential to show effects beyond its member states: The sustainability criteria provided through RED require proof of compliance by means of certification. To this end, several sustainability standards and certification schemes have been accredited under the EU RED. The EU RED sustainability criteria are therefore sometimes referred to as a meta-standard (van Dam et al. 2010).

In the absence of authority to create legally binding rules and enforce them, effectiveness (i.e. receptiveness or responsiveness) of sustainability standards firstly depends on its credibility and acceptance with its target groups – those actors whose practices and circumstances it aims to change (Cashore 2002; Fung 2003; Black 2008; Mol 2010; Gilbert et al. 2011). However, perceptions of sustainability differ pending on the relevant context, stakeholders involved and their different cultural backgrounds (e.g. Cromwell et al. 2001; Rigby and Càceres 2001; Wallis 2006) contesting acceptance and adoption of standards’ provision (e.g. Black 2008; Boons & Mendoza 2010; Gilbert et al. 2011). Therefore, the question guiding this research is: In how far do *Jatropha* producers share the understanding of sustainable feedstock production claimed by standards and certification schemes?

2 WHY PRODUCER PERSPECTIVES MATTER

Providing for context, this research question is especially (but not exclusively) linked to four more general discussion threads in the area of sustainable development and governance towards sustainability. The first line of discussion deals with inequalities between developed and developing nations, or more pointedly said, a neo-colonial or imperialist dominance of the developed over the developing world. Addressing inequalities between developed and developing countries in formulating rules, some stress the importance of deliberative approaches to provide for a mutual and common understanding, legitimacy and efficacy of the rules (Fung 2003). According to some authors (e.g. Banerjee 2003) any attempt to steer towards a global sustainable development (a fortiori when emerging from developed nation governments, international agencies, and transnational corporations) is not egalitarian for sustainable development discourses cement the legitimacy of markets, of ‘Western made’ knowledge and technology. Instead, they argue, the discourses “must ultimately be rooted in the relationship between specific human populations and specific ecosystems located in specific places” (Gould 2000:12; see also Basu 2001). With view to biofuels, Mol (2007) argues sustainability standards tend to be biased towards the issue awareness of “cosmopolitans (such as climate change) rather than those of the locals” (ibid.: 309). On a related note, some see neoliberal

economics reflected in current environmental governance approaches (Redcliff 2000) as they argue that such approaches consider those areas, products and issues only that can be “transacted through the market” (Banerjee 2003: 173). Under this reasoning, assumptions that sustainable development can be promoted through ecological modernization – greening capitalist markets led by the actions of private market authorities – are explicitly rejected (see also Hollemann 2012).

The dynamics of sustainable global production chains is the central theme of a second related strand. Gereffi’s (2001) commodity chain analysis focuses on international governance structures and the power relationships between actors of a supply chain but is criticized for ignoring the discursive dimension of authority and power as noted by Boons and Mendoza (2010). Addressing the need to integrate a social constructivist approach when looking at sustainable product chains and their governance (see also Koponen 2002, 2009; Boons 2009; Fortin 2011) they assess how notions of sustainability emerge and are shared among actors in bioenergy chains (Boons & Mendoza 2010).

The fact that a standard’s rule-setting and enforcement authority is not directly based on national state sovereignty (e.g. Gilbert et al. 2011) is the point of departure for a third discussion strand that more specifically deals with the legitimacy of these so called private or hybrid governance approaches (e.g. Partzsch 2011). “Legitimacy means social credibility and acceptability” (Black 2008), i.e. that an organizations actions are required and appropriate in a certain social system with shared norms. Derived from democracy theories legitimacy is seen as a normative requirement for this novel form of governance by some authors (e.g. Partzsch 2011; Vogelpohl & Hirschl 2011; Fortin 2011). Others draw on organizational sociology to stress legitimacy as a precondition for efficacy of standards and certification schemes. Palazzo and Scherer (2006), for example, assume that responsiveness to a standard is likely to be influenced by the approach to and extent of deliberations on which standard provisions are based. Cashore and Bernstein (Cashore 2002; Bernstein & Cashore 2007) framework conceptualizes the diffusion and adoption of “non-state market-driven (NSMD)” governance based on three types of legitimacy (pragmatic, moral, cognitive) assuming that a standard’s durability depends on the type of legitimacy granted by its main audience. In biofuel governance in particular, Partzsch (2009) and Vogelpohl and Hirschl (2011) assess the legitimacy of biofuel standards and certification schemes based on a deliberative understanding of legitimacy - that is, they analyze whether, how and which stakeholders have been included in developing sustainability criteria of relevant schemes.

The fourth discussion line focuses on the role of small-holder producers and further issues inherent to the standard and certification schemes themselves. Assessing sustainability certification in tropical agriculture Edwards and Laurance conclude that “current certification schemes select against small-holder producers, because schemes are complex, expensive, and difficult to apply at the scale of just a few hectares” (Edwards & Laurance 2012). Lee and others (2011) confirm this result for biofuel feedstock production in particular and point out the need to understand and integrate the specific circumstances of small-scale producers as their buy-in is critical for truly sustainable biofuel markets.

Although many studies shed light on appropriateness, emergence and scope, as well as implementation effects of attempts to steer towards sustainability of biofuels (e.g. Lewandowski & Faaji 2005; Verdonk 2006; van Dam et al. 2010; German & Schoneveld 2011; Bailis & Baka 2011; Scarlat & Dallemand 2011) the producer perspective is hardly ever addressed. Especially empirical studies on what producers of biofuel feedstock consider sustainability issues in their field of business and how their perceptions are matched by existing governance schemes is scarce (Black 2008; Boons & Mendoza 2010, Gilbert et al. 2011). This research contributes to filling this gap by analyzing sustainability perceptions of *Jatropha* feedstock producers and the congruencies with a sustainability standard and certification system. We analyze qualitative empirical data obtained from interviews of 111 *Jatropha* oilseed producers globally in Mid-2011 (section 2.1) and assess how they match with the principles of the Roundtable on Sustainable Biofuels (RSB), a certification scheme accredited under the EU RED that is widely recognized as a comprehensive and inclusive approach to biofuel sustainability governance (Box 1).

Box 1: The Roundtable on Sustainable Biofuels (RSB)

Initiated in 2007, the RSB is an international, multi-stakeholder initiative that aims at “channeling good intention and solid science into practical and meaningful implementation of standards to the benefit of everyone in the supply chain, user community and global citizen” (RSB 2011a, 1). Hosted by the Swiss Federal Institute of Technology in Lausanne (EPFL), it involved more than 120 member organizations from more than 30 countries over a period of four years in developing a verifiable standard for “socially, environmentally and economically sustainable production of biomass and biofuel” (ibid.) Members are organized as 7 consensus-oriented working groups (the 7th being non-voting): (1) growers of biofuel feedstock; (2) industrial biofuel producers; (3) retailers, blenders, transporters and investors; (4) rights-based NGOs; (5) community organizations; (6) environmental organizations; and (7) governmental organizations, research institutes, and consultants. As a result of the “unprecedented” (ibid.), extensive global consultations 12 principles and criteria (section 3) were established forming the core of the global RSB standard against which chain of custody operations of biofuel can be certified. In July 2011, a (slightly adapted) RSB standards and certification scheme was recognized under the EU RED.

3 METHODOLOGY & DATA COLLECTION

3.1 Data collection and sample characteristics

To establish an overview on the local growers’ practices perspectives a survey was conducted. The worldwide survey is based on interviews in summer 2011 and captures 154 projects dealing with oil-fruit-bearing tree species, mostly *Jatropha* (111). Respondents of the survey were project managers and representatives of large- and small-scale commercial *Jatropha* cultivation projects in which activities ranged from mere trial plantations to nurseries to oil production and further processing (mostly into biofuel). The objective of the survey was to shed light on the current situation and to understand approaches taken to oilseed production based on *Jatropha*. The interviews were based on a standardized questionnaire, including both structured and unstructured questions on a wide range of aspects including agronomic practices and economic parameters. The resulting comprehensive database provides insight into the business of growing *Jatropha* worldwide (for more details see Wahl et al. 2012). The focus of this research paper is an analysis of qualitative data derived from questions on perceptions of relevant issues and fields of action for sustainability. Questions openly asked interviewees which sustainability issues they consider important and which sustainability measures had been taken in their projects.

In total, 94 interviewees provided information for their projects. For reasons of comparability only those projects that produce *Jatropha* and target biofuel markets are considered, which is why 2 respondents of projects that address the cosmetic and soap industry are not. The remaining 92 responses in the sample are mostly from interviewees representing commercial projects (84) and few representing research and development projects (8). The projects surveyed are located in tropical and sub-tropical climate zones of emerging and developing economies in Africa, Latin America and the Caribbean (LAC), and Asia (Table 1). In view of the results presented in the following sections it should therefore be kept in mind that Asian projects are underrepresented in the sample.

Region	# of interviewees
Africa	36
Asia	23
LAC	33
Total	92

Table 1: Distribution of the sample in regions

We distinguish three types of project schemes for organizing commercial *Jatropha* cultivation (FAO 2010). In the first scheme the cultivation sites are managed in public or private ownership operated by the project owners themselves. The second scheme relies on farmers that are contractually linked to a central organization to cultivate the energy crop in cultivation areas, so-called outgrower schemes. The third model is a combination of these two schemes (mixed scheme). Among the *Jatropha* projects surveyed, the most common project scheme is companies operating their own plantations (43 projects), followed by outgrower schemes (36 projects) and the mixed model (11 projects) (Table 2).

Two projects in the sample cannot be matched to a specific scheme as they are research and development projects that don't grow *Jatropha* commercially. The other 6 research projects of the sample conduct their research based on a plantation model.

Project scheme	# of interviewees
Outgrower model	36
Plantation model	43
Mixed model	11
Unknown	2
<i>Total</i>	<i>92</i>

Table 2: Distribution of projects schemes throughout the sample

In this regard, it should be emphasized that the survey was conducted among decision-maker in *Jatropha* projects, i.e. managers of plantations or representatives of outgrowing schemes, but not with small-holder farmers themselves. Perception of sustainability may certainly differ among these groups.

3.2 Method of data analysis

Extensive empirical data from projects interviews exists in form of audio files of the interviews which were transcribed as well as written documents such as emails and PDF-files that were returned by the respondents. The main analysis of matches and mismatches of responses by representatives of *Jatropha* projects and the RSB Principles is based on the open-ended questions on sustainability perception and activities. Our method of data analysis is a qualitative content analysis to withdraw replicable and valid inferences from the files (Krippendorff 1969: 103). To this end, we derived deductive coding categories and sub-categories from the RSB principles and criteria (Mayring 2000) in order to align respondents' statements with the RSB standard. In cases of RSB criteria that contain a high density of further topics we established a third level of coding categories in order to acknowledge relevant specific aspects to allow for a differentiated matching of responses. For example, RSB criterion 5a ("In regions of poverty, the socioeconomic status of local stakeholders impacted by biofuel operations shall be improved") includes several aspects topics such as training and capacity building, biofuel for local communities, shareholding options but also job creation and social benefits to the community. These and further aspects were accounted for in coding categories 5a1 to 5a7 (Table 3).

RSB principles & criteria	RSB #	Coding category	Code #
LEGALITY - Follow all applicable laws & regulations.	1	According to principle	1
PLANNING, MONITORING & CONTINUOUS IMPROVEMENT - Plan, implement & continuously improve sustainability through an open, transparent & consultative impact assessment & management process & an economic viability analysis.	2	Systematic and precautionous sustainability management	2
Undertake an impact assessment process and develop an implementation, mitigation, monitoring and evaluation plan	2a	Conduct environmental impact assessment Conduct social impact assessment Apply environmental management plan Apply social management plan	2a1 2a2 2a3 2a4
Establish Free, Prior & Informed Consent (FPIC)	2b	Apply FPIC, consult & involve stakeholder	2b
Implement a business plan that reflects commitment to long-term economic viability	2c	According to criterion	2c
GHG EMISSIONS - Contribute to climate change mitigation by significantly reducing lifecycle GHG emissions as compared to fossil fuels.	3	According to principle (including generation of carbon credits)	3
Comply with relevant GHG legislative policy or regulations	3a	According to criterion Calculate GHG emissions	3a 3b1
Calculate GHG emissions using RSB calculation methodology	3b	Reduce/avoid GHG emissions from LUC Reduce GHG emission through use of co-products, residues & wastes	3b2 3b3
HUMAN & LABOUR RIGHTS – Do not violate human rights or labor rights, promote decent work & workers' well-being.	4	According to principle	4
Ensure workers' freedom of association, right to organize, and to collectively bargain	4a	According to criterion	4a
No slave labor or forced labor shall occur	4b	According to criterion	4b
No child labor shall occur (except on family farms and then only when schooling not and/or health are not at risk)	4c	According to criterion	4c
No discrimination of any kind shall occur	4d	According to criterion	4d
Respect all applicable laws regarding wages and working conditions	4e	Compliance with laws & conventions Fair wages Overtime should be voluntary and paid Provided housing should be in good sanitary conditions	4e1 4e2 4e3 4e4
Conditions of occupational safety and health shall follow internationally recognized standards	4f	According to criterion	4f
Implement mechanisms to ensure human rights and labor rights when labor is contracted through third parties	4g	According to criterion	4g
RURAL & SOCIAL DEVELOPMENT - In regions of poverty, contribute to the social and economic development of local, rural & indigenous people & communities.	5	According to principle (including local/regional income generation)	5
Improve socio-economic status of local stakeholders	5a	Socio-economic impact analysis & management plan Create jobs Provide training and capacity building Establish governance structures for empowerment Support local use of bioenergy to provide modern energy services Build structures promoting ownership (e.g. shareholding, joint ventures) Provide social benefits for the local community	5a1 5a2 5a3 5a4 5a5 5a6 5a7

Undertake special measures for participation of women, youth, indigenous communities and the vulnerable in operations in regions of poverty	5b	Apply cultural sensitivity and respect	5a8
		According to criterion	5b
LOCAL FOOD SECURITY - Ensure the human right to adequate food & improve food security in food insecure regions.	6	According to principle	6
Undertake food security risk assessment & mitigation of negative impacts	6a	According to criterion	6a
Enhance the local food security of the directly affected stakeholders	6b	According to criterion	6b
CONSERVATION - Avoid negative impacts on biodiversity, ecosystems & conservation values.	7	According to principle (including agricultural diversity)	7
		Conservation impact assessment	7a1
Maintain and enhance conservation values	7a	Low-risk areas (including use of marginal/degraded land)	7a2
		No use of "no-go-areas" (including deforestation)	7a3
Maintain or enhance ecosystem functions	7b	According to criterion (including afforestation & reforestation)	7b
Protect, restore or create buffer zones	7c	According to criterion	7c
Protect or restore corridors	7d	According to criterion	7d
Prevent invasive species from invading areas	7e	According to criterion	7e
SOIL - Implement practices that seek to reverse soil degradation and/or maintain soil health.	8	According to principle	8
		Minimize soil erosion	8a1
Implement practices to maintain or enhance soil conditions	8a	Maintain/enhance soil organic matter	8a2
WATER - Maintain or enhance the quality and quantity of surface & ground water resources & respect water rights.	9	According to principle	9
Respect the existing water rights	9a	According to criterion	9a
Include a water management plan	9b	According to criterion	9b
		Do not deplete water quantity	9c1
Do not contribute to the depletion of surface or groundwater resources	9c	Avoid production in freshwater stressed areas	9c2
Contribute to the enhancement of the quality of water resources	9d	According to criterion	9d
AIR - Minimize air pollution along the supply chain.	10	According to principle	10
Identify and minimize air pollution emission sources	10a	According to criterion	10a
Avoid or eliminate open-air burning of residues, wastes or by-products	10b	According to criterion	10b
USE OF TECHNOLOGY - Use technologies to maximize production efficiency & social & environmental performance & minimize the risk of damages to the environment and people.	11	According to principle	11
Provide information on the use of technologies	11a	According to criterion	11a
Minimize the risk of damages of technologies on environment and people	11b	According to criterion	11b
Use genetically modified or any micro-organisms cautiously	11c	According to criterion	11c
Good practices for storage, handling and disposal of biofuels and chemicals	11d	According to criterion (including use of agricultural inputs)	11d
Use of waste and by-products without damaging the environment	11e	According to criterion (including use of press cake and other residues)	11e
LAND RIGHTS - Respect land rights & land use rights.	12	According to principle	12
Assess and document land rights and land use rights	12a	Assessment & doc. of land-use rights	12a1
		Land under legitimate dispute	12a2
Ensure that FPIC is the basis for all negotiated agreements	12b	According to criterion	12b

Table 3: RSB principles and criteria (RSB 2011b) and deduced coding categories and codes

In accordance with Mayring (2000) a coding agenda provided explicit definitions, examples and coding rules for each deductive category. This agenda was adjusted and specified after coding the first 15 interviews. Reliability and validity of the analysis is also safeguarded through intercoder agreement (Tinsley & Weiss 2000), as two coders evaluated and coded the documents independently and reached consensus in cases of disagreement. Interviewer biases were accounted for by not evaluating those parts of the responses on sustainability issues that were explicitly brought up or readdressed by the interviewer.

4 FINDINGS

In this chapter we present the findings of our analyses of perceptions of relevant issues and fields of action for sustainability. Four interviewees stated that what they do is per se sustainable. In cases, in which such statements were not further justified, e.g. through referring to afforestation on marginal lands or the generation of income for farmers, such statements were not considered in this analysis. For the same reasons, very general statements such as “environmental” or “social sustainability” were not included either. One out of the 92 responses in the sample was considered invalid and therefore excluded as whole. Moreover, 5 interviewees (3 from an African, 1 from an Asian and 1 from an LAC project) answered by referring to compliance with the RSB standard or to the fact that their projects were in the process of acquiring RSB certification. Consequently we assume that to them all RSB principles represent important sustainability issues. To avoid distortion such responses are excluded from the following presentation of findings. Therefore, in the following section we present findings from the qualitative analysis of the remaining 86 responses (for consolidated results see Table 4).

4.1 Matches of producer perspectives with RSB principles and criteria

By far most often, interviewees mention aspects that are in accordance with criteria under the 5th RSB principle (*Rural and Social Development*) as 86% (or 74 respondents) referred to aspects matching at least one criterion under this principle. Differences across regions are noticeable, but overall consistent (Fig. 1): The sample of African project interviewees is predominant with 94% of respondents (31) referring to this aspect. Nevertheless, interviewees from LAC and Asian projects with 87% (27 respondents) and 73% (16 respondents) also extraordinarily stressed this aspect. Remarkably, 16 interviewees from outgrowing systems (46% of all respondents from outgrowing systems) compared to 12 from plantation systems (32% of all respondents from plantation systems) and two from mixed models (18% of all respondents from mixed plantations) referred to rural and social development or aspects thereof (Fig. 2). Zooming in on specific issues which interviewees referred to, out of 10 most frequently referred to criteria (Fig. 3) 5 are aspects that the RSB standard attributes to rural and social development. Out of 48 responses coded 5, an overwhelming majority of 30 statements (such as “rising income generated” and “increase local small farmers’ gain”) referred specifically to income generation. Also, training and capacity building was mentioned very frequently (27 overall), mostly by representatives of projects in Africa and the LAC region, followed by the issue of support for farmers through governance structures (19), and job creation (17). The second RSB criterion under principle 5 - participation of women, youth, indigenous communities and the vulnerable - was brought up by 14 respondents, mostly by such that work in projects in LAC.

Trailing a long way behind is the group of the second, third and fourth most common referred to issues globally which could be matched with RSB principles and criteria on *Conservation* (48%), *Food Security* (43%) and *Planning, Monitoring and Continuous Improvement* (37%).

	Overall	Africa	Asia	LAC	Mixed Model	Outgrow. Model	Plantation Model	Unknown
Principle 1	3%	6%	0%	3%	0%	0%	8%	0%
Principle 2	37%	48%	27%	32%	45%	34%	39%	0%
Principle 3	23%	30%	23%	16%	36%	26%	18%	0%
Principle 4	20%	21%	14%	23%	0%	17%	29%	0%
Principle 5	86%	94%	73%	87%	91%	89%	87%	0%
Principle 6	43%	55%	14%	52%	64%	49%	34%	0%
Principle 7	48%	52%	41%	42%	45%	57%	42%	0%
Principle 8	17%	21%	27%	8%	27%	26%	8%	0%
Principle 9	12%	15%	18%	16%	0%	11%	16%	0%
Principle 10	5%	6%	9%	5%	0%	6%	5%	0%
Principle 11	33%	33%	36%	29%	27%	37%	29%	50%
Principle 12	7%	12%	5%	3%	0%	6%	11%	0%
Responses	86	33	22	31	11	35	38	2

Table 4: Overview of responses matching RSB principles (in percent of interviewees according to regions and according to project schemes)

Under principle 7 the RSB standard stresses some of the most debated issues regarding conservation, such as the protection of so-called “no-go-areas” and the maintenance or enhancement of directly affected ecosystem functions (Table 3). With 41 out of 86 interviewees, this issue area is the second most common, relatively equally distributed among project schemes and regions. Eleven responses related to conservation or biodiversity in general. The non-use of “no-go-areas” was the most often matched subcategory here, referred to by 15 interviewees (Fig. 2) of which 10 are affiliated with outgrowing schemes. Most of them referred to forests in particular. Out of 13 responses that referred to *Jatropha* cultivation as afforestation (coded 7b) 9 represented projects in LAC. Responses of 9 interviewees who indicated use of degraded or marginal land for their *Jatropha* projects were coded 7, more specifically 7a as this kind of land is often viewed as bearing low risks of negatively affecting conservation values. Furthermore, 7 responses that emphasized sustainability of agroforestry systems and agricultural diversity were also regarded as matching RSB principle 7 in general. Four interviewees stressed the need for or have conducted an impact assessment in this issue area.

Matches with RSB principle 6 (*Local Food Security*) were found in responses of 37 interviewees. Interestingly, projects respondents from Africa (18) and the LAC (16) region referred to this issue far more often than respondents from Asia (3). With 64%, more representatives from mixed models are in line with this principle than such from outgrowing (49%) and plantation schemes (34%) (Fig. 2). Far more interviewees (15) referred to (the importance of) enhancing food security than conducting an assessment of this issue (2). In terms of enhancing or maintaining food security, almost all of the respondents supplemented that intercropping or side cropping systems with food crops does this. In particular African project representatives relate to food security and measures of safeguarding it: 24% of all African project representatives compared to 5% of all Asian and 19% of LAC projects representatives indicated food security. In terms of projects schemes, interviewees from mixed models are specifically concerned about food security and intercropping (45% of all mixed models).

The second RSB principle (*Planning, Monitoring and Continuous Improvement*) aims at a precautionary and systematic management of sustainability. This principle was coded if (the need for) a strategic and systematic management approach to manage sustainability of their operations was brought up by interviewees (including references to “sustainability guidelines, documents and manuals” or a “policy document about sustainability”). Out of 86 interviewees 32 agree that there is a need to systematically sustainability in their operations. For the sample of African project interviewees with 48% this result was more pronounced than for representatives from LAC and Asian contexts (Fig. 1). Eleven interviewees, of whom 6 represented own plantation systems, 3 outgrowing and 2 mixed models, stressed especially the need for environmental impact assessments. Remarkably, foremost interviewees from African projects referred to environmental impact assessments (6). Four projects

referred to external sustainability assessments: Two project representatives (from an Indian and an Ethiopian project) reported participation in the GIIRS (Global Impact Investing Rating System), a voluntary rating system that assesses the impact of companies regarding the social and environmental performance. Two projects from Ghana comply with provisions of the national Environmental Protection Agency (EPA). Ten respondents also explicitly mentioned the criterion stakeholder consultation and involvement as an important sustainability issue and were therefore considered matching criterion 2b (Fig. 3).

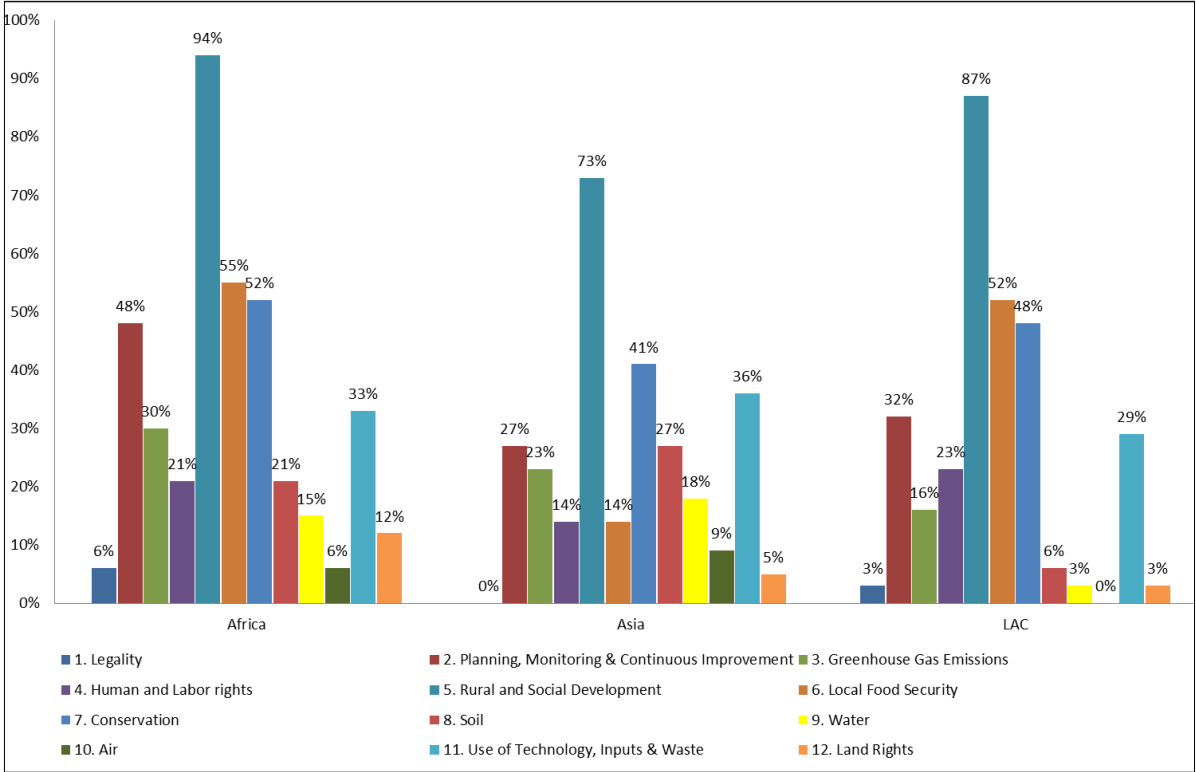


Figure 1: Matches of interviewee responses and RSB principles in percent of interviewees per region (n=86 responses; Africa n=33; Asia n=22; LAC n=31)

Closely following on the 5th rank of mentioned and matching issue groups overall (33% or 28 interviewees) are aspects regarding input management and the use of residues and by-products. They are considered matching with RSB criteria 11d and 11e. Responses of 11 interviewees were classified as matching principle 11 (*Use of Technology, Inputs and Management of Waste*) in general. Inter alia, uses of for example renewable energy technologies on site or reduction of energy-use were coded under this general category. Eighteen interviewees more specifically mentioned the use of inputs (Fig. 3). Such statements typically underlined the importance of applying less chemical inputs, using organic input (11d), and in particular applying *Jatropha* press cake as fertilizer (11e). We note that of the 18 interviewees who referred to a cautious use of inputs, 13 work in outgrower schemes or in mixed models with outgrower and only 5 in pure plantation projects.

Aspects regarding GHG emissions (RSB principle 3) were referred to by 20 out of 86 project representatives that emphasized the need to sequester carbon, to not clear land with high carbon stocks for plantations or to produce *Jatropha* in a carbon neutral way. Among representatives of African projects, reducing GHG emissions was more commonly regarded an important sustainability issue than in the other regions (30% of all African project representatives compared to 16 and 26% of all projects in the LAC region and Asia). One African project referred to carbon credits.

Overall, 17 out of 82 interviewees referred to aspects that relate to human and labor rights and therefore match RSB principle 4. It is remarkable, however, that with 14%, representatives from Asian projects are underrepresented in this group compared to 20 to 23% of African and LAC project representatives who referred to such issues. Those interviewees working in plantation schemes

addressed human and labor rights aspects more frequently (11) than those working in outgrowing systems (6) or mixed models (0). The most commonly referred to aspect here is fair wages (n=11) which matches RSB criterion 4e (we considered responses indicating “above market pay” and “higher wages than usual” to match this criterion).

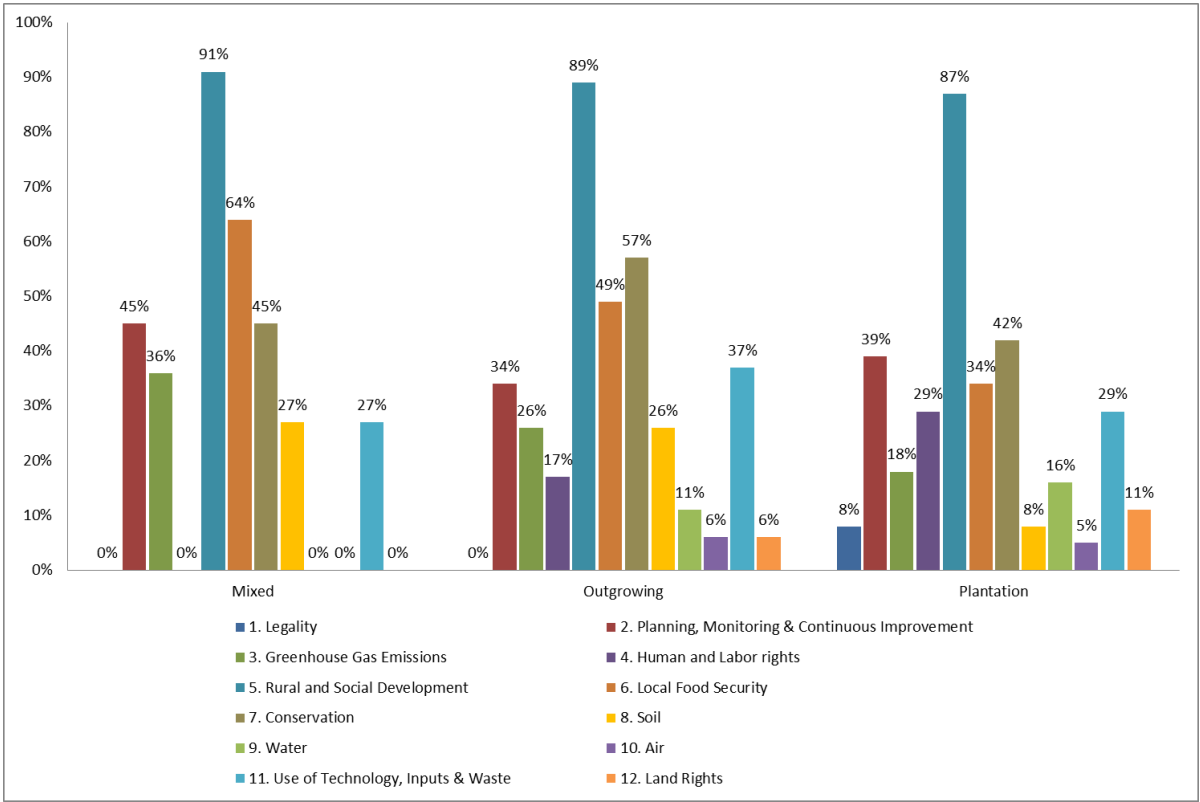


Figure 2: Matches of interviewee responses and RSB principles in percent of interviewees per project schemes represented (n=84 responses; mixed models n=11; outgrowing models n=25; plantation models n=38; 2 projects of unknown project schemes are excluded in this figure)

Five issue groups that are also considered matching the RSB standard were mentioned by less than 20% of interviewees overall: *Soil* (17%), *Water* (12%), *Land Rights* (7%), *Air* (5%) and *Legality* (3%). All in all, 15 interviewees answering on behalf of a total of 86 projects provided responses that were classified referring to soil issues, mostly interviewees from African and Asian projects (21 and 26% respectively, compared to 6% of projects from LAC). Interviewees from plantation schemes are the least worried about soil issues (6% compared to 26 and 27% from the other two schemes). The majority of the responses (13) underlined the need for enhancing soil organic matter, mostly through applying press cake (the physical residue of Jatropha oil pressing), decomposing leaves and branches or manure. Preventing soil erosion was named in 4 responses.

Overall, 10 interviewees addressed water issues. Four responses referred to water as an issue area in general, 5 referred to the need to safeguard water quantity and 2 to water quality. Interestingly, only one interviewee representing a project in LAC was among them compared to 5 (of 33) interviewees from African projects and 5 (of 22) interviewees from Asian projects. One interviewee said his project had a water management plan in place.

Issues regarding land rights (RSB principle 12) were hardly referred to – only 7% or six interviewees referred to the notion of respecting land rights or land rights at all. A representative of a project that was in preparation at the time of the interview specifically underlined the need to assess land rights issues prior to plantation establishment.

Still, less interviewee responses (4) related to issues of air pollution (principle 10). Two referred to air pollution in general, and 2 explicitly named open air burning as a practice that the projects attempts to circumvent with their outgrowing farmers in Africa and Asia.

Representing the least common issue and match, (the importance of) compliance with local environmental and labor regulations and health and safety legislation is indicated by 3 interviewees – which thereby support RSB principle 1 on legality (Table 3).

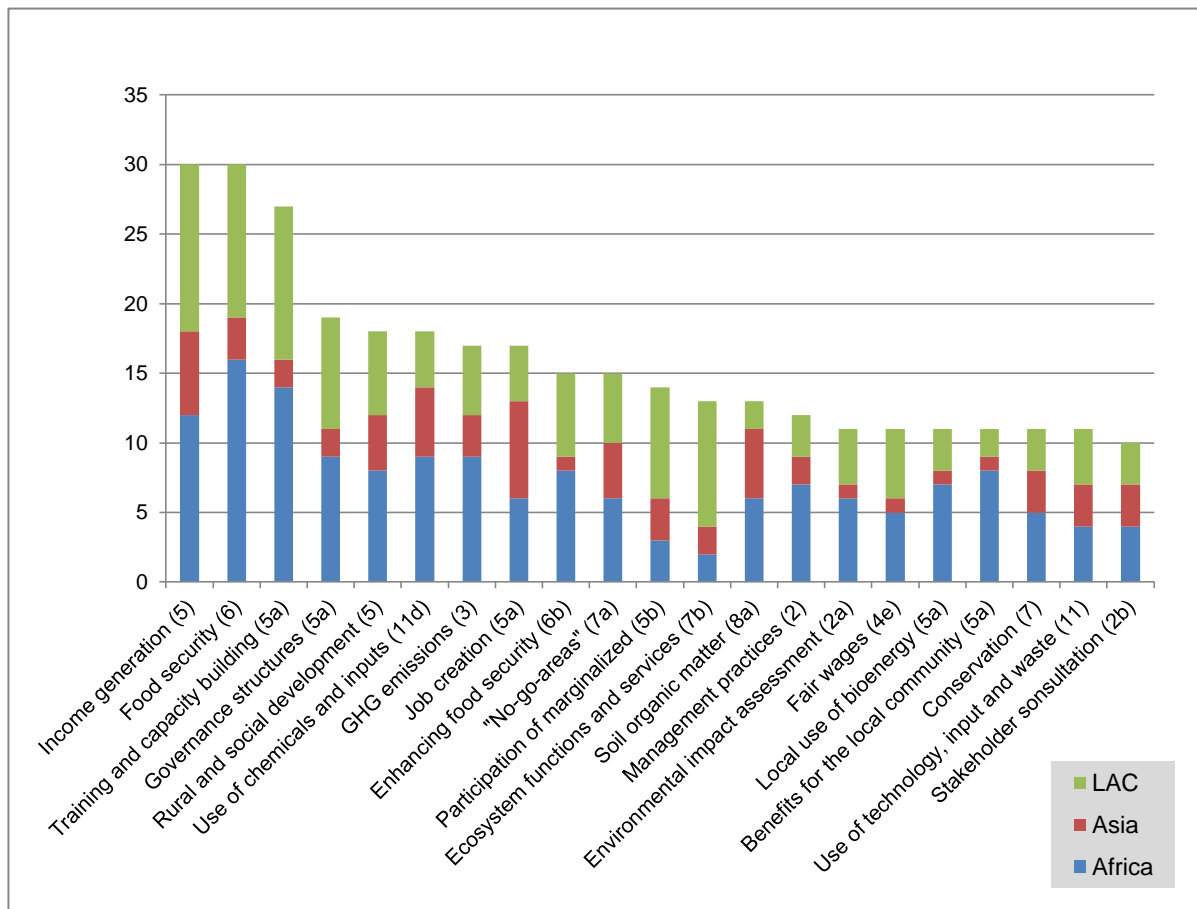


Figure 3: Ranking of single sustainability aspects that match RSB principles and distribution in regions (criteria are included if $n \geq 10$).

All in all, all RSB principles are represented in interviewee responses. However, on the level of criteria, some sub-categories have not been coded once. The following table lists 13 criteria that interviewee responses could not be associated with.

Criterion	Definition
3a	Operations shall comply with legislative biofuel policy or regulations in force regarding GHG reduction requirements
4b	No slave labor or forced labor shall occur
4d	Workers shall be free of discrimination of any kind, whether in employment or opportunity, with respect to gender, wages, working conditions, and social benefits
4g	Operators shall implement a mechanism to ensure the human rights and labor rights outlined in this principle apply equally when labor is contracted through third parties
7c	Biofuel operations shall protect, restore or create buffer zones.
7d	Ecological corridors shall be protected, restored or created
7e	Operators shall prevent invasive species from invading areas outside the operation site
9a	Biofuel operations shall respect the existing water rights of local and indigenous communities

10a	Air pollution emission sources from biofuel operations shall be identified, and air pollutant emissions minimized through an air management plan
11a	Information on the use of technologies in biofuel operations shall be fully available
11b	The technologies used in biofuel operations shall minimize the risk of damages to environment and people, and improve environmental and/or social performance over the long term
11c	Micro-organisms used in biofuel operations which may represent a risk to the environment or people shall be adequately contained
12b	Existing land rights and land use rights shall be assessed, documented, and established. The right to use land for biofuel operations shall be established only when these rights are determined.

Table 5: RSB criteria (RSB 2011b) not found matching with interviewee responses

4.2 Mismatches

In total, 43 interviewees have provided responses that were at least partly classified as non-matching with the RSB standard. Based on an inductive approach we were able to identify 5 main categories of non-matching sustainability issues which interviewees regard as important in their field of business (Table 5). Most commonly, 16 interviewees mentioned the issue of economic viability. Closely related but often mentioned in a distinct manner, 11 interviewees emphasized the importance of financial stability and especially investment funding. Ten project representatives stressed the importance of governmental support for feedstock producers or the sector as a whole, often they felt that economic viability and especially competitiveness to fossil fuel sectors depended on it. Another 9 interviewees referred to the sustainability of the end product - bioenergy as substitutes for fossil fuel energy. Lastly, the need for further research and technology was regarded an important sustainability aspect by 4 interviewees.

NO-MATCH CATEGORIES	EXAMPLES OF INTERVIEWEE STATEMENTS
Economic viability	"To achieve good pricing for products and services" "Increase of productivity and decrease of costs" "The value chain development is the biggest sustainability issue for us"
Production of renewable energy itself ("fuel switch")	"Providing sustainable fuels" "Substitute for fossil energies" "Less need to produce charcoal/ fuel wood through provision of biogas"
Governmental support	"If we don't get governmental subsidy or concession, it is very difficult to comply." "Support to producers (financing, lower taxes)" "Subsidized price of petro diesel"
Investment & financial stability	"We still need to find owners, investors" "It is important to have funding for at least 3 years for at least 3000 hectares" "Projects have to be financially stable"
Research & technology	"Enhancing the researching investment" "Research and technology" "Increased R&D on bioenergy"

Table 6: Five categories of non-matching interviewee statements and examples

Further single responses related to issues such as a lack of infrastructure, the need to explain to outgrowing farmers the implications and realistic prospects of growing *Jatropha*, the possibility of decreasing a national dependency on fossil fuel imports and the surveillance of animal welfare. Interestingly, a very critically debated issue in the biofuels arena, indirect land use change (e.g. Searchinger 2008; van Dam et al. 2010), was addressed explicitly only by one respondent: "We evaluate farmers, we're understanding where they will be planting *Jatropha*, we're understanding what level of food production they have, what land area they already have and that gives us a perspective as to whether you're doing anything to push other crops [than *Jatropha*] into other areas".

4 DISCUSSION

Researchers regard the RSB as a legitimate (Partzsch 2011; Vogelpohl & Hirschl 2011) as well as very comprehensive and profound scheme (Fortin 2011) among the biofuel certification systems recognized under the EU RED. Overall, our results indicate that *Jatropha* producers to a

large part share the understanding of sustainable feedstock production, which is promoted through the RSB standard. Of the 86 interviewees in our survey, most answers given could be matched with 2 RSB principles or aspects thereof (21 answers) and 17 answers agreed with 3 RSB principles in general. The number drops rapidly after matches with 5 principles: Only 9 interviewees mention aspects that match 6 to 8 principles. No interviewee provided a response that matched more than 8 out of the 12 RSB principles. With view to contents, most aspects as stated by interviewees were found matching principles or criteria of the RSB, only few aspects were found not matching any principle, and of the 49 principles and criteria 13 could not be matched with any of the response.

Nevertheless, there is a very distinct weighing of important aspects among *Jatropha* producers. Especially, the overall pronouncement of the aspect *rural and social development* in our sample is striking. Not only is this most commonly referred to aspect in general, but also it is remarkable that no other aspect has received as much and as detailed attention, also on the level of sub-aspects. Looking into the development and social aspects addressed under this category more closely, income generation was named most frequently and mainly in outgrowing systems; followed by training and capacity building which respondents emphasized especially in Africa and LAC and sometimes conduct in cooperation with international organizations. Also, governance structures supporting smallholders were frequently mentioned, for example: "We are using a model (based on Grameen Bank) where the biodiesel producers eventually will be a for-profit company but the growers will own a minority share in this for-profit company". Creating employment was an especially often referred to aspect among representatives of Asian projects. Interestingly, the majority of responses recognized under the much less common category of *human and labor rights* (RSB principle 4) referred to fair wages while other aspects such child labor and freedom of association fall behind and some are not referred to at all. This once again underlines the strong emphasis of socio-economic aspects in our sample of *Jatropha* project representatives. On a related note, some respondents referred to trade-offs:

"To grow on marginal land is also important, but if you don't achieve a good yield and you have to lay people off then you have to ask yourself what is more important to you, social or environmental sustainability?"

At the same time, however, social or socio-economic impact assessments and management plans are much less popular compared to environmental impact assessments. In the socio-economic dimension, direct and indirect competition with food production and impacts on food prices are among the globally most critically debated issues regarding biofuels production (German et al. 2011). *Jatropha* as feedstock for bioenergy in particular has been promoted as one that does not compete with food production and can actually contribute to food security if cultivated as side crop for example (Achten et al. 2009; FAO 2010). Therefore, it appears unsurprising that food security is the third most commonly referred to aspect among interviewees (foremost in outgrowing schemes and mixed schemes) and that it was often linked to concrete measures of enhancing food security, such as intercropping. Several interviewees reported to have strict guidelines of only including outgrowers into the system that keep on planting food crops in intercropping systems with *Jatropha*. Indirect effects on food security, however, have been addressed only once.

With view to land rights, however, we find our results in stark contrast to an internationally persistent debate on land grabbing that can also be tracked back to *Jatropha* production (Friends of the Earth 2010): Six interviewees referred to land rights (mostly representatives from plantation schemes) and none to an assessment thereof. One plausible explanation of this result might be that represented in our sample are 35 outgrowing schemes, which usually rely on farmers that usually work on their own land and therefore do not consider land or water rights as an important issue in their operations.

Almost half of the respondents *Jatropha* producers regard aspects of conservation as important for sustainable *Jatropha* production (especially so in outgrowing schemes). To maintain biodiversity was another often stated ambition among interviewees, whereby it seems that the word was more often used as a catchphrase than connected to explicit aspects or measures. In contrast to the aspect of rural and social development not many different matches to sub-aspects could be found. RSB criteria

that require to establishing buffer zones and ecological corridors, and to prevent invasive species found no match at all. Those matches found are based on very similar statements: The RSB criterion that protects ecological no-go-areas is a common match in our sample; here, almost all responses point to the issue of deforestation or the use of degraded land. Similarly, relatively frequent mentioning of afforestation and reforestation (especially by representatives of outgrowing models and LAC projects) is the reason for a common match with the RSB principle that provides for enhancement or maintenance of ecosystems. Matched with RSB principle 11 on *use of technology, inputs and management of waste*, lower chemical inputs and use of press cake for fertilization represent related issues named by every third respondent, especially from outgrowing schemes. Many respondents referred to these aspects as good agricultural practices. For outgrowing models in particular the use of press cake furthermore is not only an environmentally but also an economically advantageous alternative, as buying chemical inputs will usually be more costly. Although there has been growing concern about impacts on the availability of resources such as land and water since the Renewable Energy Directive was enforced in 2009 (Diaz-Chavez 2011). Such concerns cannot be reflected in our survey results. The comparatively low awareness regarding aspects of soil and water is even more striking considering the common naming of conservation issues but also the specific requirements of growing *Jatropha*: *Jatropha* fruit production is positively correlated with the availability of water (Jongschaap et al. 2007). While it can adapt to marginal land – which is why it has been often portrayed as hardy plant - soil fertility are critical for economically viable yields (Wahl et al. 2012). With view to soil, though, the relatively high emphasis on a sustainable input management implicitly also relates to maintaining or enhancing the quality of soil. This is supported by the fact that the sub-category of enhancing soil organic matter (mostly through applying press cake or manure) takes rank 13 among the 21 single aspects that have been mentioned by more than 10 interviewees.

Contributing to GHG emissions reductions in biofuel lifecycles is both, a central objective of biofuel promotion policies (EC 2009) and one of the most critical globally discussed issues of biofuel production (e.g. Achten & Verchot 2011). Based on expressions used by interviewees, however, we find that awareness for this issue (RSB principle 3) in our sample is comparatively low. On the other hand, from interviewee statements that declare *Jatropha* or bioenergy production being per se sustainable and from those that see their contribution to biofuel development as an alternative to fossil fuel as an important sustainability aspect in itself (see section 3.2) it could be assumed that *Jatropha* producers in the biofuel business find the contribution to reducing GHG emissions perfectly obvious.

Amongst the sustainability issues named by interviewees but that could not be matched with the RSB standard, 2 out of the 4 aspects found address rather conditions than sustainability criteria: the need for consistent governmental or policy support as well as research and technology advances. These conditions might be prerequisites that favor sustainable feedstock production, especially if based on a novel crop such as *Jatropha*. Such factors belong to the broader context settings and framework, which by definition is not targeted by sustainability standards and certification schemes. With economic viability and financial stability, however, about a third of interviewees address aspects that form the basis for any commercial operations – contributing to sustainable development or not. Directions of interviewee statements did not allow categorizing them under RSB criterion 2c, which requires a business plan that shows commitment to long-term viability of operations, though most of the named measures would be assumed to be included in such a business plan. Nevertheless, against the backdrop of a still emerging biofuel market, in which *Jatropha*-based businesses experienced a downfall around 2008 (Wahl et al. 2012), and given its ambition to promote social and rural development through this market, the question arises whether the standard should not pay more attention to the aspect of economic resilience.

The varying degrees of awareness for sustainability issues and the distinct ranking of such in our sample leaves us to ask which factors influence the awareness of sustainability issues, and also which factors influence whether producers enact on their perception and how? Our findings on the aspects of GHG emissions especially support those of Boons & Mendoza (2010): While sustainability standards

and criteria developed by consuming actors in biofuel markets apparently have effects on the sustainability definitions in producing countries, they are not effective to the extent of “internationalization” (Boons & Mendoza 2010, 1694). The understanding of the different beneficiaries and drivers behind the different sustainability aspects offers a complementary explanation that is for most issue is also applicable to our results in particularly with regard to social and socio-economic aspects (Diaz-Chavez 2011; Mol 2007): “The global benefit of a biofuel produced in a sustainable form responds to the objective to reduce GHG emissions in order to reduce climate change impacts while at regional and local levels the objectives may differ from a better use of ecosystem services and improved livelihoods and social benefits” (Diaz-Chavez 2011, 5765).

Some interviewees explicitly addressed a divide between local understandings of sustainability and the ‘Western’ perspective. One project representative furthermore pointed at the importance of local ownership:

“The definition of sustainability is the first question I would normally ask. Because if you would ask an African person ‘what is sustainability’ and after that you ask a Western person ‘what is sustainability’ you get two different definitions. [...] If we could set up what is really driven by African people, in the African way that makes sense in the environment, than sustainability would be promoted substantially.”

Exploring the dynamics of how definitions and practices of sustainability become shared along buyer-driven biofuel chains, Boons and Mendoza (2010) find that in such chains a predominantly economic producer motivation supports the adaptation of sustainability definitions and practices required by international buyers. This is especially true for big-holders which are connected to international markets and which expect that higher prices are paid for sustainable products. “Their definitions of sustainability can be generally characterized as achieving ecological value through aiming for economic value” (ibid., 1694), for small-holders in rural areas “the connection to their land can act as a motive to preserve local ecosystem functions” (ibid.). In our context, in which *Jatropha* is promoted as a bioenergy plant with potential for pro-poor development (Achten et al. 2009; FAO 2010; Romijn & Caniëls 2011), it is reasonable to also consider the role of international and development cooperation on the perception of sustainability issues and on taking measures for safeguarding sustainability. Their role can be assumed to be especially strong in African projects and in outgrowing models. The strong emphasis on systematic and precautionary management of sustainability (RSB principle 2) - foremost environmental impact assessments and stakeholder consultation – supports this assumption. Obviously, the general tenor of early *Jatropha* debates and the advantages discussed are also very likely to influence perceptions as reflected in the fact that every tenth interviewee found her or his project’s involvement with *Jatropha* or the bioenergy sector per se contributes to sustainability. Especially the commonly addressed pro-poor development aspects, the intercropping with food crops to safeguard food security as well as the emphasis on afforestation work mirror much debated potential benefits of *Jatropha* as biofuel feedstock (Achten et al. 2009; FAO 2010).

The weighing of relevant sustainability issues and fields of actions by interviewees in our survey is particularly remarkable in light of the policy objectives and sustainability schemes promoted by the European Commission (EC). Not a single interviewee mentions the need to comply with legislative biofuel policy or regulations regarding GHG reductions. The EU-RED mandatory sustainability meta-standard has its focus on reducing GHG emissions and preventing the use of land recognized as high in biodiversity and carbon stocks and peat land. Whereas, socio-economic biofuel production effects such land use changes, commodity prices and impacts on food security are merely monitored by the EC (EC 2009). However, among the schemes recognized under the EU RED, the RSB is regarded the most profound and extensive with view to social criteria included (Vogelpohl & Hirschl 2011). This is attributed to its inclusive approach in which the RSB proactively aimed at including not only those who are involved in biofuel production but also those who are only affected but often excluded from such consultations (Fortin 2011, 9), and which in turn makes it a legitimate approach to governing towards sustainability. Given the predominant role issues of socio-economic and rural development play among respondents in our sample, the RSB therefore has the potential to be regarded as a particularly appropriate scheme by producers.

“The Roundtable on Sustainable Biofuels (RSB) represents a global institution that, through a process of deliberation and consensus decision-making according to its own governance structure, has incorporated particular forms of knowledge into standards against which production processes will be measured and validated. Such an institution has potentially far-reaching power and authority [...] but it will also contribute to new networks of actors, understandings and framings of knowledge and, in turn, new power relation.” (Fortin 2011, 9)

An Indian project representative asked: “Who will give sustainability significance?” Indeed, the global standard has received positive recognition from researchers, policy makers, civil society organizations and practitioners (e.g. Vogelpohl & Hirschl 2011; RSB 2013). Whether or not it will be taken up by producers themselves depends on number of factors besides the acceptance with the criteria provided through the standard system - such as target markets, customer demands and not least costs of implementation (Boons & Mendoza 2010; Lee et al. 2011; Edwards & Laurance 2012). As stated earlier, 5 project representatives referred directly to the RSB or stated that they are in the process of achieving an RSB certification, but not one project referred to any other existing sustainability standard in this context. Today, however, only 3 biofuel operators are RSB-certified (to be seen online from <http://rsbervices.org/certificates/>) – one of which produce *Jatropha* - compared to much faster growing uptake of other biofuels schemes such as the International Sustainability and Carbon Certification (ISCC) (ISCC 2012).

5 CONCLUSION

The RSB has the potential to be regarded adequate and legitimate standard to sustainability of biofuel feedstock production by a wide range of producers – working in different parts of the world and on different scales. Certification schemes such as the RSB might contribute to paving the way towards the sustainable production of feedstock. Nevertheless, they are limited in terms of what broader sustainability issues can be accounted for especially for the environment and the local population (Diaz-Chavez 2011). It is important to involve the different stakeholders but difficult to harmonize their different interests, as becomes evident in issues of GHG emission reductions and indirect land use change. Whether or not the RSB has the potential attributed to him will also depend on other factors such as feasibility and costs. It remains to be seen its inclusiveness and the resulting comprehensiveness and complexity will be in its way of being effective. Ironically, especially small-scale producers, a critical target group of the RSB, might be overwhelmed with the range of criteria to be implemented and indicators to account for. In the still evolving biofuel sustainability governance which is marked by an upfront reliance on standards researchers may find valuable insight on the role of legitimacy versus costs and markets in such arenas of non-state market-driven or hybrid governance.

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