Global Assessment of Biomass and Bioproduct Impacts
on Socio-economics and Sustainability

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Socio-economic indicators identified by case studies

Evaluation of measurable socio-economic units and suggestions for future work

WP 2.4 & 3.5; D2.6 & D3.3

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Preface

This report was elaborated in the framework of the Global-Bio-Pact project (Global Assessment of Biomass and Bioproduct Impacts on Socio-economics and Sustainability) which is supported by the European Commission in the Seventh Framework Programme for Research (FP7). Global-Bio-Pact is coordinated by WIP Renewable Energies and runs from February 2010 to January 2013.

The main aim of Global-Bio-Pact is the improvement and harmonisation of global sustainability certification systems for biomass production, conversion systems and trade in order to prevent negative socio-economic impacts. Thereby, emphasis is placed on a detailed assessment of the socio-economic impacts of raw material production and a variety of biomass conversion chains. The impact of biomass production on global and local food security and the links between environmental and socio-economic impacts are analysed. Furthermore, the Global-Bio-Pact project investigates the impact of biomass production on food security and the interrelationship of global sustainability certification systems with international trade of biomass and bioproducts as well as with public perception of biomass production for industrial uses. Finally, Global-Bio-Pact focuses on socio-economic sustainability criteria and indicators for inclusion into certification schemes, and the project elaborates recommendations on how to best integrate socio-economic sustainability criteria in European legislation and policies on biomass and bioproducts.

An core activity of Global-Bio-Pact is the description of socio-economic impacts in different countries and continents in order to collect practical experience about socio-economic impacts of bioproducts and biofuels under different environmental, legal, social, and economical framework conditions. The results of these surveys are described in different case studies.

1   Introduction

1.1   Background

A strong public debate on sustainability aspects for biomass use for energy and products emerged in the last few years. This debate focused mainly on negative social and environmental impacts. In consequence, several initiatives were set-up, which are engaged in developing tools to ensure sustainability of biofuels. One option to ensure the sustainability of biofuels is the application of certification systems.

The main aim of the Global-Bio-Pact project is the improvement of global sustainability certification systems for biomass production, conversion systems and trade in order to prevent negative and to promote positive socio-economic impacts. Thereby, emphasis is placed on a detailed assessment of the socio-economic impacts of feedstock production and a variety of biomass conversion chains.

In order to generate data on the ground, seven in-depth case studies (covering 7 countries in 3 different continents and 5 different feedstocks) for socio-economic impacts were investigated in the framework of Global-Bio-Pact:

- Biodiesel from soy in Argentina (Sbarra and Hilbert 2011)
- Palm oil and biodiesel in Indonesia (Wright 2011)
- Bioethanol from sugarcane in Brazil (Gerber Machado and Walter 2011)
- Bioethanol from sugarcane in Costa Rica (Cárdenas and Fallot 2011)
- Jatropha oil and biodiesel in Tanzania (Sawe, Shuma et al. 2011)
- Jatropha oil and biodiesel in Mali (Burrel, Ouattara et al. 2011)
- 2nd generation biofuels and products from lignocellulosic material in Europe and North- America (Sleen, Vis et al. 2011)

The present report shows a compilation and evaluation of the indicators that were presented in the reports. A format was provided to align the case study reports, the obtained information varies from no information to very detailed.

1.2   Case Study selection

The impacts are assessed on different levels in the Global-Bio-Pact Case studies, including the national, regional and local/company/project level (see Figure 1). In each Case Study country of the Global-Bio-Pact project the following assessments were made:

- One study at national level

- One study at regional level

- Two studies at local, company or project level
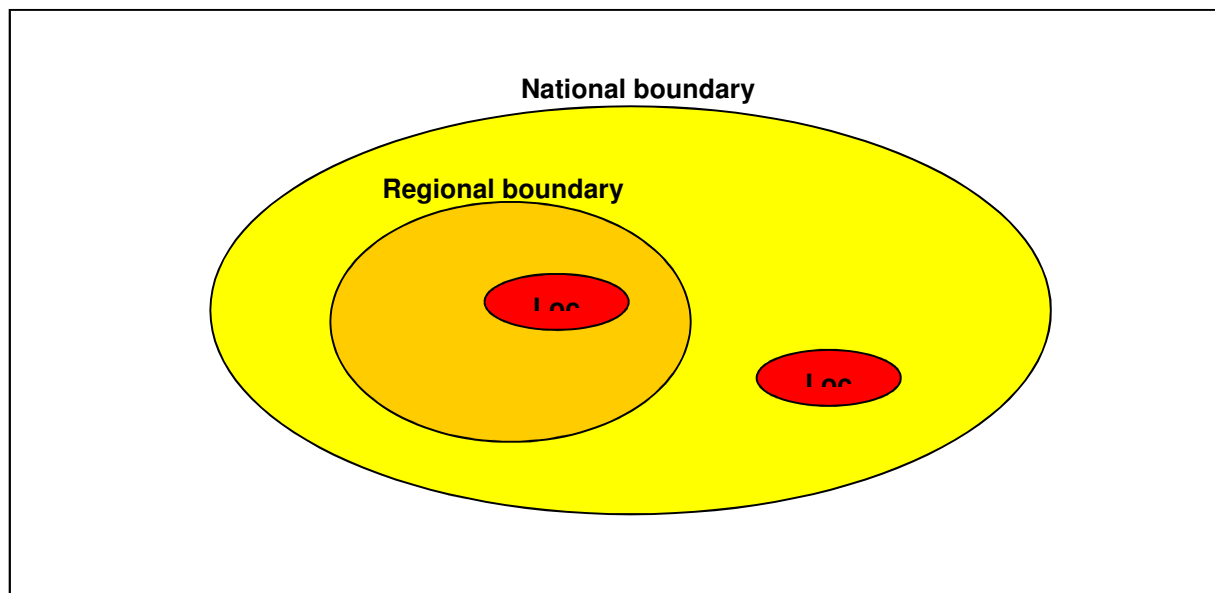
Figure 1:   System boundaries of the Global-Bio-Pact project

Case Studies at national level

The Case Studies at the national level were selected in order to balance the geographical distribution (Africa, Latin America, Asia, Europe, N-America), feedstock sources (soy, palm oil, jatropha, sugarcane, lignocellulosic feedstock), conversion technologies (e.g. fermentation, pressing, transesterification, hydrolysis, gasification) and products (biodiesel, pure plant oil, ethanol, bio-products, 2nd generation technologies). Thereby, the assessment focuses on existing conversion technologies since these are the current hotspots of socio-economic concern, but also include impacts of future technologies which are not yet commercially available.

Case Studies at regional level

In this project, the regional level was defined as a homogenous region in climate, soil, and socio-economic parameters. The size of the region depends on the country and can be a province or district. Regions that are selected:

Indonesia: North Sumatra Province

Brazil: North East Region

Canada: British Columbia, South West Canada

Tanzania: Arusha region

Case Studies at local level

At the local level the system boundary is a local area from an e.g. farmer, company, association or project level. The local area refers to the area where the biomass feedstock (including by-products) is produced and converted into the final or intermediate product. In each Global-Bio-Pact Case Study country two different local Case Studies (projects, companies) were selected and investigated. Thereby, these two local Case Studies can be within or outside the regional boundary.

- Indonesia: Aek Raso Plantation and palm oil mill, Desa Asam jawa and Harapan Makmur

- Brazil: São Fransisco Mill and Pindorama Mill

- Costa Rica: Central Azucarera Tempiswue S.A. CATSA

- Canada: Lignol process, pyrolysis

- Mali: Mali Biocarburant SA, Garalo Bagani Yeelen

- Tanzania: Leguruki Village

- Argentina: Viluco, Frias, Santiago del Estero Province, XX Plant, Roldán, Province of Santa Fe

1.3 Overview indicators

The following themes are addressed. It is also indicated which organisation did the evaluation of each theme that can be found in the next chapters.

- Economics (macro, sector and micro) (UU)

- Employment generation (BTG)

- Working conditions (BTG)

- Health issues (BTG)

- Food issues (UU)

- Land use competition and conflicts (UU)

- Gender issues (BTG)

The case study reports also indicated the relative importance of the different indicators (based on the opinion of the case study report author) and a threshold value.

Table 1:   Overview of indicator theme and relative significance indicated by the Global Biopact case study reports

Indicator theme	Number of indicators identified	Indicator significance*		
		high	low	no indication
Macro economic	9	5	6	4
Regional economic	11	0	8	5
Micro economic	14	9	3	6
Employment and poverty reduction	13	16	12	n.a.
Working conditions	11	19	5	n.a.
Health issues	11	6	8	n.a.
Food issues	13	4	5	6
Land issues	16	7	2	9
Gender issues	11	10	8	n.a.

*Some indicators are identified by multiple case study reports, therefore indicator significance total can be more than number of indicators identified

In the next chapters the indicators are evaluated. It is described whether the indicators that the case studies identified accurately describe the main theme, considering the sometimes limited amount of time and data, or that additional information or analyses are required.

2 Theme 1: Macro economic indicators

All indicators that relate to macro economic issues are based on the national level, they cover both production and conversion. See Table 3 for an overview of all indicators that are identified by the case study reports.

2.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account. See Table 2.

Table 2:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issue
Argentina / **Soy**	Huge income for the country due to taxation of soy sector. Soy biodiesel is a by-product from soy production (mainly used as animal feed).
Brazil, Costa Rica / Sugarcane	Sugarcane sector contributes significantly to GDP. Mechanisation legislation will have huge effect on number of jobs (reduced).
Mali, Tanzania / Jatropha	Still in infancy stage. Differences in income of smallholders are small, therefore do not reflect in macro-economic indicators.
Indonesia / **Palm**	Palm oil sector is large contributor to GDP but not all palm oil is used as biofuel. The 2009 implementation of RED in the EU has prevented biodiesel export to the EU.
Canada / **wood residues**	

2.2 Indicators identified by the case studies

Table 3:   Overview of macro economic indicators identified by case study reports

1	Macro economic indicators	Quantitative (Qn) or Qualitative (Ql)	Measurement method	Importance	
				High	Low
1.1	% of sector contribution to GDP	Qn	Statistical data or input/output analysis	2	2
1.2	Products exported	Qn	Statistical data	1	1
1.3	Estimated value of the sector	Qn	Statistical data	1	2
1.4	Investments in sector	Qn	Statistical data	0	1
1.5	Jobs created	Qn	Statistical data or	1	0

			input/output analysis
1.6	Number of $ invested in bioenergy infrastructure over the past decade	Qn	Statistical data
1.7	Pricing	Qn	Statistical data
1.8	GINI index	Qn	Statistical data
1.9	Value of industrial inputs	Qn	Statistical data

All indicators rely on statistical data or input/output analysis. Usually most of the indicators are collected by national governments. The indicators are derived from the case study reports, Table 5 shows in which country reports they were mentioned and what their value is.

2.3 Result per case study

There are two types of indicators; background indicators that give a more general idea of the country, not necessarily linked to biofuel developments, and indicators that link specifically to the biofuel sector. The results for both types of indicators are shown in Table 4 (background) and Table 5 (biofuel sector).

Table 4: **Background indicator results for Indonesia, source: case study reports (Sawe, Shuma et al. 2011; Wright 2011).**

Background indicator macro economic	Result (source)
GDP	Indonesia: €370,699 million in 2008 (World Databank)
Goss National Income (GNI) per capita	Indonesia: €2853 in 2009 (World Databank)
GINI coefficient	Indonesia: 38 in 2007 (World Databank) Tanzania: 34.6
People below the international poverty line of 2 $ a day	Indonesia: 32% in 2006 (above national poverty line) (World Bank 2006)

Table 5: Macro economic indicator results per case study

#	Indicator description Q: Quantitative O: Other	Indicator result*	Measurement method
1	**Macroeconomics**		
1.1	% of sector contribution to GDP (Q)	Indonesia: (requires further analysis)	GDP data from BPS
		Brazil: 2% sugarcane sector contribution to GDP	data from sugarcane industry union
		Argentina: (requires further analysis); 4% contribution of the chain	GDP data from INDEC
		Canada 1.7%	literature
		Brazil, 2-10 billion $ increase depending on scenario	Input/Output analysis

1.2	Products exported (quantity)	Indonesia: 8.2 million tons exported during first half of 2011. 42 million liters in 2006 (USDA, FAS, 2010) and 200 million liters in 2009 (USDA, FAS, 2010)	Data from GAPKI (6 monthly) indicates quantity and composition of exports, but not value. Ministry of Trade data indicates value but not disaggregated
		Argentina: 1.19 million tons soy biodiesel exported thru September 2011	Data from INDEC (monthly with a lag of one trimester) indicates quantity and composition of exports, but not value.
1.3	Estimated value of the sector	Costa Rica	
		Brazil: Revenue from Sugarcane:4,562.7 million Euros for the mills and 3,658.4 million Euros for independent producers. From Ethanol: 8.85 billion Euros.	Data from the sugarcane industry union
		Canada: Turnover of the sector: P: $3.571 billion C: $110 billion	Literature
1.4	Investments in sector	Canada: $20.0 billion	Literature
1.3	Jobs created	Canada; P: 238,200 jobs	Literature
		Costa Rica: number of people working in jobs directly and indirectly related to bioenergy	
		Brazil, depending on scenario, a loss or increase	Input/Output analysis
1.6	Number of $ invested in bioenergy infrastructure over the past decade	Costa Rica	
1.7	Pricing	Canada	
1.8	Value of industrial inputs	Brazil: growth per sector e.g. 2.5 million euro industrial equipment in 2008	

Only a few case study reports were able to obtain data about the bioenergy sector in their countries and the impact on the national economy.

2.4 Evaluation of indicators – gaps

The main macroeconomic indicators are used for a long time by several global organizations such as FAO, UNDP and so on. Statistical data is collected e.g. national governments on GINI index, sectoral GDP contribution, number of jobs per sector etc., but since the bioenergy sector is relatively new, this sector is often not disaggregated. Therefore some indicators such as investment in the bioenergy sector and number of jobs in the bioenergy sector are more difficult to gather and can only be available if the national governments or other government bodies collect this information. For example, Canada was the only country that was able to provide information on investments in the bioenergy sector.

Besides methodology based on statistics there is another methodology using input/output tables. An input output analysis per country or region, e.g. see (Herreras 2011), can provide information on the specific impact by a sector. However, Input output tables are needed per country to be able to make such an analysis as well as capabilities to perform the analyses. A General Equilibrium Model (CGE) can provide even more detailed information, but this requires technological capabilities at the organisations that perform the analyses.

In general the background statistical indicators, which are relatively easy and quick to obtain, give a snapshot idea of the state of the economy of a country. The impact of the biofuel sector on the national economy requires more data or modelling.

3 Theme 2: Regional economic indicators

3.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account. See Table 6.

Table 6:   **Specific issues per feedstock or country identified by the case studies**

Feedstock or country	Issues
Soy diesel, Argentina	
Ethanol, Brazil, Costa Rica	The country Costa Rica is too small to have regional differences
	There is a large difference between the Northeast of Brazil and the Central South, in this last region sugarcane cultivation is highly mechanised. In the North this is more difficult due to the hilly area
Jatropha, Mali, Tanzania	
Palm oil, Indonesia	Large differences between regions that produce palm since a long time, and newly established production areas
Wood residues, Canada	

3.2 Indicators identified by the case studies

Table 7:   **Overview of regional economic indicators as identified by case study reports**

#	Indicator description	Quantitative (Qn) or Qualitative (Ql)	Indicator significance High Low	Measurement method
2.1	% of bioenergy contribution to GRDP	Qn	2	Statistics or input/output analysis
2.2	Quantity of bioenergy products exported from the region/% contribution of bioenergy product export to total exports	Qn	2	Statistics
2.3	Turnover of sector in the region	Qn	1	Literature
2.4	Investments in sector in the region	Qn	1	Literature
2.5	Regional sector employment as part of total employment	Qn	1	Literature
2.6	Regional sector turnover as part of total turnover	Qn	1	Literature
2.7	Per capita income of the region compared to total per capita income	Qn		statistical data

2.8	Volume of bioenergy production by large plantations and smallholders	Qn	
2.9	Share of income for large companies and smallholders	Qn	
2.10	Amount of revenue collected from bioenergy sector	Qn	
2.11	Total number of jobs generated in the region by bioenergy sector	Qn	Input/output analysis

All indicators are quantitative and based on literature, statistics or input/ouput analysis.

3.3 Result per case study

Table 8 shows the indicator results per case study.

Table 8:   Indicator results per case study (regional economics)

#	Indicator description Q: Quantitative O: Other	Indicator resul	Measurement method
2.1	% of bioenergy contribution to GRDP (Q)	Indonesia: Data requires further analysis	GRDP data from BPS
		Argentina: Data requires further analysis	GRDP data from INDEC
		Brazil: 0.76% of northeast's economy.	Calculation using added values
		Brazil: 10-57% increase depending on scenario	Input/output analysis
2.2	Quantity of bioenergy products exported from the region/% contribution of bioenergy product export to total exports (Q)	Indonesia: NS: 4,312,082 tons exported in 2009; approximately 42% of NS exports	BPS data (from Ministry of Trade)
		Argentina: the soy core area accounts for more than 80% of the soy biodiesel exports.	Exports data from INDEC and Ministry of Agriculture.
2.3	Regional Turnover of sector	Canada: P: $4.4 billion (forestry) C: $11.4 billion	Literature
2.4	Regional Investments in sector	Canada: P: $62.1 million (forestry) C: $1.9 billion	Literature
2.5	Regional sector employment as part of total employment	Canada: P: 7%	Literature
2.6	Regional sector turnover as part of total turnover	Candada: P: 15%	Literature
2.7	Per capita income of the region compared to total per capita income	Tanzania: Arusha region 499 USD (2010) and 439 USD for mainland	statistical data
2.8	Volume of bioenergy production by large plantations and smallholders	Tanzania	
2.9	Share of income for large companies and smallholders	Tanzania	
2.10	Amount of revenue collected from bioenergy sector	Tanzania	
2.11	Total number of jobs generated in the region by bioenergy sector	Brazil: increased employment in Northeast region of 10-57%	Input/output analysis

Most of the data is derived from literature, statistics and in one case on input/output analysis. Some indicators are mentioned but no data was obtained, e.g. indicator 2.8-2.10. The regional indicators identified by Canada are based on regional data of the sector, however this sector is not biofuel specific but the forestry sector in general.

3.4 Evaluation of indicators – gaps

The impact of the biofuel sector on regions was hard to determine by the case studies. General regional differences, such as the per capita income in a region compared to the national average (Tanzania) give an idea of the relative level of development of a region but this does not give information about the impact of biofuels, rather this is background information. Two indicators seem to give a good overview of the regional impact by the biofuel sector; % of bioenergy production to GRDP and total number of jobs in the region generated by bioenergy sector.

- The % bioenergy contribution to GRDP would give a quick (if statistical data is available) first order idea of the importance of a certain sector in the region. But more detailed information would be required to assess differences in this sector, such as average wages, number of jobs, technology investment etc. The total amount of investment in the region could provide information on possible expansion of the sector.

- The total number of jobs generated in the region by the biofuel sector only provides information if this figure can be compared to a national average or to total unemployment figures of the region. Combining these indicators would provide information on possible migration of labourers (see also Theme 4: employment generation).

For both indicators often no statistical data is recorded, an input/output analysis is necessary to obtain values for these indicators.

4   Theme 3: Micro economic indicators

4.1   Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that have to be taken into account, see Table 9.

Table 9:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	The sector is very large in Argentina and well-structured/organised, micro differences are small. No smallholder production systems, only large scale.
Ethanol, Brazil, Costa Rica	Different production systems exist, with different impacts, e.g. plantation and smallholder production systems
Jatropha, Mali, Tanzania	Different production systems exist, with different impacts, e.g. plantation and smallholder production systems
Palm oil, Indonesia	Different production systems exist, with different impacts, e.g. plantation and smallholder production systems
Wood residues, Canada	No smallholder production systems, only large scale. Enforcement of national law is high.

4.2   Indicators identified by the case studies

The indicators that the case studies assessed, see Table 10, are focused both on the production of the feedstock and on the conversion. The impacts are on the local level for all indicators.

Table 10:   Overview of micro economic indicators as identified by case study reports

#	Indicator description Q: Quantitative O: Other	Impact level				Measurement method
		Local level		Indicator significance		
		Fields production	Factory conversion	High	Low	
3.1	Contribution of feedstock sales to household income (% or absolute value) (Q)	X		1		Smallholder records and interviews
3.2	Costs of feedstock production (Q)	X		1	1	Company records and interviews
3.3	Costs of feedstock conversion (Q)		x	1	1	Company records and interviews
3.4	Project investments	X	x	1	1	Interviews
3.5	Labour requirements	X	x			

3.6	Labour costs		x	1	Literature / interviews
3.7	Wage levels	X	x		
3.8	Feedstock price	X		1	Literature / interviews
3.9	Product selling prices		x	1	Literature / interviews
3.10	Internal rate of return		x	1	Interviews, CBA
3.11	Total amount earned by project				Interviews
3.12	Participation of costs	X	x		from company records
3.13	NPV	X	x		Cost Benefit Analysis
3.14	Revenue per ha from the bioenergy crop compared to revenues of other crops	X			literature and/or interviews

The methodology that is applied to the majority of indicators is by means of interviews or company records, which means data collection is partly depending on information provided by companies. Only the NPV, which can be calculated on project level, is more objective although even this methodology relies on data that is obtained from companies or projects.

4.3 *Result per case study*

In Table 11 the indicators that are assessed by the case study are listed, they are linked to production or conversion (or both).

Table 11:   **Indicator results per case study**

		field (production)	Factory (conversion)	Indicator result	Measurement method
3	**Microeconomics**				
3.1	Contribution of bioenergy sales to household income (% or absolute value) (Q)	x		Indonesia: **AR:** NA **AR(P)**: €2,385 (Rp.28,968,000) per ha per year **AJ**: €1,622 (Rp. 19,691,000) per ha per year **HM**: €870 (Rp.10,560,000) per ha per year	Smallholder records and interviews
		x		Argentina: Data requires further analysis	
3.2	Costs of feedstock production (Q)	x		Indonesia: AR: Data incomplete AR(P): €661.94 per ha (Rp 8,038,450) current annual costs AJ: €560.75 per ha (Rp 6,809,626) current annual costs HM: €346.84 per ha (Rp 4,212,000) current annual costs	Company records and interviews
		x		Argentina: Viluco Plant: Planting Material 36,20 euro/ha ; Pesticides 61 euro/ha; Tools for harvesting 46,30 euro/ha; Storage 8,55 euro/ha; Transport 26,14 euro/ha	Company records and interviews ; Margenes Agropecuarios statistics
		x		Costa Rica: 8304.79 E /ha	

3.3	Costs of feedstock conversion (Q)		x	Indonesia: ARM: €16,384,624.23 (Rp 198,971,230,547) per year	
			x	Argentina: Plant XX : Electricity: 6 euro/ton of soy biodiesel; Feedstock: 198,93 euro/ton ; Labor 23 euro/ton ; Citric acid: 1,61/ton; Methanol 7 euro/ton.	Company records and interviews
			x	Costa Rica: E 0.07 /l	
3.4	Project investments	x	x	Brazil: US$ 6 million for São Francisco Mill	-
				Costa Rica: 20 M$	
			x	Canada: Pyrolysis: 21.1 million euro; Pyrolysis: 687€/kW	Interviews
3.5	Labour requirements	x		Costa Rica: 1358.85 E/ha	
			x	Costa Rica: 6 persons	
3.6	Labour costs		x	Canada: Production: €42,593 Administrative: €57,442	Literature / interviews
3.7	Wage levels	x		Costa Rica: depending	
			x	Costa Rica: depending	
3.8	Feedstock price	x		Canada: $50-$70 a tonne wood	Literature / interviews
				Tanzania: between 0.08-0.16 USD/kg jatropha seeds	
3.9	Product selling prices		x	Canada: Ethanol: 553 euro / ton, Lignin: 222-422 euro /ton, Pyrolysis oil: 23 euro / ton	Literature / interviews
3.10	Internal rate of retun		x	Canada: 25%	Interviews
3.11	Total amount earned by project			Tanzania: 2,560 kg seeds collected by women group in 2009 (*0.08-0.29 USD/kg)	Interviews
3.12	Participation of costs	x	X	Brazil (?)	from company records
3.13	NPV	x	X		Cost Benefit Analysis
3.14	Revenue per ha from the bioenergy crop compared to revenues of other crops	x		Mali: 110-340 euro/ha for jatropha and 110-150 euro/ha for rice production	literature and/or interviews

No information was found on wage levels, and only the case study in Indonesia was able to find information on the contribution to household income. Also data on NPV or IRR of projects was not obtained. Only the costs of feedstock production and conversion seems more easy to obtain.

4.4   *Evaluation of indicators – gaps*

Because the impact on micro-economics is so project specific, the indicators have to be assessed for each project. Sometimes, if a proper business plan is publically made available, acquiring the IRR or NPV of a project could be rather easy. However, in reality the exact cost

figures might be different than the planned ones, and obtaining this type of data is very time consuming.

The revenue per ha for a certain bioenergy crop (indicator 3.14) can give a good indication of potential profits for farmers or plantation companies, especially if compared to other crops.

Wage levels and product selling prices relate directly to a certain business model and projected profits.

The distribution of profits is an important theme, both on project level and for smallholders. Wage levels, minimum wages, possibly gender disaggregated wage data but also the ratio of profits that stay in a country or goes abroed, could assist in assessing distribution.

The contribution of the bioenergy project to household income, as identified by the studies is also important, although this does not give information about other (potentially more profitable) opportunities (or the lack thereof).

5   Theme 4: Employment generation

5.1   *Specific issues per case study*

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account See Table 2.

Table 12:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	-
Ethanol, Brazil	-
Jatropha, Mali, Tanzania	Wage levels
Palm oil, Indonesia	Wage levels
Wood residues, Canada	Employment in forest sector decreases

5.2   *Indicators identified by the case studies*

The table below shows what indicators were identified related to the subject of employment and poverty reduction. The importance level (high/low) was indicated by the case study partners. Especially the wage levels and employment generation on local level is seen as important indicators. All indicators are quantitative, but information on employment of the biofuel sector on regional and national level is not always easy to access. On company level, interviews combined with company records will usually result in the required data.

Table 13:   Overview of employment indicators as identified by case study reports

4	Employment indicators	Quantitative (Qn) or Qualitative (Ql)	Measurement method	Importance High	Low
4.1	Employment generation on national level	Qn	Statistics, literature (if available)	2	3
4.2	Employment generation on regional level	Qn	Statistics, literature (if available)	2	3
4.3	Employment generation on local level	Qn	Company records and interviews	3	2
4.4	Ratio of fixed contract: casual/daily workers	Qn	Company records and interviews	1	1
4.5	Wage levels (including casual workers) compared to minimum wages	Qn	Company records and interviews	3	0
4.6	Educational level required	Qn	Company records and interviews	0	1
4.7	Job growth rate	Qn	Statistics	0	1
4.8	Average age	Qn	Sector level labour statistics	1	
4.9	Number of unjustified dismissals / end of contracts / resignations	Qn	Sector level labour statistics	1	
4.10	Participation of different races	Qn	Sector level labour statistics		1
4.11	Wages at farm/company compared to wages in traditional activities (like charcoal making, food production)	Qn	Interviews & analysis	1	
4.12	Wage levels sufficient to buy food and other household needs?	Qn?	Interviews & analysis	1	
4.13	Mandays used in the biofuel activities by family labour at local level. Threshold: Sufficient time left to grow own food (in case wages too low to buy all food)	Qn	Interviews & analysis	1	

5.3   Result per case study

Table 14 shows examples of indicator results. Except employment generation on national and regional level, the results are quantified. The wage levels can be compared to minimum wages and are an indicator with a threshold. The other indicators have informative qualities, and can be used as inputs for impact assessments.

Table 14: Indicator results per case study

#	Indicator description Q: Quantitative O: Other	Indicator result*	Measurement method
4.1	Employment generation on national level (Q)	Ind: no accurate data available Arg: Ind: no accurate data available Ca: X direct jobs, y indirect jobs; z temporary jobs	Ca: statistics of forest sector in general
4.2	Employment generation on regional level (Q)	Ind: no accurate data available	

		Ind: no accurate data available	
		Ca: X direct jobs, y indirect jobs; z temporary jobs	Ca: statistics of forest sector in general
		TZ: estimated x smallholder farms	TZ:
4.3	Employment generation on local level (Q)	Ind: Site x: 72 jobs	Ind: company records and interview
		Arg: Plant x: 71 workers	Arg: company records and interview
		Ca: X direct jobs, y indirect jobs; z temporary jobs	Ca: literature/interviews
		TZ: x jobs in factory	
4.4	Ratio of fixed contract: casual/daily workers (Q)	Ind: Plant x: all casual labour	Ind: company records and interview
		TZ: x jobs family labour, x days/year	TZ: ?
4.5	Wage levels (including casual workers (Q)	Ind: Site X: Average wages for implementation workers per month - €90.75 (Rp. 1,102,054) with an additional €51.99 (Rp. 631,328) in overtime and benefits	Ind: company records and interview
		Arg: Plant X: Unskilled labor 6.66 euro/hourSemi-skilled labor 10.38 euro/hour; Skilled labor 11.25 euro/hour	Arg: company records and interview Ca: literature Br: Statistics TZ: interviews
		Br: x Euro/month	
		TZ: x Tshs, which is above minimum wage	
4.6	Educational level required (Q)	Ind: 8 management positions, 15 skilled and 49 unskilled jobs)	Ind: company records and interview
		Arg: 2 unskilled; 38 semi-skilled and 31 skilled	Arg: company records and interview Ca: interviews Mali: company info.
		Ca: 11 jobs community college level; 5 jobs university level	
		Mali: x farmers, x seaonal workers, x skilled workers	
4.7	Job growth rate	Ca: decrease of 3.9-9.9%	Ca: forest sector in general
		Mali: x new jobs by jatropha project y	Mali: company info.
4.8	Average age	Br: 35.4 years old	Br: RAIS Statistics
4.9	Number of unjustified dismissals / end of contracts / resignations (indication of seasonal labour)	Br: x compared to x active employees	Br: RAIS Statistics
4.10	Participation of different races	Br:	
4.11	Wages at farm/company compared to wages in traditional activities (like charcoal making, food production)	TZ: opportunity costs of being employed less than forgone opportunity of charcoal production and some other activities	TZ: analysis
4.12	Wage levels sufficient to buy food and other household needs?	TZ: not possible to meet all household needs	TZ: analysis
4.13	Man days used in the biofuel activities by family labour at local level. Threshold: Sufficient time left to grow own food (in case wages too low to buy all food)	TZ: …	

5.4 Evaluation of indicators

In ex ante impact assessments employment generation is often an important parameter; while in certification systems there is usually no criterion for the number of jobs to be created; the working conditions (see next section) and (minimum) wage levels are an issue though. It can be a challenge to measure minimum wage levels e.g. for contract workers that are paid by unit. Important other questions are: Can they live from their wage? Do they have the possibility to bargain? Do they get a contract?

Interesting is to observe that indicators need to be specified well: there could be a difference between the number of workers and the number of jobs (in fte). Also the categories of educational levels vary between the case studies (unskilled, semi-skilled, skilled labour versus more detailed educational level indications).

Initially the title of this theme was "employment generation and poverty reduction". It is observed that the issue of poverty reduction is not covered separately from employment generation and wage levels. It advised to investigate indicators related to poverty reduction in more detail, for instance by a broad social impact assessment. Poverty reduction could include social benefits and economic services in general: schools, infrastructure, etc. It is also interesting to monitor if women, indigenous and vulnerable groups benefit.

6 Theme 5: Working conditions

6.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account. See Table 2

Table 15:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	-
Ethanol, Brazil	Labour conditions manual sugar cane harvesting
Jatropha, Mali, Tanzania	Rights of casual workers
Palm oil, Indonesia	-
Wood residues, Canada	Forest sector traditionally relatively dangerous

6.2 Indicators identified by the case studies

Table 16 shows an overview of the working conditions related indicators as identified in the case studies. The right to collective bargaining and to be a member of a trade union is widely accepted as an important indicator. Furthermore many indicators are relevant for one country but less for another country. For instance, the indicator regarding compliance with child labour laws was not used by all case study countries since it is not a significant issue in part of these countries. Possibilities or retirement pension will only relevant in countries that have a pension system.

Table 16:   Overview of working conditions related indicators as identified by case study reports

	Employment indicators	Quantitative (Qn) or Qualitative (Ql)	Measurement method	Importance High	Low
5.1	Maximal number of hours of work per day	Qn	Workers' contracts, company records and interviews	2	
5.2	Right to collective bargaining / respecting trade unions	Ql	Company records and interviews NGO monitoring records	5	
5.3	Extent to which child labour laws / minimum age are complied with.	Qn	Company records and interviews NGO monitoring records	2	
5.4	Number of work related accidents	Qn	Company records and interviews	2	1
5.5	Level of provision of Operational Safety and health systems, training and protective equipment	Ql	Company records and interviews	3	1
5.6	Extent to which legal requirements for social security and accident insurance are complied with	Ql	Company records and interviews	2	
5.7	Mode of transport to the fields	Ql	Company records and interviews		2
5.8	Right of training/education	Ql	Company records and interviews	1	
5.9	Possibilities of retirement pension	Ql	Company records and interviews		1
5.10	Rights of casual workers (social security, medical assistance) compared to fully employed workers	Ql	Interviews	1	
5.11	Right to understand the employment contract	Ql	Interviews, language employment contract versus language employee	1	

6.3   Result per case study

Table 17 shows examples of indicator results of part of the case studies. Some indicators are difficult to measure; for instance the number of work related accidents is not always recorded, and the interviewed company owner might have its reservations towards answering this question. Regarding collective bargaining, it can be useful to distinguish between the firm's own employee association and third party trade unions.

Table 17:   Indicator results per case study

#	Indicator description	Indicator result	Measurement method
5.1	Maximal number of hours of work per day	Cr: 8 hours/day (9 hours is legal max) TZ: 9 hours/day (8 hours is legal max)	Cr: contract and interviews TZ
5.2	Right to collective bargaining / respecting trade unions	Ind: workers are reported part of trade union x; and company does not impede workers' freedom of association Ar: workers reported part of trade unions CR: no, firm's employee association	Company records and interviews

		Ca: possible internal and sector level	
		TZ: workers had no opportunity to establish workers union	
5.3	Extent to which child labour laws / minimum age are complied with.	Ind: family farms / company reports no children are employed	Company records and interviews
5.4	Number of work related accidents	Ind: no data Ar: no data Cr: none declared	n.a.
5.5	Level of provision of Operational Safety and health systems, training and protective equipment	Ind: non provided / training provided TZ: protective equipment a, b, c, provided, needed equipment d, e and f not	Company records and interviews
5.6	Extent to which legal requirements for social security and accident insurance are complied with	Ind: reporting that all legal requirements are complied with Ar: all legal requirements complied with	Company records and interviews
5.7	Mode of transport to the fields	CR: Bus	Company records and interviews
5.8	Right of training/education	Ca: company policy of 40 hours training per year for each employee	Company records and interviews
5.9	Possibilities of retirement pension	Ca: pension is possible	Company records and interviews
5.10	Rights of casual workers (social security, medical assistance) compared to fully employed workers	TZ: casual workers have no overhead costs, social security and medical assistance.	Interviews
5.11	Right to understand the employment contract	TZ: cases in which contracts are in English while worker does not write/speak it.	Interviews

6.4 *Evaluation of indicators*

Working conditions are an important issue in many existing certification systems. Bargaining, free access to trade unions and OSH are seen as important by the project partners. Obviously, the general public expects that environmentally sustainable goods like biofuels are produced in a socially acceptable way. Especially in the young and fast developing biofuels sector, it is very important to monitor if the local communities really benefit from this development and are not exploited.

Since working conditions are so important, this group of indicators has been developed in much detail. It is observed that the measurement method is very important. Interviews with company owners can be easily result in biased outcomes, stressing the important of professional third party auditing including interviews with workers.

7 Theme 6: Health issues

7.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account. See Table 18.

Table 18:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	-
Ethanol, Brazil	When it comes to accidents and occupational diseases, sugar cane cultivation uses to be a big concern.
Jatropha, Mali, Tanzania	Risks associated with chemical use on large plantations
Palm oil, Indonesia	-
Wood residues, Canada	Forest sector has high number of accidents

7.2 Indicators identified by the case studies

Table 19 shows what indicators were identified related to health issues. The importance level (high/low) was indicated by the case study partners. The main health issues are accidents and occupational diseases. The most severe indicators are deaths and retirement due to labour accidents or labour related diseases. Other indicators are related to potential causes of long term health effects: like noise and dust emission levels etc. Although the indicators consider important issues, case study partners have indicated the issues often as "low". May this is because it is difficult to determine a threshold, as normally each accident is one too much. However, whether preventive health policies are in place or not could be checked and can be regarded as an important indicator.

Table 19:   Overview of indicators regarding health issues identified by case study reports

6	Indicators health issues	Quantitative (Qn) or Qualitative (Ql)	Measurement method	Importance	
				High	**Low**
6.1	Number of workers reporting health concerns related to agrochemical use	Qn	Company/health clinic records and interviews	2	1
6.2	Level of compliance with a given standard for waste treatment and disposal	Ql	Company records	2	
6.3	Number of accidents during work, as proportional to the total number of workers	Qn	National/regional: statistics Local level: company records		1
6.4	Number of deaths during work, as proportional to the total number of workers	Qn	National/regional: statistics Local level: company records		1
6.5	Number of retirements due to working	Qn	National/regional: statistics		1

	accidents, as proportional to the total number of workers		Local level: company records	
6.6	Benefits for disability and fatalities	Qn	Interviews and documentation	1
6.7	Health and safety policies	Ql	Company documentation and interviews	1
6.8	Noise above legal threshold	Qn	Company records, permit related documentation and interviews	1
6.9	Risk of fire outbreak	Ql	Company records, permit related documentation and interviews	1
6.10	Risk of gas emissions	Ql	Company records, permit related documentation and interviews	1
6.11	Number of staff with medical insurance	Qn	National level: statistics Local: Company records and interviews	1

7.3   *Result per case study*

Table 20 shows the indicator results for some of the case studies. In Brazil statistics on accidents and deaths were available on sector level, providing useful insights. On company level, it can be difficult to obtain correct information from the involved companies, as the number of accidents of work related health issues is clearly not good advertisement.

Table 20: Indicator results per case study

#	Indicator description	Indicator result	Measurement method
6.1	Number of workers reporting health concerns related to agrochemical use	Ind: no data provided / no data available Arg: no cases reported	Ind: company/health clinic records and interviews
6.2	Level of compliance with a given standard for waste treatment and disposal	Ind: no data provided / no data available Arg: full compliance	Ind: company records Arg: company records
6.3	Number of accidents during work, as proportional to the total number of workers	Br: x accidents Ca: x accidents own company and x accidents with contractors	Br: x accidents with leave of absence / x ambulance attendances
6.4	Number of deaths during work, as proportional to the total number of workers	Br: regional level: x death due to labour accident; x death due to traveling to workplace; x deaths due to labour related diseases.	Br: regional level: RAIS statistics
6.5	Number of retirements due to working accidents, as proportional to the total number of workers	Br: x retirement due to labour related diseases; x retirements due to labour accident.	Br: regional level: RAIS statistics
6.6	Benefits for disability and fatalities	Ca: x Euro	Ca: literature
6.7	Health and safety policies	Ca: Company x has an Occupational health and safety policy	Ca: interviews
6.8	Noise above legal threshold	Ca: can be achieved with the right countermeasures	Ca: interviews

6.9	Risk of fire outbreak	Ca: Chance of dust explosion or fire in machines. Right countermeasures are taken.	Ca: interviews	
6.10	Risk of gas emissions	Ca: Gas emissions are possible. Right countermeasures are taken	Ca: interviews	
6.11	Number of staff with medical insurance	TZ: not measured	TZ: data to be collected on national level.	

7.4 Evaluation of indicators

Biomass supply in both agricultural and forest sector has potential health risks. Much of the risks are already known, since biofuels/bioproduct is actually another application of a product of existing activities in the agricultural or forest sector. Since these risks are known and health and safety measures usually described in (national) law, it is possible to check compliance with these regulations, rather than to work out indicators in further detail. This way existing regulations are enforced.

It is difficult to define a threshold for the number of accidents. The observation whether a company has a record system for accidents in place, is an indicator of the company's awareness and attention for this issue and can be included in a certification system.

Another observation is that company records of accidents are sometimes absent. Furthermore, it is observed that health risks are mainly focussed on company level impacts. Health impacts related to environmental impacts, for instance by air, soil and water pollution could be included as well.

8   Theme 7: Food issues

8.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account, see Table 21.

Table 21:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	Soy is a food crop, Argentina is a food exporting country
Ethanol, Brazil, Costa Rica	Sugarcane is a food crop
Jatropha, Mali, Tanzania	Jatropha is not edible, Tanzania and Mali are not food self-sufficient
Palm oil, Indonesia	Palm oil is used for other purposes than biofuels only (food, cosmetics etc.)
Wood residues, Canada	Not edible, other market is paper industry

8.2 Indicators identified by the case studies

Table 22 shows the 10 indicators on food security that are identified by the case studies. The indicators describe impacts on different levels, local, regional or national.

Table 22:   Overview of food security related indicators as identified by case study reports

#	Indicator description **Q: Quantitative** **O: Other**	Indicator significance		Measurement method
		High	**Low**	
7	**Food issues**			
7.1	Conversion rates of food producing land	1	1	Statistics and literature
7.2	Poverty rates	1	2	Statistics
7.3	% of household income spent on food		1	Statistics
7.4	Percentage of undernourished children/people	1		Statistics
7.5	Calories per capita		1	Statistics
7.6	Protection programmes	1		Interviews
7.7	Providing alternative for current practices		1	Literature
7.8	Food security index score			Statistics
7.9	Number of people that became food insecure due to bioenergy production			Interviews/surveys and statistics
7.10	Quantity and type of food missing at the local community			Interviews/surveys

Four indicators were identified as being of high importance:

- Conversion rates of food producing land
- Poverty rates
- Percentage of undernourished children/people
- Protection programmes

The indicator 'food security index score' already takes several issues into account. However, not many governments collect the data for this indicator.

8.3   *Result per case study*

Table 23 shows some results per case study, although many of the values for the indicators could not be obtained.

Table 23:   Indicator results per case study

#	Indicator description	Indicator result	Measurement method
7.1	Conversion rates of food producing land	Indonesia: Data available requires further analysis	Ministry of Agrigulture data (nat/reg scales) SEIA or food security assessment (local scale)
		Canada: Not the case in Canada /BC except for mushrooms, honey, berries etc. collected from forests	Literature

		Tanzania	
7.2	Poverty rates	Indonesia: NS: 11.51% in 2009	statistics
		Argentina: Last available data : 11% in 2010	Statistics
7.3	% of household income spent on food	Indonesia NS: average 63.2% of income spent on food AJ: est 20% of income spent on food HM: no data	BPS data (down to district level). SEIA at local level
7.4	Percentage of undernourished children/people	Brazil: -	-
7.5	Calories per capita	Brazil: -	-
7.6	Protection programmes	Canada: Tembec protects biodiversity and water bodies.	Interviews
7.7	Providing alternative for current practices	Canada: Conversion solves part of the problem, because ethanol is now produced from wood instead of agricultural products	Literature
7.8	Impact on food security 1	Costa Rica: complementarity sugar - ethanol	
7.9	Impact on food security 2	Costa Rica: water use	
7.10	Impact on food security 1	Costa Rica: soil pollution	
7.11	Food security index score	Tanzania: Leguruki village scores 2.49	
7.12	Number of people that became food insecure due to bioenergy production	Tanzania	
7.13	Quantity and type of foodstuff missing in the local community	Tanzania	

Most of the indicators depend on (available) statistical data. The qualitative indicators such as type of foodstuff missing, cannot be quantified.

8.4 Evaluation of indicator – gaps

Some indicators combine a lot of information such as the indicator: Food security index score. The Global Food security index score is a dynamic quantitative and qualitative scoring model developed by the Economist Intelligence unit. It includes 25 unique indicators on 4 different categories; affordability, availability and quality and safety and will help to also identify some of the underlying reasons for food insecurity.

Table 24:   Global Food Security Index methodology, source: http://foodsecurityindex.eiu.com/

Global Food Security index	
Food affordability	Measures the ability of consumers to purchase food, their vulnerability to price shocks, and the presence of programmes and policies to support consumers when shocks occur.
Food availability	Measures the sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food, and research efforts to expand agricultural output.

Food quality and safety	Measures the variety and nutritional quality of average diets, as well as the safety of food.

Together with other indicators that are mentioned by the case studies, for example % of undernourished people, these indicators can give background information on the status of food security in a country. The link to bioenergy developments and their impact is however still not accurately showed.

Household level food expenditures data can be obtained by interviews, if this measure can be repeated it will become a performance indicator and in an area with biofuel development, part of this effect could possibly be liked to biofuel activities. Other performance indicators that can provide more information on the development of for example a region: yield developments of the 5 main staple crops (GBEP 2011).

Other indicators could be: previous land use (is agricultural land that was used for the cultivation of food crops converted into biofuel feedstock cultivation), food expenditures over time. A more qualitative measure but important is the perception of the local communities themselves, do they feel food insecure. This could be addressed in interviews or surveys.

Up to today there is no clear indicator for food security, since the concept food security is very complex and links to many different issues. Food security indexes are at the moment the best available indicators, combined with the more qualitative indicator whether people feel food secure, identified by the case studies.

9   Theme 8: Land use competition and conflicts

9.1   Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account, see Table 25.

Table 25:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issues
Soy diesel, Argentina	Sharp increase in land prices. New models of land acquisition appear such as investors that jointly purchase large plots of land.
Ethanol, Brazil, Costa Rica	
Jatropha, Mali, Tanzania	Customary land rights are very common. Land issues are already occurring not related to biofuels.
Palm oil, Indonesia	Large numbers of people in rural areas have no land, high levels of inequality in the distribution of agricultural land, land ownership structure (stemming from colonial system) has proved inflexible in responding to social changes. Lastly, lack of transparency and complexity and confusion surrounding the legal framework governing land rights. Also a lack of adequate legal recognition of customary rights to land.
Wood residues, Canada	

9.2   *Indicators identified by the case studies*

There are 16 indicators identified by the case studies, see Table 26.

Table 26:   Overview of land right related indicators as identified by case study reports

#	Indicator description Q: Quantitative O: Other	Indicator significance		Measurement method
		High	**Low**	
8	**Land use competition and conflicts**			
8.1	The extent to which land acquisition followed the correct legal process (O)	1	1	Company records and community interviews.
8.2	The extent to which community land rights are determined and mapped (O)	1	1	Company records and community interviews
8.3	The extent to which the principles of FPIC are followed in dealings with local communities and indigenous peoples, including when handling disputes (O)	1		Company records and community interviews.
8.4	Number of conflicts due to biofuels expansion	1		-
8.5	Expansion area over other cops	1		-
8.6	Compensation payments			
8.7	Language of contracts			
8.8	Availability documentation for local communities			
8.9	Lost rights to land			interviews
8.10	Coherent land ownership structure	1		Literature
8.11	Availability of treaties on land use issues with native local stakeholders	1		Interviews
8.12	Hectares of land suitable for bioenergy production			National statistics
8.13	Hectares under public land			
8.14	hectares under bioenergy cultivation			National statistics
8.15	development of land prices			National statistics
8.16	Area under bioenergy production as percentage of total planted area			National statistics

There are many indicators identified, and many of them are considered of high importance by the case studies, which indicate that this theme is important. Some of the data for the indicators can be obtained from national statistics, such as the development of land prices and total cultivation area of bioenergy (relative to total area available for example). Other indicators are more quantitative such as lost rights to land (difficult to quantify) and the extent to which land acquisition followed the correct legal process. The data for these last two indicators have to be obtained from interviews with various stakeholders.

9.3 Result per case study

Table 27:   Indicator results per case study

#	Indicator description Q: Quantitative O: Other	Indicator result	Measurement method
8.1	The extent to which land acquisition followed the correct legal process (O)	Indonesia: AR: No data provided, AR(P): NA, AJ: NA, HM: NA	Company records and community interviews. SEIA
		Argentina: Correct legal process was followed	Company records
8.2	The extent to which community land rights are determined and mapped (O)	Indonesia: AR: No data provided, AR(P): NA, AJ: NA, HM: NA	Company records and community interviews. SEIA
		Argentina: In the areas of this study no conflicts regarding land competition has been reported. Community land rights are complied.	Company records and INDEC
8.3	The extent to which the principles of FPIC are followed in dealings with local communities and indigenous peoples, including when handling disputes (O)	Indonesia: AR: No data provided, AR(P): NA, AJ: NA, HM: NA	Company records and community interviews. SEIA
8.4	Number of conflicts due to biofuels expansion	Brazil: -	-
8.5	Expansion area over other cops	Brazil: *65% pasture; 17% soy; 5% corn; 6% others; 2% frontiers	-
		Tanzania	
8.6	Compensation payments	Costa Rica	
8.7	Language of contracts	Costa Rica	
8.8	Availability documentation for local communities	Costa Rica	
8.9	Lost rights to land	Costa Rica	
8.10	Coherent land ownership structure	Canada: Stable over the years in Canada/BC little more to Aborginal jurisdiction	Literature
8.11	Availability of treaties on land use issues with native local stakeholders	Canada: Tembec does have these treaties in place. They are for example working together with the first nations and have resolution mechanisms	Interviews
8.12	Hectares of land suitable for bioenergy production	Tanzania	
8.13	Hectares under public land	Tanzania	
8.14	hectares under bioenergy cultivation	Tanzania	
		Argentina: almost 20 million ha in 2009	
8.15	development of land prices	Argentina	
8.16	Area under bioenergy production as percentage of total planted area	Argentina: 55.9% of the land is under soy cultivation	

For most of the indicators no data was obtained. This shows that it is difficult or time consuming to obtain the data.

9.4 Evaluation of indicators – gaps

Problems with land acquisition are often due to pre-existing weak institutional frameworks. Therefore it is difficult to assess whether land acquisition processes followed the correct legal path. Through interviews with various stakeholders, information can be obtained on how the process was executed, if there are national bodies that keep data on land conflicts this could enhance data collection. Communities are often content to see development in their area, however they should be compensated for any loss of land access. Checking whether there is any provision for returning land access rights in case of bankruptcy could reduce the risk.

10 Theme 9: Gender issues

10.1 Specific issues per case study

Due to the large differences between countries and feedstocks there are some specific issues that ideally would have to be taken into account, see Table 28.

Table 28:   Specific issues per feedstock or country identified by the case studies

Feedstock or country	Issue
Soy diesel, Argentina	-
Ethanol, Brazil	-
Jatropha, Mali, Tanzania	Tanzania: women are not land owners
Palm oil, Indonesia	"light" work by women paid less than "heavy" work done by men.
Wood residues, Canada	Gender inequality wage level proven statistically, though difficult to quantify on company level.

10.2 Indicators identified by the case studies

Table 29 shows what indicators were identified related to gender issues. The importance level (high/low) was indicated by the case study partners. Participation of women is considered in most case studies but is regarded as being not so important. Some jobs attract more men and other women. However, it becomes an issue if women's wages are lower than the men's. Equal opportunities, salaries, and respecting the women's reproductive rights are regarded important indicators.

Table 29:   Overview of gender related indicators identified by case study reports

	Gender related indicators	Quantitative (Qn) or Qualitative (Ql)	Measurement method	Importance	
				High	**Low**
9.1	Women's wages as a % of men's (doing work judged objectively to be similar)	Qn	Local: Company records and interviews Regional/national: statistics	3	1
9.2	The extent to which equal opportunities are extended to women and men in the workplace	Ql	Company records and interviews	2	
9.3	The extent to which women's reproductive rights are respected	Ql	Company records and interviews	2	
9.4	Participation of women (in a type of job, company or sector)	Qn	Local: Company records and interviews Regional/national: statistics		3
9.5	Women participation policies	Ql	Company records and interviews	1	
9.6	Labour employment gap between men and women	Qn	Statistics, literature		1
9.7	Presence of organizations for women's rights	Qn	Interviews, internet	1	
9.8	Gender-related Development Index (GDI)	Qn	National level: Like Human Development Index. GDI can also be expressed % of HDI.		1
9.9	Gender Empowerment Measure (GEM)	Qn	National/regional level: combines inequalities in (1) political participation and decision making; (2) economic participation and decision making, and (3) power over economic resources. Result: ranking compared to other countries.		1
9.10	Right of land ownership for women	Ql	National law and interviews	1	
9.11	Benefits distribution between men and women in the family	Qn	Interviews		1

10.3 Result per case study

Table 30 shows the indicator results. The participation of women in a certain company can be determined relatively easily. However, as already observed the indicator result is only informative not normative. Other issues like women's wages as % of men's work are sometimes hard to quantify on company level, however, even in countries like Canada there is obviously a wage gap. Interviews done for the Indonesian case clearly showed that in physical plantation work, the heavy work done by men, that women cannot perform physically, was paid better than the "light work" done by women. Also participation of housewives, working for free in the family plantation was observed. In Tanzania, women cannot be owner of land, but have rights to plant and harvest jatropha on part of this land.

Table 30:   Indicator results per case study

#	Indicator description Q: Quantitative O: Other	Indicator result*	Measurement method
9.1	Women's wages as a % of men's (doing work judged objectively to be similar) (Q)	Ind: no data provided / available; interview results: women get paid less in plantations, as they do the "lighter work". "Housewives" work occasionally in the fields. Arg: no disparities between wages were reported however this type of activity is driven mainly by men workforce Ca: wage gap of x % TA: in field women get paid equally	Ind: n.a. / interviews Ca: national statistics TZ: interviews
9.2	The extent to which equal opportunities are extended to women and men in the workplace (O)	Ind: no or insufficient data provided Arg: no data available	n.a.
9.3	The extent to which women's reproductive rights are respected (O)	Ind: no data available; interview results: no women's participation in agrochemicals use (which can be bad for reproduction). Arg: no data available TZ: maternity leave for women (sometimes unpaid)	Ind: n.a. / interviews TZ: interviews
9.4	Participation of women (in a type of job, company or sector)	Cr: x % female participation Ca: x % in 2011 on company level	Cr: interviews? Ca: interviews
9.5	Women participation policies	Ca: Canada has a Human Rights Act and Multiculturalism Act	Ca: internet
9.6	Labour employment gap between men and women	Ca: x % in 2011	Ca: national statistics
9.7	Presence of organizations for women's rights	Ca: several organisations on national level	Ca: internet
9.8	Gender-related Development Index (GDI)	Ind: calculated on national and regional leve	
9.9	Gender Empowerment Measure (GEM)	Ind: calculated on national and regional leve	
9.10	Right of land ownership for women	TZ: women do not own land	TZ: law, current practise
9.11	Benefits distribution between men and women in the family.	TZ: women sell medicinal soap from jatropha	TZ: interviews, literature

10.4 Evaluation of indicators

On national level gender-specific indicators have been developed like Gender-related Development Index (GDI) (similar to HDI) and Gender Empowerment Measure. However it is difficult to quantify gender issues related to wage levels on company level as (1) jobs between men and women differ as physically and culturally determined (2) underpayment of women, although statistically significant, is often not intentional at company level. Furthermore, it is observed that while it is difficult to quantify gender issues on local level, obvious gender issues can easily be described in a qualitative way (see the case of Tanzania for a good example). Other gender related issues, like discrimination and sexual harassment should be addressed on company level with specific indicators.

11   Suggestions for future work

Both positive and negative socio-economic impacts are, for the most part, a function of company practices, in combination with the regulatory and institutional context. Furthermore, impacts on the local level are often not visible at an aggregated national level, which is the case for example with economic indicators on local level versus macro level. Therefore it is essential to look at impacts on different levels; national, regional and local.

Background indicators provide a quick snapshot image to determine whether the theme, e.g. food security, is an issue at all in the project region. After this determination, more detailed indicators can be applied to give insight in the extent of the potential impact.

More methodologies have to be developed to gain better insight in socio-economic impacts. These methodologies should preferably be based on quantitative data. Many indicators are currently based on qualitative data, which is sufficient for themes such as working conditions, health issues and land use conflicts. But other, more complex, themes such as food security, land competition or economic development of e.g. a region, that link with many different factors, need more comprehensive methodologies such as Input/output analyses or General Equilibrium models.

More data collection is required on all levels (national, regional and local). Most economic indicators are based on robust methodologies, but accurate data is lacking and therefore it is hard to use the indicators effectively. Government bodies or international organisations could collect and monitor the data which would provide for example the basic data for the background indicators.

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