chapter 15

Social Considerations

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Highlights

- There are clear synergies and trade-offs to be established between bioenergy production and socio-economic development at different geographical scales.
- Policy instruments have been put in place in several countries to effect these synergies, but they still need to be linked to wider objectives relating to food production, education and land use planning.
- The success of bioenergy production at all levels will require taking into account the requirements of the different stages of the feedstock production along with the benefits to be obtained at small scale or the community level.
- International programs need to adopt an integrated approach for the use of renewables in general, and of bioenergy, in particular.

Summary

This chapter reviews some of the key issues that relate to the social impacts of bioenergy supply chains at local, national and international levels, with a particular focus on food production and the implications for natural resources management. The review shows that data is available only for some topics and on some regions, and how, although some point to negative aspects in this relatively new sector, there also is positive data that demonstrates that bioenergy can contribute to social and economic improvements at local and national levels, given appropriate considerations and measures. The chapter introduces some of the main social issues discussed in the literature as well as providing background information on global policy framework. This is followed by a consideration of social benefits of bioenergy production, such as job creation, provision of training and skills development. Additional social and environmental impacts that result from the use of land, water and other natural resources for bioenergy production are then examined in relation to gender, food production, poverty reduction and land tenure. The final section discusses public perception of bioenergy production and the usefulness of public reporting of corporate sustainability.

15.1 Introduction

Bioenergy can make a valuable contribution to meeting energy security, economic and social development goals, as well as addressing climate change and other environmental issues (Morese 2012). Among these issues are environmental and social aspects, including the area of land required to produce biomass raw material and the impacts on local communities and the environment (Woods and Diaz-Chavez 2007). The social impacts of different bioenergy supply chains depend on scale, location, duration of crop production (e.g. annual, perennial crops), and on the form of bioenergy provision e.g. heat, electricity or mobility. It is probably for bioenergy where more tradeoffs and integrated systems with social issues can be perceived (Figure 15.1).

Although biofuel[1] production has grown in recent years, only a few countries dominate production worldwide (Ecofys 2012). Several efforts to guarantee sustainable production have been introduced, ranging from policy regulations to voluntary standards and international frameworks such as the Global Bioenergy Partnership (GBEP). However, there is still a lack of reliable data on socio-economic impacts of biomass production and conversion, and also on the use of biomass for bioproducts that takes environmental aspects into consideration (Global-Bio-Pact 2013).

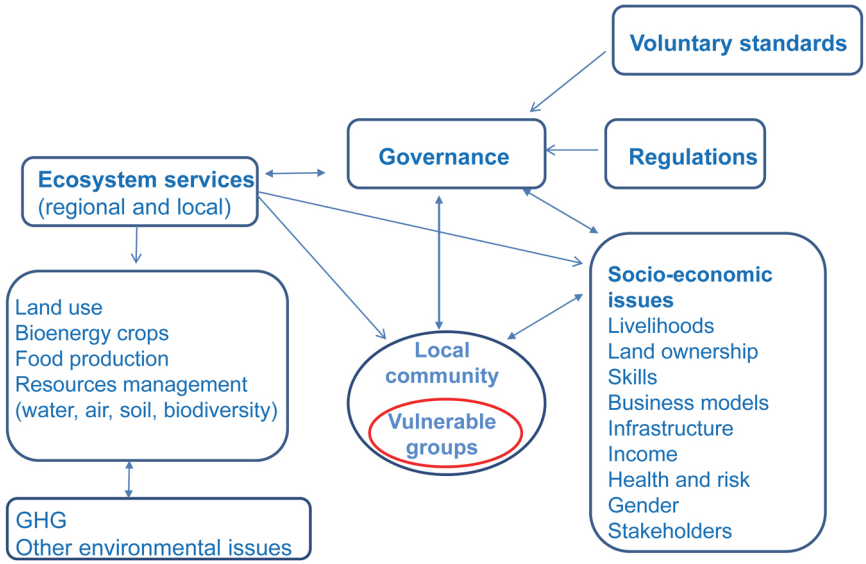

Figure 15.1. Tradeoffs and synergies of bioenergy and social issues.

[1] Define 'biofuels' as bioenergy products destined for use in the transport sector, particularly as liquid fuels

Most of the social impacts that have been investigated are found in developing countries, where claims about improving local livelihoods and reduction of poverty have not always been substantiated. Across Africa, in particular, the main issues of concern include land tenure, impacts on water availability and quality, large-scale production (Cotula and Leonard 2010), and food security (FAO 2008; Diaz-Chavez et al. 2010). Nevertheless, opportunities exist for biofuel production to make an important contribution to improve local conditions, through employment creation, business models that generate value and provide new infrastructure for local communities (e.g. outgrower schemes, joint ventures) (Sagar and Kartha 2007; Vermeulen and Cotula 2010), voluntary contributions to social services and infrastructure through private investment. Brazil, for instance, provides a positive example, where large-scale production predominates, yet some 70,000 independent sugarcane growers, along with producers associations and agriculture cooperatives are involved in the production chain. Sugarcane production by independent suppliers accounts for about 40% of the total sugarcane national production. In the Centre South region in Brazil, over 85% of sugarcane growers farm on less than 50 hectares of land. The profile of the sugarcane suppliers can be found in Table 15.1.

The topic of societal perception of biofuels has, in turn, been reviewed in a number of projects e.g. BEST, Global-Bio-Pact, and also by some authors (e.g. Fallot et al. 2011; Michalopoulos et al. 2011). Research on Corporate Sustainability Reporting has also

Table 15.1. Profile of independent suppliers and rural partners, 2012-2013 harvest seasons, Center South region, Brazil.

Quantity of sugarcane produced	Number of sugarcane suppliers	Proportion of the total Number of suppliers	Average farm size (ha)	Overall production (thousand tons)	Proportion of total production
≤ 1,000 tons	8,297	42.8%	8	4,647	3.5%
1,001–6,000 tons	7,902	40.8%	46	25,451	19.3%
6,001–12,000 tons	1,580	8.2%	151	16,720	12.7%
12,001–25,000 tons	941	4.9%	308	20,255	15.4%
25,001–50,000 tons	394	2.0%	638	17,580	13.3%
50,001–100,000 tons	161	0.8%	1,236	13,902	10.5%
> 100,000 tons	105	0.5%	4,533	33,249	25.2%
Total	19,380	100.0%	97	131,808	100.0%

Source: ORPLANA 2014

examined the topic, and an increasing number of companies offer a review through the Global Reporting Initiative (GRI 2013). Still, much more reporting and reviewing is required for a better understanding of the societal impacts of bioenergy production, its social role and its impacts on communities.

The literature on bioenergy feedstocks production and their use has increased in the last few years. For instance, German et al. (2011) and Baka (2013) report on research conducted in Africa and Asia, whereas Solomon and Bailis (2014), Schaffer et al. (2011), and Borras et al. (2011) report on research in Latin America. Bailey et al. (2011) and Selfa (2010) - in turn, report on research in the US. Nevertheless, little is yet available in the way of hard data about aspects such as water use and air emissions. Soft data is still even more difficult to obtain due to its qualitative nature and lack of agreement on measurement, for instance, public values and perception about bioenergy production.

15.2 Review of Legal Frameworks and Social Considerations in Bioenergy Production around the World

Existing legal and regulatory frameworks for bioenergy production range from mandatory targets to more advanced frameworks which include sustainability criteria which are in place in five key world regions (the EU, North America, Latin America, Africa and Asia). Their objectives also vary greatly, from a focus on climate change concerns to energy security (reducing imports of fossil fuels) and local rural development. One such policy framework is the EU Renewable Energy Directive (2009/28/EC), which aims to increase the share of renewables to 20% by 2020. Uniquely amongst these regional policy frameworks, the Directive includes mandatory environmental sustainability criteria for liquid biofuels (i.e. on land use and GHG emission reduction), whilst social criteria, although not mandatory, requires reporting. Nevertheless, on June 13th 2014, the Energy Council of the EU agreed on the draft directive on indirect land-use change (iLUC) amending the fuel quality (98/70/EC) and renewable energy (2009/28/EC) directives. The agreement acknowledges and addresses the iLUC phenomenon and indicates mitigation of indirect land-use change emissions through a threshold of 7 % of the final consumption of energy in transport in 2020 for conventional biofuels to count towards the renewable energy directive target. At the same time it encourages the transition to advanced biofuels (EN 2014). This will still need to be approved by the EU Parliament at a later stage. It is important to note that this only applies to biofuels, as solid biomass does not have sustainability requirements at EU level.

In the USA, the Renewable Fuel Standard and the California Low Carbon Fuel Standard are the two main laws incentivizing blending of biofuels into the transportation fuel supply chain. Only those renewable fuels seeking to qualify for the mandate are

regulated by the Renewable Fuel Standard 2 (RFS2 2013). The RFS sets minimum GHG thresholds for renewable fuels although the impacts on food prices remain controversial and contested (Baffes and Dennis, 2013; Kim and Dale, 2011; Oladosu et al. 2011). Nevertheless, the RFS does allow for EPA to adjust the mandate if there are effects on food prices (EISA 2007). Additionally, the USA has the Biomass Crop Assistance Program of the US Farm Bill that requires the participation of landowners and provides incentives for the establishment of new bioenergy feedstocks. The BCAP, which provides payments for the growing, harvest, and transportation and usage of non-food bioenergy crops, will receive $25M in funding for each fiscal year through 2018. The Program is also intended to assist with some of the feedstock supply challenges facing the cellulosic biofuels industry (FSA 2011).

The situation in Africa is very different as traditional fuelwood, along with other agricultural and forestry residues are the main bioenergy sources. Only a few African countries have consumption targets for liquid biofuels (Jumbe and Mkondiwa 2013) and current production and consumption are not yet significant. Several countries have been producing biofuels for energy security reasons (Deenanath et al. 2012), including South Africa, Malawi, Mauritius, Zimbabwe and Kenya (although the last two have stopped production). Mauritius, for instance, has well formulated and consistent government policies and incentives to stimulate production of both ethanol and power from sugarcane bagasse (Mapako et al. 2012). Although Watson and Diaz-Chavez (2011) reported on the potential for production and crops, large-scale production still remains at early stages (Ecofys 2012). Therefore, the main challenge for most African countries is to move away from traditional bioenergy towards modern bioenergy in order to contribute to sustainable development (IRENA 2011).

In Africa, regional strategies have been developed, such as the 2012 Regional Bioenergy Strategy, put forward by the Economic Community of West African States (ECOWAS) with the support of the GBEP. It seeks to enable investments that help address energy poverty without compromising food security and environment, through the creation of added value in employment, food and energy security (GBEP 2012). Another initiative is the Renewable Energy Strategy and Action Plan (RESAP) for the Southern Africa Development Community (SADC) finalized in 2012. The mid-term review of the SADC Renewable Energy Support Programs concluded that RESAP required improvement to make it implementable (Camco, 2012). At the continent level, the New Partnership For Africa's Development's (NEPAD) 'Strategy for Sustainable Bioenergy Development in Africa' is being developed within the NEPAD / Comprehensive Africa Agriculture Development Program (CAADP) / Program for Infrastructure Development in Africa (PIDA) frameworks and principles, for 'rural transformation'.

Local energy security impacts in some African countries, such as Tanzania, Kenya, Mozambique and Uganda, are likely to be strongly influenced by the recent discoveries of gas and oil reserves. Tanzania's Energy and Minerals minister captured the hopes placed in the new hydrocarbon discoveries thus: "*Tanzanians have been farming since independence, but remain poor. We want the gas economy to benefit all Tanzanians"*

(Reuters 2013). It remains to be seen what impacts will result from policies targeting the export of bioenergy, as the focus shifts to include these newly found options.

In Asia, the major bioenergy players are China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam (IEA Bioenergy 2009; BP 2009). Most already have bioenergy policies, mandates and regulations in place. Their main focus is to reduce dependence on fossil fuels. Yet, the social and political character of bioenergy development remains unclear with key policies currently enacted in Asia primarily regulating social aspects of food security and land tenure (Bush, 2008). The Biofuels Act implemented by the Philippines Department of Labor and Employment is meant to secure some social guarantees, such as promoting livelihood opportunities, employment, and social security coverage for workers, at the same time as making recommendations for plans, policies and programs that will enhance the positive social impacts of the National Biofuels Programs (NBB) (FAO 2009). India's policy on biofuels (National Biofuels Policy 2008) foresees the implementation of a series of financial instruments that will enable farmers to access loans and economic incentives for the whole bioenergy supply chain (FAO, 2009).

In Latin America, the Economic Commission for Latin America and the Carribean (ECLAC) (Dufey and Stange 2011) reported on policies and regulations showing that while many countries do not have a dedicated bioenergy policy, several do have mandatory targets to reduce imports of fossil fuels and develop their agricultural sector. Several countries in this region already produce biofuels for national use as well as for export, including Brazil, Argentina, Guatemala, and Colombia. Brazil has, since 1975, enhanced the bioenergy sector by reducing foreign energy sources, but this strategy has tenuous links with its social policies. More recently, though, Brazil has improved on social issues related to bioenergy production, adapting labor legislation for the agricultural sector (Sallum 2007; Moraes and Pessini 2004; Moraes 2011b). In the state of São Paulo, employer associations and labor unions have been strong and highly active in negotiating wages for sugarcane workers (Moraes 2011a). Additionally, although the Brazilian labor legislation is rather rigid, it can still accommodate flexibility through the collective agreements on wages and working hours, as long as they do not violate the thresholds contained in the legislation (Consolidação das Leis do Trabalho – CLT) (Sallum 2007). A more intensive program was created in 2004 for small-scale agriculture for biodiesel production (the Social Fuel Seal), which was not as successful as anticipated, as it proved difficult to reconcile the provision of markets for small holder production and increase production of biodiesel to 15% from soybean (large-scale) and animal fats (FAO 2009).

On the topic of sustainability standards for bioenergy production, Dam et al. (2010), Diaz-Chavez (2011), Morese (2012), Dale et al. (2013) and Endres (2012), among others, have provided in-depth reviews of several voluntary standards and frameworks that include social criteria (see Chapter 19, this volume). It is worth noting that international Conventions, such as the International Labor Organization and the work carried out by different NGOs have played a role in taking account of social issues in the bioenergy sector.

15.3 Land, Water and Natural Resources

The multi-functionality of land use has increasingly been challenged by global environmental change (Winter and Lobley 2009). In particular, there is growing pressure on farmers and land managers to act as "carbon stewards" and adapt land management to minimize carbon losses, maximize carbon storage and provide substitutes for fossil fuels (Smith and Maltby 2003).

The bionergy sector integrates different environmental components, such as, for instance, land, water, forestry, soil and biodiversity that also impact on social aspects such as health and welfare. In particular, the literature debates issues around the role of the sector on feedstock depletion (particularly forestry), water depletion and pollution (Diaz-Chavez 2011). An alternative strategy put forward for better resource management is that of integrated land use, which aims to strike a balance between economic, social and environmental objectives (DeFries et al. 2004). Bioenergy systems also provide an example of integrated systems as they cover different aspects of linking environment, socio-economic and land use alternatives.

The Ecosystem Services approach has also emerged recently as an alternative for helping establish synergies between environmental and social issues. In their review, Rettenmaier et al. (2012) noted that this approach could help reduce the trade-offs between bioenergy production and ecosystem functions. In addition, the Global-Bio-Pact project (2013) has advanced a number of indicators to monitor the impacts of bioenergy production on ecosystem services (Diaz-Chavez et al. 2012). These included impacts on biodiversity and its use for local communities (e.g. fishing, hunting, collecting, other), water use (availability and quality) and other recreational uses of the landscape.

Bioenergy production may engender a number of effects on water resources, on demand and on quality, which all depend on where the bioenergy infrastructure is located and how it is managed, leading to either water quality deterioration or improvement, and they are observable also along the supply chain, from production to transformation (Clancy 2013; Diaz-Chavez 2011). The EU has examined the option of setting up mandatory criteria for monitoring the impacts of bioenergy production on water, air and soil, where changes in local management practices might be a more effective option given differences in local conditions for feedstock production (Ecofys 2013). Further, Clancy (2013) suggests that it is possible to grow biofuels crops without damaging associated ecosystem services if institutions support is in place to help to plan and monitor agricultural development (see Chapter 19, this volume). This shows that the critical challenge is the complexity of developing integrated land management frameworks that can reconcile food and bioenergy production with ecosystem service delivery.

15.4 Employment, Rural Opportunities and Livelihood Impacts

The literature on social issues in the bioenergy sector has produced estimates of job creation that vary according to region and other factors in the supply chain. IRENA (2011) estimated that in 2010 the world's gross employment in the biofuel sector was over 3.5 million in biofuel for transport and renewable energy for transport, with an estimated 1.5 million in first generation biofuels. Commercial 2nd generation plants in operation are not yet numerous except for the Beta Renewables Ltd plant in Crescentino, Italy (Novozymes 2013), therefore estimated jobs in the lignocellulosic fuels are still limited to few thousands (see BIOCORE 2013a). In turn, the Global Renewable Fuels Association (Urbanchuk 2012) estimated that global ethanol and biodiesel production supported nearly 1.4 million jobs in all sectors of the global economy in 2010, with 221,183 jobs estimated in the EU alone. The IRENA report (2011) noted that the majority of jobs (direct and indirect) in this supply chain are currently located in a few major economies i.e. China, Brazil, Germany, India and USA majority in rural areas for production of feedstock (Ecofys 2012).

Ecofys (2012) reported that in the USA half a million jobs were created (virtually doubling since 2008), whereas in 2010, Brazil employed around one million people in the biofuel sector (Azevedo 2010). Urbanchuk (2014) reported a total of 386,780 jobs in the ethanol industry in 2013 (86,503 direct jobs, 87,164 indirect jobs, and 213,113 induced jobs to satisfy direct and indirect needs). Together, these two countries produce 88% of the world's ethanol production (Azevedo 2010). In Europe, over 150,000 jobs are thought to have been created recently as a result of biofuel production (EurObservER 2011; Ecofys 2012).

The biogreen economy (biorefineries) also presents an opportunity for job creation and rural development in different parts of the supply chain beyond feedstock production, such as pressing, collecting, transporting and storing (BIOCORE 2013a; Diaz-Chavez 2013). The BIOCORE (2013a) project, for instance, reported that feedstock production for biorefineries may contribute to the creation of indirect jobs. In Europe, case studies have indicated the actual expected contribution of the sector in terms of employment. In the in Beauce region in France, one company expected to create around 115 jobs in its biorefinery plant, whereas estimates for a similar plant in Hungary ranged from 250 direct jobs (some highly-skilled), to up to 3,000 indirect jobs (e.g. farmers and suppliers). Also, the last few years have seen an increase in the manufacturing side (biochemical) in Europe, which is expected to continue to grow as a result of incentives for green technology, particularly in pharmaceuticals and chemicals (Diaz-Chavez 2013).

A number of studies in Brazil have demonstrated the positive socio-economic impacts of the sugarcane industry for biofuel production in the state of São Paulo. Chagas et al. (2011) analyzed the effects of the increased sugarcane production on municipal revenues. They showed that the value of agricultural production of sugarcane is greater per hectare than for most crops, thus accruing a greater value of agricultural income to the municipality in

terms of tax income. Assato and Moraes (2011) also noted that jobs generated by the expansion of the sugarcane industry and related sectors have played a key role in reducing rural migration. Similarly, Satolo and Bacchi (2013) assessed the effects of the sugarcane sector expansion over municipal per capita GDP, noting that the GDP for one municipality and that of its satellite neighbors grew from 24% in 2000 to 55% in 2010.

Martinelli et al. (2011) have, in turn, compared the following development indices: the Human Development Index (HDI), São Paulo´s Social Responsibility Index (SRI), and the Rio de Janeiro Municipal Development Index. (MDI), in the municipalities predominantly based on cattle and mixed cattle against sugarcane, sugarcane with processing mills, or non-rural activities. The three indices for cattle municipalities were significantly lower than those for all the other categories compared to the municipalities with both sugarcane and processing mills, and higher than non-rural municipalities. Sugarcane's integration with processing activities has had a multiplier effect. Further, Hofmann (2006) analyzed the effects of the increased ethanol production and the poverty reduction in Brazil. A lack of food security in Brazil, as elsewhere, is strongly associated with poverty and so it is expected that, increased level of employment and income that follows the expansion of the sugarcane agribusiness will help combat food insecurity, whilst also compensating the negative effects of eventual food prices increases. Other authors have also noted the improvement on indicators, such as education, employment (quality and quantity), as well as wages in other producing states (Balsadi and Borin 2006; Moraes 2007; Oliveira 2009; Moraes 2011a; Moraes 2011b; Gerber Machado and Walter 2011; Neves and Castro 2013).

15.5 Skills and Training

The levels of job creation and job quality in the bioenergy production are likely to vary greatly, depending on whether they are needed in more intensive agricultural or forestry production or in the industrial and processing sectors, and in service delivery. These differences are also accentuated depending on location, with more intensification being observed in developing countries at the agricultural level, than at the industrial level in the more developed economies. Clear exceptions here are Brazil, as well as Argentina, that balance production with shipping requirements so as to spread along the value chain (Ecofys 2012).

Environmental legislation in Brazil that phases out the burning of sugarcane, has led to continuing mechanization of harvesting and loss of jobs. The private sector has provided training and qualifying programs for manual cutters through the *Renovacão* project. The project is a partnership between UNICA, the Federation of Rural Workers in São Paulo State (Feraesp), the Solidaridade Foundation and supply-chain companies: Syngenta, John Deere and Case IH, with support from the Inter-American Development Bank (IADB). The Project provides specialized training for approximately 3,000 workers per year in six of the major sugarcane producing areas in São Paulo (Sugarcaneorg 2014).

In developing countries where bioenergy represents an important resource, specific training needs have yet to be fully addressed. The importance given by stakeholders to training and skills development is lost to the processing stages, as producers place greater importance on maximizing productivity. On an average Indonesian oil palm plantation, only about 3% of the workers are classified as skilled, the remainder 97% is unskilled (FAO, unpublished). If bioenergy is to be made sustainable, it is fundamental that good practices and training are adopted throughout the chain, from the feedstock production upwards.

On the issue of skilling the workforce in bioenergy production, FAO has, through its BEFSCI project, compiled a set of environmental practices that producers should adopt to minimize their negative environmental impacts, whilst also increasing the potential of such practices for climate change (FAO 2012a). These practices can help improve the efficiency and sustainability in the use of land, water and agricultural inputs, thus reducing the potential competition with food production. FAO stresses the importance of training provision at all levels of the supply chain which incorporates an integrated approach to sustainable bioenergy. Furthermore, the GBEP's set of 24 sustainability indicators for bioenergy has an indicator (number 12 under the social pillar) that relates to the creation of skilled/unskilled jobs in the bioenergy sector (FAO 2011).

Recently, the BIOCORE EU FP7 funded project, canvassed the views of stakeholders in the EU and India to assess skills and capacity in the green economy sector, particularly with reference to biorefineries. The exercise showed that stakeholders disagree on the topic. While some considered that the requisite skills are already in place for feedstock production, others noted the discrepancies that exist in the industrial sector as a result of the importance of the chemistry and oil sectors. One prevalent view is a need for further development in skills for jobs in the biorefinery (BIOCORE 2013).

15.6 Poverty, Health and Food Production

These topics have been looked at under the context of rural development and access to energy. They have been researched in Africa, Asia and Latin America. Africa has the world's highest incidence of rural poverty, with over 80% of the rural population living under $2 per day (IFAD 2011), and bioenergy production has been held out as one way to help reduce it. A study on Mozambique (Arndt et al. 2011) indicates the role of poverty reduction in the African context is strongly influenced by production technologies and associated institutional arrangements. 'Outgrower' models of bioenergy production were found to be more pro-poor in that they provided more jobs to unskilled labor, compared to large-scale, centralized approaches. Raising agricultural productivity and human capacity among the poor and vulnerable are seen as vital for facilitating the poverty reduction role of bioenergy production.

The role of energy on poverty reduction especially at local level has also been considered by different authors and initiatives (UNDP 2004; Clancy 2013; RSB 2010; Diaz-Chavez 2010). Although not considered explicitly under the Millennium Development Goals (MDG), the United Nations recognizes that access to energy affects aspects of sustainability from developing agriculture to health care and education (UNDP 2004). The proposed Sustainable Development Goals to follow after 2015 when the MDGs program is finalized have not yet been decided. Nevertheless, it is crucial to explicitly include energy services. This has been the focus of the initiative "Sustainable Energy for All" (SEFA) launched by the UN which has outlined three overarching aims as follows: universal access to modern energy, double the share of renewable energy in the global energy mix, and double the rate of improvement of energy efficiency by 2030. SEFA recommended improving data and definitions for bio-energy and sustainability over the next five years (SEFA 2013).

According to Conway (2012), around three billion people in the world rely on solid fuels for cooking, whose consumption produces a number of very negative health impacts. Burning them inside households causes respiratory illnesses and nearly 1.6 million deaths per year, mainly women and children (WHO 2006). Therefore the improvement and dissemination of improved cooking stoves continues to be one of the main global objectives in terms of health and solid biomass use. The Global Alliance for Clean Cookstoves aims to foster the adoption of clean cookstoves and fuels in 100 million households by 2020 (GACC 2013). Other initiatives in Mozambique such as the Cleanstar Ethanol Cookstove program and the Cooking Fuel Project aim to facilitate a transition away from inefficient conventional biomass stoves by disseminating up to 30,000 clean burning and highly efficient cooking stoves to households in and across its peri-urban areas (UNFCCC 2013).

The debates around the food/and fuel problem and how to address this key issue continue to rage (Diaz-Chavez 2010; Fischer et al. 2009). Bioenergy production raises both positive and negative issues in each of the four dimensions of food security: availability, access, stability and utilization (CWFS 2013). Avoiding the use of food crops or the careful integration of bioenergy production on land suitable for growing food have been advocated as important ways of addressing the food versus fuel debate. Lynd and Woods (2011), for instance, have argued that the production of bioenergy from non-food crops on under-used and marginal land can have numerous positive impacts, particularly through the introduction of technologies useful for food production, local job creation, enhanced energy self-sufficiency, improved food security and economic status that reduces conflict. It has also been suggested that proposed bioenergy projects in Africa must provide concrete improvements to local food security (Lynd and Woods 2011).

The GBEP also recognizes that there is a complex, multi-faceted relationship between bioenergy and food security.

Investing in and improving agricultural systems and, particularly, in infrastructure, could lead to increased production of food fodder and fiber. It would also help reduce waste whilst making more efficient use of residues as feedstock for bioenergy production. In

combination, these measures would contribute to improved household welfare and, ultimately, rural development (FAO 2011). A case in point is that of the Bioenergy and Food Security (BEFS) projects, which FAO has implemented and which demonstrate that biofuel production from cassava in Tanzania can have positive impacts on household food security (FAO 2010).

Other issues to consider are nutrition and health improvement through agriculture. There is a need to target women of childbearing age and children during the first 1000 days of life. As Martorell et al. (2010) and Hoddinott et al. (2008) showed, improved nutrition during the first 2-3 years had long-term positive effects on education and also working capacity. Improving the nutrition of women of reproductive age and infants during the first 1000 days of life is key for overall improved health. Importantly too, indigenous foods can enhance food and nutrition security. Wild foods are important sources of nutrition in periods of food and income shortages (Kengni et al. 2004). Indigenous crops are easy to grow, have medicinal properties and are well adapted to local climate (Anwar et al. 2007; Fahey, 2005). Intercropping with bioenergy crops has been suggested as a way by which agriculture may help improve local conditions.

15.7 Land Rights, Gender and Vulnerable Groups

In developing countries, land rights are linked to livelihoods and development. Land rights refer not just to ownership but also to access to, use of, possession and occupation of land, and security of use and tenure. Dispossession of land, limits on access to land and lack of formal, documented rights to land threatens the livelihoods of farmers, peasants and fisherfolk. Many authors (Sjaastad and Bromley 1997; Adams et al. 1999) agree that a lack of secure land rights impinge on development efforts. Changes in land use and land ownership have not always been accompanied by appropriate reforms in policies (Kagwanja 2006). This has been identified as one of the main social problems, particularly in South Africa related to biofuel production (Schoneveld 2010). Yet, a review by Hamelinck (2013) of the Land Matrix database (2013) concluded that only 0.5% of total 38.3 Mha land deals worldwide are related to biofuels production (Table 15.2).

Few developing countries address issues related to land tenure disputes in their policy framework. Brazilian Law No. 11.952, 2009, for instance, grants tenure rights to individuals occupying land in the Amazon states and restricts the occupation of public land to Brazilian citizens engaged in agricultural operations who are not owners of another rural estate in the country and who effectively possessed the area prior to 1st December 2004 (FAO 2009). But this law explicitly excludes lands that have been traditionally occupied by indigenous peoples or that are found within nature reserves. India, through its National Biofuels Policy Act requires that consultations

Table 15.2. Analysis of land deals from the ILC Land Matrix (Mha) (Hamelinck 2013).

Assessed 25.8 Mha out of 38.3 Mha	For biofuels		Not for biofuels	
	Minimum	Maximum	Minimum	Maximum
Confirmed 9.0 Mha	0.53	4.9	4.1	8.5
Land grab	0	1.3	1.8	3.1
Strong concerns	0	0.16	0.22	0.38
Generic concerns	0.07	0.89	0.59	1.4
Small concerns	0	0.77	0.31	1.1
No concerns	0.45	1.8	1.1	2.5

No deals were found in 16.8 Mha

The minimum area allocated to biofuels is based on those crops that are being uniquely developed for biofuels (jatropha and a few others). The maximum area allocated to biofuels is the area for all switch crops (for both food and fuel production)

Strong concerns: land deal was not carried out correctly/local context gives rise to extreme caution

Generic concerns: Concerns related to similar activities in region, not specific to the site/ Concerns related to the holding company, not specific to the site

Small concerns: Concerns roughly less than 1% of the total acreage

be undertaken with local communities (through Gram Panchayats/Gram Sabhas which are local self-governments at the village or small town level in India) when new bioenergy plantations are planned.

FAO (2012b) produced voluntary guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the context of the National Food Security program. Some countries adopted the global guidelines on tenure of land, forests, and fisheries to safeguard the rights of their people. The guidelines address:

- Recognition and protection of legitimate tenure rights, even under informal systems
- Best practices for registration and transfer of tenure rights
- Making sure that tenure administrative systems are accessible and affordable
- Managing expropriations and restitution of land to people who were forcibly evicted in the past
- Rights of indigenous communities
- Ensuring that investment in agricultural lands occurs responsibly and transparently
- Mechanisms for resolving disputes over tenure rights
- Dealing with the expansion of cities into rural areas

Other measures to help address land rights problems, including accessible local land rights registration processes, have been advanced by various authors (Benjaminsen et al. 2009; Toulmin 2009; Kagwanja 2006). Supporting local institutions that undertake forms of land registration has shown to be effective in many places (Tousling 2009), and collective action represents one way for local communities to create and control their land rights (Meinzen-Dick et al. 2002; Meinzen-Dick and Pradhan 2002; Mwangi 2006; McAuslan 2006). For example, collective registration of community lands can be a powerful tool for protecting local land rights vis-à-vis incoming investors (Cotula et al. 2009). Voluntary guidelines (VGs) for the responsible governance of land tenure (Seufert 2013) help formalize customary tenure rights by strengthening women's land and resource rights and the tenure rights of indigenous people.

A common issue about indigenous tenure is that land rights insecurity leads to suboptimal investment incentives (Sjaastad and Bromley 1997), particularly where land rights are complex (Goldstein and Udry 2008; Sjaastad and Cousins 2009), so educating communities, and particularly women about their own land rights, is crucial. This is because of the significant role women play in agriculture (Migot-Adholla et al. 1991), and because land rights existing in various forms in developing countries have consistently discriminated against women (Carpano 2011; Gomez and Tran 2012; Whitehead and Tsikata 2003).

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), under the project "Women Accessing Re-Aligned Markets" (WARM) in Malawi and Mozambique has used the "Theatre for Policy Advocacy" (TPA) as an education tool. This participatory theatre encourages improvisation and allows for community participation. It was used to achieve the overall project goal of strengthening the capacity of women farmers to influence agriculture policy development issues. In Mozambique, one critical issue raised by women farmers during these dialogues was the challenge of "*direito de uso e aproveitamento da terra"* (DUAT), where the state granted land rights. This is a very effective tool for highlighting land right issues and getting communities to share possible solutions with policy makers (FANRPAN 2012).

Scoones et al. (2013) propose that a new phase of land grab research is needed where new concepts, methods and criteria are incorporated to implement better "systems for sampling, recording and updating information" (page 481).

15.8 Societal Perception, Corporate Sustainability Reporting and Monitoring

Over the last decade, as climate change started to be systematically tackled in international negotiations and national policies, bioenergy became part of the mitigation options being considered for the energy and transport sectors. Although the media has focused on food insecurity, land grabbing and deforestation as trade-offs of Bioenergy

production (Delshad et al. 2010), general public knowledge on bioenergy is still quite limited (Fallot et al. 2011), even in major producing countries, such as Brazil (Gerber Machado et al. 2011b) or Indonesia (Wright 2011) although more literature exists. In this context, NGOs and the media have played an important role, both in informing the public (if only partially) and in framing the debate, although several misconceptions have emerged (e.g. fuel quality issues at the combustion stage, in Germany and Costa Rica); whilst other opportunities have been detected e.g. poverty alleviation in Tanzania and Mali, agro-industrial innovation in Argentina.

Corporate Sustainability Reporting (CSR) has helped improve the image of the sector and promoted sustainable production. Since 2005, the Brazilian sugarcane sector has increased its efforts towards CSR. With an interest in exports, greater public scrutiny and encouraged by the agreement on sugar quotas against the EU, which was arbitrated by WTO, the sugarcane producers association UNICA (the Brazilian Sugarcane Industry Association), agreed to the application of EU-RED derived sustainability indicators for sugarcane ethanol destined to EU markets. Sugarcane mills faced with public pressure, regulations and certification schemes, have thus started to step up or introduce CSR and/or adopted the voluntary certification scheme 'Better Sugarcane Initiative' (Bonsucro), which is a multistakeholder initiative (MSI).

Originally the focus on the sugarcane sector was on social factors, as one mill representative stated: "*We conducted a survey with 50 journalists on the most critical sustainability issues in the sector and there was almost no concern for environmental impacts. Social issues, especially labor rights, were their main concern…"* (Olényi 2014).

To improve the sector's image and alleviate political pressure, improvements and communication became crucial. Later, demands from the EU and USA for alternative energy options put environmental concerns higher on the agenda. Mill owners support the sustainability concept and reporting, claiming it had a strong impact on their business, providing vision and a benchmark. They aim to engage the whole chain and be transparent with regular reporting on improvements (Olényi 2014).

Research into the real benefits of the CSR and MSI initiatives on this sector will still need to be conducted considering international guidelines such as the Global Reporting Initiative. Moreover, it is essential to develop monitoring and evaluation systems that permit an accurate and fair assessment of the performance of different initiatives and their impact on social conditions as well as the impact of standards and regulation, which also guide effective measurement and reporting.

15.9 Conclusions and Recommendations

This chapter presented an overview of the state of social aspects of bioenergy production in relation to a number of topics. This review is not exhaustive but demonstrates the synergies and trade-offs that bioenergy production presents for socio-economic

development at different geographical scales. Nevertheless, the data for assessing social aspects is still limited. Although literature has increased, this limitation is either because the focus of the discussion has been centered on some regions, such as Sub-Saharan Africa and Brazil or because the access and development of data is constrained by, for instance, economic factors. This data will also need to be extended to agroforestry and forestry social implications. Chapter 19 in this volume also includes a discussion on the need for data.

Policy instruments specific to biofuels have been put in place in several countries, but they still need to be linked to wider country-level objectives on food production, education and land use planning. This is the case of Brazil and the land use planning for bioenergy crops. The success of bioenergy production at all levels will still need to take account of the different production scales of the feedstocks and the benefits at small scale, or community level. Furthermore, an integrated approach (considering all pillars of sustainability) for the deployment of renewables in general and bioenergy in particular, will need to be integrated in future national and international efforts, such as the Sustainable Energy for All and the Global Bioenergy Partnership frameworks, amongst other initiatives.

Finally, it is essential to develop monitoring and evaluation systems, or use existing ones, to evaluate the progress towards sustainability on social and environmental issues. The collection of data should be carried out according to carefully selected indicators, which are used to measure the evolution of different aspects of environmental or socio-economic contexts. This will entail a larger effort that needs to involve producers, local governments and international organizations.

15.10 The Much Needed Science

Socio-economic data for assessing the social dimension in the bioenergy context is still limited. This limitation is either because discussion has centered on some regions, such as Sub-Saharan Africa and Brazil, or because access and production of data is constrained by, for instance, economic factors. Also, data collection needs to be extended to cover the social implications of bioenergy production through agroforestry and forestry, and adequate measuring tools for such social (soft) data need to be agreed upon.

It is essential to develop monitoring and evaluation systems, or use existing ones, to evaluate the progress towards sustainability on social and environmental issues. The collection of data should be carried out according to carefully selected indicators, which are used to measure the evolution of different aspects of environmental or socio-economic contexts. This will entail a larger effort that needs to involve producers, local governments and international organizations.

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