Socio-economic assessment of the pellets supply chain in the USA

A report produced for Task 40

Front cover information panel

IEA Bioenergy

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Socio-economic assessment of the pellets supply chain in the USA

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Authors: Rocio Diaz-Chavez (Imperial College London), Arnaldo Walter (Universidad de Campinas, Brazil) and Pedro Gerber (Universidad de Campinas, Brazil)

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Summary

Improvement of socio-economic conditions should be a relevant goal for the further development of biomass and bioenergy production as well as trade. Several factors, including geographical location and local economic conditions, influence local quality of life as well as society's development. In particular in rural areas the conditions cannot be generalised considering that there is a remarkable heterogeneity in the development trajectories of rural regions that go far beyond the traditional, generalized image of rural disadvantage.

As bioenergy and especially the production of wood pellets depends heavily on the forestry related sectors, it is required to sustainably produce biomass for energy purposes to extend the positive impacts they have and to minimize negative impacts on society, guaranteeing the mitigation of vulnerability in rural areas, and assuring the disassociation of rurality and backwardness. In the case of the USA, the pellet production to export has reached 7 million tons in the last years providing positive socio-economic impacts in the regions but also some socio-economic issues that need to be further improved. The main aim of this report is to understand the dynamics between local development and forestry activities related to the production and export of pellets on local communities. This report assesses selected issues and indicators for the socio-economic analysis: the following indicators were chosen: Job creation, Land property, Human Development Index, Income Gini Index, Labour conditions, Gender and Diversity, Community Impacts, Sustainable Forest Management Certification and logistics.

The assessment included a mixed method using secondary data from the literature and statistical data from the Census and data from interviews of stakeholders in the selected States or related to the sector.

The indicators were applied in the southeastern region of the USA (particularly in the States of Georgia, Louisiana and Mississippi) where an established sector for exporting pellets is already in place. The findings particularly of variances over 15 years of HDI and Gini coefficient show the difficulties for the sector and the human resources involved. It is noticeable that these selected States are those with the lowest income and the highest Gini index in the USA.

The forest sector in the USA shows few signs of development vector. Income increases slowly, but steadily in the United States, but the forest sector does not follow this same path. Job creation was clearly affected between 2000 and 2010 in the USA in the feedstock production and with no signs of general improvement between 2010 and 2014 (due to the housing crisis in the US), but improvements are seen in the transformation sector. This could provide better opportunities for the expansion and adaptation of the pellet sector.

The methodological challenges for socio-economic assessment (such as confidentiality issues related to the market, the novelty of the sector, the lack of data) remain in place without the possibility of disaggregating the data from the general sector of the forest and wood industry to the new sector of bioenergy with the production of pellets. This is due mainly because the sector is still relatively new and despite it has continue growing, it is still political driven and somehow opportunistic in finding new markets. This may change in the future when more data is available and with a horizontal analysis will be possible to better provide conduct a monitoring of the sector.

Additionally, indicators used such as HDI and Gini, are highly aggregated and beset by inertia. Still, they were used in the analysis to compensate for the difficulties of accessing data from

companies because the establishment of the sector is relative recent, and as a result, there is high competition between producers who carefully guard against revealing sensitive commercial information. Yet, it is not possible to infer any firm conclusions from these indicators because of the diversification of local economies and the fact that pellets production contributes only a rather limited number of jobs. Hence, at state level, the overall impact of this activity is unlikely to be significant. However, the socio-economic impacts of the whole supply chain may be important at the local level, and this may be ascertainable through assessment of pellet production data spanning several years, which is not currently feasible given that the sector is relatively newly established.

The analysis regarding employment opportunities showed that job creation in feedstock production (wood) in the USA grew very slowly in 2010-2014. Growing demand for pellets may entail job expansion in pellets production with possible knock-on effects on feedstock production that will increase demand for labour. Also, any job growth in pellet production and bioenergy projects more widely should ensure greater participation of women in the workforce.

The report was based on secondary data but was enhanced with the in-depth interviews of key stakeholders in the market. The views of the stakeholders on different issues such as the history on the region and power relationships in the forestry sector, the possibilities of job creation and the growth of the sector. They reported for instance an increase in the number of jobs taken up by women, particularly in activities in pellets trading and other activities in the forestry sector.

Overall then, it can be said that the forestry sector plays a role in helping create employment along the feedstock production chain in the three states examined here, although at a modest scale. Nevertheless, as some interviewees observed, local communities, for the most part, welcome this contribution. But they also they also noted a certain animosity towards them by NGOs representing local groups who feel excluded from the benefits these businesses may bring to communities or are critical of perceived negative environmental impacts even where these are not directly created by pellets producers but by other, longer-standing forestry activities (e.g. logging).

The report provides the following recommendations:

- Further and more comprehensive research to be carried out to enable a fuller assessment of the impacts of pellets production with more in-depth interviews with relevant stakeholders and with the communities.

- Extend the scope of the assessment to include perceptions of different social actors about the environmental impacts of pellets production, including ecosystem services analysis, to enable a clearer understanding of the changes initiated or compounded by the sector

- Linking current US monitoring programmes to international certification organisations to help produce a robust, reliable and accessible database

- Greater integration between stakeholders (e.g. NGOs), government agencies and the pellets producing sector at the local level to allow for more inclusive planning of activities and of mitigation measures that take account not only of environmental factors but also socio-economic issues (e.g. job allocation, wages, working conditions, gender and race equality, quality of life, community assets, etc)

1. Introduction

Due to the EU objectives to reduce greenhouse gas (GHG) emissions under the Renewable Energy Directive (RED, 2009) and the objectives of pushing forward the green economy in the EU, the biomass imports for electricity, heat and biomaterials increased in the last years.

Several studies have been conducted to evaluate the main supply chains regarding environmental issues such as GHG emissions, land use, and indirect land use. Nevertheless, few studies (Brett and Wear, 2013; Butler et al, 2016; Henderson et al, 2016; Dale et al, 2017) have been conducted to better understand the socio-economic implications of this production and use for specific supply chains feeding the European market and, in particular, assessing the impacts on smallholders or on communities. These studies have been seminal on assessing the sector and are explained below within this report , especially in the analysis of job creation. The International Energy Agency Task 29 (completed with last period of 2010-2012) had the objective of achieving a better understanding of the social and economic drivers and impacts of establishing bioenergy fuel supply chains and markets at different levels. This Task produced several reports but the case of the production and export particularly from regions outside the EU were not covered (IEA Bioenergy Task 29).

The Overseas Development Institute (ODI, 2014) indicated that a starting point for assessing socio-economic impacts would be to use an analytical framework to assess the balance and distribution of different impacts on (socio-economic) issues with comparison points. It also recommended using more data from baseline surveys and longitudinal studies that allow comparison before-and-after impacts and comparison over time and across target populations.

Several factors, including geographical location and local economic conditions, influence local quality of life as well as the society's development. Distance to regional urban centres, local population density, local market size and even infrastructure issues as electricity and highway networks are just samples of locational variables used to capture the effect of local development (Joasson and Helfand, 2010).

To spread and effectively bring development to a country or a region, public policies directly focused on areas with reduced opportunities in terms of jobs, public health and education are necessary. In general, in rural municipalities income is inferior, infrastructure is reduced and non-farm jobs are not abundant, leading to high levels of emigration to urban centres. The connection between rurality and backwardness, however, cannot be generalized, considering that there is a remarkable heterogeneity in the development trajectories of rural regions that go far beyond the traditional, generalized image of rural disadvantage. In this sense, many profitable crops have brought development into municipalities when other activities were not feasible in remote areas (European Commission 2008). In the USA, for instance, the Forest Project (Wear and Greis, 2013) allowed to better understand the different drivers and impacts influencing the production and development of the forests in the South East States where the management, restoration, and policy were considered to vary across the different identified sub-regions due to this heterogeneity.

Socio-economic impacts have been investigated mainly on the use of biomass for traditional uses

such as cooking stoves (e.g. Malla and Timilsina, 2014)[1], or for the production of liquid biofuels (Diaz-Chavez, 2014; Rutz and Janssen, 2014; Brinkman et al, 2018). This project looked to assess some socio-economic indicators related to the biomass production and conversion supply chain in particular of pellets for the EU biomass market (e.g. Henderson et al, 2016).

As a case study the biomass supply chain in the South-East United States was chosen, where the total forest area is around 100 million ha. Despite economic development and growing population, the total amount of forested land in the US has remained constant throughout the past century but with differences in the different regions (see Wear and Greis, 2013). However, increasing development and continuing population growth are expected to drive a reduction in forest area in the near future (Wear and Greis, 2013). Historically, the US has been both the largest producer and the largest consumer of woody biomass in the world. The US share of global wood product production peaked at 28% in 1998 and has since fallen to below 20% (Prestemon et al. 2015 in Fingerman et al, 2015). Three States were selected (Mississippi, Louisiana and Georgia) in the South East which are currently a major exporter of pellets to the EU. According to the Biotrade2020 project (Fingerman et al, 2015), in the past decade pellet production has increased throughout the US, particularly in the Southeast region, mainly as a response to the increasing EU market demand. In 2014, US wood pellet production was estimated at 6.9 million tonnes (Mt) (including domestic use) – an increase of about 21% from 2013 (UNECE-FAO 2015). Most of this production is exported to the EU market.

The overall aim of the project is to identify selected macro socio-economic indicators related to the pellet supply chain and to test it in the case study. Specific objectives include:

- Identify selected indicators for socio-economic assessment
- Analyse the selected indicators to the case study through secondary data and information from in-depth interviews with relevant stakeholders

[1] There is a plethora of literature on socio-economic impacts of cooking stoves in developing countries which is acknowledged but will not be addressed in this report

2. Methodology and indicators selected

The proposed methodology followed the socio-economic assessment framework developed for the EU FP7 funded project Global-Bio-Project[2] which aimed to assess the impacts of biofuels supply chains in different countries across the world. The set of indicators developed with partners and other stakeholders was applied to two supply-chains one of sugarcane, in Brazil, and one of soy-bean, in Argentina. A number of socioeconomic sustainability criteria and indicators were selected to be included in the Global-Bio-Pact project (Diaz-Chavez, 2014). These indicators aimed to measure socioeconomic impacts of biomass production and cover a wide range of aspects related to macro and micro socioeconomic sustainability, including contribution to local economy, working rights and working conditions, health and safety, gender, land rights and conflicts, food security and a range of environmental impacts that could affect local communities (Table 1). In the Global-Bio-Project the industries were asked to fill in a questionnaire that covered different aspects of the indicators. This was followed up with a visit to the facilities and production areas. The original framework conducted interviews with main stakeholders and employees.

Table 1. Issues and indicators of the Global-Bio-Pact Project (Diaz-Chavez, 2014)

Impact	Examples of indicators
Basic information	
Framework conditions	Location, average yield
Socio-Economic	
Contribution to local economy	Value added, employment
Working conditions and rights	Employment benefits
Health and safety	Work related accidents
Gender	Benefits
Land rights	Land rights and conflicts
Food security	Land converted from staple crops
Environmental	
Air	Open burning
Soil	Soil erosion
Water	Availability of water
Biodiversity	Conservation measures
Ecosystem Services	Access to ecosystem services

The set of issues and indicators of the Global Bio-Pact was adapted to wood pellet production and is presented in Table 2. The issues and indicators are both qualitative and quantitative in nature but the qualitative indicators are also presented in a narrative form.

In an attempt to understand the impacts of production of pellets on local society, this report deals with some well-established indicators and index (e.g. HDI, Gini) that can reveal the dynamics between local development and silviculture activities and the economic links of exports. The methodology uses mixed methods using secondary data and qualitative data gathered from in-depth interviews with selected stakeholders. The following steps were applied: 1. Selecting criteria; 2. Provide basic background information of the study region with by statistical data; 3. Identify stakeholders and conduct interviews along the supply chain; 4. Qualitative assessment of

[2] http://www.globalbiopact.eu/

the indicators; 5. Conclusions and recommendations.

Based on four basic rules for indicators including measurability, easiness to gather data, usefulness of assessing socio-economic impacts and temporality, as proposed by Diaz-Chavez (2012), the following issues and indicators were chosen: Job creation, Land property, Human Development Index, Income, Gini Index, Labour conditions, Gender and Diversity, Community Impacts, Sustainable Forest Management Certification and logistics. The analysis of women's share in the forest and wood sectors is a recognition of the importance of gender equality in sustainable development, and to orientate policies to ensure women's participation in economic activities (UN, 2014). Nevertheless, the forestry sector (as others) has a lower share of women participation.

The background information (first criterion in the framework), as well as the identification of stakeholders, was conducted during two field visits and in-depth interviews. The focus was on a combination of macro and meso level indicators and although the micro level (household and small producers) is acknowledged as of main importance in this project it was not possible to conduct it. A survey was prepared to be distributed by an organisation related to forestry owners associations in Georgia[3], USA. The Association decided not to distribute it.

Table 2 Selected socio-economic indicators

Impact	Examples of indicators	Applied to the case study
Basic information		
Framework conditions	Location, average yield	
Socio-Economic		
Contribution to local economy	Value added, employment	HDI Gini Number of workers/producers
Working conditions and rights	Employment benefits	Sustainable reports

3 https://imperial.eu.qualtrics.com/SE/?SID=SV_42biANaclzFwBed

Gender	Benefits	Equity issues
Land rights/property	Land rights and conflicts	Land tenure
Certification	Compliance	Indication of certification schemes used
Logistics	Available infrastructure	Available infrastructure

Among the criteria considered in this socio-economic assessment was the Human Development Index (HDI). According to the United Nations Development Programme (UNDP, 2016), the HDI was created as the main indicator for assessing the development of a country or region based more on people and their capabilities and not just on economic growth. It is an average of key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions (Figure 1).

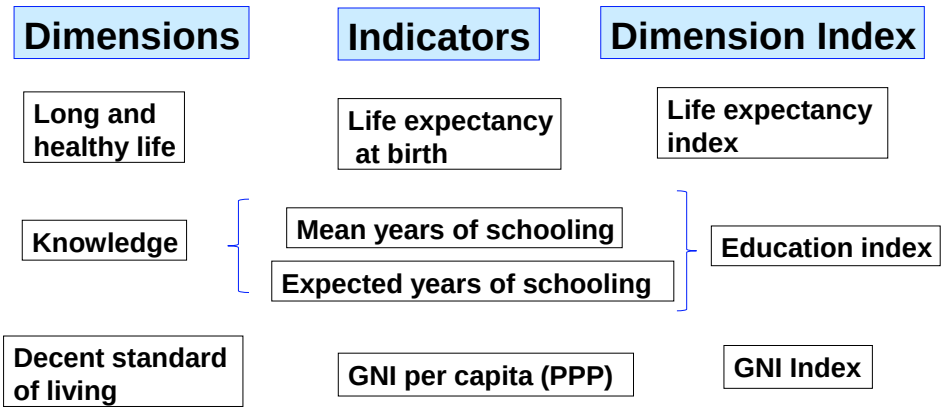


Figure 1. Dimensions of the Human Development Index (after UNDP, 2016)

Although there are difficulties attributing some socio-economic indicators to the bioenergy sector in general (as it encompasses different sectors, such as agriculture, forestry, industry), this research highlights some of these links and how the activities within the bioenergy sector may impact, both positively and negatively, in local and regional communities. The HDI includes three relevant dimensions which are the decent standard living, health and knowledge. The Gini Index was also included to show the inequality of income.

As a case study it was selected the South-eastern region in the United States, where pellets have been produced for exporting to the EU. Nevertheless, considering the whole region was out of the scope of this project and therefore the case study looks at three States of Georgia, Mississippi and Louisiana where major pellet exporters are localised and where the researchers visited some facilities.

The analysis of the data considered two main divisions of the supply chain, the production of the raw material (mainly pulp and logs from pine plantations) and the production of the pellets with the focus on exporting. That means that some issues on the logistics of the ports were considered as well in the analysis as the researchers visited two ports used for exporting pellets to Europe.

Secondary data were used for main sources and databases. In the case of USA as a whole and also for the three states considered (Louisiana, Mississippi and Georgia), data for income and employment (and women's share of employment) were taken from the U.S census (U.S Census Bureau, 2016a, 2016b) from Measure of America, and from the Social Science Research Council (Social Science Research Council, 2016). Additional data was gathered from literature review.

A simple Pearson's correlation[4] should be calculated between HDI, Gini and income, and production value of silviculture. But due to lack of data, the correlation was calculated between the number of wood transformations establishments, and Gini and income, for the years 2000, 2010 and 2014. Louisiana resulted in 192 observations, and Mississippi in 246 and Georgia in Pearson's correlation is a measure of the linear dependence between two variables, varying from -1 to 1.

The report presents in chapter 3 the background information of the USA Southeast case. Due to the nature of the method and the limited availability of data to conduct a horizontal analysis, the indicators and their analysis are presented in Chapter 4. Chapter five presents the conclusions and recommendations.

[4] A Pearson's correlation is a measure of the linear dependence between two variables, varying from -1 to 1.

3. Case study: USA

3.1. BACKGROUND

The United States covers an area of 9,826 million square kilometres, with a population of 318.9 million (estimated) in 2014 (IEA, 2014). It remains the largest economy in the world, with a gross domestic product (GDP) in current prices (2013) of USD 16,800 trillion, or USD 51.7 thousand per capita. The GDP composition is: agriculture, 1.6%; industry, 20.7%; and services, 77.7% (CIA, 2015)

The main agricultural products include: wheat, corn, other grains, fruits, vegetables, cotton, beef, pork, poultry, dairy products, fish and forest products, while the industry is highly diversified and includes high-technology, petroleum, steel, motor vehicles, aerospace, telecommunications, chemicals, electronics, food processing, consumer goods, lumber, and mining (CIA, 2015).

Forestry area in the USA is about 33.3% of the total area of the country. Forests face impacts from land development, suppression of natural periodic forest fires, and air pollution. According to the US Forest Service (2001) the forest Area in the USA has been relatively stable since the19th Century (see Figure 2 for the whole of the USA). Nevertheless, the area of forests has been reduced in the last 20 years, particularly in the SE mainly to shifts to agricultural land and urbanisation.

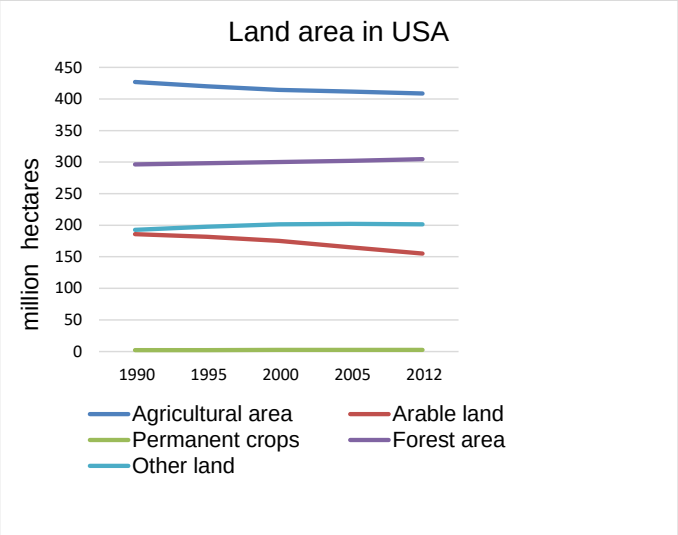


Figure 2. Land use area in the USA (FAOstat, 2015a).

According to the U.S. Bureau of Economic Analysis (BEA, 2016), the GDP has a strong correlation with how many people live in those areas. The Statistics showed that the Southeast (with a combined population of 12 states) with approximately 83 million (or a quarter of U.S. citizens), has the biggest GDP share, standing at 21.4 percent of total GDP. Some economic activities are linked to the type of land use. In the Eastern U.S. land change is connected primarily to timber harvesting and urban growth (Loveland and Acevedo, 2011). According to Loveland and Acevedo (2011) research from the Land Cover Research Project, agricultural lands have been converted to forest (e.g., in the southeast ecoregions) and also lost to urban growth. Also associated with timber harvesting and expanded urban development they found a very large amount of transitional, disturbed lands.

According to the Biomass Magazine (2018)[5] there is currently a total of 136 plants with a total capacity (Metric tons/yr) of 14,028,800 operating in the USA. There are eight main states in the South-East of the USA where pellet production is taking place or projects about this activity have been developed (Figure 3). According to NRDC (2015) in 2015 there were 24 operating and 27 proposed mills in the region, with some areas showing particularly high concentrations of facilities (e.g. the Virginia–North Carolina border, Southeast Georgia, and the Alabama–Mississippi border), while the production is still incipient in Southern Louisiana (Table 3). For 2018, Biomass Magazine (2018) reported a total of 39 operating plants in the same 8 states as shown in Table 3.

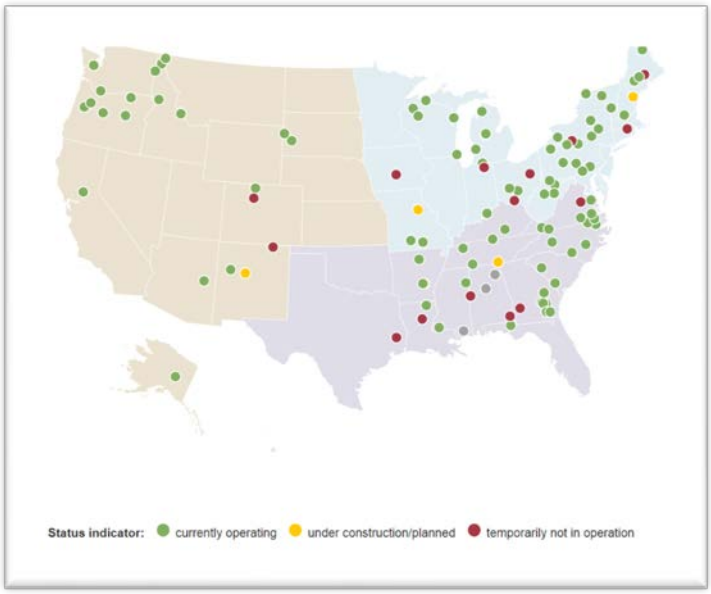


Figure 3. Manufacturing facilities and status, July 2017 (EIA, 2017).

Table 3. Operating and proposed pellet mills per state, as per October 2015 (NRDC, 2015).

State	Number of Operating Mills	Number of Proposed Mills	Total Number of Mills
Alabama	3	3	6
Florida	1	0	1
Georgia	7	8	15
Louisiana	0	1	1
Mississippi	3	5	8
North Carolina	2	4	6
South Carolina	2	3	5
Virginia	6	3	9
Total	24	27	51

The areas visited for the purpose of this Task 40 project were in the States of Georgia[6], Mississippi and Louisiana. The stakeholders identified in the region are presented in the next section.

[5] http://biomassmagazine.com/plants/listplants/pellet/US/page:1/sort:plant/direction:asc
6 Different locations were visited as part of a Bioenergy Tour organized by the Oak Ridge National Laboratory, on April 10-14, 2016.

3.2. PRODUCTION AND CONTRIBUTION TO LOCAL ECONOMY

The Southeast of USA is the area where pellets production has increased and from where pellets are being exported to Europe. The US Southeast gained attention from the traditional forest sector around the 1980s due to the decline of the spotted owl on all public lands in the west. Production attention shifted strongly to the southeast, and led to further investments in plantations. As a consequence, both plantation area as well as growth rates of slash pine and loblolly pine increased (Fingerman et al, 2015). These plantations represent only 30% of the total forest area but their increment (stem wood volume) is more than 2/3 of the total increment in the region (see Table 4). The US SE generates 60% of the timber harvested in the US each year (Conrad et al. 2011).

Table 4: Forestry overview statistics for the US Southeast (FIA 2012)

	Forest area (million ha)	Net annual stem wood volume increment (million m^3)	Fellings (pulp logs and saw logs) (million m^3)	Mortality (million m^3)
Total South	100	364	224	78
Longleaf and shortleaf pine plantations	29	246	148	33

Historical levels of timber removals from the U.S. South (1995-2011) (Figure 4) include removals for softwood and hardwood pulpwood and saw timber, and for industrial wood products and composites (Abt et al, 2014).

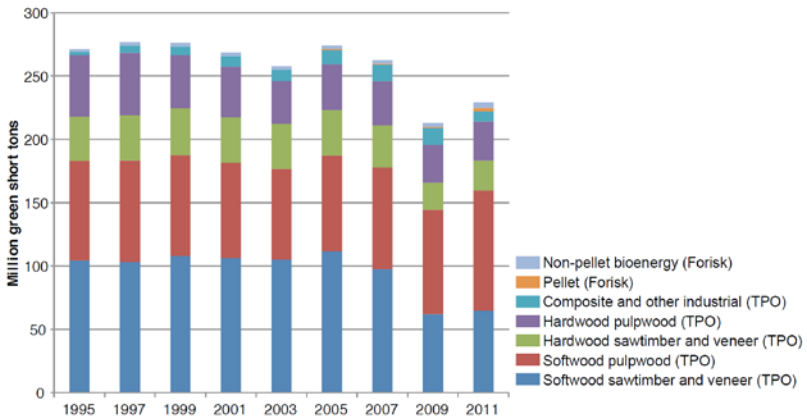
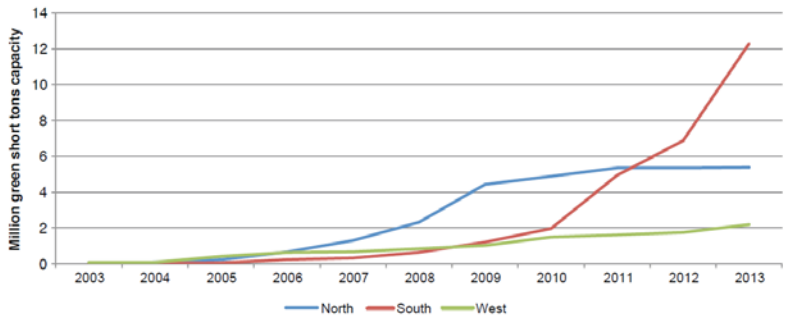
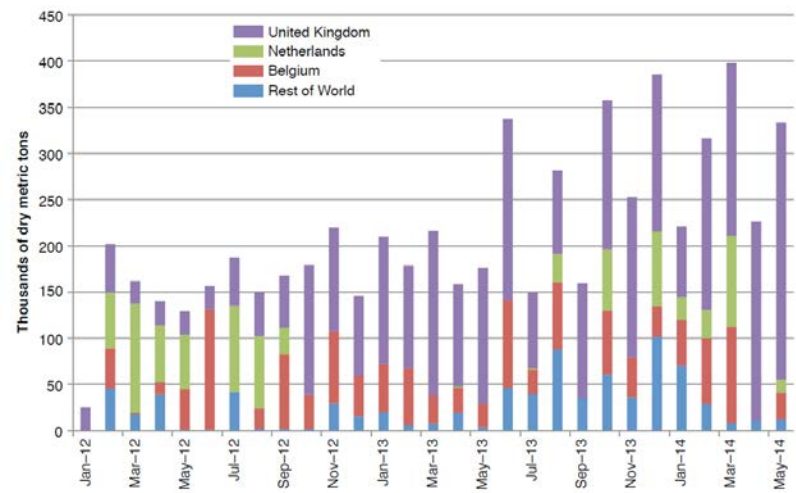


Figure 4. Timber product output (TPO) removals for U.S. South (excluding Texas) for 1995–2011 (Abt et al, 2014).

Pellet production has increased in the USA in the last ten years responding to the EU market demand. Figure 5 shows the origin of the pellets production in the USA (classified in three regions) while Figure 6 shows the main destinations of the pellets exported by US, in 2012-2014.



A



B

Figure 5. A) Growth in pellet production capacity by U.S. region from 2003 through 2013. (Forisk Consulting, 2014, in Abt et al, 2014). B) Destination of pellet exports from the United States from January 2012 to May 2014. (U.S. Department of Commerce, 2014, in Abt, 2014).

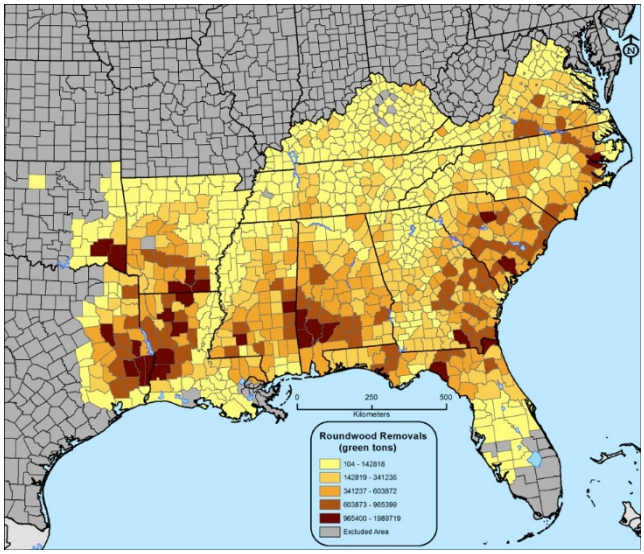


Figure 6. Roundwood removals in the USA (Perlack, 2011, in IINAS, 2014).

A report produced for the Department of Energy & Climate Change (DECC) in the UK estimated that by 2020 there could be approximately 23.8 - 51.5 Modt/year of North American forest residues available, that would otherwise be burned on the roadside, and between 1.7 and 12 Modt/year of unused saw-mill residues, depending on the recovery of the lumber market (Stephenson and MacKay 2014). The report also estimated the potential use of dead trees that have been killed by natural disturbances and would otherwise be burned as a waste at the roadside although a significant issue associated with this feedstock is the inconsistency of the annualised volumes within a designated landscape, and the high costs associated with its recovery and utilisation (Stephenson and MacKay 2014).

According to Stephenson and MacKay (2014), forest residues often have high contents of bark and non-combustible elements, such as alkali metals, which can cause problems of slagging, fouling and corrosion in boilers; therefore some electricity stations require pellets produced from biomass with low bark contents, such as roundwood. It is therefore conceivable that a significant proportion of the feedstock used to produce biomass pellets in the future might be roundwood (in addition to sawmill residues). This roundwood is harvested from North American forests at a rate of ~ 210 Modt/year, and is generally classified as saw logs and pulpwood, with saw logs used for construction, and pulpwood and residues from saw log processing used to produce particleboard, fibreboard, and paper products, besides wood pellets (which currently comprise a very small fraction of roundwood harvesting). The available feedstock for production of pellets until 2016 is presented below in Figure 7 (Abt et al, 2014).

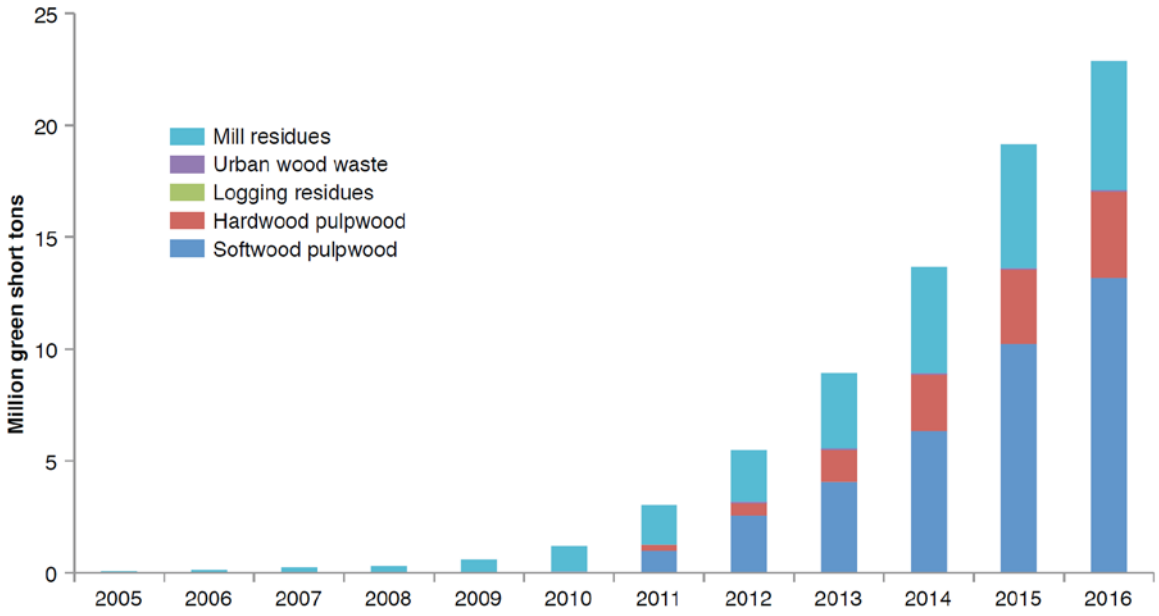


Figure 7. Forecast of feedstock source for use in pellet production in the U.S. South for 2005–2016 (Forisk Consulting, 2014, In: Abt et al, 2014).

Stephenson and MacKay (2014) reviewed different publications to estimate the resource availability from two sources: residues from forest logging in the USA and those from forest residues that otherwise would be burnt on the roadside. The results are presented in Table 5.

Table 5. Resource availability of forest logging residues and residues that would otherwise be burnt on the roadside (Stephenson and MacKay, 2014)

Resource availability of forest logging residues		
Resource description	**Resource availability** (Modt/y)	**Reference**
Forest residues collected after conventional harvesting techniques. Assuming that a minimum of 30 wt% should be left in the forest to prevent soil degradation & loss of habitats. Includes pre-commercial thinnings.	13.0 to 47.0 depending on the biomass economic value.	US DOE, 2011
Forest residues, potentially available from fire-treatment processes.	14.0 to 35.0 depending on the economic value	US DOE, 2011
Forest residues from the conversion of forest to other uses.	4.4 to 12.0	US DOE, 2011
Forest residues currently left in the forest, assuming 35 wt% should remain in the forest.	28.0	Forisk, 2011
Resource availability in 2020 - forest residues to be burned as waste		
Residues from fire-treatment of US forests	0.0 to 17.5	Lower: Forisk, 2011 Upper: US DOE, 201153
Residues from clearing of US forests	4.4 to 12.0	Lower: US DOE, 2011 Upper: US DOE, 2011

3.3 PELLET FACILITIES AND INTERVIEWED STAKEHOLDERS

To complement the data research of this report, the authors carried out several in-depth interviews and site visits in the South-east US. The interviews were conducted with 18 stakeholders (Table 6) of the pellets sector, including pellet producers, members of the supply chain, sector associations, representatives from government agencies and the civil society. Information from the interviews served to describe the pellets supply chain (upstream and downstream), and to enrich the sections about socio-economic indicators following below.

Table 6. Interviewed stakeholders of the pellets sector

State	Institution	Name	Format
GA	JRL pellet mill Swainsboro		Visited
LA	Export facility Baton Rouge	Brian Taylor	Visited
MS	Drax	Richard Peberdy, John Bennet	Visited
GA	Peeples Industries Inc.	Brad Orwig	Visited
Region	USIPA	Jessica Marcus	Phone
NC	Forest2Markets	Tracey Lesley	Phone
Region	Major wood supplier	Interviewee A	Phone
		Interviewee B	Phone
AR	Highland-Pellets	Tom Reilley	Phone
Global/TX	Copenhagen Merchants Biomass	Todd Bush	Phone
SC	US Endowment for Forestry and Communities	Carlton Owen	Phone
AR	Arkansas Forest Association	Max Braswell	Phone
LA	Biomass Power Louisiana LLC.	Andy Burns	Phone
ID	Dome Technology	Lane Roberts	Phone
LA	LSU AgCenter Baton Rouge	Richard Vlosky	Phone
NC	Dogwood Alliance	Adam Macon	Phone
Region	Enviva	Jennifer Jenkins	Phone
Region/ Washington	American Forest Foundation	Rita Hite	Phone

The following table presents a detailed inventory about all pellet and port facilities which have been considered in the stakeholder interviews (Table 7).

Table 7 Inventory of pellet plants and export facilities referred to in stakeholder interviews.

State	County	Company	Start of operation	Name / type of facility
MS	Amite County	Drax	2015	Amite BioEnergy Plant
LA	Morehouse Parish	Drax	2015	Morehouse BioEnergy Plant
LA	LaSalle Parish	Drax	2015/2017	Louisiana Pellets (Urania) Plant
AR	Jefferson County	Highland-Pellets	2016	Pine Bluff Plant
GA	Ware County	Georgia-Biomass	2011	Waycross Plant
GA	Emanuel County	LJR Forest Products	2013	LJR Forest Products Plant
NC	Hertford County	Enviva	2010	Ahoskie Plant
NC	Northampton County	Enviva	n. a.	Northampton Plant
NC	Sampson County	Enviva	2017	Sampson Plant
NC	Richmond County	Enviva	end 2017	Hamlet Plant
MS	Amory County	Enviva	2010	Amory Plant
FL	Jackson County	Enviva	2008	Cottondale Plant
VA	Southampton County	Enviva	2012	Southampton Plant
LA	Natchitoches	Biomass Power LA	not yet	Natchitoches Plant
LA	West Baton Rouge	Drax	2014	Port of Baton Rouge
VA	Norfolk City	Enviva	2011	Port of Chesapeake
AL	Mobile County	Enviva	n. a.	Port of Mobile
FL	Bay County	Enviva	n. a.	Port of Panama City, Florida
NC	New Hanover County	Enviva	2016	Port of Wilmington

3.4 THE PELLETS SUPPLY CHAIN IN THE SOUTH-EAST US

The forestry sector is a traditionally strong economic sector in the south and south-eastern region of the US and has been delivering raw materials for manufacturers of diverse wood products such as lumber, construction and pulp and paper industry since the early 20th century. Over the last decade, the export-oriented pellets industry in the US South rose as a result of EU renewable energy policy, with first large-scale mills being built around 2010. At the same time, other wood product manufacturing sectors declined due to the housing crisis in the US and the general decline in the use of paper products (Dale et al, 2017). The pellets supply chain is intertwined with the supply chain of other wood products, which all together result in the current forestry management system found in the region. Figure 8 describes the pellets supply chain, as described in the different interviews, before and after the pellet mill, highlighting the different level of complexity between the sourcing of feedstock and the supply chain between the mill and the end-user. All pellet producers interviewed for this report and associated with the US Industrial Pellet Association – USIPA – operate under long-term off taking contracts with electricity utilities in Europe. Only small amounts are sold to independent biomass traders which tend to purchase pellets at lower prices during summer periods and sell when the electricity demand and prices rise in the winter.

The pellets facility contracts a transport company to haul the finalized pellets to the port. Most facilities send their pellets by truck, but also railway and barges are used for transportation, depending on the geographic location of mill and port facility. The port facilities mostly work under long-term lease agreements and are run by logistics companies which manage loading and shipping of the pellets. In the rare cases of the port of Wilmington and the port of Chesapeake, facilities are owned by the pellets company. At these ports, pellets are stored in waterproof and insulated domes with a volume of up to 40,000 tonnes of pellets. In other ports they are kept in warehouses. After pellets are shipped to the European harbor, the receiving utility usually contracts the final transport to the power plant.

While the supply chain post-production appeared to be structured in a rather linear way, the wood fiber supply to the pellet mill takes place through a variety of channels. Even though the exact distribution of suppliers depends on regional characteristics and the procurement policies of the different wood pellet companies, Figure 8 draws the general structure of the supply chain as result of regional forestry management practices.

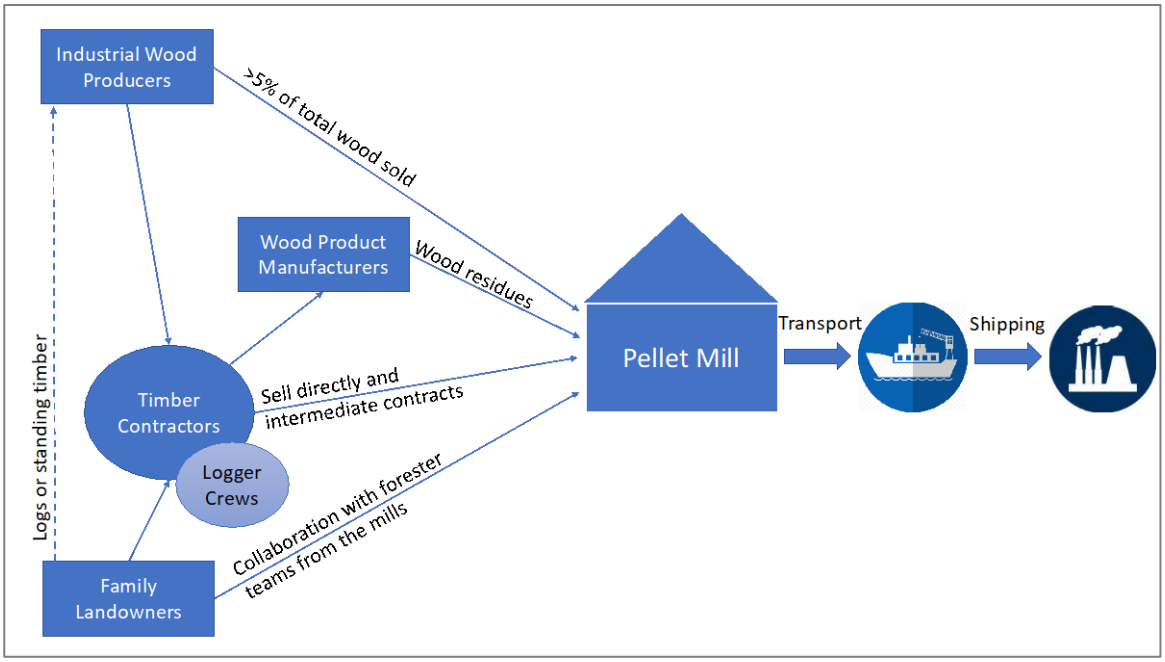


Figure 8 The wood pellets supply chain upstream and downstream of a pellet mill. Material streams in this figure do not consider the procurement characteristics for other wood products (own creation).

None of the pellet mills interviewed in this report owns and manages their own timberlands. Companies rather focus on the procurement of low value wood from harvests and silviculture practices in the region, such as thinning, and of residuals from wood products manufacturing. In the case of most managed forestry systems, pellet mills purchase wood of the bottom-end of the wood value chain, while more pristine materials from timber harvesting go into lumber production, construction industry and the pulp and paper industry. Pellets plants use similar fibre and may compete directly with pulp and paper plants for medium and low value wood (depending also on geographic proximity and type of wood processed). However, the decline of many pulp and paper mills over the last decades, resulted in a situation of oversupply of wood fibres; pellet plants have been found to have absorbed part of this demand, according to the information provided by the interviewees. Pellets are considered as low value products and being sold at an average price of 150 USD per tonne, which tends to be lower than any other wood product, pellets companies have the lowest purchasing power for wood fibres. Low value wood and residues make up about 10 to 35% of the total harvested wood (summary of the interviews conducted as per table 6).

Depending on the delivery costs for fiber, pellet companies procure wood in a radius of 50 to 100 miles (80-160 km) around their facility, defined as their “fibre basket”. Four main wood sourcing channels have been identified:

- **Industrial wood producers** produce about 95% of their wood for high and medium value wood consumers. Pellet mills have been found to absorb low value wood and residuals from silviculture practices, such as thinning. Industrial wood producers employ their own logging crews, but also make use of independent logging companies.

- **Small landowners** are the main source of wood fibre for pellet plants in the South East of USA (at least in the three States analysed in the report and reported by the interviewess). Some pellet companies employ their own forester teams which procure wood directly from family landowners and mostly hire independent logger crews to provide the harvest and transport of feedstock to the mill. Small landowners are paid between 8 to 12 USD per tonne going into the biomass supply chain.

- **Wood product manufacturers** sell residuals from their manufacturing processes to pellet plants in direct contracts.

- **Timber contractors** work as flexible agents or brokers in the forestry system, intermediating between wood producers and consumers and are usually well connected and familiar within their local region. They assess and purchase standing timber in large parts from small landowners, harvest, and then redistribute the different wood fibre categories to all ranges of customers. In some cases, timber contractors also intermediate direct contracts between small landowners and pellet mills. Timber contractors exist in diverse forms and degrees of organization, ranging from single individuals working as forest consultants to small and medium sized companies. Timber contractors can provide logging services as part of their business or hire independent logging crews to harvest the timber and then transport it to the end-user.

Some logging crews often act as timber contractors between timber producers and pellet mills. However, in this report they are presented as independent entities of the wood procurement network. Logging crews are contracted as and when required for thinning or clearing timberlands, and for transportation of the wood fiber. A constant flow of logging contracts is crucial to their business because of high investment costs in logging equipment, which also explains why they work with multiple actors in the wood supply chain.

The following sections include the data for the selected socio-economic issues and indicators. These include: local employment; land property; Human Development Index; Income; Gini Index; Labour conditions; Community Impacts; Certification; Logistics.

4. ISSUES AND INDICATORS SELECTED FOR THE SOCIO-ECONOMIC ANALYSIS

4.1 JOB CREATION

Job creation and local employment directly linked to the pellet sector is still difficult to assess as it is a fairly new sector and highly intertwined with the forestry industry as a whole. Henderson et al (2016) analysed information related to jobs and wages for the pellet sector in the SE of the USA, thereby confirming that access to reliable data was a key challenge. They estimated that a pellet mill with a processing capacity of 75,000 dry tonnes per year generates around 30 direct jobs, a number which was confirmed in several interviews with pellets facility operators. Henderson et al (2016) found similar relationship with other authors such as Lu and Rice (2011, in Henderson et al, 2016).

Spelter and Toth (2009) reported that the pellet sector generated around 2300 jobs in the USA, being a third of them located in the Southern States. Following an input–output methodology, Henderson et al (2016) calculated the direct impacts regarding job creation and reported these numbers separately for the construction phase and operation phase of pellet mills. Table 8 shows the summary of their findings per type of production facility (by capacity, in dry tonnes) for States reviewed in this report.

Table 8. Jobs and annual income generation (in USD) for different pellet mills capacities (data source from Henderson et al, 2016)

	75,000 dry tonne		100,000 dry tonne		150,000 dry tonne	
	Construction phase					
State	Jobs	Income	Jobs	Income	Jobs	Income
Georgia	115	6,935,559	150	9,016,227	231	13,871,118
Louisiana	106	6,237,071	137	8,108,192	211	12,474,142
Mississippi	103	5,106,732	133	6,638,751	205	10,213,463

	Operation phase					
Georgia	146	7,766,878	189	10,096,942	291	15,533756
Louisiana	129	7,066,777	168	9,186,810	259	13,017,819
Mississippi	129	6,635,243	168	8,625,816	258	13,270,487

These numbers could not be confirmed during the expert interviews carried out with representatives from diverse companies of the pellets supply chain. All interviewees unanimously confirmed that the pellets industry created important socio-economic benefits by offering alternative employment options, especially in regions where the forestry sector has suffered from the decline of the paper industry and from the general economic crisis in the US after 2008. However, different from values shown by Henderson et al. (2016), the number of direct employees for operating pellet plants is estimated to range from 30 to 70, depending on the size of production.

Jessica Marcus (USIPA): "There is an anecdotal average from our members that usually there are 50 jobs directly at the plant and 100 indirect jobs throughout the supply chain. But we are using this number for years, this could be more now".

Nevertheless, as mentioned above the number of jobs created vary largely between the small pellet producer companies to large ones with a larger capacity.

During construction of the pellet facility, the number of workers varies depending on the phase of construction. As an example, during the construction of a first plant with a capacity of 150,000 tonnes per year by Highland Pellets, the number of workers fluctuated from between 90 to 180 (*personal communication* Tom Reilley). However, most challenging is the estimate of the number of indirect jobs related to the production of wood pellets in the US south, especially because the pellets supply chain is highly intertwined with the supply chain of the broader forestry industry (see section 3.4 on the supply chain). This means that service providers (logging, equipment, transport, logistics, maintenance, etc.) of pellet producers often also work for other forestry and non-forestry industries, unless the pellet companies specifically set up their own service infrastructure. Examples therefore are Drax and Enviva, which set up exclusive contracts with transport and logistics companies (e.g. truck, rail, ship) and lease or even own port facilities for storage and exportation of the pellets along the coast. The logistics company Peeples Ltd. manages the East Coast Terminals in Georgia with storage capacity of 25 000 tonnes (in each dome) and hires 20 direct staff in the tunnel and loading area, and over 100 people in the rest of the facilities (*personal communication* Brad Orwig). Seasonal employment plays a minor role in the pellets sector, as this is mainly attributed to forestry operations and not to harvesting or manufacturing activities.

It depends on regional and local characteristics to determine the impact of the pellets industry on the local employment and income situation, as well as to answer the question if they jobs created rather filled a vacuum left by other sectors or are additional jobs. In many cases, company

representatives alleged that their plants were built in areas of high fibre supply which often is the result of the declining fibre demand from other forestry product manufacturers. In these cases, the pellets industry became an important actor to fill the demand gap caused by economic decline in many regions and offers an alternative market for private landowners to sell their fibre, and to keep logging companies in operation.

Tom Reilley (Highland Pellets): "Our plant is one of the larger plants in the US, taking in about 1.4 Mio. tonnes of roundwood, forest residuals and bark that need to be harvested. This means over 56,000 truck loads per year and between 30-35 logging crews, all directly dedicated to our plant. In a study in cooperation with diverse forestry companies in the region we calculated that about 350 to 425 forestry jobs can be related to our pellets production."

The purchase of low-value wood from forest management practices offers an alternative or additional income to landowners and is said to prevent the abandonment of uneconomic forest land and their final conversion into alternative land-uses.

There is rising awareness between pellets companies about the importance of transparency over the local employment and income situation related to their activities. Therefore, USIPA contracted a job and economic development impact assessment for the US South, which at the time of writing this report has not been published yet. Enviva reported the results of a recent study which estimated that the company's regional activities since the start of operations in 2011 have created about 1900 new jobs and 1 billion USD of economic activity (*personal communication* Jennifer Jenkins). However, the challenge of double-counting due to the structure of the forestry sector remains a challenge for employment studies and new methodologies should be developed.

4.2 LAND PROPERTY

The United States has about 7.5% of the world's forests (about 300 million hectares). There are three different types of forest ownership: Federal, State, and Private. The US Forest Service directly manages 78 million hectares of Federal Forests and Grasslands for multiple uses, including conservation, production, and recreation. State lands are also managed for a variety of benefits and compose about 9% of forest lands in the US. More than 50% of forest land (179 million hectares) in the United States is owned and managed by some 11 million private owners. Of these private owners, 95% are classified as "Family and Individual" ownerships, 4% as "Corporate" ownerships, and 1% is classified as "Other Private" ownerships (Tidwell, 2016).

Unlike in the Western United States, where most forests are publicly owned, much of Southern forests are privately owned and managed. Over the last ten years Butler et al. (2016) observed a slight change in ownership, and public ownership grew in the Southeast of the US. However, as shown in Figure 9, still nearly 90% is private, with two-thirds of that (around 54 million hectares or 134 million acres) owned by an estimated 1.8 million families or individuals (Butler et al., 2016).

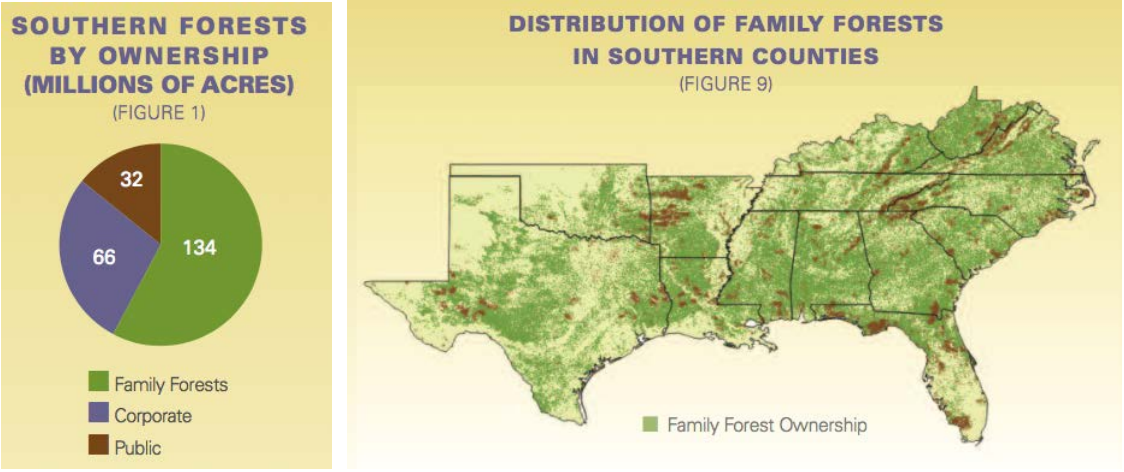


Figure 9 Distribution of forest ownership in the US south in area (a) and geographic overview of family forests (b) (AFF, 2016).

The South is dominated by private ownership according to Butler and Wear (2013). Over 5 million private forest owners across the region hold 200 million acres of forest land, 86 percent of the total forest land area. On average, families and individuals own two out of every three acres of private forest land. The remaining one third of the private acreage (66 million acres), is owned by corporations, conservation organizations, partnerships, and tribes (Butler and Wear, 2013). The small landowners are estimated to provide roughly half of raw materials for all types of wood product manufacturing in the region. In the future, the forest area is expected to decrease mainly to urbanisation growth which will affect mainly privately owned land (Butler et al. 2016; Wear and Greis, 2013). Many family owners harvest only once per generation, about every 30 to 40 years (AFF, 2016).

4.3 HUMAN DEVELOPMENT INDEX

The USA has increased 10% of its Human Development Index (HDI) from 1980 until 2014, but this has not been seen in the states selected as case studies. There is a an alternative methodology to develop the American Development Index (Social Science Research Council, 2016). It allows the user to analyze the evolution of development through time (a difference with the HDI), and the ADI shows a reduction of development in Georgia and Mississippi, while Louisiana has been performing better with an increase of 3% ADI (in the period 2000-2014), improving from being 4th worst, to 5th worst in 4 years (UNDP, 2016).

The data presented below is a proposal from Measure of America (2016) of a modified American Human Development Index (AHD). This index measures the same three basic dimensions as the standard HDI, but it uses different indicators to better reflect the U.S. context. For instance, instead of using average number of years that students spend in school, the AHD uses educational attainment.

From the three selected States that were visited, the HDI for America shows in the last years some variances. The highest HDI was found in the State of Georgia, while Mississippi showed the lowest (Figure 10).

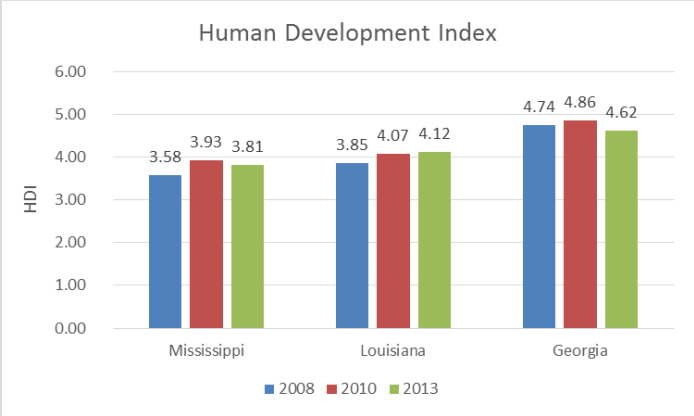


Figure 10. Human Development Index in selected States (Measure America, 2016)

As a reference, in 2008 the State with the highest HDI was Connecticut (6.37) and Mississippi was the lowest; in 2010 the District of Columbia had the highest HDI (6.21) and the lowest was Arkansas (3.87), and in 2014 the highest rank was for District of Columbia (6.45) and the lowest for Mississippi (3.81).

The Human Development Index changes along the time and main criteria (e.g. race and ethnicity, representation, etc) for the State of Georgia is shown in Figure 11. It can be observed that the HDI increased in a period of nearly 13 years while in the last period it was lower. Nevertheless, the education index grew during the indicated years, except in the last period, when it also decreased.

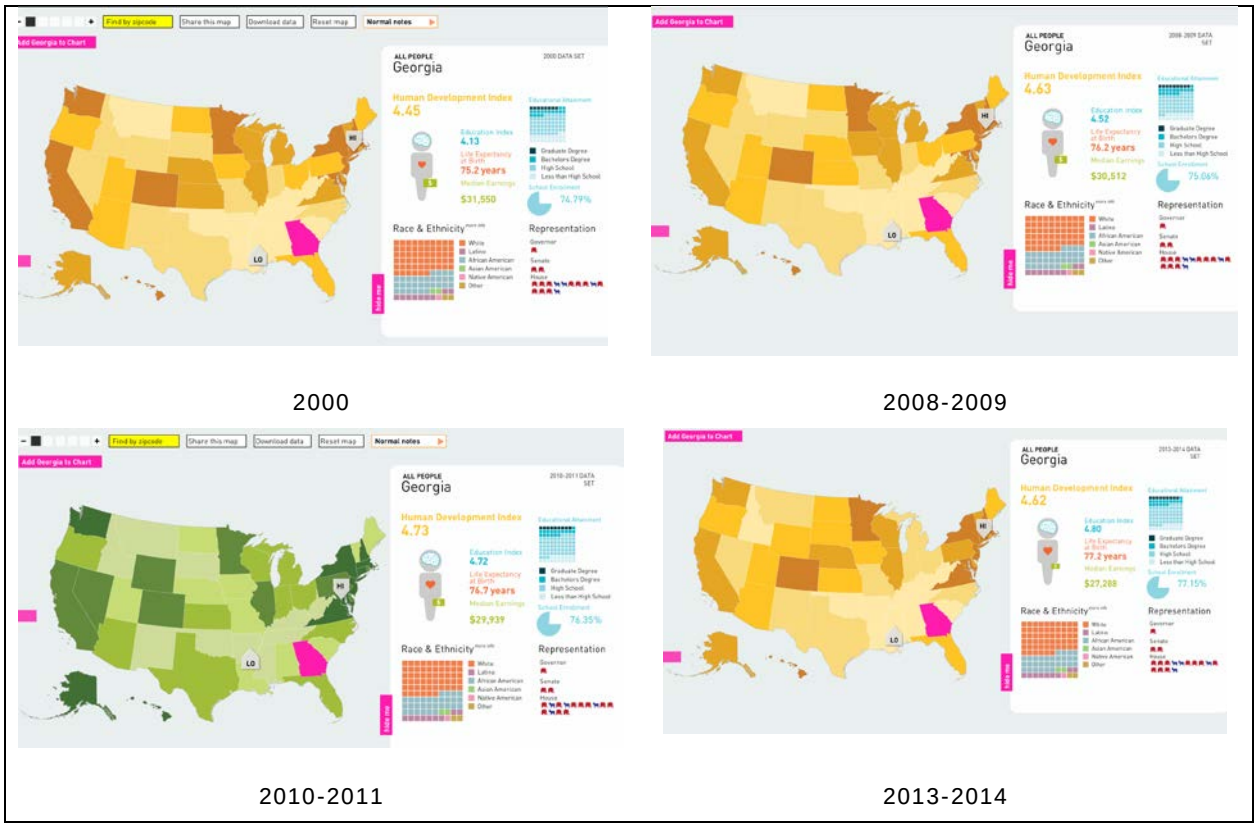


Figure 11. State of Georgia Income data for series of data from 2000 (Measure America, 2016).

4.4 INCOME

Measure for America presents information regarding the Income Index. This is different as it presents median personal earnings (wages and salaries) for all full and part time workers of 16 and above years old. Measure for America (2016) states that this index better represents gaps of earnings between men and women, racial and ethnic group at State level. The Index for three different years is shown in Figure 12 for the three States. As a reference the District of Columbia had the highest Index (7.37) in 2014, while Arkansas had the lowest (3.34).

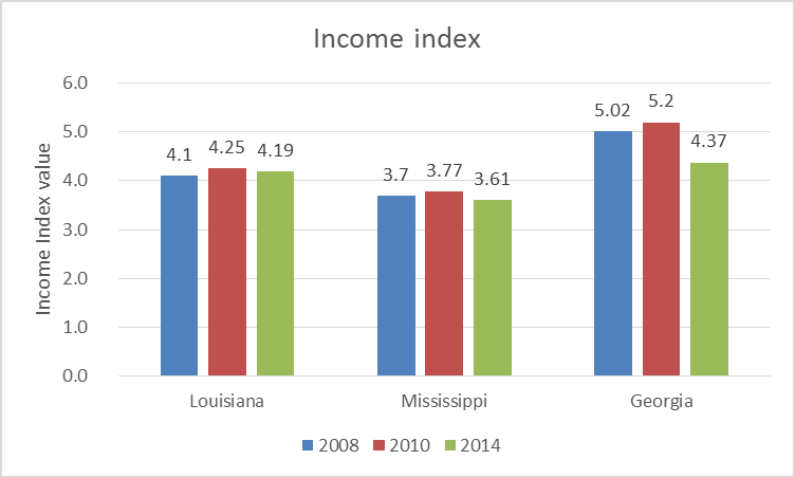


Figure 12. Income Index (Measure for America, 2016).

The income at county level was reviewed showing differences in the las t five years where data was available. Information from Measure America indicated almost no change in the county of Chatham (where Peeples Ltd is located) and a slight change in Emanuel (where RL is located), in Georgia (Table 9 and Figure 13).

Table 9. Income index (Measure America, 2016)

State / county	2010	2014
Georgia, Chatham	27,693	27,262
Georgia, Emanuel	19,665	20,678
Mississippi, Amite	21,762	21,764
Louisiana, West Baton Rouge	28,664	27,919

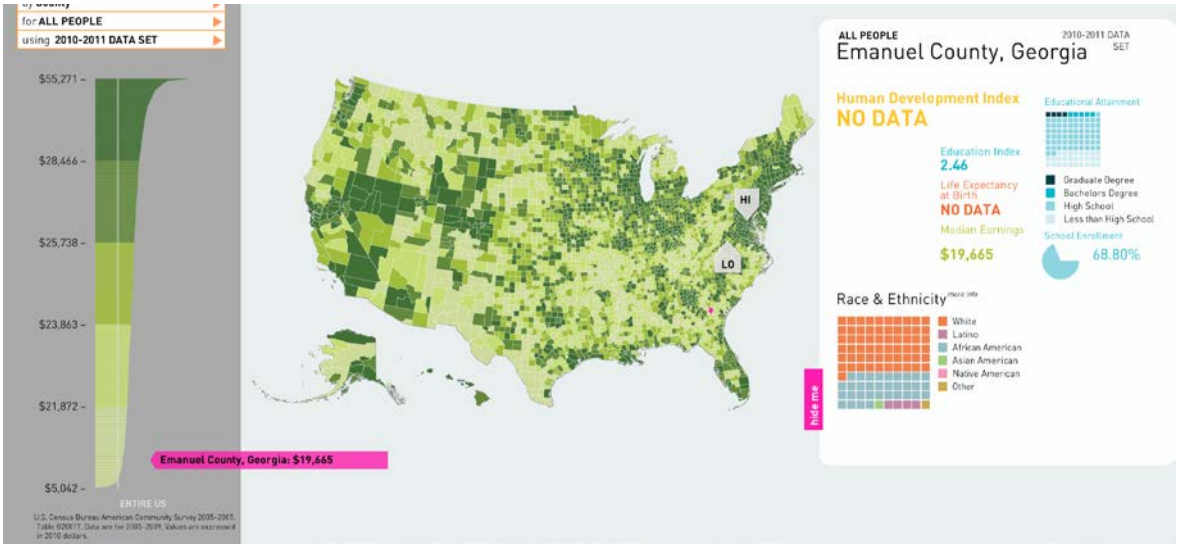


Figure 13. Income data for the county of Emanuel (Measure America, 2016).

The income index data gathered for the three selected States in Measure America included a limited timeline (2008 -2014) and it was deemed necessary to compare to other data sources that allow a better horizontal analysis. The following figures show the selected indicators for a 14 years time period with data from the US Census. The selected case studies are shown along with the states' average.

Figure *14.* Total number of workers by State and County in selected years (US Census Data)Figure 14 shows the total number of workers by State and by County (where the pellet facilities are) and their changes along the 14 years of available data. It is not possible to infer that the growth on number of workers in 2014 is related to the pellet production.

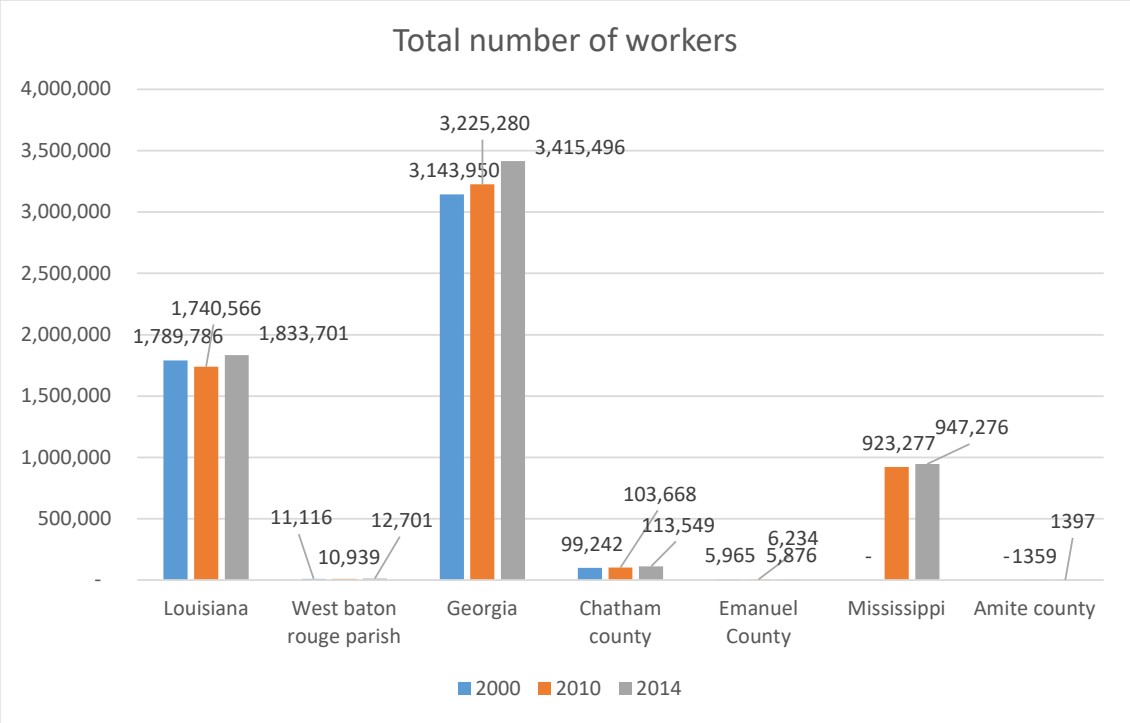


Figure 14. Total number of workers by State and County in selected years (US Census Data)

On the contrary, in Figure 15 it can be observed a decline in the number of workers in the forestry sector. Georgia shows the largest reduction

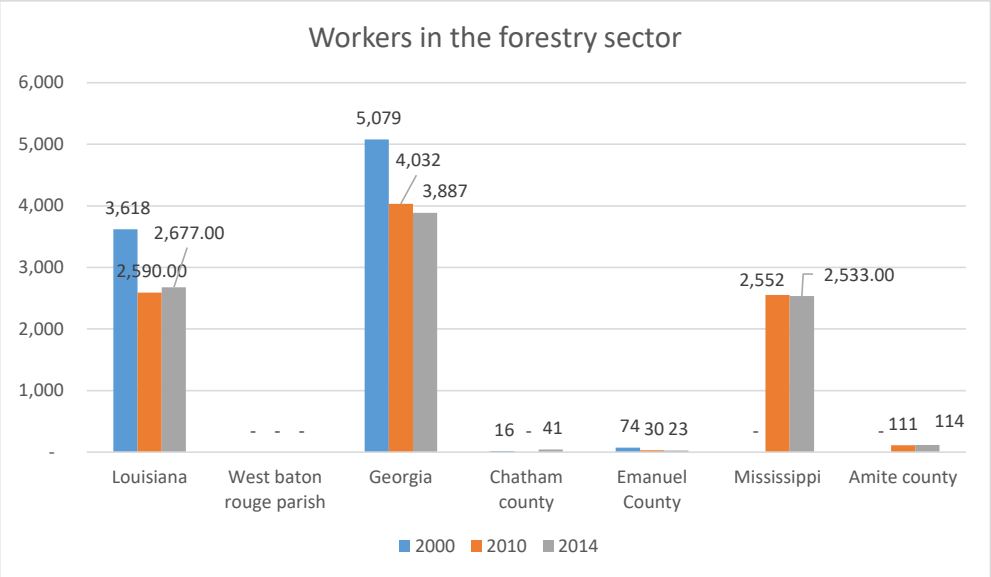


Figure 15. Workers in the forestry sector by State and county in selected years (US Data Census).

Income is steady increasing in all states and counties of interest, with particular highlight to Louisiana, with 19% increase in 14 years, followed by Mississippi with 7% and Georgia with a 3%. Nevertheless, it is important to note that these are general salaries for the forestry sector and not specifically to the pellet production. Still, this information allows to have a better understanding of the average income in the selected States.

The forest sector follows two different paths in the case studies: in Louisiana there is a considerable increase in income, but a considerable decline is perceived in Georgia, with 32% reduction in Chatham County, GA. Mississippi has no data available for 2000, which interdicts the analysis of growth. The transformation sector also shows decline in Georgia and steady increase in Louisiana (Figure 16). Interesting enough, Georgia shows signs of recovery, when analyzing the situation in Chatham county, where the transformation sector increases 72% in average income, in contrast with the 32% reduction in the forest sector, following a convergence tendency in these sectors income. It is difficult to draw conclusions from these differences without more detailed data .

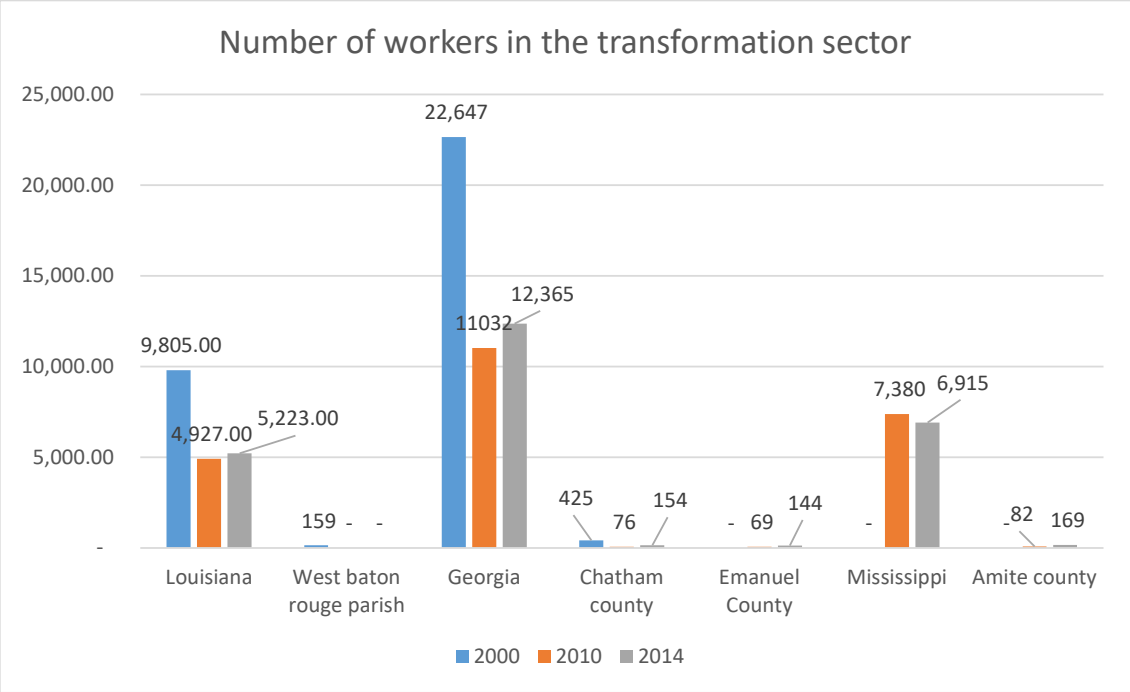


Figure 16 Number of workers in the transformation sector (Data from the US Census).

Acording to Abt (2013), it is expected that the paper industry which will continue reducing in labour in the next years. Abt (2013) indicated that bioenergy demands resulting from State and Federal policies (even international policies as the main driver for pellet production in the USA) are expected to lead to increases in logging sector jobs and output but competition with the sector mentioned above may have an impact in the region although it is not expected to be great.

Women's share of labor indicates that the states of study, as a whole, show equal opportunities for women as long as the number of jobs is considered. The forest sector, on the other hand, shows no sign of consistent improvement.

4.5 GINI INDEX

Considering that the Gini Index allows to analyse inequality in income, the Gini index for the three states over a period of time of 14 years is shown in Table 10 Gini Index for three states:

Table 10 Gini Index for three states (Measure America, 2016).

Indicator	Year	State		
		Louisiana	Georgia	Mississippi
Gini	2000	0.48	0.45	0.48
	2010	0.44	0.44	0.47
	2014	0.47	0.45	0.47

The change in Louisiana is accompanied by a negligible decline of inequality from 2000, but an increase between 2000 and 2014. This is a trend in the whole USA, which shows an increase in inequality as a whole (World Bank, 2016). Other states show very poor evolution of income distribution, with practically null change in inequality. As an example, the Gini coefficient in Amite, Mississippi where the mill of Drax is located showed a Gini factor of 0.48 showing the highest factor, which means it is where most inequality exists (Figure 17).

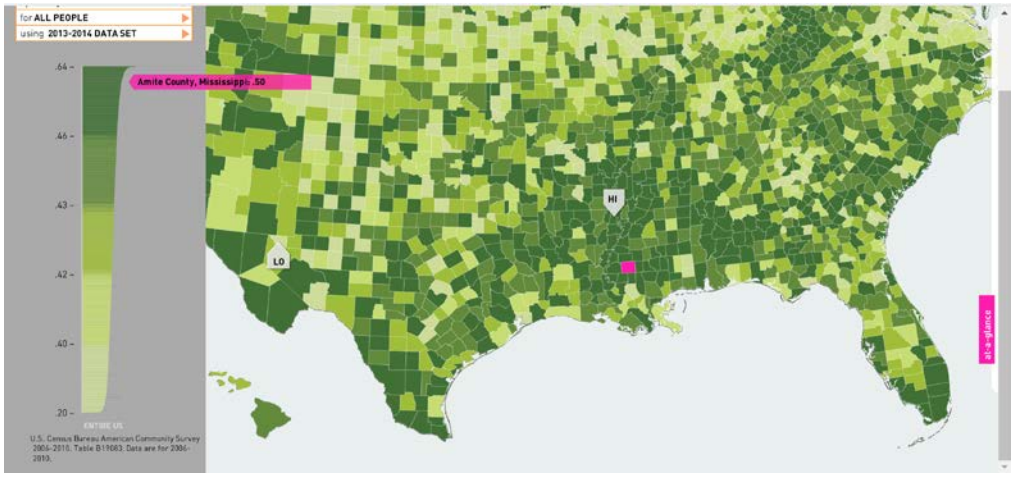


Figure 17. Gini coefficient for the Amite County, Mississippi (Measure America, 2016).

The reasons for the inequalities are numerous and it was not possible to review all of them in this report. Nevertheless, the overall impact of the sectors and other aspects of the local economy need to be considered for future works. It also should be noted that pellets operations in Amite started in 2015 and therefore it is not possible at the moment to work on a horizontal analysis.

4.6 LABOUR CONDITIONS

According to Abt (2013) the logging sector in the Southeast of the USA has been experiencing small increases in both industry output (3%) and jobs (2%) since 2008 and expected to carry on to 2018. Nevertheless, the growth in demand from bioenergy is expected to increase mechanization and reduce demand from some traditional wood-using industries. On the other hand, wood products manufacturing is expected to increase in industry output (2.2%). Technical change is expected to continue (with capital substituting for labour) leading to continued declines in jobs through 2018 (8%) (Abt, 2013).

The USA is not signatory of all the ILO conventions that have a relationship with the bioenergy sector (see Table 11).

Table 11. ILO conventions ratified by the USA (ILO, 2015)

No.	ILO Convention	Ratified	In force
29	Convention concerning Forced or Compulsory Labour	1969	No
87	Convention concerning Freedom of Association and Protection of the Right to Organise	1976	No
98	Convention concerning the Application of the Principles of the Right to Organise and to Bargain Collectively	1976	√
100	Convention concerning Equal Remuneration of Men and Women Workers for Work of Equal Value	1963	No
105	Convention concerning the Abolition of Forced Labour	1963	√
111	Convention concerning Discrimination in Respect of Employment and Occupation	1969	√
138	Convention concerning Minimum Age for Admission to Employment)	2001	√
182	Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour	2005	√

4.7 GENDER & DIVERSITY

Women's participation in the workforce in the three selected States is quite low in general as can be seen in Figure 18.

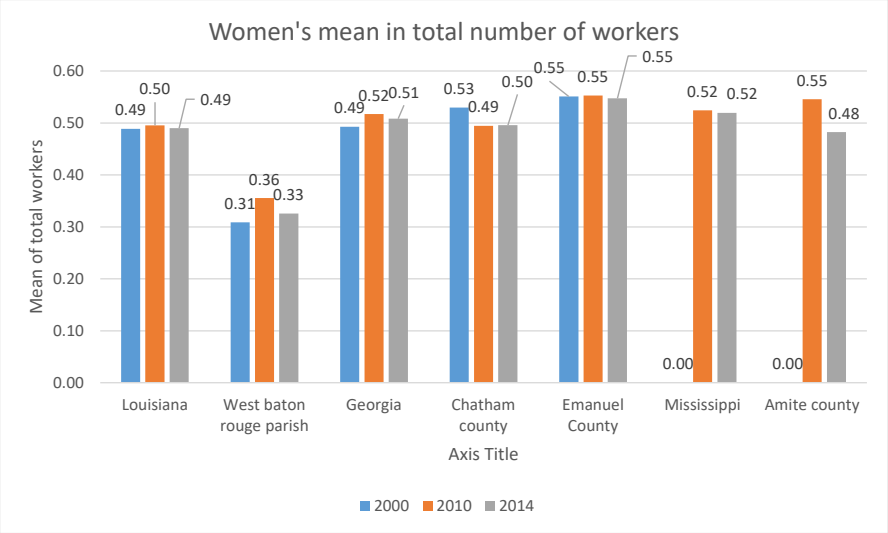


Figure 18. Women's share in total workforce. The y-axis shows the percentage of women in the workforce. (Data from US Census)

Most interviewees confirmed that the forest products industry is typically white and male dominated, especially the logging industry with about 77% male employees *personal communication* Richard Vlosky). Even though the share of women employed in the sector is increasing (Figure *19*), they mostly are hired for non-machinery work such as administration, human resources, community/sustainability management. There is awareness and effort for gender equality in the pellet companies. Some company representatives stated that their teams included female foresters, which is not representative for the forestry sector; in comparison, their wood suppliers continue being mostly male. One interviewee mentioned the increase number of women as forester practitioners.

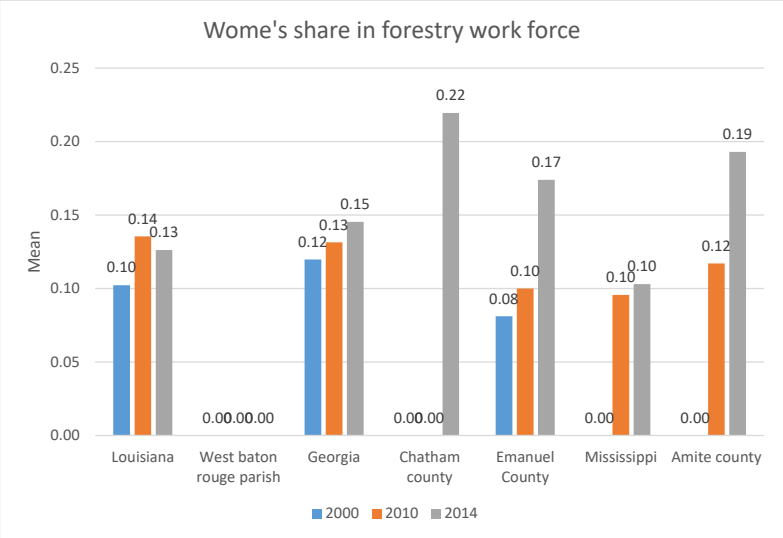


Figure 19. Women's share in the forestry workforce. The y-axis shows the percentage of women in the forestry workforce. (Data from US Census)

Carlton Owen, US Endowment: "This (the share of women in the forest sector) is an ongoing challenge, but it is slowly making progress".

The percentage of women within the group of private landowners is difficult to estimate, as often it is a couple that runs the land together.

Rita Hite, American Forest Foundation: "What we have seen a lot is that a couple, husband and wife, manage the land together for a couple of decades, many of them are over 60 years old. But then the husband dies, for example, and we have seen a lot of women taking on ownership and becoming the predominant decision makers on the property".

4.8 COMMUNITY IMPACTS

The counties where pellet mills are located are some of the poorest in the US south. According to the interviews conducted, pellet mills seem to contribute to revitalize poor and depressed communities which have been left behind after the paper and other manufacturing industry declined. Communities welcome well paid full-time employment options at the plant and the increase in economic alternatives around the mill. In comparison, employment in tourism and recreation in the Southern States is seasonal and not as much an option for communities in the inlands of the US south.

Carlton Owen, US Endowment: "These are working communities, and not amenity communities. They don't have mountains or natural attributes that allow them to be affluent without economic activity and the traditional making of something."

In those small communities, where education levels are lower in comparison to the rest of the US, every job is perceived as valuable. The pellets industry provides opportunities for rural development in renewable energy as a future oriented sector. Some interviewees shared the impression that communities seemed to derive regional pride and the feeling of local identity from newly rising economic activities from the pellets industry. Two interviewees mentioned the example of the success of the pellets industry are the domes used to store large amounts of wood pellets of up to 50,000 tonnes.

Lane Roberts, Dome Technology: "When we built the first dome in Chesapeake for Enviva, after it was inflated in a couple of hours, I remember that several community leaders like the Mayor and the CEO of Enviva were there, and it became a community event and hit the news, both press and TV. It was a thing where the community was proud of."

The forests also are substantial for forming local identity for communities in the US southeast, for having a long tradition as the primary source for income in the region. As long as forests generate some profits, small landowners are found to prefer maintaining their forests standing. This provides valuable ecosystem services to the communities, such as the prevention of fires, the provisioning of fresh water and air, wildlife habitat for local biodiversity and outdoor recreation options, such as hunting and fishing. At present, there is no public support to remunerate landowners for delivering these services to their communities or even for converting the forests in nature reserves, without depending on any economic activity. This means that at present, income from the pellets sector helps to maintain forests productive and thus, prevents the conversion of the land to other more profitable land-use options.

Rita Hite, American Forest Foundation: "Family landowners receive their land over multiple

generations and many of them harvest once or twice per generation. Having a diverse set of markets, from low to high quality wood, helps them afford to pay property and income taxes, keep land in forest and manage it well. And the pellet market for low value wood is a steadier market than the high value timber that has grown from 40 to 60 years."

Main community concerns towards pellet production are related to physical impacts from the mills, such as manufacturing noise, increased traffic and air pollution from sawdust. However, in many cases, communities already hosted other manufacturing plants and are used to operational movement in their neighbourhoods. To attenuate any negative effects, pellet companies interviewed for this report maintain a high degree of personal engagement with communities, starting from early stage during the planning process of the pellet plant. Community relations managers engage in dialogue with community leaders, NGO representatives, and local population to arrange any necessary mitigating measures. This strong personal involvement of the pellets companies with the communities continues even after operations start. Many pellets companies engage in local charity, community and restoration projects, give donations and support local businesses and diversity projects.

Max Braswell, Arkansas Forestry Association: "Most corporate citizens in the forestry product industry also are good community citizens, who tend to be leaders and become anchors for their communities".

Pellet manufacturers receive their strongest opposition from local civil society movements which criticize the exploitation of natural resources and communities in the US south by a social elite, striving for economic development without delivering long-term economic gain and sustainable social development to them. There is a general mistrust from local NGOs towards pellets companies and their activities, alleging that underprivileged parts of the communities continue being marginalised and excluded from political decision-making.

Carlton Owen, US Endowment: "Even though the pellets sector has grown a lot, it still represents only about 1% of the timber harvesting. The opposition that has come has been because of two factors: it is a new use and people are afraid of everything new, and second, it is an export which is easy to attack in our current society where we put America first."

Environmental NGOs express their concerns about deforestation and high disturbance rates due to logging activities in unique natural forests such as bottomland hardwood forests, swamps and wetlands. Nevertheless, it is important to notice that these preoccupation is not new, it has been standing for several years even before the pellet production started and it is more related to logging activities.

Adam Macon, Dogwood Alliance: "We have to build a map of our most biologically rich, diverse and critically important areas for wildlife and community benefit. Those must be taken off the table and be said 'no logging'. Second, there should be management practices for our natural forests which are more tailored to ecosystem services rather than industrial timber production."

Pellet companies work on improving their environmental image and strive to meet demands from the civil society by engaging in community oriented conservation projects and setting up sustainable supply chain management plans. For example, Drax engaged with the American Forest Foundation to invest in the future of small forest landowners, by offering technical assistance for sustainable forestry, and committed to focus their sourcing efforts on certified feedstock. Enviva created a responsible wood supply program and founded the Forest Conservation Fund, a $5 million USD 10-year program which is administered by the U.S. Endowment for Forestry and

Communities. Each year the program contributes $500,000 for conservation easements to total $5 million after the 10 years. The program is designed to protect tens of thousands of acres of sensitive bottomland forests in the Virginia-North Carolina coastal plain, therefore allocating grants to areas in private ownership with high recreational value, thus following a 'payment for ecosystem services' approach.

4.9 SUSTAINABLE FOREST MANAGEMENT CERTIFICATION

The US Forest Service has no mandate or authority to require certification in private lands, hence certification systems are joined voluntarily by forest owners and wood product manufacturers. The decision of adhering certification systems mostly is triggered by market conditions rather than economic benefits. Although there is no legal obligation for obtaining certification in the US, private owners receive assistance from the USA Forest Service and have to comply with US Forest Laws and the Clean Water Act, an overarching environmental legislation in the US. The US Forest Service works closely with States and private landowners by offering direct financial and technical assistance, joint research programs, and development and transfer of new science, technology, and decision support tools to the broad community.

Van Dam and van Eijck (2016) identified different programmes and initiatives related to the sustainability of forest management in the USA (Table 12). These included best practices and lessons learnt from identified programs and initiatives to stimulate certification in the country. The authors indicated that focusing on one certification systems only is challenging because the systems vary among regions and respond to personal preferences of the forest owners. In the regions visited in the field work the identified schemes included the Sustainable Forestry Initiative (SFI); the American Tree Farm System (ATFS); and the Forest Stewardship Council (FSC).

Table 12 Summary of initiatives and programs related to forest sustainable management (van Dam and van Eijck, 2016).

Initiative	Key findings
SFI Forest Partners Program	ATFS/SFI group certification Cooperation with State Foresters, SFI Logger program Outreach and technical consultancy , Focus on large forest owners
ATFS	Social marketing strategy, No costs for small landowner Pilot in landscape management Strong component in outreach and education
FSC	Promoting SLIMF certification Successful models of group certification
RA – Southern Woodlands Association	Combined investment from major paper and pulp companies (incl. DOMTAR) Landowner outreach is strong component Key message: good stewardship / FSC focused
DOMTAR case study	Supports projects, outreach and group certification Type of intervention depends on context Consulting forester and clients are leverage point to involve forest owners
Wisconsin group certification	Exceptional situation due to strong role of State involved combined with economic incentives and the role of industry and State > 30.000 landowners group certified
Center for Forest and Wood certification	Involved Domtar and University of Kentucky Centre secures group certificates: participants agree to management assistance
Greenlink Forest Resources	Company that offers group certification for an enrolment and management fee per year
Jointly Owned Forests	Establishing cooperatives: financial benefits – shareholders under majority rule Option established in legislation to avoid fragmentation forest
US experiences on developing cooperatives	Difficult to establish due to infrequency harvest activities Key to support in developing new products / markets
Virginia Tech Center for Forest Products Business	Help companies remain competitive Cooperation between organizations
Cooperation publishing companies – SFI	Partnering of four publishing companies to spur certification through SFI Forest Partners Program
GreenBlue – AFF cooperation	Partnership – Incorporation of key brands (as Mars) Focus on packaging industry
Keep Maine's Forest Partnership	Forum between stakeholders in Maine to share information, knowledge and promote SFM in the region
VVNH and sustainability ambitions	Target set amongst members with yearly reporting to improve transparency Differences in 'easiness' to realize ambitions between product groups Most certification effort comes from buying pressure
Green Deal – sustainability solid biomass	Reporting increases transparency in the market Annual progress measured
Online self-assessment	online system that allows forest owners to become certified (gap analysis) By means of an online checklist
Paper Company Environmental Index	Environmental Performance Index for sector Measuring continuous improvement
Tool for social marketing	using a predictive modelling database, it can identify landowners with a potential interest in being certified Tree Farmers in ATFS,
Track and tracing	Track and trace system ENVIVA allows to collect data from the sourcing region – including e.g. certification status or forest cover type.

Most pellets manufacturers comply with the Sustainable Biomass Programme (SBP)[7] standard or are working on achieving it. The standard is recognised in most of the countries where companies operate biomass-based power stations. SBP has also recognised the other two main forestry standards, the Forest Stewardship Council and the Programme for Endorsement of Forest Certification (PEFC).

The SFI is the most common certification scheme in the US, which covers almost the entire industrial wood production but still marginal. However, an increasing number of wood producers also use FSC, due to its international recognition and general popularity in Europe. Family landowners with lands up to 200 acres (81 hectares) tend to adhere the ATFS, which has been created and is overseen by the American Forest Foundation but mostly managed by partners at

7 http://www.sustainablebiomasspartnership.org/

State level, such as State Forestry Associations. Wood produced under the ATFS commonly feeds into the SFI supply chain. While SFI, FSC and ATFS work as both chain of custody certification and forestry management certification, the SBP builds on existing systems but with the GHG calculations. These main sustainability schemes show an overlap in up to large parts of their criteria, which are applied to the forest land in its entirety.

Carlton Owen, US Endowment: "I have never understood why we believe that there has to be special certification standard for pellets, because we are talking about the forest, and the forest is not only made of pellet wood. To me this is responding to pressure rather than reality, if a forest is certified for one of those standards, the cutting of a tree that becomes a pellet is no different from the tree that is becoming a sheet of paper. I think it is a waste of effort and will not resolve the concerns from environmentalists. "

In general, exporting wood pellets manufacturers do not see certification as a barrier to their business, rather see the harmonisation of sustainability criteria at EU level as an opportunity to harmonise regulations in different EU countries and improve investment security in the pellets business. Also, many wood and pellets producers see certification as an opportunity to achieve third-party audited and objective prove of sustainability of their products. All pellets producers interviewed for this report work under several certification schemes at facility level, varying between locations. Pellet producers prioritise the sourcing of sustainably certified raw materials, an effort which is hampered by the lack of certified supply base, especially from the side of small landowners.

The largest burden of the certification lies on small family landowners, who receive only minor part of the total economic income of their forests (low value wood, thinnings and residues) from pellet plants, but have to provide certification of their entire stands in order to sell to them. Often, family landowners only harvest once per lifetime which for them does not offset the burden. Higher value industries such as lumber or pulp and paper mostly do not require sustainability certification which also explains the limited number of certified private landowners. However, only a very limited number of pellet companies pay green premium prices for sustainable material, which shifts the burden of certification to the landowners who receive very little or no economic advantage from certifying their lands. In most cases, certification acts as requirement for landowners to access markets and sell wood to pellet facilities. But the change of management systems, the bureaucratic processes to achieve certification and certification fees are often seen as a barrier by small landowners. Many pellet manufacturers have started to support landowners in the process of achieving certification in order to increase their supply base of certified materials. This has driven an increased activity of sustainability certification in the US south.

Some concerns that if certification or verification requirements for access to the EU become too burdensome for small landowners, they might decide to sell their lands. This would endanger the very existence and the sustainability of forest lands and the benefits provided by them. Fragmentation of forests, especially with pressure from urban development, has been confirmed as a real consideration in the Southeast US. Consequently, it is important to avoid negative unintended policy outcomes from an overly regimented, prescriptive policy when designing sustainability criteria in the EU (Tidwell, 2016).

On the other hand, environmental NGOs criticize some sustainability certification schemes for their weak standards, lax auditing and outdated definitions of sustainability.

Adam Macon, Dogwood Alliance: "SFI and SBP are standards made by the forest industry for the forest industry, and they are unanimously rejected by the

environmental community. In these standards, trees are seen as crop and the only definition of sustainability is if the forest is able to sustainably supply wood to industrial markets at an extended period of time."

4.10 LOGISTICS

Logistics in this report refers mainly to the two facilities visited in the USA. The East Port of Peeples Ltd in Savannah (Georgia) which has an infrastructure for receiving, aggregating and distributing pellets, and the facilities of Drax in Port Allen Baton Rouge (Louisiana)

Peeples Limited has two facilities in Savannah, Georgia. The first is the Georgia Marina House Warehouse which has a Terminal Type- Multi-Purpose Bulk Storage. It has a warehouse floor to where the rail arrives to deliver the pellets and has Hoper Systems or Hopper Trucks which handle Dry Bulk cargo. The facility has skilled workers that are not affiliated to a union.

The second facility is the port (East Coast Terminal Co.) (Figure 20). Overall, the terminal facility has 100 non-union, full time skilled workers, and in the administrative area the terminal has 20 employees.

Figure 20. Peeples Ltd port terminal and rail facility

The second port facility visited in the US was the one from Drax in Baton Rouge, Louisiana. It is located at the Port Allen of Baton Rouge, on the east bank of the Mississippi River. This facility receives wood pellets from Drax own mills in Louisiana and Mississippi, as well as third-party suppliers. The facility acts as storage and loading terminal prior to shipment. The new facility forms part of Drax's US$350 million investment in its biomass operations in Louisiana and Mississippi.

4.11 SUMMARY OF INDICATORS

It was the objective of this section to present the selected issues and indicators studied to assess the socio-economic development from the forestry and pellet sector in the USA southeast. Because in socio-economic studies in the biomass sector, it is difficult to disaggregate data from the agricultural or forestry sector, and therefore there is a risk of double counting or biased analysis may be concluded. As quantitative data is difficult to gather and analyse, statements and additional information from the interviews conducted were added.

Some particular remarks lie in the information of issues such as job creation and community impacts. The statements particularly on community impacts explain the views of the stakeholders and their experience on how communities have been benefited or impacted by these sectors. Considering the information provided by the Gini index, where the selected States are among the most deprived communities in the whole country, job creation and income may make a difference for them. This will be possible to analyse after more years of this sector contributing to the economy of the region. It is also expected that the economic benefits will be from other business improvement as secondary tiers in the supply chain rather than directly associated (e.g. particularly on the services area).

5. Conclusions and recommendations

Large scale pellets production is a relatively new activity in Southeast US and although it is now the highest producing area worldwide, it is difficult to gauge its local socio-economic impacts. The forestry sector has not changed significantly since pellets production started in that region, largely because it represents an alternative to long-established forestry extraction and has principally offset the recent decline in pulp production, rather than opening up new opportunities.

The industrial units involved in pellets production have only been operational for a few years and although among the largest in capacity in the world, they are highly automated, thus contributing only to a relatively small number of jobs in local communities, yet significant at a local level, which makes it difficult to ascertain their socio-economic impacts. But pellets trading has helped businesses to diversify into logistics and port terminal activities, although more time is needed to allow for noticeable ex-ante and ex-post impacts that can have larger impact at regional level.

The forestry sector in the three southern states in the US examined in this study has shown little sign of expansion in recent years in comparison to the overall stage of development of the country, although such comparison might introduce a bias. But whilst incomes have increased steadily in the US more widely, this has not happened in the forestry sector. Indeed, in some regions, the forestry sector has declined because of the reduced importance of some industries that consume wood, such as the pulp industry.

A methodological issue related to ascertaining the socio-economic impacts of pellets producers is that indicators such as HDI and Gini are highly aggregated and beset by inertia. Still, they were used in the analysis to compensate for the difficulties of accessing data from companies because the establishment of the sector is relative recent, and as a result, there is high competition between producers who carefully guard against revealing sensitive commercial information. But the use of these key indicators does allow for verifying the impacts of a single economic activity where it is the predominant one in a region and, in addition, this data was supplemented by data obtained from stakeholders involved in academic research, and also from industrial association to help build a broad picture of the dynamics of sector.

Yet, it is not possible to infer any firm conclusions from these indicators because of the diversification of local economies and the fact that pellets production contributes only a rather limited number of jobs. Hence, at state level, the overall impact of this activity is unlikely to be significant. However, the socio-economic impacts of the whole supply chain may be important at the local level, and this may be ascertainable through assessment of pellet production data spanning several years, which is not currently feasible given that the sector is relatively newly established.

Regarding employment opportunities, existing data shows that between 2000 and 2010, job creation in feedstock production (wood) in the USA grew very slowly, with no marked improvement between 2010-2014, in contrast to observable job creation in pellets production, which has grown over the same period. Hence, growing demand for pellets may entail job expansion in pellets production with possible knock-on effects on feedstock production that will increase demand for labour. Also, any job growth in pellet production and bioenergy projects more widely should ensure greater participation of women in the workforce. Indeed, some of the interviewees noted an increase in the number of jobs taken up by women, particularly in activities in pellets trading and other activities in the forestry sector. More generally, though, policies for

these sectors should explicitly incorporate women empowerment as a key goal that will help bolster local development and pursue sustainability.

Overall then, it can be said that the forestry sector plays a role in helping create employment along the feedstock production chain in the three states examined here, although at a modest scale. Nevertheless, as some interviewees observed, local communities, for the most part, welcome this contribution. But they also they also noted a certain animosity towards them by NGOs representing local groups who feel excluded from the benefits these businesses may bring to communities or are critical of perceived negative environmental impacts even where these are not directly created by pellets producers but by other, longer-standing forestry activities (e.g. logging).

In view of our findings, the following recommendations are proposed:

- Further and more comprehensive research to be carried out to enable a fuller assessment of the impacts of pellets production, involving:
  - visits to more sites/businesses, including larger-scale operations
  - more in-depth interviewing conducted with businesses owners
  - interviews, workshops and focus groups with workers at pellet producing mills
  - interviews, workshops and focus groups with local residents
- Extend the scope of the assessment to include perceptions of different social actors about the environmental impacts of pellets production, including ecosystem services analysis, to enable a clearer understanding of the changes initiated or compounded by the sector
- Linking current US monitoring programmes to international certification organisations to help produce a robust, reliable and accessible database
- Greater integration between stakeholders (e.g. NGOs), government agencies and the pellets producing sector at the local level to allow for more inclusive planning of activities and of mitigation measures that take account not only of environmental factors but also socio-economic issues (e.g. job allocation, wages, working conditions, gender and race equality, quality of life, community assets, etc)

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Further Information

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