

FAMILY FARMING, BIODIESEL AND SOCIAL INCLUSION IN  
BAHIA: ASSESSING BRAZIL'S NATIONAL PROGRAM FOR THE  
PRODUCTION AND USE OF BIODIESEL

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## Abstract

The present research evaluates the social inclusion component of the Brazilian National Program for the Production and Use of Biodiesel's (PNPB) by studying its impact on the livelihoods of family farmers in the country's Northeast region of Bahia. The overall objective is to critically analyze the social sustainability aspect of the program by including different dimensions of social exclusion in its analysis. More specifically, this thesis examines the PNPB's effectiveness in helping family farmers in Bahia achieve positive livelihood outcomes. In terms of theoretical perspective, the Sustainable Livelihoods Framework (SLF) is employed while existing research and government data are analyzed using a descriptive method. The findings of this thesis indicate that the PNPB is predominantly designed in economic terms, largely ignoring the multi-dimensional nature of social exclusion. In this sense, the results suggest that the lack of success of the program in the country's Northeast region can be in part explained by its failure to adopt coherent and sustainable strategies that go beyond market insertion and income generation. In particular, the research demonstrated that the PNPB's lack of participatory approach and the absence of social and cultural considerations, along with inadequate technical extension services, hampered the program's success in the region. Based on these results, this research highlights the need for a broader approach when it comes to promoting social inclusion, as well as the importance of taking into account and developing the cultural, social and political capital of family farmers in Bahia. In this sense, this thesis emphasizes the importance of recognizing that social exclusion is a complex and multi-faceted phenomenon, which calls for improving the ways with which we evaluate and deepen the understanding of the livelihoods of family farmers in Bahia.

## Abbreviations and acronyms

|        |                                                                                                             |
|--------|-------------------------------------------------------------------------------------------------------------|
| CPT    | Land Pastoral Commission (Comissão Pastoral da Terra)                                                       |
| MDA    | Ministry of Agrarian Development (Ministério de Desenvolvimento Agrário)                                    |
| PNPB   | National Program for the Production and Use of Biodiesel (Programa Nacional de Produção e Uso de Biodiesel) |
| PRONAF | National Family Agriculture Support Program (Programa Nacional de Produção e Uso de Biodiesel)              |
| SL     | Sustainable Livelihood                                                                                      |
| SLA    | Sustainable Livelihood Approach                                                                             |
| SLF    | Sustainable Livelihood Framework                                                                            |
| DFID   | Department for International Development                                                                    |
| SFS    | Social Fuel Seal (Selo Combustível Social)                                                                  |
| VCC    | Value-Chain Collaboration                                                                                   |

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# CHAPTER I

## **1. Introduction**

Over the past few decades, there has been a growing movement to acknowledge the need for broader approaches to development that go beyond focusing solely on the economic dimension of poverty. These efforts stress the importance of adopting holistic and comprehensive measures that take into account various underlying factors that contribute to perpetuating marginalization among rural and urban populations. The Sustainable Livelihood Framework (SLA) represents one such initiative. By recognizing social exclusion as a complex and multi-faceted phenomenon, SLA enables researchers to better understand the economic, social, political and cultural realities that shape people's livelihoods. It is with this context that the present study seeks to assess the impact of the National Program for the Production and Use of Biodiesel (PNPB). More specifically, focus will be directed at analyzing the biodiesel program's attempt to promote social inclusion among the marginalized family farmers in Brazil's Northeastern state of Bahia.

Launched in 2005, the PNPB is considered to be an innovative strategy that combines efforts to diversify the country's energy matrix with those of diminishing poverty and promoting social sustainability. The idea behind the latter is based on the assumption that integrating family farmers in the biodiesel production chain will lead to increased social inclusion and overall wellbeing. Accordingly, and using SLA as the method of analysis, this research examines the intricacies surrounding the livelihoods of family farmers in the prescribed region with the ultimate goal of assessing PNPB's performance and its impact on the livelihoods of family farmers in Bahia.

### **1.1. Thesis outline**

This thesis is comprised of five chapters. The first chapter includes the purpose statement and motivation surrounding the topic in addition to the research objectives. Moreover, background information is provided regarding the PNPB, biofuels, ideas underpinning integration in production chains, and background information on the area

and population being studied. The second chapter outlines the theoretical and conceptual insights used for this research, as well as providing a general discussion and definitions of key related concepts. In addition, focus is also directed at articulating the research design, the methodology employed and highlighting related considerations. The third chapter contains the research findings related to the livelihoods of the family farmers under study. These are in turn used as basis for analysis in the fourth chapter, where the main objectives and research questions are more specifically addressed. Finally, chapter five serves to offer additional insights in the form of summary and concluding remarks.

## **1.2. Purpose statement**

The purpose of this research is to investigate the PNPB's social inclusion component by highlighting and exploring its relations in regards to the four dimensions of social exclusion. While acknowledging the importance of supporting and enhancing the ability of family farmers to generate economic capital, taking into account the influence of social, political and cultural factors is crucial not only in highlighting the framework within which livelihoods operate, but also in providing a more comprehensive picture of how marginalization is maintained and reproduced. Accordingly, this study looks to further the understanding of the relationships that exist between PNPB's attempts to promote social inclusion and the livelihoods of family farmers in Northeastern Bahia. In this sense, the thesis aims to contribute towards the discourse of social sustainability within the context of rural development and bioenergy, as well as to fill gaps in literature that exist in this regard. It is thus hoped that this study will help to understand the dynamics surrounding Brazil's regional development policies, and will offer a positive contribution to broader debates concerned with market-oriented development strategies, biofuel production by smallholders and the promotion of social inclusion in rural settings.

## **1.3. Research objectives**

The first objective of this research is to critically analyze the social inclusion component of the PNPB. Discussed in greater detail in Chapter 2, the latter concept is

understood as an inclusionary process that goes beyond the economic dimension. Accordingly, it will specifically evaluate the effectiveness of the program in enhancing the livelihoods and quality of life of family farmers in Bahia. The second objective is to help further the understanding of social exclusion (as a complex and multi-faceted phenomenon) by challenging the PNPB's conceptual and practical approach in regards to social inclusion. Rural development policies have often been criticized for failing to systematically consider all of the dimensions related to social exclusion. In this sense, and through the use of the SLA, the goal of this research is to highlight the need for broader systemic approaches when formulating, implementing and evaluating rural development policies.

In order to address these two objectives, the following research question and sub-questions have been formulated:

How effective has the PNPB been in helping marginalized family farmers in the Northeastern region of Bahia achieve positive livelihood outcomes?

1. Have family farmers benefitted from increased income?
2. Has the program contributed to empowering these families socially and politically?
3. Has the program improved the cultural wellbeing of these families?
4. Did the program improve the families' food security and on-farm diversification?
5. How effective has the program been in reducing vulnerabilities of these rural households?

## **1.4. Background**

### **1.4.1. Rural development and family farming**

Over the past 70 years, policies governing rural development have been subject to a number of important shifting processes. As pointed out by Ellis and Biggs (2001), these shifts did not follow a clear and distinct path and often overlapped. However, it is still possible to identify key changes that have shaped development practices in the past.

During the 1950s, large-scale high input farming was considered to be a much more efficient way of approaching agricultural production; as a result, less emphasis was placed on developing the potential of small-scale farmers. Accordingly, small-scale farmers were viewed as possessing a limited capacity to contribute to rural economic development. An important paradigm shift began to take place in the mid 1960s when small-scale farming began to be seen as a potential engines of growth and development (Ellis & Biggs, 2001). Nevertheless the idea that large-scale export-oriented agriculture was more efficient dominated the discourse and policy option until the 1970s (McMichael, 2009). A second significant shift started to take place in the 1980s and 1990s when the traditional top-down approach to rural development began to be challenged by bottom-up grassroots approaches emphasising participatory processes that looked to empower small-scale farmers (Ellis & Biggs, 2001). By the mid 1990s (and continuing into the 2000s) the focus on empowerment and participation began to solidify, and thus led to the emergence of initiatives aimed at enhancing the resilience of the livelihoods of small-scale farming households. During this period, we also witnessed efforts towards the mainstreaming of rural development in poverty reduction strategies, with livelihood perspectives occupying a central role in rural development thinking and application (Ellis & Biggs, 2001; Scoones, 2009)

Since the 2000s, the shift in rural development thinking in the 2000s and 2010s has also changed the way smallholders are viewed in the context of poverty reduction and social exclusion. Whereas previously they were regarded as being passive actors, they are now being increasingly recognized for their potential in promoting rural socio-economic development. In effect, family farms constitute 98% of global farming establishments and occupy 53% of all agricultural land (Graeub et al., 2016). As a result, a growing number of rural development initiatives are seeking to better integrate small-scale farmers in national agricultural production chains as a means of bringing about positive socio-economic change. Such market-oriented strategies work towards improving the ability of small-scale farmers to capture market opportunities mainly by enhancing their assets and improving their access to organizational, technical and financial resources. By and large,

these initiatives center on two main objectives: increasing the agricultural productivity of small-scale farmers and strengthening their ability to engage in local and regional markets. The appeal of these types of market-based approaches to rural development is based on the dual utility that they offer. On the one hand, they stimulate socio-economic development, and on the other, they enable governments to capture and include the economic productivity of small-scale farmers in the national policy matrix. Nevertheless, market-oriented approaches have often been criticized for their unidimensional approach in dealing with social exclusion, as highlighted in the course of this thesis.

#### **1.4.2. Biofuels, value chains and livelihoods**

By integrating small-scale family farmers in national value chains, biodiesel production in Brazil has been presented as an operational strategy for simultaneously promoting rural development and diversifying the country's energy matrix. However, both the use of biofuels and value chain integration remain contentious subjects in the field of rural development. On the one hand, there is the argument that biofuel production can play an important role in rural development by stimulating agricultural production efforts and helping smallholder farmers to diversify their production and capture market opportunities (see Wiens et al. 2011; Florinm Van De Ven & Van Ittersum, 2014; Erwing & Msangi, 2009). Conversely, other researchers argue that such a model may be socio-economically and environmentally detrimental to the livelihoods of the rural poor (see German et al., 2010; Obidzinski et al., 2012; Escobar et al., 2009).

The rise of biofuel production in the last few decades has given researchers and policy-makers a multitude of issues to consider. In addition to economic and environmental concerns, studies have also focused on the impact of biofuels on agricultural practices, rural livelihoods, land tenure, food security, dietary diversity and cultural reproduction. Considering that bioenergy finds itself in the middle of a number of such important global debates, evaluating the impacts of biofuel production is a particularly complex endeavor. As a result, biofuel policies tend to be analyzed in terms of trade-offs. In other words, it is largely understood that producing biofuels will inevitably entail certain negative impacts, and as such, the main objective becomes determining whether trade-

offs result in an overall positive or negative impact, and to what extent. For instance, a good amount of literature has focused on the potential impacts of crop-based biofuel production on commodity food prices. As noted by Ewing and Msangi (2009), a linkage has been identified between biofuel production and international food price increases, which are expected to continue to rise over the coming years. As a result, the authors suggest a need for a broader examination of trade-offs between poverty reduction and food security. In this sense, they argue that opportunities to generate income and develop agricultural production through biofuels may provide welfare gains that can in turn increase purchasing power and decrease vulnerability to price shocks (Ewing & Msangi, 2009).

Such arguments reflect a popular trend in rural development where value-chain collaboration (VCC) with companies in the private sector is promoted as a way of improving the socio-economic wellbeing of small-scale farmers by increasing their access to technology, inputs and markets (Bitzer, 2011). The idea behind VCC and rural development is relatively straightforward: inserting small-scale producers in production chains and thus linking them with the private sector so they can take advantage of market opportunities. Effectively, access to markets is seen by many as a key component for promoting rural development, as it provides a conduit for transferring skills, knowledge and resources from the private sector towards individuals and households (Neilson & Shonk, 2014).

Value chains integration does carry the potential of improving productivity, income and innovation. Additionally, it can offer insights into the broad structural processes that shape livelihood possibilities (Neilson & Shonk, 2014). However, adopting the VCC approach as a tool for development “tends to disregard the complexity of smallholder livelihoods that shape poverty alleviation pathways in different contexts” (Neilson & Shonk, 2014, p. 269). After all, examining the causes of socio-economic exclusion is a multi-faceted exercise, and as such, engaging in a comprehensive analysis unavoidably requires that a number of dimensions be considered. Formulating rural development strategies where the economic dimension constitutes the foundation for policy

intervention is problematic because it fails to take into account the wide range of variables that shape the livelihoods of small-scale farmers.

In effect, insertion into value chains does not necessarily translate into social benefits. In certain cases, it may do little to improve welfare outside the economic dimension; it may even exacerbate existing socio-economic inequalities and power imbalances. As noted by Ros-Tonen and colleagues (2015), risks associated with the integration of small-scale farmers in value chains include: increased gender inequalities, loss of decision-making power in terms of crop choice, uneven risk and benefit sharing, loss of dietary diversity, and a decline in biodiversity resulting from production intensification and landscape homogenization due to monoculture. With its heavy focus on technology, productivity and income, VCC based approaches largely ignore questions relate to diversity, power imbalances, autonomy and sustainability (Ros-Tonen et al., 2015). Opponents of market-oriented rural development strategies also contend that VCC does not (to any significant degree) take into account the social, cultural, political, institutional, historical and geographic contexts under which it operates. Here, one might wonder to what extent socio-economic inequalities are reproduced in VCC. Perhaps a more important question to ask is whether market-based strategies are suited for addressing structural, root causes of social exclusion in the first place.

Such concerns have led to a rethinking in the rural development community characterized by a growing support for ideas and frameworks emphasizing the need for a more comprehensive approach to socio-economic development. The Sustainable Livelihoods Approach (SLA) is one such method that is used to better understand the livelihood strategies of rural populations. It provides a useful overview of the dynamic inter-relationships that exists between the capabilities and capital at the household level, the institutions and processes that interact with them, and the wider political, economic and social context (Kinsella et al., 2000). By identifying economic, social, political and cultural constraints that individuals and households face, SLA (discussed in more detail in the following chapter) is especially useful in evaluating rural development initiatives and in providing comprehensive insight into the livelihoods of the population being

studied. This in turn gives actors involved in the decision-making process a better understanding of the situation and makes them better equipped in deciding on the strategies needed for promoting sustainable rural development.

#### **1.4.3. Biofuels and climate change mitigation**

Although fossil fuels continue to overwhelmingly dominate the global energy market, there has been a noticeable rise in the production and consumption of alternative energy sources in the past decade. Largely due to rising energy prices, unsustainable patterns of energy consumption and declining global supplies of recoverable fuels, an increasing number of countries have been revising their energy strategy and focusing on biofuels to not only increase energy self-sufficiency but also to curb greenhouse gas emissions.

The potential of biofuels to help mitigate the effects of climate change is contested however. Opponents often argue that biofuel production is subject to low and even negative energy balance (depending on the type of crop used). For example, according to Manuel (2007) only 25% of each gallon of ethanol can be considered as ‘new energy’. In other words, ethanol generates 25% more energy than that used to produce it (which is mostly due to the high energy inputs required for its production). As a result, biofuel production only marginally contributes towards the reduction of greenhouse gas emissions. Secondly, the large amount of land needed for biofuel production often comes at the expense of deforestation, which is considered to be one of the main causes of climate change. As pointed out by Abramovay and Magalhaes (2007), biofuel expansion in Brazil’s Central West region pushed soybean and livestock production towards the Amazon, further increasing deforestation in the region. Lastly, biofuel production is heavily based on monoculture, which furthers land degradation and threatens biodiversity. This is significant because biodiversity enhances ecosystem resilience and thus makes an important contribution towards climate change mitigation and adaptation.

#### **1.4.4. Agriculture in Brazil**

Colonization in Brazil started in the country's Northeast region, and to a large extent, through sugar cane production and subsistence farming. Indeed, during the 17<sup>th</sup> and 18<sup>th</sup> centuries, the Northeast of Brazil was considered to be the country's economic and political center. However, the region subsequently lost economic importance in the 19<sup>th</sup> century as a boom in mining and coffee production began to shift focus towards the Southern and Central regions. The first waves of European immigrants also brought grain and livestock production to the South, which created a different agricultural production pattern compared to that in the Northeast (Filho & Vian, 2015).

In 1940, Brazil's agricultural sector occupied 106 million hectares, with production mostly being concentrated in the South, Southeast and Central West regions (Dias, 2017). By the 1960s however, the country began to witness important changes in agricultural production. In order to keep up with industrial growth and a growing urban population, part of the country's urban-industrial capital began to be channeled into the agricultural sector, and important investments were made in technologies available internationally through the Green Revolution (Santana & Nascimento, 2012).

The success of the country's agricultural policies during the 1960s and 1970s promoted industrialization and territorial expansion (notably into the Central West region) and transformed the country into a major global agricultural player (Filho & Vian, 2015). Subsequently, large areas of agricultural land were established throughout the country in the 1980s, with massive investments in agriculture culminating into 40% of the national land area being converted into farmland. This led Brazil to occupy the 4<sup>th</sup> place globally (with 261 million hectares) in terms of total land area destined for agricultural production (Fernandes et al., 2012; Lowder et al., 2016). Currently, Brazil's non-family farming sector is comprised of 807,587 farms (occupying 75.7% of the total agricultural area), is characterized by its highly capitalized, large-scale commodity and export-oriented production and is responsible for 62% (US\$44.5 billion) of the country's total agricultural output (Graeub et al., 2016).

#### **1.4.4.1. Family farming in Brazil**

Family farming in Brazil represents up to 70 per cent of some of the country's staple food production, employs three quarters of farm labor force and is responsible for 38% (US\$27 billion) of the country's total agricultural output (IFAD, 2016; Graeub et al., 2016). According to the most recent agricultural census (2006), family farming accounts for 84.4% (4,367,902 farms) of the country's total farming establishments while occupying only 24.3% (80.25 million hectares) of the country's total farmland (França et al., 2009). Half of the country's family farms are found in the Northeast region, followed by the South (19,2%) and Southeast (16%) regions (França et al., 2009). Additionally, the highest concentration of family farms (665,831 or 15.2% of all the family farms) is observed in the state of Bahia (França et al, 2009), which makes it a particularly relevant region for this research.

The demographic composition of family farmers in Brazil is quite diverse. It ranges from extremely poor families with low levels of education and technical skills to those possessing a high level of organization and access to capital and technology (Silva et al., 2014a). This socio-economic disparity among the country's farming community can be largely explained by the endemic and historical presence of social exclusion and inequality that continues to plague the country's rural population, despite some efforts by the central government to address the issue. When compared to other sectors, agricultural work remains one of the least remunerated, with the average income equivalent to only 53% of the revenue in the service industry (Hoffmann, 2011). There is also a pronounced discrepancy within the agricultural sector and across regions. For instance, the average income in the Center West region of Brazil is more than three times that recorded in the Northeast, where 43.2% of the population employed in agriculture sector is found, while the South is considered the most dynamic region for family farming, with the lowest rate of rural poverty (Filho, 2013).

#### **1.4.4.2. Poverty in the Northeast**

Over the past decade, Brazil has made important headway in regards to poverty reduction. Between 2003 and 2009, the national poverty rate was reduced by 40% and extreme poverty by 52% (World Bank, 2011). Put differently, about 22 and 13 million Brazilians emerged out of poverty respectively during this period (Helfand et al., 2015). Nonetheless, sharp regional socio-economic discrepancies are still very much evident in the country.

Along with the North, Brazil's Northeast is considered to be the country's most marginalized area. Although significant reductions in poverty rates have been recorded in the past decade, the Northeast still lags behind in terms of indicators of social development when compared to more affluent regions, such as the country's South. In 2011, the Northeast received 50% of the total amount of cash transfers allocated by the anti-poverty program Bolsa Familia, despite representing only 25% of the country's population (Burney et al., 2014). In terms of education, the Northeast has the lowest literacy rates, with 42.55% of the heads of the family farms being illiterate, in contrast to the national rate of 26.74% (Medina et al., 2015). A significant difference can also be detected when comparing family farmers to non-family farmers in the Northeast, with the former being subject to higher poverty and lower literacy rates (Helfand, 2015).

#### **1.4.4.3. The state of Bahia**

The state of Bahia is the largest of the nine states that make up Brazil's Northeast region. It is also the strongest in terms of regional economic output and the fourth most populated state in Brazil. However, this part of the country is also considered to be one of the most socio-economically underdeveloped. The Northeast region ranks lowest on the Human Development Index compared to the rest of the country and is plagued by a limited availability of water due to dry climatic conditions and a lack of environmental oversight (Silva et al., 2014). In terms of agriculture, it is predominantly home to semi-commercial family farmers primarily engaged in subsistence farming, who have the lowest levels of education and either possess a low level of capital or are significantly

marginalized economically (Filho, 2013; Silva et al., 2014). Accordingly, the Northeast region is considered a primary target for rural development and the PNPB's objective of promoting the inclusion of family farmers in the biodiesel production chain. The main feedstock promoted for biodiesel production in the Northeast region is castor oil, with palm oil coming in second. Traditionally cultivated in the Northeast region as a cash crop, the Brazilian government selected the castor bean based on the assumption that it would be the best choice for generating employment and income for family farmers. As such, the castor bean is considered to be a pivotal component of the PNPB program in the Northeast, with the vast majority of regional production taking place in the state of Bahia.

#### **1.4.4.4. Land distribution and ownership**

Land distribution and property rights have long been a contentious issue in Brazil. Nationally, the top 1.5% of rural landowners own 52.6% of the total agricultural land (Graeub et al., 2016). In addition, the country is also subject to a sharp regional discrepancy in terms of agricultural area. For instance, the average size of farmland in the Northeast is 29 hectares compared to 322 and 56 hectares in the Central West and Southeast regions respectively (Filho, & Vian, 2015). In effect, the small size of most farms in the Northeast is considered to be an important factor perpetuating rural poverty in the region, where 20% of family farms have less than one hectare of land and 33% have between one and five hectares (Helfand et al., 2015).

Property rights are another major issue affecting small-scale farmers in the Northeast, where only 67.39% of farmland is occupied with a legal title (compared to the national average of 74.68%) (Medina et al., 2015). More striking, only 41% of the total farms less than 10 hectares in size are registered (Pereira, 1999). As a result, the level of informal land occupation in the Northeast is the highest in the country (12.28%), considerably higher than those observed in the Central West (3.58%) and Southeastern (4.7%) regions (Helfand et al., 2015).

#### **1.4.4.5. Environmental considerations**

Due to hot semi-arid conditions (including low levels of annual rainfall), droughts are considered a natural occurrence in the Northeast. In fact, the region has experienced a number of severe episodes of drought throughout history, with the last one taking place from 2011 to 2013. During this period, a state of emergency was declared in the Northeast as entire crops were lost and over 4 million people were affected (Marengo et al., 2013).

Considering their dependence on agriculture, family farmers in the Northeast are arguably the most vulnerable segment of the Brazilian population when it comes to climate change. This is mainly due to their inefficient production practices, reliance on scarce water resources, lack of coping mechanisms and institutional weaknesses leading to a lack of overall adaptive capacity (Burney et al., 2014; Simões et al. 2010). As such, adverse weather conditions threaten to not only aggravate socio-economic inequalities, but also food insecurity and traditional rural ways of life.

Unfortunately, little has been done so far to enhance the adaptive capacity of family farmers in the Northeast. This is especially worrisome considering the fact that the region will be facing some of the most dramatic increases in temperature among all Brazilian regions. More specifically, future projections for the area show significant temperature increases and rainfall reductions, along with a tendency for longer and more frequent periods of consecutive dry spells and droughts (Marengo et al., 2016; Barbieri et al., 2010; Rohman, 2013).

#### **1.4.5. Rural development policies in Brazil**

In the last two decades, rural development has been a major force driving Brazil's social policy framework. Schneider, Shiki and Belik (2010) as well as Stattman and Mol (2014) observe and describe the following three phases in Brazil's post-military rural development history. In the first phase (1993-1998), the government was primarily concerned with agrarian issues, such as the unequal distribution of land. During this time,

a number of important rural organizations and social movements advocating agrarian reform emerged as key social forces, including the Brazilian Landless Movement (founded in 1984) and the Land Pastoral Commission (CPT). Additionally, this period saw the creation of the first generation of rural policies aimed at providing family farmers with access to credit and financial support through the National Family Agriculture Support Program (PRONAF), which was created in 1996. The second phase (1998-2005) was characterized by social and compensatory policies tasked with increasing the income and welfare of family farmers. During this period, programs for food security and family spending were developed and instituted. The federal government also created the Ministry of Agrarian Development (MDA) in 1999 to specifically support agrarian reform and the sustainable development of family agriculture. This is a unique characteristic of the Brazilian federal institution that was created in 1999, under the Fernando Henrique Cardoso government, in response to popular pressures. Indeed, it was meant not so much to promote economic growth and competitiveness but mostly to reduce inequalities and discontent among marginalized rural populations, without transforming the powerful Ministry of Agriculture, which was and remain under the control—and in the interests of—large Brazilian agribusinesses. In the third phase (2005-present), focus moved to improving existing rural development initiatives by modifying their institutional design and better integrating different levels of governmental institutions (Schneider et al., 2010; Stattman & Mol, 2014).

#### **1.4.5.1. The National Alcohol Programme for the production of ethanol**

Biofuel production in Brazil has a long and eventful history, and public policies have played a central role in the country's alternative energy sector. The country's experience with bioenergy dates back to to the 1940s. The first concerted effort came in 1975 under the Brazilian National Alcohol Programme for the production of ethanol (ProÁlcool). Intent on promoting biofuel production as an alternate fuel source for light vehicles, the Brazilian state established a highly regulated market to ensure the inclusion of ethanol into the country's energy matrix. Overall, ProÁlcool was based on a set of policies that were characterized by a significant amount of intervention at the state level

which included: 1) designing agricultural and industrial policies that were favourable to the programme; 2) investing public resources in research and development; 3) regulating and offering incentives to the private sector to encourage innovation and investment in ethanol-related activities; and 4) providing incentives to car owners to switch to ethanol-fuelled vehicles (Puppim de Oliveira, 2002).

By 1980, the use of pure petroleum gasoline largely ceased in favour of ethanol/gasoline blends, and by 1986, approximately 12 billion litres of ethanol was produced and ethanol-run cars represented roughly 90% of new car sales (Wilkinson & Herrera, 2010, p. 750). The success of ProÁlcool (in terms of achieving desired policy outcomes) was largely due to particularly strict controls on supply and demand, which were stimulated and regulated by means of a centralized control system (Nass et al., 2007). The program has been lauded for its contribution to energy diversification and energy sovereignty, as well as for the economic and developmental benefits it has brought to specific regions (Stattman & Mol, 2014). However, the program lacked major environmental and socio-economic considerations. More specifically, it was mostly based on a large-scale monoculture model, was dominated by agribusinesses, promoted geographical concentration, had a single crop focus, and largely excluded family farmers from the equation (Stattman & Mol, 2014). As a result, when state-level interest for biofuel production picked up again in the mid 1990s, the Brazilian government decided to adopt a more inclusive approach.

#### **1.4.5.2. The National Program of Production and Use of Biodiesel**

In 2003, Brazil's Federal Government created an inter-ministerial initiative tasked with evaluating the viability of using vegetable oils and animal fats as fuel. One year later, the National Program of Production and Use of Biodiesel (PNPB) was launched and came into force in 2005, under Law No. 11.097/2005. The PNPB involves fourteen ministries organized in an executive committee and has four main goals: 1) to structure the supply chain of biodiesel in Brazil, 2) to produce biodiesel from different oil seeds (such as castor beans, cotton, peanuts, dendê oil, sunflower seeds and soybeans) from the

diverse regions of the country, 3) to promote social inclusion and regional development in underdeveloped areas, and 4) to support the production of a new source of oil supply at competitive prices and with appropriate quality (Zapata et al., 2010). In other words, the PNPB is motivated by two main policy objectives: to reinforce biodiesel as a transportation fuel in the national fuel matrix and to integrate family farmers in its production chain. By combining biodiesel production with socio-economic development, this initiative has made Brazil one of the first countries to explicitly include social sustainability, beyond the usual environmental and politico-economic objectives of similar programmes, into its national biodiesel policy framework (Stattman & Mol, 2014).

#### **1.4.5.3. The Social Fuel Seal**

The Social Fuel Seal (SFS) is the primary instrument with which the PNPB promotes regional development and social sustainability in Brazil's rural regions. This certificate is awarded by the MDA to biodiesel producers that “foster social inclusion and regional development through the generation of employment and income for family farmers who fulfill the criteria of the National Program to Strengthen Family Agriculture (PRONAF)” (Silvia & La Rovere, 2010, p. 1667). In this sense, the SFS acts as a mechanism that encourages the participation of family farmers in the biofuel production chain. More specifically, biodiesel producers need to meet the following requirements in order to qualify for the SFS: 1) purchase a (regionally specific) minimum percentage of raw materials from family farmers, 2) enter contracts with small-scale farmers, 3) ensure technical assistance to small-scale farmers, 4) provide training to small-scale farmers in oilseeds production techniques, 5) stimulate oilseeds cultivation in designated areas (da Silva Júnior et al., 2012). Motivations to obtain the SFS include commercial and financing incentives, including easier qualification for public bank loans and decreased rates of federal taxes, associated positive marketing tools and exclusive access to biodiesel auctions organized by the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (Silva et al., 2014; César & Batalha, 2010).

## CHAPTER II

### **2. Analytical framework**

#### **2.1. Introduction**

The previous section presented some arguments in the rural development debate related to the use of biofuels, more specifically the inclusion of family farmers in the biofuel production chain, as a potential socio-economically sustainable method of promoting rural development. However, there has been reservation expressed in regards to the potentially negative and profound impacts such a model may have on the livelihood opportunities of the country's disadvantaged family farmers. Loss of access to vital natural resources and of biodiversity, negative implications for food security and income generation, land grabbing, speculation and increasing land prices, environmental degradation and increased external dependency, are commonly cited dangers that biofuel production may pose to marginalized family farmers (Schoneveld, et al., 2011; Koh & Ghazoul, 2008; Karlsson & Banda, 2009; Montobbio & Lele, 2010; der Horst & Vermeulen, 2011). Additionally, policies promoting economic interactions between family farmers and private companies (i.e. value chain inclusion) have not only been critiqued for ignoring social and political inequalities that are inherent in such models, but also for reproducing existing inequalities and power imbalances found between value-chain actors (Brune, 2010; Hetherington, 2009; Lee, 2015 & Ros-Tonen et al., 2015).

#### **2.2. Conceptual framework**

##### **2.2.1. Social exclusion**

Social exclusion has become a major focus of analysis in social policy. There is a lack of agreement among researchers and policymakers on how to define this concept. Regardless of its conceptual ambiguity, the following common elements can be identified in the literature.

1. Multidimensionality refers to exclusion that occurs along four (social, economic, cultural and political) material and immaterial dimensions and at different levels (i.e. micro, meso and macro), along which “a social exclusion/inclusion continuum is seen to operate” (Mathieson et al., 2008, p. 12).
2. Social exclusion is a relative phenomenon. It is not an absolute notion, but rather, it is considered an individual’s or group’s socio-economic situation in relation to a given society. This focus on social relationships represents an important conceptual shift from the traditional emphasis placed on distributional outcomes in poverty discourse (Mathieson et al., 2008; Room, 1995).
3. The dynamic aspect “refers to the changing and interactive nature of social exclusion along different dimensions and at different levels over time” (Mathieson et al., 2008, p. 13). In other words, social exclusion is a process that takes into account temporal matters and the complex relationships between individual and external factors.

### **2.2.2. Dimensions of social exclusion**

Within academic literature, social exclusion is usually analyzed based on political, social, cultural and economic dimensions. The political dimension, relates to an individual’s or a group’s level of political engagement, which is measured by their involvement and agency in local or national democratic decision-making processes. More specifically, it deals with issues related to access to decision-making and participation in the political process and community organizations. It also has to do with access to structures and processes that enable effective community involvement, including access to relevant information and technological tools and those related to political despondency (i.e. disempowerment, alienation and lack of confidence in political processes) (Arthurson & Jacobs, 2004; Millar, 2007 & Percy-Smith, 2000).

The economic dimension refers to income, production and access to goods and services. In that sense, people experiencing a lack of access to the labor market, credit and other forms of financial assets “may be excluded from income and livelihood, from

employment and the labor market and from the satisfaction of such basic needs as housing, health and education” (Bhalla & Lapeyre, 1997, p. 418).

The social dimension has to do with the ability to engage with others, build relations, obtain public service provisions and be included or excluded in supportive networks. In this sense, employment and integration into the labor market are important elements of the social dimension, as they provide social legitimacy in addition to access to income. Conversely, lack of employment not only denies income and output but it also fails to recognize the productive role of individuals in society, which in turn has an adverse impact on human dignity and can lead to social disintegration (Sen, 1975; Gorz, 1994; Bhalla & Lapeyre, 2004).

Finally, the cultural dimension deals with the production, transmission and legitimization of cultural values and norms, as well as with a group’s ability to generate and sustain social and economic resources through culture. Kabeer argues that cultural exclusions are:

...forms of injustice stemming from social patterns of representation, interpretation and communication... manifested in the ways in which dominant social groups marginalize, seek to impose dominant values, or routinely devalue and disparage certain categories of people (2000, p. 84).

This dimension also encompasses personal and subjective elements that manifest themselves through self-worth, dignity and community identity. Hence, when all of these dimensions are adequately satisfied, a high degree of inclusion can be detected, whereas a lack of inclusion in one or more of these dimension is a sign of some degree of exclusion.

### **2.2.3. Social exclusion versus poverty**

The conceptual differences between poverty and social exclusion can be explained by the fact that these two notions are rooted in different scientific traditions. The idea of social exclusion is grounded in French republican thought, more specifically, Rousseau and Durkheim’s theories on social cohesion. This concept focuses on the

relational dimension of marginalization to complement the distributional one. It places the emphasis on the importance of social and cultural integration in addition to a transfer of material assistance (Levitas, 1996; Madanipour et al., 1994).

The origins of the poverty discourse, on the other hand, reflect the Anglo-American liberal tradition that “emphasizes individual autonomy within a market economy, and sees social policy in largely residual terms” (Saunders, 2008, p. 78). In contrast to the French republican perspective, the Anglo-American liberal tradition adopted an individualist approach when defining social order, viewing it in terms of “networks of voluntary exchanges between autonomous individuals with their own interests and motivations” (Buckmaster & Thomas, 2009, p. 8). Overall, broader social dimensions received less attention in Anglo-Saxon literature, with focus being placed on the distributional dimension of poverty instead, such as access to resources at the individual and household level.

Over the past few decades nonetheless, there has been a good deal of academic debate regarding whether the concepts of poverty and social exclusion actually differ to any great extent. Some researchers have argued that they have been increasingly homogenized and used interchangeably, and that the concept of poverty has been considerably reframed to include a multidimensional and relational component (see Townsend, 1979; Bhalla & Lapeyre, 1997; Sommerville, 1998; Alcock, 2006). Other researchers have stressed the fact that these two concepts continue to differ fundamentally, and that the increasing use of social exclusion in the area of policy analysis and decision-making reflects the view that poverty is too narrow and limiting of a concept.

Overall, poverty and social exclusion are usually distinguished in the following manner (adapted from Jehoel-Gijsbers & Vrooman, 2007):

1. Static versus dynamic condition: Poverty is often viewed as being a static state of being while social exclusion is presented as a more dynamic process.
2. Unidimensional versus multidimensional approach: The biggest critique of the

concept of poverty is its quasi exclusive emphasis on the lack of income or material resources. Social exclusion on the other hand focuses on deficiencies that exist on a number of dimensions.

3. Endogenous versus exogenous agency: Poverty analysis is usually assessed at the individual or household level and its agency is regarded as being endogenous in nature. Conversely, social exclusion takes into consideration more diffused and exogenous variables (i.e. social network, communal ties, etc.). The implications of such differences is that with poverty, the household is responsible for getting out of poverty whereas social exclusion is due to multiple factors, including a set of conditions that are outside of the control of individuals or households.
4. Distributional versus relational emphasis: Poverty analysis tends to focus more on the distributional factors related to economic disadvantages while social exclusion is mostly concerned with relational aspects such as social and cultural dimensions.

#### **2.2.4. Social inclusion**

Similar to the concept of social exclusion, social inclusion has not been defined in its own right and is subject to a lack of conceptual consensus. The ambiguity of the term is illustrated by the fact that the meaning of social inclusion is often implied or asserted in relation to social exclusion (Cameron, 2006). In general, social inclusion relates strongly to the notion of social participation and belonging. The term highlights the importance of granting access to resources, both material and immaterial, that in turn enable individuals and groups to engage in vital social, cultural and economic activities. The conceptual understanding of social inclusion in the present thesis will be based on the definition put forward by Cobigo et al. who argue that, in order for the concept to be operationally cogent in research and practice, social inclusion should be defined as:

- 1) a series of complex interactions between environmental factors and personal characteristics that provide opportunities to (2) access public goods and services, (3) experience valued and expected social roles of one's choosing based on his/her age, gender and culture, (4) be recognized as a competent individual and trusted to perform social roles in the community, and (5)

belonging to a social network within which one receives and contributes support (2012, p. 82).

As noted by Cobigo et al. (2012), the understanding of social inclusion has the tendency to be grounded on models of economic and civil participation that largely ignore the perspectives and experiences of the individuals or groups in question, often leading to a distorted view in terms of the type of results that can be achieved. Conversely, the above-mentioned definition offers a more comprehensive understanding by emphasizing the experiences and perceptions of those involved, and by highlighting the need to incorporate the notion of social responsibility in addition to ideas of entitlement.

#### **2.2.5. Family farming**

Due to the fact that family farming differs greatly across regions, formulating a standard definition of a “family farm” is a particularly difficult exercise. Traditionally, family farming has been defined in relation to land ownership, size, management and labor. A commonly cited definition is the one proposed by Gasson and Errington (1993) which focuses on the following six elements:

1. Business ownership is combined with managerial control in the hands of business principals.
2. These principals are related by kinship or marriage.
3. Family members (including these business principals) provide capital to the business.
4. Family members including business principals do farm work.
5. Business ownership and managerial control are transferred between the generations with the passage of time.
6. The family lives on the farm (Garner and Gender, 2014: p.5).

Various other efforts to define family farming or family agriculture have stressed the need to consider alternative factors when attempting to distinguishing family farms from other types of farming establishments. For instance, Garner & de la O Campos (2014) note that family farming goes beyond capacity, size and orientation, seeing that the term is also used to denote ecological, social, cultural and environmental objectives, and therefore has ties to local culture and rural community.

In the context of the PNPB in Brazil, the MDA determines who can register as a family farmer. The following legal definition, as contained in law number 11.326 of 24 July 2006, outlines the criteria in more detail:

A family farmer and rural farmer entrepreneur is one who practices activities in the rural areas, meeting simultaneously the following requirements: 1) Does not hold, in any capacity, an area larger than four fiscal modules<sup>1</sup>; 2) Utilizes mostly the manual labour provided by his/her family in the economic activities of its establishment or undertaking; 3) Has family income originating predominantly from the economic activities related to the establishment itself or undertaking; 4) Manages his/her establishment or undertaking with his/her family (Litre et al., 2014, p. 171).

#### **2.2.6. The Sustainable Livelihood Approach (SLA)**

The concept of Sustainable Livelihood (SL) is often referred to as ‘people-centric’ way of approaching sustainable development. It is also widely regarded as an attempt to go beyond the traditional definitions and approaches to poverty reduction. Accordingly, SLA primarily emphasizes the relationship between individuals and their livelihoods, as opposed to focusing mainly on access to material resources and income. In this sense, SLA aims to produce positive livelihood outcomes by promoting development that is environmentally, institutionally, socially, and economically sustainable. The concept of sustainable livelihood is most often attributed to Chambers’ work where they presented the following definition:

A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term (1992, p. 7).

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<sup>1</sup> Fiscal modules refer to farmland ranging from 20 to a 100 hectares (ha), depending on regions and municipalities. These are usually determined based on the productivity of the land itself.

This definition advances a way for conceptualizing development that is both normative (i.e rights-based) and practical, and premised on three key tenets: capability, equity and social sustainability (Chambers & Conway, 1992, p. 22-23).

- Enhancing capability: In the context of change and unpredictability, the abilities of the poor to be adaptable, versatile and quick to react to change should be enhanced in order for them to be able to exploit diverse resources and opportunities.
- Improving equity: Emphasis should be placed on prioritizing the capabilities, assets and access of the poor, including minorities and women.
- Increasing social sustainability: The vulnerability of the poor should be minimized by reducing external stress and shocks and establishing safety nets.

More recently however, a number of modified versions of Chambers and Conway's definition have been put forward. For example, Scoones proposed the following definition, which excludes Chambers' criteria that sustainable livelihoods must "contribute net benefits to other livelihoods at the local and global levels" mentioned above:

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base (1998, p. 5).

This definition relates to three core principles that underpin the SLA (as developed by Norton & Foster; 2001; Krantz, 2001; Petersen Pedersen 2010; Ellis, 2000). Firstly, there is the understanding that while economic growth is instrumental for poverty alleviation, the relationship between the two is not automatic since it depends on abilities of the socio-economically marginalized to take advantage of economic opportunities. Secondly, social exclusion operates within social, political and cultural contexts as well, which are often interrelated. Thirdly, the marginalized themselves have to be key actors in the design of policies intended to better their livelihoods considering that they often possess the best knowledge about their situation.

In order to operationalize the concept of SLA, the present study makes use of the Sustainable Livelihood Framework (SLF) as developed by the British Department for International Development (DFID). By providing an organizing structure for understanding people's livelihoods, the SLF's works to help ensure that external support is compatible with people's livelihood strategies and priorities (Ashley & Carney, 1999). In terms of evaluating and measuring livelihood sustainability, this framework relies on the following five key features:

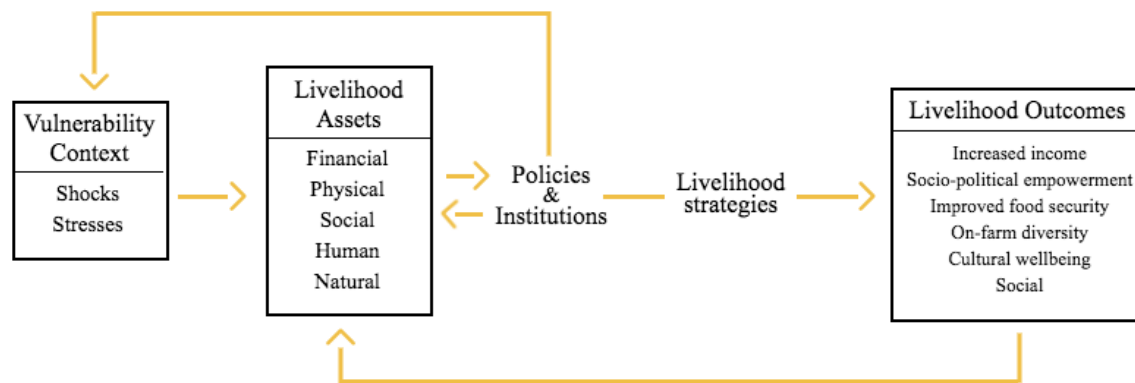
Table 2.1 The five elements of sustainable livelihoods

| Feature                               | Elements                                                                                                                                                                                                                       | Description                                                                                                                                                        |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Vulnerability Context                 | <ul style="list-style-type: none"> <li>• Trends</li> <li>• Shocks</li> <li>• Seasonality</li> </ul>                                                                                                                            | Related to the external environment in which people exist and which affects people's livelihoods and availability of assets (including climatic and market trends) |
| Livelihood Assets                     | <ul style="list-style-type: none"> <li>• Natural</li> <li>• Physical</li> <li>• Human</li> <li>• Financial</li> <li>• Social</li> </ul>                                                                                        | Range of assets that individuals and groups rely on to achieve positive livelihood outcomes                                                                        |
| Transforming Structures and Processes | <ul style="list-style-type: none"> <li>• Structures</li> <li>• Processes</li> </ul>                                                                                                                                            | Institutions, organizations, policies and legislation that shape livelihoods                                                                                       |
| Livelihood Strategies                 | <ul style="list-style-type: none"> <li>• Sequencing</li> <li>• Clustering</li> <li>• Diversification</li> </ul>                                                                                                                | Range and combination of choices and activities used to generate positive livelihood outcomes.                                                                     |
| Livelihood Outcomes                   | <ul style="list-style-type: none"> <li>• Increased well-being</li> <li>• Increased income</li> <li>• Improved food security</li> <li>• Reduced vulnerability</li> <li>• Sustainable management of natural resources</li> </ul> | Achievements of various livelihood strategies used to evaluate livelihood sustainability                                                                           |

Based on DFID 1999 & Scoones 1998

The diagram below illustrates the dynamics of SLF in greater detail. It shows how individuals exist in a context of vulnerability, which they try to mitigate using the collection of livelihood assets they possess. These assets are largely influenced by various structures and processes (i.e. policies and institutions), which in turn shape people's livelihood strategies and outcomes.

Figure 2.1 Sustainable Livelihood Framework



### 2.2.7. Strengths and limitations

The SLF is useful both on the theoretical and practical levels. This is partly due to its flexible design, which has helped make it adaptable and operational in various contexts (Moser, 2008; GLOPP, 2008). Its core principles listed above also contribute towards its strength as an analytical tool. For instance, its people-centric focus promotes a participatory approach to development and enables a systematic, holistic and manageable analysis of poverty by offering an informed perspective of development opportunities, impacts and challenges (Ashley & Carney, 1999). Additionally, the multi-sectoral and interdisciplinary nature of SLF provides a comprehensive framework for addressing a whole range of policy issues relevant to development and marginalization (Moser, 2008; Serrat, 2008; Hussein, 2002). This includes moving beyond narrow sectoral perspectives and focusing on linkages between sectors. Furthermore, SLF takes into account the dynamic nature of livelihoods, as well as the factors that influence them. As a result, the focus of this perspective in understanding change and complex cause-and-effect relationships from the outset provides researchers with a clear analytical advantage (Morse et al., 2009).

Even though the SLA framework has become central in rural development thinking and planning, a number of critiques have been raised. Firstly, some authors have highlighted its weakness in conceptualizing and incorporating the notions of power and governance. For example, Moser (2008) argues that despite the large number of variables that SLA incorporates in its analytical framework, it does not adequately address issues of politics, power, rights and empowerment. Instead, it tends to concentrate on the technical side of development. Scoones (2009) also echoes this concern and points to SLA's confusing and contradictory theorization of politics and power, as well as its failure to link livelihoods and governance debates in development studies.

Secondly, there is criticism about the SLA's inability to engage in analysis at the macro level. As a result, and as Norton and Foster (2001) highlight, the framework may exhibit limitations when it comes to connecting micro and macro elements of analysis. Solesbury (2003) and Moser (2008) also discuss how the framework's context specific, micro-level focus, makes it difficult to establish micro-macro linkages, and renders designing a macro-level model aimed at improving livelihoods at the national level problematic. Moreover, there has been reservation expressed in regards to analysis and measurement of capitals within the SLF (Mores & McNamara, 2013). Although evaluating financial and physical capitals is usually straightforward, measuring human and social capital may prove to be more ambiguous. This is not only due to their normative nature, but also to the fact that individuals may not attach the same value to different forms of capital. For example, individuals or groups may decide to replace some capitals for others if they view those as more appropriate for the pursuit of their livelihood. This in effect exemplifies the complex dynamic of change related to the importance placed on different forms of capitals by any single individual or group (Bebbington, 1999).

Despite these criticisms, SLF remains a popular theoretical approach and practical tool in the formulation and implementation of poverty reduction strategies, as well as in a variety of fields ranging from wildlife management (Ferrol-Schulte et al., 2013) to tourism (Simpson, 2007), and renewable energy development (Fan et al., 2011). When properly adapted and applied, it offers valuable insights into livelihood challenges, priorities and

strategies. It further allows for an integrated development model by emphasizing multiple dimensions, which is essential in understanding the complex interrelationships that define people's livelihoods and the ways by which they can be enhanced. The attractiveness of the SLF continues to lie in its holistic, consultative and participatory approach. Furthermore, its proponents attribute the shortcomings to the extreme complexity of livelihood systems (Carney, 1999). They usually stress that SLF should not be viewed as a rigid and static model, but rather as an adaptable and dynamic framework that applies a broad range of conventional methods and instruments aimed at improving our understanding of the complexities of livelihoods, particularly those of the socio-economically marginalized (GLOPP, 2008; Kollmair & Amper, 2002; Norton & Foster; 2001; Carney, 1999). SLA's popularity is also evident in the efforts aimed at addressing its limitations by elaborating its conceptual framework. For instance, Norton and Foster (2001) have advanced a rights based approach to better address the power dimensions related to marginalization and development. Another example includes examining the relationship between sustainable livelihoods and institutions, more precisely, the broader institutional structures of social provisioning and the degree to which they relate to the needs of the poor (Kabeer, 2004).

## **2.3. Research methods**

### **2.3.1 Research design**

This thesis will follow a case study approach. By assessing the PNPB's performance in the region of Bahia, a reference point for the program's performance will be established, which can then be used to elaborate on potential program improvements in future research. Considering the complex nature of the phenomena being studied, a qualitative and descriptive approach has been selected. Descriptive research is commonly used in studies concerned with rural development (Evans et al., 2015) and is interested with exploring particular issues while also providing additional information about them. The descriptive process is based on creative exploration, and works to organize findings in order to offer explanations (Krathwohl, 1998).

In terms of design and focus, the qualitative research method I have chosen will allow me to understand the meaning people have constructed and how they make sense of their world and experiences (Merriam & Tisdell, 2015). Indeed, qualitative research provides an understanding and description of people's experiences and works to conceptualize complex phenomena. A qualitative approach also enables researchers to study dynamic processes and is deemed to be particularly responsive to local situations, conditions, and stakeholders' needs (Johnson & Onwuegbuzie, 2004), which is one of the core objectives of this thesis. Furthermore, qualitative research allows for a substantial level of flexibility when it comes to data collection and analysis, as well as in the use of theoretical frameworks (Guest et al., 2012). Accordingly, and keeping in mind the complex, subjective and multidimensional character of social exclusion, the use of a qualitative method will allow for an inclusive and flexible approach that will facilitate the exploration and analysis of the objectives set forward in this thesis. Lastly, an inductive approach will also be used in this research. Here, inductive analysis refers to the use of data to establish patterns and themes in order to subsequently formulate general conclusions. As highlighted by Thomas (2006, p.237), employing this technique will be useful in a) condensing and summarizing raw textual data; b) establishing links between the research objectives and summary findings; c) developing a framework of the underlying structure of experiences and processes.

### **2.3.2. Analytical approach**

Due to the lack of consensus in the literature in regards to the definitions of farming and social exclusion, these concepts will be discussed in the context of the PNPB to avoid any conceptual ambiguities. In this sense, the understanding of family farming will be based on the legal definition set forth by the MDA (see section 2.2.5.). The concept of social exclusion will be employed to evaluate the social inclusion component of the PNPB according to the dimensions of social exclusion listed in the section above. For the purpose of this study, social inclusion and exclusion are going to be treated as semantic opposites. The tendency to do so is not uncommon among policy makers and service providers (Cobigo et al., 2012; Craig et al., 2007; Sherwin, 2010). An example

includes the UK government, which has used its definition of social exclusion to define social inclusion as its opposite (CESI, 2002). Here, it is important to note that there is no consensus in the literature that points to these concepts as constituting two opposite ends of a continuum. Regardless, the objective of this particular research is not to solve or engage in this conceptual debate, but rather to provide a context-specific analysis of the PNPB's social inclusion components. Accordingly, social inclusion is implicitly defined within the PNPB and refers more to a desired policy outcome, which is to counter social exclusion by promoting economic growth defined in conventional terms. In other words, the program itself implies the binary relationship mentioned above, and with the purpose of facilitating analysis, this research will operate under the same assumption.

In order to operationalize the assessment of the PNPB's social inclusion component, an adapted version of DFID's Sustainable Livelihoods Framework (SLF) will be employed to evaluate the livelihood outcomes for family farmers. This method allows for the dynamic and multidimensional analysis of development policies, which makes it a useful analytical tool for this study. More specifically, SLF focuses on livelihood assets as well as structures and processes in determining how policies affect people's livelihoods (DFID, 1999). As such, it is well-suited to address the research questions and main objective of this project. Table 2.2 outlines the various dimensions of social exclusion under study and the corresponding SL assets and indicators used to evaluate the social inclusion component of the PNPB.

Table 2.2 Summary of analytical framework

| SOCIAL INCLUSION<br>DIMENSION | SL ASSETS                  | SL INDICATORS                                                                                                                                                                                                                    |
|-------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Economic                      | Financial<br>Physical      | <ul style="list-style-type: none"> <li>• Biodiesel feedstock production</li> <li>• Income generation</li> <li>• On-farm diversity</li> <li>• Access to technical assistance provided by biodiesel producing companies</li> </ul> |
| Political                     | Social<br>Human            | <ul style="list-style-type: none"> <li>• Role of cooperatives</li> <li>• Growth of cooperatives</li> <li>• Access to political consultation/decision-making</li> </ul>                                                           |
| Social                        | Social<br>Human<br>Natural | <ul style="list-style-type: none"> <li>• Inclusion in value chain</li> <li>• Food Security</li> <li>• Organizational capacity</li> </ul>                                                                                         |
| Cultural                      | Natural<br>Social<br>Human | <ul style="list-style-type: none"> <li>• Consideration/incorporation of farmers' knowledge and culture</li> <li>• Transfer and reproduction of culture</li> </ul>                                                                |

The four SL indicators were selected following a review of the literature covering sustainable development, biodiesel production and rural livelihoods. The list is also based on the United Nations Development Program's recommendations (Hoon et al., 1997) for developing SL indicators. In order for the collected data to be interpreted within the context of this research, policy objectives of the PNPB were also included. Furthermore, the indicators were formulated with the aim of highlighting the input and output processes, as well as the impacts and outcomes of the PNPB to provide practical

information about the development impact attributable to this particular program. Due to the limitations associated with this research (see section below), the availability of data was also taken into consideration.

It is important to note that, due to the complexity and scale of the topic being studied, the purpose of this framework is not to provide a comprehensive and definitive evaluation of the PNPB. Rather, it is meant to help advance our understanding of sustainable rural development and provide insights into initiatives that might go beyond traditional ways of approaching development. It also contributes to test the value and practicality of the SLF of analysis, and potentially how it can be improved or adapted to different contexts and development programs. Accordingly, this framework is designed to highlight the significance of using participatory approaches, the importance of addressing the multidimensional nature of social exclusion, and the importance of emphasizing asset development at the local level.

### **2.3.3. Data collection**

Data for this study were collected using secondary analysis of both quantitative and qualitative data sets. Using existing data to engage in original research can be a useful avenue of analysis with a number of advantages if performed correctly (Hakim, 1982; Johnston, 2014; Mogalakwe, 2006; Long-Suthehall et al., 2010). Among other things, secondary analysis is used when researchers want to apply a new perspective or a new conceptual focus to the original research issues (Heaton, 1998) or to describe the contemporary attributes and behavior of individuals, societies, groups or organizations (Corti, et al., 1995) (cited in Long-Suthehall et al., 2010, p.336).

While the use of quantitative data may be more common, secondary analysis of qualitative data has also become an increasingly popular tool. In order to enhance the value of the present research, this thesis had the opportunity to access the in-depth qualitative interviews executed by Sarina Kilham, Catarina Camargo and Juliet Willetts (2010) and prepared for the ETC Foundation by the Institute for Sustainable Futures. This research project was composed of both semi-structured and informal interviews of 20

participants residing across the state of Bahia and producing a range of biodiesel feedstock. The participants were farmers who were planning to participate, were currently participating, or had participated in the PNPB in the past. The goal of the project was to “explore the lessons learnt from a local perspective and to provide a voice for farmers in the national and international debate on sustainability of biofuels... by focusing on farmers’ experiences of participating in the biodiesel program” (Kilham et al., 2010, p.iii).

In terms of quantitative data, this research relied on two main sources. First, the database maintained by the Brazilian Institute of Geography and Statistics (IBGE) was used to collect data related to agricultural production and economic indicators. Second, data was also obtained through the MDA’s database and 2006 agricultural census. Information was also supplemented using a variety of technical and non-technical documentation including governmental and academic sources.

#### **2.3.4. Data analysis**

Data analysis was conducted using a form of asset mapping and documentary analysis of existing research and government data. As Mogalakwe (2006) argues, the use of documentary methods on its own constitutes an operational and cost-effective approach in studying social phenomena. Bowen (2009) also notes that documentary analysis can be used as a stand-alone method, and is particularly applicable to qualitative case studies. More specifically, this method refers to:

[a] systematic procedure for reviewing or evaluating documents, both printed and electronic material. Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Bowen, 2009, p.27).

Asset-mapping is a measurement tool commonly employed in evaluating program effectiveness and determining potential program improvements. More specifically, asset categories and their related criteria were used to measure the level of vulnerability of family farmers. The degree to which individuals or households lack the specified assets

serves to indicate their level of vulnerability. If assets increase, a positive impact on livelihood outcomes is expected, or in other words, individuals and households are more likely to achieve an enhanced and sustainable standard of living (Whaley et al., 2010). Conversely, the level of vulnerability is less likely to decrease if assets fail to develop following the implementation of a specific program. In this manner, the present research uses asset-mapping to evaluate changes in the livelihoods of family farmers by focusing on livelihood outcomes. The diagram below illustrates the asset mapping approach used in this thesis.

### **2.3.5. Units of analysis**

Social exclusion is a multi-faceted phenomenon and is routinely studied on various levels (i.e. micro, meso and macro). In order for this research to be more focused, analysis will be limited to the local level. Local level analysis links well with SLF, which considers individual or community asset development as a crucial component in evaluating social inclusion (Whaley et al., 2010). More specifically, the units of analysis will be family farming establishments located in the Northeastern Brazilian state of Bahia. Those that have and have not participated in the PNPB will be included in the analysis. Including both groups will provide important first-hand insights related to the effectiveness of the program.

### **2.3.6. Limitations and challenges**

Initial limitations for this research are related to cost and time restraints, and thus a decision was made to engage in secondary analysis, without completing participant observation or interviews in Brazil. This in itself presented a new set of challenges in terms of potential bias related to data selection and availability, as well as in the evaluation of the appropriateness and quality of the data selected for analysis. As a result, a number of methodological and ethical considerations had to be taken for this research; especially seeing that secondary analysis of qualitative data was performed. The most obvious one relates to the contextualization and interpretation of data. However, as argued by Heaton (1998), the design conduct and analysis of both qualitative and

quantitative research is always dependent on the contextualization and interpretation of situations and responses. As such, secondary analysis is no more problematic than other forms of empirical inquiry, all of which (at some stages) rely on the researcher's ability to produce critical analysis based on inter-subjective understandings (Heaton, 1998). Moreover, utilizing qualitative data obtained through extensive field research by researchers familiar with the native portugese language and familiar with the socio-cultural context provides the advantage of helping navigating around some inherent challenges presented by this study.

Context sensitivity and specificity also had to be addressed, which as a number of authors have pointed out (see Medjedović 2011), by themselves do not constitute insurmountable obstacles. Accordingly, the data included in this analysis was selected after it was evaluated to be methodologically compatible with the design of this thesis. Criteria for the latter process included ensuring that the geographic region of interest, sampling of the population and overall objectives of the research projects matched. This in turn served to minimize selection bias and ensured that existing data can be adequately used in generating a new conceptual focus to the original research issues. Although this project could have benefitted from field research in Brazil to obtain original data and to expand the coverage of the analysis provided, this would not have been possible in the context of this Master's thesis. Accordingly, some of the limitations highlighted in this study can be used as basis and motivation for further analysis, and thus addressed in future research.

## **2.4. Conclusion**

The present chapter introduced the theoretical and analytical frameworks used in the course of this study. As previously discussed, the concepts of social exclusion and social inclusion are complex and multi-faceted, and as such, engaging in their analysis requires an approach that takes into account various related dimensions. By focusing on the livelihoods of family farmers as a measure for change, the SLF offers a comprehensive and multi-dimensional assessment of the PNPB in regards to its social inclusion component. The analytical and methodological tools employed in this thesis not only reflect the multi-dimensional nature of the phenomena being studied, they also work

to place family farmers at the center of a network of inter-related variables. They therefore provide important insights into how they construct a livelihood for themselves and their families.

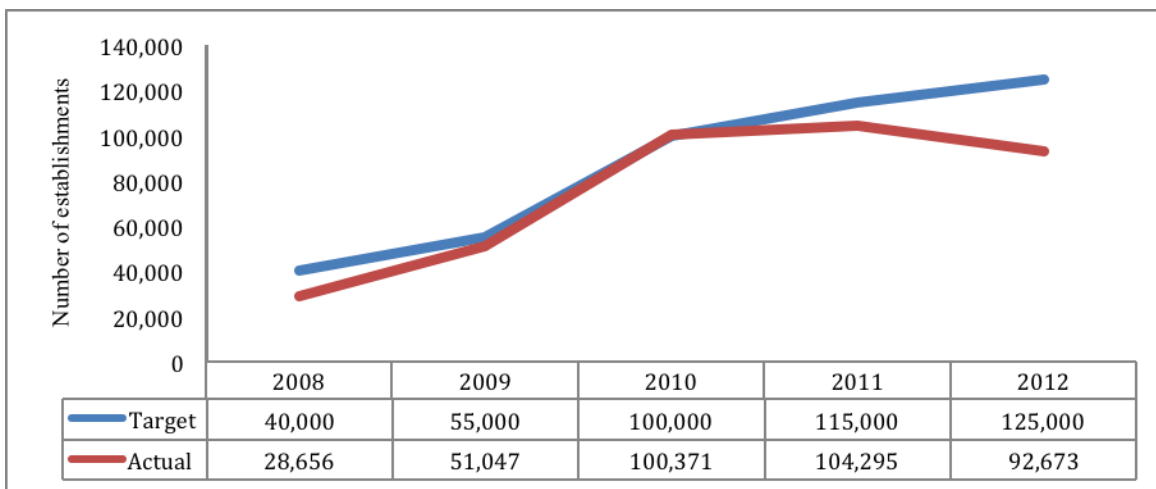
## CHAPTER III

### 3. Data and findings

#### 3.1. Family farmer participation

During the early stages of the PNPB, no official targets were published in terms of the number of family farmers to be included in the country's biodiesel production chain. However, it was unofficially understood that the government intended to include up to 200,000 families during the initial years of the program. In the first three years, 16,328 (2005) 40,595 (2006) and 36,746 (2007) family farming establishments participated, representing on average less than 16% of the initial goal (da Silva César et al., 2014). As shown in figure 2.1 however, participatory levels matched considerably better the revised targets established internally by the MDA for the period of 2009 to 2011, while a pronounced discrepancy was observed for 2008 and 2012.

Figure 3.1 Evolution of family farmer participation in the PNPB (target versus actual)



MDA (2015); TCU (2013)

In 2012, a multi-year plan was laid down for 2012-2015 with the goal of attaining the original 200,000 mark. Figure 3.1 illustrates the breakdown by region of the target and actual levels of participation.

Table 3.1 Family farming participating in the PNPB by region

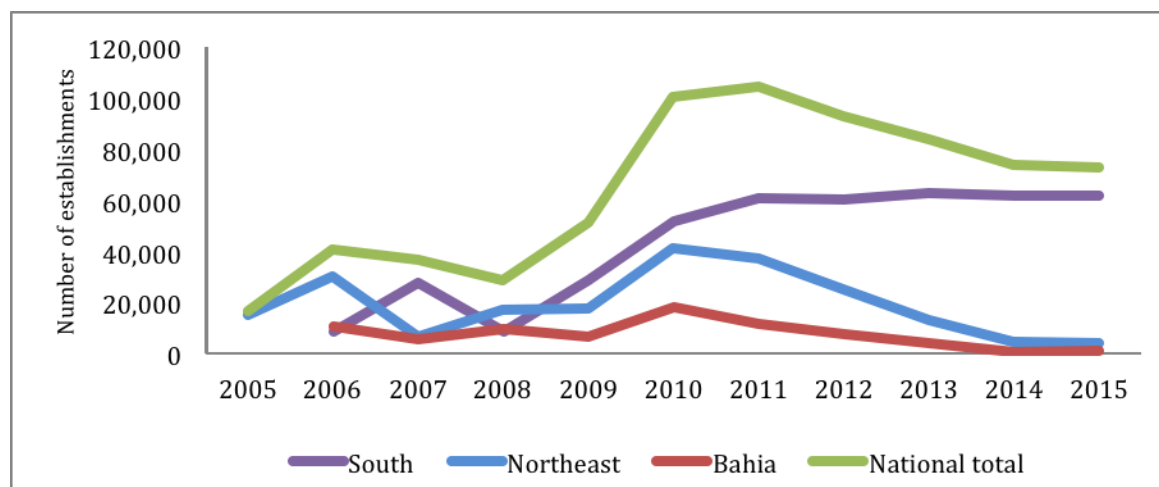
|             | Target<br>(Set in 2012) | Actual<br>(At end of 2015) | Achieved     |
|-------------|-------------------------|----------------------------|--------------|
| Center-West | 8,000                   | 4,548                      | 56.85%       |
| Northeast   | <b>85,000</b>           | <b>3,926</b>               | <b>4.62%</b> |
| North       | 6,000                   | 304                        | 5.07%        |
| Southeast   | 6,000                   | 1,818                      | 30.03%       |
| South       | 95,000                  | 61,889                     | 65.15%       |
| Total       | 200,000                 | 72,485                     | 36.24%       |

Own elaboration based on EPE (2012); MPOG (2012); MDA (2015)

As the above data demonstrates, the PNPB was unable to build on the momentum gained during the 2008-2011 period, only achieving 36.24% of the target goal set out in 2012. What's more, the levels of participation in the Northeast continued to decline significantly. In 2015, 3,926 family farming establishments participated in the PNPB, the lowest level of participation recorded for this region since the launch of the program. Additionally, only 4.62% of the original target goal of 85,000 established in 2012 was attained.

The integration of family farmers in the Northeast has in all evidence fallen short of expectations. While during the first two years 80% of participating establishments were from the Northeast, participation has subsequently fluctuated considerably. After a weak performance in 2007, levels rose in 2008 and even more dramatically in 2010. Since however, levels have fallen consistently with 2015 being the year with the lowest number of family farmer establishments participating since the start of the program, representing a little over 5% of the national total for that year (figure 3.2).

Figure 3.2 Number of family farming establishments participating in the PNPB



MDA (2015)

Up until 2012, the state of Bahia was one of three states (the others being Ceará and Rio Grande do Sul) where the majority of family farmers participating in the PNPB were located (MDA, 2015). The decrease in participation 2012 onwards in Bahia is reflective of the wider decline observed in the Northeast during the same period. In 2015, Bahia was ranked as the 7<sup>th</sup> state in terms of participation, representing 1.6% of the overall number of families participating in the program (see annex 1). Concurrently, the southern region of Brazil demonstrated strong growth in participation 2009 onwards, and by 2012, the vast majority of families were from that region. By 2015, participation in the PNPB was dominated by families found in the Southern region of Brazil.

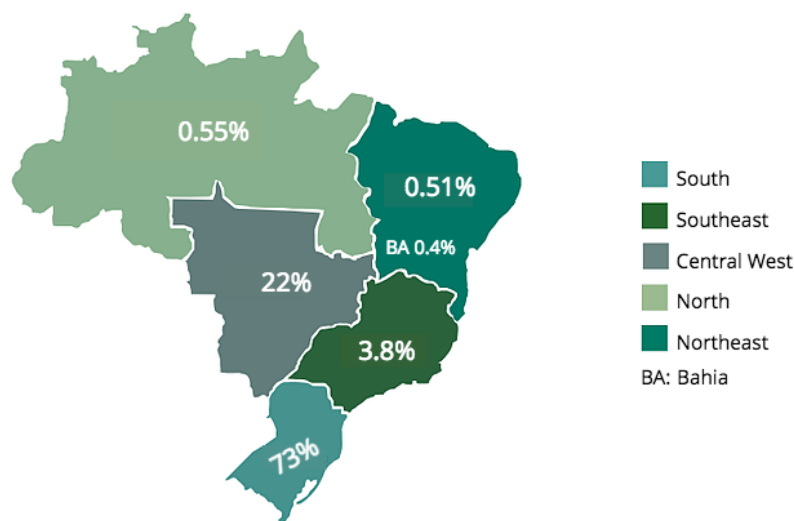
### 3.2. Biodiesel feedstock production

Feedstock production by family farmers in the Northeast has consistently failed to meet desired expectations. Out of the country's five regions, the Northeast produced the least amount of feedstock (in volume) from 2008 to 2015, with the only exceptions being 2009 and 2010 where it only surpassed the Northern region. In Bahia, a 395% increase was registered from 2008-2009, with a 74% increase the following year (see annex 2). However, a 99.6% decrease in 2011 brought production in the state to a near stand still, a trend that persisted until 2014, when a noteworthy increase in production was finally observed. Additionally, regional distribution of production is overwhelmingly concentrated in the South and Southeast, which combined, were responsible for 95% of

national feedstock production over the last eight years. During the same period, 0.51% of overall production took place in the Northeast and 0.4% in Bahia (see figure 3.3).

Under the PNPB, the castor bean was chosen as the main designated feedstock for the Northeast. It did not need to be introduced seeing that it has been (and continues to be) the region where that the majority of the national production takes place. Other reasons include the relatively low cost of production and high price, its ability to withstand the climatic conditions of the region and its capacity to generate employment (being particularly ill-suited to mechanized agriculture). Accordingly, the type of feedstock produced by family farmers in Bahia is almost exclusively castor, which constituted 99.9% and 97% (with soy making up the difference) of total production in 2014 and 2015 respectively (MDA, 2015).

Figure 3.3 Percentage of raw materials acquired from family farming establishments by region (average 2008 - 2015)



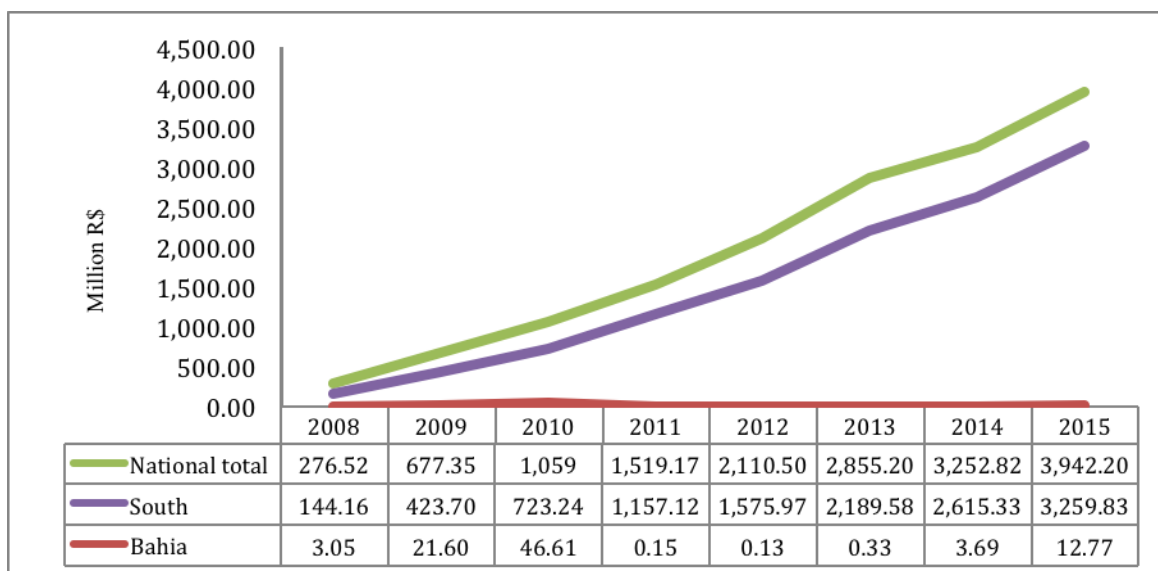
Own elaboration based on MDA (2015)

### **3.3. Income generation**

The sales of raw materials under the Social Fuel Seal (SFS) have been growing considerably. Between 2008 and 2015, a 464% increase has been observed in the average annual income generated through feedstock production (MDA, 2015). In 2010, family farmers produced 20% of the nation's biodiesel feedstock, by 2014 the number had grown to 30% (MDA, 2015; UBRABIO, 2010). The growth in the total monetary value generated by family farmers is even more impressive: in 2008 276.52 million R\$ worth of feedstock had been produced, by 2015 that amount had grown to 3.94 billion R\$ (a 1325.65% increase) (see figure 3.4). While these numbers are used by some proponents of the PNPB to maintain the success of including family farmers in the country's biodiesel production chain, as well as the progress being achieved in moving towards the wider objective of socio-economic inclusion, it is clear that the economic benefits being generated are unevenly distributed. In the Northeast, income obtained through feedstock production has consistently been the lowest in relation to the other regions. Excluding the period of 2011-2013, income in Bahia has been noticeably higher than the Northeast average. Annual income in the state increased the most from 2008 to 2009, going up from 307 R\$ to 3,046 R\$ (a 892% increase) while the highest annual amount (11,153 R\$) was registered in 2015 (see figure 3.5). And yet, even at its peak, income in Bahia has been far lower than the national average. Conversely, the Southern region has regularly recorded the highest annual value of feedstock produced, while family farmers in the Center-West region earned the highest annual incomes.

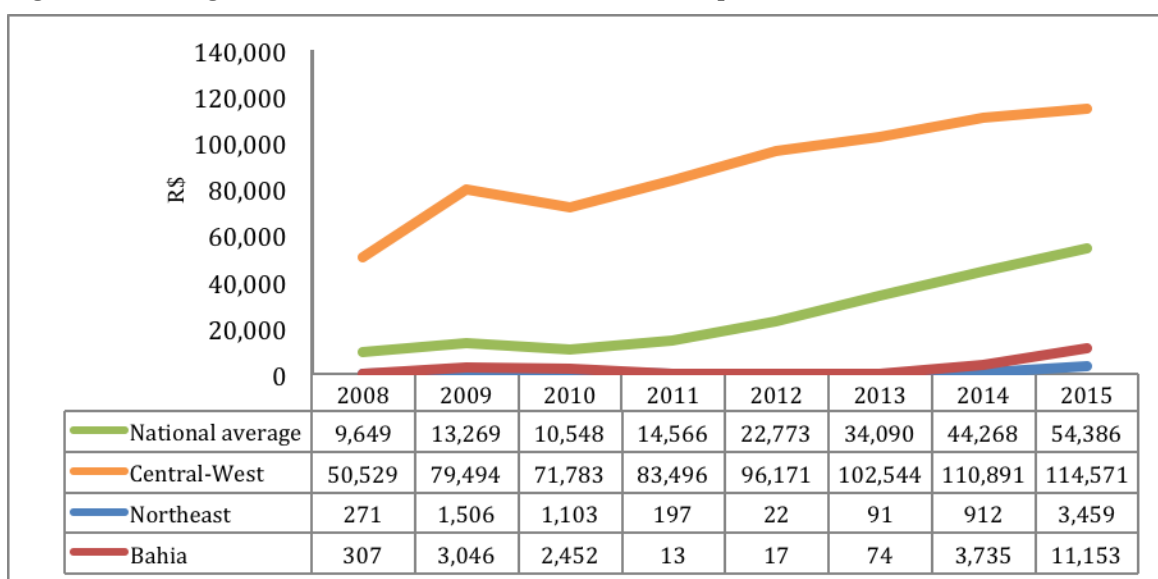
The dominance of the Southern region in feedstock production has also translated into soy becoming the dominant family farm crop destined for biodiesel production (seeing that's where national soy production is focused). While soy does make up the primary crop used in the country's biodiesel production matrix, its concentration in family agriculture is even more pronounced. For example, soy (as feedstock) represented over 99% of the total monetary value generated by family agriculture from 2011 onwards (see table 3.2).

Figure 3.4 Value of raw materials acquired from family farming establishments



MDA (2015)

Figure 3.5 Average annual income from raw materials sales per establishment



Own elaboration based on MDA (2015)

Table 3.2 Value of raw materials acquired from family farming establishments

| Year | Soy                | Castor         |
|------|--------------------|----------------|
| 2008 | 266.250 (96.28%)   | 5.140 (1.86%)  |
| 2009 | 645.190 (95.25%)   | 26.790 (3.96%) |
| 2010 | 1,001.410 (94.58%) | 46.360 (4.38%) |
| 2011 | 1,506.820 (99.18%) | 7.730 (0.51%)  |
| 2012 | 2,099.400 (99.47%) | 0.920 (0.04%)  |
| 2013 | 2,845.551 (99.66%) | 1.940 (0.07%)  |
| 2014 | 3,246.339 (99.8%)  | 4.700 (0.14%)  |
| 2015 | 3,927.277 (99.6%)  | 13.091 (0.33%) |

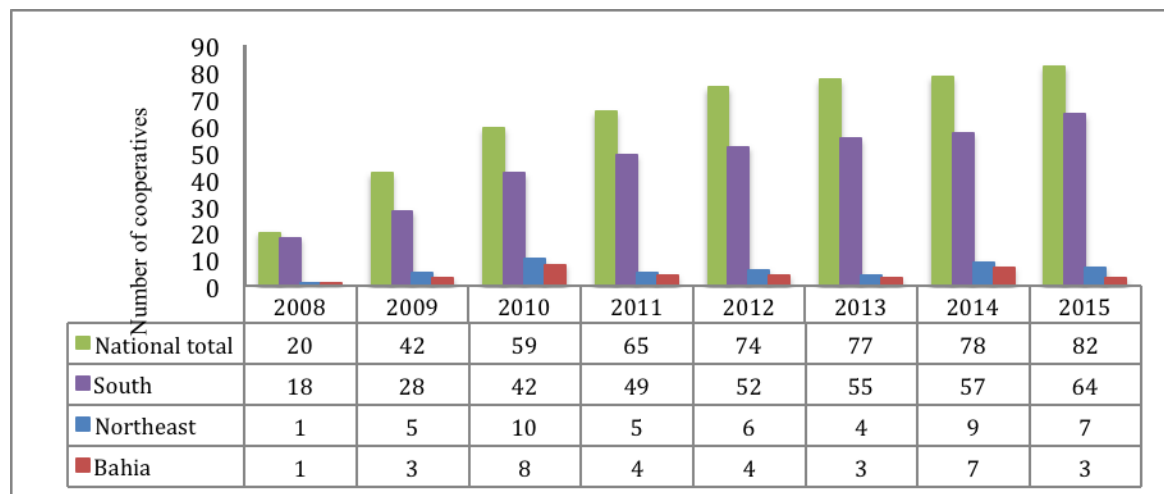
Own elaboration based on MDA (2015)

In contrast, castor production comes in at a distant second (except from 2012-2013 when it was overtaken by sunflower production). Typically, the price of soy is considerably lower than that for castor, which (for family agriculture) has usually ensured higher levels of revenue than traditional crops, even though it offers lower yields due to its labor-intensive nature and incompatibility with mechanized agriculture.

### 3.4. Cooperatives and organizational capacity

The regional distribution of co-operatives in Brazil is also skewed, with the Southern region being home to most (see figure 3.6). As a result, a significant disproportionate ratio (of participating family farmers versus co-operatives) can be observed in the Northeast up until 2014. However, the gap was narrowed mainly because of a significant drop in participation of family farmers (in the Northeast), which took place in 2014 and 2015.

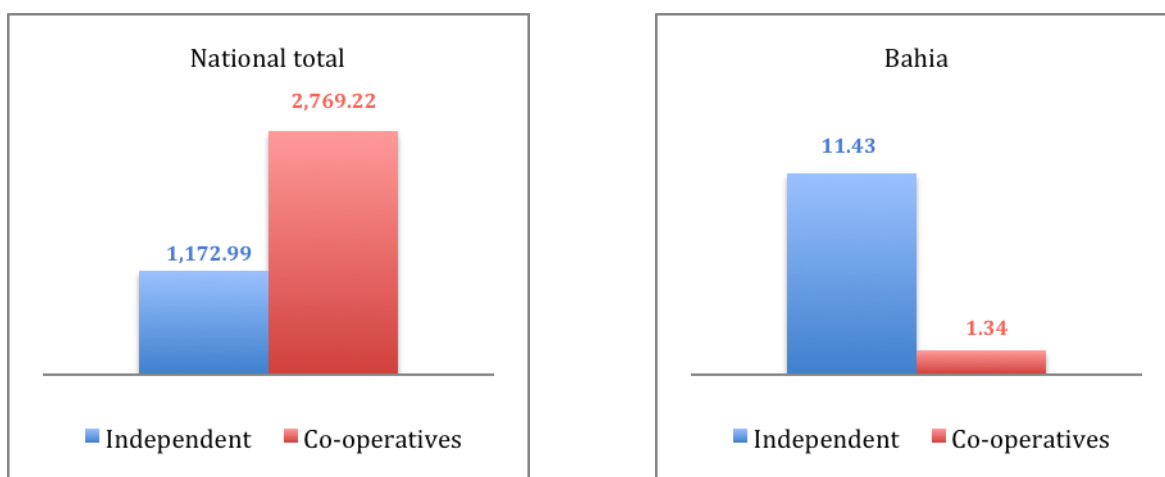
Figure 3.6 Number of cooperatives supplying biodiesel feedstock under SFS



MDA (2015)

The majority of co-operatives in the Northeast are located in Bahia. However, it has been noted that most of them suffer from structural and organizational deficiencies. During field research, Silva (2015) observed that co-operatives in Bahia lacked financial support, working capital, adequate infrastructure, qualified personnel, had their capacity restricted to straightforward tasks (i.e. delivering seeds) or were in default. In effect, the poor performance of co-operatives in Bahia is reflected in the figure below, which compares (both nationally and in Bahia) the total value of feedstock sold by independent family farmers versus co-operatives.

Figure 3.7 Feedstock sold by independent farmers versus co-operatives in 2015 (in million R\$)



MDA (2015)

While it was found that the Brazilian government, for the most part, has failed to prioritize the promotion and management of co-operatives involved in biodiesel production (Silva, 2015), the reasons behind the poor performance of co-operatives in Bahia (and the Northeast in general) is mostly the result of the region's lack of tradition, understanding and capacity to engage with co-operatives. According to Stattman and Mol (2014), co-operatives in Brazil tend to flourish predominantly in the Southern region of the country, where farmers possess a higher farming efficiency, operate on a larger scale and produce for the global commodity market (Stattman & Mol, 2014). Family farmers located in the Northeast, on the other hand, mostly engage in subsistence farming or produce for local or regional markets.

Kilham et al. (2010) also observed that both farmers and co-operative staff in Bahia viewed the role of co-operatives as being closer to that of government service providers, in contrast to farmer's associations, which were seen as civil society bodies. What's more, Watanabe, Bijman and Slingerland (2012) also found that farmers in the Northeast also lacked the social capital and trust required for co-operatives to operate efficiently, while César and Batalha (2010) reported an overall negative opinion of co-operatives due to corruption and their perceived roles in the political control of farmers .

### **3.5. Technical assistance**

The requirements related to obtaining the SFS (as listed in section 1.4.6.) are indicative of the PNPB's reliance on market actors in promoting social inclusion. Effectively, the biodiesel producing companies play a crucial part in the design and implementation of the program, with a number of important tasks being delegated to them. One important responsibility relates to the delivery of quality technical assistance to family farmers. And while a number of extension services are made available to the latter (mostly outside of the framework of the program such as the National Program for Strengthening Family Agriculture), the focus of this thesis will be restricted to analyzing technical assistance as being provided by biodiesel companies. This not only serves to focus the scope of the analysis, but is also a good basis for analyzing the PNPB's market-oriented policy assumptions in regards to rural development and social inclusion.

As such, and despite the significant amount of funds invested in technical assistance, efforts to support family farmers and cooperatives have been largely inadequate in the Northeast region. In 2011 for instance, family farmers in this region received approximately 43% of the total investment in technical assistance, 22% of all grants provided by biodiesel producing companies and nearly 33% of the agricultural technicians involved in the program (Machado, 2012). Regardless of these efforts, family farmers in the Northeast generated only 7,350,000 R\$ from biodiesel feedstock sales, which represented a mere 0.48% of the national total (Machado, 2012).

Despite this disproportionate ratio, technical assistance for feedstock production was highly sought after by family farmers. According to interviews conducted by Kilham et al. (2010), all interviewed farmers considered access to technical assistance and agricultural extension services a priority. However, these farmers also felt like the services provided were 'superficial' and centered on registration, seed distribution and the purchase of feedstock. Moreover, few farmers viewed the technicians as a source of information, regarding them instead as purchasers or even as control and monitoring measures. Kilham et al. also discovered that farmers and technicians found that the technical assistance program allowed insufficient time for quality services to be provided, with at least 2 to 4 months separating each visit. One respondent cited that a large number of technicians had come from other parts of the country to work in the area and thus lacked the necessary knowledge pertaining to the realities of the region (Kilham et al., 2010). These individuals often needed time to adapt to local conditions and to get to know and build relationships with the local population. This process was seen as highly time consuming, something that the technical assistance program did not accommodate. What's more, the interviews also suggested that technicians often learned about new crops together with farmers, and as a result, the assistance that technicians could offer farmers was limited. In turn, these deficiencies hindered the creation and maintenance of meaningful relationships between farmers and technicians. For example, a farmer that had previously sold his feedstock to a biodiesel company in the first year of the PNPB, decided not to participate the following year. Instead, he went back to doing business with a local broker. The farmer cited the fact that his castor had become diseased and that

he did not trust technicians hired by biodiesel producing companies. His decision was further influenced by the fact that the broker was known to him and was from the local community (Kilham et al., 2010).

Interestingly enough, there is suggestion that quality technical assistance was not a priority for biodiesel producing companies in the first place. As attested by one technician, companies might have been motivated to register as many family farmers as possible, without delivering quality technical services, simply to be eligible for favorable provisions stipulated under the SFS:

I had several locations and in each location I was responsible for about 40 farmers, the company *wasn't concerned about the quality of technical assistance but more concerned with how many people were registered*, the more the better. The technical assistance ended up just being we'd go by to see if the farmer had planted the seeds or not... we were responsible for buying the feedstock too. So in the end, we had lots of families and no time. Often I'd make one visit when the farmer had just planted and by the time I went again in reality the crop was almost ready to harvest (Kilham et al., 2010, p.14,).

Failure of biodiesel companies to meet obligations in respect to technical assistance was also noted by Carneiro and Castro (2016), who found that biodiesel producing companies had engaged in breach of contract in relation to MDA's requirement to provide technical assistance and seed distribution to cooperatives. Of the seven cooperatives surveyed, only two said they had regularly received technical assistance and seed distribution, one claimed to receive the services sporadically, while four claimed they had not received support.

Finally, in interviews conducted by Fernandes (2013), all the family farmers stated that they received technical assistance for the cultivation, harvesting and processing of the castor bean. These services were provided by outsourced technicians who were also responsible for monitoring approximately 100 families in other regions of the Northeast. In all the cases, the technicians made four visits: one in the pre-planting phase to help with soil preparation and planting; two in the planting phase to aid with crops

management and the control of pests and diseases; and one in the harvesting phase to help determine the timing and method of harvesting, potential adjustments to the threshing machine and the processing method of the harvested crop. The visits themselves were confirmed by reports signed by family farmers attesting to the realization of the visits. However, family farmers stated that the order of visits did not always follow the sequence described above. Furthermore, farmers also reported the lack of involvement on behalf of public agricultural agencies when it came to technical assistance. According to the interviewees, state assistance for castor production was almost exclusively in form of financial aid.

On the other hand, Fernandes found that the biggest challenge faced by technicians was either resistance or the lack of interest on behalf of family farmers to adopt recommendations, as well as their decision to continue to exercise familiar yet improper crop management practices. The technicians interviewed credited this resistance to cultural factors and low levels of education of farmers. Technicians also listed regular delays in getting reimbursed for expenses (such as for fuel allowances), late payment of wages (which at times were overdue up to three months) and the lack of regular access to reliable transportation as factors jeopardizing the quality of the services delivered.

### **3.6. Cooperatives versus farmer's associations**

Despite the fact that cooperatives were active in Bahia, according to the research conducted by Kilham et al., (2010) none of the farmers interviewed considered themselves as being members of a cooperative. Farmers were also unaware of the fact that members of cooperatives had certain rights and responsibilities. What's more, farmers did not consider cooperatives as organizations negotiating on their behalf or that they were investing in local communities, and were often referred to (by farmers and cooperative staff alike) as "companies" or "government".

In contrast, the research team also found that farmers had a strong understanding of how local farmer associations operated and were well informed about their rights and responsibilities as members. Additionally, many farmers regarded these associations as

their representatives promoting their interests, and a way by which they could express their “voice”. For instance, one participant stated that “If I am just one voice, then I am not so loud, but if I am in the association, then we are many voices and we can be heard...” Participants also cited associations as being active in procuring electricity to villages, purchasing community owned vehicles and attracting government programs or projects. The researchers also noted that both farmers and cooperative staff regarded the role of cooperatives “closer to that of a government service providers or contractors, as opposed to [that of] farmer’s associations, which were perceived as civil society bodies” (Kilham et al., 2010, p.17). The following statement by a local community mobiliser illustrates well the value family farmers place in associations:

Today if it wasn’t for the associations or the organized groups, then we wouldn’t be able to get many benefits for our community... we know there are projects with government funds and that these funds are to be utilized by the community, but unless the communities are organized, then they can’t get access (Kilham et al., 2010, p.17).

All of the five cooperatives surveyed by the research team were participants in the PNPB via contracts with biodiesel refineries. For at least two cooperatives, the contracts constituted the main source of income and all five cooperatives experienced a precarious financial situation due to their heavy dependence on the renewal of contracts. In addition, four of the five cooperatives were not involved in political activities and simply worked to facilitate commercial interactions between family farmers and biodiesel producers.

### **3.7. Transfer of culture**

A prominent finding among Kilham et al.’s research is the frequency by which farmers reported that they did not want their children to follow in their footsteps. The reasons for this outlook included: lack of educational opportunities, underdeveloped infrastructure, negative effects on health and general precariousness associated with being a family farmer (Kilham et al., 2010). According to one technician:

Farmers today don’t want their children to follow in their footsteps and be family farmers, it’s because it’s like family farming has lagged in reality, it’s something that is very insecure, farmers are planting without knowing if they will be harvesting

and the income that people make is little compared to people in the city.... (Kilham et al., 2010, p18)

Nearly all of those interviewed reported that they felt a great deal of pride in being a farmer, and many participant regarded farming as being “honest” and a “good” way of earning a living. However, younger individuals did cite the lack of appreciation for farming as an occupation and lifestyle. For example, the youngest interviewee felt like society perceived farming as being a “backward” profession. When asked if his friends would choose farming if the income was that of an engineer, his response was “No, it’s not about money, it’s about how society values farmers” (Kilham et al., 2010, p.18).

Those interviewed also cited experiencing difficulties when dealing with government and banking service providers on account of them being farmers. For one participant, the perceived lack of value placed on agricultural work was systemic and reflected in the educational system, where traditionally valued occupations were emphasized. When asked about the future of farming, a community organizer responded:

[The] parents are getting tired, and the value of their produce is at a minimum and they are feeling un-stimulated and all of this is contributing to the fact that in 10 or 20 years there will be a minimum number of farmers here, perhaps just pensioners living on their pensions and the fields will be abandoned because none of their children want to continue doing what their parents did... (Kilham et al., 2010, p.18).

According to respondents, there was also an impression that the PNPB did not generate enough income to help retain young people in rural areas. Kilham et al. also noted that in one case, a 21-year-old migrated after the biodiesel feedstock crop he planted failed. In effect, participants frequently emphasized the need for local economic opportunities, and cited employment and income as motivating factors for leaving the countryside. One agricultural technician also commented on the lack of government incentives for small farmers and the need for greater economic development to counter the rural exodus.

### **3.8. Incorporation of farmers' knowledge**

One evident observation made by Kilham et al. was the lack of value placed on local farmer knowledge within the PNPB and by external agencies in general. It was also recorded that local knowledge possessed and generated by farmers and technicians lacked the necessary mechanisms to spread the information to the wider biodiesel producing community. More specifically, the researchers noted that no apparent methods of sharing knowledge about crops, climate, production or on-farm management techniques were observed. Instead, farmers were generally viewed as being passive “receivers” (of seeds, financial aid, technical assistance etc.) rather than pro-active partners within the program (Kilham et al., 2010).

In terms of the political and decision-making process, it was also noted that family farmers were being discouraged from participating. One interviewee was told that farmers would not be eligible to be on a local working group's leadership board as they did not possess the necessary qualities (Kilham et al., 2010). When asked what exactly was meant by that, the respondent clarified that it was in reference to him being illiterate. This experience is reflective of the wider observed sentiment that very little local input from family farmers was included in the design of the PNPB. As one respondent notes:

I think that programs should have been created together with the participation of the community, not created in some meeting room of Petrobras or the government or some cooperative... Not just thrown to us as a package and we have to swallow it...  
(Kilham et al., 2016, p. 20).

A separate study conducted in the Northeast region by Brune (2010) also found that the biodiesel program failed to take into account the values and motivations of farmers and to provide disadvantaged groups a say in the decision-making process. In addition, it also noted that the design of the program catered to large-scale agriculture and ignored the culture of family farming, which in turn prevented the effective participation of the latter (Brune, 2010). To support these claims, Brune cites the Landless Workers' Movement (MST), one of Brazil's largest social movements (present in 23 out of 26 states, including Bahia), as claiming to never have been invited to participate in any decision making at

the state level. Accordingly, Brune concludes that the political inclusion component highlighted in the design of the PNPB largely failed in the area of study.

### **3.9. On-farm diversity and food security**

Another main finding relates to the importance of on-farm diversity. In effect, respondents considered it essential not only for food security and mitigating market and climatic fluctuations, but also for “ensuring social reproduction and cultural life of communities” (Kilham et al., 2010, p. 9). Adverse market conditions, extreme weather and crop failure were reported as major factors threatening food security. According to participants, coping strategies included exchanging food with neighbors, utilizing food reserves from past harvests and planting a variety of crops. Additionally, family farmers highlighted the importance of on-farm diversity to help meet various economic, cultural and dietary needs. For instance, Kilham et al. listed one participant planting corn and peanuts to share with family and friends during an annual festival. Similarly, various other crops were reported as being destined for sale and personal consumption.

Even though mono-cropping had already been established prior to the introduction of the PNPB, Kilham et al. found that the high prices for oleaginous crops and higher yields associated with mono-cropping were increasingly influencing family farmers to practice monoculture at the expense of on-farm diversity. One interviewee was reported saying that “lots of people stopped planting cassava and beans, they are just planting castor, why wouldn’t they when the price is so good” (Kilham et al., 2010, p.10). In effect, a number of participants raised concerns regarding the biodiesel program’s effect of encouraging family farmers to move towards monoculture. When discussing the hazards for family farmers switching towards predominantly mono-cropping models of production, one agricultural technician reported:

For me this is a weakness of the program because a farmer doesn’t need just castor, sunflower or jatropha to make a livelihood, he needs to have his beans that he’s always planted, he needs to have his corn, his andú, his melons... monoculture is a threat to family farmers... (Kilham et al., 2010, p.10).

What's more, Kilham et al. also found that certain type of feedstock being promoted were not particularly suited for on-farm diversity. For example, palm (being introduced in the south of Bahia) is only suitable for inter-cropping for a short period of time in the initial planting stage before it starts eclipsing other plants and must be planted as a monoculture.

## CHAPTER IV

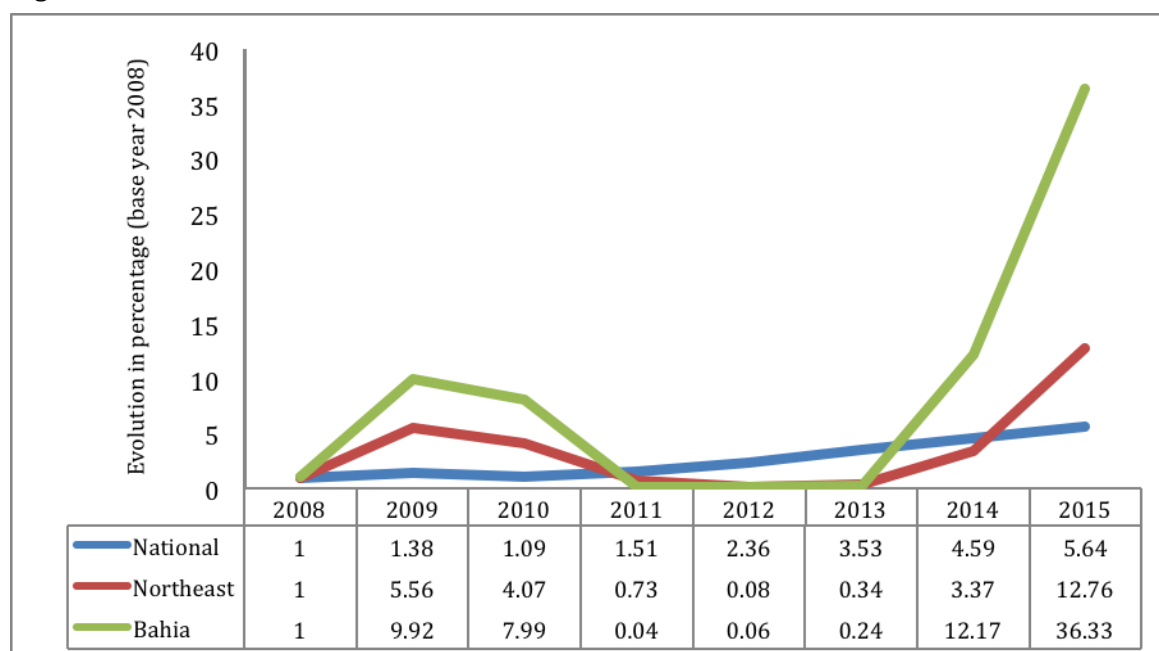
### 4. Analysis and discussion

#### 4.1. Income generation

As the PNPB's social inclusion approach relies heavily on income generation, a number of observations can be made regarding the program's performance in this regard. Firstly, there is little to indicate that the PNPB has had a sustained positive effect on income generation in Bahia. While there has been significant growth at the national level (both in terms of volume of feedstock produced and income generated), there is evidence to suggest that the regions with the lowest levels of socio-economic development benefitted the least financially. In the state of Bahia, the average annual income for family farming establishments for 2011 and 2012 was 13R\$ and 17R\$ respectively. These amounts corresponded to roughly 0.65USD and 0.8USD per month, well below the World Bank's 1.25USD/day marker (set in 2008) used to assess extreme poverty. Income rose decisively in 2014 (4.34USD/day) and again in 2015 (9.21USD/day), although the World Bank's International Poverty Line had reached 1.90USD/day by 2015.

Secondly, the strong variations in income between 2008 and 2015 in the Northeast, and Bahia in particular, highlight the region's precarious economic reality years after the implementation of the program. In contrast to the steady increase observed at the national level, family farmers in Bahia saw their income rise and fall markedly during the 7-year period (see figure 4.1). What's more, and given that the program's poor performance in the Northeast is attributed in part to adverse weather conditions (Silva et al., 2014a) and price fluctuations in the fuel market (Zapata et al., 2010; Ferreira et al., 2015), there is also grounds to question the PNPB's capacity to mitigate external shocks directed at livelihoods. More specifically, the program has exhibited shortcomings in addressing family farmers' vulnerability in regards to exposure to external risks, such as market and environmental pressures.

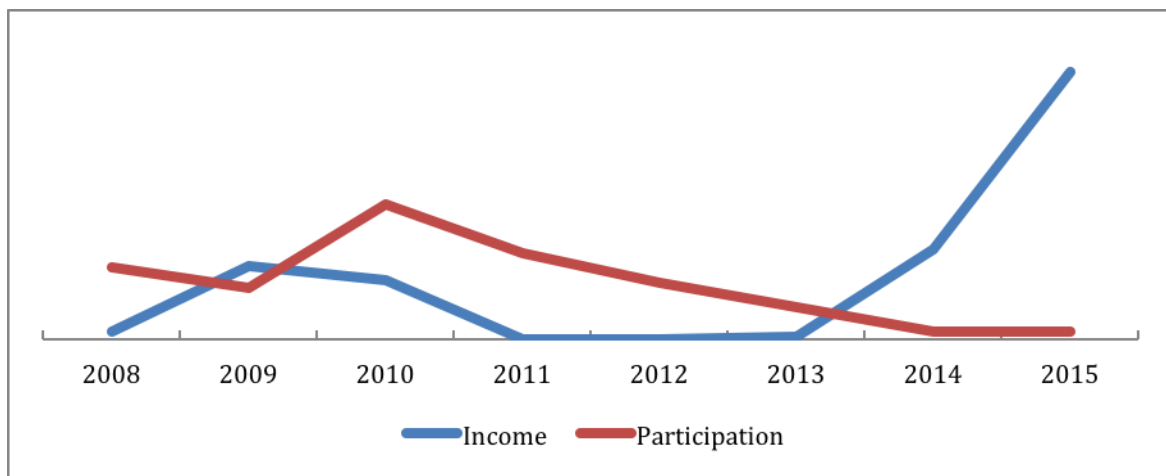
Figure 4.1 Income evolution



Silva (2015)

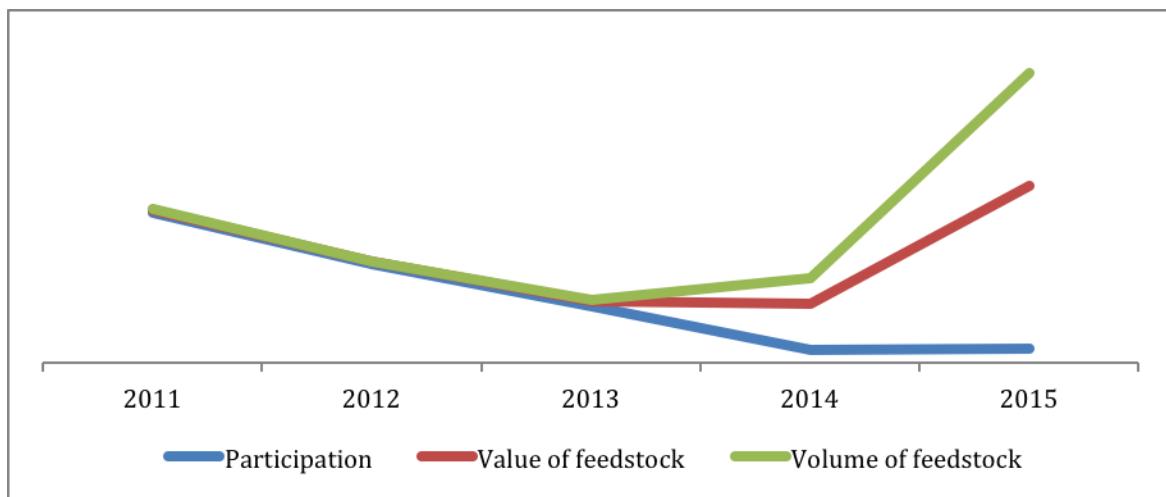
Thirdly, PNPB's impact on income generation in Bahia is also subject to negative correlation when comparing participation in the program to income evolution (see figure 4.2). For instance, from 2008 to 2009 participation dropped while income increased. The trend was reversed the following year when a record number of family farmers participated in the PNPB whereas income dropped. From 2013 onwards however, participation levels remained low while income rose dramatically. As a result, and although some family farmers may have benefitted financially from the program, there is no evidence to indicate that the benefits were distributed evenly throughout Bahia. Rather, it may be even argued that income generated through feedstock sales was at times skewed to favour a smaller number of farmers. For example, the total quantity and value of feedstock sold by family farmers in Bahia increased noticeably from 2013 to 2015 (see figure 4.3). This same period however saw a record low number of family farmers participating in the program, suggesting the possibility that the increased amount of revenue generated was concentrated among a fewer number of participants.

Figure 4.2 Income versus participation



Own elaboration based on MDA (2015); Silva (2015)

Figure 4.3 Feedstock and income generated



Own elaboration based on MDA (2015); Silva (2015)

The PNPB's failure to deliver on the promise of improving income in Bahia, and in the Northeast in general, has meant that most family farmers in the region were unable to benefit financially (to any significant degree) from the biodiesel program. As a result, the persisting lack of regular inflow of financial capital continues to directly affect the ability of family farmers in the region to construct effective livelihood strategies. As discussed above, the main issues of concern here relate to the lack of economic efficiency and income stability, which collectively constitute important factors in determining family

farmers' level of resilience. In effect, family farmers in Bahia have experience vulnerability in coping and recovering from external shocks and stresses.

## **4.2. Shocks and stresses**

### Climate

The Northeast's semi-arid climatic conditions have a direct influence on the way family farmers in Bahia construct their livelihood strategies. It is for this reason that the castor bean was selected as the biodiesel feedstock of choice for the Northeast. More precisely, the plant's drought-resistance properties (along with its low production cost) prompted policy-makers to encourage its regional production in the context of the PNPB (Brune, 2016). However, the agro-ecological conditions of the Northeast still render effective participation in the PNPB a challenge. Even with its tolerance to drought, the castor bean still requires regular rainfall during its initial stage of development. In addition, high temperatures and winds during peak growing and fruiting periods often require increased irrigation (Birgham, 1993). In this sense, the castor bean's ability to mitigate the Northeast's harsh climatic conditions (and in turn their impact on the livelihoods of family farmers) is limited. In fact, production of castor bean has been directly impacted by dry weather conditions over recent years, explaining in part PNPB's lack of success (Silva et al., 2014a). For instance, in 2009 and 2010, irregular rainfall distribution led some family farmers to make the strategic choices of abandoning castor production in favor of food security. As the rainy season came late and was brief, farmers concentrated on cultivating foodstuffs, such as maize, beans and cassava (Brune, 2006).

The link between climate-related vulnerability and natural resources in Brazil's Northeast is evident, as illustrated by the reduced crops yields of castor bean during periods of climatic shocks. Fundamentally, the region's heavy dependence on natural resources places family farmers at the mercy of Mother Nature. When family farmers' natural resource base is reduced, not only is their capacity to respond to shocks affected, so is their ability to meet basic needs and move out of poverty. As such, promoting social inclusion in the Bahia is made that much more difficult. The question, then, is whether castor bean production (and in essence the PNPB) is an effective coping strategy for

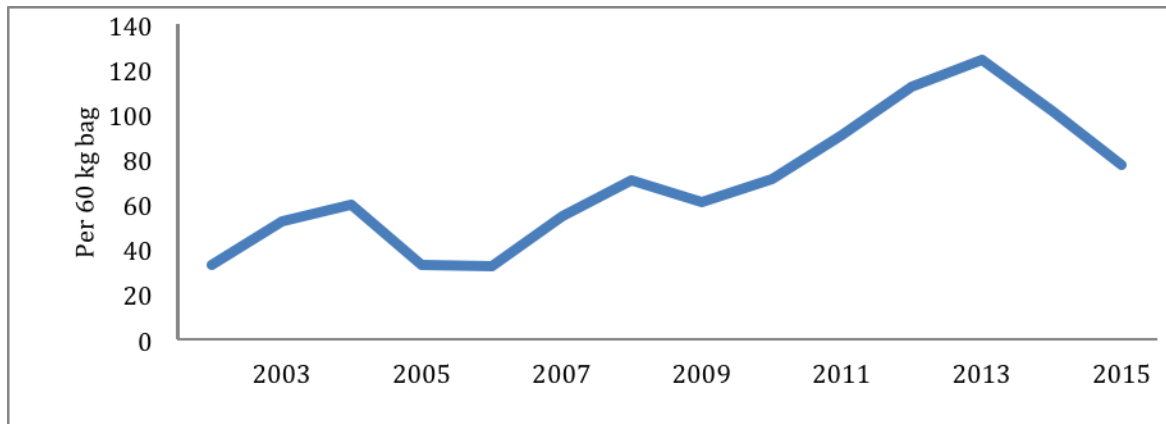
family farmers looking to develop livelihoods able to withstand and recover from climatic stresses and shocks.

### Market volatility

Market-related shocks and stresses have also influenced family farmers' exposure to risks. For instance, price volatility of the castor bean has made its production less attractive in Bahia due to risk aversion, in turn negatively impacting the insertion of family agriculture in the biodiesel market. Supporting the latter argument is the fact that little increase in castor bean production associated with PNPB policy incentives and price increases have been observed (Ferreira et al., 2015). What's more, many of those who participated incurred economic losses partly due to price fluctuations (Zapata et al., 2010; Vorley et al., 2012; Ferreira et al., 2015; Silva, 2015). In this sense, critical trends in the biodiesel market have hindered PNPB's efforts to reduce vulnerability and enhance resilience of livelihood systems in Bahia.

Interestingly enough, there is evidence that points to the PNPB itself directly contributing to market instability. As a number of researches have suggested, the PNPB added new sources of price instability by creating a new market for the castor bean. This in turn altered the market's structure and consequently price volatility in Bahia (Ferreira et al., 2015). For instance, the implementation of the PNPB encouraged biodiesel plants to set up shop in Bahia. However, as PNPB's policy incentives failed to render the industry viable, many of these plants subsequently migrated to areas where biodiesel production was more profitable (César & Batalha, 2010a; 2010b). Naturally, these events affected the price of castor in the region as supply and demand were both impacted. Along with high transaction costs, this also made biodiesel production in the Northeast less competitive compared to other regions (César & Batalha, 2010a). Thirdly, increased instability is also attributed to variations in market prices of other vegetable oils (such as soybean), which the castor bean previously did not have to contend with (Ferreira et al., 2015). Finally, non-compliance of contracts (both by biodiesel companies and family farmers alike) increased market uncertainty, which greatly contributed to the volatility of the sector (César & Batalha, 2010a).

Figure 4.4 Evolution of castor prices in Bahia



Own elaboration based on CONABb, SEAGRI

The type of instability described above highlights an important counterproductive element within the PNPB: It tries to create demand for castor bean (as a biodiesel feedstock) while simultaneously discouraging its production by generating greater market instability. In other words, the PNPB's mandate of promoting social inclusion in Bahia (and in the Northeast in general) is being undermined by its own inherently contradictory mechanisms.

### 4.3. Technical Assistance

The failure of PNPB's technical assistance component is largely due to the lack of structural mechanisms that otherwise would've helped ensure a certain level of quality for these services. As previously discussed, technical aid is primarily provided through biodiesel producing companies looking to obtain the SFS. However, adequate measures to control and support these extension services were not implemented. As a result, biodiesel companies in Bahia and the Northeast failed in providing quality technical assistance. When services were provided, they were often superficial in nature and inadequate. Some companies set up shop in regions (such as the South) where technical assistance was least needed, while others only provided just enough to benefit from program incentives.

As a number of researchers have pointed out (César and Batalha, 2010a, 2014; Watanabe et al., 2012; Wilkinson & Herrera, 2010), companies experienced huge difficulties in maintaining agreements with family farmers in Northeast. In addition to structural weaknesses of family farming, biodiesel-producing companies also had to contend with economic policy incentives that did not fully compensate their efforts. As a result, these companies were unable to deliver adequate services, affecting their ability to uphold production arrangements in the Northeast (César & Batalha, 2014).

In all fairness, the use of extension services among farmers in Brazil has traditionally been subject to sharp regional discrepancies. According to Garagorry (2002), roughly half of the establishments in the South, 41.5% in the Southeast and 32% in the Central West region were found to make use of technical services. In contrast, only 14.6% in the Northeast and 14.5% in the North made use of such services. Among family farmers the number was even lower, with the nationally average being 16.7%. Once again, the percentages varied strongly from region to region, with 47.2% of family farmers receiving technical assistance in the South and only 2.7% in the Northeast (Guanziroli, 2000). In this sense, providing technical assistance to family farmers in the Northeast has been a challenge even before the implementation of the PNPB.

One important factor that helps explain the regional discrepancy mentioned above is the strong tradition of cooperatives that exists in the South. The level of technical assistance provided in the South through cooperatives is much higher than that in other regions, and thus, farmers have access to better quality and larger range of services. For instance, it is common for cooperatives in the South of Brazil to provide their members with access to a variety of technical services by means of agronomists, veterinarians and other technicians specializing in agricultural sciences (Castor, 2015). Conversely, family farmers in the Northeast do not enjoy the same level of organizational capacity. Cooperatives that appeared following the implementation of the PNPB were heavily limited in their capacity to provide technical assistance and acted more as intermediaries. As such, the only source of technical guidance for family farmers is that provided by biodiesel companies.

Another important aspect is the impact of low education on efforts to provide technical assistance. A regional breakdown of figures reveals that only 10% of farmers have completed primary schooling in the Northeast, less than 5% have secondary or technical education and about 1% possess higher education (IBGE, 2009). These low levels aggravate the already failing technical assistance component of the program and negatively impact the willingness and ability of farmers to make structural changes (see Fernandes, 2013; Castro, 2015; Stattman & Mol, 2014). Helping support the above argument, Stattman and Mol (2014) have found that medium-sized family farmers have been most successful in benefiting from technical assistance largely due to their capacity and education to adopt new knowledge and change production practices. As such, the PNPB's efforts to develop human capital by means of technical assistance is being greatly hampered by the lack of educational and practical training efforts. The program aims at strengthening the productive base of households, yet does not invest enough in human capital through education and skills training. Instead, it relies on market forces to provide farmers with the necessary technical knowledge crucial for such a risky and foreign economic endeavour.

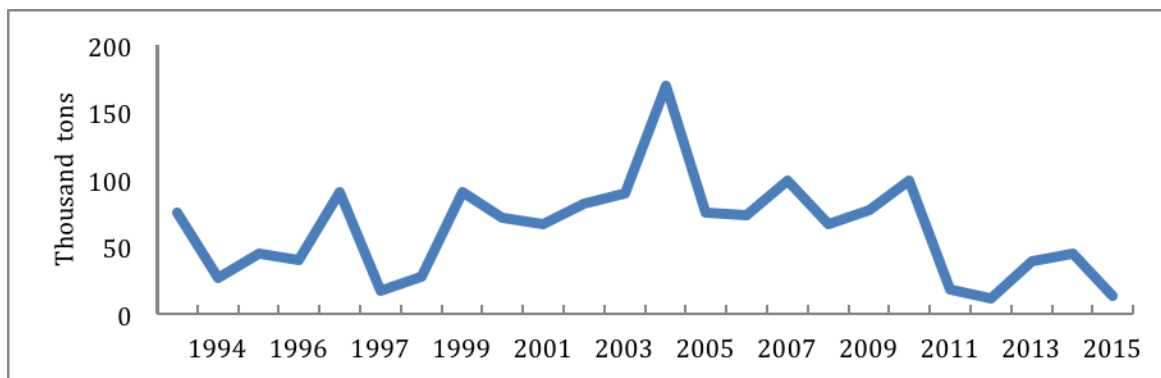
In addition to impacting productivity, the failure of companies to adequately comply with their support duties has also led to a missed opportunity for family farmers to develop and enhance their social resources. In the context of constructing effective livelihood strategies, networks and connectedness increase people's trust and capacity of working together, while also expanding access to wider political and social institutions (DFID, 1999). These types of relationships facilitate co-operation, reduce transaction costs and enable the creation of informal safety nets (DFID, 1999). In this way, social capital exerts a direct impact on other kinds of capital. For instance, by improving the efficiency of economic relations, social capital helps increase people's financial assets. Rather than creating trust however, the PNPB's technical assistance component reinforced suspicion and doubt about the program. This affected the relationship between technicians and farmers, further undermined the quality of services and made it more difficult for farmers to assimilate information. As a result, these experiences negatively shaped farmers' perception of the program and even created disincentives for joining the PNPB.

#### 4.4 Feedstock production

Although the volume of feedstock produced through the PNPB may seem impressive, it is important to consider the lack of feedstock diversification and regional asymmetry highlighted in the previous chapter. The Northeast region needed to benefit most from the program, and yet, soy from the South has dominated production. In fact, castor bean production in Bahia has not increased under the PNPB. As shown in figure 4.5, production levels have remained somewhat comparable to those of the late 90s and early 2000s.

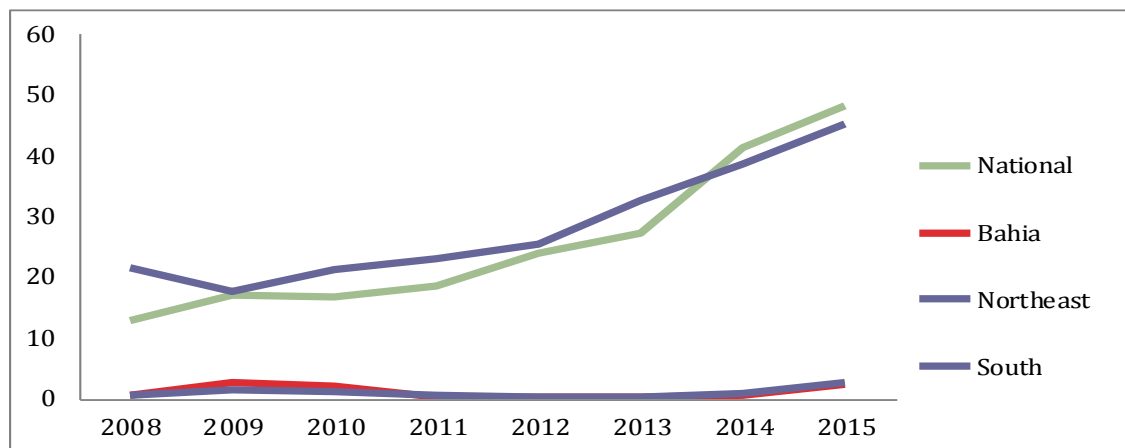
In addition to food security, inefficient support services and improper production techniques, lack of human capital is also considered to be an important restrictive factor in the Northeast, especially in Bahia, where migration of rural workers to urban areas is common (Goncalves et al., 2013; Zapata et al., 2010b). This is further aggravated by the fact that castor is a labor-intensive crop. Compared to soy production for example, which only needs 1 worker per hectare, cultivating castor requires 10 (Silva et al., 2007). All this has translated into the low and stagnant feedstock production rates in Northeast (See figure 4.6).

Figure 4.5 Evolution of castor production in Bahia



CONABa

Figure 4.6 Quantity of feedstock produced per family farming establishment (in tons)



Own elaboration based on MDA (2015)

Essentially, soy production in the Southern and the Central Western regions is the main reason why the PNPB continues to function. A case in point is the fact that even though biodiesel companies in the Northeast deal with castor producers, the reliability of the soybean supply chain (from other regions) makes soy the main and sometimes only raw material being processed (Da Silva Júnior et al., 2012). Being a top producing country, Brazil's soy industry is well established and efficient. As such, it has reacted well to the program, offering reasonable production costs and the ability to meet demand (Faria, 2009). However, soybean's economic viability comes at the expense of stimulating social inclusion in the most marginalized regions of the country. More specifically, it is isolating family farmers in the semi-arid regions by directing biodiesel production away from the Northeast. Secondly, it also helps reinforce the idea that monoculture is required for efficient feedstock production. In the context of this analysis, whether that is the case or not is not as important as the fact that monoculture is not compatible with the livelihood realities of family farmers Bahia. These individuals typically lack the necessary resources to meet the high input requirements of monoculture and tend to avoid large-scale production of a single crop due to risk aversion and subsistence farming. In this sense, the PNPB is becoming incompatible with the reality of family farming in Bahia, and the Northeast in general.

#### **4.5. Social inclusion through cooperativism**

The PNPB's focus on cooperatives is in line with earlier government initiatives aimed at enhancing rural development and including small-scale farmers into wider national development trajectories (Stattman & Mol, 2014). In the context of the biodiesel program, cooperatives were supposed to help integrate family farmers into the biodiesel market and develop a cooperative tradition. Effectively, the use of cooperatives in advancing rural development through agriculture is well documented. Cooperatives are shown to help members exploit market opportunities, deliver extension services, aid with natural resource management and provide better access to information and technologies (Valentinov, 2007; Wollni & Zeller, 2007; Tortia et al., 2013; Neto, 2014; Markelova et al., 2009).

The potential of cooperatives is perhaps particularly evident in Brazil, where 37.2% of the country's agricultural GDP and 5.4 per cent of overall GDP is generated through cooperatives (IFAD, 2011). As might be expected, the proportion of farmers being part of such organizations is highest in the South and the Southeast (38.43 and 23.16 per cent respectively) and lowest (2.68%) in the Northeast (IBGE, 2006). The strong presence of cooperatives in the South explains in great part why the PNPB achieved better results in this region. Family farmers in the Northeast on the other hand, with little experience in cooperativism or commercial production chains, have struggled. Regardless of the region however, being part of a cooperative has been shown to increase substantially income generation among farmers (see table 4.1). More specifically, the average annual income for farmers belonging to cooperatives is 273.06% higher than that of all farms. Interestingly enough, the biggest variation is recorded among farmers in the Northeast (503.14%), indicating that although the proportion of farmers being part of cooperatives is smaller, their average income is considerably higher than the regional average (Neto, 2014). Supporting the data above, Stattman and Mol (2014) also contend that cooperatives have indeed helped family farmers in Bahia profit from secure market outlets created by the PNPB. Thus, the PNPB does seem to be advancing socio-economic inclusion in the area. Unfortunately, this is only the case for a very small percentage of

the population being targeted, and as such, does not reflect in the overall regional performance of the program.

Table 4.1 Cooperative participation and income (in R\$)

| Region    | Cooperative membership | Average income of all farmers | Average income of cooperative members | Variation in income |
|-----------|------------------------|-------------------------------|---------------------------------------|---------------------|
| Brazil    | 15.17%                 | 33,649                        | 91,882                                | 273.06%             |
| Northeast | 2.68%                  | 13,744                        | 69,152                                | 503.14%             |
| South     | 38.43%                 | 43,428                        | 59,502                                | 137.01%             |

Neto (2014)

In the context of the PNB, cooperatives were also tasked with meeting the program's social inclusion objectives by expanding horizontal and vertical social networks. As the related data in chapter 3 shows however, cooperatives have not been able to increase the organizational capacity of family farmers in Bahia to any significant extent. In this regard, dispelling the negative perception of cooperatives and encouraging family farmers to join has been a consistent challenge. As a result, evidence suggests that the potential of farmers' organizations needs to be explored in relation to strengthening the social capital of family farmers.

#### 4.6 Food security and on-farm diversity

Small-scale agriculture and diversified cropping systems have been shown to improve the resilience livelihoods by mitigating climatic stress, protecting biodiversity, promoting democratic decision making processes, contributing towards food security and nutrition, creating alternate revenue streams, enhancing agricultural systems and emphasizing local agro-ecological knowledge (Lin, 2011; Makate et al., 2016; Kremen et al., 2012; Kremen & Miles 2012; Altieri et al., 2012; Andrée et al., 2014). As such, and in a region characterized by a high ratio of subsistence farming, diversity can play a key role in improving the sustainability of livelihoods by providing greater flexibility and strengthening resilience, especially in regards to shocks and stresses. However, food security remains a top priority for many family farmers in Bahia and often dictates their

livelihood choices. These farmers have a tendency to produce types of crops that provide them with the most security and least amount of risk (Ferreira et al., 2015; Kilham et al., 2010; Viana et al., 2011). In this sense, effective participation in the PNPB continues to be problematic due to the simple fact that biodiesel feedstock is non-edible. Even with policy incentives made available, risk aversion and negative perception of the program has discouraged subsistence farmers from planting crops that do not contribute directly towards their food security.

Interestingly, the PNPB's strength and potential in promoting sustainable livelihoods lie within the context of diversification. First, considering that rural populations possess fewer opportunities when it comes to diversification (Hussein & Nelson, 1998), the PNPB has the ability to act as an important support mechanism for subsistence farmers looking to diversify their livelihood strategies. Second, by providing access to the biodiesel market and thus enabling family farmers to participate in income generating agricultural activities, the PNPB can provide flexibility by reinforcing livelihoods and reducing exposure to risk. In effect, growing castor in Bahia can be an effective strategy for reducing vulnerability by providing family farmers with a minimum income. Third, the PNPB can help break the dependence on subsistence farming by building financial capital. The potential increase in purchasing power can in turn improve access to food by creating a different way of acquiring it. Lastly, diversifying production can also be used as a means of coping with climatic variability. Even though vulnerable to extreme weather conditions, castor remains a drought resistant crop and hence can contribute towards building resilient livelihood strategies (i.e. by reducing shocks stresses when other crops fail).

However, the ability of family farmers in Bahia to benefit from diversification strategies (through castor production) has largely depended on their capacity to engage successfully in this new economic activity. As previously discussed, the PNPB's failure in supporting family farmers in Bahia has meant that they have either been side-lined from the program or have been left to navigate it without adequate support. In this sense, the program's potential in promoting livelihood diversification is undermined by weak policy measures

and overdependence on market forces. Considering that the PNPB is a market-oriented rural development model, effective measures are needed to ensure that subsistence farmers (who have traditionally been marginally included in markets) are able to integrate effectively in the biodiesel production chain.

For family farmers in Bahia and the Northeast, successful participation also requires that food security be taken into account and farmers retain the ability to produce their own food. In other words, castor production needs to be part of a wider diversification strategy and cannot constitute the primary agricultural activity. Although the biodiesel program does promote intercropping in theory, it lacks the necessary mechanisms to limit monoculture and ensure diversity (Kilham et al., 2010). For those looking to participate in the PNPB, the perception of increased income and higher yields associated with monoculture can threaten diversification. As presented in the previous chapter, there is evidence pointing to some family farmers in Bahia gravitating towards monoculture. Since family farming in Bahia is typically characterized by small farm sizes, attempts to maximize profits and productivity may well mean using most if not all of the available land to grow biodiesel feedstock. This presents a challenge for the PNPB's social inclusion component because monoculture is in essence incompatible with the livelihoods of family farmers in Bahia and other marginalized regions. As a number of authors have noted, monoculture undermines smallholder livelihoods by creating dependence on market forces, exacerbating food security, reducing adaptability to climatic stress and contributing towards the degradation of basic ecosystem services (Guereña & Burgos, 2014; FAO, 2008; Adger, 2000; Vandermeer & Perfecto, 2005; Krishna & Laksmi, 2010). Much of the success observed in the Southern and Centre-West regions can be attributed to the mechanized monoculture of soy. The realities of family farmers in these regions however are different to those in Bahia. The former typically enjoy higher levels of socio-economic inclusion, have access to more land and possess a greater deal of experience with financial systems and production chains. It is largely for these reasons that they have responded well to the biodiesel program. For farmers in Bahia on the other hand, reliance on a single crop and dependence on the biodiesel market may prove problematic as it may actually increase vulnerability. In this sense, the biodiesel

program's lack of measures in regards to ensuring on-farm diversity and discouraging monoculture is yet another example of its shortcomings.

#### **4.7. Culture**

The cultural dimension is virtually non-existent within the PNPB. The lack of participatory approach has also meant that local culture and knowledge have been left out of the design of the program. Locally relevant criteria have been mostly limited to selecting region-specific crops varieties and setting up guidelines for biodiesel companies to follow, such as the minimum percentages of feedstock to be purchased from family farmers. The cultural component however is essential to development and is seen as key to influencing the success of development interventions (Daskon & Binns, 2009; Sasaki, 2010; Duxbury et al., 2016; Stephen, 1991; Rao & Walton, 2004). It helps improve quality of life and wellbeing while also enhancing livelihood opportunities and options. Equally as important, culture contributes in the dynamic construction of individual and collective identities (Duxbury et al., 2010).

The latter idea is particularly relevant in the context of transfer of cultural and propagation of family agriculture. As discussed in chapter 2, a number of farmers and their families perceived farming as not being conducive to healthy livelihoods, leading some youth to seek opportunities elsewhere by migrating to urban areas. In effect, migration is a common strategy adopted by rural populations experiencing degrading livelihood options. This of course is problematic because (by eroding human capital) emigration undermines rural culture and identity, both of which are essential for social inclusion to take place. This is not to say that that staving off rural-urban migration should rest squarely on the PNPB. Instead, it's an example of the multi-dimensional nature of social exclusion and the program's lack of multi-criteria goals.

Not making room for the cultural component has also led to some unintended and perhaps unanticipated consequences. For instance, the lack of integration of local agro-ecological and cultural knowledge within the program's technical assistance component not only omits cultural considerations, it also has helps fuel the negative perception of the

program. As pointed out by Kilham et al. (2010), there is importance placed by family farmers on the social and cultural aspects of on-farm diversity. Thus, when technical experts imposed their views in deciding what would be most appropriate for intercropping (Zapata et al. 2010b), they ignored cultural and social factors while also increasing aversion towards the program. In this sense, the PNPB's technical and rigid approach to development does not work to build on existing local knowledge and culture, but rather, further exemplifies how the program views family farmers as passive recipients of aid.

#### **4.8. Political capital and organizational capacity**

Considering that the PNPB's social inclusion approach focuses mainly on generating income and delivering agricultural extension services, it's no surprise that the program's political dimension is perhaps one of the weakest components. This of course is unfortunate considering that political capital is a key asset in the construction of livelihoods. The PNPB's failure in this regard is mainly due to the fact that family farmers were never invited to participate in any decision-making processes. Participation is viewed in the context of integration in the biodiesel value chain. Family farmers are treated as passive recipients of external aid instead of dynamic partners, and are thus discouraged from being actively involved in the construction of their own livelihood strategies.

Much of the negative perception and mistrust surrounding the PNPB was in fact created by its unilateral approach to design and implementation. The program largely avoids taking into account political structures and processes, or relationships of power. Instead, it is designed as a poverty reduction strategy framed predominantly in economics. As such, political marginalisation and uneven power relationships are ignored, including their impact on livelihoods. As a number of researchers have noted however, politics and power are key elements in developing sustainable livelihood strategies (Scoones, 2009; Narayan, 1998; Wolmer & Scoones, 2003; Baumann & Sinha, 2001). What's more, participatory models reinforce political capital by

developing civic conscience, mutual trust and confidence (Pretty, 2003). Conversely, and by failing to link development with participatory processes, the PNPB hinders the ability of family farmers to articulate their needs and develop their political capabilities.

The lack of emphasis placed on developing political capital not only undermines the PNPB's capacity building approach to development, it also adds to its paradoxical nature. Even though the program's aim is to promote social inclusion, by neglecting the issue of political capital, it reduces the ability of family farmers to acquire resources and defend livelihood strategies. As previously discussed, family farmers in Bahia, and the Northeast in general, had little to no experience with large-scale commercial ventures prior to the implementation of the program. Instead of focusing on community interactions and local governance structures to help ensure that trust and mutual understanding about the program's direction was achieved, policy makers decided to forgo a participatory approach. As a result, the program's lack of engagement and exclusionary nature (in terms of design and implementation) were directly responsible for discouraging participation (Zapata, 2010b; Kilham et al., 2010; Vorley et al., 2012).

Lastly, not capitalizing on the potential of farmer's associations in Bahia has also proved to be to the detriment of the program. Failing to do so was largely based on the belief that organizational capacity building and integration in the production chain was to be achieved through cooperativism, which would benefit all farmers (Kilham et al., 2010). As previously discussed however, the lack of cooperative tradition in Bahia meant that family farmers in that region were not able to benefit from the program as much as they were expected to. This in turn had a direct impact on participation in the biodiesel program and its primary goal of advancing social inclusion. In this sense, and considering the general attitude of family farmers towards farmer's associations, relying on the former may have proved useful in building trust and understanding in regards to cooperatives, and consequently, in increasing political capital and overall organizational capacity among farmers in Bahia.

## CHAPTER V

### 5. Conclusion

#### 5.1. Summary

One of the primary objectives of this thesis has been to analyse the impacts of the PNPB's social component on the livelihoods of family farmers in Bahia. Accordingly, the research has studied the program's capacity to enhance the capabilities and assets of family farmers within the multidimensional context of social exclusion. To answer the main research question, this research has examined five sub-questions dealing with the four dimensions of social exclusion. The data and the subsequent analysis presented in this research have highlighted the PNPB's failure to effectively respond to the complex and multi-faceted nature of the social exclusionary process. As such, the PNPB's efforts to improve the livelihoods of family farmers in Bahia have been overwhelmingly inadequate.

##### 5.1.1. Income generation

On the whole, the PNPB was able to successfully establish a national market for biodiesel from which certain family farmers have benefitted economically. In the span of a decade, feedstock produced by family farmers has increased considerably, along with income related to this activity. As data in this thesis has demonstrated however, there is a large regional discrepancy in this regard, with the family farmers in Bahia being among those that have benefitted the least from the program. Furthermore, and in reference to instances where the Brazilian government has cited participation levels to support the program's performance, it is also clear that participation in the PNPB alone has not translated into increased economic wellbeing. In fact, some family farming establishments were actually found to have lost income by engaging in castor production.

It is also important to note that the number of establishments officially participating in the PNPB may be misleading, as a number of family farmers registered were either unwilling or unable to commit fully to the program. Inadequate extension services, lack of

participatory engagement, low education and entrepreneurial experience, as well as food insecurity and market volatility were found to be the primary reasons hindering effective integration in the biodiesel production chain in Bahia. These factors heightened the level of risk aversion among family farmers and further discouraged them from participating in the PNPB, which in turn impacted the program's ability to stimulate income generation. Accordingly, the value of raw material acquired from family farmers in Bahia has consistently remained low, especially when compared to the national total. More importantly, in the eleven-year period following the program's implementation, average income of family farmers in Bahia did not display any significant gains, in contrast to the national average which has increased steadily during the same period. As a result, it can be concluded that the PNPB has not had a meaningful economic impact in the region of Bahia.

#### **5.1.2. Social and political empowerment**

Family farmers in Bahia had very little cooperative tradition prior to the PNPB. Since the launch of the program however, the region has seen the number of cooperatives grow. And although their overall capacity has remained limited, especially when compared with those in the South, the PNPB has contributed towards improving their organizational and supportive capacities (see Stattna & Mol, 2015). By association, it can be argued that the farmers that participated in these organizations have profited from enhanced social capital. The problem however lies in the fact that cooperatives remain fragile in Bahia, as illustrated by the variation in the number of cooperatives from year to year. More importantly, participation among subsistence farmers and smaller family farming establishments has remained low, meaning that the most marginalized segment of the population is not benefitting from what cooperatives have to offer. This of course has been unfortunate, considering the important role cooperatives can play in reinforcing social and political capital.

As already discussed, aversion towards and mistrust of cooperatives (and the program itself in general) has been found to be an important factor in discouraging smaller family farmers from joining. This negative perception is reflective of the overall lack of

confidence in the political process, which has excluded family farmers from all levels of decision-making. In turn, the lack of participatory approach has prevented good social relationships and political empowered to take place, leading to low confidence in the program and a reluctance to pursue the necessary structural changes required for biodiesel feedstock production. Low participation levels have also meant that farmers have not been able to develop political and social resources through the program's intended mechanisms. As a result, the impact of the PNPB on the social and political wellbeing of farmers has been limited.

### **5.1.3. Cultural wellbeing**

The PNPB has been shown to largely ignore the cultural dimension of social exclusion. Due in part to its lack of participatory approach, the program does not incorporate or even consider family farmers' knowledge or culture to any significant extent. As data in this research has illustrated however, the cultural component is an important element in ensuring the wellbeing of family farmers that goes beyond questions of productivity and income. By not integrating local culture and knowledge in its design, the PNPB limits its ability to create the necessary opportunities for family farmers to develop their self-worth and control over their lives.

Keeping in mind that self-esteem and sense of identity are among some key components that determine overall wellbeing, omitting the above-mentioned considerations has meant that an important facet of people's livelihoods has been ignored. Accordingly the PNPB's weakness extends to its failure to take into account important trends within the cultural dimension that hinder attempts at promoting social inclusion. A concrete example would be the negative general perception that exists towards family farming as an occupation. The ensuing erosion of human capital and loss of cultural identity has undoubtedly rendered the question of social inclusion in Bahia more complex. In this sense, it can be argued that attempts by the PNPB to promote development in the region are being undermined by its failure to include the cultural dimension.

#### **5.1.4. Food security and on-farm diversity**

Food security has been shown to directly influence the livelihood choices of family farmers in Bahia, with subsistence farming continuing to be an important activity and a critical source of access to food in the region. By increasing income, the PNPB may have improved access to food by bolstering the purchasing power of households. As previously discussed however, efforts to increase income in the region have failed, and so did the program's potential to contribute positively towards food security in this sense. Overall, local food production and food security has not been impacted (either positively or negatively) to any apparent degree. This is at least partly due to the fact that subsistence farmers in the region have been resistant to planting castor and other biodiesel feedstock in the first place, on account of it not being perceived as advancing their food security needs.

For those participating however, there are concerns that biodiesel feedstock production may lead to land use changes, which may in turn diminish food production. More specifically, emphasis placed by the program on productivity and competitiveness may inadvertently encourage family farmers to adopt farming practices that are not compatible with their livelihoods, such as monoculture. Considering that the program presently lacks the necessary mechanisms to ensure on-farm diversity, the potential proliferation of monoculture among family farming establishments in Bahia will undermine the PNPB's efforts to promote social inclusion, as well as have significant socio-economic impacts on their livelihoods.

#### **5.1.5. Vulnerabilities**

##### Climate

By encouraging the production of the drought-resistant castor bean in the semi-arid region of Bahia, the PNPB hoped to contribute towards the resilience of livelihoods of family farmers. As previously discussed, castor's agro-ecological properties and the fact that the crop has traditionally been grown in Bahia made it a logical choice for the region. There can be doubt however as to whether the PNPB contributed towards

decreasing vulnerability. For one, low levels of actual participation have meant that most family farmers in Bahia have not benefitted from the PNPB, including castor's drought-tolerant potential. Secondly, and in the framework of sustainable livelihoods, the crop's capacity to mitigate adverse climatic conditions is reserved to it being utilized in a diversified farming context. This is due to not only the fact that monoculture is less resistant to climatic stress, but also because it directly contributes towards environmental degradation. In this sense, if the biodiesel program is unintentionally promoting monocropping, then it is essentially compromising the ability of family farmers to adapt and mitigate climatic variability in the long run. Finally, planting drought-resistant feedstock alone has been shown to not be enough if not part of a wider strategy aimed at helping family farmers cope with climate-related vulnerabilities. In effect, the 2011-2013 droughts have highlighted the crop's limitations in Bahia in face of extreme weather conditions. The drastic drop in production during this period illustrates the need for a comprehensive approach in helping family farmers deal with climatic variability, including proper extension services that the program lacks.

### Economic stability

It is clear that the PNPB has increased the level of vulnerability of family farmers in Bahia by exposing them to market forces. This of course was to be expected considering that farmers in the region (especially subsistence farmers) were previously excluded from the market and were hence generally isolated from such shifting economic trends. Thus in a sense, it is only natural that their integration in the biodiesel production chain leads to increased risks in addition to economic opportunities. The important question then is whether the biodiesel program minimizes or exacerbates these risks. As demonstrated in this research, the PNPB lacks the necessary measures to facilitate the integration of family farmers in the country's biodiesel supply chain. First, its reliance on cooperatives and biodiesel companies to provide the necessary services to minimize instability has proved to be largely inadequate. Moreover, the program does not take into consideration the limitations posed by low education and entrepreneurial experience, which have been responsible for hindering effective participation in the market. Third and most importantly, the PNPB has itself been directly responsible for increasing market

volatility in Bahia and the Northeast. Given the above, it is evident that the program has increased vulnerability related to economic instability.

## **5.2. Conclusion**

The Brazilian government introduced the PNPB with the goal of advancing social inclusion and regional development in the country's most disadvantaged rural regions. The program aimed to achieve the latter by linking family farmers to the biodiesel production chain. Accordingly the program was designed to focus predominantly on income generation and the transfer of extension services. However, after over a decade since its implementation, family farmers in Bahia (and the Northeast region in general) are still only marginally included in the program.

By and large, the PNPB is based on traditional conceptions of marginalization, focusing almost exclusively on issues of low income and poverty while failing to consider (to any significant extent) other key underlying factors leading to and perpetuating socio-economic exclusion. In this regard, broader components of social exclusion have largely been sidelined. As the analysis in this thesis has shown however, achieving positive livelihood outcomes requires that social, cultural and political dimensions be taken into consideration. Doing so involves uncovering the various factors that prevent individuals from achieving positive livelihood outcomes and better understanding how livelihoods are constructed. Equally as important, the evaluation of the PNPB's performance has also highlighted the importance of recognizing the dynamic interrelation between various dimensions. As this research has illustrated, the lack of emphasis placed on supporting social, cultural and political assets has negatively affected the capacity of family farmers in Bahia to engage in the biodiesel production chain, and ultimately their ability to generate income. Thus, understanding the intricate nature of the livelihoods of family farmers in Bahia (and designing effective policy measures accordingly) is crucial for promoting social inclusion in the region. In essence, the PNPB's inability to deliver concrete benefits in Bahia can be traced to its failure to do so.

In the course of this research, a potential negative implication associated with the biodiesel program's approach to development has also been identified. More specifically, focusing solely on access and productivity was found to be problematic because the program's production-oriented model implies that family agriculture needs to be competitive with large-scale producers who engage in industrialized monoculture systems. This in turn has the potential to undermine efforts to foster social inclusion in the long run by helping reproduce dominant agricultural practices, which are largely incompatible with the livelihoods of family farmers in Bahia (see Brune, 2010). For instance, land use change associated with monoculture may lead to reduced food security and on-farm diversity, decreased flexibility, loss of culture and an increased dependence and vulnerability to markets. These trends may in turn pose serious challenges for the construction of sustainable and resilient livelihood strategies in the future. That being said, the findings of this research already question the long-term sustainability of the PNPB. As illustrated throughout the thesis, the program's performance in Bahia and the Northeast in general has been underwhelming. Family farmer participation has remained low and the region has not been able to produce meaningful amounts of biodiesel feedstock. The relevance of family farming establishments in the production chain is thus limited to providing biodiesel companies with the means to acquire the SFS. Essentially, this translates into participating family farmers becoming dependent on the continuation of the biodiesel program, which can in turn lead to increased vulnerability if unfavorable policy changes were to be introduced. As a result, the current position of family farmers in the national biodiesel production chain can be considered to be precarious at best, making its long-term sustainability questionable.

The present work has also revealed some inherent contradictions and inconsistencies within the PNPB. The first contradiction relates to the impact the biodiesel program has had on market volatility. On the one hand, the PNPB looks to create demand for castor bean in Bahia, while on the other, it discourages its production and increases aversion towards the program by directly contributing towards market instability. The second contradiction has to do with the program's use of cooperativism. As discussed in this thesis, participation in cooperatives in Bahia and the Northeast in general has been

arduous. Conversely, family farmers in other parts of the country have responded better thanks in part to strong traditions of cooperativism. By emphasizing the use of cooperatives while simultaneously failing to ensure participation in marginalized areas, the PNPB essentially contributes towards these organizations becoming exclusive social networks rather than tools for social inclusion. Third, the PNPB's objective of promoting participation in the country's biodiesel production chain is hindered by the lack of effective support measures. In addition to inadequate technical assistance, the program also fails to take into account educational, informational and technical factors limiting the ability of family farmers to deal with and engage in business and commercial processes.

Fourth, while the Northeast's dry and semi-arid climatic conditions have been considered by the program, efforts to mitigate adverse weather conditions have been largely reserved to selecting a drought-resistant crop. Accordingly, the program does not offer a concrete strategy for safeguarding natural capital or enhancing resilience in regards to climatic vulnerability. Given their dependence on their natural resource base, protecting the latter should be considered a key element in supporting the livelihoods of family farmers in Brazil's semi-arid regions. Lastly, the PNPB lacks a coherent and practical approach in regards to ensuring food security and farm diversity. Although it does promote it in theory, the program may in fact be inadvertently encouraging the opposite through the inherent nature of biodiesel production and the region's reliance on food crops for food security.

### **5.3. Final remarks and considerations**

Advancing socio-economic development among family farmers in Brazil's Northeast is an enormous undertaking to say the least. In addition to requiring a substantial amount of both material and human resources, achieving social inclusion in the region also requires innovative thinking, commitment from various actors and a strong political will. In this regard, the Brazilian biodiesel program deserves praise because it does embody the above mentioned in many respects. Unfortunately, the PNPB's limited approach to social inclusion, coupled with regional structural weaknesses of family farming, has meant that the program has had little success in Bahia.

This research set out to critically analyse the PNPB's social inclusion component using the Sustainable Livelihood Framework. By doing so, it was hoped that a contribution would be made to current and future policy debates related to rural development initiatives in Brazil and elsewhere. Throughout the research process, the livelihoods of family farmers in Bahia were used to not only assess the PNPB, but also to explore the impact of social exclusion in the area, including its influence in shaping livelihood strategies and its role in hindering the realization of certain positive livelihood outcomes. Accordingly, the main theme of this research revolves around the need to adopt multi-dimensional approaches to development that acknowledge the complex nature of the issue at hand. In this sense, this thesis ultimately serves to challenge the PNPB's narrow conception of social inclusion.

The lessons that can be drawn from the PNPB and its experience are applicable and relevant in a number of different ways. First and most obvious, analysis of the program can be used to better appreciate the intricacies of the issues at stake, and thus, contribute towards overcoming the barriers that are hindering its success. More broadly speaking, analysis of the biodiesel program is also useful in the context of rural development in general. In other words, the PNPB serves as an important basis of analysis for policymakers looking to design multi-goal development initiatives in the future. As environmental and social sustainability issues become increasingly prevalent, the PNPB's experience becomes ever more pertinent in furthering the understanding of social exclusion and its multi-dimensional character. For its part, this thesis has looked to provide a general overview of the PNPB's performance in one the country's most marginalized areas by including social, political and cultural components in its analysis. In this sense, and by bringing together and analysing a collection of literature and data, the present research has worked to connect dots and fill some existing gaps in literature. In doing so it's hoped that my work, as humble as it may be, will add to wider efforts aimed at emphasising the importance for greater socio-political and culture considerations in the design and implementation of rural development policy initiatives.

The findings and issues raised in this study can also be used as basis for future research. Among them is the central question of whether biodiesel is an appropriate and viable method for promoting social inclusion in heavily marginalized rural areas. As discussed in the chapters above, most family farmers in Bahia either do not possess the means or feel like they can't risk engaging in this type of agricultural activity. Even if they did, there is doubt as to whether they could remain competitive in the volatile and production-oriented reality of the national biodiesel commodity market. Second, efforts can be aimed at exploring the influence monoculture (and other dominant modes of agricultural production) may have on the livelihoods of family farmers in Bahia. Special emphasis can be placed on analysing potential social and cultural implications associated with land use change for example. Lastly, and within the framework of examining livelihood resilience, greater in-depth research is required in assessing the impact climate change is and will be having on the livelihoods of family farmers in Brazil's semi-arid North and Northeast. Considering that reports are predicting a rise in the frequency and severity of extreme weather events in the above-mentioned regions, findings ways to protect natural capital and enhance coping strategies will not only respond to current concerns, but will also help family farmers develop their capacity to adapt and deal with climate change in the future.

## References

- Abramovay, R., & Magalhães, R. (2007). The access of family farmers to biodiesel markets: partnerships between big companies and social movements. *Regoverning Markets Innovative Practice Series*.
- Andree, P., Ayers, J., Bosia, M., & Massicotte, M. (2014). Food sovereignty and globalization: Lines of inquiry. Globalization and food sovereignty: Global and local change in new politics of food. Toronto: University of Toronto Press. Google Scholar.
- Ashley, C., Carney, D. (1999). *Sustainable livelihoods: Lessons from early experience*. London, UK: Department for International Development/DFID=.
- Barbieri, A. F., Domingues, E., Queiroz, B. L., Ruiz, R. M., Rigotti, J. I., Carvalho, J. A., & Resende, M. F. (2010). Climate change and population migration in Brazil's Northeast: scenarios for 2025–2050. *Population and environment*, 31(5), 344-370.
- Baumann, P., Sinha, S. (2001) Natural Resource Perspectives 68, <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/2825.pdf>
- Bhalla A., & Lapeyre F. (1997). Social Exclusion: Towards an Analytical and Operational Framework. *Development and Change*, 28(3), 413-433.
- Birgham, R. D. (1993). Castor: Return of an old crop. In *New crops* (380-383). New York: Wiley.
- Bowen, G.A. (2009) Document analysis as a qualitative research method *Qualitative Research Journal* 9(2), 27-40.
- Brune, S. (2010). *The Brazilian Biodiesel Program (PNBP) and Social inclusion Power: Knowledge and discourse in actors' strategies* (Master's Thesis). Wageningen: Wageningen University.
- Burney, J., Cesano, D., Russell, J., La Rovere, E. L., Corral, T., Coelho, N. S., & Santos, L. (2014). Climate change adaptation strategies for smallholder farmers in the Brazilian Sertão. *Climatic change*, 126(1-2), 45-59.
- Cameron, C. (2006). Geographies of welfare and exclusion: Social Inclusion and Exception. *Progress in Human Geography*, 30(3), 396-404.
- Castro, C.N. (2015) Desafios da agricultura familiar: O caso da assistência técnica e extensão rural. IPEA. *Boletim regional, urbano e ambiental*, 12.
- Carney, D. (1998) Sustainable Rural Livelihoods: What Contribution Can We Make?

- Cardoso, B. F., Shikida, P. F. A., & Finco, A. (2017). Development of Brazilian Biodiesel Sector from the Perspective of Stakeholders. *Energies*, 10(3), 399-413.
- Centre for Economic and Social Inclusion (CESI). (2002). Social Inclusion. London, UK: CESI.
- César, A.S., Batalha, M.O. (2010). Biodiesel production from castor oil in Brazil: A difficult reality. *Energy Policy*, 38, 4031–4039.
- Chambers, R. (October 1992). *Rural appraisal: rapid, relaxed and participatory*. (IDS discussion paper 311). Sussex, UK: Institute of Development Studies.
- Chambers, R., & Conway, G. (1992). *Sustainable Rural Livelihoods- Practical concepts for the 21st Century*. (IDS discussion paper 296). Sussex, UK: Institute of Development Studies.
- Cobigo, V., Ouellette-Kuntz, H., Lysaght, R., & Martin, L. (2012). Shifting our conceptualization of social inclusion. *Stigma Research and Action*, 2(2), 75-84.
- Commins, P. (2004). Poverty and Social Exclusion in Rural Areas: Characteristics, Processes and Research Issues. *Sociologia Ruralis*, 44(1), 60-75.
- Companhia Naciobal De Abastecimento (CONABa). Séries Históricas de Área Plantada, Produtividade e Produção, Relativas às Safras 1976/77 a 2015/16. Retrieved June 26, 2017, from [http://www.conab.gov.br/conteudos.php?a=1252&t=2&Pagina\\_objcmsconteudos=3#A\\_objcmsconteudos](http://www.conab.gov.br/conteudos.php?a=1252&t=2&Pagina_objcmsconteudos=3#A_objcmsconteudos)
- Companhia Naciobal De Abastecimento (CONABb). Conjuntura Mensal. Retrieved June 20, 2017, from [http://www.conab.gov.br/OlalaCMS/uploads/arquivos/16\\_07\\_08\\_17\\_35\\_34\\_mamonajunho2016.pdf](http://www.conab.gov.br/OlalaCMS/uploads/arquivos/16_07_08_17_35_34_mamonajunho2016.pdf)
- Department for International Development (DFID). (1999). Sustainable development guidance sheets. Retrieved May 09, 2017, from <http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf>
- Dias, L. C. P. (2017). Patterns of land use and greenhouse gases emissions from Brazilian agriculture (1940-2014) (Doctoral Dissertation). Universidade Federal de Viçosa.
- Djurfeldt, G. (1996). Defining and Operationalizing Family Farming from a Sociological Perspective. *Sociologia Ruralis*, 36(3), 340-351.
- Ellis, F., & Biggs, S. (2001). Evolving themes in rural development 1950s- 2000s. *Development policy review*, 19(4), 437-448.

Empresa de Pesquisa Energética (EPE). (2012). *Plano decenal de expansão de energia 2021*.

Escobar, J. C., Lora, E. S., Venturini, O. J., Yáñez, E. E., Castillo, E. F., & Almazan, O. (2009). Biofuels: environment, technology and food security. *Renewable and sustainable energy reviews*, 13(6), 1275-1287.

Ewing, M., & Msangi, S. (2009). Biofuels production in developing countries: assessing tradeoffs in welfare and food security. *Environmental science & policy*, 12(4), 520-528.

Faria, J. (2009). Biodiesel for rural development: a sustainability assessment of the Brazilian biodiesel program. (Master's thesis). Lund: Lund.

Fernandes, F.M. (2013). *Competitividade da produção de mamona destinada ao biodiesel: o caso do núcleo de produção de oleaginosas de Serra do Ramalho (BA)*. (Master's Thesis). Florianópolis: Serviço Nacional de Aprendizagem Industrial (SENAI).

Fernandes, B. M., Welch, C. A., & Gonçalves, E. C. (2012). Land Governance in Brazil: A geo-historical review of land governance in Brazil. *Land Governance in the 21st Century: Framing the Debate Series*. Rome: ILC.

Ferreira, M. D. P., Daniel, L. P., & Lima, J. E. D. (2015). O Programa Brasileiro de Biodiesel e o Risco Associado ao Preço da Mamona em Irecê, Bahia. *Revista de Economia e Sociologia Rural*, 53(4), 667-682.

Filho, J.E. (2013). The structural heterogeneity of family farming in Brazil. *CEPAL Review*, 111, 99-115.

Filho, J. B., & Vian, C. (2015). *The Evolving Role of Large and Middle Size Farms in Brazilian Agriculture* (No. 212026). International Association of Agricultural Economists.

Florin, M. J., Van De Ven, G. W. J., & Van Ittersum, M. K. (2014). What drives sustainable biofuels? A review of indicator assessments of biofuel production systems involving smallholder farmers. *Environmental Science & Policy*, 37, 142-157.

Food and Agriculture Organization (FAO). (2008). From subsistence farming to sugar-cane monoculture: Impacts on agrobiodiversity, local knowledge and food security. Gender, Equity and Rural Employment Division.

Garner, E., & de la O Gender, A. P. (2014). *Identifying the family farm: an informal discussion on the concepts and definitions*. ESA Working Paper No. 14-10. Food and Agriculture Organization of the United Nations.

- Gasson, R. & Errington, A. (1993). *The Farm Family Business*. CAB International, Wallingford, UK.
- Garagorry, F. L., Quirino, T.R., Sousa, C.P. (2002). Diagnóstico sociotécnico da agropecuária brasileira. *Embrapa Informática e Tecnologia*, documentos n. 3.
- Garner, E. & de la O Campos, A.P. (2014). Identifying the “Family Farm”: An Informal Discussion of the Concepts and Definitions. *Food and Agriculture Organization of the United Nations*. ESA Working Paper 14-10.
- German, L., Schoneveld, G., Skutsch, M., Andriani, R., Obidzinski, K., Pacheco, P. Dayang Norwana, A. A. (2010). *The local social and environmental impacts of biofuel feedstock expansion: A synthesis of case studies from Asia, Africa and Latin America*. CIFOR.
- Globalization and Livelihood Options of People Living in Poverty (GLOPP). (2002). *DFID’s sustainable livelihoods approach and its framework*. Retrieved March 15, 2015, from [http://glopp.ch/B7/en/multimedia/B7\\_1\\_pdf2.pdf](http://glopp.ch/B7/en/multimedia/B7_1_pdf2.pdf).
- Goncalves, Y. K., Favareto, A., & Abramovay, R. (2013). Estruturas sociais no semiárido e o mercado de biodiesel. *Caderno CRH* 26(68), 347-362.
- Gorz, André. (1994). Revenue minimum et citoyenneté. *Futuribles* 188, 61-66.
- Graeb, B. E., Chappell, M. J., Wittman, H., Ledermann, S., Kerr, R. B., & Gemmill-Herren, B. (2016). The state of family farms in the world. *World Development*, 87, 1-15.
- Guanziroli, C.E. (2000). Reforma agrária e globalização da economia. *Revista do Núcleo de Estudos Agrários Para o Desenvolvimento*, 1(2), 123-146.
- Guereña, A., & Burgos, S. (2014). The future of smallholders in Latin America: land, food, livelihoods, and the growth of monoculture. *Food Chain*, 4(2), 140-159.
- Hakim, C. (1982). *Secondary analysis in social research: A guide to data sources and method examples*. London, UK: George Allen & Unwin.
- Heaton, J. (1998). Secondary analysis of qualitative data: An overview. *Social Research Update* (22), Department of Sociology, University of Surrey.
- Hoffmann, R. (2011) Distribuição da renda agrícola e sua contribuição para a desigualdade de renda no Brasil. *Revista de Política Agrícola*, 20(2).
- Helfand, S., Moreira, A. R., & Bresnayan Jr, E. W. (2015). Agricultural Productivity and Family Farms in Brazil: Creating Opportunities and Closing Gaps. *Washington, DC: World Bank*.
- Hetherington, K. (2009). The strategic incoherence of development: marketing

expertise in the World Development Report. *The Journal of Peasant Studies* 36(3), 653-661.

Hussein, K., & Nelson, J. (1998) Sustainable Livelihoods and Livelihood Diversification. IDS Working paper number 69. Brighton: Institute of Development Studies

Hussein, K. (2002). *Livelihoods Approaches Compared: A Multi-Agency Review of Current Practice*. London, UK: Department for International Development.

Instituto Brasileiro de geografia e estatística (IBGE). Censo Agropecuário 2006. Rio de Janeiro: IBGE, 2009.

International Fund for Agricultural Development (IFAD). (2011). *Agricultural cooperatives are key to reduce hunger and poverty*. Retrieved June 11, 2017, from [https://www.ifad.org/newsroom/press\\_release/past/tags/y2011/1910907](https://www.ifad.org/newsroom/press_release/past/tags/y2011/1910907)

Jehoel-Gijsbers, G., & Vrooman, C. (2007). *Explaining Social Exclusion: A theoretical model tested in the Netherlands*. The Hague: The Netherlands Institute for Social Research/SCP.

Johnson, R.B., & Onwuegbuzie, A.J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, (33)7, 14-26.

Kabeer, N. (2004) Re-visioning "the social": Towards a citizen-centred social policy for the poor in poor countries. Working paper series, 191. Brighton: IDS.

Kilham, S., Camargo, C., & Willetts, J. R. (2010). Biodiesel: Farmers perspectives from Bahia Brazil. Foundation by the Institute for Sustainable Futures. University of Technology, Sydney.

Krathwohl, D.R. (1998). *Methods of Educational and Social Science Research: An Integrated Approach* (2nd ed.). New York: Longman.

Levitas R. (1996). The concept of social exclusion and the New Durkheimian Hegemony. *Critical Social Policy*, 46(16), 5-20.

Lowder, S. K., Scoet, J., & Raney, T. (2016). The number, size, and distribution of farms, smallholder farms, and family farms worldwide. *World Development*, 87, 16-29.

Machado, A. G. (2012). As ações e estratégias do governo para o SCS. In: *Congresso agribio: Agricultura familiar no biodiesel*. Palestra: São Paulo.

Madanipour, A., Shucksmith, M. & Talbot, H. (2015). Concepts of poverty and social exclusion in Europe. *Local Economy*, 30(7), 721-741.

Manuel, J. (2007). Battle of the biofuels. *Environmental health perspectives*, 115(2), A92.

Marengo, J. A., Alves, L. M., Soares, W. R., Rodriguez, D. A., Camargo, H., Riveros, M. P., & Pabló, A. D. (2013). Two contrasting severe seasonal extremes in tropical South America in 2012: Flood in Amazonia and drought in northeast Brazil. *Journal of climate*, 26(22), 9137-9154.

Marengo, J. A., Torres, R. R., & Alves, L. M. (2016). Drought in Northeast Brazil—past, present, and future. *Theoretical and Applied Climatology*, 1-12.

Markelova, H., Meinzen-Dick, R., Hellin, J. & Dohrn, S. (2009). Collective action for smallholder market access. *Food policy*, 34(1), 1-7.

McMichael, P. (2009). A food regime genealogy. *The Journal of Peasant Studies*, 36(1), 139-169.

Medina, G., Almeida, C., Novaes, E., Godar, J., & Pokorny, B. (2015). Development conditions for family farming: Lessons from Brazil. *World Development*, 74, 386-396.

Medjedović, I. (2011). Secondary analysis of qualitative interview data: Objections and experiences. *Qualitative Social Research*, 12(3), ART 10.

Morgan, C., Burns, T., Fitzpatrick, R., Pinfold, V., & Priebe, S. (2007). Social exclusion and mental health: conceptual and methodological review. *British Journal of Psychiatry*, 191, 477–483.

Ministério de Desenvolvimento Agrário (MDA). (2016). Balanço dos 10 anos do Selo Combustível Social. Retrieved July 21, 2016, from [http://www.mda.gov.br/sitemda/sites/site\\_mda/files/user\\_arquivos\\_383/SCS%20-%20Balan%C3%A7o%202015%20para%20publica%C3%A7%C3%A3o.pdf](http://www.mda.gov.br/sitemda/sites/site_mda/files/user_arquivos_383/SCS%20-%20Balan%C3%A7o%202015%20para%20publica%C3%A7%C3%A3o.pdf)

Ministério do Planejamento, Desenvolvimento e Gestão (MPOG). (2012). *Lei de diretrizes orçamentarias 2012*.

Nass, L.L., Pereira P.A. & Ellis, D. (2007) Biofuels in Brazil: An overview. *Crop Science*, 47(6), 2228-2237.

Narayan, D. (1998). Agriculture and the Environment: Perspectives on Sustainable Rural Development. In *Agriculture and the Environment: Perspectives on Sustainable Rural Development* (pp. 103-117). World Bank.

Neto, S.B. (2014). *Brazilian agricultural cooperatives in the agricultural border: A new kind of cooperativism*. International Summit of Cooperatives.

Obidzinski, K., Andriani, R., Komarudin, H., & Andrianto, A. (2012). Environmental and social impacts of oil palm plantations and their implications for biofuel production in Indonesia. *Ecology and Society*, 17(1).

Okada, S.I. (2008). Análise dos Pontos Críticos de Sucesso na Cadeia Produtiva do Biodiesel no Centro-Oeste Brasileiro: Um Subsídio à Gestão Estratégica. Master's Thesis, Federal University of Goiás, Goiânia, Brazil.

Pereira, A. W. (1999). God, the devil, and development in northeast Brazil. *Praxis: The Fletcher Journal of Development Studies*, 15, 1-18.

Pretty, J. (2003). Social capital and connectedness: Issues and implications for agriculture, rural development and natural resource management in ACP countries: a review paper for CTA.

Puppim de Oliveira, J.A. (2002). The policymaking process for creating competitive assets for the use of biomass energy: the Brazilian alcohol program. *Renewable and Sustainable Energy Reviews* 6, 129–40.

Rohman, J. (2013) Flood and drought assessment of Brazil: Implications for local insurers. TransRe White Paper.

Santana, C. A. M., & Nascimento, J. R. (2012). Public Policies and Agricultural Investment in Brazil. Rome: FAO, Available online at: [http://www.fao.org/fileadmin/templates/tci/pdf/InvestmentPolicy/Inv\\_in\\_Br\\_agriculture\\_-\\_20\\_08\\_2012.pdf](http://www.fao.org/fileadmin/templates/tci/pdf/InvestmentPolicy/Inv_in_Br_agriculture_-_20_08_2012.pdf).

Saunders, P. (2008). Social exclusion: challenges for research and implications for policy. *The Economic and Labour Relations Review*, 19(1), 73-91.

Scoones, I. (1998). *Sustainable rural livelihoods: A framework for analysis*. Working Paper 72. Brighton: IDS.

Scoones, I. (2009). Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, 36(1), 171-196.

Scoones., I. (2009). Livelihoods perspectives and rural development. *Journal of Peasant Studies*, 36(1), 171-196.

Secretaria da Agricultura, Pecuária, Irrigação, Pesca e Aquicultura (SEAGRI). Cotações Agrícolas. Retrieved June 26, 2017, from [http://www.seagri.ba.gov.br/cotacao?produto=492&praca=286186&tipo=368&data\\_inicio=01%2F02%2F2002&data\\_final=01%2F03%2F2002](http://www.seagri.ba.gov.br/cotacao?produto=492&praca=286186&tipo=368&data_inicio=01%2F02%2F2002&data_final=01%2F03%2F2002)

Sen, A. K. (1975). *Employment, Technology and Development*. UK: Oxford University Press.

Serrat, O. (2008). The sustainable livelihoods approach. Manila: *The Asian Development Bank*.

Silva, G. H., Melo, C. O., & Esperancini, M. S. (2007). Estimativa de área e emprego em culturas de soja e mamona para biodiesel. *Revista de Política Agrícola*, 3, 58-65.

Silva, A. G., Vianna Leite, M. A., Clemente, F., & Perez, R. (2012). *Contract farming: Inclusion of small scale farmers in the Brazilian biodiesel production chain*. International Forum on Innovation and System Dynamics in Food Networks.

Silva, M. S. (2015). *Biodiesel, inclusão social e competitividade: diagnóstico, estratégias e proposições para a cadeia produtiva no estado da Bahia*. Universidade Federal da Bahia.

Silva, M. S., Fernandes, F. M., Teixeira, F. L. C., Torres, E. A., Fernandes, F.M., & Rocha, A. M. (2014a). Family farming and biodiesel: The difficulties of socio-economic inclusion in the northeast of Brazil. *Journal of Agricultural Science*, 6(7), 231-252.

Silva, M. S., Fernandes, F. M., Teixeira, F. L., Torres, E. A., & Rocha, A. M. (2014b). Biodiesel and the “Social Fuel Seal” in Brazil: Fuel of Social Inclusion? *Journal of Agricultural Science*, 6(11), 212-228.

da Silva César, A. & Batalha, M. O. (2010a). Biodiesel production from castor oil in Brazil: A difficult reality. *Energy Policy*, 38(8), 4031-4039.

da Silva César, A., & Batalha, M. O. (2010b). Biodiesel in Brazil: History and relevant policies. *African Journal of Agricultural Research*, 5(11), 1147-1153.

Silvia, B. S. & La Rovere E.L. (2010). The quest for eco-social efficiency in biofuels production in Brazil. *Journal of Cleaner Production*, 18, 1663-1670.

Silver, H. (1994). Social exclusion and social solidarity: Three paradigms. *International Labour Review*, 133, 5-6.

Simões, A. F., Kligerman, D. C., La Rovere, E. L., Maroun, M. R., Barata, M., & Obermaier, M. (2010). Enhancing adaptive capacity to climate change: The case of smallholder farmers in the Brazilian semi-arid region. *environmental science & policy*, 13(8), 801-808.

Simpson, M. C. (2007). An integrated approach to assess the impacts of tourism on community development and sustainable livelihoods. *Community Development Journal*, 44(2), 186-208.

Soares, S., De Souza, L., Silva, W. J., Silveira, F. G., & Campos, Á. (2016). *Poverty profile: the rural North and Northeast of Brazil* (No. 138).

- Solesbury, W. (2003). *Sustainable livelihoods: A case study of the evolution of DFID policy*. London: Overseas Development Institute.
- Somerville, P. (1998). Explanations of social exclusion: where does housing fit in? *Housing Studies*, 13(4), 761–780.
- Stattman, S. L., & Mol, A. P. (2014). Social sustainability of Brazilian biodiesel: The role of agricultural cooperatives. *Geoforum*, 54, 282-294.
- Tortia, E. C., Valentinov, V. L. & Iliopoulos, C. (2013). *Agricultural cooperatives*. *Journal of Entrepreneurial and Organizational Diversity*, (2)1, 23-36.
- Townsend, P. (1979). *Poverty in the UK*. Penguin, Harmondsworth.
- Tribunal de Contas da União (TCU). (2013). Retrieved May 11, 2016, from <http://portal.tcu.gov.br/lumis/portal/file/fileDownload.jsp?fileId=8A8182A24E01FA6B014E037AC31670E5>
- União Brasileira do Biodiesel (UBRABIO). (2010). O biodiesel e sua contribuição ao desenvolvimento brasileiro. FGV Projetos.
- Valentinov, V. (2007). Why are cooperatives important in agriculture? An organizational economics perspective. *Journal of Institutional Economics*, 3(01), 55-69.
- Viana, K., Perez, R., Machado, C.T. (2011). Risco do cultivo da mamona promovida pelo programa do biodiesel brasileiro. *Revista Agrotecnologia*, 2(2), 15-29.
- Vorley, B., Cotula, L., & Chan, M. K. (2012). Tipping the Balance: Policies to shape agricultural investments and markets in favor of small-scale farmers. *Oxfam Policy and Practice: Private Sector*, 9(2), 59-146.
- Watanabe, K., Bijman, J., Slingerland, M.A.. (2012). Institutional arrangements in the emerging biodiesel industry: case studies from Minas Gerais—Brazil. *Energy Policy*, 40 381–389.
- Wilkinson, J., & Herrera, S. (2010). Biofuels in Brazil: debates and impacts. *The Journal of Peasant Studies*, 37(4), 749-768.
- Wolmer, W., Scoones, I. (2003) Livelihoods in crisis? New perspectives on governance and rural development in Southern Africa. *IDS Bulletin* 34.
- Wiens, J., Fargione, J., & Hill, J. (2011). Biofuels and biodiversity. *Ecological Applications*, 21(4), 1085-1095.

Wollni, M. & Zeller, M. (2007). Do farmers benefit from participating in specialty markets and cooperatives? The case of coffee marketing in Costa Rica<sup>1</sup>. *Agricultural Economics*, 37(2 - 3), 243-248.

World Bank. (2011). *Country Partnership Strategy for the Federative Republic of Brazil 2012-2015*. Washington, DC: World Bank.

Zapata, C., Brune, S. & Adero, A.J. (2010a). Retrofitting the Brazilian biodiesel programme: Implications for policy design. *The International Policy Centre for Inclusive Growth*. Research brief (15).

Zapata, C., Vazquez-Brust, D., Plaza-Úbeda, J. (2010b). Productive inclusion of smallholder farmers in Brazil's biodiesel value chain: Program design, institutional incentives and stakeholder constraints. *International Policy Centre for Inclusive Growth*, 73. Working paper.

## Annex

Annex1 Family farming establishment participating in the PNPB

|               | 2005       | 2006          | 2007         | 2008         | 2009         | 2010          | 2011          | 2012         | 2013         | 2014       | 2015         |
|---------------|------------|---------------|--------------|--------------|--------------|---------------|---------------|--------------|--------------|------------|--------------|
| North         | 414        | 185           | 223          | 215          | 177          | 246           | 56            | 60           | 327          | 313        | 304          |
| Northeast     | 15,000     | 30,226        | 6,850        | 17,187       | 17,711       | 41,253        | 37,226        | 25,210       | 12,949       | 4,757      | 3,926        |
| <b>Bahia</b>  | <b>N/A</b> | <b>10,996</b> | <b>5,994</b> | <b>9,938</b> | <b>7,092</b> | <b>18,417</b> | <b>11,814</b> | <b>7,790</b> | <b>4,470</b> | <b>988</b> | <b>1,145</b> |
| Central- West | 0          | 1,441         | 1,690        | 2,400        | 2,550        | 3,388         | 3,533         | 4,513        | 5,133        | 4,757      | 4,548        |
| Southeast     | 914        | 7             | 55           | 87           | 1,457        | 3,297         | 2,486         | 2,378        | 2,287        | 1,837      | 1,818        |
| South         | 0          | 8,736         | 27,928       | 8,767        | 29,152       | 52,187        | 60,994        | 60,512       | 63,058       | 61,815     | 61,889       |
| Total         | 16,328     | 40,595        | 36,746       | 28,656       | 51,047       | 100,371       | 104,295       | 92,673       | 83,754       | 73,479     | 72,485       |

Zonin (2013), César et al. (2014), MDA (2015)

Annex2 Volume of total raw materials acquired from family farming establishments under SFS (in tons)

|              | 2008         | 2009          | 2010          | 2011       | 2012      | 2013       | 2014         | 2015         |
|--------------|--------------|---------------|---------------|------------|-----------|------------|--------------|--------------|
| North        | 12,410       | 14,400        | 16,860        | 8,920      | 8,740     | 9,020      | 8,340        | 10,950       |
| Northeast    | 5,490        | 23,910        | 33,430        | 6,960      | 550       | 730        | 2,570        | 9,460        |
| <b>Bahia</b> | <b>3,650</b> | <b>18,060</b> | <b>31,340</b> | <b>120</b> | <b>70</b> | <b>170</b> | <b>2,050</b> | <b>8,890</b> |
| Central-West | 151,020      | 279,990       | 441,790       | 429,120    | 560,390   | 603,160    | 543,090      | 530,880      |
| Southeast    | 4,170        | 27,850        | 66,170        | 68,710     | 101,380   | 129,520    | 94,210       | 129,740      |
| South        | 188,480      | 510,870       | 1,094,320     | 1,397,580  | 1,534,060 | 2,050,570  | 2,385,080    | 2,801,390    |
| Total        | 361,570      | 857,020       | 1,652,570     | 1,911,290  | 2,205,120 | 2,793,000  | 3,033,290    | 3,482,420    |

MDA (2015)