

The national program for production and use of biodiesel and its social components – Empirical findings from a field study in Ceará (Northeast Brazil)

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Abstract: In December 2005 the Brazilian government launched its programme on biodiesel blending, especially focussing on small scale farmers for raw material production. The newly developed Social Biodiesel Label encourages the collaboration between biodiesel producers and farmers delivering the feedstock. Companies awarded with the label have to purchase a certain percentage of their raw material from the farmers. The program wants to foster rural development, foremost in the poor semi-arid northeast, by securing additional income for farmers. This case study focuses on the north-eastern state of Ceará, where the program is supported through additional public funding so as to test castor oil plants as an additional instrument for adaptation to climate change. Several problems were analyzed during the first phase of implementation, such as the participation of farmers in the program, farmers' supply quota and the Social Label control process. Whether the program will have positive effects on the rural sector depends on the way further development will take. Differences in interests of the involved actors exist, and a clear alignment of the PNPB to farmers' reality is crucial. This study is based on expert interviews and field visits conducted during December 2007 till February 2008.

Keywords: biodiesel, public policy, rural development, family farming

Introduction

Compared to other countries currently developing biofuels policies, Brazil is already quite experienced in formulating public policies in that area. Distinct from former policies though is the focus on integrating small scale family farmers in the production of raw materials for the biofuel sector. In the course of formulating policies for the Brazilian biofuel sector, the Lula Government developed in 2004 the National Program for Production and Use of Biodiesel (Programa Nacional de Produção e Uso do Biodiesel – PNPB), focussing on the social aspects of rural development and biodiesel production. Former policies on biofuels, ethanol in particular, encouraged the agricultural tradition where capital, land and power are concentrated in few hands. With the Social Fuel Label and accompanying policies the government seeks to break with this old-age tradition, formulating criteria which obligate vegetable oil producing companies to work with small scale farmers.

“The PNPB is the only biofuel program in the world which contains two crucial criteria others don't have. First, the inclusion of family farmers and the obligation to work with them, and second to be functional without subsidies” (Personal interview, Representative of Ministry of Rural Development (MDA) Ceará, 11.02.08).

Industrial producers are benefiting from buying „social fuel“, receiving tax reductions and opportunities for selling biodiesel through public auctions conducted by the National Agency of Petroleum, Natural Gas and Biofuels (ANP). The investment climate is supported by special funding opportunities offered by the National Bank of Economic and Social Development (BNDES).

The aim of the MDA is to generate new income opportunities for small scale farmers, which represent 85% of total agricultural establishments (IBGE, 1996), by including them into the national agribusiness. The main instrument of this policy is the Social Fuel Label (Selo Social) certifying the production. Companies can be awarded this label only if they fulfil a set of requirements, such as contract farming with negotiated raw material prices and conducting farmer trainings.

The present study focuses on the implementation of the PNPB in the state of Ceará, analysing its structure and interests of different actors participating in the program. The information is based on expert interviews and sight visits in rural areas of Ceará carried out between December 2007 and February 2008.

Instruments of the National Program for Production and Use of Biodiesel

There are many options for the production of biodiesel in Brazil, such as palm and babassu in the north, soybeans, sunflower and peanuts in the southern and south-eastern regions and mainly castor beans, sunflower and jatropha in the dry north-eastern regions. As cattle breeding is an important income, animal fats (beef tallow) are used to produce biodiesel. Others sources are oil and grease waste from cafeterias, industrial and residential kitchens.

Tax exemption is one of the forms used by the federal government to encourage producers of biodiesel to buy part of their raw material from family farms. Besides the economic benefits resulting from lower taxation, the producer of biodiesel cooperating with family farmers will receive the Social Fuel Label granted by the MDA. Companies purchasing their raw material from farmers based in the northeast, the most problematic semi-arid region, can enjoy full tax exemption (see Table 1 below).

Table 1: Tax rates for biodiesel.

	CIDE (Mineral oil tax)	PIS/COFINS (Social Integration Program)	Sum of federal taxes
	(in R\$/l)	(in R\$/l)	(in R\$/l)
Family farming (Castor, Palm, north, northeast, semiarid regions)	free	100% exemption	no 100% exemption
Family farming (general, all planations)	free	68% exemption (0,07)	0,07 68% exemption
Intensiv farming (North, Northeast, semiarid Regions)	free	31% exemption (0,151)	0,151 31% exemption
General biodiesel taxes	free	0,218	0,218
Mineraldiesel	0,07	0,148	0,218

Source: Author's design, adopted from Giersdorf % & Nitsch, 2006, Ministerio de Minas e Energia 2006

The guidelines for granting the Label to production projects of vegetable oil are based on the requirements stated in the Normative Instruction No 01 and No 02 of the MDA, released in July and September 2005. The awarded company has to meet the following three criteria:

1. First, the buyer has to *sign a contract with the farmer* determining prices, purchasing conditions etc. In this case study, the contract conditions for farmers were negotiated by CONTAG (National umbrella organization of agricultural workers).
2. Second, the buyer has to *deliver the seeds* for the planted raw material and provide *agricultural trainings for farmers*, which should go beyond mere feedstock production and enhance also food production and food security.
3. The third requirement obliges the companies to buy a certain percentage of their raw material from family farmers. For companies based in the northeast and semi-arid regions it is 50%, in the south and south-eastern regions 30% and for the mid-west regions 10% (see figure 3).

This differentiation is designed to foster the agricultural production in the northeast where most of the family run farms are based in Brazil.

Figure 1. Social Fuel Label: Awarding and Criteria, Author's design.

The right to award the Social Label underlies the administration of the MDA, which is also responsible for controlling certified companies.

Since Brazil has established mandatory blending requirements for diesel fuel, there is an emerging market for biodiesel, catered for by centralized auctions conducted by the ANP. During the starting phase only certified Social Label companies were allowed to participate in these auctions, which was meant to be an incentive to obtain said label. Severe opposition from the biodiesel industry led to 20% of non-certified companies being allowed to participate. Due to the enforcement of the law 11.097/05, diesel buyers had to ensure a 2% blending of biodiesel ever since 2008. Owing to a production rate much higher than expected the government increased the blending requirement in July 2008 to 3% (see Figure 2 below).

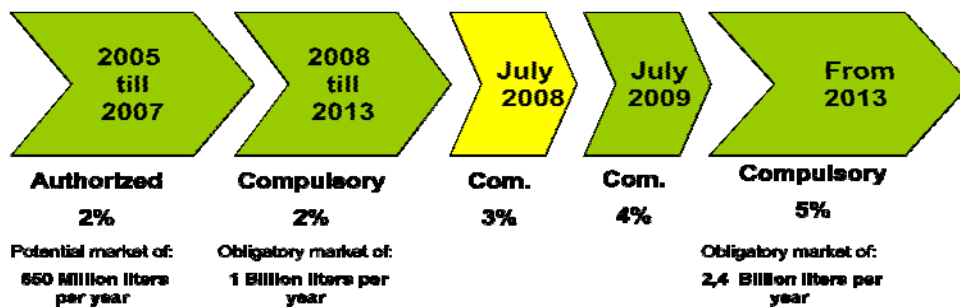


Figure 2. Compulsory blending requirements, Author's design, data MDA 2008.

Through the above mentioned auctions the government has created a biodiesel market which serves a price-regulating purpose given its competitive nature. It is important to note in this regard that biodiesel buyers from different regions produce under unequal conditions, a fact that influences the price. According to Rodriguez (2006), 75% of the production costs can be attributed to the procurement of the raw materials, an investment which will not be balanced through higher tax exemptions. This puts small scale agriculture in the northeast under pressure to develop rural production structures as quickly as possible.

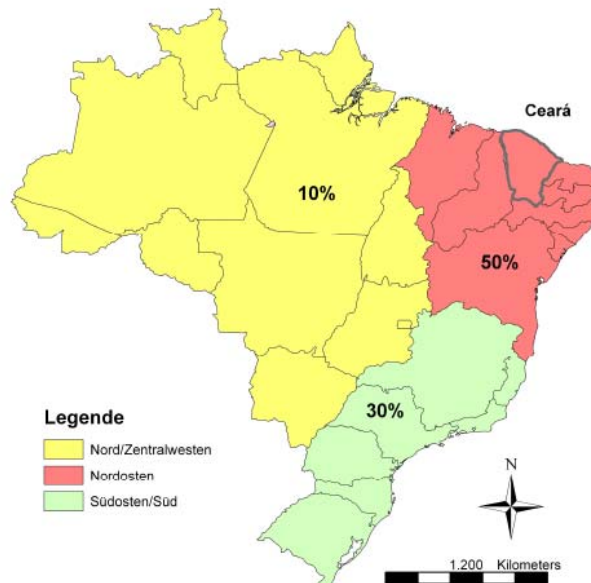


Figure 3. Raw material purchase from family farmers by region, authors design, data MDA 2008.

In the course of the programme family farmers receive improved access to micro credit lines of PRONAF (National Programme to foster family and small scale farmers), which are accessible to the farmers if they can show a valid contract with the buyer. Unfortunately, access to this program is coupled to pre-defined eligibility criteria which „ *are established by local financial institutions without consulting those who are most interested*“ (MDA, 2004). Additionally, the utilized seeds have to be certified by the Ministry of Agriculture, Livestock-breeding and supply (MAPA). Companies purchasing from small scale farmers participating in the PNPB are also obliged to use certified seeds, however said seeds were not available in sufficient quantities at the time of writing.

The implementation of the PNPB in Ceará

In principle, the whole area of the state of Ceará (figure 3) is characterized by semi-arid conditions, with a precipitation between 400mm-1,800mm per year and a rainy season from February until May/June. Ever since having been a home to human settlers, the region has been plagued by scarce rainfalls and consistently appearing droughts. Most of the area inhabited by small scale farmers belongs to the Sertão (semi-arid region) with rainfalls between 400-600mm. Given current and future climate change dynamics, the IPCC (2007) predicts rising temperatures going along with more intensive droughts. Irregular rainfalls and droughts are considered to be the main factor of poverty in the northeast. Due to climate change, the already scarce water resources are predicted to diminish even more. Negative outcomes of climate change, such as scare water resources, soil degradation and salinization, are usually coupled with high population density, aggravating the situation even more.

The PNPB in the northeast focuses on the integration of family farmers that are planting mostly castor beans and in some cases sun flowers, peanuts or jatropa. As castor bean is a drought resistant plant it is also used as a means of fighting negative outcomes of climate change, providing small scale farmers an alternative income to maize and beans (La Rovere et al, 2007). Some interviewees saw it as the only alternative for the northeast. But still, castor-oil plants need rainfalls up to 500mm during the first growing period in order to grow fruits with high oil content. The following factors are important for castor oil plants:

- Altitude between 300 and 1.500 above sea level
- Average rainfall of at least 500mm per year
- Average temperature between 20 and 30° C.

Since 2006, the government of Ceará supports the participation of family farmers with 150 R\$ for each hectare planted with castor-oil plants. However, only a maximum of three hectares per person can be subsidized, thus up to 450 R\$ per year. Given the dominance of this species in Ceará, the research was especially focused on castor beans. The Brazilian Agricultural Science Institute EMBRAPA developed two special drought resistant breeds, BRS 149 Nordestina and BRS 188 Paraguaçu. Distributional problems of quality seeds are discussed in the analysis below.

The productivity of castor-oil plants in Ceará averages 649kg/ha (Mendes, 2005). A harvest of 600kg castor can produce 300 litres of biodiesel.

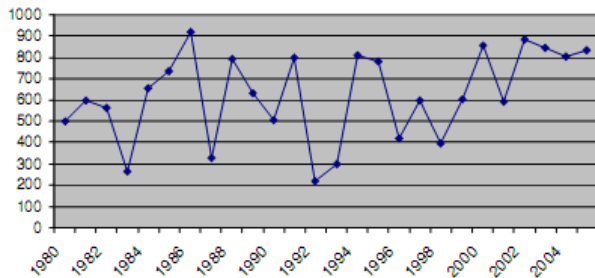


Figure 4. Average productivity of castor (kg/ha), data Mendes 2005.

Cultivating castor beans in Ceará has been a tradition since mid of the 19th century, but production rates went down given the decline in importance in the national economy during the 1980ties. Generally, castor beans are planted in intercropping systems with maize and beans, which are cropped in rows of three between each castor bean row. Soil depletion is considerably reduced due to this intercropping system.



Figure 5. Small scale farming castor oil production in Ceará.

As technical assistance (extension services) is not readily available, most of farmers plant in traditional ways. Since the whole harvesting process is manual, harvesting castor seeds is still a challenge for family farmers. The dry fruits are the ones with the highest oil content, but they can only be harvested during a very limited period. Farmers have to time this period perfectly in order to pick the fruit before it falls down. Seeds, once on the ground and in the soil, are valueless for production as germination begins immediately and the oil content changes. During this period, farmers compete for casual farm workers, the result of which is increasing labour and harvesting costs.

Additional income can be generated if seeds are hulled. Buyers like Petrobras pay 20 Cent (R\$) more per kilogram (Personal interview, biodiesel consulter, 14.01.08). Although this work can be done after harvesting, farmers prefer to sell unhulled seeds since manual work consumes a lot of time and hand-operated machines are only available for a few cooperatives. Theoretically, farmers could profit

from using the remaining press cake as fertilizer for poor soils, however until now (2008) the value chain in Ceará does not foresee a press cake return flow back to the farmers.

Results and discussion

This part of the paper will discuss the challenges during the implementation of the PNPB in Ceará. Given the recent coming into force of the PNPB (since end of 2004), the analysis is based on qualitative interviews and literature review only; no quantitative analysis was undertaken. Structural problems and development barriers that reduce the possibility for family farmers to benefit from the implementation of the PNPB in the state of Ceará will be discussed.

Participation of family farmers

"The benefit for small scale farmers depends on the grade of their participation in the value chain. On no account they should be restricted to the production of raw materials " Sergio Sepúlveda, Inter-American Institute for Cooperation in Agriculture (in Zenti, 2007). The development of a value chain seeking to especially include family farmers is an important aim. In order to achieve this, it is crucial to set up functioning organisational structures in cooperatives, initiate cooperation between the different actors of local and national institutions e.g. the agrarian science institute EMBRAPA, Universities, the private sectors, politics or civil society and small holder organisations, among others.

To foster the participation, the government of Ceará promised the installation of 14 small plants for biodiesel production on cooperative premises. In this point the state policy contradicts the national policy of the MDA. *"Our strategy [MDA] is not working with small plants, because they are not economically feasible. 10 small plants in Brazil had to be closed down because they were not profitable"* (Personal interview, Representative of MDA, 10.02.2008). Biodiesel prices from small mills range between 2 R\$/l and 8 R\$/l. They are considerably higher than the 1,8 R\$/l of biodiesel paid in the auctions. Small plants for castor oil production are also not working efficiently as 15% of the oil content still remains in the seeds. This impedes a further use of the press cake. Working with efficient oil presses is only possible in cooperatives, but until now, positive experiences are lacking and motivation is very low.

A more intensive participation has to go along with the integration of landless farmers. This group is representing 50% of all family farmers in Ceará (IGBE, 1996). Landless farmers are not included in the cultivation of castor beans because of traditional land tenure systems. After harvesting the cultivated maize and beans the tenant uses the field for stock-breeding. As castor leaves are poisonous for unaccustomed farm animals it is impossible to plant them in this farming system.

A decisive point for a successful development of the PNPB is the realization of the ceasing land reform: *"Family farming can only develop if more land is distributed under the reform. The few hectares we own impede a development. Without a reform the program can't rise and there won't be any integration of family farmers"*. (Personal interview, Representative of farmer association, 08.02.2008).

Technical assistance

As mentioned above, providing extension services to the contracted farmers is one of the three criteria of the PNPB and has to be ensured by the Social Label recipient. However, the insufficient technical extension services are one of the main structural problems. In order to provide the advisory service Petrobras is working together with state owned EMATER (agricultural technical assistance). The other company operating in the northeast, BrasilEcodiesel (insolvent in the meantime), contracted private consultants. Farmer representatives commonly criticise that the law only calls for 'technical assistance to be available', but does not provide a clear framework as to the extent of the

services. Most resources for technical assistance were spent on the farmers to be contracted under the PNPB, using up the resources needed for trainings and knowledge transfer.

Another decisive point is that the advisors available to consult the contracted farmers do not match the number of farmers to be supported: *"We claim one advisor for 88 families, visiting them once a week. Now we have approximately one for 200"* (Personal interview, Farmers representative, 08.02.2008).

Technical support is urgently needed if the PNPB wants to succeed adapting to climate change, and it is essential for combating the low productivity of smallholder farmers.

Quota of purchase from small scale farmer

As the most vulnerable small scale farmers are based in the north-eastern and semi-arid regions, the PNPB focuses on this group and obliges companies based in the region to buy 50% of their needed feedstock from them. This number was negotiated with the Association of the semi-arid regions in the north-east (ASA), a network of 700 local NGOs. However, contracts with farmers were closed without any planning beforehand, the outcome of which is that farms are geographically dispersed and logistical cooperation is hampered.

At the project launch, Petrobras expected to buy pressed raw oil directly from the farmers. However, given that production structures were only recently put in place these expectations turned out to be too high: *"Companies have to adapt to the conditions and reality of family farmers"* (Personal interview, Secretary of rural development, 14.02.2008).

Auctions

Due to contract farming, future biodiesel production can be sold in advance to the diesel distributors. These circumstances caused financial problems to BrasilEcodiesel, main biodiesel producer in the northeast, calculating its sales on the basis of the concluded contracts. As these contracts could not be lived up to, either because of higher estimated yields or farmers selling to other markets or companies, the estimated amount of raw materials was not available. Because of the biodiesel boom during the implementation phase of PNPB, various farmers closed double contracts with BrasilEcodiesel and Petrobras. The award of the Social Label is linked to existing contracts, causing the problem of double contracts of the same feedstock. In the end, only one company could be delivered with the raw material.

Problematic are the basic conditions for companies based in the northeast, where rural structures are less developed, thus hampering the cooperation with family farmers and leading to higher productions costs which cannot be compensated by tax reductions (see Table 1 above). A possibility to compensate the competitive distortions between companies from southern regions and those based in the northeast could be regional auctions, subdivided in middle-east, south and north.

Control of the Social Label

Controlling the allocation of the Social Label falls within the mandate of the MDA. At the time of writing, the MDA monitored the fulfilment of the criteria through a complicated data system which included the following different farmer categories: Farmers with interest in the program, farmers who planted castor beans and farmers who have finally castor yields. In addition to the uncoordinated monitoring system, farmers signed contracts with more than one company, accounting the family farmers contingent doubled on both contractors. Now (2008) the MDA requested companies to report about their cooperation with family farmers. Also, this data will be verified with reports from workers organizations.

Stagnating productivity

Until 2008 the participation rate and yield from family farmers was not enough for the already installed oil plants (built after the PNPB was launched) and supplementary support policies from the states. One reason for the low participation is the lack of confidence in cooperating with companies. Another point is the low price per kilo - castor seeds are sold between 0,70 R\$/kg and 0,75 R\$/kg. *"Even though farmers would be paid 1,50 R\$/kg for castor seeds, there wouldn't be enough to feed all six oil plants in the northeast"* (Personal interview Representative of MDA, 08.02.2008). As Figure 6 shows, farmers got a much higher price for castor on the world market in the 1980ties, a fact that raised expectations as to the possible positive impacts of the PNPB. On the other hand, companies based in the northeast are competing with those in the south where raw material production is cheaper and infrastructure is better developed.

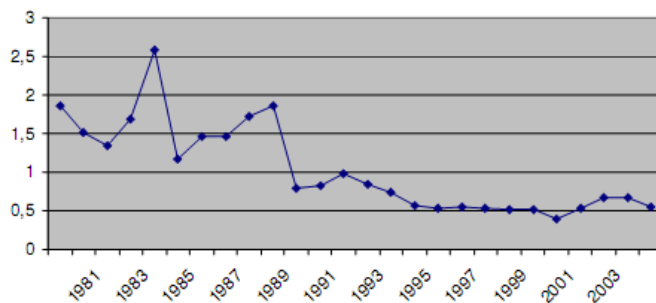


Figure 6. Price for Castor seeds between 1978-2005 (R\$/kg).

Although contracted by the biodiesel industry, farmers tend to sell their production directly on the world market if offered high enough prices: *"There is a competition between the biodiesel and the chemical industry. But the biodiesel industry has no margin to set the price higher"* (Representative of MDA, 2008). For a better insurance of the companies the CONTAG bargained new conditions for family farmers. In order not to reduce additional income for farmers, only 50% of the originally agreed on produce has to be sold to the biodiesel company. Unreachable yield estimates of between 900-1,200kg/ha caused further frustration on companies and farmers side: *"Climatic conditions this year were very hard, so that expected yields of 900kg/ha dropped to 200kg/ha"* (NGO representative, 2008). With a yield of 200kg/ha, sold for the fixed price of 0,75 R\$/kg and the additional support of 150 R\$ per ha, the farmers' additional income of 3 ha castor beans amounts to 900 R\$ (~361€). The national absolute poverty line for the northeast ranges between 1248-1848 R\$ (~500-740€) per year.

The president of the farmers union FETRAECE summarises the problem as follows: *"Disappointing results in production of the last years, the price, the risks to poison livestock and the insecurity of the granted buy-off are one of the main obstacles to achieve a higher yield of oil seeds"* (Albuquerque, 2008).

Certified castor oil seeds

Companies holding the Social Label are obliged to deliver contracted farmers with certified castor seeds, adapted to the climatic conditions of the northeast. Two main problems occurred during the implementation of the program. First, there were not enough certified seeds to serve all the contracted farmers, and second, it was quite possible that delays led to seeds reaching the farmer only after the first rainfalls. *"The seeds distributed in 2007 were first of a bad quality and second delivered behind the schedule"* (Personal interview, NGO representative, 15.01.2008). One reason for the low yields was low quality seeds from former harvests. Additional losses occurred due to considerably lower oil content (up to 20% less) of bad quality seeds.

Traditionally the seeds sector is dominated by companies like Bunge, Bayer or owners of large

plantations, all of which causes a concentration in the seed market (Personal interview, Representative of MDA, 13.02.2008). If adaptation measures for family farmers in the northeast are to be taken seriously, the distribution of quality seeds is crucial to adapt to the barren climate conditions.

Reacting on these conditions, the MDA implemented a seed growing program with the aim to supply 30% of the farmers with improved seeds (Personal interview, Representative of MDA, 13.02.2008). At least three years are estimated to guarantee a satisfactory seed supply. Applying for the small holder credit program PRONAF is linked to the use of certified seeds, controlled by the state run EMATER.

Conclusions

This study focused on the impact of the PNPB on family farmers in the north-eastern state of Ceará. It analyzed the structure and the early implementation stage of the program. The objective of the program is to enhance the integration of family farmers in the national production of raw materials, however several essential deficits reducing expected positive outcomes were encountered. Answering the question whether the PNPB leads to sustainable rural development depends essentially on the interest of the involved actors.

On the other hand, the PNPB is promoted as a tool for adaptation to climate change in the north-east, where climate change can be regarded as an important challenge threatening rural livelihoods in the semi arid regions. In the light of enhanced income security, improved castor seeds are indispensable for castor oil production in the region. Seeds have to be adapted to the unfavourable geophysical conditions.

Of fundamental importance is the implementation of an effective control tool for the Social Label to increase pressure on companies so they offer better agricultural assistance to family farmers.

Profiteer of the program is definitely the soy industry with access to the new biodiesel market, which in contrary to the European food market, offering a new market for the sale of genetically modified soy beans.

Despite the binding criteria of 50% of the raw material coming from family farming, the north-eastern based company BrasilEcodiesel, awarded with the Social Label, declared a 99% content of soy in its biodiesel production (Garcia, 2007). Profit is mainly achieved by the soy farmers in the south. The economic integration of north-eastern family farmers is subject to an unequal competition with southern and western states. If soy remains the dominant oil fruit, the PNPB runs the risk to take the line of the Proálcool program, leaving the production in the hands of the agroindustry, therewith reducing possible positive impacts on rural and social development.

Whether family farmers of the northeast will gain from the PNPB depends on overcoming the above named challenges. Decisive improvements should be sought in the following areas:

- Capacity building for farmers – improve technical assistance
- Availability of certified seeds – guarantee sufficient certified seeds
- Castor oil price policy – foster motivation for castor oil production through attractive prices
- Participation of family farmers – increase participation through organizing family farmers
- Effective control of the social label

In order to intensify the participation in the north-eastern biodiesel program, the MDA started a program to foster castor plant production in so called biodiesel production centres. These centres envisage the constitution of comprehensive communication structures on the local, federal and national level. On the local level, these production centres comprise actors from labour unions, representatives from the MDA, representatives of the local government, regional banks, technical advisor of BrasilEcodiesel and the EMATER and organize them in working groups. In the first phase 10 micro regions were chosen where working groups organised the production. The aim of these

centres is to find solutions to structural problems like insufficient technical assistance or logistical difficulties.

A crucial difference can be seen between the federal policy in Ceará and national surrounding conditions of the PNPB. On the national level, the PNPB does not apply subsidies in order to reduce the political dependency of family farmers, whereas the state of Ceará on the local level decrees support for smallholder farmers.

Brazil is one of the first countries applying a certification scheme for biodiesel that especially focuses on social aspects. For a sustainable implementation of this program, a realistic assessment of the expected production potential of family farmers is crucial. Furthermore, from an environmental perspective ecological criteria should be included to encourage sustainability and the adaptation to climate change.

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