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The Bitter Sweet Promise of Biofuels

Sweet for few, bitter for many: A study case of Honduras

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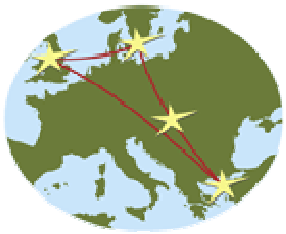

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Tack!

ευχαριστώ

Merci!

Abstract

Today, biofuels emerge in forms that can offer some unique opportunities to help combating climate change, while coping with emerging energy crisis and promoting rural development for millions of rural poor who could benefit from this new development. Rural opportunities are expected to occur through: a) the generation of new employment and income opportunities and increased capital turnovers, b) the chance to advance a critical production input, i.e. energy, to other rural enterprises, and c) the possibility to facilitate Millennium Development Goals' (MDGs) achievement. Honduras, as many other countries where biomass growing potential exists, has been attracted by the above-mentioned opportunities and consequently, launched an aggressive "mega agro-industrial biofuels initiative" in early 2006. Through this plan, the government seeks foremost to advance rural development through the creation of new jobs opportunities for millions of rural poor, and to a certain extent to reduce its total dependency on expensive imported oil. To reach these goals, the Government plans to develop its African palm oil based biodiesel potential. Nevertheless, these opportunities are not straightforward. Moreover, the net balance of such biofuels development could even be negative for local communities and the environment as biofuels production can also serve to threaten food security and could contribute to vulnerable communities' displacement, to ecosystems degradation and to soils and water impacts, etc. As a result, it is pertinent to ask: "are biofuels actually a good idea at all?"

Through an analysis of available secondary data and of stakeholders' perspectives, this study seeks to understand the opportunities and challenges that palm oil based biodiesel offers to rural poor in Honduras. The study concludes that potential opportunities palm oil based biodiesel could offer to rural poor communities in Honduras are unlikely to happen. Even though new employment opportunities are likely to occur, these do not seem to have a significant impact on poverty alleviation. On the one hand, smallholders' benefits from palm cultivation seem to be marginal, temporary and highly dependent on external factors. Even more to the point, it is unlikely biodiesel production help boost traditional rural economy and/or help advance MDGs achievement as produced biodiesel will not remain in the rural areas. On the other hand, it was found that palm oil based biodiesel is likely to worsen already insecure food context, to trigger sporadic forced population displacements, to negatively impact on soils and water quality and to exacerbate ecosystems degradation processes. Therefore, the present study found that palm oil based biodiesel production in Honduras is not such a good idea as it seems at a first glance.

Executive Summary

Today, biofuels emerge in forms that can offer some unique opportunities to help combating climate change, while coping with the emerging energy crisis and also serve to advance rural development for millions of rural poor who could benefit from this new development. Arguments favoring biofuels development include biofuels' potential to partially replace fossil fuels and contribute in such way to reduce carbon dioxide (CO2) emissions, or to be more accurate, their potential to offset anthropogenic carbon emissions. On the other hand, biofuels has been thought to be an excellent chance to achieve energy security as primary energy demand increases, oil prices soar and political instability affects major oil producing countries. Finally, rural development opportunities are expected to occur through: a) the generation of new employment and income opportunities and increased capital turnovers, b) the chance to advance a critical production input, i.e. energy, to other rural enterprises, and c) the possibility to facilitate Millennium Development Goals' (MDGs) achievement.

The first category of opportunities, i.e. generation of new employment and related income opportunities and increased capital turnovers, is expected to occur as a direct consequence of an increment in the demand of labour forces in the agricultural sector. Moreover, improved capital turnovers are likely to occur as a result of the creation of a second alternative market where surpluses can be commercialized, and as a consequence of a reduction of business risks associated to the existence of a single market. The second category of opportunities, i.e. advancement of energy provision to rural enterprises is expected to boost traditional rural economy through the provision of a key factor to production. In such way, many in farm activities such as ploughing, weeding, tilling, grinding, etc. can become more productive and efficient. Likewise, off farms activities in rural economies can be improved if affordable and secure energy is advanced. Brick makers, bakers, artisans, etc., all of them could increase and add value to their productions if energy was to be accessible. The third kind of opportunities, i.e. advancement of Millennium Development Goals, could occur if access to modern energy was to be supplied to the 2.6 billion people who currently depend on traditional biomass to satisfy their basic needs. In this sense, energy provision could particularly contribute to the fulfilment of poverty and hunger eradication (MDG1), and could collaborate in the reduction of child mortality and the improvement of maternal health (MDG4). Satisfaction of energy related needs, e.g. cooking, heating, pumping and boiling water, etc. could all be met in a healthier, more efficient and less environmentally destructive way. Millions of deaths caused by malnutrition, respiratory infections and water borne diseases could be prevented. In addition, millions of people who do not attend to school or participate in more productive activities because they are engaged in fire wood collection, in processing staples food and of cooking, could do so if affordable and secure energy was to be provided. Finally, much of the environmental impact that wood collection brings about could be avoided if access to modern energy was enabled.

Encouraged by the promise detailed above, and by the fact that global commercial biofuels production has doubled in the last five years and is likely to double again in the next four as a response of developed countries demand, a significant number of developing countries where large biomass production potential exists, set sail to the promised land of biofuels. From such actions, it appears that they are confident that through a development of the national biofuels sector boosted by the increasing demand, they could benefit from building up a valuable export market, while reducing their dependency on expensive oil imports and promoting rural development at the same time.

On of these countries is Honduras who launched an aggressive "mega agro-industrial biofuels initiative" in early 2006. Through this plan, the government seeks to create 100 000 direct and 200 000 indirect new jobs. In addition, the country seeks to reduce its total dependency on

expensive imported oil and the burden oil bills suppose to the Government's arcs. To reach these targets, the Government relies on existing African palm oil industry and infrastructure. Its plan is to add 200 000 new hectares of African palm oil plantings to already cultivated area, which presently covers some 90 000 hectares. In such way, the government expects to raise annual palm oil based biodiesel production from 20 500 m3/year to 757 000 m3/year in the long run. On the other hand, the government's mega project timely arrives at a time when Europe has set biofuels use binding targets for the transport sector and the US has officially recognized (and widely broadcast) their insecure and problematic dependency on Middle Easter oil supplies. As such, these circumstances could signify an exceptional opportunity for Honduras to build up a valuable cash crop based export market, even though the Government has not officially targeted such as an objective.

Expectations and hopes could however turn to be only theoretical, since biofuels opportunities are not straightforward and they need a set of enabling conditions to be met in order to make them happen. This is especially true in the case of rural development and local prosperity, where human, technical, physical and financial capacities and resources need to exist to an adequate level in order to allow rural poor to benefit. In this sense, biofuels can be thought as train leading to prosperity, helping people who get aboard to escape from hardships. However, to get on the train, people do not only require that the train runs near their home, they also need a ticket to ride; as such, they need enabling conditions that allow them to get on board. Therefore, it is important to elicit how realistic these expectations and hopes are on the ground. This because the reality may be such that the opportunities may not only vanish, but even worse, the apparent good intentions of the Honduran Government might translate the opportunities of biofuels into very real problems. In this vein, there is real potential that the new industry could actually destabilize developing and rural economies and even constituting a form of "resource curse". In this sense, large-scale shifts to commercial biofuels production could contribute to worsen food insecure contexts, trigger forced population displacement, exacerbate ecosystems destruction and contaminate soils and water.

Food scarcity as a result of biofuels production can occur if vast amounts of staples are diverted from food to biofuels production or if water and land are allocated for energy crops cultivation in detriment of food crops plantations. Likewise, food security could be at risk if expected stronger connections between the agricultural and the oil markets lead to higher food prices. Even though threats to food security at the global level are hard to image, biofuels production could certainly negatively impact local food security context. This is especially the case if biofuels are produced in previously food insecure regions or in situations where countries or households are net buyers of food or where no adequate policies to prevent biofuels negative impacts are implemented. Secondly, biofuels development as any other cash crops export oriented development can cause forced population's displacement. This in turn can provoke landlessness, joblessness, marginalization, and violation of human rights, among others. Moreover, forced population displacement frequently implies intimidation, population property destruction, dismantling of population's subsistence base, physical aggressions, groundless criminal accusations, forced evictions, and even murders. Forced displacement, is expected to occur especially in those regions were development induced forced displacement has already been experienced and where socio-economic inequalities are wide. Thirdly, biofuels development has the potential to negatively impact water availability and its quality. Additional irrigation and increased evapotranspiration could threaten water balance and consequently, negatively impact on populations and ecosystems, which are dependent on that. On the other hand, water quality can also be negatively affected during feedstock cultivation and biofuels processing. Wide spread use of organic and inorganic fertilizers contributing to eutrophication, river sedimentation, and water contamination can all be exacerbated by feedstock cultivation and biofuels production. Soils

can also be negatively affected by fertilizers use, compaction from heavy machineries use, deforestation, soil contamination, etc. Finally, biofuels production can exacerbate ongoing process of deforestation and consequently, contribute to ecosystems degradation. It has to be considered that agricultural frontier expansion is already the most significant driver of terrestrial ecosystems change, and as such, biofuels feedstock cultivation, could constitute a new pressure on vulnerable ecosystems that at the end will lead to ecosystems degradation, habitats transformation and fragmentation, and biodiversity loss. As a result of all these, it also becomes essential to understand what challenges and implications biofuels development could present for the rural poor and the environment.

Through an analysis of available secondary data and of stakeholders' perspectives, this study sought to understand the opportunities and challenges that palm oil based biodiesel offers to rural poor in Honduras. As such, this thesis is set to answer: a) how realistic are opportunities offered by biofuels development for rural poor communities in Honduras, b) what are the challenges and implications biofuels production is likely to present to rural poor and the local environment, and c) where does it appear that the benefits of biodiesel development will accrue.

Findings showed that palm oil based biodiesel is likely to contribute to the creation of new employment opportunities. These are likely to occur in association to the farming sector and close to the areas where plantations are and will be located. It is however unlikely that created jobs in the palm sector contributes to alleviate rural poverty as it was observed that poverty in rural Honduras was mainly caused by low job earnings and not by unemployment. When jobs earnings from the palm sector were analyzed in order to understand how much these would contribute to alleviate poverty, it resulted evident that these will not contribute much. Even if the most optimistic opinions (claims that express the highest amount for salaries in the sector) were considered, it resulted that jobs earnings in the palm sector were low to a level where they do not enable access to the basic shopping and food baskets1. In addition, findings demonstrated that enhanced capital turnovers for small-holders (those who own a plot bigger than 5 hectares) were likely to be marginal, temporary and risky. Monopolized oil palm production chain and powerful palm oil holdings reduce small holders' chances to have real gains. In addition, the existence of "coyotes" (intermediaries) between large holdings and small producers strips the latter from their already modest gains. As such, biodiesel development does not seem such an attractive solution. On the other hand, findings showed that the rest of rural residents, that is to say, the truly poor peasantry, will not benefit since 55% of them subsist on less than 2 hectares, i.e. on less than the minimum legal requirement for accessing credit facilities from the Government and being able to participate in palm expansion; and the remaining peasantry (45%) will not either as they remain landless. On the other hand, findings showed that palm oil based biodiesel produced in Honduras is not likely to remain in rural areas as it is mainly intended to satisfy transport related needs. As a consequence, produced biodiesel is not likely to help boost traditional rural economy to a significant level where local economy blooms and surely will not contribute to advance MDGs since biodiesel will not be devoted to cooking, heating or to pumping and disinfecting water needs satisfaction.

On the other hand, findings showed that many of the potential threats biofuels can pose on the local communities and the local environment are likely to occur in rural Honduras. Exacerbation of the food scarcity context of the country is likely to occur as already exists competition over arable land between palm and food productions. In this sense, evidence

[1] Access to basic food basket and to basic shopping basket are the criteria for determining extreme poverty and poverty respectively.

show that people are abandoning traditional crops cultivation e.g. bananas, maize, cassava, etc. to plant African palm and consequently, they provoke the destruction of the food subsistence base. On the other hand, incomes generated from palm cultivation seem to be short-term guarantied, highly dependent on external factors (the existence of a monopolized market and of a chain of ambitious intermediaries that water down small holders' expectations) and marginal. Therefore, these incomes might turn out to be scarce to even guaranty access to food down the road. In addition, it was found that a very high percentage (55%) of the peasantry practice subsistence farming and some of them are located precisely in those areas where palm cultivation is likely to occur. If palm expansion occurs, it could put at risk the livelihoods of millions of peasants and threaten their access to readily available food without providing them any good opportunity in exchange. Lastly, it was found that oil palm expansion is likely to exacerbate food scarcity because the country already presents a food insecure situation and because it is already vulnerable to raising and fluctuating prices of the food international sector.

Even more, it was found that palm oil based biodiesel production has the potential to trigger forced population displacements. Even though in Honduras most rural migration responds to economic and environmental causes, and that in general African palm expansion responds to voluntary migrations where powerful holdings move forward, buy land to small producers and expand palm plantings palm could also provoke forced population displacement,, since such kind of events has occurred before in the country and it has even happen in relation to palm cultivation. Moreover African palm expansion is likely to occur in where peasants families live and practice subsistence agriculture, displacements cannot be ruled out.

With regards to water and soils impacts it was found that palm plantings by themselves do not seem likely to negatively affect water resources availability in Honduras. Nevertheless, water quality could be highly impacted by the great use of agrochemicals agriculture and by river and coastal sedimentation originated as a result of soil erosion and deforestation. On the other hand, it was found that African palm expansion is likely to contribute to soils impacts caused by the large amount of agrichemicals use in palm cultivation and by deforestation leading to soil erosion. If ecosystems degradation is considered, findings showed that this kind of impact is very likely to occur as deforestation will probably be intensified in order to expand palm plantings. Reasons behind this claim comprehend the fact that agro-business cash crops expansion is already the number one cause of deforestation in the country, secondly, the fact that African palm cultivation has already caused deforestation and subsequent ecosystems degradation in other countries, and most importantly, the evidence shows that experienced increase in palm fruit and palm oil productions in the country have occurred as a result of an expansion of the cultivated area, and in no case, as a consequence of agricultural intensification.

Based on these findings the study concluded that the potential opportunities palm oil based biodiesel could offer to rural poor communities in Honduras are unlikely to happen: though new employment opportunities are likely to occur, these do not seem to have a significant impact on poverty alleviation. Moreover, smallholders' benefits seem to be marginal, temporary and highly dependent on external factors. Even more, as produced biodiesel is not going to remain in rural areas, rural poor themselves are not likely to enjoy any of the benefits biodiesel production could deliver to them in terms of boosting the local economy and contributing to the achievement of the MDGs. On the other hand, palm oil based biodiesel is likely to worsen already insecure food context, to trigger sporadic forced population displacements, to negatively impact on soils and water quality and to exacerbate ecosystems degradation processes. As such, the net balance of palm oil based biodiesel production seem

to be negative for rural poor people in Honduras and for the local environment and it appears to be positive for large holders who can really participate in the development.

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1 Introduction

1.1 Background and problem description

Today, biofuel[2] industries are emerging in forms that can offer some unique opportunities to help ameliorate some of the most complex and urgent problems that our generation faces. Several reports state that when produced and utilized well, biofuels can help combating climate change, cope with the emerging energy crisis and also serve to advance rural development for millions of rural poor who could benefit from this new development (UN-Energy 2007, Hazell and Pachauri 2006). However, the same studies also warn that these opportunities are not straightforward. Moreover, they note that the net balance of such biofuel initiatives could even be negative for society and the environment as biofuels production can also serve to threaten food security and contribute to vulnerable communities' displacement, disruption of local economies, deforestation, habitat loss, ecosystems degradation, etc. (UN-Energy 2007, Hazell and Pachauri 2006 and Dutch Ministry of Economic Affairs 2007). As a result, biofuels have become one of the most controversial and debated topics in the scientific and political arena where experts, politicians and society as a whole ask "are biofuels actually a good idea at all?" (Peskett *et.al.* 2007, Hall 2006, de Fraiture *et. al.* 2007 and Pimentel 2003)

Arguments favoring biofuels development include biofuels' potential to partially replace fossil fuels and contribute in such way to reduce carbon dioxide (CO_2) emissions, or to be more accurate, their potential to offset anthropogenic carbon emissions. The rationale of this claim lies on the fact that biofuels are in principle CO_2 neutral since carbon emissions released during biofuels' combustion have been previously taken up by green biomass during the photosynthesis process. A different reason for supporting biofuels has been found in emerging global energy crisis (Hazell and Pachauri 2006 and UN-Energy 2007). According to those reports, biofuels have the potential to enhance energy security by coping with growing primary energy demand; which is expected to increase by 50% from current's 418 EJ/year by 2025 (Hazell and Pachauri 2006). This growth, in conjunction with limited fossil resources, political instability in major oil producing countries and escalating oil prices, have all imposed on governments and markets the need to find new alternatives to meet growing energy demand. As a consequence, biofuels have been pointed out as an excellent chance to achieve energy security (Johansson *et. al.* 1993 and UN-Energy 2007). Another key argument for supporting biofuels has been perceived in their potential to advance rural development and contribute to poverty alleviation efforts in those developing countries[3] where significant biomass growth potential exits (UN-Energy 2007, Peskett *et. al.* 2007 and Von Braun and Pachauri 2006). In this sense, biofuels development is not only expected to provide employment and alternative income opportunities in rural areas; but also to contribute to the

[2] In this thesis the term biofuels encompasses modern liquid fuels refer generated from biomass, which are produced and used efficiently and cost-competitively (Larson and Kartha, 2000).

3 For the purpose of this thesis, Developing Countries refer to those states that can be classified into any of the following World Bank's categories: Heavily Indebted Poor Countries (HIPC), Middle Income Countries (MIC), Low Income Countries Under Stress (LICUS) and Small States. Simply speaking developing countries meet the following criteria: a) the majority of their population makes far less income and/or has significantly weaker social indicators than the population of high-income countries [World Bank web site: http://go.worldbank.org/N174APV2T0 (visited on February 6, 2008). Honduras is considered a Heavily Indebted Poor Countries (HIPC).

rural economy by providing a critical input (energy) to rural enterprises. Moreover, biofuels production could enhance access to energy for some of the 2.4 billion people who currently rely on traditional biomass fuels for cooking and other basic energy related needs (Modi *et. al.* 2006). As such, energy provision and income opportunities are key entry points to Millennium Development Goals' (MDG)[4] fulfilment (Larson and Kartha 2000).

Encouraged by the promise detailed above, and by the fact that global commercial biofuels production has doubled in the last five years and is likely to double again in the next four as a response of developed countries` demand (UN-Energy 2007), a significant number of developing countries where large biomass production potential exists, set sail to the promised land of biofuels (Hazell and Pachauri 2006 and UN-Energy 2007). From such actions, it appears that they are confident that through a development of the national biofuels sector, they could benefit from building up a valuable export market, while reducing their dependency on expensive oil imports and promoting rural development at the same time.

One of these countries is Honduras, located in Central America, between the Pacific Ocean and the Caribbean Sea. Honduras, attracted by the above-mentioned opportunities, launched an aggressive "mega agro-industrial biofuels initiative" in early 2006 (Rothkopf 2007). Through this plan, the government seeks to reduce its total dependency on expensive imported oil (Government of Honduras n.d.) which resulted in payments of up to USD 1 billion in 2006 according to the information provided by the Central Bank of Honduras (Ribeiro Gallo 2007), a figure that amounts to 63% of all its export value for the same year (Starkman 2008). Equally important for the Honduran government, is to advance rural development (Starkman 2008) for some of the 1.6 million rural poor who live in the country (International Fund for Agricultural Development 2007). It is indicated that this goal is expected to be achieved through the creation of 100 000 direct jobs and 200 000 indirect new jobs (Government of Honduras n.d.). To reach these targets, the government relies on existing African palm oil industry and infrastructure[5]. It seeks to add 200 000 new hectares of African palm oil plantings (Government of Honduras n.d.) to already cultivated area that presently covers some 90 000 hectares (Rothkopf 2007). In such way, the government expects to raise annual palm oil based biodiesel production from 20 500 m^3/year to 757 000 m^3/year in the long run[6] (Rothkopf 2007). On the other hand, the government's mega project timely

[4] The Millennium Development Goals (MDGs) are the eight world's main development challenges that countries have committed to attained by 2015. The MDGs are drawn from the actions and targets contained in the Millennium Declaration that was adopted by 189 nations and signed by 147 heads of state and governments during the UN Millenium Summit in September 2000. [UNDP web site: http://www.undp.org/mdg/basics.shtml (visited on February 6, 2008)].

5 In the country there are also 5 private small jatropha projects that in total cover 2 000 hectares. Most of these projects take place in dry tropical areas of the country and are pursued in the frame of community development related programs, in which several international development agencies and local NGOs participate (FUNDER?)

6 The terms medium and long run frequently appear in the regional and national reports I have looked at in this thesis; however, no clear period is stated. Similarly, interviewees, do not express clearly what they intend to convey by the expression "medium or long run". Nevertheless, in my opinion, the context in which the terms are used intend to signify 3 to 5 years in the case of "the medium run" and 8 to 12/15 years in the case of "the long run".

arrives at a time when Europe has set biofuels use binding targets for the transport sector[7] and the US has officially recognized (and widely broadcast) their insecure and problematic dependency on Middle Easter oil supplies[8]. As such, these circumstances could signify an exceptional opportunity for Honduras to build up a valuable cash crop based export market, even though the Government has not officially targeted such an objective.

Expectations and hopes could however turn to be only theoretical, since biofuels opportunities are not straightforward and they need a set of enabling conditions to be met in order to make them happen (UN-Energy 2007 and Peskett *et. al.* 2007). This is especially true in the case of rural development and local prosperity where human, technical, physical and financial capacities and resources need to exist to an adequate level in order to allow rural poor to benefit (UN-Energy 2007). In this sense, biofuels can be thought as train leading to prosperity, helping people who get aboard to escape from hardships, however, to get on the train, people do not only require that the train runs near their home, they also need a ticket to ride; as such, they need enabling conditions that allow them to get on board.

For any assessment of how likely this is to happen, it is important to elicit how realistic these expectations and hopes are on the ground. This is because the reality may be such that the opportunities may not only vanish, but even worse, the apparent good intentions of the Honduran government might translate the opportunities biofuels offer into very real problems. In this vein, there is real potential that the new industry could actually destabilize developing and rural economies and even constitute a form of "resource curse[9]". In this sense, evidence is growing that large-scale shifts to commercial biofuels production are contributing to displacement of rural poor, destruction of valuable forests, pollution of vital water bodies, threats to food security, disruption of agrarian social systems and influx of migrant worker populations. Such impacts have been clearly documented in countries such as Malaysia and Indonesia (Peskett *et.al.* 2007, Devisscher 2007 and Hall 2006). Consequently, it also becomes essential to understand what challenges and implications biofuels development could present for the rural poor and the environment.

Anticipating these appears to be even more crucial in the case of Honduras since in the country is at the very start of the process. Unlike in Malaysia and Indonesia, where plantings already total many millions of hectares and where very significant social and environmental damage has already being ensued (WWF 2007 and Devisscher 2007), the industry is in a much earlier form. As such, it seems reasonable that if adequate criteria for sustainable production

7 The European Union (EU) has set ambitious targets in regards to renewable energy consumption in the transport sector, which requires that a minimum proportion of (5.75%) of biofuels and other renewable fuels are placed by Members States in their domestic economies by the end of December 2010.

8 President Bush warned that US dependency on Middle East oil is insecure and problematic for the country since only 35 % of the oil distillated in US refineries comes from domestic sources, whereas the rest (65%) comes from foreign countries like Saudi Arabia, Mexico, Venezuela and Canada. Subsequently, he made a call for "be[ing] aggressive about finding alternative sources of fuel" (President George W. Bush' speech at the 16 th annual Energy Efficiency Forum 2005)

9 The resource curse phenomenon refers to the incongruity that countries or regions with abundant natural resources often are inclined to have less economic growth than countries or regions that do not count on those resources. Reasons for this phenomenon are loss of competitiveness of other sectors of the economy, government mismanagement, etc. (Stiglitz 2005).

and local prosperity are implemented, then a number of common problems could be avoided and biofuels could actually help to advance development in the forms desired within the Millennium Development Goals (UN-Energy 2007). Moreover, to answer these in the case of Honduras becomes essential as at least in theory the possibility exists that biofuels consumption occur abroad and so that externalities and benefits from such development could potentially be shouldered and enjoyed disproportionably by different groups in society or even by different societies[10].

1.2 Objective and research questions

Objective: To understand the opportunities and challenges that palm oil based biodiesel offers to rural poor in Honduras

Research Questions:

1. How realistic are opportunities offered by biofuels development for rural poor communities in Honduras?

2. What are the challenges and implications biofuels production is likely to present to rural poor and the local environment?

3. Where does it appear that the benefits of biodiesel development will accrue?

1.3 Scope, limitations and definitions of key terms

The scope of this thesis is limited to palm oil based biodiesel commercial production and use to the extent it affects rural poor communities in Honduras. As, biodiesel commercial production has not begun yet, opportunities and challenges cannot be verified on the ground for that product as such. However, as biodiesel production largely depends on multipurpose palm oil commercial production and the diesel production as such does not constitute a significant variant from the main process, opportunities and challenges are studied for the former as a proxy. In addition, specific opportunities biodiesel as an energy carrier could offer to local communities are also analyzed. Opportunities and challenges are analyzed with respect to those rural poor who live and work in those areas where palm oil cultivation and oil processing currently take place. Atlántida, Yoro, Cortés and Colón. In addition, opportunities and challenges for prospective areas of expansion are also examined, i.e. the department of Gracias a Dios (La Moskitia region). (See Figure1-1).

Some of the limitations affecting this research refer to the impossibility to attribute certain impacts of palm oil production, e.g. soil erosion and rivers sedimentation, only and exclusively to such development, since these impacts respond to multiple and concomitant causes. Another limitation refers to the impossibility to analyze all the opportunities and challenges that biofuels development could have on rural poor and the local environment. Consequently, only direct, apparent and often cited opportunities and challenges are discussed. Lastly, though enabling conditions necessary for rural poor to benefit from biofuels development is not the focus of this thesis and therefore, they will not be studied in depth, an explicit mention of them through the text will be attempted as these conditions explain why theoretical opportunities offered by biofuels are realistic or not in the Honduran case.

[10] Those distributional aspects of environmental benefits and burdens (externalities) are of key concern in Environmental Justice Theory.

For the purpose of this thesis, by "rural poor" it is meant: people who show the three (3) following characteristics: a) live in a farmstead or a group of houses containing less than 2 000 people, separated by farmland, pastures, shrubs, etc., b) spend most of their working time in agricultural, gathering, fishing or agro-forestry activities and c) count on a income below of the Honduran National Poverty Line. The two first features refer to the "rural phenomenon" and the last one tries to capture the meaning of poverty[11]. The conceptualization of the "rural phenomenon" corresponds to the working definition used by the Honduran National Institute of Statistics (Instituto Nacional de Estadísticas) who draws the line of urban and rural populations in 2 000 inhabitants (SERNA 2005). In addition, the Institute uses the following complementary criteria in order to characterize an urban population and by default a rural population:

a) Existence of pipelines network for the provision of drinking water service,

b) Existence of a primary school facility,

c) Regular transportation service by roads or railway,

d) Existence of a post office or at least one of the following services: public lighting, electricity access, waste water pipelines network or public health center (SERNA 2005).

As a complementary criterion to that, the thesis has added the following one: "livelihoods strategies performed" in order to accommodate the latest trends in the international arena (International Fund for Agricultural Development 2001). Likewise, when characterizing poverty, the National Poverty Line[12] criterion has been preferred since that responds to the national and regional perception of poverty and it reflects the real purchasing power of the

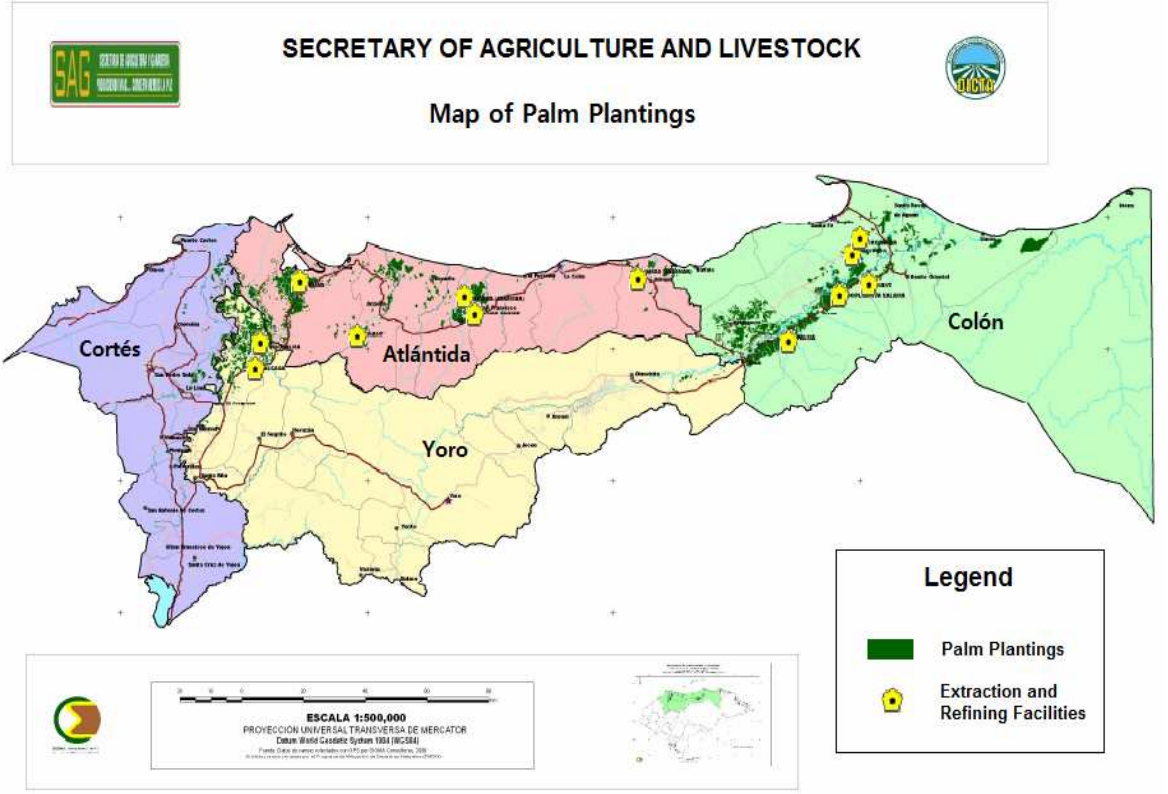
11 The author however, recognizes that definitions of "rural population" and of "poverty" are over simplistic and do not capture the multiple dimensions those conceptual categories have, especially in the case of depravation and wellbeing. In this sense, poverty is not an objective category that can be diagnosed by impartial observers (Colchester et. al. 2006), but on the contrary, it is a characterization that can be differently placed in by different subjects, i.e. one self, the government, the others in general. Likewise, poverty and extreme poverty are multidimensional phenomena that entail economic and social exclusion and discrimination, lack or limited access to education, health or other essential services and a level of income that hinders access to goods and services that satisfies basic needs (Quijandría et. al. 2001). However, such delineation corresponds in the case of "the rural" to similar international indicators widely used by developing agencies in order to allow comparisons (International Fund for Agricultural Development 2001) and it in the case of "poverty" to national perceptions on the topic (Sistema de Naciones Unidas en Honduras 2003)

12 The National Poverty Line defines the threshold of poverty. Those whose income do not allow them to economically access a basic shopping basket that includes selected food items and basic services are considered to be below the national poverty line and thus are categorized as poor. The basic shopping basket is 1626 Lempiras/capita/month (USD 85 /capita/month) (INE 2007). In addition to that, it also exists an extreme national poverty line that is defined by the economic access a person has to a basic food basket. Those who cannot access the basic food basket are considered extremely poor (Sistema de Naciones Unidas en Honduras 2003). The basic food basket only comprises necessary food items that provide 2 200 calories/person/day. The Honduran basic food basket for a family of 5 people was estimated on 4 809 Lempiras (USD 252) per month as of October 2007 (El Heraldo Honduras 2007).

population. In any case, it is worth to mention that the Honduran National Poverty Line is more stringent that other international based poverty thresholds[13].

For all values given in Lempiras the exchange rate considered for conversion to USD is that of the month of April 2008 informed by the Central Bank of Honduras unless otherwise is expressly stated. In April 2008, the exchange rate was of 19 Lempiras /USD 1 (http://www.bch.hn/esteco/ianalisis/proint.xls).

Figure 1-1 Map of palm plantations and extraction and refining oil facilities in Honduras



Source: adapted from Secretaría de Agricultura y Ganadería de Honduras. Dirección de Ciencia y Tecnología Agropecuaria (DICTA)

1.4 Methodology and justification

The research was initiated with a preliminary review of existing literature on biofuels opportunities and challenges (UN Energy 2007, Von Braun and Pachauri 2006 and Dutch Ministry of Economic Affairs 2007), followed by a review on existing literature on sustainable rural livelihoods in order to understand necessary preconditions for such outcome (Chambers and Conway 1992, UK Department for International Development 2001 and Scoones 1998).

[13] Honduras requires a greater access to food and basic services in order not to consider a person as poor; whereas some other international measures, e.g. the poverty line set in USD 2/person/day is less stringent and consequently, many who would not be considered poor under this international standard are according to the Honduran characterization.

Knowledge on the Honduran biofuels potential and particularly, on palm oil based biodiesel, was mainly gained from studies and reports done on the topic by the Inter-American Development Bank (IADB) and the UN Economic Commission for Latin America and the Caribbean (ECLAC) (Ribeiro and Waldyr 2007, Rothkopf 2007 and Horta Noriega 2004).

Primary data collection on the Honduran National biofuels plan was obtained from the official web page of the Honduran Government (www.biocombustibles.gob.hn) and from interviews with Honduran Presidential Advisor Ambassador Moisés Starkman and other national experts. In addition, information on the opportunities and challenges palm oil production has on rural poor and the environment was mainly obtained from interviews done to different stakeholders: national authorities, academia experts, NGO representatives, and representatives from the Inter-American Development Bank. In addition, data on rural employment and the reasons for poverty in Honduras were obtained from a comprehensive assessment conducted by Paes de Barros *et. al.* 2006. For eliciting opportunities and challenges, open ended questions were put forward to interviewees. In selecting questions, criteria were drawn from the literature on biofuels opportunities and challenges, on the reasons behind rural poverty in Honduras, on environmental problems affecting the country and on the National Biofuels Plan. The identity of two of the interviewees is not disclosed in order to avoid inconveniences for themselves and the work they do. They are identified in the Thesis as informant A from NGO A and as informant B from NGO B.

1.5 Outline

The following paragraphs offer a brief description of the contents found in each chapter of this Thesis:

Chapter Nº 2 introduces the reader to the potential opportunities and challenges biofuels development could present.

Chapter Nº 3 portrays an overview of rural poverty in Honduras and explains the reasons behind such phenomenon. It also offers a description of the main environmental problems Honduras suffers. Next, Honduran National Biofuels Plan is presented.

Chapter Nº 4 provides stakeholders' perspectives on the opportunities and challenges palm oil based biodiesel presents for rural communities in those areas where palm cultivation is likely to occur.

Chapter Nº 5 offers main findings concerning opportunities and implication biodiesel could have in the country based on the analysis of stakeholders' perspectives and secondary data collection. Next main findings are discussed and interpreted in light of the potential opportunities and challenges portrayed and analyzed in Chapter Nº 2. Lastly, conclusions and answers to research questions stated in Chapter N 1 are presented.

2 Theoretical review: opportunities and challenges of biofuels

As previously stated, there are many sources that indicate that biofuels could offer great opportunities for combating climate change while also helping manage current energy crises, which can be characterized by a growth in energy demand, limited availability of fossil fuels and rising energy prices (UN-Energy 2007, Hazell and Pachauri 2006, Peskett *et.al.* 2007). In addition, biofuels development appears to be an attractive strategy for advancing rural development and local prosperity in countries where significant biomass growth potential exists (Peskett *et. al.* 2007). However, these opportunities are not forthright; but on the contrary, they call for a set of enabling conditions if they are to become true (UN-Energy 2007 and Peskett *et. al.* 2007). Some of these preconditions refer to the existence of an adequate capacity building platform addressing information/knowledge related needs benefiting those rural poor who wish to engage in biofuels development (Peskett *et. al.* 2007 and UN-Energy 2007). Another condition relates to the extent in which rural poor participate in the different stages of the value production chain. In this sense, the broader their participation is, the more chances rural poor have to benefit (Hazell and Pachauri 2006). Others prerequisites pertain to the concrete possibilities rural poor have to access land, water and financial credit (UN-Energy 2007). Consequently, if these conditions and others do not exist on the ground, rural poor' expectations and hopes on biofuels do not seem realistic. Moreover, not only opportunities could vanish, but also rural poor could be worse off as a result of biofuels development since biofuels production presents challenges and has implications that need to be anticipated and addressed. These local challenges include threats to food security, forced population displacement and ecosystems degradation just to mention a few (Dutch Ministry of Economic Affairs 2007). In addition, biofuels also have global implications that mainly refer to the carbon and energy balances. A review on biofuels opportunities and challenges will shed more light on the topic.

2.1 Opportunities

2.1.1 Combating climate change

Biofuels have been supported because they can partially contribute to combat climate change (UN-Energy 2007 and Hazell and Pachauri 2006). This claim lies on the fact that biofuels are in principle CO_2 neutral since carbon emissions released during biofuels' combustion have been previously taken up by plants during the photosynthesis process. As a consequence, released CO_2 does not build up in the atmosphere and therefore, it does not contribute to climate change (Hall *et. al.* 1993). However, biofuels carbon neutrality is not straightforward, but on the contrary, it depends on circumstances like chosen feedstock, locations, production processes, etc. just to mention a few (Hazell and Pachauri 2006). In addition to that, the carbon balance for biofuels is affected during biomass cultivation and biofuels production since oil, is consumed throughout the process as well, e.g. oil-fuelled machinery is used for land preparation, plantation, irrigation, harvesting, etc. In addition, biomass transportation, biofuels production and distribution, all demand oil utilization as well[14]. As a result, a

14 Moreover, during biomass cultivation other green house gases are also released, e.g. when fertilizers containing nitrous oxide (N2O) are produced and used, emissions that have 310 higher greenhouse potential effect than CO2 are released (Dutch Ministry of Economic Affairs 2007). Consequently, these impacts have also to be accounted for in the net balance of biofuels with respect to greenhouse gas emissions.

particular biofuel might turn out to be more damaging to the atmosphere in terms of CO_2 and other green house gases emissions than a fossil-based alternative if overall fuel life cycle production is considered.

Even more to the point, it is commonly agreed that biofuels global net CO_2 contribution will largely depend on two main factors: first, the amount and type of fossil fuels biofuels are called to replace and secondly, the land use that otherwise would have prevailed if bioenergy crops had not been planted (Kartha 2006). In this sense, Kartha explains: if a forest was to be cleared to provide biomass to a bioenergy facility and the site would be left nude, the CO_2 balance could well be negative since a sink for CO_2 storage has been destroyed. A different case, explains the cited author, would be given by a situation where a forest was to be cleared in order to plant energy crops that would be harvested seasonally in order to feed a facility; in this case, CO_2 released from deforestation would partially be compensated by the new plantations[15]. However, as the author recognizes, the local environmental impacts associated with deforestation, such as habitat loss and watershed protection are not considered in the CO_2 balance analysis; and consequently, they might outweigh the benefits from biofuels production. The third case, concerns a situation in which bioenergy crops are planted in already degraded lands (already deforested). In this case, not only the carbon balance would be positive, since not only biofuels would replace fossil fuels and deforestation would not occur at all, but also because the planted land would hold more carbon than a degraded nude land would (Kartha 2006).

Similarly, an early study by Marland and Marland (1992) compared the effectiveness of two alternatives in regards to CO_2 emissions mitigation potential. In the first option, trees for organic carbon storage were to be grown and conserve (forestry projects); whereas in the second one, forests were to be planted in order to later utilize the wood in a bioenergy facility. The study concluded that there were no hard and fast rules, and that a higher greenhouse mitigation potential depended on context specific factors such as rates of forest productivity, wood conversion energy efficiency, prior land use that otherwise would have prevailed, and the time scale under consideration. In fact, the study noticed that when the first two and the last one were increased, planting trees for wood utilization as a substitute of fossil based fuels was a good idea as this alternative had a higher CO_2 mitigation potential than growing trees only for carbon storage purposes.

On the contrary, Nguyen *et. al* (2007) demonstrated that substituting conventional gasoline by sugar molasses based ethanol would lead to an increase of roughly 25% or 31% in green house gas (GHG) emissions[16]. It was found that Methane (CH_4) from anaerobic pond treatment of distillery and carbon released during ethanol processing were the main responsible for this increase. In this case, the study showed that ethanol production had a negative GHG balance if compared to gasoline and consequently, it was not an acceptable option.

15 Rough estimations predict that an average forest (sequestration rates depends on the type of forest) sequesters around 300 tC/ha, whereas cropped land sequesters around 30 tC/ha. Consequently, if biofuels were to replace fossil fuels, compensating those extra 270tC/ha -which standing forests would have sequestered if not cleared out-, would take 45 years. This figure seems to support biomass production for biofuels production (Kartha 2006).

16 The figure depends on the chosen ratio for allocating emissions between sugar and molasses. The study not only considered the carbon balance but whole biofuels GHG balance.

In conclusion, different studies show that biofuels' positive carbon balance and more comprehensive GHG balance are not granted and that they depend on many circumstances, such as chosen feedstock, locations and production techniques, al of which, will determine the benefits of adopting a particular biofuels strategy. Even more, at an aggregate level, global CO_2 net balance will ultimately depend on two factors: the amount and types of fossil fuels biofuels will substitute and on the prevailing land use that otherwise would have predominated.

2.1.2 Securing energy

Though today's primary energy use is already significant (418 EJ/year), projections show that the energy demand is likely to grow by 50% by 2025[17] (Hazell and Pachauri 2006). Presently, this demand is vastly met by fossil fuels (79%) and in particular, by oil, which represents 35% of the total energy consumption (UNDP 2004). However, as fossil resources become more limited, political instability in major oil producing countries in the Middle East and Africa continues, and oil prices[18] escalate, biofuels become an excellent chance to achieve energy security through a reduction of oil imports and a diversification of domestic energy portfolio sources (Hazell and Pachauri 2006 and UN-Energy 2007). Even more to the point, in developing countries securing relatively affordable energy becomes an opportunity to reduce expensive oil bills[19] that prevent Governments to allocate economic resources to other priority areas (UN-Energy 2007).

Two key aspects deserve analysis in regards to biofuels as an opportunity to advance energy security: first, feedstock availability, i.e. if biomass resource base is adequate, that is to say, if it is plentiful; secondly, biofuels economic feasibility, i.e. if biofuels are competitive in economic terms. In relation to first one, the topic seems to be quite contentious, and so bioenergy/biofuels potential contribution remains unclear. In a review of 17 studies, Berndes *et. al.* (2003) tried to determine the potential contribution biomass could have in the future. They showed that conclusions from these 17 reviewed studies were significantly different. Some of them estimated a potential contribution of 100 EJ yr^{-1}; whereas others calculated that the contribution could be as high as 400 EJ yr^{-1} by 2050[20]. According to the same review, the difference in the results can be explained by examination of two crucial parameters: assumed land availability and yields in energy crop production.

Similarly, De La Torre Ugarte (2006) tried to demonstrate how much feedstock and land availability would be needed if we were to totally replace the 21 million barrels of gasoline and the 21 million barrels of diesel we utilize each day. He believes that in order to do so, 30 million barrels of ethanol and 23 million barrels of biodiesel respectively, would be needed. In terms of land requirements, potential ethanol and biodiesel demand would take an additional area of 300 million hectares of sugarcane and of 225 million hectares of palm oil respectively. Those figures correspond to about 15 and 20 times, in each case, of current world plantings of those crops. (De La Torre Ugarte 2006). To give a visual reference on how much land that

[17] Increasing global demand of energy is mainly driven by fast growing Chinese and Indian economies. China's energy consumption rose by 8.4% in 2006, totaling 1 698 million tonnes oil equivalent, representing 15.6% of total global primary energy consumption, as such, China has become the largest growing energy consumer at the global level. India, itself consumed 423 million tonnes oil equivalent in 2006; which represents a change of 5.4% over 2005, and accounts for 3.9% of total global primary energy consumption (British Petroleum 2007).

[18] In May 2008 the crude oil barrel rose to USD 135 [West Texas Intermediate (WTI)] in the New York Mercantile Exchange (BBC News 2008).

[19] Poor countries spend in imported oil bills as much as 6 times more than they do in domestic health programs or twice as much as they invest in poverty reduction initiatives(UN-Energy 2007).

[20] Total energy demand for the same year is predicted to total 561 EJ/year (Johansson et. al. 1993).

would mean, it would be helpful to think that in the case of ethanol it would demand an area a little bit smaller than the one of India and in the case of biodiesel, planting would expand in an area as extensive as the territory of Sudan, the largest country in Africa.

As for biofuels' economic feasibility, it is worth bearing in mind that two drivers are the main responsible for biofuels competitiveness: fossil fuels and agricultural feedstock prices (Von Braun and Pachauri 2006). The first factor is easily explained by the fact that biofuels partially emerge as an answer to high oil prices; as such, biofuels have to be economically competitive in regards to this commodity they come to partially substitute. In this sense, biofuels become competitive at 2006 oil prices, which ranged between USD 60 and USD 70 a barrel (Von Braun and Pachauri 2006). Even more to the point, as De La Torre Ugarte (2006) indicates, Brazilian ethanol is already competitive, without any support from the government, at oil prices surpassing USD 35 a barrel. However, as the same author explains, the break-even point is difficult to define as it largely depends on feedstock prices, the local economy, logistics and energy conversion specific conditions. Nevertheless, he concludes, if oil prices continue to increase as it is expected to do and if new technology is advanced in the short-term, biofuels will become more and more competitive. The second factor to analyze in relation to biofuels economic competitiveness is feedstock prices. In this sense, as agricultural commodities prices[21] have kept decreasing for the last decades, biofuels have become competitive. However, it is also important to bear in mind that as biofuels demand increases, agricultural commodities prices will increase, and many types of biofuels (particularly first generation liquid biofuels) can become uncompetititive.

In conclusion, as long as oil prices continue to increase, biofuels will become more and more competitive; low agricultural commodities prices will among others, encourage that competitiveness. However, as biofuels become more and more demanded, feedstock prices will increase and that could hurt some of their competitiveness. On the other hand, as future feedstock availability remains obscure, due to uncertainties on future land availability and biomass productivity, biofuels potential as such is still controversial.

2.1.3 Rural development

Biofuels development offers opportunities for rural poor livelihoods through three main mechanisms: a) as a source of employment/income generation and increased capital turnovers, b) as a chance to advance a critical production input (energy) to other rural enterprises, and c) as a key entry point to Millennium Development Goals' (MDGs) achievement (Larson and Kartha 2000).

The first category can be divided for analytical purposes into two. The first one corresponds to employment and income opportunities that could emerge from feedstock production, handling, processing, distribution and marketing activities. The second one refers to the generation of increased capital turnovers for farmers as a result of increased agricultural yields and of the existence of an alternative market for agricultural yields and surpluses. With respect to first one, employment and income opportunities are expected to occur as a direct consequence of an increment in the demand of labour forces in the agricultural sector (Larson and Kartha 2000). In addition, as feedstock are heavy and bulky, a factor that limits cost efficient transport, processing facilities are likely to be constructed near to bioenergy plantations and jobs opportunities for local people are likely to occur. However, employment

21 Edible agricultural commodities such as sugar cane, maize, palm oil, soy, rape seed oil, etc. are also major biofuels feedstock.

opportunities are not straightforward and they might not realize if the level of agricultural mechanization is significant. For instance, in Argentina, biofuels employment opportunities in the agricultural sector are reduced because of the highly mechanized agricultural infrastructure the country presents (Wicke 2006).

On the other hand, biofuels could also enable enhanced capital turnovers since farmers could benefit from the creation of a second alternative market where surpluses can be commercialized (Larson and Kartha 2000). In addition, business risks rising from the existence of a single market are likely to decrease and rural poor in developing countries are likely to gain from the emergence of less distorted markets at the international level. Currently, poor farmers in developing countries cannot compete against artificially inflated prices that benefit agricultural goods produced in some developed countries where price-supporting measures are implemented. However, if agricultural production finds an alternative market, especially in these countries, surpluses are likely to disappear and so are price-supporting mechanisms hurting farmers from the South (De La Torre Ugarte, 2006). Nevertheless, in order for these benefits to occur, certain preconditions must exist, and consequently, if rural poor do not have access to land and to water, or do not count on adequate financial capital to face upfront investments, income opportunities are not likely to occur for them (UN-2007 and Peskett *et. al.* 2007). Yet more, if these conditions do not exist, the opportunities are likely to be captured by those who own the land, have access to water, are financially capable, etc.

In addition to employment opportunities and improved capital turnovers, biofuels could contribute towards rural development through the advancement of energy provision, a critical input to the rural economy (Larson and Kartha 2000). Today, many farmers rely on human or animal energy for in farm activities such as ploughing, weeding, tilling, grinding, etc. Moreover, they depend on rain for irrigation purposes and so agricultural yields are far from optimal. This, however, could be enhanced just by providing affordable and secure access to energy. Likewise, just by having access to energy, farmers could be able to switch to higher value crops and to improve animal husbandry, all of which would enable increased capital turnovers and employment opportunities for others (Modi *et.al.* 2006). Similarly, if off farms activities in rural economies were to count on reliable energy, capital turnovers would be improved (Larson and Kartha 2000). In this sense, energy supply has proven to be critical for brick makers, bakers, ceramics, artisans, etc., all of which can increase and add value to their productions when energy is accessible (Larson and Kartha 2000). Experience shows that in Mali, one of the poorest countries in the world, where almost no rural electrification exists, energy provision to rural enterprises has meant advancing a crucial input to rural economy and supporting a key entry point to human development. Modi *et. al.* (2006) exemplifies such beneficial impact by presenting the result of a previous study conducted by Anderson *et. al.* (2004). In 1993, the United Nations Industrial Development Organization (UNIDO) and the International Fund for Agricultural Development (IFAD) initiated a program aimed at providing a Multifunctional Platform (MFP) to rural villages in the country. The MFP is a 10-horsepower diesel engine that through different integrated components can perform as diverse activities as grain milling and de-husking to welding and water pumping. The MFP is owned and managed by women organizations who sell its energy services to community members who want to boost their precarious production. So far, after a decade of wide implementation, evidence shows that energy provision to rural enterprises has resulted in increased cash income, in enhanced nutrition parameters and in higher attendance to school as young girls and women are now more time efficient in daily domestic duties (Anderson *et. al.* 2004).

Thirdly, biofuels could contribute to rural development by enabling MDGs fulfilment for the 2.6 billion people who currently depend on traditional biomass to satisfy their basic needs

(UN-Energy 2007). In this sense, the key role that energy plays in poverty reduction and development advancement cannot be overstated. Indisputable evidence demonstrates that there is a direct relation between increased access to modern energy[22] and prosperity. Consequently, the more people climb in the energy ladder[23], the more welfare they experience. Inversely, the higher the HDI[24] of a country is, the higher the energy consumption levels appear to be (UNDP 2005). As such, biofuels could help advance MDGs. In particular, they could contribute to the fulfilment of poverty and hunger eradication (MDG1), and could collaborate in the reduction of child mortality and the improvement of maternal health (MDG4). In this sense, if rural poor would count on modern biofuels, they could better satisfy their cooking needs[25] and so nutrition levels would improve. In addition, if biofuels were accessible and affordable for rural poor, heating and cooking needs would be satisfied with lesser implications for human health. For example, respiratory diseases, a factor that remains the single most important cause of death in children under 5 years around the world, accounting for around 2 million deaths annually in this age group (WHO 2002), could be reduced if modern biofuels were supplied. Similarly, though the lack of energy services[26] is not gender specific, women and young girls tend to be the ones who suffer its absence the most since they tend to be in charge of cooking related activities and they usually do it in smoky stoves and indoor fires places[27]. In this sense, if biofuels were to be accessible, not only maternal health would be improved, but also child mortality would decrease as in most of the cases, when women are in the house, babies and children are with them under their care. In addition, as women and young girls in rural areas are in general in charge of fire wood collection, of processing staples food and of cooking; the lack of modern fuels particularly impacts on them. They lose the chance to attend to school or receive medical treatment or to participate in more productive activities that overall would enhance their wellbeing. Yet more, if biofuels were advanced in rural areas and mechanical power for irrigation and machineries use were enabled, agricultural yields would be likely to increase and so improved nutrition enabled and new sources of income would be expected. Finally, modern biofuels could provide a unique opportunity for advancing clean and safe water as they can be used to pump water and to boil it, as such; biofuels would help prevent up breaks of water borne diseases that yearly kill millions.

22 Modern Energy refers to more efficient and cleaner energy (UNDP 2005)

23 The energy ladder refers to the order of fuels in consideration to their efficiency, cost and "cleanliness" (UNDP 2005)

24 HDI (Human Development Index) is a summary composite index that measures a country's average achievements in 3 different aspects of human development: health, knowledge and a decent standard of living (UNDP website: http://hdr.undp.org/en/statistics/indices/hdi/question,68,en.html)

25 Biofuels could help to satisfy adequately cooking needs since nearly 95% of all staple food on which human nutrition depends has to be cooked before being eaten (UNDP 2005)

26 Energy services refer to the benefits energy provide: lighting, cooked food, clean water, mechanical power, etc.

27 It has been calculated that 60% of the 1.6 million annual deaths attributable to the fumes provoked by indoor biomass burning correspond to young girls and women (UNDP 2005)

2.2 Challenges

As it was seen previously, biofuels offer great opportunities to mitigate climate change, while securing energy access and advancing rural development. However, biofuels are not all roses as they also present several significant challenges. Simply speaking, biofuels require land and water, and in this sense, they compete with two other major users of these resources: food production and environmental preservation in its broadest sense (Raja opal *et. al.* 2007). In addition, biofuels development could threaten local communities, as population might be subject of forced displacement, human rights abuse, systematic violence, etc as a consequence of feedstock expansion. Moreover, biofuels have the potential to destabilize rural economies, prevent traditional sustainable livelihoods and exacerbate already precarious conditions under which many rural poor live (Peskett *et.al.* 2007, Devisscher 2007 and Hall 2006). For all these reasons, anticipating the challenges biofuels pose to local realities become essential since such development may turn out to be a "resource curse".

2.2.1 The food vs. biofuels debate

In the last years, several authors (de Fraiture *et. al.* 2007, Brown 2006 and Pimentel 2003) have pointed out that biofuels have the potential to become a major threat to food security. From the mentioned literature on biofuels, it seems apparent that biofuels could threaten food security if vast amounts of staples are diverted from food to biofuels production or if water and land are allocated for energy crops cultivation in detriment of food crops plantations. Likewise, food security could be at risk if expected stronger connections between the agricultural and the oil markets lead to higher prices in the food sector as a response to escalating oil prices.

However, the food vs. biofuels debate has been oversimplified and consequently, up to date, it remains unclear what the net food balance will be (UN-Energy 2007). What is clear though, is that food scarcity will be context specific and will largely depend on a conjunction of many factors and not only on biofuels development. These circumstances range from already existing food insecure context, to the degree in which national policies adequately address biofuels development and food insecurity, to the type of encouraged feedstock, to the particular setting i.e. whether rural or urban, to the specific farming systems in place, etc. (UN-Energy 2007). In these lines of thought, Rosegrant *et. al.* (2006), show that food vs. biofuels tradeoffs are likely to occur in a scenario where both, biofuels growth increasingly and no adequate investments are made in order to advance large-scale cellulose conversion technologies and/or higher productivity yields in food/energy crops. On the contrary, the study asserts that if large-scale second-generation technologies are timely introduced and investments are made so to increase agricultural yields productivity, these tradeoffs might not occur[28].

28 In first generation biofuels, ethanol is obtained through fermentation and biodiesel through esterification. In both fuels, only some parts of the crops are utilized for fuel generation; on the other hand, the technology process involved is more or less straightforward. In second-generation technology biofuels, rich cellulose biomass is converted into sugars (cellulosic ethanol) through bio-chemical processes that rely on enzymatic enhanced fermentation and woody biomass is converted into synthetic diesel through the Fischer-Tropsch synthesis process (UN-Energy 2007). The great advantage of second-generation technology is that non-edible plants and all the parts of the plant can be used to obtain biofuels, minimizing in such way competition between and food and the negative environmental impacts resulting from the expansion of the agricultural frontier (UN-Energy 2007).

On the same grounds, it is important to bear in mind that food scarcity is a complex and multi-causal problem; which can not be simplistically attributed to the absence of food. On the contrary, food insecurity can occur if at least one of the following four circumstances exits. The first situation in which biofuels could compete with food would be that where biomass production affects food availability: people might have the money to buy food, but there is not enough food to be bought, or at least not locally. This situation could happen if most agricultural yields or the resources needed to produce them (water, land, etc.) are diverted from food generation to biofuels production. Although, it is harder to imagine such scenario at the global level, food shortages at the local level are imaginable and can occur (UN-Energy 2007). The second reason that could lead to a competition between food and biofuels relates to food access, the most common and frequent of the four reasons leading currently to food shortages. Food scarcity generally occurs because people do not possess the necessary economic resources to purchase enough nutritious food. Access to food thus, is largely dependant on food prices; and consequently, an increase in the price of agricultural commodities resulting from exacerbated biomass demand for biofuels production, could lead to a situation where rural poor people starve because they cannot afford expensive food (UN-Energy 2007). In this sense, evidence already shows that prices of those agricultural commodities commonly used in the production of food and biofuels, e.g. sugar, maize, rapeseed, soybean and palm oil, have increased as a result of biofuels growing demand (UN-Energy 2007). Thirdly, food scarcity could occur because of unexpected and fast shifts in market prices. In this sense, it is worth mentioning that though agricultural commodities prices are already determined by expensive oil prices, e.g. fuelled machineries and fertilizers used in agricultural activities already affect the price of food; the impact that this market has on food prices could be even greater as the link between both strengthens (UN-Energy 2007). Finally, biofuels can affect food utilization if as a consequence of water diversion in an already water stressed region; concerned populations are impeded to properly utilize food nutrients (UN-Energy 2007).

In conclusion, though still is adventurous to predict what will be the impacts biofuels will have on global food security, at the local level effects seem to be clearer and trade offs are likely to occur. This is especially true if biofuels are produced in previously food insecure regions or in situations where countries or households are net buyers of food or where no adequate policies to prevent biofuels negative impacts are implemented. In all these cases, threats to food security are likely to occur and to overshadow the potential opportunities biofuels production could bring (Hazell and Pachauri 2006).

2.2.2 Population migration

One of the most alarming and heartbreaking outcomes biofuels development could cause is forced population displacement. Turton (2003) following the teachings of Richmond (1994) and Van Hear (1998) distinguishes between forced or compulsory displacement and unforced or voluntary migration. The second one is proactive (Richmond 1994), it entails more options, more choices (Van Hear 1998); whereas the first one is reactive (Richmond 1994), and in it, options are reduced and limited (Van Hear 1998). Despite of this distinction, it has to be admitted that these conceptual categories suppose a continuum that at moments gets blurry, since both phenomena contain some elements of coercion and of choice as even compulsory dislocations responds to a certain extent to rational decision-making or strategic choice (Robinson 2003). Development induced displacements corresponds to the second category, that is to say, to forced population displacement where options to remain are limited (Turton 2003).

Development projects often suppose dislocations of communities who used to live in the area to hand over the area to the developer. The phenomenon is not only widespread and increasing, but it also seems to disproportionally affect poorest and most marginalized sectors of society, while the benefits of such developments accrue to other privileged groups of society (Robinson 2003).

A type of projects that results in massive forced displacement is agricultural expansion. In this sense, in the biofuels field, evidence is growing that large-scale commercial biofuels development is the reason behind massive forced migration affecting poor farmers and ethnic minorities around the world. In El Choco, Colombia, the Afro-Colombian ethnic minority has reportedly been subject of coerced movement, persecutions and murderers by military and paramilitary groups linked to palm oil investors who want to expand palm plantations towards the land where people lived (Hall 2006). Immediately after black communities were forced out of their ancestral territories, the land was deforested, rivers were contaminated and precious species disappeared as a result of palm plantations expansion. At the end, many of these families ended up living in Bogotá's slums where there is not access to land to practice subsistence agriculture or possibilities to continue traditional lifestyles. Consequently, minorities' livelihoods, *modus Vivendi,* and unique culture have been threatened (Hall 2006). Likewise, things have not been easier for those Afro- Colombian who remained in the area in the hope of working as day labourers on the palm plantations. Colombian palm oil workers earn a pittance, receive vouchers instead of a wage (which can only be used in local expensive shops belonging to the palm oil companies) and do not count on any social or health security benefits as no legal contracts link workers to the companies (Hall 2006).

As the Colombian case demonstrates, biofuels development could constitute a new source of systematic human rights abuse. Development induced displacement could bring about food insecurity, forced migration to slums or to other countries, cultural disintegration and loss, persecutions, murders, etc. This could be especially true in cases where such practice, i.e. development forced displacement, has been common in the past or where recent history of systematic violence against vulnerable groups, human rights abuse, or civil unrest is still latent.

The consequences that such phenomenon could bring about are serious and complex. Robinson (2003) presents the following list of potential interrelated risks that forced displacement could bring about. To do so he builds on the teachings of Cernea, Muggah and Downing. The first seven risks were exposed by Cernea in 2000, whereas the eighth risk was described by the same author in 1996. The last two ones are drawn from Muggah (2000) and Downing (2002).

1. Landlessness: people become landless. This expropriation gives way to the main cause of impoverishment as people also lose the very foundation of their livelihoods strategies.

2. Joblessness: forced displacement entails the risk of loosing wage employment. Unemployment among displaced people often endures long after relocation has been completed.

3. Homelessness: forced displacement could result in permanent loss of shelter and/or downgrading of housing conditions. This tends to result in alienation and status deprivation.

4. Marginalization: people loss their economic power and perhaps even the opportunity to make a living by means of previously acquired skills. Economic marginalization is often followed by social marginalization manifested in a worsening of the social status of resettlers and by psychological marginalization expressed in a deep feeling of injustice and vulnerability.

5. Food insecurity: compulsory displacement increases the risk of temporary or chronic undernourishment.

6. Increased morbidity and mortality: forced population migrations often threaten health conditions as it induces social stress and psychological trauma. Moreover, many times populations are pushed to areas were no water supply and waste water collection systems exist and/or where risks of parasitic and vector borne diseases are higher.

7. Loss of Access to Common Property: For poor people who are prone to depend on open access to pasturelands, forests, water bodies, etc., massive displacement could entail a worsening of their income and livelihoods levels if they cannot access those resources where they resettle.

8. Social Disintegration: When massive displacement occurs social organization collapses. Production systems are dismantled, kinship groups are disorganized and scattered, informal social networks enabling livelihoods strategies are destroyed, traditional management systems tend to loose their leadership, commercial relations are impeded and cultural identity is lost when is closely related to spatial markers that are left behind.

9. Loss of Access to Community Services: massive displacement could entail the loss of access to health centers, educational facilities, etc.

10. Violation of Human Rights: Massive displacement is likely to entails violations to human rights. The right to freely establish a residence, to development and self determination, to participation, to receive fair compensation in case of property loss, to exercise freedom of speech, to culture, to worship, to livelihoods, to access education and health services, to corporal integrity and ultimately to life, are usually affected to different degree when massive displacement is undertaken.

In conclusion, biofuels development is likely to provoke in certain cases population displacements. Any or all of the above-mentioned consequences could be one of its outcomes. The phenomenon is however, likely to occur in regions where land concentration, conflicts over land and human rights violations are frequent.

2.2.3 Water impacts

Today's 2.8 billion people worldwide suffer from water scarcity[29]; 1.2 billion of them struggle against physical water scarcity[30], the remaining 1.6 billion seek to cope with economic water scarcity[31] (Molden *et.al.* 2007). Contrary to that which is commonly believed, the reason for water scarcity is not the lack itself of that precious resource, but water mismanagement. In this

29 Water scarcity is defined from a people centered perspective rather than from a hydrological perspective. As such, it is defined as the "lack [of] secure access to safe and affordable water to consistently satisfy [individuals'] drinking, washing, food production, and livelihoods needs (Molden et.al. 2007).

30 Physical water scarcity occurs when water resources are insufficient to meet all demands, including minimum environmental flow requirements (Molden et. al. 2007).

31 Economic water scarcity occurs when human and economic resources are insufficient to develop water resources available in the area, and as a consequence, available water is insufficient to meet all demands (Molden et. al. 2007).

sense, water in the Planet is plentiful to grow enough food for growing humankind, but water is frequently mismanaged and as a consequence, people become water scarce (Molden *et.al.* 2007).

Today, agriculture accounts for 65 to 70% of total water withdrawals[32] (Berndes 2001). This demand is however expected to continue rising as human population increases and new dietary habits emerge. Water demand from other sectors, i.e. industrial and domestic uses, is also expected to increase; therefore, existing conflicts over water use are likely to be exacerbated and new ones expected to arise. In the mentioned context, biofuels development implies a new source of water demand, and as such, it has the potential to threaten water availability and its quality. In this sense, emerging evidence shows that biofuels development has already resulted in a loss of livelihoods opportunities for poor fishers and gatherers in rural areas among many other detrimental impacts (Devisscher 2007).

2.2.3.1 Impacts on water availability during feedstock production and biofuels processing

During feedstock cultivation and biofuels production water is required. The impacts however, from both production phases are significantly different as significant water withdrawals are only required during feedstock production (Berndes 2001). In this sense, it is helpful to remind that energy crops can be irrigated, rain fed or dependent on a combination of both. Consequently, biofuels water demand has the potential to negatively affect the availability of water resources in two different ways: by means of claiming water resources and/or by increasing evapotranspiration (Berndes 2001). In the first case, irrigated crops could negatively influence water availability as they entail a new demand of water. In the second case, as energy crops expansion increases, the rate of evapotranspiration also does. As a consequence, rainfall is redirected away from infiltration and runoff and consequently, water balance of aquifers and water bodies could be negatively affected (Berndes 2001).

Today energy crops demand 44 km^3 (2%) of total irrigation related withdrawals in the agricultural sector and account only for an additional 100 km^3 (around 1%) of total crops water evapotranspiration (Fraiture *et. al.* 2008). However, if every national biofuels development plan was to be implemented, feedstock production would take 30 million additional hectares of land, an additional evapotranspiration of 170 km^3 and additional withdrawals of around 180 km^3 (Fraiture *et. al.* 2008) [33]. Though these figures might not seem significant at the aggregate level, especially in relation to food crops production which is projected to require 1400 million hectares, to evapotranspirate 7600 km^3 of water and to demand water withdrawals of around 2980 km^3(Fraiture *et. al.* 2008); at the local level impacts from feedstock production can be compelling. To illustrate the case, Fraiture *et. al.* (2008) show that in Europe, where rain fed rapeseed is cultivated, the amount of irrigation is insignificant. A similar case occurs in Brazil, where sugar cane is almost totally rain fed. On

32 Water withdrawal refers to water use that entails water to be moved from one location to another.

33 As a baseline to simulate water and land demand for biofuels feedstock production in the frame of food production, Fraiture et. al. (2008) use the optimistic scenario developed for the Comprehensive Assessment of Agricultural Water Management. This is an optimistic scenario that assumes a combination of strategies to meet food demand while minimizing additional water requirements. Under this scenario, one of the conclusion is that water resources are sufficient to meet food security, poverty reduction, and environmental goals simultaneously; provided the right policy and investment measures are implemented; however under this scenario, energy crops cultivation are not considered as a new source of water demand.

the contrary, in China, where 2400 litres are necessary in order to produce enough maize to obtain just one litre of ethanol; or in India, where 3500 litres of water withdrawals are necessary to obtain 1 litre of sugar based ethanol, water impacts are significant. Consequently, if China and India were to implement their national biofuels plans, they would require additional water withdrawals of around 35 km^3 and 29 km^3 respectively; a demand that seems difficult to meet in both countries as they already face regional and seasonal water shortages.

Feedstock cultivation impacts are context specific and they largely depend on the actual need of irrigation, on specific crop water requirements, on cultivation methods, on evapotranspiration at different growth stage and on different agro-climatic zones. Most importantly, feedstock cultivation impacts depend on previous existing water scarcity conditions.

Reduced water availability entails on the other hand, diminishing livelihoods options as local livelihoods strategies might be affected by the new development, e.g. production of other agricultural goods upon which locals depend on. Yet more, biofuels development as a new source of water demand, could compromise the adequate satisfaction of water related needs such as drinking, cooking, washing and cleaning necessities among others. In addition, valuable downstream aquatic ecosystems upon which locals depend on, e.g. for practicing traditional fishing, may be degraded or deteriorated as a result of water scarcity. Finally, other negative outcomes from a reduction of water availability include impacts on health resulting from stagnant waters, increased sedimentation and reduced nutrients deposition on floodplains and in coastal areas (Falkenmark *et.al* 2007).

Impacts on water availability can also occur during biofuels production. However, they are insignificant, if compared to those happening during feedstock production. In this sense, evidence shows (Varghese 2007) that maize based ethanol requires only 15.8 liters (4.2 gallons) of water per 3.7 liters (1 gallon) of ethanol produced in processing plants in the State of Minnesota in the US. Likewise, to produce 3.7 liters (1 gallon) of sugar cane based ethanol, only 79.4 liters (21 gallons) of water are required in San Paolo in Brazil. These figures, which seem negligible, are possible since water efficiency technologies have been implemented in producing facilities and are likely to continue improving.

In conclusion, biofuels production has the potential to negatively impact water availability during feedstock cultivation and biofuels production processes; though the bulk of impacts is only likely to occur during biomass growth. During this phase, both, additional irrigation and increased evapotranspiration can threaten water balance. This situation could be especially the case in regions where a previous water scarcity context exists (Berndes 2001 and Fraiture *et. al.* 2007).

2.2.3.2 Impacts on water quality water during feedstock production and biofuels processing

Water quality can be negatively affected during both, feedstock cultivation and biofuels processing. During the first phase, wide spread use of organic and inorganic fertilizers could contribute to increased levels of nitrates and phosphates; which in turn, by leaching into the soil and running off into water bodies, are responsible for water quality degradation, exuberant algae blooming, hypoxia, eutrophication, fisheries collapse and biodiversity loss (Falkenmark *et. al* 2007). Moreover, dangerous agrochemicals have the potential to mimic or block the correct functioning of hormones, undermining in such way, illness resistance and normal development (Falkenmark *et. al.* 2007). In addition, agricultural practices such as forests clearance, increases soil erosion, contributing in this manner, to rivers sedimentation.

On the other, during dangerous byproducts from biofuels production can end up in nearby recipient water bodies and in soils. In this sense, evidence on the impacts biofuels development can have on the quality of water is growing. Gunkel *et. al.* (2006) demonstrated how significant can be the impacts associated to sugar cane cultivation and ethanol processing in the Ipojuca River in Northeast Brazil. In this region, stillage, a rich organic matter fluid by-product generated during sugar and alcohol production, is deposited in sugar cane fields for irrigation and fertilization purposes; this process is known as fertigation (fertilization+ irrigation). Stillage, infiltrates into the soil and washes off into the Ipojuca River, causing a rise in water temperatures of about 2º to 3º C, acidification (due to fertigation low Ph levels), increased turbidity, increased BOD_5[34], oxygen imbalance and increased coliform bacteria levels.

In conclusion, biofuels development has the potential to negatively affect the quality of water during feedstock production and during biofuels production. Turbidity, acidification, eutrophication, biodiversity loss, ecosystems degradation and livelihoods opportunities loss are some of the negative outcomes such development is likely to have.

2.2.4 Soil impacts

Biofuels can negatively impact soils during biomass cultivation and biofuels production (Hazell and Pachauri 2006). For instance, harvesting practices, in which entire crops (complete plant) are collected and little organic matter is left on the field, prevent nutrients recycling and consequently, soil fertility and structure are affected. This could be the case of lands that depend on organic matter for fertilization purposes (Kartha 2006). On the other hand, if soil fertility depends on artificial fertilizers inputs for biomass growth, acidification problems could occur. Biomass cultivation could also bring soil compaction if heavy agricultural machinery is frequently used. This in turn could generate water infiltration problems and consequently, aquifers recharge might suffer. Moreover, soil erosion and related negative impacts such as desertification and river sedimentation are likely to happen. In addition, deforestation practices can lead to water logging[35]problems and so to soil degradation (Falkenmark *et. al.* 2007). Water logging can occur when the water input (irrigation or rain) is excessive and surpasses soil drainage rate. Water builds up in soil's profile, reducing soil fertility and impairing high productivity in such way. On the other hand, both, excessive irrigation and deforestation can cause salinisation. In the first case, in a process known as irrigation salinity, excessive irrigation leads to a disproportionate recharge of water table; as a consequence, salts are brought up onto the surface. In the second case, salinisation occurs as a result of changes in native vegetation in a process known as dry land salinisation. Since energy crops may have a lower evapotranspiration rate in comparison to previous natural cover, rainfall may become excessive. If that is the case, infiltrated water could raise the water table and result in salinisation. The opposite can also be true, as deforestation can lead to a decreased rainfall

34 BOD stands for Biological Oxygen Demand. It is a measure of the oxygen used by microorganism to decompose waste. If the amount of organic waste is large, present bacteria will also be significant and so the oxygen required to decompose organic matter (oxygen demand) will be high, decreasing oxygen concentration in the water.

35 Waterlogging represents excess amounts of water in the soil profile. It occurs when land is cleared off from native vegetation and water infiltration to the soil (either from rainfall or irrigation) begins to exceed evaporation or plant water use.

infiltration and so aquifers' water balance and water dependent ecosystems can be affected. Finally, certain practices such as fertigation in sugar cane cultivation can lead to toxic concentrations levels of potassium in soil (Korndörfer and Anderson 1997).

2.2.5 Ecosystems degradation

Land cover changes have been the most important driver of terrestrial ecosystems change over the last 50 years; with agricultural frontier expansion being the most significant of them (Molden *at al.* 2007). Biofuels feedstock production has, as any new agricultural development, the potential to exacerbate negative impacts agriculture already presents, i.e. deforestation, habitats transformation and fragmentation, and biodiversity loss (Hazell and Pachauri 2006). In this sense, bioenergy crops, which already occupy between 11 to 12 million hectares or around 1% of the total area under crop cultivation (Fraiture *et. al.* 2008), could entail a new threat to natural ecosystems. In Indonesia, for instance, where 6.5 million hectares of oil palm have been planted, 4 million hectares of rain forests have disappeared. This decline of forested areas is thought to be responsible for the reduction of at least 50% of orangutans'` habitats (Friends of the Earth 2005). Likewise, biodiversity is likely to suffer as habitats disappear. Wakker (2000) has demonstrated that 80 to 100% of the animal species inhabiting the Malaysian and Indonesian rainforests are not able to survive when natural habitats are substituted by oil palm plantations. In conclusion, biofuels development is very likely to provoke an expansion of the agricultural frontier and as such to negatively impact natural ecosystems.

3 Honduras

Honduras, bordered by Guatemala, El Salvador and Nicaragua and with coasts to the Pacific Ocean to the West and the Caribbean Sea to the North, is the second largest country in Central America with a total surface area of 112 492 Km^2 (Serna 2005). Geographically, Honduras is divided into the east and the west sections by the Central American Cordillera, which runs from North to South and reaches in some sections 2000 meters above sea level (m.a.s.l.) The Honduran climate is tropical, with an average temperature of around 26 º C and precipitation of some 3300 mm/year in the North Coast. Temperatures however decrease with altitude (16º to 26º C between the 600 and 2000 m.a.s.l.) and precipitation becomes scarcer in the southern part of the country (800 mm/year) (Serna 2005). Politically, Honduras is divided into 16 Departments.

Honduran population is small. According to the last census conducted in 2007, the population totals around 7 530 000 inhabitants. From this total, 4 105 500 (55%) live in rural areas (INE 2007). The country features a low population density with only 46 inhabitants/km^2, but population is unequally distributed (Federal Research Division 2006). Figures for the year 1989 showed that in the Department of Cortés, the most developed area in terms of agricultural and industrial production, population density was 188 inhabitants/km^2; whereas, in the Departments that conform the region known as La Moskitia, population density was just of about 2.5 inhabitants/km^2 (Federal Research Division 2006). This imbalance is partially explained by the fact that only 15% of the Honduran territory has agricultural potential as the remaining sections are mountainous. (Federal Research Division 2006).

Population growth is higher (2.5%) than the Latin American average (1.5%) (Serna 2005). As a result, the population aged under 18 is significant (48%); while people over 60 years old only represent 7.5% (INE 2007). Ethnically speaking, Honduran society is composed by 90% of mestizos (mixed people with European ancestry and indigenous roots), 7% of indigenous people, 2% of African descendents and 1% of whites (Federal Research Division 2006). Mestizos, whites and most blacks are culturally Ladinos, that is to say, they practice Hispanic cultural patterns and as such they speak Spanish and belong to the Roman Catholic Church. On the other hand, non-ladinos, Black Carib, Miskitios and other indigenous groups, keep on using their own aboriginal languages.

Honduras is a poor country. PPP[36] GNI[37] in 2006 was 23.9 billion international dollars and GNI per capita totaled some 2 420 dollars for the same year (World Bank 2007). Farming[38] is one of the most important sectors of the Honduran economy, ranking second[39] in terms of contribution to GDP (15%) (Paes de Barros *et. al.* 2006). The sector; however, continues to be

36 PPP means purchasing power parity, an international dollar has the same purchasing power parity over the GNI as US dollar has in the United States (World Bank 2007)

37 GNI is Gross National Income, it takes into account all production in the domestic economy, i.e. Gross National Product (GDP) plus the net flows of factor income such as rent, profits and labour income from abroad (World Bank 2007).

38 Farming in this thesis comprehends soil cultivation (agriculture), livestock ranching, poultry farming, fisheries, etc.

39 The first contributor to GDP is the manufacturing industry (19.6%) (Paes de Barros et. al. 2006).

the major source of export revenues (55%) (SERNA 2005). In addition, farming continues to be the most important employer (35%) (INE 2007). If economic activities within the farming sector are considered, national data show that 63% of the labour force is employed in agriculture[40], 11% in cattle farming, 8% in forestry, 8% in poultry farming and 6% in fisheries. The rest of farming workers participate in other minor activities such as hunting and apiculture (SERNA 2005). Agriculture in the country is oriented to exports and it is mainly based on bananas and coffee productions, although in recent years, production of other crops has also emerged.

3.1 Rural poverty in Honduras

Poverty[41] in Honduras affects 972 000 households (60%) (INE 2007). Average household is compounded by 5 persons in rural areas and by 4.3 in the urban setting (INE 2007). Deprivation is more severe in rural areas not only because most of Honduran population live in these areas, but also because 66% of rural households suffer from this phenomenon compared to only 55% which do in the urban context (INE 2007). In this sense, from the total poor population the country has, 71% reside in the rural setting (Paes de Barros *et. al.* 2006). Even more to the point, deprivation in rural areas can be characterized as extreme, [42] since 435 000 rural households (53%) cannot access the basic food basket (INE 2007).

Such levels of deprivation are largely explained by extremely uneven wealth distribution. In this sense, the welfare gap between the richest 10% and poorest 10% is of such magnitude that the country shamefully ranks fourth in terms of unfair wealth sharing (Sistema de Naciones Unidas en Honduras 2003). As such, the Honduran upper class, which constitutes only a small proportion of the people, monopolizes control over the politics and wealth. Concentration of large landed estates has permitted this class to earn its fortune. The phenomenon started after the World War II when cotton and cattle farming export oriented production boomed in the fertile valleys of the North Coast, and it has continued until now, despite of the land reform efforts made by different governments. This moment in history signalized the emergence of a new class structure and exacerbated earlier dispossession and displacement processes initiated at the beginning of this century by the two American bananas companies settled in the Central American region, the Chiquita Brand International[43] and the

40 Agriculture in this thesis refers exclusively to soil cultivation.

41 Poor households or people are defined in accordance to the Honduran National Poverty Line. Those households whose total income is not enough to access a basic shopping basket, which is compounded by food and other essential services, such as housing, education, health and transport, are considered poor. The cost of the Basic Shopping Basket in 2007 was calculated in 1626 Lempiras/capita/month (USD 85/capita/month at the national level; 2005 Lempiras/capita/month (UDS 104/capita/month) for urban areas and 1053 Lempiras/capita/month (USD 55/capita/month) in rural areas (INE 2007). More information on poor characterization is provided in Chapter 1.

42 Extreme poverty as a conceptual category comprehends those who cannot access the basic food basket, that is to say the necessary food intake plenty enough to satisfy nutritional requirements for an average level of physical and psychological activity. In 2007 the cost of the Honduran basic food basket was estimated in 856 Lempiras/capita/month (UDS 45 /capita/month) at the national level, 1027 Lempiras/capita/month (USD 53/ capita/month) for urban areas and 788 Lempiras/capita/month (USD 41 /capita/month) for rural areas (INE 2007).

43 Formerly known as United Fruit Company.

Dole Food Company[44] (Federal Research Division 2006). The middle class in the country is incipient and small. The occupations its members engage in are the main distinctive feature this class presents since salaries are very low too. As such, the middle class can be distinguished from the others as its members are professionals, students, merchants, business employees and civil servants. On the other hand, they do not exert real power in political decision making in the country (Federal Research Division 2006).

The lower class, mainly comprised of the rural poor, constitutes the vast majority of the country. Until the 1950s, this class enjoyed readily available land in the North Coast and in hilly areas. They used to practice subsistence farming. Their livelihoods however changed, when powerful land concentration holdings disembarked in the region to seize opportunities offered by the above-mentioned cotton and cattle farming. Consequently, most of the peasantry lost its land and moved towards the East to unpopulated forested areas. Others remain in the fertile North Coast in the hope to be employed by agro-business developments. Some others, instead, joined the nascent peasantry movement and constituted cooperatives enterprises that enabled them to meet a satisfactory throughput volume and to counterbalance the negotiation power enjoyed by big stakeholders. Finally, a portion of the peasantry moved into the cities, beginning in this way the ever exacerbated rural emigration process (Federal Research Division 2006). Today, most of rural residents in Honduras[45] are farmers, 55% of them subsist on less than 2 hectares of land and practice subsistence agriculture; while the rest is landless and work for wages in large estates or in small farms (Federal Research Division 2006). The typical case in rural Honduras is one of these two: either a peasant works at his father's plot, to later continue working at his own parcel and complements his meager income with seasonal employment compensations, or on the other hand, a man is landless and works for wage in temporary jobs in the farming sector.

The described situation has submerged the rural poor in the vicious circle of poverty and the peasantry experiences food insecurity, lacks potable water provision and safe access to energy, and features high illiteracy rates. If food security is considered, it is possible to assert that the unfortunate combination of meager rural incomes and low food productivity resulting from subsistence agriculture has provoked widespread hunger. In this sense, evidence[46] shows that hunger in Honduras is endemic, as the proportion of children suffering from this condition increased from 35% in 1991 to 36% in 2001. If this trend persists, by 2015 undernourished children in the country will represent 38% of the population (Sistema de Naciones Unidas en Honduras 2003). In rural areas however, malnutrition is even worse, since 42% of children who reside in these areas suffer from such condition compared to only 24% who are affected by it in urban areas. Even more to the point, Honduras is not producing neither importing enough staples to feed its population. The country's basic grains deficit rose from 52 800 metric tons in 1990 up to 462 000 metric tons in 2001, a figure equivalent to the yearly food consumption of 2.8 million people (Sistema de Naciones Unidas en Honduras 2003).

If other development indicators in rural areas are considered, it is possible to observe that illiteracy affects 30% of rural population and that only 23% of children aged between 12 and 18 years old attend school (INE 2007). Unfortunately, the contrary, that is to say, child labour, is very common. Figures show that in the rural setting 300 000 children aged between 5 and

44 Standard Fruit Company.

45 There are 4 105 500 inhabitants in rural areas according to the last census (INE 2007).

46 Children Malnutrition is used as a proxy indicator for total population malnutrition.

18 work, a number that represents 10 % of total child population of the country (INE 2007). If access to water is considered, 72% of the rural population enjoys the service, that is to say water provision as such; however only 12% of the rural population have access to safe potable drinking water (Sistema de Naciones Unidad de Honduras 2003). On the other hand, access to modern energy sources is deplorable. The country largely satisfies its energy related needs by burning wood (65%); this is especially the case for rural areas, where 75% of all gathered wood is used for domestic needs satisfaction and the remaining 15%, is burnt by small rural enterprises such as bakeries, brick makers, etc. (SERNA 2005).

Equally important for the understanding of poverty in Honduras is the examination of the land tenure structure. In this regard, the country is characterized by three major problems: first, rural land concentration, secondly, by plot fragmentation into a size which does not enable profitable exploitation (usually caused by poor peasants who distribute land among their sons); and thirdly, by illegal land tenure and continuous encroachments (Serrato Combe 2000). Inequitable land tenure structure has resulted in class tensions for years. Official attempts to ameliorate the situation began as early as the 1960s, when the Land Reform Law of 1962 was passed and sought to redistribute land so it would meet the demands of the social function of ownership postulates. Over three decades, a total number of 409 000 hectares (12% of total agricultural area of the country) were handed over to 60 000 peasants families (13% of total rural population of that time). Even though this redistribution alleviated somehow the situation of rural poor, it could not stop the parallel process of land concentration (Fian and La Vía Campesina 2000). Even more to the point, in 1992 the process was stopped because of the wide implementation of structural adjustment policies. Yet more, 15 000 hectares that were already handed over to peasants families were reverted back to early expropriated bananas companies Chiquita Brand International and the Dole Food Company (Fian and La Vía Campesina 2000). As a result, today the majority of the peasantry remains landless[47]. Today, while plots with less than 5 hectares constitute 72% of total number of parcels, they only occupy 12% of all agricultural land; whereas, plots that surpass 10 hectares, represent 1.6% of total number of plots, but occupy more than 40% of total arable land (Fian and La Vía Campesina 2000). Landlessness has provoked that farmers have kept on moving to marginal lands on the hills and towards the rainforests in the East, destroying natural ecosystems, expanding the agricultural frontier, and degrading soils through common practices such as "mush and burn" and/or "slash and burn" (Federal Research Division 2006).

3.1.1 Reasons for rural poverty

Poverty in rural areas in Honduras is mainly rooted in low-income levels (Paes de Barros *et. al.* 2006). As Table 3-1 demonstrates, in those Departments where average incomes are higher, the proportion of poor population is lower and vice versa.

Table 3-1 Relation between average income and % of rural population under poverty by Departments

	Average rural income per capita in Lempiras in 2003	% of poor people in rural areas in 2003

[47] Rural farmers in Honduras, the majority of rural population, subsists on less than 2 hectares of land and practices subsistence agriculture (55%), the rest (45%) is landless and works for wages in large states or small farms (Federal Research Division 2006).

Honduras	555	77
Departments		
Choluteca	469	80
Valle	520	75
Comayagua	497	82
Intibuca	262	94
La Paz	321	91
Cortés	1039	48
Santa Bárbara	430	84
Yoro	574	75
Atlántida	756	66
Colón	672	70
Olancho	488	82
El Paraíso	409	85
Morazán	731	69
Copán	371	90
Lempira	221	90
Ocotepeque	392	96

Source: Paes de Barros et. al. 2006

Not only is rural income meager, the average income in 2007 rounded 1605 Lempiras/capita/month (USD 84 /capita/month) (INE 2007), and as such it did not allow gaining access to the basic shopping basket[48], but it is also unequally distributed. Indicators

48 The cost of the basic shopping basket in 2007 for a household of 5 people was estimated in 4 809 Lempiras/month (UDS 252/month), (El Heraldo Honduras 2007).

show that the average income of the richest 20% inhabiting in rural areas is 30 times higher than that of the poorest 20%. Even more striking, the richest 1% hoards 13% of total rural income, while the same wealth proportion is shared by the 50% poorest of the population (Paes de Barros *et. al.* 2006).

Eighty five per cent of rural households' income originates in work earnings[49] (wages and compensations of independent workers[50]) (Paes de Barros *et. al.* 2006). Since jobs earnings play the most significant role in rural earnings composition, it is possible to conclude that rural poverty is largely induced by low work earnings[51]. This deduction is supported by Table, 3-2 that shows a direct causal relation between low work earnings and poverty. In this Table it is possible to observe that in those Departments where earnings are higher, poverty levels are lower and vice versa.

Table 3-2 Relation between work earnings and % of rural population under poverty by Departments

	Work earnings in rural areas in Lempiras in 2003	% of Poor people in rural areas
Honduras	1590	77
Departments		
Choluteca	1390	80
Valle	1360	75
Comayagua	1560	82
	Work earnings in rural areas in Lempiras in 2003	% of Poor people in rural areas
Intibuca	810	94
La Paz	940	91

49 The remaining income proceeds from fund transfers (11% of total income) and rents (4%). Among the first category, voluntary private remittance sent by family members working outside the country, is the main contributor (86%), and retirement pensions and other public fund transfers only represent 14% of total transfers (Paes de Barros *et. al.* 2006).

50 For independent workers it is understood self employed workers, employers and members of cooperative enterprises.

51 Average rural work earnings amounted to 2 355 Lempiras/month (USD 124/per month) in 2007 (INE 2007).

Cortés	2750	91
Santa Bárbara	1180	84
Yoro	1680	75
Atlántida	2160	66
Colón	1880	70
Olancho	1340	82
El Paraíso	1210	85
Morazán	2070	69
Copán	1100	90
Lempira	710	90
Ocotepeque	710	96

Source: Adapted from Paes de Barros et. al. 2006

If the labour market is analyzed in order to understand the reasons behind low incomes and work earnings in rural areas, one of the first striking features that highlights (against to what would be expected in most of the cases), is that rural unemployment is very low. Only 31 000 people in rural areas are unemployed (2% of total rural economically active population[52]) (INE 2007). Consequently, at least in rural areas, unemployment cannot be pointed out as a reason for poverty. On the contrary, invisible underemployment[53] seems to be problematic as 650 000 workers (44% of the rural labour force) are judged to fall within this category (INE 2007). In addition, visible underemployment[54] is also a serious problem. Some 83 000 laborers (5.7% of the rural labour force) are estimated to be in this situation (INE 2007). Here again, the commented numbers of invisible underemployment confirm that poverty is mainly provoked by poor work related earnings.

52 Economically Active Population comprehends all people who are aged above 10 (INE 2007).

53 Invisible underemployment refers to the phenomenon in which laborers work more than 36 hours a week but earn less than 1 monthly minimum salary.

54 Visible underemployment refers to the phenomenon where laborers work less than 36 hours a week, but would like to work more time. Visible underemployment is mainly the result of seasonal nature of most agricultural work.

The analyses of the reasons behind rural poverty also showed that work earnings depend on the different sectors of the rural economy laborers participate in. As such, it was observed that those rural workers who were employed in the farming sector have lower incomes than those who were engaged in other sectors of the economy. Rural laborers who worked in the farming sector earned an average of 1180 Lempira's/month in 2003 (USD 67/month[55]) (Paes de Barros *et. al.* 2006), a sum that is equivalent to 51% of the average earnings made by other rural workers who were involved in a different sector of the economy. Table 3-4 features the ddifferences in average earnings rural workers gain depending on the sector of the rural economy to which they belong. From that Table, it can be inferred that workers engaged in farming sector gained less income that those who participated in other sectors of the economy.

Table 3-3 Number of rural workers by Department and proportion of participation in different sectors of the economy

Department	In thousands of rural workers	Farming sector in %	Other sector in %
Choluteca	84	51	49
Valle	29	51	49
Comayagua	62	75	25
Intibuca	43	84	16
La Paz	35	80	20
Cortés	141	30	70
Santa Bárbara	81	69	31
Yoro	83	65	35
Department	In thousands of rural workers	Farming sector in %	Other sector in %
Atlántida	50	62	38
Colón	54	68	32
Olancho	90	77	23

55 Corresponds to the average annual exchange rate of Lempira to UDS for 2003 according to the Central Bank of Honduras (17.54 Lempiras/USD 1) http://www.bch.hn/esteco/ianalisis/proint.xls

El Paraíso	81	77	23
Morazán	99	47	53
Copán	61	75	22
Lempira	62	79	21
Ocotepeque	26	75	24

Source: Adapted from Paes de Barros et. al. 2006

Table 3-4 Differences in average earnings of rural workers in relation to the sector of the rural economy in which they work

	Average earning rural worker in the farming sector in Lempiras in 2003	Average earning rural worker in other sectors in Lempiras in 2003
Honduras	1180	2300
Departments		
Choluteca	1150	1730
Valle	1050	1690
Comayagua	1290	2360
Intibuca	750	1120
La Paz	840	1350
Cortés	1900	3110
	Average earning rural worker in the farming sector in Lempiras in 2003	Average earning rural worker in other sectors in Lempiras in 2003
Santa Bárbara	1000	2320
Yoro	1360	2290
Atlántida	1710	2890

Colón	1680	2320
Olancho	1140	2020
El Paraíso	1060	1720
Morazán	1260	2800
Copán	990	1430
Lempira	690	800
Ocotepeque	1040	1340

Source: Adapted from Paes de Barros et. al. 2006

Low compensations in the farming sector are mainly explained by the quality of the job itself. In fact, it has been shown that low quality level of employments is responsible of the existence of poorly paid jobs in the farming sector (60 to 80% of responsibility) (Paes de Barros *et. al.* 2006). A low quality job is influenced in turn, by at least three different factors: the size of the company in which laborers work, the occupational category workers have, and the type of production rural workers engage in within the farming sector, i.e. if they work in agriculture, cattle farming, fisheries, etc.

Considering the first determining factor, it results that the bigger the company is in terms of the number of people it employs, the higher work earnings are. For example, in Cortés, Yoro and Colón, where the proportion of workers employed in enterprises with 10 or more employees is around 20%, 16% and 15% respectively, average earnings are higher (1900, 1360 and 1680 Lempiras per month, respectively). On the contrary, in Intibuca and Lempira where workers employed in enterprises with 10 or more employees are few (only 0.9% and 0.4% respectively), earnings round the 750 and 690 Lempiras in each case. Similarly, Table 3-5 shows that in those Departments where bigger proportions of farm workers are employed in enterprises with 10 or more employees, work earnings are higher. According to Paes de Barros *et. al.* (2006), this factor explains lower earnings in at least 20%.

Table 3-5 Average earnings of rural workers in the farming sector and proportions of workers employed by enterprises with less than 5, 10 or more than 10 employees

	Average earnings rural worker in the farming sector in Lempiras in 2003	% of workers in enterprises with 5 or less than 5 employees	% of workers in enterprises with 6 to 9 employees	% of workers in enterprises with 10 or more employees
Honduras	1180	91	2	6
Departments				

Choluteca	1150	82	2	16
Valle	1050	89	1	9
Comayagua	1290	95	2	3
Intibuca	750	99	0.1	0.9
La Paz	840	96	2	2
Cortés	1900	75	5	20
Santa Bárbara	1000	94	2	4
Yoro	1360	82	2	16
Atlántida	1710	82	5	13
Colón	1680	83	2	15
Olancho	1140	98	1	1
El Paraíso	1060	94	2	4
Morazán	1260	92	2	6
Copán	990	94	3	3
Lempira	690	99.5	0.1	0.4
	Average earnings rural worker in the farming sector in Lempiras in 2003	% of workers in enterprises with 5 or less than 5 employees	% of workers in enterprises with 6 to 9 employees	% of workers in enterprises with 10 or more employees
Ocotepeque	1040	98.5	1	0.5

Source: Adapted from Paes de Barros et. al. 2006

The second determining factor explaining low quality jobs is occupational category. Workers can participate in the labour market either as a) employer, b) temporary employee, c) permanent employee, d) self employed worker who does not hire temporal workers, e) self employed worker who hires temporary workers, f) independent worker, member of an association or cooperative enterprise, g) worker who works with his family group and does

not receive any salary. According to these criteria, it can be observed from Table 3-6 that except for workers who are unpaid (as they work in family enterprises), the ones who are worst paid, are temporary workers and self employed workers who do not hire other temporary workers. These three groups together represent more than 75% of total farm rural workers of the country (Paes de Barros *et. al.* 2006). As such, according to the mentioned authors, this factor contributes in a 21% to explain difference in work earnings.

Table 3-6 Proportion of farm workers by occupational category and average work earnings

Category	% of farm workers in rural areas	Average work related income in Lempiras in 2003
Employer	38	1235
Temporal worker	28	996
Permanent workers	9	1955
Cooperative member	0.5	2221
Self employed worker who does not hire other temporal workers	33	1156
Self employed worker who hires temporal workers	12	2281
Employer or share holder	2	8996
Family worker who does not receive any salary	13	0

Source: Adapted from Paes de Barros et. al. 2006

The last determining factor to consider, is the type of productions rural workers engage in within the farming sector, i.e. if they work in agriculture, cattle farming, fisheries, etc. From Table 3-7, it is possible to assert that within the agricultural activity, those laborers who work in the fruit, nuts and plants sector, have higher incomes than those who are employed by the basic grains, and by the vegetable and legumes sectors. Similarly, Table Nº 8, which shows disaggregated data by Departments (only those Departments where palm oil production takes place have been featured), corroborates that workers employed in the fruit, nuts and plants sector are better paid than those engaged in other sectors of agriculture. Difference in work earnings, as a result of participation in different kinds of production, can be explained by the impact economic agricultural productivity (economic yields per hectare) has on salaries. Consequently, when productivity is higher, work earnings of employees are too and vice versa (Paes de Barros *et. al.* 2006).

Table 3-7 Types of farming production, participation of each in the farming sector and average work earnings

Type of Production	% Participation	Average work earnings
Basic grains	51.1	636
Vegetables and Legumes	7	1620
Nuts, Fruit and Plants	25.1	1460
Livestock	9.2	2484
Fisheries	2	3509
Other	5.5	1609

Source: Paes de Barros et. al. 2006

In conclusion, rural poverty in Honduras is mainly provoked by low income levels. These in turn are generated in a 85% by work earnings. As such, these factors can largely be blamed for poverty levels experienced in those areas. On the other hand, poorly paid jobs are largely explained by the sector of the rural economy particular workers are in. As such, rural workers engaged in farming activities receive lower compensations than those who contribute to other sectors of the economy. Furthermore, within the farming sector, the average quality of the job characterized in terms of the size of the enterprise, the occupational category and the type of production workers participate in, determines the significance of the earnings. As such, workers who are employed in enterprises that have 10 or more workers, earn the highest compensations. Moreover, farming temporary workers, self employed workers who do not hire others workers and family workers, receive the worst compensations within the sector. Lastly, those workers who participate in the nuts, fruit and plant sector are, within agriculture, the ones who earn more income, though they do not receive as much as workers of the livestock or fisheries sectors.

3.2 Population displacement in rural Honduras

In Honduras population displacement is mainly driven by economic and environmental reasons (Casasfranco Roldán 2001). Globalization, liberalization of the economy, deregulation of the labour sector, reduction of social expenditure, insecure land tenure and recurrent natural hazards, have all negatively influenced internal and external migrations (Casasfranco Roldán 2001). In the first case for example, the emergence of the "maquila" (the assembly industry), has provoked long-term population displacement from rural areas to the cities of San Pedro Sula and Tegucigalpa. Likewise, the continuous demand of temporary day laborers for the bananas, coffee, pineapples and oil palm plantations leads to temporary and pendular migrations (Casasfranco Roldán 2001). On the other hand, periodic natural hazards affecting the country, e.g. landslides, hurricanes, etc., have led to permanent rural migration. For example, in 1998, Hurricane Mitch provoked the displacement of 23% of the total Honduran population (Casasfranco Roldán 2001). Despite being economic and environmental reasons the two main motives for rural population migration, Honduran displacement does not only respond to these two reasons but also to coercion and violence. In that context, evidence shows that precisely in those regions where palm cultivation is going to take place (see Figure3-2), forced peasants displacement are a common practice. In 2007 for example, 110 peasants in the Department of Yoro were evicted from the land where they used to practice subsistence agriculture, despite of the fact that the land had been previously granted to them in 1982 by the Government. Eviction was performed by a paramilitary group that violently forced out 26 peasants families and kidnapped 4 of their members to later release them. Attackers claimed that the land belonged to a rich landowner and consequently, they have to

move. These rural families are now landless and are scared to gain entrance again into their land as their lives are at risk. This episode was the sixth time this group of families was illegally evicted. In the previous attacks paramilitary forces destroyed the irrigation system and the subsistence crops base of peasants; even more, they gun fired some members of the peasant community (Fian 2007).

Similarly, in the Department of Cortés, 74 peasant families have suffered intimidation and violence since 2005. These families have resided since 1951 in an area of 21 hectares of land that is located at the confines of the bananas plantations owned by Tela Railroad Company, a subsidiary of the Chiquita Branch International. This group of peasants used to work for the bananas company and to practice subsistence agriculture. Despite of the long term tenure peasants exercised over the land, the Company decided to "friendly" ask the peasant community to leave since the Company's intention was to expand its African palm cultivation. Some of the members of the community accepted, but some did not. Those who remained in the region have suffered different types of intimidation. Security personnel from the company destroyed peasants' houses and fruit trees by crashing tractors into them. They also cut off the electricity and water supply; and though water supply has been somehow recovered, electricity service has been off since then. Moreover, peasants have been impeded to physically access the market where they go to sell their agricultural production and have been accused of illegal land seizure (Fian b 2007).

A last example shows that conflicts over land between powerful holdings and peasants communities in Honduras do not only entail physical violence, destruction of property, abduction, and all kind of threats, but also murder. In 2002, in the Department of Colón, 17 security guards employed by the Standard Fruit Company, a subsidiary of the Dole Food Company, murdered 3 farmers who were engaged with the company in a conflict over land. Security guards ambushed them on their way to work and fired automatic weapons against them. After the incident, the Company published in local newspapers its version of the story. It stated that the 17 security guards acted in self-defense when they were attacked at gunpoint by the 3 peasants. The police never found; however, any weapons on the bodies of the massacred farmers (Fian 2002). As such, evidence shows that in rural Honduras not economic and natural risks provokes migration, but also development induced forced displacement; which in most of the cases is violent and illegal it and responds to systematic practices in the name of agro commercial interests.

3.3 Environmental profile

Honduras' environmental profile will be reviewed in relation to the three main environmental local challenges biofuels production presents: water and soil impacts, and deforestation.

Honduras is a water-rich country. The country has 19 river basins that annually discharge 92 000 million m^3 of water (SERNA 2005). Water availability per capita is very high as each Honduran theoretically counts on 13 500 m^3/person/year[56] (SERNA 2005). As a tropical mountainous region, with abundant precipitation, Honduras enjoys a magnificent hydrological potential that is however underused. The main reason behind this, is the lack of adequate storage and canalization infrastructure. This situation, together with water resources contamination, deforestation, and river sedimentation, provokes seasonal water shortages in the country (Sistema de Naciones Unidas en Honduras 2003). The greatest water use demand comes from agriculture, which uses 1 153 million m^3/year (61% of total water demand in the

56 Water scarcity occurs when availability of water does not surpass the 1 000 m3/person/year (SERNA 2005).

country) (SERNA 2005). Water contamination is a serious problem: the immense amount of agrochemicals used in the agro-business sector has affected invaluable ecosystems. One of them has been the unique Meso American Coral Reef, which has undergone though significant processes of eutrophication and of coastal sedimentation as a consequence of the excessive agrochemical inputs and deforestation.

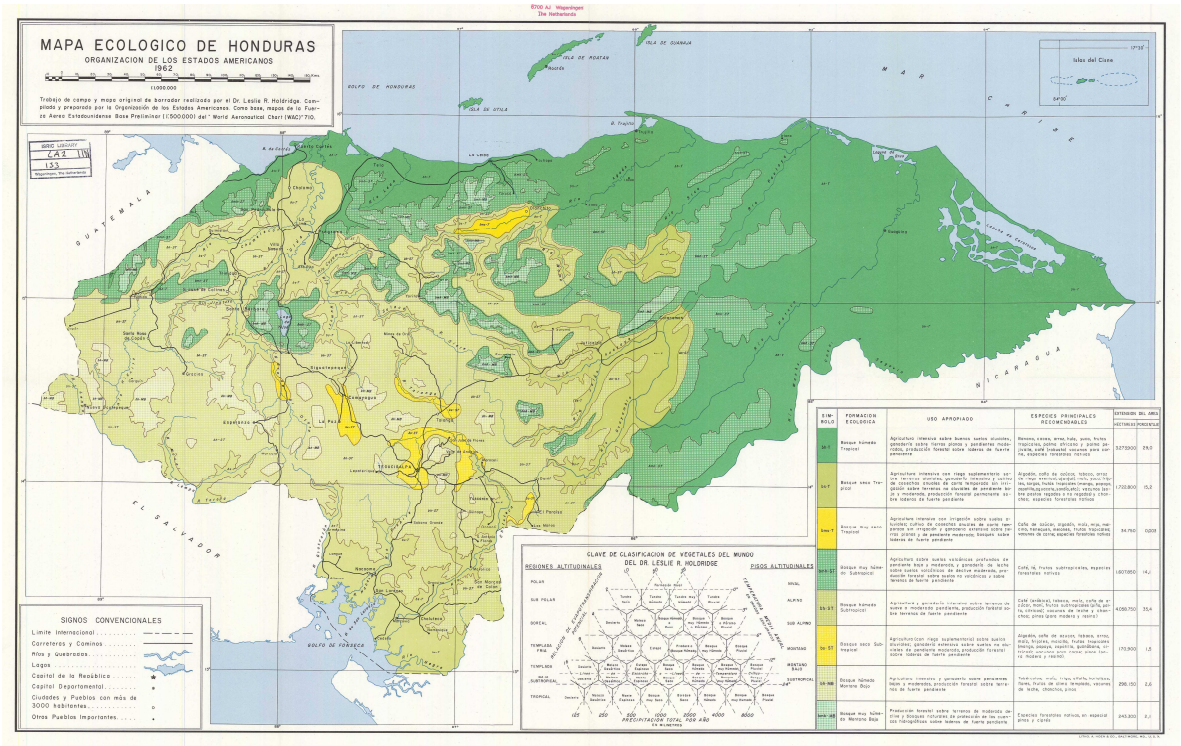
If soils are considered in Honduras, two main impacts can be observed: firstly, an ongoing process of soil erosion provoked by deforestation and secondly, the above mentioned over use of artificial agrochemicals[57] that also negatively affect this medium (SERNA 2005). Both processes, contribute to rivers and coastal areas sedimentation, loss of soil fertility and structure, etc.

Lastly, deforestation in Honduras is very problematic. Some 90% of the country area is considered to be biologically suitable for forestry (Sistema de Naciones Unidas 2003). At this time however, only 53% (5 990 000 hectares) of the Honduran territory remains untouched (Sistema de Naciones Unidas 2003) and calculations estimates that most of the deforestation impact (80%) has been inflicted in broadleaf forested areas (SERNA 2005). The reasons behind such detrimental process are several, but agro-business cash crops expansion is the number one (Bustillo Pon and Dominguez 2002). Population growth, forced displacements, illegal commercial logging, extensive cattle farming and wood gathering for energy needs satisfaction, have all also contributed to the problem. The identifiable results of such degradation are soil erosion, reduced water infiltration, river sedimentation, loss of habitats and their associated biodiversity and climate imbalance (Sistema de Naciones Unidas en Honduras 2003).

Figure 3-1 shows the ecological areas of Honduras. Dark green indicates the regions where tropical rainforests are situated and most valuable mangroves and wetlands ecosystems exist. The region is known as La Moskitia. It shelters the Biosphere of the River Plátano and many other more protected areas.

57 Honduras agrochemicals use amount to 86 tons/1 000 hectares, an average that by far exceeds the Central American and Latin American averages (Paes de Barros et. al. 2006).

Figure 3-1 Ecological Map of Honduras



Source: Association of American Status (OAS). Autor: Dr. Holdridge L.R. Year 1962

3.4 The National Biofuels Plan

Energy security in Honduras is crucial. The total energy consumption of the country reached 23 000 million bboe[58] in 2004 (Ribeiro Gallo 2007). Of this total, 13 700 million bboe (59%) were generated from oil-based fuels (Ribeiro Gallo 2007). The remaining energy was supplied largely by wood, especially in rural areas, and in a minor extent by hydrological power, despite of the fact, the country counts on an immense hydro electrical potential. Imported oil based fuels were used in transport (37%), electricity generation (31%), industry (11%), commercial and residential sectors (2% each), and in other activities such as agriculture, construction and mining (17% all together) (Ribeiro Gallo 2007).

Oil based fuels are 100% imported (Ribeiro Gallo, 2007). As such, Honduras spends significant resources on oil imports and is extremely vulnerable to oil international prices changes. In 2002, the value of imported oil added up to USD 395 million, a sum that was equivalent to 10.5% of total National GDP and to 17% of the value of all good and services imported (Ribeiro Gallo 2007). In 2006, this economic burden increased to more than USD 1 012 millions, a number that equaled 67% of total exports value the country made (Starkman 2008). This trend is likely to continue as oil prices soar in the international markets. In only one year, from May 2007 to May 2008, the crude oil barrel[59] rose from USD 65 to USD 135 (BBC News 2008), and in just seven years (2001-2008), oil prices have risen 400% (BBC News

58 bboe, means barrel of oil equivalents refers to an energy unit equivalent to the energy released when burning one barrel of crude oil.

59 West Texas Intermediate (WTI)

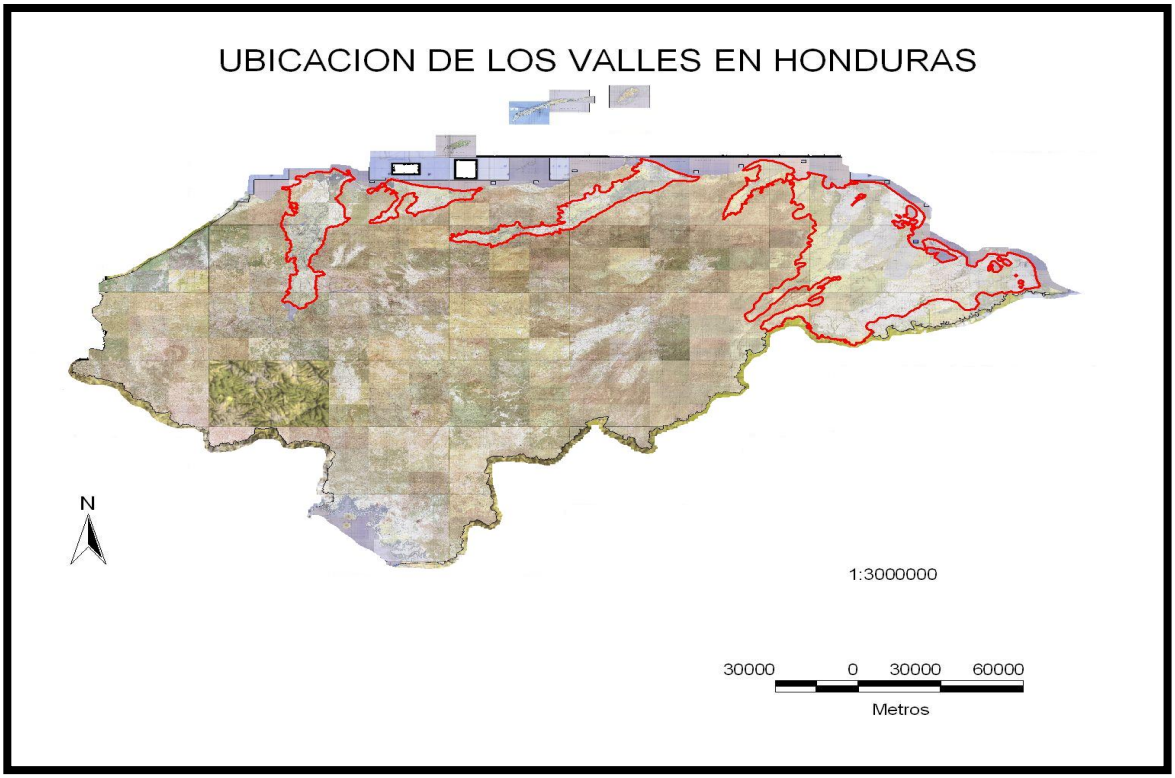
a 2008). Though already concerning, this trend is likely to continue as energy market experts consider that the barrel is likely to rise up to USD 200 in the next six month to two year time. The reason behind this is the geopolitical situation in producing countries remains unstable and supply struggles to meet demands from growing Chinese and Indian economies (Murti, 2008).

In this energy insecure context, the Honduran Government has set sail to develop the biofuels potential the country counts on. To do so, the Government announced in 2006 a mega agro-industrial program based on the existing African palm oil platform (Rothkopf 2007). For this purpose, Honduras has received from the Inter American Development Bank, a grant of USD 350 000, which is intended to facilitate the implementation of the national strategy targeting the production and promotion of biofuels (Inter-American Development Bank 2007). The Government's plan is to plant 200 000 new hectares of African palm (Ribeiro Gallo 2007 and Rothkopf 2007), which will add up to existing 90 000 hectares (Rothkopf 2007). Expectations are that oil palm based biodiesel production will be increased up to 757 000 m^3 from current 20 500 m^3/year production (Ribeiro Gallo 2007). Through this plan, the Government seeks to progressively substitute fossil fuels based diesel for biodiesel, attempting to reduce in such way, its total dependency on imported oil (Ribeiro Gallo 2007). Furthermore, biofuels production is perceived as a one of a kind opportunity to tackle rural poverty through employment generation. In this sense, rough government's estimations assert that biofuels development could contribute to create 100 000 direct and 200 000 indirect jobs (Rothkopf 2007). Currently, the palm oil sector provides jobs for 106 000 people (Presentation Ambassador Starkman)

Current palm plantations are located in the North Coast of Honduras, in the Departments of Colón, Atlántida, Yoro and Cortés (See in Chapter Nº 1 Figure 1-1). This region, also known as the Caribbean Lowlands, is an area characterized by river valleys and coastal plains. To its West, the most exploited agricultural and industrial areas of the country are situated. This is also one of the most densely populated areas of the country. On the other side, eastwards from the city of Trujillo towards the frontier with Nicaragua, La Moskitia or the Mosquito Coast lies. This area is the Honduran region of intact rainforests, mangroves and biodiversity richness. Almost unpopulated, access to the area is almost impossible, except by precarious boats. Even more, these pristine rainforests shelter culturally distinctive minority groups, such as the Pech, the Moskitios and the Black Caribs, etc. (Federal Research Division 1995).

New plantations are expected to occur near existing ones since palm oil producing facilities are near them and cost efficient transport does not enable long distance transport (Starkman 2008). However, other areas in the country also enjoy agricultural suitability for palm cultivation. The official map the Government presented to explain the potential of oil palm in the country, shows potential cultivation areas (Figure 3-2) (Starkman n.d). Some of them are areas where palm cultivation already exists: The Valley of Sula, the Valley of the River León and of the River Aguán (See Figure 1-1 in Chapter Nº 1). However, the largest one to the East, overlaps with regions where valuable rainforests ecosystems remain (region of La Moskitia). [See how the area delineated in red in the most eastern part of the country (showing African palm suitability), coincides with the areas in dark green (existence of tropical rainforests) in Figure 3-1.

Figure 3-2 Map of suitable areas for African Palm cultivation in Honduras



Source: adapted from Presidencia de la República de Honduras. Asesoría Proyectos Especiales (Ambassador Starman presentation on biofuels plan)

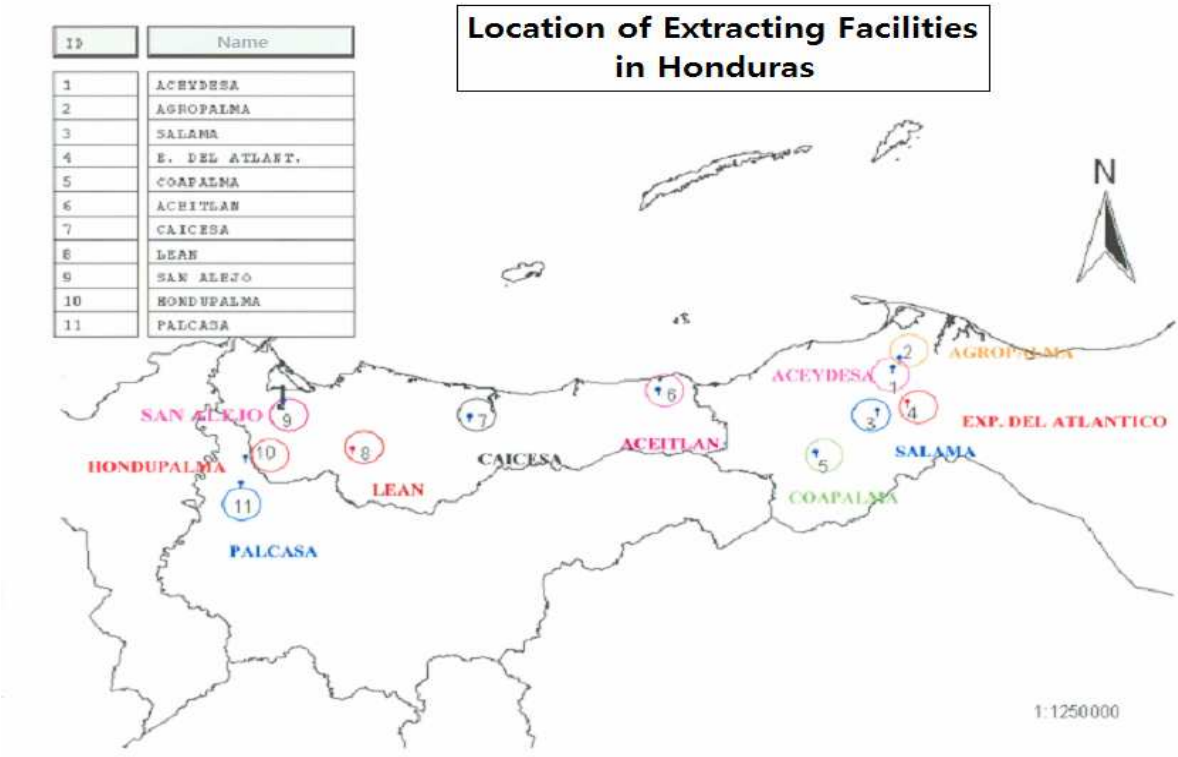
Palm oil production in Honduras has been increasing in the last decade. Statistics from CEPALSTAT-Siagro and from FAOSTAT presented by Ribeiro Gallo (2007), show that palm cultivated areas has tripled from 33 000 hectares in 2000 to 90 000 hectares in 2007. Palm fruit production has also augmented, since production amounted to 610 000 tons in 2000, whereas for 2005 this figure escalated up to 1 077 000 tonnes. Agricultural productivity has nevertheless dropped, from some 18.5 tonnes/hectare in 2000 to only some 13 tonnes/hectare 2003. Likewise, palm oil production has increased from 141 500 tonnes in 2002 to 203 300 tonnes in 2005. Here as well, productivity has declined, as figures show hat the ratio "oil/cultivated area" was around 4 tonnes /hectare in 2003, whereas in 2005, this figure reduced to only of 2.5 tonnes/hectares.

This shows that increasing production of palm fruit and palm oil is occurring because cultivated area is being expanded, and not because of intensification. Total palm oil exports have also augmented from 94 000 tonnes in 2003 to 120 000 tonnes in 2005 (60% of total palm oil produced in the country) (Ribeiro Gallo 2007). Revenues from the palm oil exports have also increased: from USD 53 millions in 2003 to some USD 56 millions in 2005; however, the price of the commodity did not during the same period[60]. This means that enhanced gains are mainly attributable to increased production, and not to higher market prices, according to the figures released by the Central Bank of Honduras (Ribeiro Gallo 2007).

60 The price of palm oil has however kept on rising from 2006 onwards. In 2006 average annual price was USD 478/tonne; in 2007, the average annual price rose to USD 780/tonne; whereas from the beginning of 2008 to April 2008, the price has soared to USD 1 161/tonne (World Bank 2008). This increasing trend is likely to boost palm oil production and the intentions to build up a profitable cash crop export oriented market.

The oil palm production chain is dominated by 7 holdings groups. In addition to that, 7000 small producers cultivate palm in small plots that in average have 10 hectares each (Ribeiro Gallo 2007). As of 2007, the country had 11 palm oil producing facilities, these are owned by powerful enterprises such as DINANT and JAREMAR, and also by several independent producers who associate into cooperatives as is the case of HONDUPALMA and SALAMA (Ribeiro Gallo 2007).

Figure 3-3 Location extracting and refining palm oil facilities in Honduras



Source: adapted from Presidencia de la República de Honduras. Asesoría Proyectos Especiales

4 Stakeholders' perspectives on opportunities and challenges

In this section, stakeholders and experts' views on biofuels development in Honduras are presented. Stakeholders and expert's perspectives provide useful information that helps answer the three Research Questions stated in Chapter Nº 1:

1. How realistic are opportunities offered by biofuels development for rural poor communities in Honduras?

2. What are the challenges and implications biofuels production is likely to present to rural poor and the local environment?

3. Where does it appear that the benefits of biodiesel development will accrue?

Stakeholders and experts gave insight into the opportunities and challenges[61] that biofuels present for rural poor who live and work in those areas where palm oil cultivation and oil processing currently take place[62] or are likely to expand[63]. In order to better elicit opportunities and challenges, questions to stakeholders and the expert considered particular information provided on Chapter Nº 3 on rural poverty and the environmental profile of Honduras. As such, in this section stakeholders and experts' provide their perspectives on:

A. Opportunities offered by biofuels to:

1. Promote rural development by means of:

a. Providing new sources of employment/income generation and increased capital turnovers.

b. Advancing a critical production input, i.e. energy, to other rural enterprises, stimulating in turn local prosperity.

c. Facilitating Millennium Development Goals' (MDGs) achievement by supplying secure and affordable energy for basic needs satisfaction.

B) Challenges presented by biofuels in terms of:

1. Food security

2. Population displacement

3. Water and soils

5. Natural ecosystems

61 Presented in Chapter Nº 2.

62 Departments of Atlántida, Yoro, Cortés and Colón

63 Department of Gracias a Dios

Stakeholders who provided information on biofuels opportunities and challenges were:

1. Ambassador Moisés Starkman Pinel. Advisor of Special Projects to the President of Honduras. Ambassador Starkman was interviewed in consideration to the chief role he plays in advising on and implementing the Honduran Biofuels Policy (Interviewed 25th of March, 2008).

2. Arnaldo Vieira de Carvalho. Sustainable Energy Specialist at the Energy Division, Infrastructure and Environment Department of the Inter American Development Bank (IADB). Mr. Vieira de Carvalho was interviewed in consideration to the role the IADB plays in granting funds and providing technical assistance to Honduras for the Biofuels Plan implementation. (Interviewed 18th of March, 2008).

3. Dr. Mario Contreras. Director of the Center of Renewable Energies at the University of Zamorano, Honduras. Dr. Contreras was interviewed in his role of an expert on biofuels development in the region. (Interviewed 27th of March, 2008).

4. Informant A from NGO A. (Interviewed 25th of March, 2008).

5. Informant B from NGO B (Interviewed 19th of March, 2008).

4.1 Aim of the National Biofuels Plan

Different stakeholders have different views on the aim pursued by the Honduran biofuels strategy. The Government position is that the Honduran biofuels plan seeks foremost to create employment through the cultivation of a crop that people already know well, a fact that guarantees, according to the Government's opinion, the success of plantings. As such, the most important goal pursued by the plan, is to provide rural employment and to contribute in such way to rural poverty alleviation vis a vis to opportunities provided by rising oil prices. In addition, the plan also seeks to save money through the reduction of expensive oil bills (Telephone Interview Ambassador Starkman 25th of March, 2008). The aim pursued by the Inter-American Development Bank (IADB) when providing funding and technical assistance to the Honduran Government is to support a commercially competitive product for which Honduras and the rest of the Central American region have a great potential. Through the support of such commercial developments, the Bank seeks to advance economic investments, social and economic development, employment opportunities and competitiveness (Telephone Interview Vieira de Carvalho 18th of March, 2008). On the contrary, one of the skeptical environmental NGO representatives, thinks that the existing energy crisis the country goes through is used as a pretext to promote biofuels expansion, when in reality, biofuels expansion are just promoted to satisfy large agro-business's interests, which seek to build up a valuable cash crops export oriented market (Telephone Interview Informant A from NGO A, 25th of March, 2008).

4.2 Destiny/Purpose of oil palm based biodiesel

Here again, stakeholders and experts have different views on the final destination and/or the purpose palm oil based biodiesel will have. The official position explains that currently, biodiesel production is scarce and is undertaken only by five companies that allocate the minimal production they have to own internal transport needs satisfaction. The official voice emphasizes that the aim of the Government is not on biodiesel production as such, but on palm oil; which can be used either for fuels or for food manufacturing. In fact, the Government interlocutor expresses that he does not believe large-scale commercial biodiesel

production will be a reality in the short term. This, the Government implies, could happen in the medium or in the long term, but not for now. Consequently, the goal so far is to produce palm oil which would be intended for food domestic needs satisfaction in the first place, and later to expand the existing edible oil export market the country has. In the long term, the officer explains, oil could be used as a feedstock for biodiesel, but today this is not possible because of two reasons: first, because palm oil based biodiesel production is not yet economically feasible/competitive and secondly, because it does not exit in the country a supply chain enabling commercial use. As such, he says, the focus is on palm oil production as such, and not on palm oil based biodiesel production, something, he emphasizes, could just happen in the future (Telephone Interview Ambassador Starkman March 25th of March, 2008).

On the other hand, the IADB officer thinks produced biodiesel will be devoted to transport purposes. When asked about possibilities to use produced biodiesel to supply electricity and provide power to rural machinery, the opinion of the officer expressed skepticism: though such alternatives are technically possible, he expresses, rural electrification and energy provision to rural areas can be achieved by other means that seem in his opinion more adequate, e.g. micro-hydro power generation, etc. As such, he explains, the Bank has other programs aimed at rural electrification in Honduras, but in the particular case of biodiesel production, the Bank's support to Honduran biodiesel production does not target the provision of energy in rural areas.

When asked about the final destination of the produced biodiesel, the officer expressed that such destination is not a topic of concern since wherever the biodiesel goes or even if it remains in the country, the country will benefit. If produced biodiesel remains in the country, oil imports will decrease and so fossil fuels bills. On the contrary, if the product is exported the country will generate revenues that will facilitate the international payment of expensive oil bills. Nevertheless, the IADB officer continues, the first option is easier to implement, since in that alternative, no regulatory frame and/or supply chain are needed; whereas otherwise, regulations on biofuels taxation, blend requirements, etc. are needed (Per. Comm. Vieira de Carvalho 28th of March, 2008).

Similarly, the biofuels expert thinks that at the end the final destination of produced biodiesel will be driven by economic reasons. He explains that final destination/purpose of biodiesel will respond to a need to balance stakeholders' interests. The Government will make sure that part of biodiesel production remains in the country for domestic needs satisfaction, but at the same time, it will be interested in the possibility to generate export revenues. On the other hand, entrepreneurs will be interested in supplying the international markets and gaining higher profits, while contributing as well to domestic transport needs satisfaction and maintaining a good image in front of Honduran society. This game of interests will finally determine biodiesel final destination. He continues explaining that currently, biodiesel is produced in very limited amounts and is used internally for companies own transport needs satisfaction. However, he explains, Honduras will eventually produce and consume biodiesel at a larger extent. It will be urged to do so as oil prices exacerbate; however, he argues, this will not happen soon as there is not supply chain in place enabling the profitable development of the sector (Telephone Interview Dr. Contreras 27th of March, 2008).

On the other hand, one of the representatives of an environmental NGO thinks biodiesel production will not help solve the energy crisis. Biodiesel production, when it occurs, will be devoted to the export market and will not remain in the rural communities for energy needs satisfaction in the area (Telephone Interview Informant A from NGO A, 25th of March, 2008). Likewise, the representative of the another environmental NGO thinks that produced

biodiesel will not remain in rural areas for the benefit of rural communities as it will be mainly exported or at it best consumed in Honduran urban centers (Telephone Interview. Informant B from NGO B, 19th of March, 2008).

4.3 Description of the oil palm sector

Stakeholders and the expert were asked to describe the oil palm sector in terms of existing actors, their presence in the sector, the ownership they enjoy over land and processing facilities, etc. Their opinions on the topic varied significantly. As such, the Government's officer expressed that the palm oil industry is very diverse and it is composed by giants, large, medium and small[64] actors. The production chain comprehends small, medium, large and giant feedstock producers; whereas only giants and large feedstock buyers own producing facilities and produce oil. Securing plentiful feedstock seems to be the most worrying concern for large and giant oil producers. The Government emphasizes that avoiding land concentration is a main concern for the Government and consequently, it has launched a plan that provides financing facilities and land tenure legalization for the benefit of those small palm producers who want to participate in the expansion of the palm oil sector (Telephone Interview Ambassador Starkman, 25th of March, 2008).

Similarly, the expert coincides with the Government in that large and giants palm oil producers have problems to guaranty necessary feedstock production. As such, these big actors seek to sign long-term feedstock supply contracts with small and medium producers, similar to those that link small producers participating in cooperative associations. He explains that the market is composed by two large, several medium and plenty small producers. He also acknowledges the intention of the Government to stimulate small producers' participation through land tenure regularization and access to credit (Telephone Interview Dr. Contreras, 27th of March 2008).

On the other hand, one of the environmental NGO's representative described the oil palm sector as a monopoly. He agrees on the existence of financing opportunities advanced by the Government to small producers. However, he thinks, small producers are misinformed. He believes that when small producers change whatever edible crop they cultivate now for palm plantings, they loose; since they become 100% dependent on giant producers' conditions (Telephone Interview Informant A from NGO A, 25th of March 2008). Likewise, the representative of another environmental NGO agrees on the fact that oil palm giants monopolize the industry and adds that giants stimulate small producers participation in order to secure abundance of feedstock. As a result, he explains, small cattle ranchers, bananas, maize and cassava modest growers abandon traditional crops cultivation and engage in palm oil plantings. To encourage participation, large corporations provide small producers with fertilizers, seeds, financing opportunities, etc. Later, small producers have to pay them back little by little and become doubly dependent on large corporations: they (large corporations) are at the same time the only buyers and the only supply of credit, seeds, fertilizers, etc. Consequently, small producers become extremely dependent on conditions unilaterally set by giant producers since "they cannot sell to anyone else" (apart from those who dominate the domestic market) and "they cannot even eat the palm, as they could do, if they were to continue planting traditional food crops". On top of that, the NGO representative expresses,

64 Small producers in the interviews emerge as the terminology to refer to those who count on a small plot and perhaps on a small capital and cultivate the land for commercial purposes, they enjoy very limited turnovers. They should not be confused with the rural peasantry, which is landless or has a very small plot in where to practice subsistence agriculture. The rural peasantry also works as day laborers.

that small producers do not sell directly to the giants, but to the "coyotes", an ambitious group of intermediaries who are in charge to buy all production from very modest producers and supply the giants. While coyotes make gains without risks, small producers have meager profits (Telephone Interview Informant B from NGO B, 19th of March 2008).

4.4 Who will benefits from the Biofuels Plan

Stakeholders had different views on where it appears benefits will accrue. The Government believes that rural poor who will enjoy new employment opportunities will be the winners of the Government's strategy. In addition, the Government's officer believes that small holders could also benefit if they decide to participate in the palm oil new development. This involvement is stimulated through financing opportunities and land tenure legalization. (Telephone Interview Ambassador Starkman, 25th of March 2008). The IADB officer believes benefits will accrue to palm producers as feedstock is the main component of biofuels costs; those who produce biofuels competitively will be the winners (Telephone Interview Vieira de Carvalho, 18th of March 2008).

On the contrary, one of the environmental NGO representative thinks that the ones who will really benefit from the Government's strategy are powerful stakeholders, those who concentrate the land and have real financing possibilities. In this sense, he explains, there has been no real land reform in Honduras. Some small producers could also be favored to some extent, he thinks, but real benefits will accrue to agricultural holdings. In fact, he explains, the existence of small holders is neglect able. However, when they exist, they work in a system that he describes as "feudal". Peasants cultivate part of their own small plots (if the have them) for subsistence needs satisfaction and the rest of the land is devoted to satisfy the interests of the "lord" (Telephone Interview Informant A from NGO A, 25th of March 2008). Likewise, the representative of another NGO, believes that powerful agro-commercial holdings are the ones who will truly benefit, those, he thinks, who are now after large extensions of land in the fertile valleys of the country and in the East ecologically rich region of Honduras. In fact he argues, small producers who live in rural areas and cultivate some palm, and those who have no land or anything at all, not only will not benefit, but they will be worse off. They will loose because they will abandon traditional crops cultivation and will become palm growers who depend on the conditions set by oil palm giants. They could also loose because they could be forced to sell the land where they have inhabited since immemorial times and, as a consequence, they would be forced to leave for the cities. If that were not the case, small farmers, who resist to handing over the land and to cultivate palm could suffer as a result of fierce forced displacements (Telephone Interview Informant B from NGO B, 19th of March 2008).

4.5 Opportunities for rural poor peasantry

When asked about the opportunities the rural poor peasantry could have if it were to participate in palm oil development, stakeholders and the expert expressed the following opinions. The Government said that those people who are landless or who do not count with at least 5 hectares of land cannot participate. The only ones who will be able to invest are those who have money to invest. Landless people and poor rural peasantry will be able on the contrary to enjoy new employment opportunities. As such, the government estimates that for every two cultivated hectares, one direct and two indirect jobs will be generated. Consequently, 100 000 new day laborers positions will be created inside the farm (harvesters, etc.) and 200 000 indirect jobs will be generated in other economic sectors related to the oil palm development (Telephone Interview Ambassador Starkman, 25th of March 2008).

The Ambassador was suggested that rural poverty in Honduras is not a consequence of unemployment, but of meager salaries (See Section 3.1.1) and that consequently, the situation of rural poor was not going to be drastically enhanced because of the creation of more employment opportunities when salaries were actually the real reason behind poverty. To this, he replied that poverty in rural Honduras is a consequence of both: low incomes and unemployment. He continued explaining that though in Honduras there is a great demand for labour force, many of the jobs are temporary and so employment is temporary. Low salaries on the other hand, he continues, are caused by low agricultural economic productivity; therefore, if more marketable crops are grown, better salaries for workers are advanced. In this sense, he added, day laborers salaries in the palm sector can be around 2 500 to 3 500 Lempiras/ month (USD 130 to 183 /month) (Telephone Interview Ambassador Starkman, 25th of March 2008). The IADB expert coincided in that one of the main targets pursued by the biofuels plan was the creation of new jobs positions. However, he noticed, the existing trend towards mechanization might turn unreal employments expectations at the farm level (Telephone Interview Vieira de Carvalho, 19th of March 2008).

The expert thinks that rural poor peasants who count on 2 or 3 hectares will not be able to participate since not much can be done for them to lift them from poverty, either through palm or any other crop cultivation. The opportunities for them are confined to finding a job at the palm plantations, where on the other hand, there are lots of employment opportunities. These chances mainly occur during planting, weeding and harvesting phases (Telephone Interview Dr. Contreras, 27th of March 2008). One of the environmental NGO representative thinks the only opportunity the poor peasantry will have in the palm sector is to work as day laborers in the plantations. On the other hand, he describes the work to be as very hard and exhausting, as climatic conditions of the North Atlantic inflict unbearable temperatures. In addition, the work environment is very toxic and laborers are continuously in contact with dangerous agrochemicals. He adds that salaries are miserable (USD 1 or 2 /day) and laborers do not receive any kind of social benefits or health care. He explains that work is temporary and that large agro-commercial holdings employ people for planting, weeding, fertilizing, harvesting and guarding the plantations. However, he also notices, that employment opportunities could be reduced as many plantations are introducing mechanization improvements (Telephone Interview Informant A from NGO A, 25th of March 2008). Lastly, the representative of the other NGO expresses that landless peasants or rural poor will not have any benefit from palm plantations expansion, at it best, he thinks, rural poor could be employed as day laborers. The salaries, he states, are "salaries for starvation". Workers are employed for field leveling, planting, fertilizing, harvesting, etc. All these activities are done manually. In addition, women and children are hired to pick up from the ground small pieces of fruit that have fallen while men cut the palm cluster with big knives called "malaysians". He expresses that jobs are in all of the cases temporary: when plantations' owners need employees they go to town and bring some people to the fields, these are on the other hand, desperately waiting for odds jobs opportunities (Telephone Interview Informant B from NGO B, 28th of March 2008).

4.6 Location of new plantations

Stakeholders were asked about the location of future palm plantations. In particular, they were consulted in relation to Map 2 that indicates areas where oil palm cultivation potential exits. The official voice informed that such map only refers to areas where theoretically cultivation potential exists, but not necessarily to areas where palm plantings actually will take place. Plantings, he thinks, are going to be located in areas where producers own land already, near to where palm cultivation currently exists; but in no case, palm cultivation will occur in forested areas. He continues explaining that most of these prospective cultivation areas are

located in the valleys of Honduras and in most of the cases these locations are underutilized, since they present extensive cattle ranching, traditional crop growing or abandoned pasturelands (Telephone Interview Ambassador Starkman, 25th of March 2008).

The expert coincides with the Government representative. He believes plantings will occur in the region of the Valley of Sula, the Valley of Aguán and of the Río Tinto; near from current plantations and processing facilities as transport costs will require new plantations to be near current cultivated areas and facilities. As such, he thinks, plantations will not affect rainforests. He explains that areas where new plantations will take place used to be forested ecosystems, but they are not any longer as deforestation for agricultural frontier expansion has already devastated the region. He agrees on that proposed areas for new plantations are under extensive cattle ranching exploitation, in which 2 or 3 cows graze in 2 or 3 hectares and produce only 2 liters of milk per day. There is also some subsistence agriculture, but most of the area is an abandoned pastureland. However, he emphasizes, palm development should not only occur as a result of an expansion in the cultivated area, but foremost, as a consequence of increasing yields per hectare obtained through technology and better seeds varieties cultivation (Telephone Interview Dr. Contreras, 27th of March 2008).

On the hand, the representative of one of the environmental NGO warns that palm oil producers might be interested in introducing palm eastwards of existing plantations where rainforests exit (Telephone Interview Informant A from NGO A, 25th of March 2008). Similarly, the representative of the other NGO believes that palm oil entrepreneurs have set their eyes on the east part of the country, heading towards the Biosphere of the River Plátano, where they have already started to buy land and to clearance the forests (Telephone Interview Informant B from NGO B, 19th of March 2008).

4.7 Food vs. biofuels debate

When asked about the probabilities that the food vs. biodiesel debate could become a reality for rural poor in Honduras, the representative of one of the NGO stated that the risk exists as farmers shift from growing traditional food crops to cultivate palm "that cannot be eaten". However, he recognizes, hunger in Honduras has a structural character and palm cultivation on its own cannot be blamed for the food insecure picture the country presents (Telephone Interview Dr. Informant A from NGO A, 25th of March 2008). The representative of the other NGO thinks that by shifting from traditional crops growing to palm cultivation, farmers destroy their food subsistence base. He explains that people who used to cultivate maize, cassava or bananas, or to practice cattle ranching, have abandoned these activities to grow palm trees. He argues that though palm could be seen as a good opportunity now, at certain moment it will not, since palm prices will stabilize and small producers will be caught with a production they cannot eat or sell to anyone else but to powerful holdings who will unilaterally set the price. He thinks the country makes a big mistake when it abandons staples production and becomes more dependent on international food market. He points that the Valley of the River Aguán and of the River Lean, once known as the granary valleys of Central American, have now become the palm valleys of Central America. Such shift is in part responsible, in his opinion, of the staples deficit the country presents. Now, he continues, maize, the basic staple consumed in tortillas by Honduran population, has to be imported from the US and so the latest increase in US produced maize has dragged up along the cost of the basic food basket in the country. This situation however, he claims, could be avoided if only the Government was willing to support traditional crops growers, who now have to face on their own unfair competence from imported maize, threatening climatic phenomena, encroachers, thieves, etc. (Telephone Interview Informant B from NGO B, 19th of March 2008).

4.8 Forced/Voluntary Displacements

Asked about the possibilities oil palm expansion had to provoke forced population displacement or to destabilize rural livelihoods and consequently lead to "voluntary" population displacements, stakeholders expressed different opinions. The expert thinks that is impossible to predict what would happen to those who currently practice subsistence agriculture in areas where palm plantings are going to occur. As such, anything could happen: landless people could move eastwards threatening the rainforest ecosystem, they could sell their small plots and leave for urban conglomerates, or they could just stay and keep on growing maize. However, he adds, peasantry population migration is not driven by agro-commercial developments expansion, but on the contrary, it is provoked by the poor lifestyle rural people experience in Honduras. As such, he thinks, the peasantry has realized that they cannot survive any longer from subsistence agriculture and so, they migrate to cities in the country or to the US (Telephone Interview Dr. Contreras, 27th of March 2008).

The representative of one of the environmental NGO thinks that poor peasants are face with the choice to either sell the small parcels they own to powerful agro-commercial holdings or to engage in palm exploitation by means of the financing facilities holdings or the Government offer. As such, migration to urban centers or to other rural areas, when the land is sold, is not forced. However, he warns, agro-commercial developments in the country, and this could apply one day to the palm industry, have had a long history in making use of military and paramilitary forces to move people away. These forced displacements, he continues, have been characterized by reproachable practices such as the fabrication of criminal charges against grassroots leaders, threats, imprisonment, denial of land tenure rights, etc. (Telephone Interview Informant A from NGO A, 25th of March 2008). The representative of the other NGO claims that when powerful palm holdings expand, they try to buy the land of poor peasants; however, if these people do not count on a legal title legitimizing the possession of the land where they settle, they are just simply moved away. The same happens with those who are landless and reside in areas where palm cultivation interests exist. The destiny that awaits displaced people is either migration to the cities, to the US, or go to forested areas in the East where they exert new pressures on pristine ecosystems (Telephone Interview Informant B from NGO B, 19th of March 2008).

4.9 Threats to natural ecosystems

When asked about the possibility that natural ecosystems could be at risk because of palm expansion, stakeholders' view were diametrically different. The official voice asserts that deforestation is not going to occur since the law forbids it. Even more, he asserts, regions were palm expansion will take place are areas that currently present subsistence agriculture, cattle farming or abandoned pasturelands, but in no case, they shelter valuable ecosystems. To show how stringent Honduran law is against criminals who deforest, he recalls the case of some peasants in the Department of Colón who were imprisoned because they were found guilty as charged for logging down native tress and planting palm instead (Telephone Interview Ambassador Starkman, 25th of March 2008). Likewise, Dr. Contreras thinks that the areas where palm expansion will occur will not affect natural ecosystems or biodiversity as plantations will not occur in forested areas. He asserts that Honduras has learnt from past experience and consequently, ecosystems located in the East of the country will not be affected. He explains that the major threat to natural ecosystems in the country has been population pressure: poor people come from the south of the country, encroach into the rainforests regions and practice subsistence agriculture and modest cattle ranching in these areas, that is, according to his opinion, what has caused natural ecosystems degradation (Telephone Interview Dr. Contreras, 27th of March 2008).

The representative of the other NGO, asserts that palm oil is a threat to conservation since palm plantings expand into protected areas even though the law forbids that. This happens when wild animals take palm fruit and disperse it within the protected areas. It also happens when small holders intentionally plant palm trees inside conservation areas. He asserts that though powerful holdings do not appear to be the visible face behind those encroachments, which are carried out by independent small farmers, the former are after such practices since they are the ones who stimulate small producers to cultivate palm through the provision of economic resources, fertilizers, plants, etc. Moreover, he asserts that rainforests which are not protected will receive the pressure of new comers who have been displaced as a result of agro-commercial expansion. In addition, he thinks, palm expansion will directly affect valuable ecosystems as powerful holdings have set their eyes on the Biosphere of the River Plátano and towards that direction they are heading to (I Telephone Interview informant B from NGO B, 19th of March 2008).

4.10 Soils and Water

When asked about the impacts soils and water could suffer as a consequence of feedstock cultivation and biofuels processing, the official voice asserts that companies try hard to reduce environmental impacts and so environmental impact swill be minimum. To show his point, he mentions that the enterprise DINANT is in the process of certifying ISO 14 000 (Telephone Interview Ambassador Starkman, 25th of March 2008). He continued explaining that river sedimentation is mainly caused in the highlands a result of cattle ranching and traditional crops cultivation and not in the low Caribbean Coast where palm plantations exist (Telephone Interview Ambassador Starkman, 25th of March 2008). The representative of one of the consulted NGO asserts that palm cultivation uses significant quantities of agrochemicals, around 1 kg of fertilizers/year/palm tree. These fertilizers are sprayed 4 times throughout the year. He also explains that many rivers and lakes in the area are negatively impacted by fertilizers use and by soil erosion; however, he recognizes, it is very difficult to say that palm plantings are exclusively responsible for such problems; nevertheless, he asserts, palm plantings certainly contribute (Telephone Interview Informant B from NGO B, 19th of March 2008).

5 Is Palm oil based biodiesel a good idea at all?

In this section, main findings coming from secondary data collection (Chapter Nº 3) and from stakeholders' perspectives (primary data) (Chapter Nº 4) will be summarized and presented in order to later discuss them in the light of the opportunities and challenges biofuels could present (Chapter Nº 2). Next, conclusions and answers to Research Questions formulated in Chapter Nº 1 will be attempted.

5.1 Findings

5.1.1 Rural poverty

It was found that poverty in Honduras affects 972 000 households (around 60%) (INE 2007). Though such proportion is already significant, in rural areas poverty is even more severe, since it affects 541 000 households (around 66% of total rural households) (INE 2007). Even more to the point, it was found that deprivation in rural areas can be largely characterized as extreme, since some 435 000 rural households (53%) cannot access the basic food basket (INE 2007).

Research on the reasons behind rural poverty in Honduras revealed that the main contributing factor to deprivation is low-income levels (Paes de Barros *et. al.* 2006) and since 85% of rural income comes from work related earnings (Paes de Barros *et. al.* 2006), then meager work earnings can be pointed out as the principal reason for poverty. Rural unemployment on the contrary, was discarded as a reason for rural poverty, since it was found that unemployment rate is only around 2% (INE 2007); consequently, low work earnings and not unemployment, are the cause of poverty in rural Honduras. In this frame, it was found that job earnings vary significantly across different sectors of the economy. As such, rural workers who are engaged in the farming sector receive lower compensations than those who are in other sectors of the economy. In addition, within the farming sector, the quality of the job itself contributes to explain in 60 to 80% variations in earnings. It was found that the quality of the jobs is determined by at least three factors: numbers of employees a particular rural enterprise employs, the occupational category workers have, and the type of production rural workers engage in within the farming sector. As such, it was found that workers who are employed in enterprises that have between 1 and 5 employees are the ones who gain lowest retributions for their work if they are compared to workers who are employed by bigger companies. Similarly, temporary workers, self-employed workers who do not hire others, and family workers, receive the lowest compensations if they are compared to permanent workers, self- employed workers who hire others, and members of cooperatives. Finally, it was found that within the farming sector, workers who participate in the nuts, fruit and plant sector are, within agriculture, the ones who earn higher incomes if compared to those who are engaged in traditional crops cultivation (Paes de Barros *et. al.* 2006).

5.1.2 Food vs. Biofuels

It was found that hunger in Honduras is endemic. In rural areas, some 42% of children are undernourished (Sistema de Naciones Unidas en Honduras 2003). Food insecurity is mainly caused by an unfortunate combination of meager rural incomes and low food productivity resulting from subsistence agriculture. Even more to the point, from research emerged that Honduras is not producing, neither importing, enough staples to feed its population (the basic grains deficit of the country in 2001 was around 462 000 metric tons) (Sistema de Naciones Unidas en Honduras 2003).

It also emerged from stakeholders interviews that recent increase in prices of american produced maize, has dragged along food prices in Honduras. This, coupled with a trend in small holders to abandon traditional crops cultivation, e.g. bananas, maize and cassava, in order to allocate land for palm plantations, has exacerbated food insecurity in rural areas (Telephone Interview Informant B from NGO B, 19th of March 2008). As such, it was found that at least for one of the interviewees, the peasantry is destroying its food subsistence base to plant palm trees.

5.1.3 Energy

Findings in the energy panorama of Honduras showed that the total energy consumption reached 23 000 million bboe in 2004. Of this total, 13 700 million bboe (59%) were generated from oil-based fuels (Ribeiro Gallo 2007). Information provided by some stakeholders, Ambassador Starkman and Mr. Vieira de Carvalho, and by secondary data, revealed that oil based fuels are 100% imported (Ribeiro Gallo 2007). Oil bills are a heavy burden for the country as in 2006, oil bill increased to more than USD 1 012 millions, a number that equaled 67% of the total export value the country made, according to Government source consulted (Telephone Interview Ambassador Starkman, 25th of March 2008).

Secondary data revealed that access to modern energy sources is deplorable as energy related needs are satisfied by burning wood (65%). Lack of access to energy is however more severe in rural areas, where 75% of all gathered wood is used for domestic needs satisfaction, and 15% of it is burnt to satisfy the energy requirements that small rural enterprises such as bakeries, brick makers, etc. have (SERNA 2005).

5.1.4 Livelihoods

A particular and significant finding is the fact that most of rural residents in Honduras are farmers: while 55% of them subsist on less than 2 hectares of land and practice subsistence agriculture, the rest is landless and works for wages in large estates or in small farms (Federal Research Division 2006).

As such it is concluded from information drawn from secondary sources (Federal Research Division 2006) and confirmed by some stakeholders' perspectives (Telephone Interview Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008) that the typical case in rural Honduras is one of these two: either a peasant works at his father's plot, to later continue working in his own parcel and complements his meager income with seasonal employment compensations, or on the other hand, a man is landless and works for wages in temporary jobs in the farming sector

5.1.5 Land tenure

It was found that land tenure structure is characterized by three major problems: first, rural land concentration; secondly, by plot fragmentation into a size that does not enable profitable exploitation, and thirdly, by illegal land tenure and continuous encroachments (Serrato Combe 2000). Some 45% of the peasantry remains landless. The rest subsists, on less than 2 hectares of land (Federal Research Division 2006).

5.1.6 Water and soils

Findings show that even though Honduras is a water-rich country seasonal water shortages are frequent in the country because of a lack of adequate storage and canalization infrastructure, the contamination of water resources, deforestation and river sedimentation (Sistema de Naciones Unidas en Honduras 2003).

Secondary data also revealed that river and coastal sedimentation resulting from agricultural expansion and excessive use of fertilizers are the main sources of degradation of the Meso American Coral Reef. However, it exits agreement among stakeholders that river and coastal sedimentation is not mainly caused by palm plantations, but that it responds to multiple causes, e.g. cattle ranching and traditional crops growing. However, it is agreed that palm plantations contribute to that process to some extent, though it is not known how much they do (Telephone Interview Ambassador Starkman, 25th of March 2008 and Informant B from NGO B, 19th of March 2008).

5.1.7 Ecosystems degradation

Secondary data revealed that most of deforestation (80%) has occurred in broadleaf-forested areas (SERNA 2005), that is to say, in similar ecosystems to those where oil palm cultivation could take place. Even more, it emerged from research that the main reason leading to deforestation is agro-business cash crops expansion, that is to say, similar developments to palm oil export oriented cultivation (Bustillo Pon and Dominguez 2002). In addition, it was found that forced displacement and wood gathering for energy needs satisfaction are important contributors to deforestation (Sistema de Naciones Unidas en Honduras 2003). Both of these are important findings since deforestation could be exacerbated as a result of palm expansion or on the contrary, it could be reduced if access to modern energy was to be provided.

Stakeholders' opinions reveal controversy on whether oil palm expansion will or will not threaten valuable ecosystems, i.e. rainforests located in the East part of Honduras. In this sense, some interviewees think that deforestation is not a real threat. They argue that such risk is not likely to happen since firstly, deforestation is forbidden by law; secondly, because many sectors of these valuable ecosystems are protected for conservation purposes and thus deforestation is ruled out, and thirdly and most importantly, because oil palm expansion will occur in different regions than those where significant ecological values exits (Telephone Interview Ambassador Starkman, 25th of March 2008 and Dr. Contreras, 27th of March 2008). On the other hand, NGOs representatives think that palm expansion truly presents a threat to valuable ecosystems in at least three ways. Firstly, because small holders unlawfully introduce palm plantings into protected areas; secondly, because oil palm expansion could trigger population displacements affecting untouched natural ecosystems and thirdly, because oil palm plantings is already advancing into these areas (Telephone Interview Informant B from NGO B, 19th of March 2008).

Another important finding in regards to ecosystems degradation is that latest increases registered in palm fruit and palm oil productions have occurred as a result of area expansion and not as a consequence of agricultural intensification (Ribeiro Gallo 2007)

5.1.8 Location of new plantations

Research unveiled another disagreement in relation to the locations in where oil palm cultivation will take place in the future. As such the official map that the Government presents

in its National Biofuels Plan shows that suitable areas for palm cultivation are much more extensive than actual planted areas and that they include practically all Eastern portions of the country (La Moskitia). However, during research interviews when the Government' officer and the expert were asked about the map and about future palm cultivation locations. Both explained that the map the Government presents when advocating for biofuels development (areas marked in red), shows where in theory agricultural suitability exists. In no case it shows where in reality plantations will occur. Therefore, according to their opinion, the map tries to convey only a theoretical potential and not a concrete plan of expansion. They argued that plantations on the contrary, are likely to occur in those areas where palm cultivation already exists, in areas that are near to existing facilities since transport costs limit the distances feedstock can be transported and still be economically competitive (Telephone Interview Dr. Contreras, 27th of March 2008 and Ambassador Starkman, 25th of March 2008). Most of these areas they propose present extensive cattle farming, and subsistence agriculture or are abandoned pasturelands (Telephone Interview Dr. Contreras, 27th of March 2008 and Ambassador Starkman, 25th of March 2008). These areas are located in the Valley of Sula, the Valley of Aguán and of the Río Tinto (Telephone Interview Dr. Contreras, 27th of March 2008). On the contrary, the NGO representative claims that the official map actually shows the direction and locations towards which powerful oil palm holdings are already heading to (Telephone Interview Informant B from NGO B, 19th of March 2008).

5.1.9 Description of the oil palm sector

It was found that the palm oil sector is dominated by seven holdings groups. In addition to that, 7 000 small producers cultivate palm in small plots that in average have 10 hectares each (Ribeiro Gallo 2007); however, it becomes also apparent from some stakeholders information, that the sector is monopolized by powerful companies (Telephone Interview Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008). It also emerged that small producers do not sell directly to the oil giants, but to the "coyotes", the group of intermediaries who enjoy supply contracts with powerful holdings and make gains without risks. As a consequence, small holders have to content with meager profits (Telephone Interview Informant B from NGO B, 19th of March 2008).

Research also revealed that feedstock supply seems to be the most significant bottleneck in the production chain (Telephone Interview Ambassador Starkman, 25th of March 2008, Dr. Contreras, 27th of March 2008, Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008). As such, palm oil giants (who are the ones who in most of the cases own the processing facilities) try to secure abundant palm oil feedstock. To do so, they stimulate small producers to cultivate palm trees by facilitating seeds, fertilizers, and funding. On the other hand, small producers have to pay them back little by little and become very dependent on oil giants production and price conditions (Telephone Interview Dr. Contreras, 27th of March 2008, Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008). It also emerged from research that in order to solve this problem and with the intention to enable small holders participation, the Government launched an initiative directed to legalize land tenure and enable access to financing opportunities to all those small producers who wish to participate in oil palm cultivation and own a plot bigger than five hectares (Telephone Interview Ambassador Starkman, 25th of March 2008 and Dr Contreras, 27th of March 2008).

5.1.10 Destiny/purpose of oil palm based biodiesel

It was found that every stakeholder seems to agree on the fact that there are no possibilities for near future biodiesel commercial production and use in the country. The inexistence of a

supply chain enabling commercial use seems to be the main obstacle for that (Telephone Interview Ambassador Starkman, 25th of March 2008 and Dr. Contreras, 27th of March 2008). As such, the focus is placed on palm oil production; however, in future times oil palm based biodiesel production is expected to become a reality (Telephone Interview Ambassador Starkman, 25th of March 2008 and Dr. Contreras, 27th of March 2008). Most of interviewees agreed that future biodiesel production is likely to be exported since better prices paid in the international market and the difficulties to set up a supply chain and a legal taxation frame are likely to provoke such a trend (Telephone Interview Dr. Contreras, 27th of March 2008 and Mr. Vieira de Carvalho, 18th of March 2008). However, it was also found that it is likely that some minimum amount of biodiesel stays in the country in order to satisfy internal needs (Telephone Interview Dr. Contreras, 27th of March 2008 and Informant B from NGO B, 19th of March 2008). Nevertheless, it emerged that it is unlikely that some of that remains in rural communities for basic energy needs satisfaction or for rural enterprises use, since biodiesel production is mainly intended to satisfy transport related needs (Telephone Interview Mr. Vieira de Carvalho, 18th of March 2008, Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008).

5.1.11 Benefited parties

It was found that when stakeholders were asked to point out main benefited parties from the Governmental biofuels strategy, opinions were diametrically opposed. The Government suggested that rural poor who will enjoy new jobs opportunities will be the winners of biofuels official strategy; whereas the IADB officer expressed that benefits will accrue to those producers who have enough investment capacity to participate in the business and also to a lesser extent to rural workers. On the other hand, environmental NGO representatives believe benefits will be enjoyed by powerful agro-commercial holdings that benefit from land tenure concentration and which have access to credit or count on enough financial resources to face upfront needed investments (Telephone Interview Informant A from NGO A, 2nd of March 2008 and Informant B from NGO B, 19th of March 2008). They pointed that though small producers could have temporary modest gains; at the end, they are likely to be worse off. Their claim is based on the fact that small holders cannot break down the intermediaries link and so their gains are reduced. In addition, as they abandon traditional crops cultivation to devote entire small plots to palm plantings, they become extremely dependent on conditions and prices set by powerful holdings and intermediaries, narrowing down in such way, their cultivation and livelihoods options (Telephone Interview Informant B from NGO B, 19th of March 2008).

5.1.12 Rural peasantry and landless people

It was found that every stakeholder agreed that the only opportunities for landless peasants and rural poor who have less than five hectares of land are employment opportunities (Telephone Interview Ambassador Starkman, 25th of March 2008, Dr. Contreras, 27th of March 2008, Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008). In this sense, it was estimated by the Government that for every two cultivated hectares, one direct and two indirect jobs will be generated. Consequently, 100 000 new direct jobs will be created (harvesters, etc.) and 200 000 indirect jobs will be generated in other economic sectors related to the oil palm development (Telephone Interview Ambassador Starkman, 25th of March 2008). It was also revealed that work in the palm cultivation sector is characterized by temporary positions, which are randomly offered (Telephone Interview Informant B from NGO B, 19th of March 2008).

Secondary data analysis demonstrated that average earnings in the nuts, fruit and plants sector are 1460 Lempiras/month (USD 77/month) (Paes de Barros *et. al.* 2006). However, controversy existed among stakeholders in regards to how much a day laborer working in the palm sector (harvester) could earn. On the one hand, it was found that the Government believes that this amount can be as much as USD 4.5 to 6 /day[65] (Telephone Interview Ambassador Starkman, 25th of March 2008); whereas the NGO representative stated that salaries in the sector can be as meager as to USD 1 or 2 /day (Telephone Interview Informant A from NGO A, 25th of March 2008). It was also established that laborers do not receive any kind of social or health care benefits (Telephone Interview Informant A from NGO A, 25th of March 2008). In addition, research suggested that it exists a trend in mechanization and so employment opportunities could not be as good as expected (Telephone Interview Informant A from NGO A, 25th of March 2008 and Mr. Vieira de Carvalho, 18th of March 2008).

5.1.13 Forced/voluntary displacements

Research showed that in Honduras most rural migration responds to economic and environmental causes (Casasfranco Roldán 2001). However, sporadic events of forced displacement driven by agro-commercial expansion have also been experienced (Fian 2007, Fian b 2007 and Fian 2002).

Research showed controversy on whether commercially oriented oil palm expansion could provoke voluntary and/or forced people displacement. On the one hand, it seems to remain uncertain the destiny that awaits poor farmers who practice subsistence agriculture in those areas where palm plantings are going to be introduced. Optimistic positions assert that rural poor will have the opportunity to find a job in the plantations (Telephone Interview Dr. Contreras, 27th of March 2008). On the contrary, NGOs representatives believe that voluntary and forced displacements are a common experience in rural Honduras, and as such, it would not be unrealistic to think that this unfortunate phenomenon could be triggered by the palm sector as well (Telephone Interview Informant B from NGO B, 19th of March 2008 and Informant A from NGO A, 25th of March 2008).

It was found that the dynamics of voluntary migration responds to the following pattern: powerful holdings move forward, buy land to small producers and these abandon the area, migrating to Honduran cities, to other countries or to neighboring forested areas. On the other hand, the dynamics of forced population displacements, that pertain to agro-commercial expansion in general and not to palm cultivation expansion in particular, are characterized by coercive actions in which landless peasantry are just pushed away and just like in the case of small holders, they migrate to cities, foreign countries or forested areas (Telephone Interview Informant A from NGO A, 25th of March 2008 and Informant B from NGO B, 19th of March 2008).

5.2 Discussion

In this section, main research findings are discussed and interpreted in light of the potential opportunities and challenges that biofuels present. First, opportunities offered by palm oil based biodiesel production are discussed in terms of:

Opportunities to promote rural development by means of:

[65] Information inferred from personal communication with Ambassador Starkman who said that a harvester could earn as much as 2 500 to 3 500 Lempiras/month (USD 130 to 183 /month).

1. Creation of new sources of employment/income generation and increased capital turnovers,

2. Advancement of a critical production input: energy provision to other rural enterprises,

3. Facilitation of Millennium Development Goals' (MDGs) achievement through secure and affordable energy provision.

Later, the challenges and implications that palm oil based biodiesel present to rural poor communities will be discussed in terms of:

1. Food security

2. Population displacements

3. Water and Soils

4. Natural ecosystems

5.2.1 Opportunities to promote rural development

5.2.1.1 Creation of new sources of employment/income generation and increased capital turnovers

It was seen in Chapter Nº 2, that biofuels have the potential to promote rural development through:

1. The creation of new sources of employment and associated jobs earnings, and

2. The generation of increased capital turnovers benefiting those who can participate in the new development.

The first opportunity is expected to occur as a direct consequence of an increment in the demand of labour forces in the agricultural sector (Larson and Kartha 2000); however, it also became apparent that employment opportunities might not come true to the expected level if the degree of mechanization was significant. As such, the debate centers on the following:

a. Will palm oil based biodiesel contribute to create new sources of employment?

b. Will these new employment opportunities help alleviate poverty in rural Honduras?

a. From the findings, it results that palm oil based biodiesel is likely to contribute to the creation of new employment opportunities. These are likely to happen in the areas where plantations are and will be located and to occur in association to the farming sector. Day laborers are most likely to be needed during leveling, planting, fertilizing and harvesting periods. Therefore, most work opportunities in the biodiesel sector seem to be related to in farm activities and to be temporary. The ultimately number of new created positions is difficult to predict. Official expectations (100 000 direct and 200 000 indirect new jobs) could be water down to a certain extent if perceived trend in mechanization becomes true.

b. From research, it results unlikely that palm oil biodiesel development will have a significant impact in alleviating poverty. It was observed that poverty in rural Honduras was mainly

caused by low job earnings and not by unemployment; consequently, just the mere creation of new jobs positions does not guaranty a reduction in poverty. What actually would help reducing deprivation in rural areas are higher jobs incomes: higher, at least, to a level where people could access basic food and shopping baskets. Therefore, if jobs earnings in the palm sector are analyzed in order to understand how much these would contribute to alleviate poverty, it results evident that they will not contribute much.

Findings show that jobs earnings in the palm sector are low and they are not enough to reach the basic shopping and food baskets. According to secondary data analysis, average income in the nuts, fruit and plants sector (in which African palm cultivation is included), totaled USD 83/month in 2003[66] (1460 Lempiras/month) (Paes de Barros *et. al.* 2006). For the Government, the same figure for 2008 totaled USD 6 /day, that is to say, USD 180 /month; whereas, for the NGO representatives the average income for a day laborer in the sector could be as maximum as USD 2 /day, that is to say, USD 60 /month. No matter which one of the three (USD 83, USD 180 or USD 60) are compared against the costs of the basic food and shopping baskets; the truth is that none of these incomes is enough to enable access to any of them. In this sense, it is useful to remember that the cost of basic shopping basket in rural areas for 2007 was calculated in 1053 Lempiras/capita/month (USD 55 /capita/month); and that the cost of the basic food basket was estimated for the same area, in 788 Lempiras/capita/month (USD 41 /capita/month) (INE 2007).

These values tell how much one single person needs to satisfy its basic needs and to eat. If it is considered that the average household in rural Honduras is compounded by five people (INE 2007), then the costs total some USD 275 /month (basic shopping basket) and USD 205 /month (basic food basket). Consequently, not even the optimistic salaries expressed by the Government (USD 180 /month) have a level enough to access any of the baskets by a typical family in rural Honduras. Therefore, as access to the basic shopping and food baskets were taken as criteria for poverty characterization (Chapter 1), establishing that those who cannot access them were poor and extremely poor respectively, it can be concluded that even in the most optimistic scenario (official one) income levels of the palm sector are not likely to contribute to alleviate poverty in rural Honduras.

The second opportunity biofuels are expected to enable is enhanced capital turnovers. Farmers could benefit from the creation of a second alternative market which could reduce business risks associated to the existence of a single market and where surpluses could be commercialized (Larson and Kartha 2000). However, it was seen that opportunities were not straightforward and for these benefits to occur, certain preconditions were needed. As such, rural poor would have to count on access to land and water, and on adequate financial capital to face upfront investments if they were to enjoy increased capital turnovers (UN-2007 and Peskett *et. al* 2007). Therefore, the debate centers on the following:

a. Will small holders benefit from enhanced capital turnovers? Who will benefit among small holders and what benefits should they expect?

a. It seems that in the short-term small holders who own a plot bigger than five hectares (the minimum size requirement the Government asks for enabling access to credit) could benefit

66 USD values corresponds to average annual exchange rate the Lempira had in 2003 according to the Central Bank of Honduras (17.54 Lempiras/USD 1) http://www.bch.hn/esteco/ianalisis/proint.xls

from the biofuels strategy launched by the Government. However, these benefits seem to be marginal, temporary and highly dependent on external factors. The benefits that these small producers seem to be likely to gain are not as appealing as they might seem. Monopolized oil palm production chain and powerful palm oil holdings who set cultivation and price conditions and to which small producers are doubly bounded reduce small holders' chances to have real gains (powerful holdings are the sole buyers small holders have for their production and they are at the same time the source of financing and fertilizers and plants provision). In addition, the existence of "coyotes" that intermediate between large holdings and small producers and strip the latter of their already modest gains, contributes to water down small holders expectations. The rest of rural residents, that is to say, the truly poor peasantry, will not benefit since 55% of them subsist on less than two hectares, i.e. on less than the minimum legal requirement for accessing the credit facilities and participating in the palm development; and the remaining (45%) is landless.

In conclusion, though small holders who have plots bigger than five hectares are likely to benefit, these gains seem to be marginal, temporary and risky. On the other hand, for those poor peasants who count on less than five hectares or who remain landless, the only opportunities they have are employment opportunities, which as discussed above do not seem so impressive.

5.2.1.2 Energy for improving the rural economy and for Millennium Development Goals' (MDGs) achievement

Opportunities 2 and 3 will be discussed together as main findings, arguments and conclusions apply to both.

In Chapter Nº 2, it was discussed how biofuels could contribute towards rural development through the advancement of energy provision. In this sense, rural economy could be boosted if only affordable and secure energy could be provided to power machinery (Larson and Kartha 2000). Farmers could be able to switch to higher value crops and to improve animal husbandry, increasing in this way capital turnovers and creating in turn employment opportunities for others, if energy were available (Modi *et.al.* 2006). Similarly, if off- farms activities in rural economies, e.g. brick makers, bakers, ceramics, artisans, etc. were to count on reliable and affordable energy, capital turnovers would be improved, just by increasing production and by adding value to it (Larson and Kartha 2000). Similarly, it was seen that biofuels could contribute to rural development by enabling MDGs fulfillment for the 2.6 billion people who currently depend on traditional biomass to satisfy their basic needs, e.g. cooking, heating, pumping water, powering machinery, etc. (UN-Energy 2007). Consequently, it was concluded that biofuels could be a key entry point to poverty and hunger eradication (MDG1), child mortality reduction and improvement of maternal health (MDG4). As such, the discussion should center on the following aspect:

a. Will produced palm oil based biodiesel remain in rural areas for the benefit of rural poor in Honduras? Where produced biodiesel is likely to be destined?

a. Palm oil based biodiesel produced in Honduras is not likely to remain in rural areas and consequently, it is unlikely that it benefits rural poor. Research findings demonstrated that produced biodiesel is mainly intended to satisfy transport related needs. As such, produced biodiesel is not likely to help boost traditional rural economy to a significant level where local economy blooms; and surely will not contribute to advance MDGs, since biodiesel will not be devoted to cooking, heating or to pumping and disinfecting water. Even more, produced biodiesel is not likely to remain in significant amounts in the country for the satisfaction of

transport related needs since better prices paid in the international market and the inexistence of a commercial supply chain and complete regulatory frames will most probably drive production towards the export market. Nevertheless, the country still could gain from building up such export market since export revenues could be used to pay expensive oil bills that currently burden its economy. Likewise, some Hondurans could also enjoy some of the nationally produced biodiesel if the Government requires a minimum amount of the production to remain in the country for transport needs satisfaction, an intention that seems on the other hand, likely to exist. In conclusion, rural poor themselves are not likely to enjoy any of the benefits biodiesel production could deliver to them in terms of boosting the local economy and contributing to development as produced biodiesel is not intended for that and will not remain in rural areas.

5.2.2 Challenges and implications affecting rural communities

5.2.2.1 Food security

Chapter Nº 2 pointed out that biofuels have the potential to become a major threat to food security if vast amounts of staples are diverted from food to biofuels production or if water and land are allocated for energy crops cultivation in detriment of food crops plantations. Likewise, food security could be at risk if expected stronger connections between the agricultural and the oil markets lead to higher food prices. In this sense, escalating oil prices and increasing demand of feedstock for biofuels production could lead to a rise on food prices (UN-Energy 2007, de Fraiture *et. al.* 2007, Brown 2006 and Pimentel 2003). It was also observed that impacts provoked by biofuels production on the food balance were hard to predict and unlikely to occur, at least at the global scale. Nevertheless, threats to food security at the local level were easier to predict and likely to occur under certain conditions. In this sense, it was determined that food security could be at risk if biofuels were to be produced in previously food insecure regions or in situations where countries or households were net buyers of food or where no adequate policies to prevent biofuels negative impacts were in place (Hazell and Pachauri 2006). Therefore, within this frame, the discussion should focus on the following aspect:

a. Could food insecurity in rural Honduras be exacerbated as a result of palm oil based biodiesel production? Will vast amount of staples or the resources needed to produce them be diverted to cultivate biodiesel feedstock? Are connections between the palm oil market and the food market likely to become stronger because of biofuels production?

a. It is likely that the food insecurity context in rural Honduras worsen as a consequence of an expansion of oil palm plantings for biodiesel production. Reasons for this are several:

It was perceived that there is already a competition over arable land between palm expansion and food production. Arable land is on the other hand, very limited: only 15% of Honduran territory has agricultural potential (Federal Research Division 2006). In this sense, the abandoning of traditional crops cultivation e.g. bananas, maize, cassava, etc. to plant African palm is already provoking the destruction of the food subsistence base. Consequently, land is being diverted from traditional food production to palm oil cultivation.

Incomes generated from palm cultivation seem to be short-term guarantied, highly dependent on external factors (the existence of a monopolized market and of a chain of ambitious intermediaries that water down small holders' expectations) and marginal. Therefore, these incomes might turn out to be scarce to even guaranty access to food down the road.

Consequently, current shift from food cultivation to oil palm growing might not be a reasonable decision in the long term.

In addition, since a very high percentage (55%) of the peasantry practice subsistence farming and some of them are located precisely in those areas where palm cultivation is likely to occur, then palm expansion could put at risk the livelihoods of millions of peasants and threaten their access to readily available food, without providing them, any good opportunity in exchange. This is not to say that subsistence agriculture is good enough for population nutrition, since it was also observed that one of the reasons for hunger in the country was precisely low food productivity resulting from subsistence agriculture; however, it is to say that half bread is better than no bread. Consequently, subsistence agriculture seems to preferable in terms of nutrition than the alternative to it, that is to say, to relying on palm sector salaries in order to access food as it was seen that these do enable access to basic food basket.

Lastly, oil palm expansion is likely to exacerbate food scarcity because the country already presents a food insecure situation: basic grains deficit was around 462 000 metric tons in 2001 (Sistema de Naciones Unidas en Honduras 2003) and it is already vulnerable to raising and fluctuating prices of the food international sector.

Because of all the mentioned reasons palm oil based biodiesel production is likely to exacerbate hunger in rural Honduras.

5.2.2.2 Population displacement

It was seen in Chapter Nº 2 that one of the most alarming and heartbreaking outcomes biofuels development could cause was forced population displacement. Agricultural expansion is one of the kinds of projects that are likely to bring about such phenomenon. Some of the outcomes such displacements can provoke are landlessness, joblessness, homelessness, marginalization, food insecurity, increased morbidity and mortality, loss of access to common property, social disintegration, loss of access to community service and violation of human rights (Robinson 2003). Moreover, forced population displacement frequently implies intimidation, population property destruction, dismantling of population subsistence base, physical aggressions, groundless criminal accusations, forced evictions, and murders. As such, the debate should focus on:

a. How likely is it that African palm expansion provokes forced population displacement in those areas where palm cultivation is expected to take place?

b. What seem to be the destiny of displaced communities?

a. Though in Honduras most rural migration responds to economic and environmental causes (Casasfranco Roldán 2001), and that palm expansion partially responds to voluntary migration where powerful holdings move forward, buy land of small producers and expand palm plantings; forced displacement cannot be ruled out. Several factors seem to make possible such event. Firstly, commercial African palm expansion has already proven to be a cause of displacement in other parts of the world. In Colombia large-scale commercial biofuels development is the reason behind massive forced migration, persecutions and murders (Hall, 2006). Secondly, Honduras itself presents a history of forced displacements in relation to conflicts over land and agricultural expansion. More to the point, compulsory population displacements have occurred in the country even in relation to commercial African palm cultivation. Evidence presented in Chapter Nº 3 showed that precisely in those regions where palm plantations take place (Departments of Yoro, Colón and Cortés) peasants families have

been violently evicted from their land despite they had been living in the area over decades and had been granted legal entitlement to do so by the Government. In these cases, population displacement has implied intimidation, use of violence, physical aggression, kidnaps, destruction of the subsistence base of the communities, illegitimate criminal accusations and even murders. Thirdly, some stakeholders have expressed their concerns that massive forced population displacement is likely to occur. Findings from research showed that NGOs representatives believe development induced displacements are a common experience in rural Honduras, and as such, they are convinced it is not unrealistic to think that this phenomenon could be triggered by commercial African palm expansion as well. Fourthly, plantations are likely to occur, according to the official and the biofuels expert's perspectives, in areas nearby to existing plantations, areas that today accommodate subsistence farmers. As such, displacement of these populations seems likely to occur. For all these reasons, though it is not possible to assert that massive population displacement will be the most frequent practice when African palm expands, it is possible to claim that occasional forced population displacements are likely to occur. Those dislocations are likely, on the other hand, to be violent and to provoke systematic human rights violations in detriment of the involved peasants communities.

b. The destiny that awaits displaced communities still remains uncertain. Based on previous displacements in Honduras and on research findings, it is possible to predict that if displacements were to occur, peasants would move to forested areas on the East, or would resettle on hilly areas, provoking in such way, deforestation, soil erosion, river sedimentation, etc. On the other hand, migration to Tegucigalpa and San Pedro Sula and to other cities in Honduras and to other countries would also be one of the option peasants would follow.

5.2.2.3 Water and Soils

It was observed in Chapter Nº 2 that biofuels production has the potential to negatively impact water availability during feedstock cultivation and biofuels production processes; though the bulk of impacts, are only likely to occur during biomass growth. During this phase, both, additional irrigation and increased evapotranspiration could threaten the water balance, impacting populations and ecosystems. This could be especially the case in situations where it exists a previous water scarcity context (Berndes 2001 and Fraiture *et. al.* 2007). On the other hand, it was also studied that water quality can be negatively affected during feedstock cultivation and biofuels processing. During the first phase, wide spread use of organic and inorganic fertilizers could contribute to increased levels of nitrates and phosphates; which in turn, by leaching into the soil and running off into water bodies are responsible for water quality degradation, exuberant algae blooming, hypoxia, eutrophication, fisheries collapse and biodiversity loss (Falkenmark *et. al* 2007). On the other hand, agricultural practices such as forests clearance, increase soil erosion; and so, it contributes to rivers sedimentation. Moreover, dangerous byproducts generated during biofuels processing, can end up in nearby recipient water bodies and in soils.

In addition, biofuels can also negatively impact soils during biomass cultivation and biofuels production (Hazell and Pachauri 2006). Harvesting practices in which entire crops (complete plant) are collected and little organic matter is left on the field, can lead to soil fertility loss (Kartha 2006). On the other hand, if soil fertility depends on artificial fertilizers inputs for biomass growth, acidification problems could arise. Moreover, deforestation can lead to soil erosion and related negative impacts such as desertification and river sedimentation. In addition, forests clearance can cause water logging problems that in turn provoke soil degradation (Falkenmark *et. al.* 2007). Finally, certain practices such as "fertigation" in sugar cane cultivation, can lead to toxic concentrations of potassium in soil (Korndörfer and

Anderson 1997). Given all these possible impacts on water and soil, the discussion should focus on the following aspects:

a. How likely is it that African palm expansion negatively affects water resources?

b. How likely is it that African palm expansion negatively affects soils?

a. Palm plantings by themselves do not seem likely to negatively affect water resources availability in Honduras. Reasons behind this claim comprehend that the country is a water-rich country with abundant precipitations (SERNA 2005) and secondly, that palm plantings are rain fed. As such, impacts on the availability of water seem unlikely to occur. However, massive deforestation for palm expansion, if this happens to be the case in Honduras, (See section 5.2.2.4), could negatively reduce water infiltration and consequently, negatively impact populations and ecosystems which depend on those aquifers. Nevertheless, water quality could be highly impacted by the great use of agrochemicals the country presents, which in average surpasses Latin American average (Paes de Barros *et. al.* 2006). As such, eutrophication and water contamination are likely to occur. Similarly, processes of river and coastal sedimentation are likely to be intensified by African palm expansion. As a consequence, a continuation and worsening of the destruction of the Meso American coral reef is likely to persist and exacerbate. However, it is important to notice that even tough African palm expansion will contribute to these impacts, these plantings cannot exclusively be blamed by these impacts as these respond to multiple degrading activities taken place in both the uplands and plain lands.

b. African palm expansion is likely to contribute to soils impacts. Here again, palm cultivation cannot be pointed out as the only or even main source of soil contamination and soil erosion. From stakeholders' interviews, it emerged that soil erosion and its detrimental effects respond to multiple causes that comprehend cattle ranching, agricultural exploitation, etc. Consequently, African palm plantings cannot be exclusively blamed for it, though palm expansion surely will contribute to the process, especially if deforestation occurs (See section 5.2.2.4).

5.2.2.4 Natural ecosystems

In Chapter Nº 2, it was observed that the expansion of the agricultural frontier has been the most significant driver of terrestrial ecosystems change (Molden e*t al.* 2007). Biofuels feedstock production has as such the potential to exacerbate the negative impacts agriculture already presents, i.e. deforestation, habitats transformation and fragmentation, and biodiversity loss (Hazell and Pachauri 2006). As such, the discussion should center on the following aspect:

a. How likely is it that African Palm cultivation exacerbates ecosystems degradation, especially by means of deforestation?

a. It is likely that African palm cultivation negatively impact on Honduran ecosystems, especially if deforestation occurs. This phenomenon on the other hand is most likely to occur. Reasons behind these are several. Firstly, from findings resulted that agro-business cash crops expansion is the first cause of deforestation in the country (Bustillo Pon and Dominguez 2002), as such, palm expansion, which is a cash crop export oriented product, is likely to follow the same destructive patterns other cash crops have. Secondly, because African palm cultivation has already caused deforestation and subsequent ecosystems degradation in other countries; such is the case of Indonesia, where 4 million of hectares of rainforests have

disappeared as 6.5 million hectares of African palm have been planted (Friends of the Earth 2005). Thirdly and most importantly, because the increase in palm fruit and palm oil productions has occurred as a result of expansion of the cultivated area but in no case as a consequence of agricultural intensification (Ribeiro Gallo 2007). Fourthly, because most of the areas where valuable rainforests exist, also show agricultural potential for African palm growing (See Figure 3-2). Finally, because controversy exists among stakeholders on the definite locations African palm will extent to. From stakeholders perspective analysis it emerged that while the Government and the experts' opinions are that deforestation will not occur, especially not in eastern valuable parts of the country, NGO's representatives sustain the opposite is already happening. For all these reasons, ecosystems degradation through deforestation seems likely to occur.

5.2.2.5 Where benefits seem to accrue

In Chapter Nº 4 stakeholders were asked to express their perspectives on who, in their belief, was going to be the most benefited party from the biofuels development plan. It was found stakeholders' opinions were controversial. As such, the official voice argued that rural poor who will enjoy new jobs opportunities will be the winners of the biofuels development strategy; however, as it was previously analyzed in Section 5.2.1.1, low salaries in the palm sector make improbable these job opportunities contribute to poverty alleviation. Consequently, rural poor do not seem to be the ones who will accrue most of the benefits. On the other hand, the IADB officer expressed that benefits will accrue to those producers who have enough investment capacity to participate in the business and to a lesser extent, to rural workers. In this sense, as it was already discussed, small holders (only those who own more than five hectares of land and can access official facilities enabling the participation in the sector) are likely to benefit; however, benefits seem to be ill-fated, since they are short-term guarantied, marginal and vulnerable gains (See Section 5.2.1.1). As such, benefits from the biofuels strategy do not seem to vastly benefit them. On the other hand, environmental NGO representatives manifested that benefits will be extensively enjoyed by powerful agro-commercial holdings, that is to say, by those who concentrate the land, have access to credit and own all phases of the production chain. Their claim seems sound as existing inequality gap between different sectors of society, the monopoly enjoyed by holdings over land and production chain, and the power Honduran upper class exert in the politics of the country makes the argument reasonable.

5.3 Conclusions

In this section of the thesis, conclusions and answers to research questions presented in Chapter Nº 1 will be attempted in light of the findings and the discussion that preceded this section. Therefore, the following research questions should be answered:

1. How realistic are opportunities offered by biofuels development for rural poor communities in Honduras?

2. What are the challenges and implications biofuels production is likely to present to rural poor and the local environment?

3. Where does it appear that the benefits of biodiesel development will accrue?

1. Potential opportunities palm oil based biodiesel could offer to rural poor communities in Honduras do not seem realistic and are not likely to happen to the extent it would be expected. If creation of new sources of employment and associated jobs earnings are

considered, it results evident that despite of the fact that palm oil based biodiesel is likely to contribute to the creation of new employment opportunities (positions), these opportunities do not seem to have a significant impact in poverty alleviation. Even in the most optimistic scenario (the official perspective), job incomes in the palm sector do not reach a level adequate enough to alleviate poverty as they do not enable access to either the basic shopping or the basic food baskets; the two parameters taken into account to characterize poverty and extreme poverty respectively. As such, expected jobs in the palm sector are not likely to contribute to rural poverty alleviation. On the other hand, if opportunities biodiesel could provide to enhance capital turnovers are examined, it results evident that small holders who own a plot bigger than five hectares could benefit from the biofuels strategy launched by the Government. However, the benefits they might gain seem to be marginal, temporary and highly dependent on external factors (the existence of a monopolized market and of a chain of ambitious intermediaries that water down small holders expectations). Moreover, it seems not to be any opportunities to enhance capital turnovers for those poor peasants who count on less than five hectares or who remain landless except for, opportunities related to employment in the palm sector; which were previously discussed.

If opportunities related to the advancement of energy intended to boost rural economy and to facilitate Millennium Development Goals (MDGs) are considered, benefits to the rural poor are unlikely to happen. Biodiesel will be mainly oriented to transport needs satisfaction and to the international market. Consequently, produced biodiesel is not likely to help boost traditional rural economy to a significant level or to advance MDGs achievement since produced biodiesel will not be devoted to cooking, heating, or pumping water related needs, but to transport necessities satisfaction. In conclusion, none of the potential opportunities biodiesel development could bring to rural communities in Honduras is expected to occur at expected levels.

2. Palm oil based biodiesel is likely to present several challenges and to have a number of implications for the local rural communities and the local environment. Firstly, oil palm expansion has the potential to already worsen insecure food context in rural areas because lace food and biodiesel feedstock production are likely to compete over limited arable land. In this sense, the abandoning of traditional crops cultivation to plant African palm is already provoking the destruction of the food subsistence base. Moreover, incomes generated from palm cultivation seem to be short-term guarantied, highly dependent on external factors (the existence of a monopolized market and of a chain of ambitious intermediaries that water down small holders' expectations) and marginal. Therefore, these incomes might turn out to be scarce even to guaranty access to food down the road. Consequently, current shift from food cultivation to oil palm growing might not be a reasonable decision in the long term. In addition, since a very high percentage (55%) of the peasantry practice subsistence farming and some of them are located precisely in those areas where palm cultivation is likely to occur[67], then palm expansion could put at risk the livelihoods of millions of peasants and threaten their access to readily available food, without providing them any good opportunity in exchange. Lastly, oil palm expansion is likely to exacerbate food scarcity because the country already presents a food insecure situation and because it is already vulnerable to raising and fluctuating prices of the food international sector. For all these, oil palm expansion is likely to contribute to structural food scarcity in rural Honduras.

Secondly, African palm expansion in rural Honduras has the potential to trigger forced population displacement. Several factors determine the likelihood of this phenomenon to

67 According to Ambassador Starkman and Dr. Contreras.

occur. First, the fact that commercial African palm expansion has already proven to be a cause of displacement in other parts of the world. Secondly, the precedents that Honduras itself, has on forced displacements in relation to conflicts over land and agricultural expansion, and even in relation to commercial African palm cultivation. Finally, the high likelihood that palm expansion occurs, at least partially, in areas surrounding current plantings, that is to say, in areas that today accommodate subsistence farmers. These reasons alert about the possibility of forced displacements. The destiny of displaced peasants' communities, if forced displacements were to occur, still remains uncertain, but if those were to happen, most likely peasants would either encroach into untouched natural ecosystems or migrate to urban centers within and outside the country.

Thirdly, palm plantings by themselves do not seem to pose a threat to water resources availability in Honduras. Abundance of precipitations will probably prevent such outcome. However, water quality seem likely to be highly impacted by the great use of agrochemicals and by coastal and river sedimentation. Likewise, palm cultivation will probably contribute to soils impacts as soils will be eroded and contaminated by intense agrochemicals use. Nevertheless, it has to be mentioned, that in both cases, such impacts on water and soils cannot be exclusively attributed to palm expansion as they actually respond to multiple causes.

Finally, it is very probable that African palm cultivation negatively impacts on Honduran ecosystems, especially if deforestation occurs, a phenomenon that is on the other hand most probable to occur. Several reasons support this argument. Firstly, the fact that agro-business cash crops expansion is already the first cause of deforestation in the country. Secondly, the precedent that African palm has already proven to be a threat to ecosystems and to provoke deforestation in other countries. Thirdly and most importantly, because the experienced increase in palm fruit and palm oil productions in the country have occurred as a result of expansion of cultivated area and not as a consequence of agricultural intensification (Ribeiro Gallo 2007). Fourthly, because rain-forested areas in the country also present agricultural suitability for palm plantations as it was shown by the official map. Finally, because there are legitimate worries that palm expansion towards pristine ecosystems regions has already started. For all these, ecosystems degradation mainly provoke by deforestation is likely to occur.

3. It seems that in their most part, benefits from biofuels development in the country will accrue to powerful agro-commercial holdings, since these groups are the ones who have significant access to land, own the oil chain production, count on sufficient financial resources and most importantly, have access to power.

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