

# MASTER'S THESIS

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*Payments for Environmental Services and Microfinance:  
Proyecto Cambio in Nicaragua*

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# Payments for Environmental Services and Microfinance: Proyecto Cambio in Nicaragua

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## **Abstract**

In this thesis I try to give an evaluation, using the case study of Proyecto Cambio in Nicaragua, of the mix of microfinance tools and payments for environmental services to stimulate rural environmental friendly development. I try to give a global view on the potential environmental impacts of such programs and to correlate them with socio-economic inequalities. The results presented underline the good potentiality for these programs, but at the same time the need to embed them into a clear set of environmental and development strategies. The absence of this last step could indeed induce an overall doubtful impact on the environment and could promote practices that worsen the environmental degradation and sustain or strengthen the socio-economic inequalities, even for programs that are perfectly working at the financial level point of view.

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*This thesis is dedicated to the rural producers in Nicaragua*

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# 1 Executive Summary

Micro Finance (MF) and Payment for Environmental Services (PES) had and are having an important role both at the local and at the international level in poverty reduction and environmental preservation strategies. Indeed they both have appealing features: MF aims to financial inclusion, claiming that this could foster the development of the poor in a cost effective way; PES claims that the allocation of a price to the services provided by the environment would stimulate the preservation of the environment itself. Recently it was proposed to combine MF and PES to foster the environmentally friendly rural development of small and micro entrepreneurs. This choice is motivated by the vulnerability of the MFIs' clients to environmental degradation, their local contribution to environmental damaging activities and the privileged access of the MFIs to the small and micro entrepreneurs. However, even if potentially very promising, MF plus PES is a market tool that try to correct market problems, and it seems natural to wonder about its actual effectiveness and the possible need of additional tools and strategies to complement it. A large scale and interesting MF plus PES program is right now implemented in five Central America countries under the name of Proyecto Cambio. This program combines credit, technical assistance and PES to stimulate the development of rural environmentally friendly activities such as pasture combined with shadow trees, cacao or coffee plantations mixed with shadow trees, protection of water sources, living fences, filter for the coffee activity, etc. that could at once increase the stability and the amount of the income of small and micro rural producers, and at the same time foster the reforestation and the protection of biodiversity.

The major goal of this thesis is to investigate some aspects of the combination MF plus PES and in particular its effectiveness on the environment preservation and its correlation with socio-economic inequalities, using the case study of Proyecto Cambio in Nicaragua.

In the thesis I try analyze the program taking into account the underlying complexity of the human-environment system that seems to be hardly reducible to the typical market system. My study proceed in three steps: a careful investigation of the relevant literature at the international and national level, and the analysis of the local rural development pathways and their impacts on the environment and the socio-economic inequalities; the analysis of the secondary data coming from the internal analysis and the database of the local institutions implementing the program; and the collection of primary data with interviews and visits in the farms of various sample of producers in the central and north part of Nicaragua, and with interviews to managers and technicians of the institutions implementing the program, and to the local governamental institutions.

The study of the primary data, forming the core of this thesis, follows a methodology divided into four steps: economic and or environmental additionality of the realized activities; potential medium term sustainability of the implemented changes and their integration into the production strategies of the rural producers; the relation between the program activities and the livelihood strategies of the producers and the induced externalities of the program in the full rural production of the clients, and its effects on the neighborhoods, to try to obtain a picture of the potential global impact of the pro-

gram; the analysis of the synergies and trade-off among the various objectives and actors implementing the program.

The results presented in the thesis agree with the line of thought of the institutional ecological economics, and they argue that the market tools for environmental preservation, reforestation, biodiversity protection, etc. to be really effective should be thought as embedded into a set of rural development strategies that try to promote at once the improvement of the livelihood of rural producers and the preservation of the environment, with the aim to articulate with the various actors in the system to try to redirect the macroscopic development pathways that could be dangerous for the environment and the strength of socio-economic inequalities. The results presented in this thesis indeed clearly show that, even a such a well structured and complex program as Proyecto Cambio, working well from the financial level point of view, could have an overall doubtful impact on the environment and could promote practices that worsen the environmental degradation and sustain or strengthen the socio-economic inequalities. This conclusion seems to be due to the absence of a clear environmental credit policy, that should try to maximize the environmental impact, and the not careful enough implementation of the mechanisms that should aim to create synergies among the various strategies and actors. From my analysis it appears quite clearly that the absence of these, and other complementary mechanisms, seems to stimulate a market logic that is satisfied by the local impact of the program and, not caring of the globality of the human-environment dynamics, tends to indirectly reproduce or sustain the classical line of development strategies, with their known drawbacks in term of environment and socio-economic inequalities. My analysis seems moreover to confirm the correlation between socio-economic inequalities and environmental degradation, and the necessity for a policy that should try to relate with both of them at the same time.

Proyecto Cambio in Nicaragua has great potentialities in term of rural development and environmental preservation, but to be really effective it should undergo an evolution path that could bring it from being a good microfinancial product to be a micro financial product for the environment that should try to transcend the individual-farm level incentive strategies and stimulate territorial cooperations.

## 2 Introduction

The modern development model, while quite successful in term of growth, it was not able to eradicate, but instead it sustained to certain extent, socio-economic inequalities (Wade, 2002), and boosted environment degradation (MEA, 2005) which has among its major consequences the climate change phenomenon (AR4 IPCC, 2007; CC UNEP, 2009). Socio-economic inequalities and environment degradation are not only moral problems, but they could also potentially offset many of the socio-economic progresses already achieved: too unequal societies deprive the human beings to be actors in their own society (Sen, 1999), undermine the socio-economic growth (WDR , 2006; World Bank, 2008) and moreover threaten the socio-economic stability; while the environmental degradation and the associated rapid loss of biodiversity and the climate change phenomenon could be among the major socio-economic drawbacks of our history (Stern, 2006; Harris and Goodwin, 2009).

MicroFinance (MF) and Payments for Environmental Services (PES) played and are playing an important and rapidly increasing role in the international scene to try to prevent and mitigate these two major drawbacks. MF was developed to correct some of the financial market imperfections to allow the poor to have access to the formal financial sector and foster in this way their economic growth and reduce, at least in part, the unequal access to various freedoms and opportunities (Morduch, 1999; Bauchet et al., 2011); PES were developed with the idea that environmental degradation is an externality of our market economy and it could be corrected once adequate property rights for the environmental assets are established and consequently a price for the services they provide to the humans is fixed (Ferraro and Simpson, 2002; Wunder, 2005; Engel et al., 2008; Lipper at al., 2008). The clients of MFIs, especially in rural areas, are among the most vulnerable to the consequences of environmental degradation and moreover sometimes their activities are also seriously damaging the environment and biodiversity (Hall et al., 2008; Munoz and Christen, 2004). For this reason it could seem quite natural to introduce a third bottom line: the environment, into some of the MF programs. MF programs that aim towards this direction form what is called: the "Green Microfinance" (GMF). An interesting example of GMF is the combination of MF with PES to look for possible synergies that could at once increase the economic and financial opportunities of the poor and preserve at the same time the environment, in the path of a win-win logic. However, even if MF and PES are both conceived as tools to correct the market imperfections and the externalities that generate and sustain socio-economic inequalities and environmental degradation, they are both market tools that try to correct market problems, and it seems natural to wonder about their actual effectiveness and the possible necessity to complement them with additional tools and strategies.

A large scale and interesting MF plus PES program is right now implemented in five Center America countries under the name of Proyecto Cambio (CAMBio I, CAMBio II). Its main objective is to try to foster rural development and environmental preservation.

The major goal of this thesis is to investigate some aspects of the combination MF plus PES: its effectiveness on the environment and its correlation with socio-economic inequalities, using the case study of Proyecto Cambio in Nicaragua.

In this thesis I try to argue, along the line of the institutional ecological economics prospective (Paavola and Adger, 2005), that MF plus PES has good potentialities, but to be really effective it should be though as part of rural development strategies that try to promote at once the improvement of the livelihood of rural producers and the preservation of the environment, with the aim to articulate with the various actors in the system to try to redirect the macroscopic development pathways that could be dangerous for the environment and the strength of socio-economic inequalities. Indeed my results show that in the absence of a clear environmental credit policy, that should try to maximize the environmental impact, and with a not careful enough implementation of the mechanisms that should aim to create synergies among the various strategies and actors, the overall impact on the environment is doubtful. Moreover from my analysis it will explicitly appear that socio-economic inequalities are correlated with environmental degradation and that the simple straightforward application GMF as a market instrument could worsen the environmental degradation and strengthen the socio-economic inequalities, even if the product is perfectly working at the financial level.

## 2.1 Research Objectives

The broad objective of my research is to contribute to the generation of knowledge about the support of microfinance to rural environmental friendly development. The specific empirical research objective is to investigate in depth the potential impacts of the Proyecto Cambio at the global level, and not just at the single MF product level, to try validate or invalidate the previous preliminary empirical and theoretical results about the drawbacks of simple market products to preserve the environment, and the need of a more institutional approach to complete and complement these products. Important attention will be devoted to the comprehension of the main mechanisms that generate and sustain social bias, leakage and ineffectiveness. The theoretical objective is to try to understand some of the possibilities to reformulate the PES plus MF programs inside a pattern of environmental development strategies that avoid the perpetuation of environmental degradation and the increase of inequalities, and potentially reduce these phenomena.

The main research question is:

- What are the actual effects and potentialities of MF plus PES (in the specific case of Proyecto Cambio in Nicaragua) on the environment and rural development, and how are they correlated with socio-economic inequalities?

The main sub-question is:

- Is there room to formulate MF plus PES programs in a way to tackle at once socio-economic inequalities and environmental degradation and promote more effective environmental development patterns?

## 2.2 Thesis Outline

The rest of the thesis is organized as follow. In section 3 I give a short review of the theoretical discussion about MF and PES relevant for the rest of the analysis, and I report on some of the preliminary analysis and discussions on the specific case of Nicaragua and Proyecto Cambio. In section 4 I describe the methodology I use to analyze the program along the concept of: Additionality, Sustainability, Externalities and Governance. In section 5 I present some of the details of my field study during the internship period, some information about the macroscopic environmental and socio-economic trends at the national and regional level, and the text of the main questionnaires used in the interviews. In section 6 I discuss the main sources of data: primary and secondary, and the degree of their reliability. Moreover I present some of the recent trends of the Proyecto Cambio, as it appears from previous studies and discussions. In section 7 I present my main results. In the first part I discuss the motivation of the producers to engage in the program, the environmental and economic additionalities provided by the program and its potential medium term sustainability. I then discuss at length the externalities it induces and how they are correlated with socio-economic inequalities, and I raise some points concerning the global effectiveness of the program. I then briefly analyze the synergies and trade-off among the various actors and the potentialities for an institutionalization of the program. In section 8 I present my conclusions and policy advises.

### 3 Review of Literature

This thesis mainly analyzes a GMF product: Proyecto Cambio; and in particular the combination of MF credit, technical assistance (TA) and PES to preserve biodiversity and induce reforestation. For this reason it is important to put the results presented in the following in the general context and literature debate.

GMF is a part of microfinance plus (see for example (Hermes, 2011; Armendáriz and Labie, 2011) and citations thereof): namely that approach of MF that combines the financial services for unbanked people with other non financial services. MF plus developed from the idea that the constraints of poor people are multidimensional and not only related to financial capital, and that a program that tries to impact the development of poor people should hence need to provide a combined set of services to compensate for the missing of physical, human and financial capital (Bastiaensen and Marchetti, 2011). However there are strong critics against this development approach that sustain that the only duty of MFIs should be to provide financial services, and that this specialization would provide the best results in term of poverty alleviation. In the case of GMF (GREENMF) the additional services provided by the MFIs should help to generate a positive impact on the environment (Hall et al., 2008; Allet, 2011; Munoz and Christen, 2004; Rippey 2009). Here too there are two main lines of thought (see for example (Allet, 2012) and citations thereof): the pro sustain that, because poor people are usually among the more affected by environment degradation, their, usually not regulated, activity could strongly affect the environment at the local level, and MFIs are among the few channels to influence micro entrepreneur activities, MFIs should promote environment preservation; the con sustain that the MFIs do not have the necessary technical skills an funds to sustain green programs and that their first duty should be financial inclusion or poverty alleviation and not environment protection. The program I'm going to study in this thesis is quite complex and it tries at once to provide human and financial capital to rural producers and combine them with the incentive of a PES to stimulate environmentally friendly activities. For this reason the program already agrees that the environment and rural development should be combined in a unique package and that additional tools, such as PES, are required to positively impact the environment. However, despite the presence of multidimensional tools, MF and PES are two market tools and if not put in the context of a environment development program it is debatable that they could effectively positively affect the environment (Muradian et al. 2010; Vatn 2010). The environment is a well known example public good, and as such it is not naturally preserved by the market (MEA, 2005; Patterson and Coelho, 2009), moreover it does not have well defined boundaries or values, fact that make it difficult to carefully introduce a commoditization of the environmental services it produces (Kosoy and Corbera, 2010; Farber et al., 2002). In addition the environmental externalities are multidimensional and not well understood and reducing these externalities to services for the human beings could compromise the effective preservation of the environment (Norgaard, 2010; McAfee, 1999). Moreover the interactions between the rural producers is quite complex and not easily reducible to the classical economic one to one interaction: for example rural households interact among

themselves both directly and quite often indirectly through the modification of the local environment.

There are two main opinions about the PES: the Environmental Economics prospective, and the Institutional Ecological Economics prospective (Van Hecken, 2011). The first one sustains, along the line of thought of Coase, that the environment degradation is caused by the fact that there is no a well functioning market for the services furnished by the environment and once the property rights and prices for these services would be fixed the market will automatically allocate them in the most possible efficient way (Engel, 2008; Wunder, 2005; Ferraro and Simpson, 2002). Namely the idea is that the environment is an externality of the market and once it is correctly internalized in the market, the market by it self will provide the most effective allocation of environmental goods and resources. The Institutional Ecological Economics prospective appreciates the idea of PES as a stimulus to develop a cooperative consciousness to preserve and protect the environment. However it criticizes oversimplification of the market approach and, underlining the complexities of the humans-environment system, it thinks to PES as being a "part of a policy mix in a broader rural development strategy" (Van Hecken, 2011, table page 50). Moreover it stresses the importance of institutions to stimulate collective and individualistic actions to preserve the environment and it underlines the necessity to pay attention to a more complex set of values than the mere economic value (Muradian et al. 2010).

To try to shed some light on the debate in the literature and try to put in context the product studied in the thesis, I believe that it is first of all necessary to carefully analyze the system we want to influence with a MF plus PES program and discuss its main aspects using what is known at the theoretical and empirical level on this topic. I believe that to formulate a product that tries to promote the preservation of the environment and the rural development, one should first understand what the fundamental variables of the problem are, as well as their interactions. Then the program should be adapted to this context according to the outcomes one hopes for.

The environment and socio-economic relations are in general, and in particular in the Nicaraguan case, complex and correlated systems (Ambrosio-Albalá and Bastiaensen, 2010). Moreover it is often the case that the degradation of the environment induces the increase of socio-economic inequalities, and vice versa the increase of socio-economic inequalities produces environment degradation (Martinez-Alier, 2002; Martinez-Alier, 2004). In Nicaragua the well known pattern that sustains socio-economic inequalities and induces environment degradation is (Bastiaensen, 2012): non environmentally careful activities rapidly consume the biological fertility of the land of poor producers that are obliged to sell their small land properties to richer producers and go to the agricultural frontier where the land is cheaper. In this way the richer producers become richer and accumulate land and increase their possibility to grab economic opportunities, while the poor are forced to move to cheaper and far away land where the economic opportunities are fewer and they are in such a way constrained to stay in the lowest place in the value chain. Moreover the richer producers keep on accumulating land that they typically use for extensive cattle activities, that even if highly profitable is one the main causes of deforestation and

biodiversity loss. At the same time the poor are forced to look for cheaper land and move towards the natural reserves where they cut the trees and contribute with their activities to deforestation and endanger water sources.

The complexity of the system, its multidimensional interactions, its "public character", its badly known properties, and the complex poverty-environment interaction seem to imply that a purely individualistic economic approach would not have good chances to protect the environment and stimulate the socio-economic progress of poor rural households. It seems reasonable that an effective rural development policy should focus on the territory and the community, and should address at the same time socio-economic inequalities and environmental issues in a development prospective that try to improve the position of poor households in the value chain of rural production (Ambrosio-Albalá and Bastiaensen, 2010; Van Hecken, 2011; Bastiaensen and Marchetti, 2011). Moreover it seems reasonable to think that the minimal structure of such systems should not be considered the individual local farmer or part of its activity, but instead the territorial and community dimension should also be at the targeted subjects of PES plus MF (Vatn, 2005; Cranford and Mourato, 2011).

Because the main ingredient of Proyecto Cambio to induce environmental friendly activity is the PES, let us shortly discuss the main critiques raised in literature against the simple market approach and the existing proposals to improve it. The line of thought related to market tools for environmental goods I've just presented is supported by the quite extensive critique to the market approach of the PES present in the academic literature, where a more institutional ecological economics prospective is advocated to integrate the PES as a "part of a policy mix of a broader rural development strategies" (Van Hecken, 2011; Kosoy and Corbera, 2010; Tacconi, 2011; Van Hecken and Bastiaensen, 2010; Vatn, 2010; Van Hecken and Bastiaensen, 2009). In this literature the complexity of the socio-environmental interaction is recognized and the importance of the institutions to create common incentives and decisions for development and environment preservation is stated. The main critiques raised against a market based PES are (Van Hecken, 2011):

- it is a market solution for problems generated by the market, implying that tiny modifications inside the market logic could overcome the environmental degradation without the necessity for deep reforms inside the growth model (Norgaard, 2010; Van Hecken and Bastiaensen, 2010);
- it over simplifies complex human-environment interactions inducing potentially dangerous trade-offs between the social and economics norms for environmental preservation, with the potentiality to reduce the importance of the social norm, and among the different environmental services to be preserved (Vatn, 2005; Chisholm, 2010; Bowles, 2008; Martin et al., 2008);
- it could preserve and enhances the local and international inequalities due to the fact that the poor sell their environmental services at a cheaper price while the rich buy their right to pollute (Karsenty, 2007; Martinez-Alier, 2002; Martinez-Alier, 2004; McAfee, 1999; McAfee, 2012);



moreover the sustainability of these programs is questioned in the long term due to the implicit requirement of an increasing amount of available funds for successful programs, or the establishment of a real global recognized markets without intermediaries. These critics underline some of the potential missing tools of MF plus PES products that try to stimulate with markets tools the institutionalization of the environmental problem.

I would like now discuss some of the specific aspects of the program we are going to analyze in the main part of the thesis, trying to keep in mind the theoretic background we have just introduced. Proyecto Cambio is a response to the Central America biodiversity loss induced by the rural micro, small and medium enterprises that, looking for cheap land for agricultural purposes or extensive cattle raising, destroy the primary forest (CAMBio I; CAMBio II; MCB). In Nicaragua the MFI Fondo de Desarrollo Local (FDL) and the rural development center Nitlapan are implementing the Proyecto Cambio to promote rural development and biodiversity preservation in the context of agroforestry (SAF: sector agroforestal) and silvopastoral (SSP: sector silvopastoral) practices (Ramírez Roustan and Dávila Tercero, 2010). The FDL product combines MF services, TA and PES (Ramírez Roustan and Dávila Tercero, 2010; III-INFORME, 2010; Mendoza et al., 2011). Local farmers receives a credit from FDL to develop their agricultural or livestock activities in an environmentally friendly way determined according to some biodiversity indicators established by the Banco Centroamericano de Integración Económica (BCIE). The most financed activities are: pasture with trees and fodder plants to induce the intensification of cattle activities, cacao or coffee with shadow trees, and living fence. The FDL clients received free training from Nitlapan mainly about cattle raising intensification and the inclusion of trees in their agricultural activities. Once the conversion of the use of client's land is achieved, the client's rural activity is established and a certain number of environmental impact parameters are fulfilled, the farmers receive from the BCIE (through the FDL) a PES called the Bio Premio corresponding to the 14% of the loan, while the FDL receives from the BCIE the 6% of the disbursed loan as a compensation for its risky environmental activity. This combination of PES and MF activities is quite successful at the financial level, it improves the social image of FDL through the promotion of environmentally friendly products, and, at the same time, it offers to the clients a subsidized credit that allow them to repay more easily their debts. However preliminary internal analysis and discussions in Nitlapan<sup>2</sup> seem to questioning the overall impacts of the Proyecto Cambio on poverty reduction and environment preservation, and they raise some concerns about the real effectiveness of this individual, still quite market-based, approach, along the lines of the main critics of market oriented PES we have just presented.

Indeed some of the weak points of the market oriented PES in the Nicaraguan context were already raised in (Van Hecken and Bastiaensen, 2009), where they analyze the Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (RISEMP), one of the main GEF-World Bank funded pioneering pilot projects of PES in Latin America. In this study it is stressed the question of cost-effectiveness and additionality of the product, and the importance of TA and exogenous market conditions for

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<sup>2</sup>I kindly thanks discussions with Omar Dávila, René Mendoza and Johan Bastiaensen about these topics.

the positive outcomes of the program. Moreover internal studies in Nitlapan<sup>3</sup> underlines how RISEMP were sustaining socio-economic inequalities among rural producers, mainly rewarding more the richer producers that are the ones that could more easily grab these PES opportunities, due to their initial physical capital. Proyecto Cambio is considered as a follow-up of the RISEMP project and it is reasonable to consider the limitations found in RISEMP as potential theoretical and practical limitations to analyze in the study of Proyecto Cambio. In the implementation of Proyecto Cambio the major concerns found discussing with practitioners and academics, before this study, are some evidences related to the preservation and enhancement of socio-economic inequalities: due to the explicit targeting of the rural producers with a good record of credit repayment, that are reasonably correlated to the better off among the rural producers; ineffectiveness: the change in the land use is related to a specific area of the farms and do not directly implies an overall improvement of environmental services; leakage: the better off receiving a privileged credit with the Proyecto Cambio and the Bio Premio could further increase their economic power, accumulate more lands and expel the poorer from the local territory, forcing them to migrate to the agrarian frontier looking for cheaper land and keeping on destroying the forest. These drawbacks could undermine the effectiveness of the combination of PES with rural MF products, sustain or increase the socio-economic inequalities and perpetuate the environmental degradation. It is hence worthwhile to study in detail some of the development and environmental dynamics of Proyecto Cambio to validate or invalidate, with quantitative data, these rumors, and to try to go more in depth into the potential global impacts of the program.

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<sup>3</sup>I kindly thanks discussions with Francisco Pérez about this topic.

## 4 Methodology and Hypotheses

As we have previously explained the main objective of this study is to understand if integrated MF plus PES programs, such as the Proyecto Cambio, have or could really have a positive impact on the environment: reforestation and biodiversity; and how they relate to socio-economic inequalities. The research was focused on the implementation by Nitlapan and FDL of Proyecto Cambio in Nicaragua. I tried to do a careful analysis of some global aspects of the program, that could hopefully, build up a framework to analyze other similar projects. The main investigation hypothesis is: even if the Proyecto Cambio is a successful financial product it should not be automatically considered a good environmental product. Indeed Proyecto Cambio, even if quite articulated, is a market product that try to impact the environment: a public good. As we have previously discussed, this is usually something quite complex. Indeed all the attention of Proyecto Cambio is on the reforestation of a specific small part of the farm of a bunch of rural producers in Nicaragua, in a particular short lapse of time. Why the short term success in this limited area should imply the positive impact on the environment? My approach is to think to the system as composed by a microscopic part: the direct area of influence of Proyecto Cambio; and a macroscopic one. The macroscopic area should be thought as a multidimensional space containing: the long term environmentally friendly changes in the microscopic area, the farm's area outside the committed region, the area outside the farm of the rural producers taking part to Proyecto Cambio, the socio-cultural background of the rural producers and their livelihood strategies, the behaviors of the institutions regarding the environment, etc. I believe that a product or a program that really want to have a positive impact on the the preservation of the environment, should be able to positively influence, at least in part, this macroscopic structure. However a real impact study on this of system would be very long and complicated. For this reason my methodology would be to study and analyze the existence and effectiveness of the mechanisms that should imply the generation of environmentally positive externalities from the microscopic structure, directly influenced by the Proyecto Cambio, to the macroscopic structure that would imply a real impact on the environment. My study will proceed analyzing four different aspects of the product:

- **Additionality:** is the program really financing activities that are not normally done by the producers?
- **Sustainability:** does the program have the potentialities to induce long term environmentally friendly changes in the producers-environment interactions?
- **Externalities:** what is happening outside the area committed in the program?
- **"Governance":** are the various actors in the program working for a common goal: the environment?

I consider these four topics as fundamental building blocks to understand the global aspects of a MF plus PES program, and in particular for Proyecto Cambio. Additionality is important for at least three different reasons: the environment, the economic conditions

of the producers, the use of subsidies. The good allocation of subsidies implies that we should subsidize only activities that are not normally done by the producers, and the subsidy should be in some sense proportional to the cost of the additional activities or the price of the additional environmental services provided. Moreover additionality should imply a positive impact on the economic conditions of the producers thanks to the diversification of its production and the additional human and physical capital acquired with the new activity. A certain degree to additionality of the program should also have a positive impact on the biodiversity, thanks to the additional area of influence of the environmentally friendly activity and the new different biological species introduced by this activity. Sustainability is related to the long time scale associated to the environmental changes and the scarcity of subsidies. Namely the changes induced in the rural production should be economically sustainable in the medium and long term, induce a change in the average mentality related to the environment, and the new trees planted should be preserved and integrated in the global production of the farmers. Externalities are of fundamental importance for a market product that try to impact common good as the environment: the program influences directly only the microstructure but it should have the aim to bring relevant changes to the macroscopic structure: the environment and the biodiversity, as well. It is fundamental to understand what is happening outside the compromised area: is the program really influencing a change in the overall activities of the producers towards a more environmentally friendly production? Or is the product directly or indirectly financing environmentally dangerous activities outside the compromised area? Are the environmental friendly activities stimulated by Proyecto Cambio influencing a change in production also in the producers that do not have access to the PES plus MF product? The study of the Governance aspects of the project is also important, because various different actors are participating to the implementation of the Proyecto Cambio: the producers, Nitlapan, FDL, BCIE, UNDP, GEF, and indirectly the local institutions with their environmental policy. One should need to understand if all the actors involved are working directly or indirectly to reach the same objective. I believe that this would be a natural prerequisite that should induce positive synergies among the actors and enhance the effectivity of the product.

The research done for this thesis was pursued along three main lines: theoretical analysis of the synergies between MF and PES; quantitative and qualitative study of the procedures and implementations of the Proyecto Cambio with secondary data coming from databases of Nitlapan and FDL, some of their preliminary analysis at the national level, and various interviews to the managers of the program and the technicians actually operating in the field; and empirical collection and analysis of qualitative and quantitative primary data during the internship period. The theoretical analysis was mainly used to contextualize Proyecto Cambio in the local Nicaraguan environment and compare it with the results obtained from the empirical and theoretical analysis of other environmental programs. The use at the same time of secondary, primary, qualitative and quantitative data was done with the idea to obtain a broad, generic, statistically strong picture from the secondary data and a local, but in-depth, picture from the primary data that could underline subtle information not available from the secondary data; the quantita-

tive data are used to give strength to the analysis done, while the qualitative data are used to contextualized them in the broader picture and the livelihoods of the producers and the strategies of the institutions. The complementary use of both kinds of data is done with the idea that analyzing the same problem from different perspectives could strength the study done and generate synergies in the analysis. The main idea is that primary qualitative and quantitative data, secondary qualitative and quantitative data, and the theoretical literature analysis can support each others to reach stronger and more sound results. The primary data collection was mainly aimed to understand how Proyecto Cambio collocates inside the productive strategies and the logic of the rural producers, how it could influence them towards a more environmentally friendly activities and how it could impact the macroscopic structure surrounding the compromised area: namely the remaining part of the farm, the neighborhoods, the long term strategies of the producers, the cultural and socio-economic relation of the rural households with respect to the environment. The information directly collected were carefully cross-checked with the information generated by previous studies of the Proyecto Cambio, the ones already available in the broader research community and the ones collected by FDL and Nitlapan in their databases. The analysis of the data was mainly qualitative, with some quantitative cross check to test the soundness of the qualitative results. Along the data analysis we will see how the correlation between the environment and the socio-economic inequalities and its related trade-off and synergies will naturally emerge from the quantitative analysis of the externalities of the program. Namely the global environmental impacts of the product naturally brings in the system the concept of socio-economic inequality and underlines its strong interaction with the environment due to the feedback provided by different socio-economic conditions of the producers. The natural emerging of socio-economic inequalities in a study that try to focus on the effectiveness of the environmental outcomes underlines once more the necessity to analyze together socio-economic inequalities and environment preservation, and it stresses the illusion that one concept can be safely separated from the other one.

## 5 Details about the Internship

The data collected and analyzed in this thesis come from my internship period in Nicaragua, where I was working in collaboration with the rural research institute Nitlapan and with the MFI Fondo de Desarrollo Local (FDL). The main part of this work consisted in trying to evaluate the actual environmental impact of Proyecto Cambio and its relation with socio-economic inequalities. It is hence important to introduce the reader to the socio-economic and environmental conditions in Nicaragua, the local microfinancial market, Nitlapan, FDL, some details of Proyecto Cambio, and the main questionnaires used to collect the primary data.

### 5.1 Macroscopic Data about Nicaragua

#### 5.1.1 Socio-Economic Conditions

The introduction to the "Plan Estratégico 2012-2016" of Nitlapan (Nitolapan, 2011), written by Arturo Grigsby, offers a nice synthesis of the socio-economic condition in Nicaragua. The present section is based on this document. Moreover the reader can find an analysis of some of the policy trends in relation with rural development and inequalities in (Pérez, 2011). Nicaragua is classified as the second poorest country among the Latin America and Caribbean countries, after Haiti. The government and World Bank data say that the 43% of the population is poor: under the national poverty line. The majority of the poor people lives in rural areas (almost the 65% of the total poor population), where also live the 80% of extreme poor. The government and World Bank data show a decrease in the number of poor around 4% in the period 2005-2009. The main causes of this decrease are identified in: migration, increase of the remittances and increase in the number of people working in the household. Some of the background exogenous facts that allowed this decrease of the poverty level were the increase of the government expenses to reduce poverty, and the better prices of agricultural products in the last years. However it seems that these progresses in the poverty alleviation were mainly driven by an improvement of the better off among the poor. Indeed the data from the World Bank estimates that the percentage of the extreme poor is the 15% of the total population and it didn't change in the last 15 years. This data give hints towards an increase of the relative poverty of the extreme poor and hence an increase of the socio-economic inequality. The roots of poverty seems indeed to be in the highly unequal access to finance and physical capital, and opportunities. An interesting data coming from an investigation done by Nitlapan together with the World Bank shows that half of the rural population do not own land. As shown by studies of the IMF, BID and CEPAL the inequalities are sustained also by the taxation system that impose higher expenses for the poorer than for the richer in proportion to their income, and the possibility for the richer to pay even less thanks to corruption. Moreover the governmental budget to reduce poverty is grabbed for the 47% by people living above the poverty line, as reported by the World Bank. The high inequality moreover prevent the effectiveness of the average economic per capita growth to reduce poverty that it is reduced only by 0,5% for every 1% increase of the average

income per capita.

### **5.1.2 The Environment**

Nicaragua has the second highest deforestation rate among the Central American countries (FAO, 2010), equal to 2,11% of net annual decrease of the forest area in the period 2005-2010, the 1,95% in 2000-2005 and 1,67% in 1990-2000, corresponding to an average 70 000 Ha of forest loss every year in the period 1990-2010. Implying that, while the absolute value of forest lost is constant in the last 20 years, its percentage loss is steadily increasing. The Central American country with the highest deforestation rate in the period 1990-2010 is Honduras, with a net deforestation rate of 2,16% in the period 2005-2010, corresponding to 120 000 Ha lost every year. These data should be compared to the Central America average loss of 1,23% in the period 2005-2010. The main cause of this deforestation process is associated to the expansion of the crop and cattle activities towards the forest area (Van Hecken, 2011) that was not stopped by the actual governmental regulation. This dramatic situation stimulated the establishment of various PES programs in the country.

### **5.1.3 The Microfinancial Sector**

Nicaragua was till recently considered one of the best microfinancial market in the world, with an high portfolio growth: the national GLP increased of four times in the period 2003-2007, and low risk:  $PAR_{30}$  at the MF national level constantly around 3% in the period 2003-2007. However the national MF sector was hit by one of the hardest MF crisis (Marchetti, 2012; MixM) that produced a decrease of the 53% in the total national MF portfolio in the period 2007-2011, and an explosion of the  $PAR_{30}$  that increased steadily from 2007 to 2010 and it touched the 20% in 2010 and it is still today higher than 15% at the national level. The main causes of this crisis are associated to a politically induced no repayment movement called "No Pago"; the overfunding of the MF sector and the promotion of high competition, and the strong decrease of the price of the meat and especially of the price of life cattle (Bastiaensen and Marchetti, 2011; Bédécarrats et al., 2012), that negatively impacted the rural producers and particularly the poorer ones (Pérez, 2011).

## **5.2 Host Institutions**

During the internship I mainly worked in collaboration with Nitlapan and FDL.

### **5.2.1 Nitlapan**

Nitlapan is a research institute founded in the 1988 as part of the Univesitad Centro Americana (UCA) and it belongs to the Jesuit network working in the social sector of Central America (NitlapanW). Its name means in the native language: "time to plant", meaning a direct message for sustainable development. It is specialized in the investigation

and diffusion of programs and models for the rural development. The institute is not only focused on research, but it also takes active part to the process of development of the rural communities through financial and non-financial instruments: such as technical assistance, knowledge transfer, and program implementation. In 1992 Nitlapan founded FDL with task to finance small and medium producers to improve their livelihood and capital. In 1998 FDL became an independent MFI with the status of NGO, that nevertheless kept on being one of the most important partner of Nitlapan.

### 5.2.2 FDL

FDL is today the biggest MFI in Nicaragua operating in 36 municipalities with many different programs active both in the rural and in the urban sector. It has a gross loan portfolio of 56 280 720 USD and 58 104 clients at the end of 2011, with an average credit per client of 969 USD. Due to the recent hard MF crisis in Nicaragua the portfolio and the number of clients of FDL reduced drastically from the 69 332 000 USD and the 76 689 clients at the end of 2009. FDL is indeed in the process of evolution of its portfolio. While historically the agricultural sector was the main part of the FDL's portfolio, now it is progressively retreating from the rural sector and focusing more on the more profitable activities of urban microentrepreneurs. Moreover its portfolio was affected by an important credit renegotiation to try to reduce the risk and foster the financial activities. The combination of these strategies induces the decrease of the PAR<sub>30</sub> from very high value of the crisis constantly till the 9% in 2011, and allowed FDL to be slightly profitable in 2011 (Marchetti, 2012).

## 5.3 Proyecto Cambio

Proyecto Cambio is a program that try to foster the environmental sustainable development of the rural micro, small and medium enterprises of the center america, preserving the environment and the biodiversity (CAMBio I; CAMBio II; MCB). It is operative in the period 2007-2014 in five countries: Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica. The program is developed by the alliance: United Nations Development Programme (UNDP), the Global Environment Facility (GEF) and the Banco Centroamericano de Integración Económica (BCIE). In Nicaragua they are working with various institutions: Lafise-Bancentro, Fundeser, Coop 20 Abril and FDL. FDL is the local institution with the higher investment. It is operating in 22 municipalities with 991 as total number of producers deserved at the 31st May 2012. FDL gives a credit, with a maximum time term of 3 years and a maximum credit amount of 10 000 USD, at the 20,35% annual interest rate, to the producers that decide to commit part of their farm in a productive agroforestry or silvopastoral activity and at the same time contribute to the reforestation and biodiversity planting trees in the area allocated for this activity: shadow trees in pasture, cacao, coffee, living fence, water sources, etc. The BCIE provides to FDL a line of credit at the 4,5% annual interest rate, while the GEF provide the 30% of every credit amount as a subsidy of the program that distributes as: 10% as a payment to Nitlapan to



provide TA to the producers, 14% to the producers that succeed after one year to fulfill all the agreed environmental indicators as an incentive for the environmental investment (PES) and a 6% to FDL for every successful client. FDL propose this program mainly to old clients with a good credit history, to be sure of the good use of the credit and its repayment, even if in some case it proposed the program also to new clients.

## 5.4 Choice of the Regions of Investigation

The primary data collection was done in the center north region of Nicaragua: a rural area near natural reserves, mainly in the region of Rio Blanco and Matiguas, and secondary in the region of La Dalia, Waslala, San Jose Bocay, el Cua, Pantasma and Wiwili. The choice of the region of investigation was induced by various factors. The region of Rio Blanco and Matiguas is an historical area for the development programs of Nitlapan, that is operating in the area since more than 20 years. Moreover it was the area of implementation of the RISEMP program from 2002 to 2008, a silvopastoral project to induce the reforestation in degraded areas throughout the incentive of a PES, described by many of the local actors as the father of the actual Proyecto Cambio. In addition the region has undergone a strong deforestation process since the beginning of the last century. However the area of Rio Blanco and Matiguas are widely know to be a cattle area and one of the most strongly affected region of the no payment movement and microfinance crisis that induce FDL to partially retire from some of the clients in the two municipalities. Due to the peculiarity of the region I decided to compare the primary data collected in Rio Blanco and Matiguas with the dynamics of another quite different region in the north containing the communities of La Dalia, Waslala, San Jose Bocay, el Cua, Pantasma, Wiwili. This is the area in which the portfolio of the Proyecto Cambio is increasing more rapidly in the last period, and moreover it as region where the primary income activity is the coffee. Due to the different underlying dynamics of the two regions we expect that the phenomena seen in both region are potentially reproduced at the national level and not just the effect of peculiar dynamics. Indeed the analysis of the second region is thought to be used to stress the generality of certain phenomena of the Proyecto Cambio, independent of the particular region, that could reproduce at the national level, and to individuate and underline the dynamics peculiar of the two regions.

## 5.5 Main Questionnaires

In this section I report the two main questionnaires I used to collect the data and information about the additionality, sustainability and externalities induced by the Proyecto Cambio. During the internship I've also realized a certain number of interviews to some of the staff members and managers of operations and or of the Proyecto Cambio activities both in FDL and in Nitlapan, both in the field and in Managua; to some of the representatives of the BCIE; to some of the members and representatives of the municipalities and cooperatives. However this interviews were less structured and were mainly used to raise questions and opinions about the project, and check if the various actors have

the potentiality for good synergies, both among the various institutions and inside the institutions themselves, and I will not report the questionnaire here. Moreover I realized interviews also to clients of FDL but without Proyecto Cambio, and to rural producers, but not FDL clients, that I mainly used as qualitative comparison group, but due to the smallness of the sample compared to the Proyecto Cambio producers, I didn't use them in the statistical analysis, but only in the qualitative discussion, and they are not reported here.

### 5.5.1 Long in Depth Interviews

The questionnaire presented here was first used to collect data from 8 clients in Rio Blanco, and than completed, thanks to the information collected from this first field study and the help of local staff members of Nitlapan, with questions concerning exact quantitative data, and specific trends to the final present form presented here and used for the 25 interviews in Matiguas. Every interview was done in the farm or house of the interviewed producer, without the presence of any members of Nitlapan or FDL, and lasted between one hour and a half and two hours. The questions presented here were complemented by other questions and discussion to check the consistency of the answers of the producers. The data collection lasted three full weeks.

- Question to identify the producers:
  - How many credits did you obtain before Proyecto Cambio? When? Which amounts?
  - Is the farm your only economic activity or do you have another one (wage job, shop,...)?
  - What is the area of your farm?
  - What are the economic activities in your farm (number of cows, hectares of pasture, ...)? What is your principal economic activity?
  - How long did you take to close the credit? Why?
  - Discussion with the producers to understand their environmental sensitivity.
- Motivation:
  - Why did you ask for the Proyecto Cambio? (Bio Premio, TA, Environment, Other)
- Additionality:
  - Did you learn anything new thanks to the TA and the activity you realized? What?
  - Why did you invest in this activity? did you already have this plan? Why this amount of credit? Did Nitlapan or FDL propose a different amount? Why this amount of land?

- Which of the activities proposed by Proyecto Cambio were you already doing in your farm before you began the program?
  - Did you started a new activity?
  - Did you plant new species of trees that were not present in your farm before? Which ones?
  - If it is the second time that you have a credit with Proyecto Cambio: is it the same or a different activity compared to the first one? Why?
- Sustainability:
    - Do you think that the activity realized with Proyecto Cambio produced/is going to produce more income in your farm? (how much, from which activities) Did the value of your farm increased thanks to Proyecto Cambio?
    - Do you think to use what you learned with Proyecto Cambio in other parts of your farm? Have you already done it?
    - Are you happy about the Proyecto Cambio and/or the environmental friendly activity you started? Why? Why didn't you start it before?
    - Do you think to preserve the trees you planted? How many trees are there now? Did they or will they directly produce new income for your household (fruits, wood, seeds)?
    - Did you plant other trees after Proyecto Cambio in other areas of your farm? Did you invest in any of the Proyecto Cambio activities after (which, how much, surface)?
    - Are you planning to plant more trees in the future? Are you planning to implement another Proyecto Cambio activity in the future (new/old)? Also without a Proyecto Cambio credit?
    - Are you going to ask for another Proyecto Cambio credit? Same or new activity?
    - What are your plan for the short and medium term?
  - Externalities:
    - Which are the investments you did with the credit? (how much for every activity, area of influence, number of cows,...)
    - Did you change the surface of your farm during the implementation of Proyecto Cambio? What was the surface of your farm ten years ago?
    - In which activities did you invest the Bio Premio? (farm, family, repay the credit)
    - Did you employ any paid person? How many? For how long?

- Did you speak or are you speaking with other producers about Proyecto Cambio? How many? What did they do after? In the cooperative?
- Are you discussing in your family about Proyecto Cambio and the environment? (questions also to some members of the family)

### 5.5.2 Short Interviews

The questionnaire I present in this section was used to check if the main points related to additionality, sustainability and more importantly externalities, raised in the long in depth interviews done in Rio Blanco and Matiguas, are related to the particular local dynamics of the region, or are instead present in other different areas as well. The interviews were done during the three days of distribution of the Bio Premio in the end of July 2012 in the north region of Nicaragua, and they collected data from 22 producers working in La Dalia, Waslala, San Jose Bocay, el Cua, Pantasma and Wiwili. The producers I interviewed were sometimes surrounded by other producers and staff members of Nitlapan, FDL or BCIE. Every interview lasted between ten and twenty minutes. The peculiar location and the reduced time undermine in part the strength of the interviews that work as a good comparative group, but they cannot directly be included within the group of interviews done in Rio Blanco and Matiguas to form a single sample.

- Name of the producer, surface of its farm (Ha), its principal economic activity.
- Which is the activity you engaged to realize with the Proyecto Cambio? What is the area of influence of this activity and the amount of credit received from FDL?
- Is it a new activity? Was it already present in your farm before Proyecto Cambio?
- How much of the FDL credit did you invest in the activity you engaged with?
- In which other activities did you invest the FDL credit? How much for every activity? (and area of influence (Ha), number of cows...)
- How many of the trees you planted are still there?

## 5.6 About the Recent Trends

An important part of the in depth analysis I will present in this thesis is based on a group of 25 contracts inside the Proyecto Cambio delivered in Matiguas. To have a better understanding of the following data analysis it could be interesting to put it in the context of the local rural dynamics of the recent years as illustrated and analyzed in detail in the forthcoming PhD thesis of Juan Carlos Polverosa (Polverosa, 2012).

The historical reason for deforestation in Nicaragua is mainly associated to extensive cattle activity used for meat production. The main reason for the expansion of this activity is its profitability due to the historical low price of land and the low level of control over the deforestation process. In the last ten year there was a partial conversion of the cattle

activity towards diary production, due to the quite stable and higher market price of fresh milk. The conversion of the cattle production toward diary production should in principle intensify the cattle production strategy and decrease the deforestation rate. Moreover in Matiguas the favorable market prices were complemented and supported with an increase in the road network that allowed the access to the market to faraway producers, the installation of collection points for fresh milk relatively near to the producers area, an increase in the access of credit, also due to the direct action of FLD, and an intensification of the technical assistance to the producers, also thanks to Nitlapan, to help the rural producers to improve their productivity and the quality of their production. This overall picture would induce to conclude that the market opportunity, complemented with the other activities just described, should have induced a natural intensification of the rural production with economic and environmental positive outcomes. However the reality seems different and it underlines the complexity of the human-environment system and its interaction with socio-economic inequalities, in a similar pattern of the one we will discuss during the analysis of my primary data. Indeed from the data reported in (Polverosa, 2012) it seems that the ten years of diary boom, from 2001 to 2011, didn't produce the expected overall intensification of the cattle system, but they mainly induced a shift of part of the rural activity towards diary production, and the advantages associated to this market opportunity were mainly grabbed by the richer and larger producers, preventing moreover a positive outcome over the environment protection. Let us try to shortly analyze the causes of this effect, not just to try to better understand this important and interesting phenomenon, but also to try to establish a mind set that will be useful in the following analysis too. This effect seems mainly related to the still quite big availability of forest land in the farms and the concentration of land in a reduced number of big producers with the associated expulsion of the smaller farmers towards the agricultural frontiers. Some of the reason of this phenomenon are associated to the usual uneven access to opportunities for different socio-economic categories that, in the Matiguas case, mainly translate into the uneven access to roads, market and technology, and the different position of the producers in the value chain. Indeed taking advantage of the better fresh milk prices means, among the other things, to be able to produce enough quantity of high quality milk. The main constraints toward the increase in quantity and quality of the production is different for different producers (Polverosa, 2012). The larger producers' main constraint is the lack of labor, that induce them to a double cattle practices: diary plus beef, with an inefficient use of land and an overall extensive production. Their production is intensified only in small part of the farm and moreover the use of intensification techniques, such as the fodder plants or improved pasture, seems to be mainly used as a complementarily livelihood strategy and it is not a change in the production pattern. The smaller producers' main constraint is instead the lack of financial capital that prevent them to improve their technology and the hygienic practices that could allow them to grab the good market opportunity. However, despite the presence of constraints for both kind of producers, as explained in (Polverosa, 2012), it seems that the larger ones are the ones that prevail in the market competition, due to their large volume of milk production, that allow them to have access to the market opportunities, while

the smaller producers are kept in the low levels of the value chain. The overall dynamics seems indeed to reward the larger producers, and in this way foster the perpetuation of extensive cattle, the inefficient land use and the concentration of land in a small number of large producers, the exclusion of the smaller producers and the increase of the human pressure on the forest.

The manifestation of such kind of important feedbacks inside the human-environment system that induce an overall impact different from the expected one, deduced by a simple market reasoning, will be seen also in the following data analysis, and should induce to think that a program that really want to have a positive global environmental impact should directly try to face the complexity of the underline system.

Moreover these data related to the Matiguas region should be used to evaluate and contextualize the local dynamics, we will discuss in my primary data analysis, inside the livelihood patterns and regional socio-economic and environmental background.

## 6 Presentation and Data Analysis

In this section I would like to present the sources of my primary and secondary data, discuss their reliability, and their purpose in the analysis done in the thesis, and moreover I would like to sketch some of the trends of the program at the national level.

### 6.1 Secondary and Primary Data: Sources and Reliability

In this thesis I use both secondary and primary data to investigate the additionality, the sustainability and the main externalities of Proyecto Cambio, and some of the potential synergies and trade-off among the different actors participating in the implementation of the program. The secondary data come from the work of the BCIE, FDL and Nitlapan. From the BCIE I collected the main characteristics of the Proyecto Cambio at the Central American level, the practices and rules of the program, the fund structure provided by the BCIE to FDL, and the structure of the various subsidies. From FDL I took the information related to the Proyecto Cambio portfolio: names of the clients, credit amount for every client, term of the credits, structure of repayment, outstanding balance in arrears, etc., and the annual declining interest rate, the cost of commissions, the credit policy etc. From Nitlapan I received all the data concerning the environmental indicators used, the activities the various producers decided to implement, the estimated cost for every activity, the structure of the farms, the documents reporting the visits and the technical assistance of the Nitlapan staff members to the producers, the progresses done by the producers to achieve the completion of all the environmental indicators and receive the Bio Premio, and the various reports and working papers describing and analyzing the implementation of the program, and some of the macroscopic indicators for the first 838 producers: area designated, the cost of trees, the actual number of planted trees, etc.

I value the secondary sources of data on average very trustable. When some incoherences appeared among comparable sources of data, such as the ones from Nitlapan and the ones from FDL, or inside a single document, the specific contract affected by this weakness was excluded from the data analysis. This procedure reduced a bit the number of clients considered and hence the statistical sample, but I believe it strength the soundness of the results. One of the most important secondary data I used is the cost, computed by Nitlapan, for the various activities that the producers are supposed to realize inside the Proyecto Cambio. These documents carefully report the complete cost required to implement activities such as: planting one hectare of improved pasture with shadow trees, planting one hectare of cacao or coffee with shadow trees, construct living fences, etc. The cost I used is the cost for the establishment of the economic activity, and not of the full cost required to bring the plantation till the productive stage. Namely, for example, even if in the case of the coffee and cacao the plantation become productive after three years, the cost I consider for the activity is the one associated only to the first year, namely the time to establish the full plantation. This is indeed the part of the activity that FDL and Nitlapan claim to finance. The cost computed by Nitlapan include the labor, at the local market prices, and the cost of every material that the clients is

supposed to purchase to realize the activity. The computation of these costs were done by staff members of Nitlapan working in the field in cooperation with the rural producers. This exercise was done in the area of La Dalia, but before applying it to other regions, I worked with the staff members of Nitlapan in Managua, and in the region of Matiguas and Rio Blanco, to adapt the cost structure to the local situation. In the case in which the specific characteristics or quality of the economic activity of the producers is not declared or distinguished by the data, as for example sometimes happen in the case of organic or normal coffee or cacao, I considered the average of the two costs. However this procedure should not affect the overall quality of the data due to the small difference in the values over which I take the average, and allowed me to retain a bigger statistical sample.

An important part of the analysis presented in this thesis is done with primary data. The primary data were collected throughout interviews with various actors of the Proyecto Cambio, and they can be organized in the following set of sources:

- 33 detailed interviews (I reported the questionnaire in the previous section) of one hour and a half, or two hours to 8 producers in region of Rio Blanco and 25 producers in the region of Matiguas, corresponding respectively to the 40% and the 24,5% of the contracts in the two locations at the 31st May 2012. The Rio Blanco sample is composed by 7 producers in the SAF, and 1 in the SSP, and they are 1 woman and 7 men; the one in Matiguas contains 21 contracts in the SAF and 4 in the SSP, and they are 5 women and 20 men. Among them there are 3 producers that received the Proyecto Cambio two times and 1 that received it three times, meaning that the sample is composed by 20 households and 25 contracts. 3 clients were part of the proyecto Alboan after Cambio, a development program implemented by Nitlapan and containing also PES incentives. All the interviews were done by myself in the house or the farm of the producers without the presence of any staff member of FDL or Nitlapan. The great majority of the clients in the sample received the credit between 2009 and 2010, completed the agreed activity and has already received the Bio Premio;
- 22 short interviews (I reported the questionnaire in the previous section) of ten or twenty minutes each, to producers in La Dalia, Waslala, San Jose Bocay, el Cua, Pantasma, Wiwili. From now on I will call NGroup (from the north group) the sample associated to this set of 22 producers. These interviews are done during three public events for the distribution of the Bio Premio in the location of La Dalia (7 producers), San Jose Bocay (9 producers) and Pantasma (6 producers). Among the producers 5 realized activities in the SSP, while 17 in the SAF. Among which 4 are women and 18 men. The interviews were done by myself, but in a place were other producers and or Nitlapan, FDL and BCIE staff members were present. The great majority of the producers in the sample received the credit between 2010 and 2011, completed the agreed activity, and they received the Bio Premio the day of the interview;
- 5 interviews in Matiguas to FDL's clients that didn't have access to the Proyecto



Cambio. The interviews were done by myself, alone with the producer, but in the FDL branch in Matiguas;

- 6 interviews in Matiguas to rural producers that were not clients of FDL in the location of Sitio Historico, Matiguas. The interviews were done by myself in the house or farm of the producers, without the presence of any of the staff member of Nitlapan or FDL;
- Interviews to Nitlapan and FDL general directors and managers (5 people in Nitlapan and 4 in FDL) involved in the Proyecto Cambio in Managua, and staff members and technicians implementing the Proyecto Cambio in the field in the region of Rio Blanco and Matiguas (3 people in Nitlapan and 4 in FDL). The interviews were done by myself in the office of the interviewed person with or without the presence of colleagues;
- Interviews to two representatives of the BCIE. The interviews were done by myself during the ceremony for the distribution of the Bio Premio to the NGroup;
- Interviews to staff members in the mayoralty of Matiguas and Rio Blanco. The interviews were done by myself in their offices;

In table 1 I summarize some of the characteristics of the three main samples used in the following sections for quantitative study.

<b>Localities</b>	Farm area	Invested area	% of invested area	FDL Credit
Rio Blanco	68,4 Ha (59,6 Ha)	0,82 Ha (0,27 Ha)	2,1% (1,5%)	2156 USD (1439 USD)
Matiguas	18,2 Ha (18 Ha)	0,81 Ha (0,55 Ha)	7% (5,4%)	1194 USD (511 USD)
NGroup	38,0 Ha (63,7 Ha)	2,32 Ha (2,39 Ha)	11,7% (8,1%)	2777 USD (2940 USD)

Table 1: Averages and standard deviations of the groups of producers for the three samples.

The interviews done in Rio Blanco were very detailed, they are the first group of interviews I've done, and they were used to raise some important points related to additionally, externalities and sustainability of Proyecto Cambio. The results of these interviews were used to shape the following 25 interviews in Matiguas and to obtain from them more quantitative data. These interviews were done in the June 2012 and some of them were complemented with direct visit in the production of the clients to observer the activity done within Proyecto Cambio and its status after having received the Bio Premio, and observe the overall status of the farm. The following 22 interviews, belonging to the Ngroup, were done in the end of July 2012, and they were obtained during the distribution of the Bio Premio and they are used to compare the dynamics of two, in principle,

not correlated regions. The interviews underline, as we will see in the following section, that the behavior seen in Matiguas and Rio Blanco is not specific of these regions, but it is instead quite common even in regions where the exogenous variables are quite different. The interviews to Nitlapan, FDL, BCIE and in the mayoralty were done to investigate some aspects of the "Governance" of the product.

In the data analysis the first 33 interviews were used to generate the main part of the quantitative data concerning the additionally, sustainability and externalities of the program. The 22 following interviews were analyzed as a separated sample and generated comparative quantitative data concerning additionally, sustainability and externalities. I consider the primary data collected in Rio Blanco and Matiguas as very reliable due to the conditions, location and presence of various consistency checks and questions. The interviews in Matiguas moreover were able to provide exact information concerning the cash flow and the details of the invested activities for a big part of the producers. As in the case of secondary data, when an inconsistency inside the quantitative data analysis is encountered the specific indicator affected by this weakness was not considered in the final analysis. The 22 interviews done during the distribution of the Bio Premio have a series of weaknesses: the short time devoted to the interview, the potential influences on the producers and bias in their answers, due to the presence of other producers and FDL, Nitlapan or BCIE staff members. However I consider the overall quality of these primary data as quite good, due to the fact that, in a completely independent way, they confirm a pattern found in the previous interviews, and moreover that the presence of the above mentioned constraints should induce the producers to hide some of the information that instead are revealed in the interviews, especially in relation with the externalities. Moreover the quantitative reliability of the cash flow and the activities they implemented were checked with complementary questions and the data and cost obtained from secondary sources. It is important to observe that in the primary data the majority of the credits disbursed is to finance SAF activities (81,8%), and the majority of the producers interviewed are men (81,8%). This fact implies that our data are biased toward the men producers and SAF activities. However in the complete portfolio of the Proyecto Cambio at the national level, at the 31st May 2012, the percentage of credits given to men is the 84,6%, over a sample of 991 clients; while the percentage of SAF activities financed is 62,8%, and the percentage of SSP activities is 36,8%, among the first 838 clients corresponding to the first four contracts for which I have detailed data. It means that overall my primary data are good representative of the global population in term of gender, while they have a mild bias in term of activities. However a potential source of bias could be related to my selection of the clients for the interviews. Indeed, due to the limited time, absence of a private vehicle for all the period of the field analysis, and my superficial knowledge of the various places before my arrival in the field, I was not able to select the producers to interview according to a criteria of minimization of potential bias a priori, but one important criteria was the proximity to the roads, and the selection of the communities where is grouped a relevant number of producers that took part to Proyecto Cambio. This bias does not seem to appear in the analysis of the data, however excluding the more far away and dispersed clients could reasonably introduce

unobserved bias in the sample making it not representative of the full population.

The others interviews were not used to obtain exact quantitative data, but mainly to complement some of the information coming from the secondary data collection, to obtain a more complete background of the environment over which the dynamics described the first two groups of interviews develops, and analyze some of the synergies and trade-off of the cooperation among the many actors implementing the program. I judge the overall quality of the data as quite reliable for a qualitative data analysis.

## 6.2 Summary Statistics of Some Subsamples and Trends

Let us briefly see the main coarse grain characteristics of the product using data coming from reports by Nitlapan, the preliminary studies of the product done by FDL and Nitlapan (Mendoza et al., 2011; Ramírez Roustán and Dávila Tercero, 2010; Informe I, 2010; Informe II, 2010; Informe III, 2011), and the analysis of the portfolio of the FDL credits associated to the Proyecto Cambio<sup>4</sup>.

The declining annual interest rate of the product is 20,35% at the 31st May 2012. On top of that we should need to consider the commission fees charged on any credit by FDL: they have a quite complicated structure, but, in the case of Proyecto Cambio, we could reasonably claim that their amount is around 2,5% of the credit, to be paid up front. The average duration of the credit is between 2 and 3 years: 27 month on average in Rio Blanco and Matiguas; even if the producers seem to use to finish to repay the credit before the established date mainly due to the fear to have debt, or not being able to have the needed amount at the established date, or the necessity to ask for a new credit. FDL provides credits in Cordoba, the local Nicaraguan currency, or USD, and the repayment schedule is decided according to the natural cash flow of the rural producer: only once at the end of the contract, monthly, every two months, every six months, annual, irregular. The FDL allocated 991 credits in the portfolio Proyecto Cambio (84,6% to men and 15,4% to women) in 22 municipalities for a total amount of 2 010 588,41 USD, with an average credit amount of 2029 USD, at the 31st May 2012. If we compare these data with the most recent financial data of FDL at 31st December 2011 we could have an idea of the Proyecto Cambio in the context of the average credit activity of FDL. It involves the 1,7% of the total clients of FDL and the 3,6% of the total portfolio of FDL, showing moreover the higher value of the average credit of the Proyecto Cambio compared to the average credit of FDL (966 USD). The interest rate is cheaper than the equivalent standard credit provided by FDL for rural investment (between 23,55% and 26,55% according to the amount of the credit), and it has a longer time period (maximum 3 years), compared to a maximum of 2 years for the other comparable credits, not belonging to the Proyecto Cambio, to finance agricultural activities. The total portfolio in arrears for the portfolio Proyecto Cambio is 1,97%, and 0,68% is the portfolio in areas for more than 30 days at the 31st May 2012<sup>5</sup>, much better than the percentage of the total portfolio FDL in areas

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<sup>4</sup>See (Vargas et al., 2011), for the medium term evaluation of the Proyecto Cambio at the macroscopic Central American level.

<sup>5</sup>I would have liked to report about the complete quality of the Proyecto Cambio portfolio, namely the

for more than 30 days 4,73%, and the total PAR<sub>30</sub>: 9,21%, the 31st December 2011 (FDL, 2011).

Using the database provided by Nitlapan containing detailed information concerning the first 838 contracts<sup>6</sup> we obtain that the average amount of influenced area is around 1,57 Ha at the national level, corresponding respectively to an average of 7% and 11,6% of the full area of the farm in Rio Blanco and Matiguas<sup>7</sup>, and the 11,7% on average of the farm area in the NGroup. The average financed area for these three regions is: 3,7 Ha, 0,85 Ha and 2,3 Ha respectively.

The program is divided in blocks of contracts to be reported to the BCIE at fixed dates, and they correspond to 63, 135, 437 and 203 clients for the first four contracts. From the internal analysis done by Nitlapan and FDL (Mendoza et al., 2011; Informe I, 2010; Informe II, 2010; Informe III, 2011) we can observe the following trends obtained from the analysis of the first three contracts: first contract in 2009, second contract in 2009-2010, and third contract in 2010; corresponding to 635 producers, among which 261 were engaged in silvopastoral activities (SSP), and 370 producers were engaged in agroforestry activities (SAF). The main indicator chosen in SSP was planting native trees scattered in pastures (75% of the producers), with at the second position building living fences (46% of the producers). The first indicators chosen in the SAF was native trees for shadow in coffee or cacao plantation (88% of the producers). The number of clients in the first three contracts increased as follow: 44, 55 and 162 in the SSP, and 19, 80 and 271 in the SAF. The municipalities with the higher number of contracts were San Jose Bocay (90), La Dalia (86), Pantasma (75), Muy Muy (64), El Cua (59), Matiguas (54). The distribution of the credits were as follows: 157 producers with credit between 475 USD and 999 USD, and with an average compromised area of 0.93 Ha; 268 producers with credit between 1000 USD and 1999 USD, and with an average committed area of 1.07 Ha; 83 producers with credit between 2000 USD and 2999 USD, and with an average committed area of 1.76 Ha; 85 producers with credit between 3000 USD and 5999 USD, and with an average committed area of 3.01 Ha; 42 producers with credit between 6000 USD and 10000 USD, and with an average committed area of 5.14 Ha. Namely credits smaller than 1000 USD were the 24,7% of the total, the ones smaller than 2000 USD were the 67%, while the ones smaller than 3000 USD were the 80%. The average amount of credit was 2869 USD in the first contract, 2619 USD in the second contract, and 1838 USD in the third contract. The number of meetings with the technicians of Nitlapan to receive the technical assistance were almost always five for the first two contracts (respectively 95,2% and 90,37% of the contracts) while it decreased to 55,6% of the producers receiving between 4 and 5 events and the remaining ones receiving between 1 and 3 events. In

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Portfolio at Risk 30 days taking into account the full outstanding balance arrears and the renegotiated part of the portfolio, but the necessary data to compute it were not available to me.

<sup>6</sup>These data are obtained keeping only 755 contracts over the 838, and disregarding the contracts that are doubtful or incomplete.

<sup>7</sup>These data are obtained retaining only the 90% and the 84,3% of the contracts in Rio Blanco and Matiguas corresponding to 18 and 86 producers at the 31st May 2012, and disregarding the contracts that are doubtful or incomplete.

September 2009, 38 producers of the first contract (corresponding to the 60,3%) completed the 100% of the biodiversity indicators and they received or were candidate to receive the Bio Premio, while the remaining ones have an average of 83% of accomplishment; In November 2010, 118 of the producers of the second contract (87,43%) completed the 100% of the biodiversity indicators and they received or were candidate to receive the Bio Premio, while the remaining ones have an average of 50% of accomplishment; 278 of the producers of the third contract (63,61%) completed the 100% of the biodiversity indicators while the remaining ones had the 50% accomplishment. In the first contract the majority of the producers compromised with 2 indicators (53,96%), while in the second and third contract the majority of the producers compromised with only one indicators (62,22% and 88,33% respectively). This trend toward the reduction of the number of committed indicators is due to the revealed difficulty of the producers to engage in more than one commitment at once that induce a mild change in policy inside Nitlapan. Let us see the evolution of the accomplishments of the various producers, according to some of the activities they decide to invest in, during the first three contracts. In the SSP sector the most widely chosen activity was planting native trees scattered in pastures. On average the producers compromised to plant 30,6 trees per Ha in the first contract, 30 trees per Ha in the second contracts and 21,4 trees per Ha in the third contract, with an average influence area of 3,9 Ha, 2,3 Ha and 1,6 Ha respectively. On average the producers that succeeded to fulfill the biodiversity indicators over fulfilled them at the 172,8%, 119% and 138,8% respectively. The second preferred activity was the establishment of living fences. In this case the distance between trees is established to be 2,5 meter to provide enough connectivity for the bio sphere, and the producers planted on average around 400 trees for every Km of living fence. Also in this case, when the producers succeed, they over fulfill the indicators. In the SAF sector the most widely chosen activity is planting native trees for coffee or cacao shade. In this case the producers compromise to plant an average of 43,6 trees per Ha in the first contract, 16 trees per Ha in the second contract, and 44,8 trees per Ha in the third contract, with an average influence area of 1,1 Ha, 2,9 Ha, and 1,3 Ha respectively. Also in this case the successful producers overfulfill the established indicators with 188,5%, 150%, and 192,4% accomplishment respectively. The over fulfilling of the indicators seems to be due to the fact that the producers, because they are afraid that the planted trees will not survive, decided to plant more of them. Anecdotal evidence from my interviews support this conclusion and complement it with the claimed appreciation of trees by the producers and the relatively low cost of additional trees.

## 7 Results Analysis

In this section I present my main results coming from the analysis of the primary data. The section is divided into various subsections exploring different aspects of the program. The main subsection is dedicated to the study of the externalities of the program and the correlation with socio-economic inequalities and the related effectiveness of the program. Other subsections study the additionally and sustainability of the program, the motivations of the producers to engage in the program, the synergies and trade off among the different actors implementing Proyecto Cambio and the potentiality for a territorial and institutional extension of the program.

### 7.1 Motivations

From the interviews done in Rio Blanco and Matiguas it seems that the main motivation of the producers to participate to the Proyecto Cambio is related to economic or market reasons. Namely the producers choose the product because they feel that it is a good contract: it finances important rural activities that the producers value as profitable, it is a long time credit (three years) that allows the producers to invest in productive activities that could induce the development of their livelihood, it has cheaper interest rate compared to other similar products, and moreover they are supposed to receive a money compensation for their work (the Bio Premio). Indeed among the interviewed producers the 62,5% in Rio Blanco and the 76% in Matiguas chose this contract for one of the previous reasons. Among these the 50% of the producers in Rio Blanco and the 36% of the producers in Matiguas declare that the Bio Premio is the main reason to engage in this product, while the 12,5% of the producers in Rio Blanco and the 44% of the producers in Matiguas claim that the main reason is related to the structure of the contract. However the free technical assistance is the main motivation for the 25% of the producers in Rio Blanco and the 12% of the ones in Matiguas, while the preservation of the environment is the main motivation for the 25% and the 20% respectively.

### 7.2 Additionality

The program does not seem to have a high degree of additionality as such, namely it does not seem to induce new direct choices in the development strategies of the producers, or in their main short or medium term economic investments. However the majority of the producers declare that they have acquired new expertise thanks to the TA and the activity they invested in, and that they are applying them or would like to apply them in their rural activity. This induce to think that Proyecto Cambio allows to increase the human capital of the producers and could bring additionalities in the long term.

According to the data collected less than 1/3 of the producers in Rio Blanco and Matiguas, decide to invest in the proposed activity due to the specificity of the environmental product, while the remaining 2/3 declare to have already a similar plan before knowing about Proyecto Cambio. Indeed only the 12,5% in Rio Blanco and 28% in Ma-

tiguas declare to provide a new area for the Proyecto Cambio investment that was not already prepared for a similar activity; only the 0% and the 32% invest in the Proyecto Cambio activity for its additional environmental value, while the remaining ones engage in the activity for its profitability or because already present in their short term plans; the amount of credit asked to FDL is specially tailored for the decided environmental activity only for the 50% and the 32%, while the other ones told that they have already decided this amount of credit also for other investments. These results induce to think that the Proyecto Cambio is smoothly merging with the development paths of the rural producers, but it does not directly induce new development strategies in the short or medium term.

It could be interesting to separate the data more related to the economic additionally of the product: namely study if Proyecto Cambio is financing new economic activities not previously present in the farm; from the data more related to the environmental additionally: namely study if the investment done by the producers is really inducing the plantation of new trees that producers would not have planted without Proyecto Cambio.

The program is not especially financing new economic activities: only 0%, 52%, and 23% of the producers in Rio Blanco, Matiguas, and in the NGroup, begin at least a new activity with Proyecto Cambio. However the 87,5% and the 48% of the producers in Rio Blanco and Matiguas declared that they are doing an old activity but with a better quality, and they obtained or are expecting to obtain a better production thanks to the knowledge they acquire with the TA.

Nevertheless in Matiguas, the only area for which we have data for this indicator, only the 24% of the producers is planting trees for the first time. En Rio Blanco y Matiguas the 50% and 52% of the producers planted new species of trees that were not present in the past in their own farm, directly contributing to the diversification of their local biosphere.

These data induce me to think that the program influences more the quantity and quantity of the planted trees and the quality of the economic activity, than the novelty of the environmental and economic activity. This result nicely fit with the overall natural development path of low risky activities and diversification of the medium and small rural producers. Indeed only the 0% in Rio Blanco and the 8% in Matiguas have a plan to invest in the short future in a new activity, different from the one they have already completed, among the ones proposed by Proyecto Cambio.

I believe that Proyecto Cambio should have a certain degree of additionally to really contribute to the environment preservation, to the development of the rural producers, and justify the use of subsidies; however a too high degree of economic additionality (in the specificity of the program partially related to the environmental additionality) could be not beneficial for the producers and expose them to higher risks. A change in livelihood paths should be something that smoothly combine with a change in values, culture, and habits and it requires longer term. However the program should have a clear path toward an overall additionality. Unfortunately this does not seem to be the case due to a lack of a clear policy that could reward the completely new economic and environmental investments.

Moreover, even if I do not have careful statistical data, from the analysis of primary and

secondary data it appears that there are various producers that have access to the Proyecto Cambio more than once and, among them, there are various producers that invest exactly or almost exactly in the same activity implying a very low level of additionality for these producers. In Matiguas for example, among the 102 contracts collocated at the 31st May 2012, there are 8 producers that received the Proyecto Cambio more than once. In my primary data collection I interviewed 4 producers that took the Proyecto Cambio credit more than once, and among them 2 producers engaged exactly in the same activity in the two contracts. Of course this is only anecdotal evidence and a sound statistical study would be required.

A final comment is due: the degree of additionality required by a program should be related to the local situation. Sometime additionality could also mean a faster implementation of the normal environmentally friendly development strategies of the producers through the release of the credit constraints that prevent these investments, without directly stimulating new activities. Moreover it could be also conceivable that a high degree of additionality should not be required if the program is able to support those evolutions which go in the environmentally friendly direction<sup>8</sup>.

### 7.3 Sustainability

From the analysis of the primary data, it seems that the short and medium term sustainability of the project is pretty good. In particular the majority of the producers is realizing or would like to realize in the future an activity similar to the one done with Proyecto Cambio, even without the direct support of credit from the Proyecto Cambio itself. Moreover the majority of the producers declare that the economic activity in which they invested in is producing or is going to produce more income for the household, and that the planted trees are or will also be a new direct source of economic income thanks to the fruits they produce or the wood for future need of the family. These results induce me to think that it is reliable that the producers are going to preserve and potentially reproduce the activities they realized with Proyecto Cambio.

Indeed the 100% and the 96% of the producers in Rio Blanco and Matiguas declare that the activities they started with Proyecto Cambio is producing, directly or indirectly, more income for them and their families; the 100% and the 76% declared to have acquired new abilities thanks to the TA, and all the producers in the two regions (100%) declared to be satisfied of the program. Moreover the 75% and 88% of the producers want to ask for a new Proyecto Cambio.

The potential medium term impact of the program is supported by the fact that all the planted trees of the 87,5%, 84%, and the 73% of the producers respectively in Rio Blanco, Matiguas and in the NGroup are still there 1 or 2 years of the verifications done by the BCIE. The reliability of this declaration is supported also by the economic value associated to the trees: the 62,5% producers in Rio Blanco and the 100% of the ones in Matiguas indeed estimate that the planted trees are providing or will generate new

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<sup>8</sup>I would like to acknowledge the people that took part to the presentation of the preliminary results of this work, at the beginning of July in Managua, and Johan Bastiaensen for discussions about this topic.



income for the family from the fruits or the wood, supporting the idea that the trees will be protected, preserved and included in the economic dynamics of the farm, not just as an environmental good, but also as an economic resource.

All the producers (100%) interviewed in Rio Blanco and Matiguas have future plan for more trees in their rural production. The 50% and 80% respectively is already planting more trees, after the accomplishment of the activity committed in the Proyecto Cambio, in other part of the farm, using a technique similar to the one learned during the TA of the program. Some of these new environmental activities were also verified by myself with direct visits in the field.

I believe that the most important data to evaluate the sustainability of the program is that the 87,5% of the producers in Rio Blanco and the 96% of the producers in Matiguas, declared that they are going to invest in one of the activities proposed by Proyecto Cambio, using a technique similar to the ones they have already used, also without receiving an new credit from the Proyecto Cambio! The soundness of this last data is sustained by the fact that the potential bias in the interview, related to the fact the producers could have associated me with one of the staff member implementing the program, would have pushed the producers to declare that they would have reproduce the activity done in Proyecto Cambio only if a new credit would be provided to them.

### **7.3.1 Correlation between Additionality and Sustainability**

In the previous two subsections I tried to analyze the additionality and the sustainability of the program as two separate concepts, however it is reasonable that there exists a correlation between the two. Indeed a high sustainability could be at least in part caused by a low additionality: namely if the changes induced by the program are not too big it will be easier for the producers to preserve and reproduce these changes. The analysis of the relevance of this potential correlation is beyond the aim of this thesis, but these kinds of potential interactions among the different indicators should always be taken into account when interpreting the data<sup>9</sup>.

## **7.4 Externalities**

In this section we analyze the externalities of the program, namely all those effects on the environment and the economic investments and production of the clients that are not directly constrained by Proyecto Cambio, but that are induced, directly or indirectly by it<sup>10</sup>. Even if the overall impact of externalities is difficult to assess I believe that the study presented in this section allows to appreciate the importance of a specific credit policy for a program that would like to really impact the environment. Moreover it underlines the

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<sup>9</sup>The existence of these potential interactions among indicators came out in a discussion with Frédéric Huybrechs, that is kindly acknowledged.

<sup>10</sup>Please observe that in the rest of the thesis I use the concept of externalities with this meaning and not the usual one attributed to them in the PES literature, that usually refer to their more specific meaning used by economists: costs or benefits that are not rewarded in monetary price terms. I hope that this abuse of language will not confuse the reader.

correlation between environment preservation and socio-economic inequalities and some of its trade-off and synergies that should be taken in consideration.

The externalities considered in this thesis could be divided into: "internal" ones: the investments and activities of the rural producers that influence her or his own farm outside the area in which she or he implements the Proyecto Cambio activities; and "external" ones: the actual and potential changes in attitudes and activities of the neighborhoods of the clients taking part to Proyecto Cambio, and the overall influence on the community, the institutions and the social values. My analysis will be mainly focused on the "internal" type of externalities, for which I believe to have sound quantitative data, while the "external" externalities will be only briefly discussed and contextualized with secondary data. This decision is mainly due to the lack of data and time for a careful analysis.

In the case of the "external" externalities I just have few qualitative data that underline how the activity of the producers that take part to the Proyecto Cambio could influence other producers. The analysis of the data indeed shows that the 87,5% of the producers in Rio Blanco and the 70% of the producers in Matiguas speak about the Proyecto Cambio with other producers, with an average of 4,25 producers per client in Matiguas. From the interviews it appears that some of the producers contacted by the clients with Proyecto Cambio got interested in the product for the quality of the activity or the convenience of the credit line, and asked to FDL and obtained a Proyecto Cambio credit, or started a similar activities without external financing or with a credit not belonging to Proyecto Cambio. Moreover 25% of the producers in Rio Blanco and the 40% in Matiguas speak about the product in the cooperative they belong to. The Proyecto Cambio seems also to generate new paid employment, required to realize the activity the producers commit with. This happen in the 50% of the producers in Rio Blanco and the 72% of the producers in Matiguas. The generation of this employment possibilities is an important source of income for the poorer households that do not own a farm and they are forced to work in the farm of other producers to generate enough income for their family. However it is very difficult to establish how many of these employment opportunities are directly associated to Proyecto Cambio and how many of them are simple associated to the normal activity of the farmers. As we previously explained the major recognized cause of deforestation is the extensive cattle activity. To evaluate the global impact of the Proyecto Cambio it is import to check that the clients do not keep on or start cumulating land for extensive cattle, also thanks to the profitability of the activity established with Proyecto Cambio. The change in the size of the farm could be a potential problem in Rio Blanco, while it does not seem to be relevant in Matiguas. Indeed the 37,5% of the producers in Rio Blanco increased the size of their farm during, after or just before the implementation of Proyecto Cambio and these producers declare that the cattle raising is their main activity, while no one reduced the size of its farm. In the Matiguas the 8% increased the size of its farm, while the 8% decreased it. It is moreover interesting to observe that the medium term plan of the producers seems to be only partially affected by the experience they had done with Proyecto Cambio, and more ruled by the opportunities of the market or their differentiation strategies. The different patterns of land accumulation between Matiguas and Rio Blanco that we have seen in my sample, nicely match with

the macroscopic dynamics that shows that the majority of the land market activity is presently taking place in Rio Blanco, while similar processes took place in Matiguas 15-20 years ago reducing the present availability of land and hence its land dynamics. The direct impact on this land dynamics of Proyecto Cambio seems to be quite small, mainly due to the small average amount of credit. However it would be interested to analyze how this dynamics interact with the global portfolio of FDL. A study of this correlation is beyond the aims of this thesis.

I will now present the results concerning the "internal" externalities, for which I have much more detailed data. The analysis of these results will take the rest of this section.

The data in Rio Blanco and Matiguas show that the 50% and 85% respectively of the producers planted new trees outside the compromised region after the conclusion of the investment done with Proyecto Cambio. These data, complemented with the qualitative information coming from the interviews, probably show that the idea to plant trees in the production and how is done is appreciated by the producers and they reproduce the activities of Proyecto Cambio also outside the compromised area and after the end of the contract. However when the producers plant shadow trees inside their economic activities without being checked, they typically do it complementing the presence of natural trees with additional planted trees, and they use to plant less shadow trees than the ones required by the Proyecto Cambio. There are also some relevant exception to this pattern: producers that claim to reproduce exactly the same activity done with Proyecto Cambio, and other claiming that they plant more trees than the ones required by Proyecto Cambio. The presence of this kind of producers and the claimed facility to reproduce the investment done with Proyecto Cambio, brings once more the discussion of the degree of additionality of the product. However, some producers also declare that an additionality is the fact that, even if they were doing an activity similar to the one they used to do, right now they know that they are doing the right thing and they claim that they want to reproduce it and communicate to the other producers what they learnt. The potentiality of this externality is difficult to evaluated, however it is nice to observe that there exist specific program developed by Nitlapan that try to induce the creation of this kind of externalities among the different producers<sup>11</sup>. The analysis of the database of Nitlapan concerning the first 838 clients<sup>12</sup> coming from the first four contracts shows that the FDL credit is on average bigger than the cost of the agreed activity, with an average excess of credit of 547 USD per producer, and that the compromised environmentally friendly activities are on average financed with the 273% of the required amount. In figure 1 I show the amount of credit provided by FDL in function of the cost estimated by Nitlapan for every activity of the first 838 reliable contracts: every point is a client taking part to the Proyecto Cambio, if the FDL credit was exactly the amount required for the committed activity, all the points should stay in the line drawn in figure 1. The points above the line are the producers that received a credit amount bigger than the cost estimated by Nitlapan, while the ones below are the producers that received a credit smaller than the required

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<sup>11</sup>I would like to thank Elias Ramírez for discussions on this point.

<sup>12</sup>The analysis presented here is done considering only 755 contracts over the 838, and disregarding the contracts that are doubtful or incomplete.

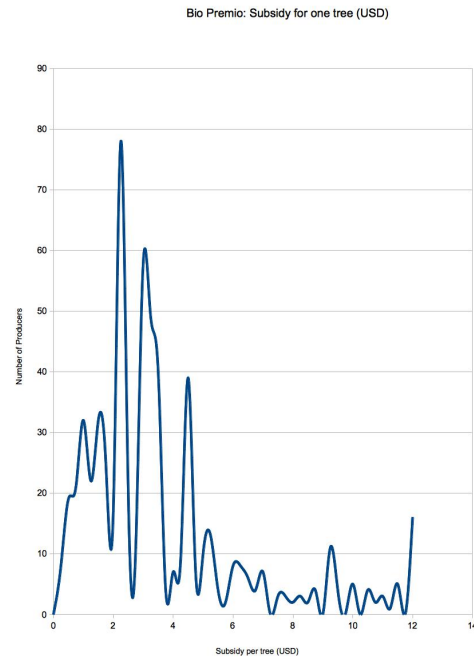
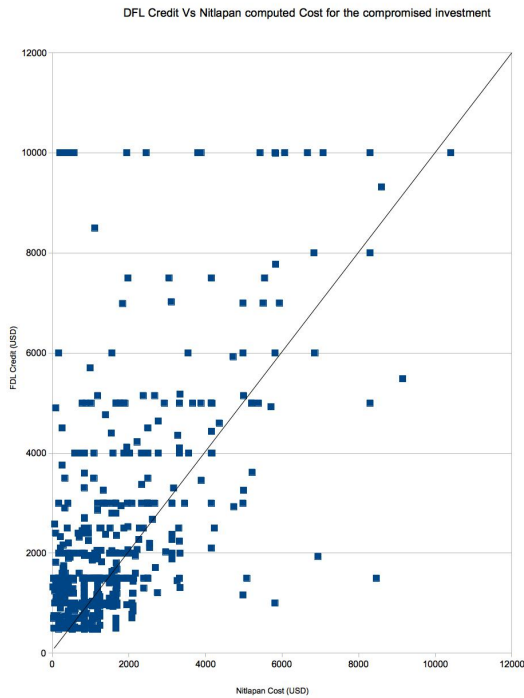


Figure 1: Credit FDL in function of the cost computed by Nitlapan for every contract. Figure 2: Number of producers that receive a certain amount of subsidy per planted tree.

amount needed as computed by Nitlapan: from now on we will call them over financed and sub financed producers. Figure 1 shows that, even if the producers receive a credit from FLD that is on average bigger than the required amount for the declared activity, this "over financing" is not systematic and there exists an important number of producers that receive an amount of credit smaller than the one that would be required to realize the compromised activity. The computation is done using the data concerning the cost of the various activities as computed by Nitlapan, and explained in section 6.1, and the kind activity and amount of area invested in as provided by the Nitlapan database. Some of the costs used more in the analysis are: 1 Km of living fence: 838,5 USD; 1 Ha of cacao with shadow trees: 884,4 USD; 1 Ha of trees to protect water sources: 228,4 USD; 1 Ha of coffee with shadow trees: 1486,5 USD; 1 Ha of improved pasture with shadow trees: 554 USD; 1 Ha of fodder plants: 1332 USD; cost to plant 1 tree: 0,42 USD. From the study of the database it appears that the average number of trees that every producer commits to plant<sup>13</sup> is 96, and Proyecto Cambio pays per every tree, through to the Bio Premio, an average of 3,9 USD, with the wide distribution of payment amounts shown in the figure 2. There I report the number of producers that receive an amount smaller than a fixed threshold for every tree she or he plants. The subsidy received by the producers should

<sup>13</sup>It is important to observe that we are considering the trees the producers engage to plant and not the ones actually planted.

in principle be comparable to the actual cost of the additional trees that the producers plant thanks to Proyecto Cambio, or the price of the additional environmental services the producers provide to the rural community (more difficult to estimate). However the most important fact about figure 2 is that the price paid for one tree varies a lot and it is difficult to believe that it is correlated to any sensible environmental indicator. It is important to observe that the relation between the amount of credit provided by FDL and the cost of the investment computed by Nitlapan varies for different categories of activities and the location of the producers. Indeed in the case of SSP activities, the excess of credit with respect of the required investment is on average of 1314 USD per client, and every activity is financed with the 421% of the required capital, see figure 3; while the SAF activities have an excess of credit of only 86 USD and every activity is financed on average with the 183 % of the required capital, see figure 4. This should imply that on average the over financing is driven by the SSP. Indeed figures 3 and 4 clearly show the different dynamics of the two kinds of sectors. It is possible to do the same

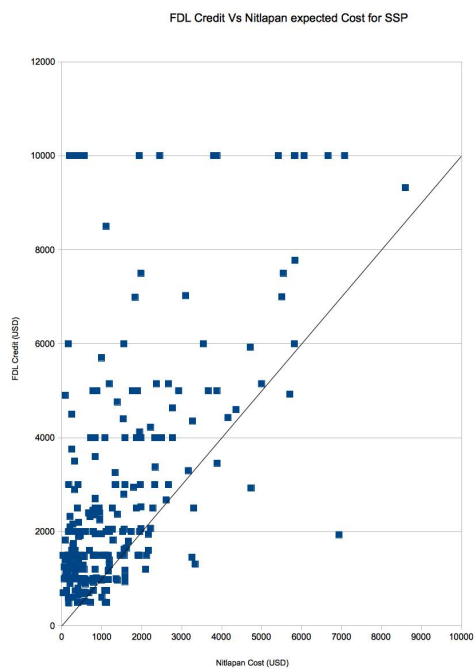


Figure 3: SSP

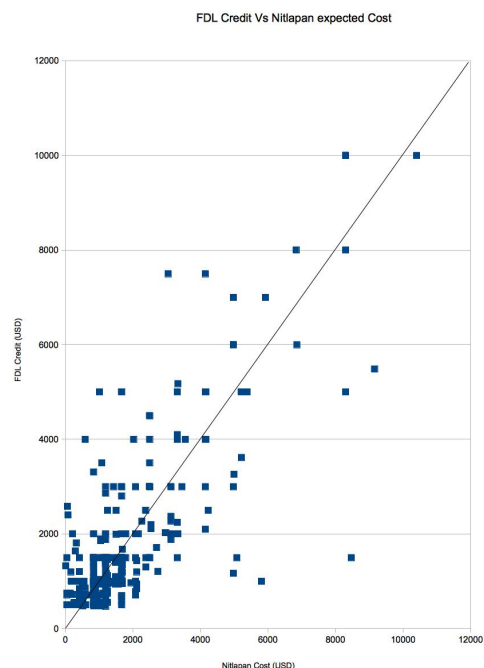


Figure 4: SAF

analysis done in figures 3 and 4 for every FDL branch operating in the 22 municipalities in which the Proyecto Cambio is present. From this analysis it is easy to observe that the various branches of FDL operate with a different credit policy. This behavior is clear if we compare the distribution in the amount of credit of FDL and the expected cost for the compromised activity as computed by Nitlapan in three prototypic examples: the SAF in San Jose Bocay (figure 5), the SAF in Matiguas (figure 6), and the SSP in Rivas

(figure 7). In San Jose Bocay the committed activity is systematically under financed, with an average missing capital per client of 526,5 USD and the FDL credit is financing only the 81,3% of the capital required for the investment. In Matiguas, while there is an average over financing of the compromised activity, with an excess of credit per client of 258,5 USD and every client is financed on average with the 371,2% of the required capital for the committed activity, it is easy to understand, looking at figure 6, that the credit of FDL and the expected cost computed by Nitlapan are not really correlated. An observation that is confirmed by the low value of the Pearson correlation (0,34) for the sample. An opposite situation with respect to the one found in San Jose Bocay can be seen very explicit in Rivas, where FDL systematically over finance the compromised activity. Indeed the average excess of credit per client is 2874,6 USD and the committed activities are financed on average with 1716% of the required capital. The difference in

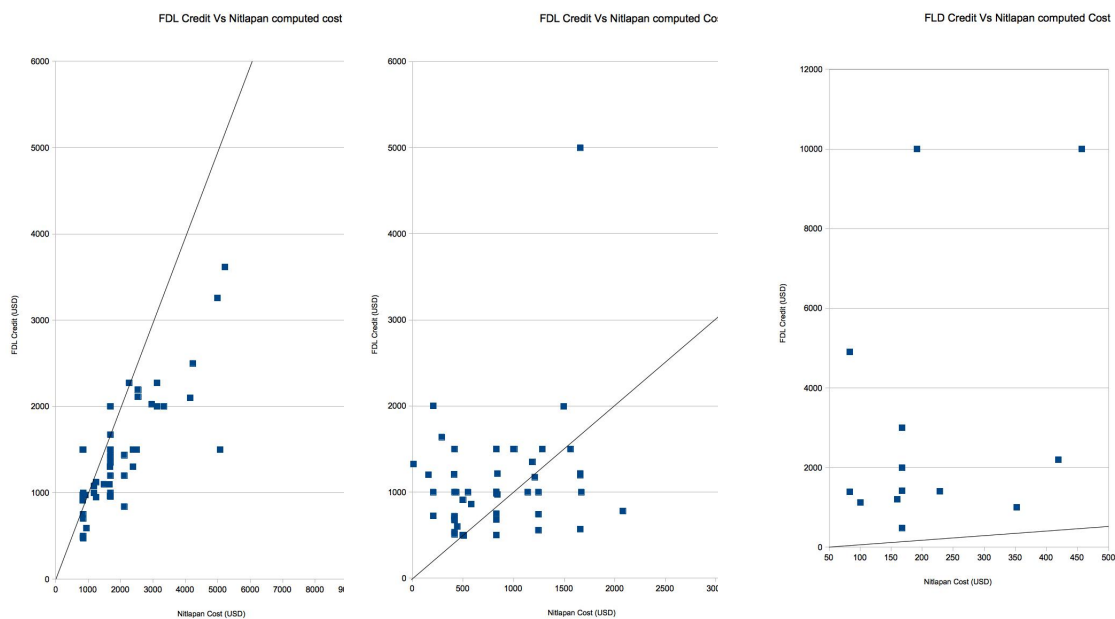


Figure 5: SAF, S. J. Bocay. Figure 6: SAF, Matiguas. Figure 7: SSP, Rivas.

credit policy could be observed not only at regional level, but also at the level of the financed activity. Indeed in the example of Matiguas it is clear that the financing of coffee, figure 8, and of cacao, figure 9, follow two different logics, even if it is reasonable to believe that the environmental impact of the two activities should be comparable<sup>14</sup>. The coffee is systematically under financed, with an averaged missing capital of 315 USD

<sup>14</sup>The data presented here are obtained from: 25 clients that planted cacao with shadow trees, and 44 clients that planted coffee with shadow trees, corresponding respectively to the 24,5% and the 43,1% of the contracts present in the portfolio Proyecto Cambio in Matiguas at the 31st May 2012. In this selection the contracts that were judged doubtful or incomplete were disregarded.

per clients, and a financed capital corresponding only to the 85% of the required cost to realized the compromised activity. The Cacao is instead systematically over financed with an averaged over financing of 749 USD per clients, and a financed capital corresponding to the 233% of the required cost to realized the compromised activity. Moreover the amount of credit per hectare financed in cacao (2063 USD/Ha) is bigger than the amount of credit per hectare financed in coffee (1265 USD/Ha), while the cost estimated by Nitlapan to realized one hectare of cacao (884,4 USD/Ha) is smaller compared to the required cost to establish one hectare of coffee (1486,5 USD/Ha).

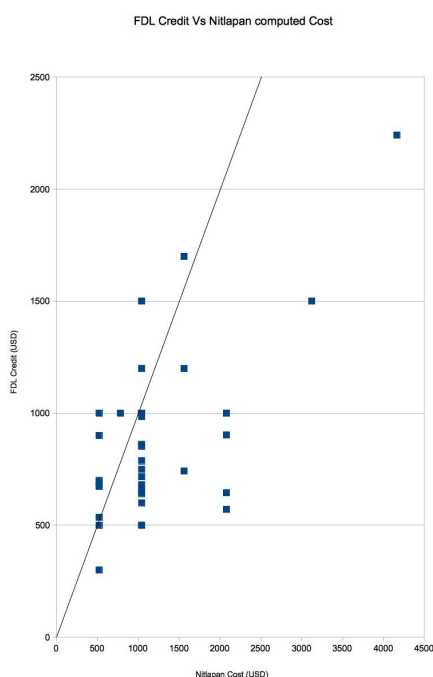


Figure 8: Coffee, Matiguas.

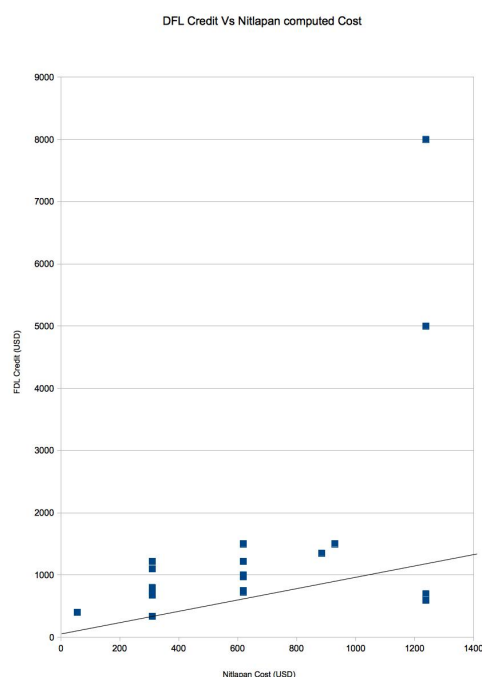


Figure 9: Cacao, Matiguas.

#### 7.4.1 Producers' Investments

In the previous section we have seen that on average the amount of credit received by the clients of FDL is bigger than the required capital to realize the activity they committed with in the Proyecto Cambio. A natural question is: in which activities this average excess of credit is invested? To try to, at least partially, answer to this question, I use the primary data I collected with the direct long and detailed interviews to the 33 producers in Rio Blanco (8), and Matiguas (25) and I will use the other 22 short and focused interviews belonging to the NGroup, done during the distribution of the Bio Premio to producers living in the regions of La Dalia, Waslala, San Jose Bocay, El Cua, Pantasma, Wiwili, to support the generality of the phenomenon. Before starting the analysis it is important

to underline that it is a common fact that a relevant part, sometime the majority, of the credit received by a MFI is used by the clients for activities different from the ones she or he declared, see for example (Collins et al., 2009) or (Guérin et al., 2011). Moreover it is not easy to track the real investment done by the producers with the credit they received due to the fungibility of money. However I believe that in the case of a program that try to impact a specific activity, such as in our case reforestation and preservation of biodiversity, and moreover it pays a subsidy proportional to the credit to reward the activities in which the clients invest, it is important to try to understand the cash flow of the clients and how the various investments sit inside the livelihood strategies of the producers.

It is important to underline that, when we try to understand how the credit received by the Proyecto Cambio flows in the various activities valued by the producers, there exists at least three different amounts to take into consideration: the amount of credit the producers receive by FDL, the amount of capital Nitlapan estimates that is necessary to realize the agreed activity, and the amount of money the single producers really use to realize the required activity. This three amounts of money could be quite or very different, and one of our aims is to understand which kind of phenomena are generated by this difference. It is reasonable to think that the cost estimated by the single producer is smaller than the one computed by Nitlapan. Indeed, while Nitlapan tries to do a computation of the investment reconstructing, with a sample of producers, the required activities necessary to realize the required investment, using the "market" cost of the various products and the labor; the producers use to do not fully value their or their family labors, do not buy at least part of the seeds required for the productive activity, if already present in the farm, and they do not buy trees, if they can be transplanted from other parts of the farm or taken from neighborhoods.

In table 2 I report the activities in which the producers invest in using the amount of credit received in the Proyecto Cambio. For the tree groups: Rio Blanco, Matiguas and NGroup, it is reported the percentage of the producers that invested part of the credit in each one of the stated activities: the ones that invested in the activity they engaged with in the Proyecto Cambio, the ones that used the credit only for the activity decided within the Proyecto Cambio, the ones that invested in other part of the farm in activities classified by the Proyecto Cambio as environmentally friendly, the ones that invested in other activities, such as corn, beans, cacao without trees, etc that I would classify as environmentally neutral, the ones that invested in one on the environmentally "dangerous" activities, in order of potential danger: pasture without trees, cattle, for which I also reported the average cattle number per clients in every region, land purchase. The subdivision of the activities as environmentally neutral or dangerous is a bit arbitrary and questionable, but it is the most effective and simple I've found that match with the environmental problems produced by the extensive cattle, that seems to be the the main environmental danger at the macroscopic level, as explained in the previous sections, and the local situation and rules of Proyecto Cambio, that for example would forbid to buy cattle and or expand the area committed to cattle activities inside the farm (SPCAMBio). See downstairs for a more complete disclaimer. From table 2 we immediately see that the



Localities	PC	OPC	OEnv	OA	PWT	Cattle	Land
Rio Blanco	87,5%	0%	25%	37,5%	50%	37,5%(2,9)	12,5%
Matiguas	100%	0%	68%	52%	28%	44%(1,4)	4%
NGroup	100%	27%	14%	41%	9%	23%(1,8)	0%

Table 2: Activities invested in using the credit of the Proyecto Cambio, in % of the producers that invested in the stated activities. PC: Proyecto Cambio; OPC: Only Proyecto Cambio; OEnv: others environmentally friendly activities; OA: other environmentally neutral activities; PWT: pasture without trees.

large majority of the producers use the credit provided by FDL to invest also in other activities in addition to the activity they engaged with in Proyecto Cambio. The only exception to this phenomenon is the 27% of the producers in the NGroup that declared to invest all the credit only in the activity within the Proyecto Cambio. This fact is reasonable if we look to the peculiar FDL credit Vs Nitlapan cost in the region of the NGroup. Indeed it happens that this region is on average less over financed or even sub financed (as we have seen with the specific example of the SAF in La Dalia in the previous section) and this implies that the producers need sometime to compose the credit with other source of funds to realize the agreed activity, or the amount of the credit received by FDL is on the border of their actual cost, as confirmed in some of the interviews. An interesting observation from table 2 is that the overall effect of the externalities generated by the excess of credit cannot be easily classified as dangerous for the environment or environmentally friendly. Indeed let us take the example of Matiguas, but reproduced in a similar pattern in the other two samples. There the 68% of the producers invest part of their credit in other environmentally friendly activities, as classified by the indicators of Proyecto Cambio, in other area of their farm, outside the committed region. This kind of externalities I will call from now on Positive Externalities: they are environmental friendly activities in excess to the ones agreed inside the project, but generated by the financial capital provided by the credit the producers receive inside the program. On the other end the 44% of the same producers invest part of the FDL credit, directly 32% or indirectly 12% (using the income generated by the Proyecto Cambio activities or other activities (fungibility of money)), to buy cattle (cows, calves or both), with an average of 1,4 cattle per producers. I will call the sum of the investment in cattle together with the investment in pasture without trees and the investment in land, the Negative Externalities. Before proceeding we need to provide a disclaimer to this strong claim: buying cattle is not directly a sign of negative environmental externalities. Indeed there are situation in which this is not the case: buy 2 or 3 calves is a normal activity for many of the rural producers in Nicaragua that allow them to insure themselves against downturn of their production at the moment of repaying the credit. Indeed calves are sold very easily and quickly on the local market at an almost fixed price, and in many cases they provide the liquidity the producers need to repay the credit. Another possible critic to my classification is that the cattle the producers buy, could be part of a cattle

intensification strategy of the producers that typically goes with the production of fresh milk and dairy products and the investment in fodder plants. Unfortunately I do not have the required data to statistically distinguish between environmentally dangerous or friendly cattle investments. However, I feel quite confident to classify the investment in cattle or pasture without trees as a negative externality, because first of all invest in cattle is formally forbidden in Proyecto Cambio, and in the second instance, all the cattle the producers bought were not on average accompanied with any of the SSP environmentally friendly activities classified in Proyecto Cambio. In addition no one of the producers I visited has a clear cattle intensification production. Moreover the hoped intensification pattern that should be induced by dairy production or intensification techniques, such as investment in fodder plants, does not seem to be very effective at the regional level, as explained in (Polverosa, 2012) and reported in section 5.6. However it will be interesting to distinguish between the producers that buy calves and the ones that buy cows, and the role this cattle is going to play inside the farm production: diversification, insurance, accumulation. However I do not have enough and the right data to proceed in this analysis and I will stick in this easier but a bit imprecise classification of externalities.

Another thing to observe from the table is the fact that some of the producers in Rio Blanco and Matiguas buy land, merging the Proyecto Cambio credit with other sources of credit or income. This purchase of land, even if small and all the time indirect (the producers has bought it just before, or just after the credit, or with other incomes) it is a phenomena that should be taken in consideration because it seems that what constrained more the producers to buy or not to buy other land is its high price (right now around 1500 USD per Ha in the region of Matiguas) and the small amount of FDL credit, and not a phenomenon of production intensification, or rules or incentives of the program. However, from now on I will consider not statistically relevant the investment in land, due to the indirectness of its process.

The successful producers receive a Bio Premio equal the 14% of the amount of the credit, it would be nice to know in which activities the producers invest this capital. From table 3 we see that the majority of the credit is used for investments in the farm, another part for household needs, and another part to repay the credit. It was not possible to explicitly classify the kind of activity the producers invest in the farm. However in Matiguas, I have data that allows us to conclude that the 18% of the producers invest the Bio Premio in what I classified as negative externalities: the 9% buy cattle, while another 9% invest in pasture without trees.

Localities	Farm	Family	Reimburse
Rio Blanco	37,5%	25%	25%
Matiguas	76% (9% Cattle, 9% Pasture)	20%	9%

Table 3: Investments done with the Bio Premio.

I believe that the average excess of credit is not only an important externality that need to be taken into account, but it is also a proxy to see how the Proyecto Cambio is

embedded inside the logic of the producers. From these two tables the first clear strategy that emerge in the producers livelihood is the diversification. The producers that take part to the Proyecto Cambio are indeed relatively small producers and to assure their own development they try to invest in more than one activity at the same time (cattle raising, diary production, cacao, coffee, corn, beans, ...) that provide different cash flows (order of a week for the income from the milk, and order of six months for the one from the cacao or coffee), and weakly correlated market values: like cacao and milk, or coffee and milk. I believe that this diversification process is of fundamental importance for the livelihood of the producers and programs that try to improve the environmental impact of the production should not try to change the livelihood strategies of the producers according to a planned "better strategy", but they should instead try to improve the quality and productivity, throughout intensification, reforestation and upgrading in the value chain strategies of the activities in which the producers naturally invest in, and integrate this process inside a territorial strategy.

Till here we have classified the various externalities according to the number of producers that invest in them. Now, to better understand the magnitudes of these externalities, I would like to investigate the amount of money invested in each activity. These data are presented in table 4 for the samples of Matiguas the NGroup<sup>15</sup>. In this table it is shown the average amount of money of the FDL credit that flows in all the activities other than the ones agreed in Proyecto Cambio, and its value in percentage of the amount of the credit of received by FDL.

Localities	OEnv	OA	PWT	Cattle	Land
Matiguas	234 USD (295 USD) 18,8%	199 USD (250 USD) 19%	40 USD (138 USD) 3,4%	269 USD (503 USD) 18,4%	0 USD (0 USD) 0%
NGroup	402 USD (1445 USD) 10%	377 USD (637 USD) 17,4%	95 USD (330 USD) 1,7%	342 USD (1084 USD) 10,1%	0 USD (0 USD) 0%

Table 4: Average amount (and standard deviation) of the Proyecto Cambio credit invested in other activities in addition to the agreed ones. Notation as in table 2.

In Matiguas on average only the 40,3% of the credit, corresponding to 505 USD per client, goes into the activity agreed within Proyecto Cambio, while the 59,7% of the credit, equivalent on average to 742 USD per client, goes in other activities, not checked or constrained in any way by the structure of the program. In the NGroup sample the dynamics is quite similar, with the 60,1% of the credit (1555 USD) that goes directly into the committed activity, while the 39,9% of the credit (1222 USD) goes in other,

<sup>15</sup>These data are obtained from a subsample of the producers interviewed in Matiguas: 18 contracts, corresponding to the 72% of the sample, and the 17,6% of the full portfolio Proyecto Cambio in Matiguas at 31st May 2012. The remaining clients were disregarded, because I judged that the data collected for the cash flow were not sound enough. While I retained the complete sample of 22 clients for the NGroup.

not related, activities. The difference in amount of credit and percentage invested in the various activities with respect to Matiguas, is related to the different exogenous variables (see for example the table 1): namely the average amount of credit in Matiguas (1194 USD) is smaller than the average amount of credit in the NGroup area (2777 USD), while the average excess of credit of FDL with respect to the computed cost of Nitlapan is 470 USD per client, corresponding to a 188% of the capital necessary for the agreed investment, in Matiguas, and it is of 327 USD per producer in the NGroup, corresponding to a 120% of the capital required for the investment<sup>16</sup>. It is interesting to observe that the exceeding amount of credit in absolute value and in percentage, for both samples, is almost equally distributed among what I classified as positive and negative externalities. This fact makes it difficult to judge the overall impact of the externalities, and at the same time it offers the possibility to formulate a better credit policy that could try to maximize the positive externalities with respect to the negative ones, as we will see in the following section. For the careful reader it is maybe worthwhile to explain that the difference in amount of the excess of credit as show in table 4 and discussed in the main text, and the one classified as exogenous variables in the main text is due to the fact in the first case we use the cost declared by the single producers, while in the second case we use the average cost computed by Nitlapan. This difference also underlines the usually quite big difference between the cost computed by Nitlapan and the one actually declared by the producers. This effect is expected and explained due the reasons we discussed at beginning of this subsection. A last comment is important to contextualize the big standard deviations in table 4, in particular for the NGroup. The big standard deviations show the inhomogeneity of the investments inside the samples and they are partially motivated by the fact that the producers invest, with a relativity small amount of excess of credit, in between one and three activities. A better understanding of the dynamics originated by the average excess of credit can be obtained reading together table 4 and table 2. Even in presence of these big standard deviations I believe that the use of the average is justified, not to underline the representative behavior of the average producer, but to synthetically show and contextualize the aggregate flux of money in the various extra activities.

A similar question about the the various activities in which the producers invest could be also asked for the amount of money the successful producers receive with the Bio Premio. A summary of these data can be found in table 5 in the case of Matiguas<sup>17</sup>, where it clearly appears that even the Bio Premio is distributed among different uses following a logic of diversification (productive investments in the farm) and needs (family and repayment) of the producers. Moreover the Bio Premio sustain both positive and

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<sup>16</sup>These data are obtained from a subsample of the producers interviewed in Matiguas and NGroup: 20 contracts, and 19 contracts, respectively in Matiguas and NGroup, corresponding to the 80% and the 86% of the two sample. The remaining clients were disregarded due to incompleteness of the data.

<sup>17</sup>These data are obtained from a subsample of the producers interviewed in Matiguas: 22 contracts, corresponding to the 88% of the sample, and the 21,6% of the full portfolio Proyecto Cambio in Matiguas at the 31st May 2012. The remaining clients were disregarded, because I judged that the data collected were not sound enough.

negative environmental externalities.

Farm	OEnv	OA	PWT	Cattle	Family	Repayment
128 USD	22 USD	63 USD	13 USD	30 USD	25 USD	14 USD
76,6%	13,3%	37,5%	7,9%	17,9%	14,8%	8,6%

Table 5: Amount of Bio Premio invested in different activities in Matiguas: the average amount and in percentage of the Bio Premio. The farm investment is equal to the sum of OEnv plus OA plus PWT plus Cattle. Notation as in table 2.

#### 7.4.2 MF plus PES and Socio-Economic Inequalities

In the previous section we have seen how the average excess of credit induce environmentally friendly and environmentally damaging activities that are not controlled by the product and are externalities of the program that could have an important influence on the macroscopic structure associated to the biodiversity and reforestation process. However the data we have used are aggregate data that underline the main pattern but do not distinguish between different categories of producers. It is reasonable to believe that different producers would take advantage in different ways of the average excess of credit according to their various exogenous constraints and possibilities. Moreover as we have already stressed the phenomenon of over financing is an average phenomenon and there exist a large part of the producers that are actually under financed with respect of the capital required to realize the agreed activity. Understand if there is a systematic under financing of a specific category of producers or a systematic over financing of another category, and what is the average influence on the environment of the externalities for different categories of producers is of fundamental importance to clarify the interaction between the environment preservation and socio-economic inequalities.

Before starting to analyze some of the primary data I collected, it is maybe worth remarking that it could be reasonable to think that there could be a natural drift of opportunities towards richer producers. First of all it is a common fact that not everyone has the same abilities and possibilities to grab an economic opportunity and, as explained in section 5.1.1 and in section 5.6 it is often the case in the Nicaraguan context, both at national and regional (in Matiguas) level, that the richer producers more easily grab economic opportunities. Let us try to do a theoretical analysis of the potentiality of the Proyecto Cambio to benefit more one category of producers. All the actors of the program gain in proportion of the credit: 14% to the producers, 6% to FDL, 10% to Nitlapan; and not directly in proportion to the positive environmental impact of their investment. This could induce to think that all the actors have the incentive to ask for a bigger credit that would correspond to a bigger amount of subsidies for everyone. However there exists some constraints in the system. First of all the credit has a maximum amount of 10 000 USD, secondly the amount of credit a producer could receive from FDL is somehow proportional to its repayment capacity that is correlated to its socio-economic conditions,

moreover the area committed in the Proyecto Cambio is naturally constrained by the total area of the farm. This physical and credit structure constraints prevent the big and very big producers to enter in the Proyecto Cambio actives, because they would need a credit bigger than 10 000 USD, but at the same time they seem to induce a polarization of the product towards the not too poor rural producers that could support bigger credits. This potential polarization of the product could be though to be positive for the environment due to the natural belief that the bigger producers are difficult to influence and smaller producers are typically more costly to work with and they should have a smaller impact on the environment. Instead providing Proyecto Cambio to medium producers could have an aggregate positive impact on the environment, first of all for their higher potential impact in term of land and the smaller cost for FDL and Nitlapan to provide them credit and TA, moreover they could have positive influence on the other categories of producers. This logic is also in part support by the FLD policy that decided to offer the product mainly to producers already known and that has a good (long) credit history, thinking that these producers could have a better effect both in term of FDL publicity and a trickle down effect on other smaller, poor or worse performing producers.

However there are other cultural constraints in the system mainly coming from the production logic of the farmers. It is logical to believe that the rural producers do not want to radically change their production, if they already have a profitable production, as for example extensive cattle raising, being afraid that the new activity would not be as profitable as the previous one; moreover they do not want to compromise too much in an activity that they judge new and they are not completely sure that they could realize it in the due time and with the right criteria to receive the Bio Premio; on top of that the producers, trying to reduce the risk of their investment they naturally try to diversify their production, and invest their source of financial capital in different activities at the same time. The addition of these cultural constraints should bring us to think that the idea that the bigger producers, among the ones potentially eligible for the Proyecto Cambio, should have a bigger impact on the environment is not guaranteed, because the producers that already have a good production should logically try to maximize the amount of FDL credit and minimize the amount of compromised land and hence of environmental impact, while the producers that have a reduced production and of overall lower quality should try to grab the opportunity to improve their production, but they are highly constrained by the reduced amount of credit and land. In addition the land constraint of the smaller producers, even if it reduces the potentiality for big environmental investments it also naturally increases the intensity of the production, indirectly inducing an higher degree of reforestation. It is important to remark that there are at least other two constraints in the the system: the national context of post "No Pago" movement, that could induce the FDL to do not be too much strict in the amount of environmental investment required to the producers, but being more interested in keeping the good clients with an advantageous low interest rate product, naturally inducing in this way an higher excess of credit to the bigger producers; and the logic of the producers that do not want to have debts too big, being afraid that they could not be able to repay it.

Summarizing: even if the system could seem quite easy at a first look, it becomes

quickly complex and the global outcome is not clear. To reach a better understanding let us try to analyze some of the primary and secondary data to see what could be the global effect.

Figure 10 illustrates the relation between the area of the farm and the difference between the FDL credit and the Nitlapan expected value for the financed activity, while figure 11 show the relation between the area of the farm and the difference between FDL credit and the Nitlapan expected value for the agreed activity in proportion to the expected cost computed by Nitlapan. Both figures describe data coming from the portfolio Proyecto Cambio in Matiguas<sup>18</sup>

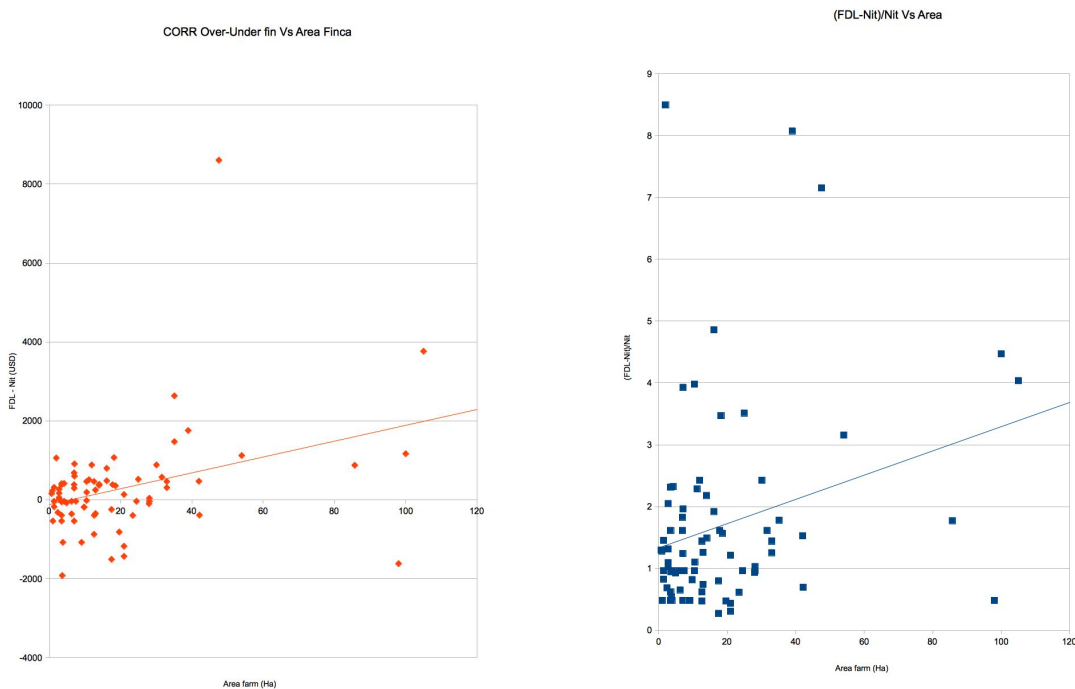


Figure 10: FDL credit - Nitlapan cost Vs area of the farm.

Figure 11: (FDL credit - Nitlapan cost)/Nitlapan cost Vs area of the farm.

These data show the presence of a tendency to over finance more the producers that own a bigger farm than the smaller one, and moreover that this over financing of the richer producers remain true also if computed in proportion of the expected cost of the environmental friendly investment, meaning that the over financing is not only related to the bigger activity but also directly to the bigger area of the farm<sup>19</sup>. The Pearson

<sup>18</sup>These data are obtained from a subsample of the Proyecto Cambio portfolio in Matiguas: 80 contracts, corresponding to the 78,4% of the full portfolio Proyecto Cambio in Matiguas at 31st May 2012. The remaining clients were disregarded, due to the absence of important information or soundness of the data.

<sup>19</sup>Here and in the following we are implicitly assuming that the land is a good proxy for the economic capital of the producers. I believe that it should be the case, even if there are counter examples, and

correlation between the difference of FDL credit and Nitlapan expected cost and the area of the farm is 0,35, while the one between the excess of credit in proportion to the committed investment and the area of the farm is 0,27, where the outsiders have been disregarded. Moreover the producers that have a bigger farm also seem to be the ones that have a more tendency to invest bigger portion of the excess of FDL credit, with respect to their actual declared cost to realize the Proyecto Cambio activities, in negative externalities: cattle and pasture without trees. Indeed from the data coming from my primary data collection in Matiguas<sup>20</sup> the value of the Pearson correlation between the portion of the excess of credit invested in negative externalities with respect to the area of the farm is: 0,69. On the other hand the producers that have a smaller property seems to be the ones that have bigger impact in term of the area influenced by the positive externalities. From the primary data I collected in Matiguas the Pearson correlation between the area of the farm and the area of the positive externalities is negative and equal to -0,26. These correlations are small but still present and they induce us to dig more inside this relation. Moreover they raise, for the first time in our discussion, the possibility of the presence of a trade-off between the financial and the environmental outcomes of the product: namely the financial logic would push towards bigger credit or richer producers, but this bigger credit could have an over all negative impact on the environment, even if they have bigger impact in term of the agreed environmentally friendly activities; while the smaller producers, that seems to have better externalities for the environment, are instead less financed probably due to their reduced repayment capacity. Let us try to investigate a bit more this subject introducing another parameter to distinguish among the different producers: namely their primary activity. From the data I collected in Rio Blanco and Matiguas, it is possible to classify the different producers according to their main activity: namely the activity they judge as the one that produces more income for their household. I tried to analyze the different kinds of externalities generated by the producers according to their main activity. I divided my set of data in four subsets: all the producers (33), that should give us an idea of the average dynamics, the producers with cattle as their main activity (10), the ones with coffee as their main activity (11), and the ones that declared to have more than one main activity, that I called diversified (7). The other categories do not contain enough producers to justify a statistical study. The figure 12 and 13 show how different categories of producers in Rio Blanco and Matiguas invest their excess of credit. The figures report the percentage of the producers that invested in environmentally friendly activities (figure 12) or in cattle (figure 13) according to their main activity: from left to right: all the sample, producers with cattle as their main activity, producers with coffee as their main activity, producers with a diversified

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that it is the easiest proxy to obtain and use. However a more careful analysis is required to link the livelihood strategies of the producers and the credit policy of FDL with the socio-economic status of the clients.

<sup>20</sup>These data are obtained from a subsample of my primary data in Matiguas: 14 contracts, corresponding to the 56% of the sample and the 13,7% of the full portfolio Proyecto Cambio in Matiguas at 31st May 2012. The remaining clients were disregarded, due to the absence of important information or soundness of the data.



production. It is easy to see that different producers behave in a quite different way: indeed, while the diversified producers invest in positive and negative externalities in a way quite similar to the average producers, the producers with main activity cattle of coffee act in opposite way. The producers with main activity cattle try to invest the excess of credit more in cattle (60% of the producers with cattle as their main activity, well above of the average: 42,2%) and less in activities classified by Proyecto Cambio as environmentally friendly activities (30% of the producers with cattle as their main activity, well below the average: 57,6%). On the opposite side the producers with coffee as their main activity invest more often their excess of credit in environmentally friendly activities (81,8% of the producers with coffee as their main activity, well above the average: 57,6%) and less in activities potentially damaging for the environment (18,2% of the producers with coffee as their main activity buy cattle with their excess of credit, well below of the average: 42,2%). To try to go deeply in the different behavior of the producers according

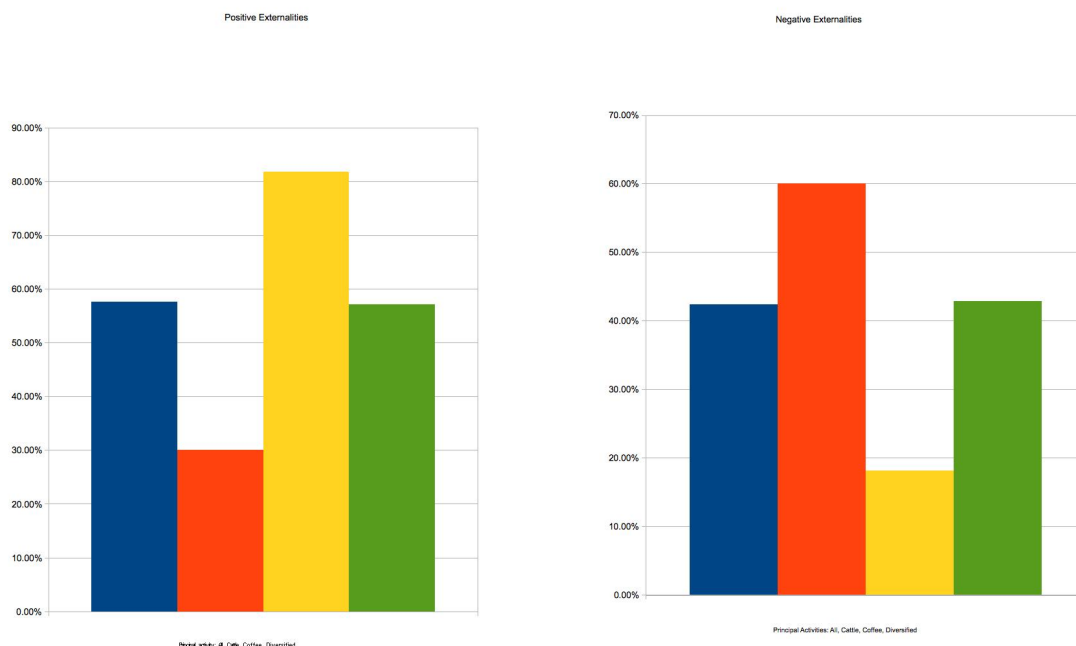


Figure 12: % of the producers investing in Positive externalities according to their main activity (Rio Blanco plus Matiguas): Average 57,6%, plus Matiguas): Average 42,4%, Cattle 60%, Cattle 30%, Coffee 81,8%, Diversified 57,1%. Figure 13: % of the producers investing in Negative externalities according to their main activity (Rio Blanco plus Matiguas): Average 42,4%, Cattle 60%, Coffee 18,2%, Diversified 42,9%.

to their socio-economic conditions let us focus our attention to some of the primary data I collected in Matiguas for the producers with main activity cattle or coffee. Table 6 report a summary of the investments of the excess of credit for these two different categories<sup>21</sup>

<sup>21</sup>These data are obtained from a subsample of my primary data in Matiguas: 5 contracts with main

in term of the average USD invested in positive or negative environmental externalities, and in term of the percentage of the the real excess of credit (namely the difference between FDL credit and the cost declared by the producers to realize the committed activities) invested in the various externalities. Moreover it is reported the average area of influence of the positive externalities. First of all it is important to observe that the producers with cattle as their main activity are also the ones that on average own the bigger surface of land: 42 Ha compared with the 13,1 Ha of the average farm area for the producers with coffee as the main activity; and the ones that invest the bigger amount of land in the Proyecto Cambio activities: 1,3 Ha compared to 0,8 Ha for the coffee producers. However the producers with coffee as their main activity committed a bigger percentage of their land in the Proyecto Cambio (7,7%) compared to the 3,2% of the producers with cattle as their main activity. In addition the average amount of financial capital coming from the FDL credit and flowing into positive externalities is bigger for the coffee producers both in absolute amount (383 USD) and in percentage of their actual excess of credit (75%) compared to the cattle producers: 254 USD and 29%; while the average amount of financial capital coming from FDL credit and flowing into negative externalities is bigger for the cattle producers both in absolute amount (700 USD) and in percentage of their actual excess of credit (63%) if compared to the coffee producers: 117 USD and 14%. In addition, quite surprisingly, the average amount of land influenced by the positive externalities is bigger for the coffee producers: 0,93 Ha, than the amount of land influenced by positive externalities for the cattle producers: 0,33 Ha. Using these anecdotal data one could be tempted to speculate about the global effectiveness of the product. Namely the average FDL credit for the producers with cattle as their main activity, in the sample retained for the analysis, is on average 1680 USD and their average excess of credit (with respect to the cost estimated by Nitlapan) is 411 USD, while the producers with main activity the coffee, in the sample retained for the analysis, receive an average credit of 1119 USD with an average excess of credit (with respect to the cost estimated by Nitlapan) of 257 USD. However, even if the area of influence of the Proyecto Cambio of the first ones is bigger: 1,3 Ha compared to 0,8 Ha, the global positive impact on the environment of the cattle producers is 1,6 Ha compared to the 1,7 Ha of the coffee producers. Moreover the cost in term of the subsidy represented by the Bio Premio to obtain this overall positive environmental impact (Bio Premio over the committed area plus the area with positive externalities) is 170 USD per Ha for the cattle producers, while it is only 94 USD per Ha for the coffee producers. Summarizing, it seems that there are certain categories of producers, that even if less profitable for the MFI, they have bigger positive impacts on the environment and are less costly in term of subsidies, but they are not rewarded by the MF credit policy, that instead has the tendency to reward those producers that are more profitable, but that, in the sample just described, are also the ones that naturally generate the bigger amount of negative externalities for the

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activity cattle, corresponding to the 83% of the producers with cattle as their main activity in my sample; 6 contract with coffee as main activity, corresponding to the 55% of the producers in the sample with coffee as their main activity. The remaining clients were disregarded, due to the absence of important information or soundness of the data.

environment and are more costly in term of environmental subsidies. It is important to underline that this conclusion is obtained from the analysis of a small sample and a more in-depth analysis would be required to better understand this phenomenon. However this trend seems to nicely agree with the more general picture provided by (Polverosa, 2012) and summarized in section 5.6 about the dynamics in Matiguas: the richer are more easily grabbing the market opportunities and they are the ones that are more likely to be dangerous for the environment; a similar dynamics seems also to act at the national scale, as explained in (Nitlapan, 2011) and summarized in section 5.1.1.

<b>PActivity</b>	Afarm	AInv	AI/AF	Pos Ext	Neg Ext	APE
Cattle	42 Ha	1,3 Ha	3,2%	254 USD (29%)	700 USD (63%)	0,33 Ha
Coffee	13,1 Ha	0,8 Ha	7,7%	383 USD (75%)	117 USD (14%)	0,93 Ha

Table 6: Externalities for producers in Matiguas with principal activity cattle or coffee. Afarm: surface of the farm, AInv: surface of the committed area, AI/AF: percentage of the committed area over the total surface of the farm, Pos Ext and Neg Ext: positive externalities and negative externalities in term of amount of money invested and in percentage with respect to the amount of excess of credit, APE: surface influenced with the positive externalities.

## 7.5 Governance of the Program

In this subsection we want to briefly discuss the "governance" of the program. By this we mean the potential synergies and trade-off among the aims of the various actors implementing the program, and the analysis of the mechanisms to assure that all the actors in the program work for the same task: environmental preservation. The analysis will be quite fast and incomplete, its main objective is to study a bit the different meanings of the program for the various actors, their potential conflicts, and the presence or absence of some of the mechanisms that could or should mitigate the different interests.

Proyecto Cambio is a quite complicated program in which various actors play different roles. It is reasonable to believe that the presence of synergies among the different actors would be an important requirement for the potential success of the program itself. Here we try to understand some of the potential conflicts that could induce or support some of the problems we have seen about the additionally, sustainability and more importantly the generations of externalities. From the interviews done to the Nitlapan and FDL staff members in Managua and in the field, some of the representatives of the BCIE, and the clients and rural producers, I obtain the the following pattern of main motivations to engage in the program:

- Producers: development and diversification, missing of natural resources, mainly wood an water, for the family livelihood;
- Nitlapan: development of rural communities and the protection of the environment;

- FDL: keep the good clients in a moment of crisis, reward the producers that had a good history of environmentally friendly activities, opportunity to stay in the rural sector that became a dangerous part of the FDL portfolio, environmental preservation as a responsibility of a MFI that want provide services to the rural sector;
- BCIE: financial inclusion, that should go together with the financing of environmentally friendly activities;

First of all it is important to observe that, among the main motivations of the various actors, the preservation of the environment as such does not appear as a direct objective, but it is mainly related to other motivations, such as the development of rural communities, the financial inclusion, the scarcity of natural resources. This is a first sign that the environmental mission, even if present in the background of the motivations of all the actors, it could be not the first aim to pursue if other more interesting particular objectives appear. However among the different actors there are some similar motivations, such as the rural development, over which it could be possible to implement a fruitful cooperation if it is pursued with an environmentally friendly strategy. Nevertheless there are also motivations potentially in conflict among each others, such as the diversification strategy of the producers with the environmental preservation of Nitlapan, or the financial inclusion of BCIE and the idea of FDL to keep or reward good clients, or the potential trade-off between development and environmental preservation present in almost all the actors. The main question is if there are enough mechanisms to prevent that the potential different meanings of the program for the various actors could create conflicts and prevent the synergies among their operations, and moreover if there exist analogous mechanisms to guarantee that the similar intentions of the different actors conspire to fulfill the main mission of the program: reforestation and biodiversity preservation.

The complete analysis of these mechanisms is outside the goal of this section. Here we just want to raise some of the potential weak points among the synergies of the various actors as it appear discussing with some of their representatives. The first drawback at the organizational level seems to be the absence of frequent meetings between Nitlapan and FDL, the two main institutions that are at the core of the operations of the product: Nitlapan for the empowerment of the producers and the protection of the environment, while FDL for the financial capital. Namely both institutions do what they are supposed to do in the program but they do not directly look for synergies between them that could increase the impact of their actions. However it seems that there is right now a plan for more regular meetings starting in the near future. At the operational level the first drawbacks are: the absence of Nitlapan in the credit committee when FDL decide to grant the credit to the producers, and the fact that the dossier used by FDL to evaluate the potential clients is the standard dossier, used for every other credit of FDL, and does not contain specific environmental criteria or the information regarding the actual cost of the activity the producer is supposed to realize. It is reasonable to believe that the absence of these mechanisms could imply that the market logic prevails over the environmental one, and induces the pattern of externalities we observed in the previous section. Indeed FDL

is the one that actually decides to whom give the credit and which amount, and if there are not explicit environmental logic in the credit policy, it is reasonable to believe that FDL would follow a market logic, even more in this period post microfinance crisis. The absence of a specific environmental policy, even in a such a well structured environmental program such as the Proyecto Cambio, seems to me one of the main causes that could undermine the global effectiveness of the program toward the environmental good. Indeed the absence of Nitlapan at the moment of the credit discussion or of a specific dossier to select the clients, the credit amount and the financed activities, not just in term of a financial criteria, but also with the aim of maximizing the environmental benefits, could induce the MFI to try to maximize the financial impact of the product even in the complete respect of the well defined environmental criteria of Proyecto Cambio. It seems however that, after the data of the present study were released and discussed with some of the actors, FDL is considering the option to include environmental criteria, such as the cost of the environmentally friendly activity computed by Nitlapan, and some additionality criteria for the producers that receive more than one time the Proyecto Cambio credit, directly inside the dossiers of the clients that are discussed in the credit committee.

## **7.6 Territorial Approach and Institutionalization**

I believe that the role of market products, such as GMF or PES, or the combination of the two, such as the Proyecto Cambio, analyzed in this thesis, is to underline the potentiality and or the effectiveness of some specific combinations of financial tools, subsidies, and knowledge transfer, to preserve the environment. These programs should operate at the border between the opportunities that as such are not profitable for the single producer's short term market horizon, and for this reason are not naturally chosen, and the potential new profitable markets at the medium and long term that could be reached by a coordinate investment among the various economic actors, and incentivize their coordinate action to cross the frontier. Once the product shows its positive outcomes the second step should be a territorial expansion of the project: namely the incentive to create positive environmental synergies among the various actors: cooperatives, NGOs, public institutions, etc. and induce a cooperation among them to reach the common objective: the environmental preservation. The third step should be the institutionalization of the program to expand it at the regional or national level. It is interesting to observe that the territorial approach is at the core of the Plan Estratégico 2012-2016 of Nitlapan (Nitlapan, 2011), and a similar logic for the evolution of the Proyecto Cambio can be found in (Mendoza et al., 2011).

In this section we want to proceed with a very short and partial analysis of some of the potentialities for these two steps for the Proyecto Cambio at the regional level in the area of Rio Blanco and Matiguas. The analysis is based on the interviews done in the municipalities of Rio Blanco and Matiguas, the interviews done in the cacao cooperative of Matiguas, and the ones done to the clients of FDL in Matiguas that didn't receive a credit inside the Proyecto Cambio, and to some rural producers in the Matiguas region that are not clients of FDL. Both in Rio Blanco and Matiguas the local municipalities

have the natural incentive to take care of the environment mainly in relation with the preservation of the water sources, coming in both cases from a mountain belonging to a natural reserve: el Cerro Musún and la Sierra Quirragua, that threaten to dry up in case of excessive deforestation. Moreover they seem to be interested in activities of other actors that try to preserve the environment and they seem to value the particular structure of the Proyecto Cambio. However even if they have some knowledge of the past RISEMP program, they do not know the present Proyecto Cambio, that is active in their area since three years. As a witness of the environmental goodwill the municipality of Rio Blanco is providing a public vivarium in which the rural producers could buy order of 30 000 trees per year at the reasonable price of 0,2 USD each, while instead the municipality of Matiguas, even if it claims to be interested in the environmental preservation, it does not have any active environmental program, due to financial constraints in its budget.

Another interesting actors that could help to facilitate the integration in the local society of the operations of the Proyecto Cambio are the cooperatives that, due to their own nature, have already a well developed network of rural producers. In the Matiguas the cacao producers cooperative is a very interesting actor to coordinate with: it has more than 400 members, it is operating in some of the same locations of operation of Proyecto Cambio, it stimulates the production of organic cacao, with techniques similar of the ones of Nitlapan or FDL, and it has a well developed environmental sensitivity. In particular, as explicitly declared during the interviews, it could be interested in participating in recycling projects, that seems to be an interesting topic also for future FDL investment. However the cacao cooperative in Matiguas is not yet active in any operation of Proyecto Cambio.

To have a very anecdotal proxy of the possibility to incorporate in environmentally friendly activities also producers that are not part of the Proyecto Cambio, it is interesting to investigate directly if clients of FDL that are not part of Proyecto Cambio, or rural producers in the same area of operation of Proyecto Cambio but that are not clients of FDL, know about the the Proyecto Cambio and or are sensitive about the environmental problems. From the 5 interviews to FDL clients that are not part of the Proyecto Cambio in the FDL branch in Matiguas, and the 6 interviews to rural producers that are not FDL clients in the region of Sitio Historico, Matiguas, it comes out that, even if the producers with Proyecto Cambio declare to communicate their experience to neighborhoods, they do not know the existence of Proyecto Cambio. However on average they recognize the existence of environmental problems in relation with: cutting of trees, extensive cattle activities, water sources, missing of woods; and they have quite well developed ideas about possible solutions that goes from the creation of a specific line of financing for environmentally friendly activities such as coffee and cacao plantation with shadow trees, or the prevention of the pollution of water coming from the preparation of the coffee, to the provision of TA, or from the important role of the institution and regulation, to the direct sensitization and the role of education.

Summarizing it seems to me that, due to the necessity of the municipalities to preserve the water sources, the presence of cooperatives working with network of producers involved in quite environmental friendly activities, and the sensitiveness of producers to engage in

environmentally friendly activities if there is the opportunity, there could be the ground for the territorial expansion of the program and a partial institutionalization. However right now there are no explicit projects in this direction, and understanding how to proceed seems to be the main problem.

However it seems reasonable that the articulation of different actors and the creation of new institutional dynamics, as proposed in the territorial aim of the Plan Estratégico 2012-2016 of Nítlapan (Nítlapan, 2011), should be associated to a redirection of the dominant macroscopic pathways of development that could assure the effectiveness of this strategy on the environment preservation<sup>22</sup>. Going back to the picture I proposed in section 4: the global system as composed by a microscopic part: the direct area of influence of Proyecto Cambio; and a macroscopic multidimensional one; it is natural to wonder about the resilience and the global impact of positive long term environmentally friendly strategies that do not directly touch the socio-cultural background dimension of the rural producers and their livelihood strategies contained in the macroscopic part of the system. Indeed, as illustrated in section 5.1.1 and in section 5.6 the dominant development pathways, both at the national and at the regional level in Matiguas, seem to be driven by the bigger producers, that taking advantage of the market opportunities, exclude the small and medium size producers and force them in the lowest part of the value chain or to migrate further towards the agricultural frontier. This dynamics induces an overall damage of the environment, represented for example by the constant decrease of the forest area in the last 20 years, as explained in section 5.1.2. The redirection of these dominant pathways, is of fundamental importance, and should imply the need to transcend the individual incentive strategy of PES, as explained in 3, and create common incentives towards an overall more rational use of the land.

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<sup>22</sup>I thanks Johan Bastiaensen for raising this aspect of the territorial approach, and related discussions.

## 8 Conclusion

In this thesis I analyzed some of the aspects of the combination MF plus PES using the case study of the Proyecto Cambio in Nicaragua. The study was focused on the effectiveness of the program on the environment preservation and its correlation with socio-economic inequalities. The investigation proceeded through the study of the existing literature, the use of secondary data and the collection and analysis of primary data. The analysis mainly articulate in four steps: additionality, sustainability, externalities, and governance of the program.

The main conclusion of the thesis is that MF plus PES has good potentialities in term of rural development and environmental preservation, but to be really effective they should undergo an evolution path that could bring them from being a good microfinancial product to be a micro financial product for the environment. By this I mean, along the line of ecological economics prospective, that MF plus PES should be integrated into a clear set of development strategies that try to promote at once the livelihood of rural producers and the preservation of the environment. The results presented in this thesis indeed clearly show that, even a such a well structured and complex program as Proyecto Cambio, perfectly working from the financial level point of view, could have an overall doubtful impact on the environment and could promote practices that worsen the environmental degradation and sustain or strengthen the socio-economic inequalities.

In the case of Proyecto Cambio, I believe the the main causes for this result are the absence of a clear environmental policy of FDL and the not enough developed promotion of synergies among the various actors in the program. This conclusion is sustained by the data analysis and extensive discussions with staff members of FDL an Nitlapan, after the release of the data contained in this thesis. The absence of a clear environmental policy reasonably induce the promoters of the program to use the usual credit policy once they face a trade-off between financial and environmental impacts. The absence of a well structured synergies among the various actors reduce the potentiality of the program that could instead point toward the enhancement of the effect of the product from the single financed activity to the macroscopic scale of the environment and biodiversity. These two major drawbacks seem to promote unequal opportunities for the different categories of producers. In particular the result is to reward the produces with bigger capital that, even if they are more profitable they seem also to be the ones potentially more dangerous for the environment, and do not focus on that smaller producers that, even if less profitable, seem to have a bigger impact on the environment and being less costly in term of subsidies. This patter smoothly match with the main trends at the national and regional level, and it is supported by the existing literature, presented in section 3, that criticize some aspects of the market ways to protect the environment.

It should be clear that we are at the crossing between two paths. Proyecto Cambio is perfectly working according to the roles and standards established in the program, but it seems to have an overall doubtful impact on the environment and socio-economic inequalities. It is the moment to take some policy decisions: being happy about the positive results obtained inside the program and stay there, or decide to take the path of



environmental preservation and reduction of socio-economic inequalities. It is important to underline that both choices could be legitimate, but that an environmental program that do not try to transcend the individual-farm level incentive strategies and try to redirect the dominant development pathways of environment damage and strength of socio-economic inequalities, will be reasonably ineffective in the medium and long term. Moreover the development choice could also be the cheapest one at the global level in medium-long term. This novel path is somehow forced to face with the complexity of the human-environment system and would require careful analysis, frequent discussions and evaluations, and policy decisions.

Moreover it is important to underline that my discussion of the potential drawbacks of the Proyecto Cambio in Nicaragua does not imply in any way a negative or positive judgment on the implementation of the program. I believe that the natural path of every program is to first be formulated, using the previous experience and knowledge, secondly be implemented, and then be assessed, and finally be reformulated according to the lessons learned in the evaluation. The potential critics or appreciations would be for the use that is done of the evaluation results. This thesis has the humble pretension to add a small brick to this evaluation process.

## 8.1 Policy Advises

In this subsection I would like to give the summary of some of the potential strategies to improve the implementation of Proyecto Cambio as they emerge in discussions with members of Nitlapan and FDL, and during the presentation of some of the results of this study during seminars in Nitlapan and FDL.

The most natural way to classify the possible policy advises is: short term and long term. The first ones are thought as something that could be almost immediately implemented, while the second ones would require careful studies and discussions and some of them could not be implemented directly inside the Proyecto Cambio, due to the rigidity of the program, but could be part of the strategies for future green products. Indeed it is important to take into consideration that both Nitlapan and FDL are in the process to try to expand the Proyecto Cambio, and to try to formulate its follow up, due to the end of Proyecto Cambio in 2014.

The short term improvements are: the introduction in the dossiers of the clients discussed in the credit committee of specific information concerning the potential environmental impacts of the rural producers and the cost of the agreed investment as estimated by Nitlapan. The participation of staff members of Nitlapan during the credit committee, even if it could seem to be the good mechanism to balance the different objectives, and it was used in the first part of the program, it is judged by Nitlapan and FDL as too costly at the organization level. Another proposal could be to establish regular meeting between Nitlapan and FDL to discuss about the progresses, problems and strategies of the program.

The long term improvements present a clear trade off between simplicity and effectiveness: namely between the idea to regulate as much as possible the program to try

to control all its dynamics, and the strategy to leave the program quite free and simple and just introduce some additional elements that could stimulate certain actions without force them. Due to the apparent low additionality of the program it seems reasonable to try to introduce some mechanisms that should try to reward economic or environmental additionalities with different characteristic of the credit for contracts with different degree of additionality, or different amount of subsidies or TA. Moreover it seems to me that a clear policy to stimulate a different investment for producers with more than one credit in the Proyecto Cambio is required. The presence of the kind of not controlled activities, directly or indirectly financed by the program, named externalities in the thesis, seems to me to require the establishment of a clear environmental credit policy that should try to maximize the positive externalities and minimize the negative ones. The presence of natural externalities is not just a problem of the program, but it is also a good opportunity. Indeed the producers naturally invest in both positive and negative externalities and they do it in different ways according to their socio-economic status and production. Nitlapan and FDL should try to take advantage of their knowledge about the different livelihood strategies for the various groups of producers to maximize the global environmental impact. A possibility could be to have different credit policies for the different kinds of producers: "ganadero", diversified, small. These three categories have different exogenous variables, in term of culture and physical, human and financial capital, that influence their livelihood strategies: extensive production, diversification of the production, intensification of the production. For the first ones it seems reasonable to propose to finance more SSP activities, due to the big amount of positive externalities that such strategy could generate. For the second one it seems reasonable to finance more added value environmental friendly products, such as the filter for the coffee production, that should stimulate the producers to invest the excess of credit more in the associated economic activities, for example coffee production, and less in potentially dangerous activities. For the last category of producer it seems that an excess of credit with respect to the required amount to realize the committed activity could have an over all positive effect, due to the natural intensification strategy induce by the land constraints of this category of producers. It could be also interesting to value the possibility to provide two credits at the same time: one with Proyecto Cambio, tailored on the expected cost for the agreed investment, and another one with the normal line of credit of FDL for the other activities that the producer would like to invest in. This technique could allow a better allocation of the environmental subsidies and moreover be an incentive for the producers to invest more in environmental friendly activities, due to the better condition of the credit with Proyecto Cambio if compared to other credits of FDL. I would be however against the strategy to provide only one credit with Proyecto Cambio of exactly the required amount to invest in the decided environmental friendly activity, because I believe that it could constrain too much the producers and in the worst scenario compromise their development path. Moreover it could induce the producers to decline the product proposed by Proyecto Cambio, in favor of the more costly, but less constrained, normal credit line of

FDL, as seems that already happened in very isolated cases<sup>23</sup>. Another strategy could be to reward the producer not in proportion to the amount of credit received but to the actual environmental positive changes it provides, along the line of the RISEMP or the Alboan program, both implemented also by Nitlapan. Before implementing this apparently very reasonable policy it would be however important to do a careful study about the cost-effectiveness of the proposal.

## 8.2 Future Research Directions

I believe that the results of this thesis raise some important points concerning the programs that try to mix PES and MF with the aims of positive environmental and development outcomes, and in particular for the Proyecto Cambio in Nicaragua. However this study has various limitations that should be taken into account when we try to interpret its results. Due to time and resources constraints, I was forced to analyze a couple of specific areas, that, even if they allow to obtain a reasonable common dynamics that nicely fits with the secondary data of the full portfolio of Proyecto Cambio of FDL, the national trends and the theoretical literature, they should be seen as questions raising and not as a definitive results about the dynamics of Proyecto Cambio in Nicaragua, even less at the Central America level or in the general discussion of PES plus MF. In the best scenario they could be used to start discussing and acting to improve the Proyecto Cambio program inside the FDL and Nitlapan, and set part of the ground for future projects, as we began to do in the previous subsection. It would be nice to see if the methodology I use in this study could be extended and used to build up a theoretical framework to analyze or formulate similar projects in the central american context or it could be useful for some of the south american countries that seems they would like to establish similar projects, or elsewhere. Due to these limitations I believe that a more sound evaluation would be required, both at the Nicaraguan and at the Central American level, in particular in relation to the global environmental impacts of this kind of programs and their correlation with socio-economic inequalities. Moreover the main message of this thesis is that the complexity of the human-environmental system force us to do not stop at the market or financial analysis, but require a more complete analysis that incorporate socio-cultural and institutional aspects. An analysis along this line of other similar programs before their implementation and after the first period of operations would be required to really try to positively impact the environment preservation and the rural development.

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## References

- Allet, M. (2011). *Measuring the environmental performance of microfinance*. CEB Working Paper N11/045, Bruxelles, Centre Emile Berheim, 2011.
- Allet, M. (2012). *Microfinance & the Environmental Bottom Line*. Development and Ethics in Microfinance course: Lecture 8. EMP 2011-2012.
- Ambrosio-Albalá, M. and Bastiaensen, J. (2010). *The new territorial paradigm of rural development: Theoretical foundations from systems and institutional theories*. DISCUSSION PAPER / 2010.02.
- Armendáriz, B. and Labie, M. (2011). *The Handbook of Microfinance*. World Scientific.
- AR4, (2007). *Climate Change 2007*. Fourth Assessment Report (AR4), IPCC.
- Bastiaensen, J. (2012). *Transformative microfinance: Finance Plus in a Value Chain Perspective*. Introduction to Rural Development 2nd semester: Lecture 2. EMP 2011-2012.
- Bastiaensen J. and Marchetti, P. (2011). *Rural Microfinance & Agricultural Value Chains: Strategies and Perspectives of the Fondo de Desarrollo Local in Nicaragua*. International Handbook of Microfinance (2011) Ed. B. de Armendáriz and M. Labie. Singapore, World Scientific Press, pp. 461-500.
- Bastiaensen, J. and Marchetti, P. (2011). *Crisis in Nicaraguan Microfinance: Between the Scylla of Business for Profit and the Charybdis of Clientelism*. IOB Working Paper / 2011.04 - 5.
- Bauchet, J., Marshall, C., Starita, L., Thomas, J. and Yalouris, A., (2011). *Latest Findings from Randomized Evaluations of Microfinance*. Reports by CGAP and Its Partners, No. 2, December 2011.
- Bédécarrats, F., Bastiaensen, J., Doligez, F. (2012). *Co-optation, Cooperation or Competition? Microfinance and the new left in Bolivia, Ecuador and Nicaragua*. Third World Quarterly, 33:1,143-160.
- Bowles, S. (2008). *Policies designed for self-interested citizens may undermine "the moral sentiments": evidence from economic experiments*. Science 320: 1605-1609.
- CAMBio I. *Estrategia para el apoyo tecnico-empresarial a micro, pequenas y*

*medianas empresa e instituciones financieras amigables con la biodiversidad, MIPYME-AB E IFI-AB. Mercados Centroamericanos para la Biodiversidad- CAMBio.*

CAMBio II. *Priorizando la conservación de la biodiversidad y sus usos sustentables en el desarrollo de Micro, Pequeñas y Medianas Empresas y su Financiamiento.* Proyecto de Mercados Centroamericanos para la Biodiversidad (CAMBio). Prioject Presentation.

CC, (2009). *Climate Change 2009, Science Compendium.* UNEP.

Chisholm, R.A. (2010). *Trade-offs between ecosystem services: Water and carbon in a biodiversity hotspot.* Ecological Economics, 69: 1973-1987.

Collins, D., Morduch, J., Rutherford, S., Ruthven, O. (2009). *Portfolios of the Poor. How the Worlds Poor Live on 2 USD a Day.* Princeton University Press.

Cranford, M. and Mourato, S. (2011). *Community conservation and a two-stage approach to payments for ecosystem services.* Ecological Economics, v.71, pp.89-98.

Engel, S., Pagiola, S. and Wunder, S. (2008). *Designing Payments for Environmental Services in Theory and Practice - An Overview of the Issues.* Ecological Economics 65 (2008): 663-674.

FAO, (2010). *Global Forest Resources Assessment 2010.* Main Report, Rome: FAO.

Farber, S., Costanza, R., and Wilson, M. (2002). *Economic and Ecological Concepts for Valuing Ecosystem Services.* Ecological Economics 41 (2002): 375-392.

FDL, (2011). *Memoria Anual 2011.* FDL, UCA, Managua.

Ferraro, P., J. and Simpson, R., D. (2002). *The Cost-Effectiveness of Conservation Payments.* Land Economics, 2002, vol. 78, issue 3, pages 339-353.

GREENMF, GreenMicrofinance, Center for Green Excellence. [www.greenmicrofinance.org](http://www.greenmicrofinance.org).

Guérin, I., Morvant-Roux, S., Roesch, M., Moisseron, J., Ould-Ahmed, P. (2011). *Analyse des déterminants de la demande de services financiers dans le Maroc rural.* Série Analyses d'impact Ex Post. Division Evaluation et capitalisation, AFD.

- Hall, J. et al. (2008). *The missing bottom line: microfinance and the environment*. written for the Social Performance MAP, 2008.
- Harris, J., Goodwin, N. (2009). *Twenty-First Century Macroeconomics: Responding to the Climate Challenge*. Edward Elgar Publishing, 2009.
- Hermes, N. (2011). *Microfinance Plus*. Microfinance products course: Lecture 4. EMP 2011-2012.
- Informe I, (2010). *Fortalecimiento de capacidades técnicas para micro, pequeñas y medianas empresas nicaraguenses atendidas por fondo de desarrollo local en iniciativas productivas amigables con la biodiversidad: Comportamiento del primer contrato de 63 productores*. Nitlapan 2010.
- Informe II, (2010). *Fortalecimiento de capacidades técnicas para micro, pequeñas y medianas empresas nicaraguenses atendidas por fondo de desarrollo local en iniciativas productivas amigables con la biodiversidad: Comportamiento final del segundo contrato de 135 productores y productoras*. Nitlapan, 2010.
- Informe III, (2011). *Fortalecimiento de capacidades técnicas para micro, pequeñas y medianas empresas nicaraguenses atendidas por fondo de desarrollo local en iniciativas productivas amigables con la biodiversidad: Comportamiento del tercer contrato de 437 productores y productoras*. Nitlapan, 2011.
- Karsenty, A. (2007). *Questioning rent for development swaps: new market-based instruments for biodiversity acquisition and the land-use issue in tropical countries*. International Forestry Review 9(1): 503-513.
- Kosoy, N., Corbera, E. (2010). *Payments for ecosystem services as commodity fetishism*. Ecological Economics 69 (2010) 1228-1236.
- Lipper, L., Sakuyama, T., Stringer, R., Zilberman D. (2008). *Payment for Environmental Services in Agricultural Landscapes Economic Policies and Poverty Reduction in Developing Countries*. Springer.
- Marchetti, P. (2012). *Management Responsiveness to changing context of microfinance*. Introduction to Rural Development lectures, EMP, 2011-2012.
- Martin, A., Blowers, A. and Boersema, J. (2008). *Paying for environmental services: can we afford to lose a cultural basis for conservation?*. Environmental Sciences 5(1): 1-5.
- Martinez-Alier, J. (2004). *The Environmentalism of the Poor: A Study of*

*Ecological Conflicts and Valuation*. New Delhi: Oxford University Press.

Martinez-Alier, J. (2002). *The Environmentalism of the Poor*. A report for UNRISD for the WSSD. University of Witwatersrand, 30 August 2002.

McAfee, K. (1999) *Selling Nature to Save it? Biodiversity and the Rise of Green Developmentalism*. Environment and Planning D: Society and Space April 1999 17: 2: 133 -154.

McAfee, K. (2012). *Nature in the Market-World: Ecosystem services and inequality*. Development (2012) 55(1), 25-33.

MCB, Mercados Centroamericanos para la Biodiversidad, CAMBio. [www.proyectocambio.org](http://www.proyectocambio.org).

MEA, (2005). *Ecosystems and Human Well-being: Current State and Trends*. Island Press, Washington, DC.

Mendoza, R., V., Dávila, O., Fonseca, F., Cheaz, J., (2011)..*Modelo de Adaptación al Cambio Climático a través de la Reconversión Productiva y transformación territorial. Proyecto CAMBIO en Nicaragua*.

MixM, Mix Market. [www.mixmarket.org](http://www.mixmarket.org).

Morduch, J. (1999). *The Microfinance Promise*. Journal of Economic Literature, Vol XXXVII (December 1999), pp. 1569-1614.

Munoz, M., C. and Christen R., P. (2004). *Microfinance as a tool to protect biodiversity hot-spots*. Washington D.C: CGAP, 2004.

Muradian, R., Corbera, E., Pascual, U., Kosoy, N., May, P., H. (2010). *Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services*. Ecological Economics 69 (2010) 1202-1208.

Nitlapan, (2011). *Plan Estratégico 2012-2016*. Nitlapan, UCA, Managua.

NitlapanW. [www.nitlapan.org.ni/site/es/](http://www.nitlapan.org.ni/site/es/).

Norgaard, R., B. (2010). *Ecosystem services: From eye-opening metaphor to complexity blinder*. Ecological Economics 69 (2010): 1219-1227.

Paavola, J. and Adger, W., N. (2005). *Institutional ecological economics*. Ecological Economics 53 (2005): 353-368.

- Patterson, T., M. and Coelho, D., L. (2009). *Ecosystem services: Foundations, opportunities, and challenges for the forest products sector*. Forest Ecology and Management 257 (2009): 1637-1646.
- Pérez, F. (2011). *Nicaragua: Without structural changes there'll be no sustainable reduction of rural poverty*. Working Paper series #2. RCASAE, UNAN-Leon, 17 p.
- Polverosa, J., C. (2012). PhD thesis, unpublished manuscripts.
- Ramírez Roustán, E. and Dávila Tercero, O. (2010). *Una esfuerzo mas en el fomento de sistemas agropecuarios amigables con el medio ambiente mediante crédito y asistencia técnica*. Talk in Panamá, Octubre 2010.
- Rippey, P. (2009). *Microfinance and climate change: threats and opportunities*. Focus Note No.53. Washington D.C.: CGAP, 2009.
- Sen, A. (1999). *Development as freedom*. Oxford: Oxford University Press.
- SPCAMBio. *Financiando inversiones amigables con la biodiversidad*. D.-Sector Pecuario. Proyecto Mercados Centroamericanos para la Biodiversidad: CAMBio.
- Stern, N. (2006). *The Economics of Climate Change, The Stern Review*. Cambridge.
- Tacconi, L. (2011). *Redefining payments for environmental services*. Ecological Economics 73 (2012) 29-36.
- Van Hecken, G. (2011). *Payments for environmental services and governance of natural resources for rural communities: Beyond the market-based model - An institutional approach. Case studies from Nicaragua*. Doctoral dissertation.
- Van Hecken, G. and Bastiaensen, J. (2009). *The Potential and Limitations of Markets and Payments for Ecosystem Services in Agricultural Landscape Restoration. Critical Reflections Inspired by an Assessment of the RISEMP Program in Matiguas-Rio Blanco, Nicaragua*, IOB Discussion Paper 2009-02.
- Van Hecken, G. and Bastiaensen, J. (2010), *Payments for Ecosystem Services in Nicaragua: Do Market-based Approaches Work?*. Development and Change 41(3): 421-444, 2010.
- Vargas, E., Ramírez, L. and Vallejo, M. (2011). *Evaluacion de Medio Termino, CAMBio, Informe Final*. Unidad de Coordinación del Proyecto CAMBio,



PNUD, 2011.

Vatn, A. (2005). *Rationality, institutions and environmental policy*. Ecological Economics, 55: 203-217.

Vatn, A. (2010). *An institutional analysis of payments for environmental services*. Ecological Economics, 69: 1245-1252.

Wade, R. (2002). *Globalization, Poverty and Income Distribution: Does the Liberal Argument Hold?*. Working Paper Series, Destin, LSE No. 02-33.

WDR, World Development Report (2006). *Equity and Development*. The World Bank.

World Bank (2008). *Institutional Pathways to Equity: Addressing Inequality Traps*. Bebbington, Dani, Haan, Walton.

Wunder, S. (2005). *Payments for environmental services: some nuts and bolts*. CIFOR, Occasional Paper No.42.