The modalities of REDD+ to encourage a sustainable transition of the small farmers in São Felix do Xingu (Pará, Brésil) : Towards a consideration of the actors' diversity

C. Schneider[1], E. Coudel[2], P. Sablayrolles[3], P. Clavier[4], S. Oliveira[4]

[1] Paris School of International Affairs, Institut des Études Politiques de Paris, 75007 Paris.
[2] CIRAD, UR Green, 34398 Montpellier, France
CIRAD, Embrapa Amazônia Oriental, Belem - PA, Brazil
[3] Gret, 94736 Nogent-Sur-Marne, France
[4] ADAFAX, São Felix do Xingu - PA, Brazil

Abstract. Although the Brazilian Federal regulation approach against deforestation has been effective with large landowners, it has little touched smallholders and may have aggravated their poverty conditions. In this context, REDD+ is seen by many institutions as a useful tool to promote conservation by small farmers, as it could encourage a transition towards alternatives livelihoods, which would reduce deforestation. In the context of a REDD+ pilot project in São Felix do Xingu, we aimed at analysing the perceptions of deforestation by small farmers and what would bring them to stop. We concluded that an investment-based scheme might be more effective than a use-restricting payment, given that support in the form of technical assistance is essential for most of them. More specifically three groups are identified: the environmentalists, the innovators and the objectors. They each have very different needs to reduce deforestation, questioning the relevance of one-fits-it-all solutions even for an investment scheme. A REDD+ project would have to adapt to this diversity by offering various forms of support. This has implications both for the equity within a REDD+ project and the control of conditionality.

1 Introduction

While the deforestation rate in Brazil declined by 84% between 2004 and 2012, in terms of GHG emissions due to land-use change Brazil is still second after Indonesia. In 2004 Brazil started taking a series of command-and-control measures tor reduce deforestation, following a top-down approach. This approach was largely successful in tackling large farmers, but only marginally affected the behaviour of small farmers, and often aggravated their poverty conditions (Assunção et al. 2013).

In the face of a dramatic lack of technical and financial means but also of environmental awareness of small farmers, there is a need to incentivize them economically to this transition. Reducing Emissions from Deforestation and Degradation (REDD+) is a programme, which is believed to play this role. It is based on the assumption that developing countries have an opportunity cost when they decide to preserve their forest instead of converting it towards other land uses. As in Payments for Environmental Services (PES), which aim at compensating people for conserving environmental services, REDD+ aims at providing economic incentives for people to maintain forest services, including carbon sequestration, but also water provision and purification. After being largely discussed theoretically and politically in the international arenas, countries are now to choose concrete REDD+ actions and programs to implement the REDD+ projects and benefit from the financial compensation. REDD+ is considered as an interesting instrument to incentivize small farmers to replace their slash-and-burn practices for cattle-farming with sustainable alternative productions, which reduce deforestation (Angelsen 2008 in: Kanowski 2011). In this stage of concrete REDD+ actions, NGOs appear as essential actors, and they have been taking the lead by proposing pilot projects, to create positive incentives for conservation and the promotion of a sustainable model of production for farmers. In this analysis we are going to evaluate the potential of REDD+ to encourage farmers on this transition.

Contrarily to Angelsen (2008), Karsenty (2012) considers that a REDD+ project will not necessarily be effective in encouraging a reduction of deforestation. One of the main risks of REDD+ projects is that they result in one-fits-it-all solutions, such as the PES programmes, which apply in the same way to all resource users, without analysing their needs to change their practices more in detail (Karsenty 2012). Therefore, the effectiveness of such incentives will strongly depend on the instruments used to encourage them this way and whether they are adapted to their needs. Given that the small farmers' needs to change their practices can vary greatly, any incentive policy or mechanism to encourage such a transition needs to take into account this diversity of actors.

This is why we raised the following question:

What are the implications of a REDD+ project for taking into account the diversity of small farmers and their needs to stop deforesting and make a transition towards sustainable land-use practices?

The goal of this study is to understand how the governance of a REDD+ project could take into account this diversity of small farmers. For this purpose, we carried out an exploratory study in São Felix do Xingu, one of

the most deforesting municipalities, to analyse what type of REDD+ measures could encourage a change of practices by small farmers. The NGO The Nature Conservancy (TNC) is currently planning a REDD+ pilot project in this municipality. Our reflexions are based upon interviews with representatives of local institutions and small farmers, that we led in cooperation with the Association for the Development of Small Farmers in the Alto Xingu (Adafax).[1]

In the following, we will first describe the political dynamics and the efforts led at the federal and local levels to tackle deforestation. Secondly, we present the methodology we used to analyse the current situation of the municipality of São Felix and of small farmers. Interviews with local institutions allowed us to understand how REDD+ is viewed by the different actors and how they consider its potential to promote a transition towards sustainable alternatives to cattle-farming within the municipality. Interviews with small farmers aimed at identifying their needs to reduce deforestation and transition towards sustainable alternatives. We will show how their needs differ according to the different types of farmers, calling for different measures. Based on these results, we raise some questions regarding the governance of a REDD+ project capable of taking into account the actors' diversity. We conclude with some recommendations for the conception of a REDD+ project at the municipal level.

2 Policies against deforestation in Brazil and perspectives for REDD+

2.1 The on-going fight against deforestation in Brazil

Deforestation is one of the main drivers of climate change, it accounts for 18% of GHG emissions globally (Meridien Institute, 2011). The Brazilian Amazon represents one third of the world's tropical forest. While annual deforestation rates in the Brazilian Amazon declined by almost 84% between 2004 and 2012, deforestation still accounted for 57% of Brazil's annual Greenhouse Gas (GHG) emissions in 2009 and makes Brazil the 6th global emitter (UNEP/GRID 2009). One of the main drivers of land-use change is cattle farming. In the region called Legal Amazon, comprising the entire tropical forest within Brazil's borders, a total of 74 million cattle are at the origin of deforestation and degradation (IBGE/PPM 2010). Cattle-farming highly contributes to GHG emissions in Brazil, not only through the practice

of deforestation through burning but also through the methane emitted by the cattle (May and Millikan 2010).

Since the 1950's the federal government of Brazil had promoted deforestation as a way of territorial conquest and occupation. Nevertheless, when deforestation reached a historical high with over 25 000 km^2 deforested in 2004, the Brazilian Federal government took strong regulatory action against deforestation. A flagship example for its regulatory approach is the 2004 Action Plan for Prevention and Control of Deforestation in the Brazilian Amazon (PPCDAm for its acronyms in Portuguese), forming part of the Plan for a Sustainable Amazon. The main idea of the plan is to reduce deforestation through command-and-control measures, while promoting an institutional culture, which stimulates legal activities through market incentives, social control and capacity-building (Barreto et Araújo 2012).

Facing an increase of deforestation in December 2007, the government launched a presidential decree targeted towards the "Arch of Deforestation" or "Fire Arch", reaching from the North-East of the Amazon region (Maranhão and Pará) to the South-West (Amazonas and Rondônia). In this zone, the government identified the most deforesting municipalities and implemented restrictive measures such as the restriction of access to rural credits for farmers who did not have any proof of legitimately owning their lands or of environmental regularity, among other measures (Assunção et al. 2012). The regulations were complemented by very strong law enforcement and market measures such as embargoes on beef production, which led to a significant reduction of deforestation (Barreto and Araújo 2012; Nepstad et al. 2009). However, this command-and-control approach was not accompanied by adequate supportive measures for small farmers. The most recent regulation is the reform of the Forest Code, approved by President Dilma's federal government in 2012. It requires that farmers with properties of over 4 rural modules (approximately 300 ha in the Amazon region) maintain 80% of forests on their properties (or 50% if they have already cleared their land), which corresponds to the "Legal Reserve". They also must conserve the forests around water sources and streams, and on hills, the so-called "Permanent Protected Areas" (Senado Brasileiro 2012).

The environmental decentralization process in the Amazon has also contributed to decrease the deforestation rates since 2005. Environment and forest policies have been transferred to the states and municipalities, which have progressively strengthened the governance on these sub-national levels. An important aspect of this process was the creation of institutional forums on the state level for environmental policies and forest management (May and Millikan 2010). The forest police IBAMA signed various cooperation

agreements with state agencies in the Amazon to delegate responsibilities to the state level for allowing forest cleaning or to accept sustainable management plans. However, the decentralization process is far from being achieved and the local levels still lack institutional, technical and financial capacities. In particular, local governments still face significant difficulties to address the problem of land reform and the National Institute for colonisation and Land Reform (INCRA) is the only competent institution for this issue. Despite of the efforts to delimitate clearly the properties and to clarify the legitimate claims, property rights are still highly uncertain in the Amazon (one third of the land claims are not entirely verified) (May and Millikan 2010).

2.2 Emerging political efforts to reduce deforestation in São Felix do Xingu

The municipality of São Felix do Xingu, situated in the State of Pará (responsible for 57% of Brazil's GHG emissions in 2009) has one of the highest deforestation rates in the Amazon since 2001, and as part of the "Fire Arch," the Brazilian government considers it as one of its priority municipalities for preventing, monitoring and controlling illegal deforestation (Guimarães et al. 2011). It is the second largest municipality of Brazil and the municipality with the largest cattle herd, with over two million heads. Cattle-farming is the main economic activity, due to the high rent of cattle, its secure and immediate return and the little required effort, leading to important extension of pasture areas. Any other type of production cannot be sold easily, as there is very limited commercialization and the roads are still in a very bad state.

Following the 2009 federal edict for embargo on cattle production from São Felix, the local government signed a Pact Against Illegal Deforestation, as required by the state and federal government, with the representatives of the agricultural sector. It also established a Commission of this Pact, to initiate inclusive environmental governance in this municipality. The involvement of small farmers in this environmental governance has been a crucial step after their exclusion from previous political processes. The members of the Commission meet once a month to discuss the specific issues within 5 sub-commissions. Its goal is to define a post-pact agenda to sustain anti-deforestation efforts in the long-term. However, it lacks a clear decision-making process and financial resources, given that it currently relies on the funding by the NGO The Nature Conservancy (TNC).

In 2010, the "Green Arch" program implemented measures to help the municipality exit the list of the "Fire Arch" and promoted the creation of municipal institutions, and an increased access to credit and capacity-building.

For a municipality to exit the list, it has to reduce the annual rate of deforestation to 40 km^2, regularize 80% of its private lands, and delimitate 80% of the properties clearly with the CAR. The NGO TNC decided to support São Felix mainly with the delimitation of properties through the CAR, and has achieved 78% of the private area (with no overlapping properties). All these measures led to a significant decrease of the annual rate of deforestation; while 877 km^2 were deforested in 2007, only 140 km^2 were in 2011. However, this still wasn't enough to exit the list and now small farmers need to be included in further efforts of deforestation reduction. The CAR allowed to estimate the total number of farmers to around 8000. Small farmers (who own less than 300 ha) represent 86% of the farmers, but only 24% of the area of private lands; the average size of their property is 125 ha. In the *assentamentos* (agrarian reform settlements), areas that are in the process of being redistributed to landless farmers, 4000 small farmers own properties of around 50 ha.

Small farmers have suffered from the strong regulation approach of the Brazilian government accompanied by sanctions of the forest police, the IBAMA. They need adequate public policies of support in order to be able to comply with the environmental regulations of the government. Despite its success in reducing overall deforestation, the regulatory approach of the "Fire Arch" did not prove to be effective for the small farmers in the long-term (Coudel et al. 2011). In fact the small farmers' share in deforestation has increased in the past few years. Deforestation of small areas increased in comparison to deforestation of large areas; the share of deforested areas above 50 ha went from 78% to 25% between 2002 and 2008, while the share of deforested areas below 25 ha decreased from 21% to 58% (NORAD 2011). This could mean that large farmers deforested smaller areas (and not necessarily that the share of deforestation by small farmers increased). However, deforested areas of less than 25 ha are generally linked with small farmers, while large farmers are necessarily responsible for deforested areas above 50 ha. For small farmers, income is still directly correlated with the deforested area through the common practice of slash-and-burn.

To overcome the dichotomy between development and the protection of the environment for small farmers, there is a need to reduce deforestation while increasing the small farmers' revenues. A transition towards sustainable alternatives to cattle farming, that are profitable but without implying deforestation of new areas, would be one possibility to combine the small farmers' development with the conservation of the world's most important ecosystem. In São Felix do Xingu, one of the main alternatives identified is the production of cocoa, which can be more profitable than cattle farming. The next step of this transition is to produce a wider variety of products,

including fruits and vegetables, while reducing progressively the share of cattle. The transition would be accomplished with the so-called Agro-forestry system (SAF), which includes a sustainable forest management with yearly wood extractions complementing the revenue. This last stage requires a significant initial investment and a long-term vision of the property, which many small famers, constrained by their immediate needs, often lack (Adafax 2012).

2.3 REDD+ as an instrument to encourage small farmers to transition

Given these remaining challenges for reducing deforestation on the national and local level, Brazil has been contemplating REDD+ as a potentially interesting instrument to access international funding, reinforce technical assistance and address poverty as a driver of deforestation.

The official adoption of REDD+ as a compensation mechanism between countries has been debated since 2001 in the international climate negotiations due to its highly difficult implementation. Since the beginning, Brazil has been participating actively in the international debate on this mechanism. Brazilian researchers around Santilli proposed in 2005 a "compensated reduction" proposal, including avoided deforestation. The main element of the proposal was the stabilisation and voluntary reduction of deforestation in non-Annexe I countries (not committed to emissions reductions under the Kyoto Protocol) (Santilli et al. 2003; Santilli et al. 2005). The second "D" in REDD+ was added in the 13th COP in Bali, when countries of the Congo Bassin insisted that not only deforestation but also degradation should also be included in the mechanism. Then, the "plus" referring to conservation, sustainable management and enhancement of carbon stocks became part of the official REDD+ designation in the COP 15 in Copenhagen.

While the international community received the theoretical idea with interest, its concrete implementation is still subject to fierce debates. One of the main challenges of this economic incentive instrument is that it is very complicated to evaluate the performance in terms of deforestation reduction. The drivers of deforestation and degradation reach from the extraction of oil and mines to industrial farming of palm oil or small-scale farming. Financial incentives could only cover the low opportunity costs due to limited funds but also because such an international mechanism would not want to encourage palm oil developers to ask for plantation permits only to obtain the compensation (Karsenty 2012).

This is why, for Karsenty (2012), a more pragmatic approach ought to define performance criteria beyond the emission reductions, including proxies

for all measurable activities, which contribute to reduce deforestation. Performance should therefore relate to a series of indicators measuring the effective implementation of deforestation reduction measures. In this sense, performance requires investments to strengthen governance and institutional capacity (Karsenty 2012).

In the case of small-scale farming, a direct payment would be feasible due to the low opportunity cost. However, it is worth questioning whether a direct payment under the use-restricting approach is the best solution for small farmers on the long-term. For PES, the use restricting approach is solely a financial compensation for the non-use of natural resources while an asset-building approach aims at encouraging a change of practices towards more sustainable production types, through investments (Wunder 2007). Pirard et al. (2010) have a broader definition of asset-building, including the transition from an extensive to an intensive agricultural system, capacity-building and development of infrastructures for alternatives activities to cattle-farming. Thus, "farmers would benefit from the possibility to use technologies, allowing them to increase their production and their income, while reducing deforestation" (Pirard and Treyer 2010).

A use-restricting PES creates a continuous assistance triggering a long-term dependence on the payment. Moreover it is detrimental to the poor, for whom resource-extracting activities are the only way to survive and they rely most on these resources. The average opportunity cost of the community will be lower than their own opportunity cost, while they loose their vital access rights to the resource (Karsenty 2011). Such a compensation scheme allows the small farmers to survive, but does not release the necessary capital to engage in a new technical path of agricultural or agro-forestry production on the long-term (Ibid). The risks of corruption and appropriation by elites are increased if cash payments, while monitoring and control of investments are slightly more effective (Ibid).

An asset-building scheme could finance the transition from current agricultural practices, such as slash-and-burn practices, towards sustainable production systems. This would allow reconciling the conservation of environmental services with better living conditions of the small farmers (Karsenty 2011). Costa (2008) showed that in the Brazilian Amazon, paying the opportunity cost is less promising than providing the necessary conditions towards alternative land uses. Costa Rica was one of the pioneering countries in this domain; it spent its PES program funds, raised through a tax of oil distribution, partly on community investments (Pagiola 2008). Since the transition towards alternative production models is a reorientation process, it requires changing the entire socio-economic model, including the technology,

economic, ecologic, socio-cultural and institutional sectors. A REDD+ project oriented towards community investments and asset-building is more likely to address these multiple drivers, according to Karsenty (2012).

3 Methodology

The association Adafax generously received us in São Felix do Xingu, but was also our intermediary to meet the local institutions and small farmers in their communities during the six weeks we spent on the field. Thanks to their good insertion within the institutional mosaic in the municipality, the association enabled the contact with the representatives of all the local institutions we interviewed.

Due to the transport challenges in the municipality, we could not travel to the farmers' communities autonomously. We therefore accompanied the Adafax technicians when they had meetings with farmers. Their presence also helped to enjoy the farmers' trust and make them feel more comfortable. The selection of the farmer sample was widely determined by the communities we were able to visit during our six-week-stay in São Felix do Xingu. However, within each community, we tried to choose farmers with different profiles in terms of production types, age, sex and poverty level. The small size of our 14-farmer sample, insufficient to obtain significant results, can be explained by the limited time we could spend in São Felix, the limited availability of the farmers and the transport difficulty.

3.1 Interviews with local institutions

A semi-open questionnaire was used to carry out 18 interviews with local institutions in São Felix do Xingu. After a series of questions on the institution itself, its evolution, its activities and its relations with other institutions, our goal was to find out the institution's position regarding the recent efforts of the municipality to exit the "Fire Arch". We aimed at understanding how the institution perceived the recent changes, which ways of reducing deforestation were considered most effective, which technical projects should be prioritised, what they considered the needs of farmers to be and what are the challenges faced by the municipality. Lastly, we questioned the institution regarding its position to REDD+, by asking whether they had already participated in discussions on the issue, which institution would be most adequate to govern and monitor such projects, how it could be included in the panoply of existing policies and which activities should be concretely financed.

The institutions we interviewed all worked with farmers or affect them with their policies. Amongst them were public institutions for agriculture and land reform from municipal, state and federal levels, but also banks, unions, technical assistance organisations and NGOs. For these institutions, we decided to synthesize the responses of the interviews without any factorial analysis, given that the objective of these interviews was to clarify the political process in São Felix.

3.2 Interviews with small farmers

We also interviewed 14 small farmers from different communities of the municipality São Felix do Xingu to analyse their perception of deforestation and its alternatives. It was crucial for us to obtain comparable responses by avoiding that the farmers deviate from the questions or answer with usual discourses.

We introduced the interview with four general questions in order to have an idea of their characteristics, mainly the size of their property and their main production. To facilitate comparison, we chose to use the Q Methodology, developed by William Stephenson (Stephenson 1953) and used in comparative psychology or "science of subjectivity" (Brown 1980). The objective is to identify similarities and differences between the responses of a sample of persons. Since the responses are discrete on a scale of agreement and disagreement (strongly agree, agree, indifferent, disagree, strongly disagree), this method enables to study which opinion statements were similarly graded and which ones strongly differed.

Each farmer was confronted with a series of opinion statements, which he had to classify according to his level of agreement or disagreement. The repartition of their responses was predetermined, following a Gauss curve: the Q classification. To facilitate the procedure, the opinion statements were written on cards that the farmers had to place on a paperboard (figure 1).

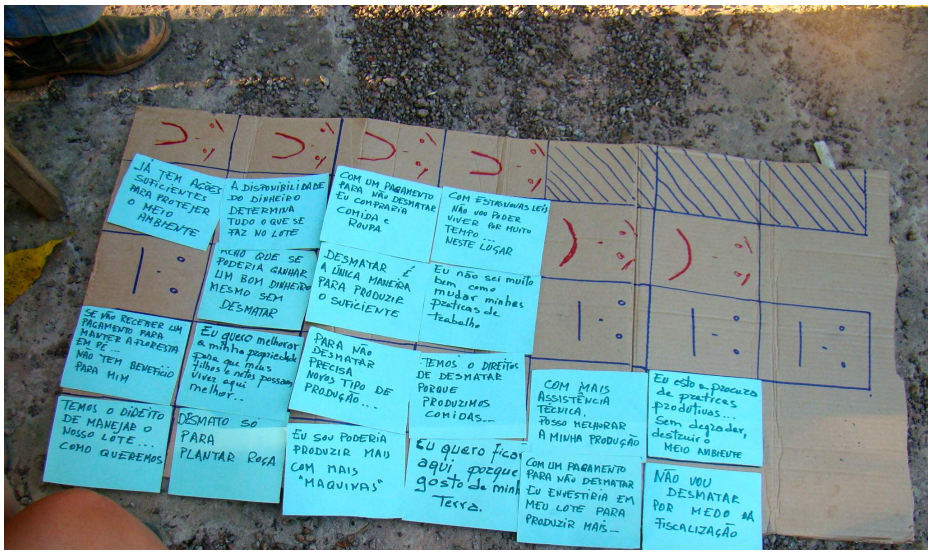

Fig. 1. Example of interview using the Q methodology

The opinion statements, pre-written by the research team, referred to 8 topics: the perception by the farmer of its farm, his capacity to change practices, his perception of environmental regulations, of deforestation, of his responsibility, his needs to be able to stop deforesting, his perception of a payment for conserving forests and the modalities of such a payment.

Box 1. The 29 opinion statements

The farmer's vision of his property
1. I want to stay on my property because I like working here.
2. I am living here because I do not have any other employment opportunities.
3. I want to improve my property for my sons and grandsons.

Capacity to change practices
4. I do not know very well how to change my farming practices.
5. I am looking for new practices, which would allow me to produce without degrading the environment.

Perception of environmental regulation
6. I am worried that I will not be able to stay any longer on my property because of increasing environmental regulation.
7. For me it is easier to adapt to environmental regulation than for other farmers.

Perception of deforestation
8. I think that deforesting is the only way for me to produce sufficiently.
9. I think that I could earn enough without having to deforest.
10. Financial profitability determines everything I do on my property.
11. If I could produce more on my property, I could stop deforesting.
12. I stopped deforesting because of the increasing controls and sanctions.
13. I stopped deforesting because I like my forest.

Responsibility of the farmer
14. I think that I have the right to deforest because I produce food for others.
15. Farmers have the right to manage their property as they please.
16. Farmers who damage the environment have to be punished more severely.
17. There is enough environmental regulation and they should stop bothering us.

Needs of the farmer
18. To be able to stop deforesting, I need new production types.
19. With new credit lines, I could produce more.
20. I think I could only produce more with more machines.
21. My biggest problem is to sell my production.
22. With more technical assistance I could improve my production.

Perception of a payment to stop deforesting
23. With a payment to stop deforesting, I would buy food and cloths.
24. With a payment to stop deforesting, I would invest to produce more.
25. If I do not obtain any payment for my forest, it does not have any benefits for me.

Modalities of such a payment
26. Such a payment should be determined according to the size of the forest.
27. Such a payment should benefit more the small farmers.
28. In a municipal program against deforestation, the priority should be support to the farmers.
29. In a municipal program against deforestation, the priority should be a payment for the farmers.

The interviews took 30 minutes on average, eventually more if they did not immediately understand the methodology. The challenge of the Q methodology was that many farmers did not understand why they could not agree or disagree with as many opinion statements as they wanted, but there was a limited allowed number for each response. Sometimes we had to place the card ourselves on the paperboard after asking them which of the statements was more important than the others. However, the advantage of the Q methodology was that farmers were very open to expose their difficulties and disposed to cooperate with such an interactive, tactile and dynamic methodology. Many farmers told us that they found this methodology interesting and original.

4 Panorama of institutions and dynamics in São Felix do Xingu

Through the 18 interviews with the local institutions of São Felix do Xingu, we obtained a clearer vision of the actors, their interactions and the internal dynamics they create. We classified the organisations we interviewed into 4 groups:
- NGOs which detain a political role in São Felix, including Adafax, Gret and TNC;
- Technical assistance organisms, including Emater, Cootagro, Procampo, Ceplac and Cappru;
- Public institutions, such as the Municipal Environment Secretary (SEMMAS), the Federal Environment Secretary (SEMA), the Municipal Agriculture Secretary (SEMAGRI) and the National Institute for Colonisation et Land Reform (INCRA); the bank providing most rural credits is the BASA.
- and organisations representing social movements, including the Union of Rural Workers (STTR), the Union of Rural Producers (SPR), the Rural Family House (CFR), and the Pastoral Commission for Land (CPT).

4.1 A municipality based on cattle-farming

In São Felix do Xingu, the financial return on cattle is secure, simple and immediate given that cattle can be displaced by foot, which explains why cattle is the only productive model that farmers know in this municipality, according to the INCRA. The profitability of cattle is very high given that labour costs are low. Many cattle favouring dynamics became very common in this municipality, including slash-and-burn practices to extend the pastures, which makes it hard to change them, says a representative of the Emater.

On the contrary, selling other products is still very complicated in the municipality because of the bad state of the roads, representing a challenge to the transport. A representative of the Cootagro explains that high production costs make it cheaper to import these products form other states. Other obstacles are the lack of technical assistance and credits, the weak training by the Rural Family House and the stringent sanitary legislation, according to him. A representative of the Pastoral Commission for Land explained that technicians, bankers and politicians all benefit from credit projects based on cattle for small farmers, encouraged by gifts from large producers. The lack of environmental awareness of small farmers and the difficult communication in such as large municipality as São Felix also contribute to the dominance of cattle-farming and the high deforestation rates according to the Municipal Environment Secretary. However, in the past decade, farmers increasingly produced cocoa, thanks to the technical assistance made available by Ceplac and the easy commercialization through the cooperative Cappru.

4.2 Progress and remaining challenges in the fight against deforestation

At the moment when the Pact Against Illegal Deforestation was established in the municipality, the SEMMAS was remodelled, equipped and its personnel trained. Training of institutions but also technicians was the objective of the Project Pacto Xingu of the MMA, financed by the German Cooperation Agency (GIZ) and the Food and Agriculture Organization (FAO). TNC arrived to support the SEMMAS by delimiting properties through CAR. All these measures have led to a significant reduction of deforestation since 2005 but there are still numerous challenges to the exit of São Felix from the list of the "Fire Arch".

A representative of TNC explained to us that the government regulation did not support small farmers to transition towards a low carbon economy. Many farmers have the will to reduce deforestation but they cannot make the transition towards alternatives to cattle because they are lacking technical and financial means. For farmers to reduce deforestation, they need technicians to explain to them how to produce cocoa, fruits and vegetables, but also how to increase their returns from their products. A representative of the SEMA in São Felix explained that technical assistance in the municipality lacked human and financial capacities to support a larger number of farmers. The public technical assistance organization Emater has only six technicians, one car and one motorcycle to support the 6000 small-scale farmers of the municipality of the size of Austria. Small-scale farmers lack the money to pay for private technical assistance from Cootagro or Procampo, so these organisms count with five technicians in total now.

Another challenge to a further reduction of deforestation is the high rotation of properties, a result of the insecurity of property rights. In São Felix, only 2% of the farmers have an official property right. An employee at BASA explains that farmers are used to buy a property with forest, deforest it and cultivate their cattle on the pastures and then sell it to buy a new property. This recurrent buying and selling of properties prevents them from having a long-term vision of their property, says a representative of Procampo. Moreover, as long as they do not have a property right of their land, farmers cannot be held accountable for any illegal deforestation, according to our interviewee of the Cootagro. The official property right allows farmers to have access to official credits, except for the Pronaf, which small farmers can have access to with a Declaration emitted by Emater or STTR.

Thus, the difficulty of transport and the strong cattle culture reduce the farmers' motivation to change their practices. The lack of technical assistance and credits in São Felix but also the unaccomplished land reform are two

additional major challenges to reduce deforestation. To have a more detailed vision on the needs of the farmers to be able to further reduce deforestation, we carried out the interviews with the farmers.

5 Characterisation of the diversity of farmers

The aim of this part is to understand how the farmers perceive the transition towards sustainable alternatives and what would be necessary for them to engage on this path. Among the results of the questionnaires with the Q methodology, we identified certain common tendencies and some heterogeneous responses (see Annexe for the responses of the interviews).

5.1 General tendencies of farmers in São Felix

Firstly, the 14 small farmers we interviewed agree on their desire to stay on their property because they like it, and not because they have no other employment options. They also want to improve the property and make it more profitable for their sons and grandsons. Given that traditionally, the municipality of São Felix do Xingu is characterised by high rotation rates of the properties, these answers can show that people would like to stay but are not always able to, but they might also reveal a change in mentalities in the past years. Instead of opening new agricultural frontiers, farmers would now prefer to increase the rents on their own properties.

Secondly, they all asserted that they agree they do not have the right to manage their properties as they please, but that certain rules are essential, and those who cause damage to the environment should be punished. While they extract resources to satisfy their immediate needs, these answers reflect that they are conscious that they have to change their practices in their own interest. This could be the result either of awareness-raising efforts by the municipality, or of the direct feeling of the environmental damage and its health impacts themselves. Most notably, many inhabitants of São Felix related months of large dust and smoke clouds in the 1990s, which caused respiratory problems, eye irritation and low visibility. Since 2009, with the change of policies against deforestation, this problem has greatly decreased, probably thanks to a combination of both the awareness and the health factors. Most farmers we interviewed cooperated with the Adafax, which offers them technical assistance and raises awareness, but this change in awareness was also true among the farmers who do not get support of the Adafax.

Thirdly, the interviewed farmers are all eager to discover practices, which would allow them to stop deforesting (except for one, who justified that his

lack of money did not enable him to look for new practices). They know that if they could produce more or make a transition towards new types of production, they would not need to deforest anymore. To engage in this transition, they all explained that they needed technical assistance and credits. They seem to be well conscious that they do not have the right to deforest any longer, or at least not to the same extent, but the government has not provided the necessary means for them to actually change their production models.

Lastly, between a financial and a technical support to reduce deforestation, they all think that the technical support is at least as important as a regular payment, if not more.

5.2 Identification of three main profiles of farmers

Despite these general tendencies, a more detailed analysis reveals clearly that the farmers are too diverse to establish a one-fits-it-all solution.

Given the divergence of some of the answers, we classified the 14 farmers in three different profiles, based on the most divergent answers to opinion statements. We obtained very divergent answers to opinion statements 6 ("*For me it is easier to adapt to environmental regulation than for other farmers*"), which reflects the different capacities of farmers to change their practices. Other controversial opinions were statements 8 ("*I think that deforesting is the only way for me to produce sufficiently*") and 9 ("*I think that I could earn enough without having to deforest*"). This showed that some farmers still consider they have to deforest and to open new pastures for their cattle, while others have already started to diversify their production. Farmers also answered heterogeneously to opinion statements 11 ("*I stopped deforesting because of the frequent controls and sanctions*") and 12 ("*I stopped deforesting because I like my forest*"), which enabled us to differentiate the farmers according to their motivation to stop deforesting. Last but not least, we obtained divergent answers to opinion statement 21 ("*My biggest problem is to sell the production*"). Here, farmers who agreed to this statement had clearly already started to diversify their production and had thus different needs from those who prioritized technical assistance and new credit lines.

It is important to note that given our small sample size, this categorisation is only explorative and has no statistical validity. Nonetheless, the inductive categories served as a basis for a more general reflexion on the diversity of farmers, which is independent of the categorisation we used. We also want to specify that the names of the categories do not imply any judgment on the different farmers and is only used to differentiate their preferences.

Profile 1: The Environmentalists

For these six farmers, deforesting is not the only way to produce sufficiently and they consider that they can earn enough revenue without deforesting. They like the forest, are very much aware of the importance of the environment and do not consider that they have a right to deforest only because they produce food for others. They agree to stop deforestation and have already stopped. They do not consider that the new environmental regulation of the federal government prevents them from staying on their property and feel that they can better adapt to this regulation than other farmers. In fact, they think that the existing environmental regulation is not yet sufficient. They have stopped deforesting because they like their forests, and not because of the controls and sanctions. Their biggest problem is to sell their production, which shows that they are already producing alternatives to cattle.

The financial profitability of the different agricultural activities is not the only factor in determining their production model; they can actually afford to take other factors into account, such as environmental protection or sustainability. They claim that preserving the forests has benefits for them even if they do not obtain any payments for it.

Profile 2: The Innovators

These five farmers are motivated to make a transition towards new types of production, such as cocoa or fruit, but they cannot yet afford to invest in them (some of them just started planting cocoa but are still waiting for the first harvest). They agree that they ought to stop deforesting and think that the existing environmental regulation is not sufficient, however they consider that they still need to deforest small areas to be able to survive. Some of the farmers who stopped deforesting told us that this led to a decrease of their already low incomes. They are aware that they need to increase their production and develop new types of production to be able to stop deforesting, but they do not know how to change their practices or do not have the means for it. They stopped deforesting because they like their forests.

They do not consider that it is easier for them than for other farmers to adapt to environmental regulation. Financial profitability of their production determines their decisions for the property because they are all very dependent on their income. Forests are not particularly beneficial for them if they do not receive payments but this was not a priority in their responses (many were either indifferent or disagreed with the opinion statement 25 (??),

none of them strongly disagreed). They would invest the payment in their property rather than in cloths or food, or would do both to the same extent.

Profile 3: The Objectors

These three farmers do absolutely not know how they could stop deforesting. For them, deforesting is the only way to earn enough, given that they claim that without deforesting, they could not earn sufficiently and could not stay on their properties. One of them told us that there are already way too many environmental regulations. They would only stop deforesting because of the controls and sanctions. Selling their production is not a major problem for them yet, because they still rely on cattle-farming only. However, as all the other farmers, they agree that they need new production types and technical assistance to be able to reduce deforestation.

They consider it harder for them to adapt to environmental regulation than for other farmers. Their decisions are clearly determined by financial profitability, which is due to their very low income. Thus, they consider that forests do not bear any benefits for them if they do not obtain payments to maintain them. As for the question of what they would use such a payment for, results were not clear; one of them preferred to invest in cloths and food, the other would invest in his property and the last one would do both equally.

6 Causes and consequences of this categorisation

6.1 Characteristics of small farmers as explaining factors for their categorisation

Before confronting the farmers with the opinion statements of the Q methodology, we asked them about the distance to the town of São Felix do Xingu, their types of production, the proportion of forest they had on their property and the support they got from Adafax. These questions allowed us to collect information on the characteristics of the farmers, which could contribute to explain the divergence between the profiles. However, although we identified correlations between their characteristics and their type of profile, the causality link is not always clear and could be reverse.

The first explaining factor is the distance to the town of São Felix. The *Environmentalists* all live in communities close to São Felix, while the farmers from the two other categories live much further from the centre of the municipality. Thus, the *Environmentalists* have better access to environment-related information and to technical assistance.

The diversity of cultivated products is another factor, which is correlated to the different categories. The *Environmentalists* all cultivate and sell fruits, vegetables and cocoa, along with cattle farming (and one does not have any cattle anymore). The *Innovators* with little resources only sell cattle and plan to sell cocoa, even though some have fruits and vegetables for their personal consumption. The *Objectors* are still very much focused on cattle farming. The distance to São Felix is actually linked to the types of production because fruits and vegetables can only be sold in the centre, while cacao cooperatives are more decentralised. However, the diversity of products is not necessarily the explaining factor for their categorisation as *Environmentalists*, it could be that they were aware of the environmental constraints and thus decided to diversify their production.

Another explaining factor of the farmers' diversity is the share of forest remaining on their property. The *Environmentalists'* properties have a reduced forest cover (around 20-30%), while the *Innovators* and the *Objectors* still have large forest areas on their properties (between 50 and 90%). Therefore, it is easier for the *Environmentalists* to diversify their production; they have more deforested areas and cannot deforest any more their properties. However, the loss of the forest may also have enhanced their awareness of environmental problems, which stem from the absence of forest (dry streams, increase of drought and heat, etc.). It would be interesting to have complementary information on their willingness to reforest part of their property, to better understand whether having forest on their property is really important to them.

Lastly, the participation of farmers in networks and unions favours their environmental awareness. The farmers who are members of the Adafax or of the Managing Council of the Environmental Protection Area of Triunfo (APA) tend to favour sustainable production and are willing to make efforts towards these alternatives. However, they may also have decided to cooperate with these networks given that they were aware of the need to stop deforesting. Moreover, for this last factor, the correlation was not as clear because some who already started diversifying their production do not cooperate with Adafax while the three *Objectors* have been cooperating with Adafax for several years.

These few factors are not representative because of the small sample size. A full characterisation of a larger sample of farmers and an analysis of a wider range of factors would be needed to fully explain the categorisation.

6.2 The farmers' needs according to their profiles and implications for a REDD+ project

The results we obtained in the interviews point to divergent needs of the farmers to be able to stop deforesting. This divergence will be used as a basis for a broader reflection on the diversity of farmers and its implications.

The *Environmentalists* explained that they mainly needed more commercialisation possibilities for their new types of production, such as fruits. For example, when we talked to farmers belonging to the Association of Women Producing Fruit Pulp (AMPPF), they related that the biggest challenge they faced was that they did not have electricity in their communities, so they could not transform the fruit into pulp. Due to the bad state of the roads, the fruit cannot be transported to the next community. Therefore, the *Environmentalists* wish they had the support of cooperatives, which would come to the communities to buy the fruit, on top of a better infrastructure in terms of roads and electricity. In their production system, they are initiating a transition towards Agro-Forestry Systems (SAFs), which are complex and expensive to put in place, so they also ask for more technical assistance and more credit opportunities. Considering the *Environmentalists*' who already stopped deforesting, a REDD+ project focused on use-restricting payments would not be effective for them to increase their revenue, preventing that they stop deforesting again. It rather has to be part of a policy mix enabling municipal investment to improve commercialisation of new products that farmers are already producing. Technical assistance and new credit opportunities would allow them to increase the scale of their fruit and cocoa production, increase their incomes but also encourage them to create innovative systems such as SAFs.

The *Innovators* are willing to change their practices but lack the technical knowledge and financial means to make the transition towards sustainable alternatives to cattle, therefore they greatly need technical assistance and new credit opportunities. For them, a REDD+ project should contribute to tackle the lack of personnel, vehicles and equipment of the technical assistance organisms in the municipality. In the public technical assistance institution, Emater, the representative told us that some subsidized credit lines already existed to support farmers in diversifying their production (the *Pronaf Floresta*), but that they have never been used in São Felix because the organisms did not know how to create a project that corresponds to the credits' conditions. Once farmers diversify their production to cocoa, fruits and other products, they may eventually become *Environmentalists* and will then require support for the commercialisation of these new products as well.

Regarding the *Objectors*, it would be important to address their perception of deforestation, given that they still consider it as absolutely necessary. A series of workshops and courses could make them become aware of the productive benefits of standing forests (in terms of water and shadow), the profitable alternatives to cattle farming and the possibility of innovative systems such as SAFs. Given that they affirmed that the forest did not have any benefits if they did not obtain payments for its conservation, and that deforesting is the only way to produce sufficiently, an initial use-restricting payment under a REDD+ project could be necessary to dissuade them from deforesting on the short-term. However, for equity reasons, it is questionable whether it is legitimate to pay only the *Objectors* who have not done any efforts until now to reduce their deforestation and diversify their production, contrarily to the *Environmentalists*. Moreover, the Forest Code approved in 2012 clearly sets the limits of allowed deforestation, which questions the legality of such a payment if it concerns the reserve already determined by law. Anyways, once they have the will to change their practices and to stop deforesting, the *Objectors* would need technical assistance and new credit opportunities to be able to diversify their production and increase their rents. It is also possible that once they start the diversification process and they realize how profitable new production types such as cocoa can be, they will not need any awareness raising or payments anymore. It has to be noted that while the production of cocoa is currently highly profitable, there is a high uncertainty as to its future price, so it can be riskier in the long-term.

Our results can be summarized in the following table.

Table 1. Categorisation of farmers

Profile	Environmentalists	Innovators	Objectors
Position on deforestation	They want to change their practices or already changed them	They would like to change their practices but do not have the means to do so	They do not want to change their practices
Conditions	Proximity to São Felix High diversification Little forest	Medium distance to SFX Almost no diversification Large forest areas	Large distance to SFX No diversification Large forest areas
Needs	Better commercialisation and infrastructure TA and credit lines	TA + credits lines Then commercialisation	Awareness raising Then TA + credit lines + Commercialisation
Implications for REDD+	Strengthening of decentralized cooperatives	Capacity-building of TA organisms and banking institutions	Awareness raising workshops and capacity-building of TA organisms

7 Discussion

Our results suggest that a REDD+ project might be more effective if it consisted of investments in supportive asset-building activities rather than individual use-restricting payments. We also showed that for this investment, there is no one-fits-it-all solution. Investments to improve commercialisation and infrastructure, technical assistance and new credit opportunities should intervene to different extents at different moments of the transition to address the farmers' needs, and thus efficiently address the current drivers of deforestation.

This diversity of the farmers' needs has various implications for the definition of the governance of a REDD+ project. In the following part, we will show that such a flexible REDD+ scheme, based on investments at the municipal level, might be more equitable. Nevertheless, the control of the conditionality becomes much more difficult in such a scheme than in an individual use-restricting payment scheme, given the complexity to sanction or to exclude farmers in the case of non-respect of the contract.

7.1 Equity implications

Equity in the context of a REDD+ project generally refers to its social risks and its effects on poverty. There is a voluminous literature on the perceived social risks of PES and REDD+. While the exhaustive list of social risks (see for example Bond et al. 2009; Grieg-Gran et al. 2005; Peskett et al. 2008) is beyond the scope of this study, equity may be significantly improved in an investment scheme.

How the project can expand production activities is a critical question when defining the exact modalities of a REDD+. Payments may disadvantage the poor because it is most difficult for them to find profitable activities without relying on resource extraction. As observed by Wunder (2008), a key determinant of the net livelihood and income effects is whether a PES activity is restrictive as regards current production activities, or whether it promotes or expands them. Our results suggest that tackling the specific needs of the small farmers to allow them to increase their income may be a better way to exit poverty than using use-restricting payments. This is also confirmed by Bond et al. (2009), for example, who argue that large-scale 'set aside' conservation projects can depress local incomes and harm the non-participating rural poor.

Another crucial aspect of individual payments playing against equity is its reliance on opportunity cost. As shown by Karsenty (2012), use-restricting

PES schemes based on individual payments are based on the average opportunity cost of the community. However, the opportunity cost of the resource-dependent poor is higher than this estimated average opportunity cost. On the other hand, an asset-building investment should be considered because it could benefit small-scale farmers, regardless of their generally low opportunity cost.

This finding is confirmed by Sommerville et al. (2010), who show that techniques such as offering in-kind, non-rival and non-excludable incentives may avert benefit capture by a small group and ensure access to the poor. In many rural communities, directing incentives (such as payments) explicitly to the poor may lead to upsetting local social structures (Agrawal, 2001; Thompson and Homewood, 2002). This distributional issue is addressed in the Menabe in Madagascar through the use of in-kind incentives that are shared by the community, including bicycles, generators and public buildings (Summerville et al. 2010).

However, in some cases meeting individual opportunity costs is deemed important to incentivize individual behaviour and to increase the perception of fairness (Fehr and Falk 2002). Targeting may be an approach to improve the environmental efficiency of the intervention. In our study, we concluded that targeting was essential to address the different needs of the farmers, the same in-kind incentives such as technical assistance won't be efficient for all farmers.

Whether the differentiated support is pro-poor will probably depend on the situation, but it is a factor that needs to be taken into account. Generally, the poorest are lagging behind in the transition, due to their lack of resources for the initial investment into alternative production types. Thus, they would benefit more of the support than those who already managed to increase their income through new production types. In our study, the *objectors* benefit of awareness raising seminars, technical assistance, new credit lines and commercialization, while the *environmentalists* only benefit of commercialization. There would probably be no resentment about this difference because environmentalists do not need the other forms of support, while resentment would be important if we had a differentiated payment. For this reason, investment could be differentiated and still more equitable than the payment.

How to categorize the farmers to decide upon the differentiated support is another challenging equity issue. There are various challenges to targeting particularly in developing countries, due to the difficulty of extracting private information from individuals seeking to receive benefits (Akerlof, 1970).

Techniques such as screening contracts can be used to induce individuals to share their true preferences and to complement publically available information on opportunity costs (Ferraro, 2008). Alternatively, spatial targeting has been explored for the distribution of incentives and may be appropriate for those with land directly adjacent to forest (Wätzold and Drechsler, 2005; Wünscher et al., 2008). However, such forms of targeting typically involve relatively high transaction costs. This demonstrates the importance of finding an adequate targeting method to distribute the differentiated support in an equitable manner.

Through targeting, it is possible to attribute different levels of support to the farmers according to their needs to reduce deforestation. Those who already stopped deforesting have no needs to reduce their deforestation, and from an environmentally efficiency perspective, there is no need to include them in the project. In our study, this is the case for the *environmentalists.* Investing REDD+ funds for them does not further reduce emissions from deforestation, so there is no additionality. However, excluding those who protected the forest in the past and rewarding those who did not poses another equity problem, raised by Kaimowitz (2008). Given that compensation is based on progress against historical baselines, there is limited scope to reward past successful conservation efforts, mostly by indigenous people and traditional communities (Kaimowitz 2008). On the other hand, large ranching businesses still represent a large threat to deforestation, so compensation for them would be very effective form an environmental point of view (Ibid). This in turn can lead to "perverse incentives", if the farmers who deforest most today receive most compensation tomorrow.

As a possible way out of this dilemma, previous efforts in the compensation scheme could be included. In São Felix do Xingu, even the *environmentalists* who already stopped deforestation still face various challenges to a permanent reduction of deforestation, most notably the commercialization of their products. If a REDD+ project could support the creation of cooperatives with vehicles, it would indirectly support the reduction of deforestation. Not only would it ensure that *environmentalists* permanently cease to deforest because they expand their other production types and increase their income, but it would also be a strong signal for *innovators* and *objectors* that the transition is feasible and profitable. According to Pagiola et al. (2004), the World Bank's Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) for example, which combines payments with technical assistance to encourage a transition from pastures to silvo-pastures, was adjusted over time to recompense those farmers who had already protected or planted forest on their pastures before the beginning of the project. Moreover, it has to be noted that while it can be

considered as environmentally ineffective to include *environmentalists* who already stopped deforesting, because there is no additionality in terms of deforestation reduction in the short term, the investment in commercialization support will benefit the other categories as well, as they progress on their transition. The prospect of a viable exploitation without deforesting may be of importance for the *innovators* and *objectors*, who are still deforesting.

Thus, an investment scheme, which favours both the poorest farmers and those who protected the forest in the past by tackling their specific needs would significantly increase equity. However, this scheme is certainly not a sufficient condition for combining a reduction of deforestation with an exit from poverty. Complementary pro-poor policies, including reinforcing the land tenure rights and strengthening local institutions, are also essential for the success of REDD+ (Meridian Institute 2011; Bond et al. 2009).

7.2 Control of the conditionality

Based on the concept of PES, the REDD+ mechanism aims at establishing a conditionality between the different types of support and the conservation of the environmental services provided by a standing forest. However, for conditionality to be efficient, it involves control. Once a contract is established between the farmer and the authority responsible for the REDD+ project (an NGO, a public local institution…), its rules and conditions have to be respected. Given that the investments in supportive activities ought to be used not only to reduce deforestation but also to diversify the production, control become particularly critical. The role of institutions to provide a mechanism to organize and coordinate control and supervision is thus reinforced through an investment-oriented scheme.

How to be sure that the farmers who benefit from these services actually stop deforesting is a crucial question. There is a dichotomy between various control options: On the one hand, satellite control, often seen as a silver bullet for monitoring, is actually not able to evidence small deforested areas. By delimitating the properties and assign them clearly to their proprietors, one of the main purposes of the CAR is to allow monitoring of these small areas. However, the CAR is a macro control approach, which does not preclude site visits for small properties. In the PES scheme in Costa Rica for example, monitoring is conducted via site visits, as participating areas tend to be small and not easily monitored with remote sensing. Monitoring responsibilities are delegated to regentes, who, along with technical personnel of FONAFIFO, are authorized to visit the property at any time to certify that it is still under

conservation (Manual de Procedimientos 2009). This effective solution can be an important lesson for any future REDD+ projects.

Advances in contract theory, mechanism design, game theory and related fields now allow to say that for monitoring, the state is attractive because it alone has the power to make and enforce the rules of the game. Communities, however, may solve problems that the states are ill-equipped to address, especially where the nature of social interactions or of the goods and services being transacted makes contracting highly incomplete or costly (Bowles and Gintis 2002). In our study, we showed that this was the case in the very large municipality of São Felix, which suffers of a lack of resources for effective monitoring. Community governance relies on dispersed private information often unavailable to states, employers, banks, and other large formal organisations to apply rewards and punishments to members according to their conformity with or deviation from social norms (Bowles and Gintis 2002). An effective community monitors the behaviour of its members, rendering them accountable for their actions. In contrast to states, communities foster and use the incentives that people have traditionally deployed to regulate their common activity: trust, solidarity, reciprocity, reputation, personal pride, respect, vengeance, and retribution, among other, as shown by Bowles and Gintis (2002).

Communities overcome free-rider problems set by their members by directly punishing 'anti-social' actions of others. Monitoring and punishment by peers in work teams, credit associations, partnerships, local common situations, and residential neighbourhoods is often an effective means of attenuating incentive problems that arise where individual actions affecting the well being of others are not subject to enforceable contracts (Whyte 1955; Homans 1961; Ostrom 1990; Tilly 1981; Hossain 1988; Dong and Dow 1993; Sampson et al. 1997). However, in order to create this interest in the actions of others, actors have to be directly affected by the behaviour of others, like for common pool resources. If the support only depends on the individual performance, other actors won't be affected by the non-respect of the contract by others. Thus, community members do not have any interest in controlling the other farmers. Any REDD+ will need to consider how to create a group conditionality, which incentivizes actors to monitor other members of their community.

The existing literature has come to two suggestions: first, the person denouncing the infringing farmer could obtain a reward. However, some authors argue that a personal repayment is not even necessary (Bowles and Gintis 2002). They argue that communities are often capable of enforcing norms, because a considerable fraction of members are willing to engage in

the costly punishment of shirkers even when there is no reasonable expectation of being personally repaid for their efforts. The authors call this behaviour "strong reciprocity". A strong reciprocator is predisposed to co-operate with others and punish non-cooperators, even when this behaviour cannot be justified in terms of self-interest. The considerable evidence that strong reciprocity motives are common is reviewed in Bowles and Gintis (2000). We suggest that making the municipal in-kind investment conditional on the performance of the entire municipality could be an interesting option could reinforce this reciprocity.

Verifying performance related to diversification efforts is more complex because external factors play a more important role. There is a risk that if the farmer did not successfully plant a field of cocoa, it can be due to hostile ground or bad advice by the technical assistance organism (and not due to his lack of efforts). One of the farmers we interviewed tried to plant cocoa two consecutive years with the support of Adafax, but was not successful. Thus, factors leading to the possible failure of diversification are highly uncertain and in the case of a municipal conditionality (as suggested before), the other members should not be sanctioned for this failure. This is why Karsenty (2012) suggest that performance should be understood in a broad sense to encompass a mix of indicators based on the effective and sustained implementation of forest-related policies and investments in the community, while some elements of performance (like forest cover and forest fragmentation) can be considered as "proxies" for reduced emissions. For example, incentivising government investment to clarify and secure tenure rights and remove the legal incentives to deforest for securing land tenure, would appear as a prerequisite to prevent "land-grabbing" and enable a range of measures targeted at integrated forest and agriculture public policies and sustainable community forestry (Ibid). Focusing on the actual increase of the supportive activities could be fairer than only accounting for the results in terms of reduced deforestation or actual diversification.

Sanctions are important to encourage compliance with the program terms and to deter fraud. In the context of national PES programs, sanctions generally include suspension or cancellation of payments, and potentially the requirement that past payments be returned. These modalities can serve as interesting lessons for REDD+ projects. In Mexico's Payments for Hydrological Services program, which has now been merged with the national PES program, the contract differentiated between intentional and unintentional land conversion. Specifically, while any loss of forest cover would result in a loss of payments for the affected area, unaffected areas would still be eligible for payment if the loss occurred through no fault of the landowner (World Bank 2012). In Ecuador's Socio Bosque program of

conservation incentives launched in 2008, incentives will be suspended in cases of minor non-compliance, and can be terminated in cases of continued minor noncompliance (resulting in suspension on more than three consecutive occasions) or major compliance problems that affect the conservation area (Manual Operativo 2009). The Ministry of Environment also reserves the right to sanction logging or destruction of native forest or other native vegetation, and to determine the cost of restitution in accordance with applicable law (Manual Operativo 2009).

However, the problem is that sanctions are only theoretically available, because it is not clearly defined that constitutes non-compliance, nor do the relevant documents describe procedures for applying sanctions. As yet, sanctions of any kind have been applied occasionally, if at all, to non-complying participants in any of the three programs analyzed, because of high compliance levels, inadequate verification, or both (World Bank 2012). Controversial sanctions such as requiring that past payments be returned or imposing newly-enacted penalties, have not been an issue because they have not been used (Ibid).

On the other hand, the use of fines and sanctions is controversial because it can undermine reciprocity or other social motives, especially if these sanctions mobilize self-interested motives of compliance (Fehr and Gächter 2000, Bewley 1995; Gneezy and Rustichini 2000; Cardenas et al. 2000), as well as other sources cited in Bowles (1998).

8 Conclusion

To reconcile the reduction of deforestation, which was enforced as a legal obligation in recent years, with increased income, farmers are making their way towards a transition from slash-and-burn practices and implantation of cattle pastures towards sustainable production types. These include cocoa, fruit and vegetables in the case of São Felix do Xingu, but there are also many other ways to reduce deforestation, such as the intensification of pastures, which allows more cattle on the land, the production milk or mechanization of agricultural productions.

In this study, we showed that in the municipality of São Felix, the challenges to such a transition is the lack of knowledge about the alternatives, technical support, financial means and commercialization of these new products. These challenges were not rightfully addressed by the regulation approach of the federal government. A REDD+ project, financed by the international community like the TNC pilot project or by a market could

contribute to address these flaws and encourage small farmers to effectively make this transition.

Our results lead to the conclusion that a REDD+ project should consist of investments into supportive asset-building activities rather than individual use-restricting payments, but that there is no one-fits-it-all solution. Small farmers have different characteristics and needs according to their stage on the transition. Only if the specific needs of the different categories of farmers are met, the farmers will be able to transition towards sustainable alternatives. This implies a governance scheme, which guarantees equity while enabling a control of the conditionality.

This diversity of the farmers' perceptions can be better understood if we consider the transition towards sustainable alternatives as a complex process, and the farmers' needs vary according to their position in this process. Based on this divergence of the farmers' needs according to their profile, the debate on REDD+ should not be limited to whether it should consist of a payment or not, but involve a reflexion on which moment of the transition such a payment or other supporting activities could be effective.

However, it is important to note that REDD+ is not a silver bullet solution for all drivers of deforestation, and one highly debated issue currently is the exact role the instrument will play within the framework of deforestation policies, which has also some exclusive competences. While some authors argue it should be limited to a compensation to even out the negative impacts of deforestation reduction policies, others consider that the REDD+ instrument should become a structuring part of the policy against deforestation. It could also play the role of an overall framework of deforestation reduction policies.

[1] Adafax was created in 2004 with the support of the Gret to support small farmers technically but also represent them politically. The association emerged from the cooperation of three local entities: the Pastoral Commission of the Land (CPT), dealing with the land reform; the Rural Family House, focusing on the education of the youth; and the Cappru, cooperative for the promotion and commercialization of cacao. These three entities decided to create the Adafax to represent small farmers and help them face their challenges.

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