

**Environmental conservation and
coordination aspects**

**“The Nature Conservancy(TNC) Case
Study in Brazil”**

TECHNICAL INFORMATION:

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THE CHALLENGE OF ENVIRONMENTAL CONSERVATION

Brazil has become an important player in the global scenario of agribusiness. The country's participation is relevant, not only for the production of food, but also for that of bio-fuels, fibers, paper and pulp. At the same time, Brazil has the largest tropical rainforest on the planet, including a significant portion of the global biodiversity. Thus, the issues regarding environmental conservation and preservation have now become part of the discourse of all the stakeholders in the agribusiness, i.e. entrepreneurs, the society at large (both local and international), importers, exporters and local communities.

The non-governmental organizations – NGOs - take an active part in this discussion, playing the role of an interface between private enterprise and the public sector. The NGOs have become important allies of the State and of modern society, seeking solutions to the environmental issues. These solutions demand that pragmatic behavior and actions be adopted, with an implied economic rationale. Whereas some NGOs opt for an ideological

discourse, based solely on the idea of environmental conservation and preservation and disregarding the economic and social issues, other organizations believe that the environmental solution must necessarily include the social and economic feasibility of the communities involved. It is through economic feasibility that the base for sustainability will be launched.

Thus, the question is how to promote environmental conservation and the maintenance of production structures (grains and bio-fuels), in areas subject to strong economic pressure (Central Brazil and the Amazon). The present study aims to present and discuss the initiative coordinated by TNC - The Nature Conservancy – in Lucas do Rio Verde/State of Mato Grosso-Brazil and in Angélica/State of Mato Grosso do Sul-Brazil, whose objective is to guarantee the regularization of the Permanent Preservation Areas (*Áreas de Preservação Permanente – APPs in Portuguese*) and Legal Reserve (*Reserva Legal – RL in Portuguese*), in compliance with the Brazilian Forest Code (*Código Florestal Brasileiro in Portuguese*). These two initiatives share the same objective; yet, since they are located in areas with different

production profiles, as well as with different demands and ecosystems as regards the Legal Reserve, they also present customized solutions. In the first case, Sadia is a relevant partner to execute the initiative, and in the second, the partner is Adecoagro, a company in the sugar and alcohol sector.

TNC is a non-profit organization, which has been operating in more than 30 countries, for over 55 years, and it is geared towards the conservation of Nature. TNC has been working in Brazil since the 1980's. Its mission is "to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive."

In the cases being analyzed, besides its scientific knowledge to deal with the environmental issues, and the technology it has developed to enable georeferencing, TNC plays the role of sensitizing, coordinating and aligning the interests of the different economic agents, for the regularization of the reserve areas. This activity is performed, considering the issues of the environmental legislation (namely the Forest Code), the use of technology to map the areas with satellite images and the development of a network of agents

(producers, industries, NGOs, research institutions and public entities). The initiative is undertaken first through pilot projects, in several locations around the country, by making a diagnosis of the environmental liability and identifying the potential areas for the compensation of the reserve areas. Once the model is developed and its efficacy is proven, the plan is to replicate it in other regions. Besides multiplying an idea, the aim is to identify the market mechanisms (a market for conservation land) that would make environmental conservation feasible and interesting, from an economic standpoint.

In the case of *Lucas do Rio Verde*, the most significant economic activity is the production of soybeans. This oilseed is a valuable commodity for international trade, with several applications in agribusiness as a source of vegetable protein, as well as an input for the production of meat and bio-fuels. The activity is also capital-intensive. The production of soybeans is considered an activity involved in the deforestation cycle. Furthermore, as it is a monoculture, this activity is also associated with the reduction of biodiversity and the concentration of income. Yet, it also generates jobs and income, as the HDI

(Human Development Index) of *Lucas do Rio Verde*¹ indicates. In the State of Mato Grosso do Sul, the main agricultural and livestock activity is cattle raising; however, the production of sugar and alcohol represents a significant economic alternative for the region, as it occupies areas of degraded grazing land. The production of sugarcane is in the spotlight of the present debates, as an option of a renewable source for the global energy matrix. Questions regarding the environmental balance in the production of sugarcane raise issues, in terms of the Brazilian competitive advantages for the production of ethanol. The international community, in spite of its lack of knowledge in the matter, cites a series of objections regarding the environmental sustainability of this energy source. The controversy surrounding the production of ethanol stems from the following: the competition between the areas producing bio-fuels and those producing food; the possibility of a negative energy balance, as a result of the fires; the labor conditions and the concentration of income, among others. In view of the broad international market opportunities for

¹ The HDI of *Lucas do Rio Verde* is 0,818. The highest development index is 1.

ethanol and, aware of the importance of the image of its product, the industry regards the environmental issue as a top priority.

All of the above is part of a context, in which a new environmental awareness is taking shape. The climate changes, the recent global catastrophes (tsunamis, floods, drought) as well as the famed global warming have turned the concern with the environment a reality, which has gone beyond the NGOs and the universities, by including the corporate scenario, in the midst of the discussions. At the same time, a conjunctural rise in the price of food commodities due to extraordinary factors, which, together with the increase in the population figures has led some to boast about a renewed 'Malthusian' theory. The question lies in how to include the production of food and the conservation of the environment, in a framework of growing demand, driven by the rise in population and income.

The present study is organized in 4 parts. First, TNC is introduced and some basic aspects regarding legislation and technology, as well as other theoretical points, for the comprehension of the environmental issue. Next, there is a description of the cases being analyzed, and

finally, some considerations are made on several critical matters around this subject.

TNC – THE NATURE CONSERVANCY

TNC is responsible for the conservation of 117 million acres (47,3 million ha) of land and 5000 miles (8000 km) of rivers, in all the countries where it operates, and it is considered the largest environmental NGO in the world. TNC has over 1 million members and a team of more than 700 scientists involved with issues regarding climate change, water, fire, forests and marine ecosystems, among other subjects dealing with the environment. In 2007, TNC presented record revenue of US\$ 1,3 billion, with net results of US\$ 206 million, posting total assets of US\$ 5,4 billion. An important part of these results originates from the activities of purchasing and selling land for conservation. Operating results from the developed programs (84%) and contributions and dues (6%) are the main source of financial resources. As regards the contributions and dues, 61% are from individual contributors, 29% from

foundations, 7% from corporations, and 3% from other sources².

Globally, TNC's strategy is to identify areas that are a priority for biodiversity, as well as to promote actions that seek long term conservation of this biodiversity. The execution of this strategy goes all the way, from implementing actions, to support the creation and management of parks, to the purchasing and selling of public and private land, aiming to its conservation. One of the actions to be highlighted is the incentive for the use of funding mechanisms to implement environmental conservation, as for example, the creation of funds for conservation and payment of environmental services.

A basic premise in finding solutions is to identify the needs of the communities involved, as well as to seek partnerships with the government, research institutions and private enterprise. Among the principles that guide TNC's activities, the following may be highlighted³:

- TNC believes that economic growth and the protection of biodiversity may

² Annual Report 2007 – www.nature.org

³ www.nature.org.br/brasil

coexist and that they are often interdependent;

- The challenges posed by conservation are met by forming alliances and always working together with the local communities, the government, private enterprise and other NGOs;
- The strategies are built on a sound scientific base that helps define the actions and measure the results;
- Above all, TNC tries to reconcile the parts involved in the environmental issues. The consensus among the different sectors has brought about more enduring results in terms of conservation.

In Brazil, TNC operates projects for the Amazon rainforest, the *Pantanal* wetland, the *Caatinga* semi-arid area, the *Cerrado* savannah lands and the Atlantic forest. These actions are developed based on three strategies⁴:

- **Strategy 1 – Guarantee that the rural properties comply with the Forest Code:** TNC shall implement

pilot projects, by means of alliances with rural producers and other players, identifying incentives and opportunities for compliance with the Forest Code;

- **Strategy 2 – Guarantee that the Forest Code is applied in an effective manner:** together with the public prosecutor's office and the municipal secretariats, TNC works for rural producers to be awarded licenses that allow them to comply with the demands of the Forest Code;
- **Strategy 3 – Involve other players:** TNC shall work with corporations, financial institutions, trade forums and opinion drivers, in order to encourage the players in the Brazilian agribusiness to set their environmental standards, in compliance with the Forest Code.

These projects are carried out in two stages:

- **Stage I – Diagnosis –** identify the environmental liabilities of the rural properties in the region. This action is funded by the partner companies, and it is performed by means of a

⁴ The Nature Conservancy – “A vision for agriculture and conservation in Brazil – an invitation to agricultural investors”

geoprocessing software (SIG – Geographic Information System) that analyzes the satellite images;

- **Stage II** – Identify the conservation area to be acquired, as a compensation for the reserve areas. During this stage, TNC counts on the support of research institutions (for example the Forest Lab at ESALQ) to carry out simulations of the cost/benefit scenarios, in order to set up the conservation area. The rural producers may choose to have the reserve in their own land or purchase an area specifically for conservation, together with other producers.

The Forest Code allows the rural producers to acquire an area, outside the limits of their rural estate, to replace the legal reserve. TNC is interested in having this done, in areas that are relevant in terms of conservation, by meeting the specifications of biome, biodiversity corridors and weakened ecosystems. In the long run, TNC believes that this initiative may represent an important market for conservation land, thus creating a financial incentive for conservation and the commercialization of environmental

services. The environmental conservation activity would thus be remunerated and encouraged. TNC's strategic objective is to maximize the conservation of biodiversity by promoting practical solutions that are socially and economically feasible.

TNC is one of the NGOs operating in Brazil, and it focuses on the compliance with the Forest Code. The goal of this initiative is to prove that this compliance is possible, at a low cost, and by a large number of producers. Appendix 2 lists some of the ongoing pilot projects, under the coordination of TNC.

Considering the example of *Lucas do Rio Verde*, the results obtained from the implementation of the pilot projects show that mapping and monitoring the farms, to assess the environmental liabilities, is not only possible, but also effective, in terms of cost and time. In the State of Mato Grosso, TNC has mapped more than 900.000 acres (364.372 hectares) in four months, with very reasonable costs for the georeferencing and monitoring of the system. This cost could be even lower, as the government and a larger number of rural owners become involved. According to a study carried out by TNC, the cost for registering and making the diagnosis of the status of the properties in

Lucas do Rio Verde amounts to R\$ 515,00/estate or R\$ 0,97/ha.

THE ENVIRONMENTAL LEGISLATION AND THE FOREST CODE

As far back as 1605, at the time of the Brazil Wood Rule (*Regimento do Pau Brasil*), the Brazilian government has been concerned with the deregulation and the “disorder”, as regards uncontrolled and non-recovered deforestation. This Rule was followed by other attempts at regulation, as with Law Number 601 of 1850, regarding vacant lands, which penalized those who cleared vacant lands or cleared the land of others. In 1934, Getúlio Vargas approved the first Forest Code, which was later followed by the Hunting and Fishing Code and the Water Code. All these codes were then joined, in a new attempt at preservation, in 1965.

In that year, President Jânio Quadros gathered a group of specialists to form a Work Team that would make proposals to help combat the deforestation, which had not been solved, either by the *El Rey* Codes, or by the other codes passed during the 1930s. The law was passed in 1965 and the new code was called the “Second Forest

Code’. Both in the law of 1934, as in the one of 1965, the preservation criteria were based on the existing vegetation, and they allowed the clearing of three-quarters of the existing vegetation, according to the law of 1934.

In 1989, this criterion was modified, as a result of Law Number 7.803, of 18 July 1989, which added a sole paragraph to article 44 of the 1965 Forest Code. The concept of preservation was then introduced, based on the total area of the property. The conservation criterion of the Legal Reserve, with a minimum of 20% of each property, was then included, and it became valid also for the areas in each property, with a forest cover resembling that of the *Cerrado* savannah lands. It also became mandatory that the Legal Reserve be recovered, through the planting, each year, of a minimum of one thirtieth of the total area. The chronological chart, with the evolution of the environmental legislation, is presented in Appendix 3.

Since that time, Provisory Measure 1956-50 was enacted on 26.05.200, immediately followed by Provisory Measure 2.166-67, of 24.08.2001, which went into effect by means of Constitutional Amendment 32/2001. In summary, the

preservation criteria continued having the total area of the property as the conservation parameter; i) 80% in forests in the Legal Amazon; ii) 35% in the *Cerrado* savannah in the Legal Amazon; iii) 20% in other forms of vegetation and; iv) 20% in areas of the *Campos Gerais* plateau grasslands. Bearing in mind the legal entanglement that governs the environment in Brazil, it seems clear that all these laws, starting as early as 1605, have not solved the problem of forest devastation. Considering the legal and concrete solutions to attenuate the problem, Appendix 4 presents the conservation practices that have been adopted, to compensate for the lack of the reserves.

Since 2004, TNC has been working in Brazil with the goal of implementing the Brazilian Forest Code. The Forest Code regulates on the Permanent Preservation Areas (APP in Portuguese), as well as on the Legal Reserve Areas. An APP must include native vegetation along the water springs, rivers and steep terrains, in order to limit erosion and protect the water resources. The objective of the Legal Reserve Areas is to guarantee a specific percentage of the total area covered with native vegetation, in order to maintain the

ecological conditions in the land used for agropastoralism. As the returns from agricultural and livestock activities are significantly higher than those obtained from the maintenance of forest areas, there is little incentive for keeping the Legal Reserve Areas and the APPs. This is the reason given for the low compliance with the law. Another reason is the difficulty to implement the legislation (lack of financial resources and people, for the necessary monitoring, as well as weak institutions, unable to enforce the law) and the lack of commitment with the environmental issues, on the part of society as a whole. These and other factors have fueled an increasing concern with the level of deforestation that is being observed in Brazil.

In order to seek a solution to this impasse and based on the Provisory Measure of 2001, a way has been found to make the legislation more flexible, with the possibility of compensating for the Legal Reserve in other areas, not necessarily adjacent to the rural property but within the same biome or microbasin. The legislation defines compensation as 'forest easement' (*servidão florestal*, in Portuguese) and the documents representing its property are defined as 'forest reserve quotas' (*cotas da*

reserva florestal – CRF in Portuguese). The administrative regulations for this legislation are presently under judgment. In any case, the CRF opens up an important prospect for Brazil, as it offers landowners the chance to maintain or restore the forests, not only for compensation of the legal reserve, but also for the international carbon market and the protection of biodiversity.

In order to put into practice the compensation of the legal reserve, it is necessary to measure the deficit of these areas, which is defined as ‘environmental liability’. This is the focus of TNC’s activities in Brazil, i.e. to guarantee that the Forest Code is applied. The rationale for the compensation system is presented in Figure 1.

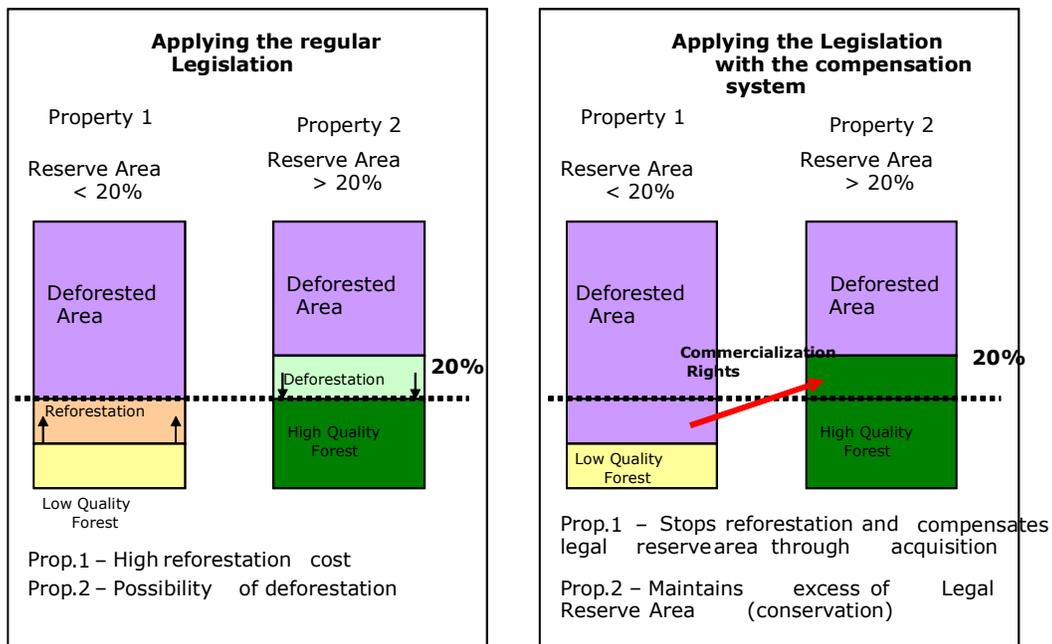


Figure 1 – Compensation System that allows for conservation

Source: Chomitz (2005) - adapted by the authors

Considering the application of the regular legislation, a rural property might have its high quality forest cleared, should this forest represent an area larger than that demanded by law. On the other hand, a

rural property with low quality forest would have to be reforested, if its reserve area were smaller than the percentage set by law. This type of distortion may be corrected by applying the compensation system. Rural

properties with environmental liabilities may compensate their deficit, in areas with higher value for environmental conservation purposes.

It is in fact possible to abide by the law, and there are legal ways to do so. The big problem, faced by those individuals that were penalized by the legislation, lies in the contradictory nature of the legal framework, and in the sudden way in which the rules and regulations, regarding agriculture and livestock farming, have changed. The large hurdles that stop the rural producers in Brazil from rectifying their legal standing are those related with the unstable institutions. This legal scenario is not only muddled, but also difficult to understand; it often lacks content and specific basis for its comprehension, considering the avalanche of changes, alterations and provisory measures. Two Actions for Direct Unconstitutionality were presented to the Supreme Court, with the present legal terms remaining.

The following are some of the doubts on the part of the agents in this sector: i) what are the scientific bases to define the Legal Reserve and the percentages of each property, according to the region? ii) are there more efficient alternatives to preserve

the sustainable use of the natural resources, the biodiversity and the essential environmental functions, in other areas rather than on the rural property? and iii) How long will there be a legal uncertainty, fostered by the Forest Code, which is a true 'patchwork', presently based on a Provisory Measure (MP 2166-67 of 2001), and which places almost all the Brazilian rural producers outside of the law?

TECHNOLOGICAL ENVIRONMENT

The starting point to identify the environmental liability is the mapping of the use and occupation of the land, in a specific municipality. In the case of *Lucas do Rio Verde*, the study also sought to update the cartographic base and analyze the registration data of the rural properties. The study used satellite images to identify remaining forests that might help in the environmental regularization of the properties. All of this data supported the execution of the "*Lucas do Rio Verde Legal*" project, in order to regularize all the rural properties in the municipality in accordance with the Forest Code, eliminate the labor liabilities and the incorrect use of pesticides.

A specialized company was contracted to perform the service of cartographic updating and geoprocessing, to map the use of the land. The work was performed in the municipality of *Lucas do Rio Verde* (MT), one of the areas with the highest production of soybeans, corn and cotton in the country, covering an area of 3.632 km².

The project involves: updating the cartographic base, mapping the vegetative cover and the use of the land, and analyzing the registration base of the rural properties, in this municipality. These are the indispensable tools to consider a project of territorial organization. The main objectives were the following: i) acquisition and digital processing of the Spot4 satellite images; ii) creation of the cartographic base; iii) interpretation and quantification of the areas of vegetative cover; iv) analysis of the rural properties; v) preparation of the theme maps and, vi) preparation of technical reports.

The Spot4 images were processed in a format that would allow their full utilization, to obtain the desired products. The image area covered by the mosaic, made up by the Spot4 satellite images, represents 3658,16 km². This corresponds to the area of the municipality, plus an additional, external

area (or buffer area) of 5 km. Appendix 5 presents a graphic outline of the location of the Lucas do Rio Verde municipality, shown in yellow, with the acquired Spot4 images. The imaging work was performed with a 10 meter pixel resolution, with much higher quality than the traditional 30 meters, used for public studies. Georeferencing was also undertaken⁵. Appendix 6 presents the cartographic base, with the land network.

The level of detail for this municipality is complete. It allows for the overlapping of information pertaining to hydrography, roads, urban areas, agricultural areas, pasture areas, reserves and others. The next steps to be taken by TNC, together with its partners in *Lucas do Rio Verde*, will be the implementation of another tool by the name of 'AGROGEO'. When the data of latitude and longitude are used in this tool with the satellite images, it provides the information regarding present use of the land, deforestation, situation of the Permanent Preservation Areas, Legal Reserve and the sketch of the property limits. This tool, based on the ARQUIGIS software, was customized with funds provided by TNC. This NGO has stated that

⁵ Geometric adjustment of the satellite images on the cartographic base

it would be willing to share the property rights of the tool, so that it might be used by other regions and institutions, interested in organizing their territories, for the purpose of preservation.

INSTRUMENTS OF ENVIRONMENTAL POLICY

Basically, there are two instruments of environmental policy: i) Command and Control Instruments, and ii) Economic Instruments. The former imply that the changes in the behavior of the agents are driven by the enforcement of the law: technical parameters, rules, regulations, procedures and standards, to be met by the economic agents, in order to comply with the environmental goals. These instruments have a punitive nature, and they foresee penalties. For their efficacy, the State needs to monitor, inspect and hold the economic agent accountable, in order to guarantee law abidance. Thus, the government's role as a regulator and that of police force must be directly associated, and there is also the additional need for financial resources. This may have a negative impact on the economic results of the activity (resulting in a rise in the cost of production/transaction).

On the other hand, the economic instruments are based on market forces. The economic agents – polluters and users – include the environmental aspects in their decisions, in a socially desirable way. The driving force is the polluter-payer principle⁶. The limitations to this model include the following: the results are less foreseeable when compared to direct regulation, and the fines may be set at very low levels. When fines are very low, 'crime pays off', and polluters prefer paying the fines, rather than having the necessary controls. Thus, there is no improvement in the environmental conditions. The advantages would be: the results are achieved at a lower social cost; there are incentives generated, for the companies that seek clearer and cheaper technology; and technology may be transferred between the players.

⁶ The polluter-payer principle may be defined as the economic resource that is used so that the polluter bears the costs of the polluting activity, i.e. there is an internalization of the external effects (externality), which affects the final cost of the products resulting from this activity. Seen from a different angle: 'the objective is to force the agents producing the externalities to bear the costs imposed on other agents, be they producers and/or consumers.'

The evidence suggests that the Command and Control Instruments have been insufficient as mechanisms to guarantee the results of the environmental policies. The Amazon issue presently under discussion shows this to be true. It becomes necessary to apply economic instruments, to offset the opportunity cost of conserving the forests in private areas, which leads to the concept of Payment for Environmental Services (*PSA in Portuguese*).

Normally, the Command and Control Instruments and the Market Instruments are used simultaneously, and it is necessary to find the complementary characteristics between them. The idea is to meet the public policy goals, at the lowest possible cost for society. Thus, the discussion on environmental adequacy does not need to be limited to the legislation. Likewise, the issue regarding the Legal Reserves does not need to be restricted to the Forest Code. The Payments for Environmental Services, as market tools, may help to resolve these legal conflicts, as well as improve the environmental preservation processes.

What exactly are these Environmental Services? They are defined as the useful services, offered to Man, by the ecosystems, as for example: the

regulation of gases (production of oxygen and carbon sequestration), scenic beauty, conservation of the biodiversity, protection of the soil and regulation of the water functions. Rural producers have no incentives to offer these environmental services. Should they have such incentives, they would surely respond to this demand for environmental services.

The Payment for Environmental Services (PSA) may be seen as a way to 'involve' the forest dwellers, in the control of the forest's natural resources. In this case, the forest dwellers would also receive a 'contract payment', for the service of building awareness and inspecting. The people in this category would be the Voluntary Environmental Agents. Another way of looking at the PSAs would be to offset the loss of competitiveness or remuneration, resulting from the compliance with forest management rules (additional cost) or with protection (within the Conservation Units). In this category, a PSA could be considered for loggers, who, by law, are obliged to draw up a management plan for lumbering. This would then be called 'compensation'. The PSA may also be regarded as a way to reward the forest users who, voluntarily, adopt rules or

practices, in order to maintain the environmental services. Within this category, we could include the rural producers who decide to implement agricultural and forest systems (*SAF in Portuguese*) or reforestation, to compensate for forest deficiencies, in third party properties.

The systems of payment for environmental services are mentioned by many researchers, as possible ways to solve the impasse of environmental preservation vs. agricultural production and livestock activities. The preservation and sustainable management of the soil, the water and the forest may be regarded as examples of environmental services. With the correct rules in place, these ecosystem-type services may become additional sources of income that would cover the costs of maintenance, as well as the opportunity costs of conservation practices. By means of the supplier-receiver principle, the rural owner or producers receive payment for the services as they increase the flow and quality of the environmental services, rendered to society.

Examples of this type of payment for environmental services in Brazil are the following: i) Tax Exemption for Private

Reserves of the Natural Patrimony (*Reservas Particulares do Patrimônio Natural - RPPNs*). This is a mechanism for the exemption of the Rural Property Tax (*ITR in Portuguese*) of the protected areas, as for example, the Private Reserves of the Natural Patrimony (RPPNs). "Society" agrees not to receive payment of the ITR, and the owner creates the Conservation Unit (*UC in Portuguese*); ii) Forest Easement (*Servidão florestal in Portuguese*). This is a system for the commercialization of forest reserve quotas: the owner of a piece of land, with a Legal Reserve area smaller than legally required (80% of the total area of the property in the Amazon), compensates, via the market, another owner, whose property has a Legal Reserve larger than legally required; c) Carbon Market: this mechanism, called 'Clean Development Mechanism' (*MDL in Portuguese*) allows a company with emissions above its quota (set by the Kyoto Protocol) to buy, via the market, 'carbon credits' from another company or project, whose emissions are below its quota or one who sequesters carbon. This mechanism is not geared to the established 'clean' activities; d) Ecological ICMS: In Brazil, since 1988, the states must transfer 25% of

the value of the Tax on the Circulation of Goods and Services (ICMS) to the municipalities. Some states have recently created the Ecological ICMS, which allows 5% of this amount to be allocated, according to environmental criteria (the existence of Conservation Units, the quality of their management). Under this mechanism, the resources go from the tax payer (via the ICMS) to the Municipality.

There is still a need to define the rules and agreements between the economic agents, so that the services to compensate for the Legal Reserves may be implemented, in an effective manner. TNC has some suggestions for this type of land organization, including notions of similar types of soil, watersheds, similar areas and others.

LUCAS DO RIO VERDE/MT

The municipality of *Lucas de Rio Verde* is located in the State of Mato Grosso, in the microregion of *Alto Teles Pires*, and the predominant ecosystem is that of *Cerrado* savannah. According to the Forest Code, the municipality is included in an area where the rural properties are obliged to keep 35% of their area, in the

form of a Legal Reserve. The region's agricultural background is linked to the incentives, given by the military government in the 1970s, to occupy the land with rural settlements. Rural producers from the south of the country, mainly from the states of Rio Grande do Sul and Paraná, settled in the region and started occupying the area, investing in land for the production of grains. According to the IBGE, in terms of land distribution, 44% of the rural properties are below 100 ha and occupy 4% of the region, while 19% of the properties have more than 1000 ha and account for more than 67% of the fertile land.

Presently, the municipality of *Lucas do Rio Verde* is a development center for the country, with one of the highest HDI⁷ (Human Development Index) figures in the Brazil. The municipality has a population of 30.741 inhabitants⁸, and its per capita income amounts to R\$ 28.849,00⁹. It is a well-known center for the production of grains¹⁰, more specifically soybeans. The municipality has also attracted investment from industries, interested in this raw

⁷ HDI=0,818

⁸ IBGE, 2007

⁹ IBGE, 2005

¹⁰ The *Lucas do Rio Verde* Municipality accounts for the production of 1% of the Brazilian soybean crop.

material for the production of animal protein. At the present time, there has been a growth in activities related with the production of poultry and pigs, involving cooperatives and companies as Sadia, who work with integrated production.

The entrepreneurial profile of this municipality has led to partnerships, for the implementation of the project called "*Lucas do Rio Verde Legal*". This project aims to regularize the environmental and labor liabilities of Lucas do Rio Verde. The goal is: to recover the areas of water springs that have been illegally cleared, meet the demand of keeping the native vegetation on 35% of the property and guarantee that the workers are employed in compliance with the labor laws. This partnership involves private companies (Sadia, Syngenta¹¹ and Fiagril¹²), representatives from the rural producers (*Sindicato Rural de Lucas do Rio Verde*), NGOs (TNC, *Fundação Rio Verde*) and public entities (Lucas do Rio Verde City Hall, Environment Secretariat - *Secretaria de Meio Ambiente – SEMA* and the Public Prosecutor's Office). To implement the pilot

¹¹ A company that produces and sells pesticides and seeds.

¹² This company does business in: commercialization and representation of agricultural inputs; receiving, storing and commercializing grains, and presently, it has investments in a plant of bio-diesel.

project, 680 producers were registered and Stage 1 – mapping the deficits in reserve areas – has already been concluded. The work has covered 99,9¹³% of the assessed areas, with the corresponding isolation of the APPs (Permanent Preservation Areas). According to the Mayor, Mr. Marino José Franz, the goal is "*.... to be the first municipality in the State of Mato Grosso, to achieve full compliance with the law, thus demonstrating that an alliance between production and the environment is possible.*"

A study carried out by SEMA points out that, from a total of 612.000 hectares, the environmental liability amounts to 74.600 hectares, i.e. there is a deficit of 12% of the Legal Reserve Area¹⁴, considering the demand of 35% for this region. The size of this deficit indicates that the recovery of the Legal Reserve areas will not be achieved, only through compensation areas. This means that there is a need for replanting, to solve the problem.

The success achieved in Stage 1 would not have been possible, without support from the partners. Each company made an initial donation of R\$ 115.000, and

¹³ Only 1 rural producer in the Lucas do Rio Verde Municipality did not adhere to the project.

¹⁴ Report Nr. 2 - "Review and lessons learned from 3 TNC projects – Robert Schneider, TNC Consultant"

they also contributed with the work of their technicians and their institutional support. The public institutions also played a significant role. Their deep involvement with this initiative afforded the project great credibility and guaranteed the commitment, on the part of the producers, as well as the monitoring of the activities. The role of promotion and communication belonged to the private companies. More specifically, this was done by Sadia, who involved its technical teams and integrated producers, thus spreading the project. Sadia's participation included: the implementation of programs, geared to building awareness in good production practices; the publication of information folders and the sponsorship of events and presentations on the subject. The company also offered financial support to carry out the diagnosis, which allowed us to map the areas, with the use of satellite images. It should also be highlighted that Sadia's opening of this industrial plant, in the Lucas region in 2005, with an investment of approximately R\$ 800 million, stemmed from the company's social and environmental policies. The partnership with TNC in the "*Lucas do Rio Verde Legal*" project joined the interests of both organizations.

The partnership with the Public Prosecutor's Office (MP) and SEMA was also extremely important for this project. According to the MP, the producers who volunteer to sign the 'Conduct Adjustment Term' (*Termo de Ajustamento de Conduta – TAC in Portuguese*), receive an abatement of 90% of the possible administrative penalties, besides the chance to pay the debt in installments. The possibility of the producers being held liable for environmental infractions means more resistance in adhering to the project. However, the MP states that their voluntary adhesion is important, to assess their level of responsibility. Among the issues considered in this assessment, there is the date of clearing, which often is the responsibility of another party and not of the present owner. For the MP, the goal of this partnership lies in the recovery of the environment, rather than in penalizing the producers.

The project in Lucas is now entering in its Second Stage, which includes the identification of the areas to compensate for the Legal Reserve. This action represents a series of challenges: i) identification of the area for conservation purposes; ii) solving the issues regarding the appropriation of the

property rights of the different producers, in a single area; iii) evaluating and paying for the costs, stemming from this initiative (recovery of the APPs and of the reserve areas and/or acquisition of the areas for compensation). All of the above involves a sophisticated structure that contemplates both the legal and institutional issues, as well as the interests of the producers and the necessary, available, financial resources. However, the results are already tangible. The involvement of the producers in the project, the creation of a network of companies and institutions, geared to

solving the conservation problem, and the repercussion of this initiative, in other parts of the country, are examples of the results this project has already achieved. As a matter of fact, the State Assembly of Mato Grosso is considering the approval of a decree, for the creation of the 'Program for Environmental and Agricultural Regularization in the Municipalities of the State of Mato Grosso', named "*Mato Grosso Legal*". The summary of the results already achieved by the "*Lucas do Rio Verde Legal*" project is presented in Chart 1.

Chart 1 – Results - "*Lucas do Rio Verde Legal*"

Activity	Results
Project Schedule	Stage 1 finished – 680 producers involved Stage 2 – being implemented
Coverage	99,9 % of the area of the Municipality has already been mapped
Environmental liability	12% - liability of 74.600 ha from a total of 612.000 ha in the Municipality
Signature of 'Conduct Adjustment Term' (TAC)	Ongoing – Partnership with the Public Prosecutor's Office places the focus on the recovery of the environment rather than on penalizing the producers. By voluntarily signing the TAC there is an abatement of 90% of the possible administrative penalties, besides the possibility of paying the debt in installments.
Creation of a network of partnerships	Rural Producers, industries, City Hall, Public Prosecutor, NGO and Representatives of the Rural Producers form a network of acting partners, geared to the regularization and recovery of the Legal Reserve Areas in the Municipality.
Multiplying effect	The State Assembly of Mato Grosso is now considering a decree, dealing with the creation of the 'Program for Environmental and Agricultural Regularization in the Municipalities of the State of Mato Grosso', called " <i>Mato Grosso Legal</i> "; similar pilot project in other areas (Santarém/PA, Angélica/MS, Guarapuava/PR).

Source: the authors

ANGÉLICA/MATO GROSSO DO SUL

The partnership between Adecoagro and TNC started in Mato Grosso do Sul, more specifically in the Municipalities of Angélica and Ivinhema, in the area of sugar cane and alcohol production. Adecoagro is in the business of agriculture and the company's investors are of Brazilian, Argentine and American origin. Presently, the company works in the production of grains (mainly soybeans, corn and rice), cotton, high quality coffee, milk and agro energy (sugar and alcohol). In Brazil, the agricultural activity is centered on the production of high quality coffee, cotton, sugar and alcohol.

In 2006, the company started the construction of the mill, in the municipality of Angélica, in the State of Mato Grosso do Sul – Angélica Agroenergia – with a capacity of 3,5 million tons. This is a large project, encompassing three mills and the exploitation of approximately 150.000 hectares of sugarcane. At full capacity, this project will account for 11 million tons of sugarcane. The total investment has been estimated at US\$ 1 billion, including the purchase of the land, for the production of

sugarcane, and the construction of the three mills.

In Mato Grosso do Sul, few rural properties abide by the environmental legislation. Adecoagro is interested in complying with the Code because, not only is this coherent with its strategic position¹⁵, but also, the company needs to have access to the international market and guarantee that it obtains all the environmental licenses, needed for the operation of the mills. Moreover, there is a concern about the rising campaign against the production of bio-fuels. The estimated 150.000 hectares of sugarcane, necessary to supply the three mills - 20% of the land is owned by the company and the rest is rented - need to be in compliance with the demands of the Forest Code.

The compensation model for the reserve area, to be developed in Mato Grosso do Sul, is different from the one in *Lucas de Rio Verde*. Adecoagro has plans to purchase a total of 18.144 hectares of land, which will compensate for the legal reserve areas – their own production and that of the tenants – for the sale of

¹⁵ According to the company representative, Adecoagro “seeks to increase the value of its agricultural business through efficient production and social and environmental responsibility.”

environmental services to its suppliers, at a later date. For this purpose, the company is estimating a total investment of US\$ 24,5 million (purchase of the land, registration and other services). Part of this amount has already been invested in purchasing 1458 hectares, to compensate for part of their environmental liability, within their own production area. Payment for the environmental service will be made proportionately to the environmental liability of each tenant, and the cost of this service equals half of the value paid for renting the land, used for sugarcane production: R\$/ hectare. The incentive for the tenants to become involved in this project lies in the profitability of the production of sugar and alcohol vis-à-vis the other alternatives for production in the region (mainly cattle raising). Another factor is the restriction to do business with Adecoagro, should the reserve and the APPs not be regularized.

From the standpoint of Adecoagro, the solution to sell environmental services is interesting because, not only does it solve the problem of complying with the Forest Code, but it also creates a new business opportunity, besides making the tenants 'loyal' to the company.

According to the company, the tenants who have already been contacted in this regard have shown interest in participating in the project. Likewise, the State institutions have also expressed an interest in identifying solutions to the environmental problems. These solutions should be feasible, and they must also guarantee some financial return, for the conservation initiatives.

THE BIG CHALLENGES OF THE MODEL

TNC's initiative represents a pragmatic solution to the problem of conservation, specifically as regards the regularization of the legal reserve areas, in regions where there is substantial economic pressure. This solution focuses on providing market mechanisms that will, in turn, offer the incentives necessary for their implementation. The rationale for this is based on the assumption that there is a drop in the costs of transaction¹⁶, which, in turn, leads to a discussion regarding the

¹⁶ According to Yoram Barzel (2001), the transaction costs are those costs involved in transferring, capturing and protecting the property rights. According to Oliver Williamson (1985) they are 'the costs involved in planning, adapting and monitoring the execution of the tasks.'

factors critical for success. This analysis is based on three main pillars: i) the institutional aspects; ii) the technological aspects and credit; iii) Governance and iv) mechanisms for incentive and control.

Institutional Aspects

In the case being analyzed, there is an appropriate and pertinent piece of legislation – the Forest Code – to deal with the issues of restoring the Legal Reserve Areas, particularly as regards the opportunities to do so, by means of the compensation areas. It is not clear, however, how this compensation can actually take place. The legislation of different states contains specific items that need to be taken into consideration. Each state may interpret the legislation in a different way, and it may also understand differently, the way such compensation may be put into practice. This may hinder the spreading of the model, to other regions in the country.

Another point has to do with the need for the compensation to be made in areas of the same biome and micro basin. This demand, despite its logic in terms of environmental conservation, turns the assets specific to a particular location. This,

in turn, represents a difficulty for the compensation to occur between private properties, in areas with high anthropic pressures. In other words, some regions, as for example the Center Region of Brazil, may face difficulties to regularize the Legal Reserve Areas, only through compensation. The reason for this is the lack of large areas covered with native forests, which leads to the need of reforestation.

It is fact that the mere existence of a piece of legislation does not guarantee its compliance. In the cases being analyzed, more specifically in the Lucas example, the partnership with the Environment Secretariat, the Public Prosecutor's Office and the Municipal authorities guarantees the power of 'enforcing' the legislation and the other agreements. The question is whether this partnership is of a temporary nature, given the well-known vulnerability of the agreements with public institutions, subject to changes depending on their political orientation (lack of project continuity).

Another relevant issue to be discussed is the legal uncertainty, generated by an institutional context, in which the rules are not clear cut. The legislation that governs the model is based on Provisory Measures, Administrative Rules and

Decrees, which, in other words, means the rules of the game are unclear.

Some uncertainties are part of the model, and some have already been indirectly mentioned. The doubts regarding the actual penalties and/or liabilities, as a result of environmental crimes, as well as the ambiguity regarding possible changes in the legislation bring on transaction costs for this model. When the producers sign the 'Conduct Adjustment Term' (*Termo de Ajustamento de Conduta – TAC in Portuguese*) at the Public Prosecutor's Office and register the Reserve Area, they become responsible for recovering the area, even if the legislation changes. For example, if the obligatory percentage of native vegetation is changed, the owners cannot alter the agreement they have signed. As some producers have stated, this legal uncertainty leads to questions and reluctance, on their part, to sign the TAC. These uncertainties and others – land titles, regular registration of the reserve areas in joint compensation areas, sale of environmental services – mean higher transaction costs for the project.

As part of the discussion regarding the institutional aspects, the analysis of the '**property rights**' is a crucial issue. The

question is how to deal with the property rights, in the case of joint compensation areas. Stage 2 of the "*Lucas do Rio Verde Legal*" project is now being implemented. Besides the difficulty to identify adjacent areas, with accepted value in terms of conservation and within the same biome of the rural estates being analyzed, each portion of the land needs to be registered, according to the official Registry Number of the rural properties being compensated. This operation is technically and legally feasible, yet its implementation is far from being a trivial matter. The issue becomes even more complex, when it is analyzed in terms of family succession rights or even the sale of parts of the property.

When the analysis deals with the payment of environmental services, as a way to regularize and remunerate the Legal Reserve areas and as suggested by the model to be adopted by the State of Mato Grosso do Sul, further difficulties arise. According to this model, the compensation for the Reserve is done through the payment of environmental services, rendered by a third party, who keeps a portion of the land with native vegetation, proportionately to the deficit of the contracting properties. In this regard, there

is the problem of contracts. Which model of contract should be signed by the parties, to guarantee the transitory transfer of property rights, on the Legal Reserve area? What are the conservation guarantees, as regards the validity of the contract, should either one of the parties no longer be interested in it? How should this complex structure be executed, within the legal standards? To what extent is this strategy of selling environmental services to potential suppliers of the mill, not a loss of independence for the producers, in their decision making process?

The issue regarding property rights becomes even more critical, in regions where these rights are not clearly stated. An example of this would be the regions, in which there is a set of 'modalities' regarding land ownership. There are trespassers, squatters and even properties with more than one title to the land, which makes the issue of responsibility, for the deficit of the Legal Reserve, a complicated matter. In regions where the property rights are not legitimate, initiatives of the kind that is presented in this work are very difficult to implement.

Technological aspects and credit

The key for the success of this project is having the technology, to map the rural properties and to make the diagnosis of the deficits in vegetation cover, at a low cost in terms of financial resources and time. The costs presented for the mapping of the Lucas Municipality – cents of Real per hectare in some regions – and the speed with which this was done show that the technological barrier has been overcome. It is our understanding that, when more rural producers join the project, the cost will be increasingly lower, allowing for the identification of other environmental liabilities, in different regions around the country. This mapping will permit the identification of customized solutions for each region, based on the existence or not, of potential areas for compensation. This, in turn, will be a starting point to define the corresponding public policies.

Thus, it becomes clear that the technology for the geoprocessing of images is of utmost importance, for the efficiency of the model presented in this study. Investment in R&D, as well as the availability of technology that is becoming ever more precise and readily available, are

critical factors, for the success of these pro-conservation initiatives.

The analysis of this case points to the need of having the support institutions, as the ones dealing with research and credit, become part of the model. The issue of how to purchase the compensation areas, or how to replace the forest areas, is basic for the feasibility of the model. The existence of credit lines, with compatible interest rates, is also key to reach the proposed objectives. The availability of credit refers, not only to the joint purchase of areas for the compensation of the Legal Reserve, but also to the recovery of areas, through reforestation and the construction of nurseries. On the other hand, this type of investment may turn out to be a new business opportunity for some entrepreneurs, thus feeding and building a future market for conservation.

Governance: horizontal and vertical coordination

Building a network of partners is another key factor. Coordinating different economic agents with conflicting interests is a complex task, albeit of a fundamental nature. This coordination and alignment of interests demands that one of the parts

takes on the role of coordinator. In the proposed model, this role belongs to TNC. TNC is an NGO with great international visibility, who has made specific investments to build this model (developing technology and contributing with human resources, as for example, by hiring scientists specialized in environmental issues). Other formats may come up, with different models and other coordination profiles. However, it is necessary to create coordination structures: horizontal ones (networks of companies – both public and private organizations) and vertical ones (producers and the industry). Vertical coordination means higher efficiency in transferring the incentives, generated from the final consumers.

The network organization results in externalities, which in this case, are positive. Each new producer involved means others will want to participate, thus reducing the natural reluctance to adhere to the proposal, and also guaranteeing a critical mass and the effectiveness of the project. It also creates a cooperation environment to allow joint investments – for the building of nurseries and or the acquisition of areas to compensate for the Legal Reserve. The activity of the network also promotes trust and a good reputation.

Incentives and Monitoring

In order to conclude the analysis, it is important to discuss the incentives generated for the agents, and the way the results can be monitored. We start with the premise that each agent becomes involved in the initiative, based on the identification of potential gains (benefits), which may, in turn, become incentives in favor of cooperation. By constantly monitoring the results, it is possible to detect the commitment of the different parties, as well as to set mechanisms for adjustment and correction, as time progresses.

For the case being analyzed, the rural producers and the industry need to guarantee their access to the international markets. In other words, the product being sold must have credibility. The public institutions and the government entities are interested in protecting their reputation and in being recognized for their efforts, in favor of conservation. The pressure exerted by the international community is a strong stimulus, to seek solutions to the environmental issues. This is also related with the necessary acknowledgement of

Brazil, as a country that is aware of its limitations, as regards environmental and social matters, but one that is also proactive, in solving its problems. The organizations in the third sector, as well as the support institutions, are included in this process, since its objectives are in line with their long-term organizational vision. This opens up an opportunity, for the creation of certification mechanisms that guarantee the origin and the quality of the products being offered. Certainly, the certification becomes an incentive for the agents to become involved in a project for environmental conservation, in areas under strong economic pressure.

It is also very important to have mechanisms for monitoring, be it through the use of the available technology (mapping the areas to follow up the status of the environmental liabilities), or by strengthening the established partnerships (spreading and encouraging the practices, with the corresponding follow-up of the properties). Furthermore, the penalties and fines, applied to those parties who do not meet the goals of the project, must be actually enforced.

Transaction Costs

According to TNC¹⁷, “the pilot projects have the following results: fostering the creation of an institutional base for the implementation of the Legal Reserves; helping to reduce the transaction costs; adding scientific criteria, to allocate the best areas for conservation; helping to improve the performance of governments; adding value, by introducing environmental benefits and contributing towards the national debate about the Forest Code”.

The key concept in this case is that of ‘**transaction cost**’. Its reduction or minimization is related with the key issues mentioned above: a strong institutional environment; clear property rights; coordinated institutional arrangements; reduction of an opportunistic behavior by the different parties and fewer uncertainties, among other factors. Strategies must be built, in order to reduce the transaction costs involved, thus opening new opportunities for the markets to work efficiently.

¹⁷ TNC Executive Summary – *Promovendo a Conservação da Biodiversidade via a efetivação das Reservas Legais – Uma visão estratégica para a TNC*, Robert Schneider.

The model presented in this study demonstrates that there can be a ‘win – win’ relationship between the different agents: the government, the rural producers, the industry and society. The government is interested in reducing the costs of enforcing the Forest Code. In the case of the private sector, the key factor lies in reducing the cost of compliance with the environmental legislation. The conservation of the environment is the final link in this virtuous circle, in that, the existence of a market solution to the environmental problem reduces the transaction costs.

ISSUES FOR DEBATING

Considering the pioneering nature of the cases being analyzed, it is difficult to conclude this study without raising a set of issues for debate. Success in the case of the “*Lucas do Rio Verde Legal*” project results from a set of converging, favorable factors: the entrepreneurial profile of the region, rural producers with capital to invest and local, private and public organizations that are sensitive to the environmental issues.

However,

- To what extent can the Lucas model be replicated in other parts of the country? What would be the necessary adjustments?
- How can credit lines and funding be made available, to balance the costs of recovering the APPs, the Reserve Areas and the purchase of areas for compensation?
- What would be the incentives to make the payment for the environmental services feasible?
- How to take advantage of the interest on the part of international investors, in order to implement models of environmental conservation that are in line with the country's need for economic development? Are the 'markets for conservation land' an alternative?

The issues above are only part of the questions. The concrete and legitimate matter is the need to seek solutions that result in the conservation of the natural resources and in sustained, economic and social development. Sadia and Adecoagro, among other companies, are private organizations which, by actively participating

in these initiatives, demonstrate their important role in the construction of a chain of value towards environmental sustainability. The efforts being made to harmonize and develop models, in which the social and environmental dimensions are aligned with economic growth, demonstrate the actual possibility of thinking in terms of sustainable development.

The analysis of these initiatives coordinated by TNC has shown that environmental sustainability demands that market mechanisms be created and implemented, so that economic solutions can be found for conservation. However, the implementation of these mechanisms depends on the existence of complex cooperation networks, in which the industry, the rural producers, the Government and the NGOs are involved, albeit acting in synergy, to generate a 'win-win' situation.

NOTES FOR DIDACTIC AND THEORETICAL SUPPORT

The present study was developed, based on the theoretical premise proposed by the New Institutional Economics (NIE). The solution to the environmental issues demands the identification of market mechanisms that create incentives, for the

economic agents to adopt practices, geared towards environmental conservation. The reduction of transaction costs lies at the core of this issue. The NIE allows us to analyze the model proposed by TNC and its partners, based on the study of a set of dimensions, among which the following may be included:

- Governance of the agricultural and industrial systems: horizontal and vertical integration;
- Attributes of the transaction: specificity of the assets, frequency and uncertainty;
- Appropriation of Property Rights;
- Analysis of the Institutional Context and the 'rules of the game'.
- Mechanisms for the Incentive and Monitoring of the economic agents.

It is our understanding that, based on this analysis, it will be possible to identify the potential and the limitations of the Lucas do Rio Verde/MT model, so that it may be replicated in other regions of the country.

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Support & Revenues	Dues and contributions	378.297	424.685
	Private contracts	25.639	19.747
	Government grants	109.637	101.232
	Investment income	350.826	218.978
	Other income	35.603	35.093
	Land sales and gifts	377.439	285.934
	Total Support & Revenues	1.277.441	1.085.669
Expenses & Purchases of Conservation	Conservation Activities and actions	338.293	298.474
	Purchases of conservation lands and easements	566.472	243.994
	Total Conservation Program Expenses & Purchases of Conservation Land & Easements	904.765	542.468
	General and administrative	101.707	86.311
	Fund raising	48.165	46.664
	Membership	16.903	16.276
	Total Administrative & Fund Raising	166.775	149.251
	Total Expenses & Purchases of Conservation Land & Easements	1.071.540	691.719
	Net Result-Support & Revenue over Expenses & Purchases of Conservation Lands & Easements	205.901	393.950
Fund Raising Summary	Fund Raising expenses as a percentage of total expenses & purchases of conservation land & easements	4,5%	6,7%
Assets, Liability & Net Asset Summary	Conservation Land	1.780.350	1.502.629
	Conservation easements	1.161.434	1.079.115
	Investments held for conservation projects	630.744	491.305
	Endowment Investment	1.161.229	922.044
	Planned giving investment	298.528	257.656
	Property & Equipment (net of depreciation)	92.628	88.351
	Current assets	186.119	379.755
	Other assets	104.480	107.639
	Total Assets	5.415.512	4.828.494
	Current liabilities	114.567	102.490
	Notes payable – long term	417.091	340.864
	Other liabilities	156.486	128.565
	Total net assets	4.727.368	4.256.575
	Total liabilities & Net Assets	5.415.512	4.828.494

US\$)¹⁸

Appendix 2 – Pilot Projects – Strategy 1 TNC

Pilot Project	Partners – public institutions	Partners - corporations	Partners - producers	Other partners	Number of Properties
Lucas do Rio Verde	Secretariat of the Environment MT (SEMA), Municipality of Lucas do Rio Verde	Sadia, Fiagril, Syngenta	Rural Union LRV, Association of Soybean Producers of MT (Aprosoja)	Imazon, ISA (<i>Instituto Sócio Ambiental</i>), <i>Fundação Rio Verde</i>	775
São Lourenço	Mato Grosso (SEMA), Secretariat of Planning	Caterpillar	<i>Federação de Agricultura de MT (Famato)</i>	<i>Instituto de terras de Mato Grosso (INTERMAT)</i> , ESALQ	2000
Santarém	Public Prosecutor's Office of Pará State for environmental issues	Cargill Agrícola and Fundação Cargill	Santarém Rural Union (SIRSAN)	Imazon, Emilio Goeldi Museum/Pará	375
Guarapuava	<i>Instituto Ambiental do Paraná (IAP)</i>		<i>Cooperativa Agrária Mista entre Rios</i>	<i>Valls, Reserva do Brasil</i>	320

Source: The Nature Conservancy: A vision for Agriculture and conservation in Brazil – An invitation to agricultural investors

Appendix 3 – Chronology of the environmental legislation in Brazil

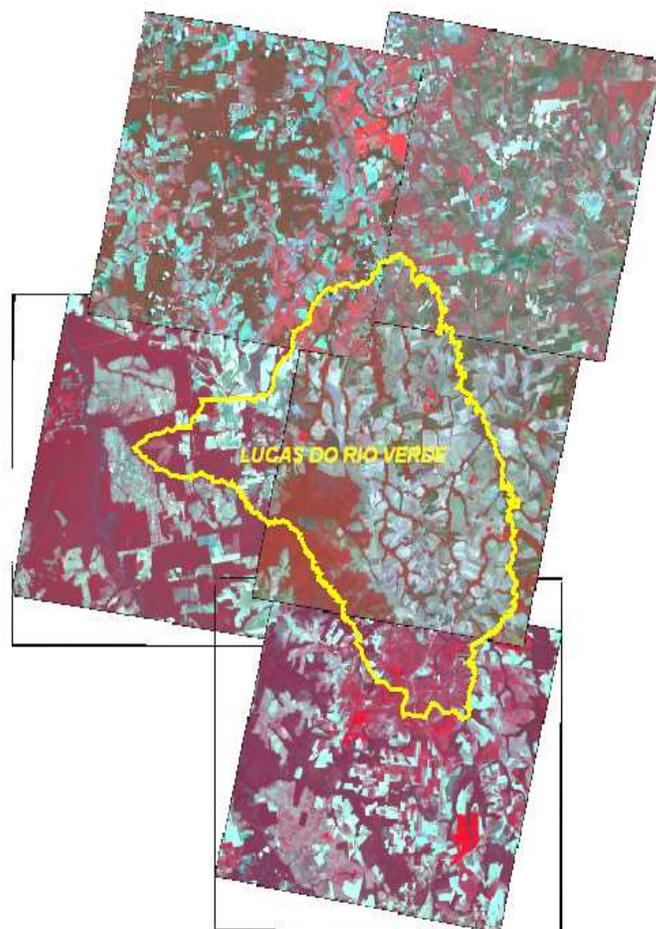
1500 – 1822 Colônia	1822 - 1889 Império	1889-1930 República Velha	1930 - 1964 1º Código Florestal	1965 – 2000 2º Código Florestal e suas alterações	2001 em diante Fase 2 - 2º Código Florestal
<ul style="list-style-type: none"> ✓Colonização; ✓Exploração da madeira (móveis e navios); ✓Pau-Brasil; ✓Captanias Hereditárias; ✓Escravidão; ✓ Açúcar, ouro, grande propriedade agrícola. <p>Regimento do Pau-Brasil (1605)</p>	<ul style="list-style-type: none"> ✓Colonização; ✓Povoação; ✓Abertura de estradas; <p>Lei 601 (1850) Terras Devolutas</p>	<ul style="list-style-type: none"> ✓Domínio político das elites agrárias (MG, SP, RJ); ✓Café: influência político-econômica; ✓Projetos de criação de parques nacionais; <p>“Mapa Florestal do Brasil” (1911)</p>	<ul style="list-style-type: none"> ✓Amazônia Legal; ✓Ocupação e desenvolvimento; ✓Exploração da madeira; ✓Transição entre elite rural e industrialização e urbanização; ✓ Constituição de 34: proteção da natureza. <p>Código Florestal (1934)</p>	<ul style="list-style-type: none"> ✓Industrialização; ✓Regime Militar; ✓Abertura econômica; ✓Ambientalismo (Estocolmo 1972); ✓Globalização. <p>Código Florestal (1965)</p>	<ul style="list-style-type: none"> ✓Abertura econômica; ✓Densa legislação ambiental; ✓Produção e exportação de alimentos; ✓Amazônia em foco; ✓Pressão das ONGs. <p>Código Florestal (1965) e suas mudanças</p>
<p>Carta Régia (1797)</p> <ul style="list-style-type: none"> • Proibição de cortar o Pau-Brasil; • Preocupação com a derrubada das matas e madeiras relevantes para a Coroa. 	<ul style="list-style-type: none"> • Penalidades para quem desmatasse áreas de terras devolutas ou alheias 	<ul style="list-style-type: none"> • Parque Estadual de São Paulo (1896); • Decreto 8843 (1911) 2 Parques Nacionais no Acre. 	<ul style="list-style-type: none"> • Código de caça e pesca (1934); • Parque Nacional de Itatiaia (1937); • Parque Nacional do Iguaçu (1939). 	<ul style="list-style-type: none"> • Instituto Brasileiro de Desenvolvimento Florestal • Áreas de proteção ambiental • Reservas ecológicas • Convenção de Zonas Úmidas (Ramsar) • Estatuto do Índio • Secretaria Especial do Meio Ambiente; • IBAMA 	<ul style="list-style-type: none"> • Sistema Nacional de Unidades de Conservação da Natureza (SNUC); • Importância de Tratados como a CDB; • Processos sobre Reserva Legal; • Setor privado se articula.

Sources: Boris Fausto; Rodrigo Medeiros; The Senate. Cited by Lima, R. *Instituto Artes*, 2008

Appendix 4 - Concepts related with the conservation of vegetation areas

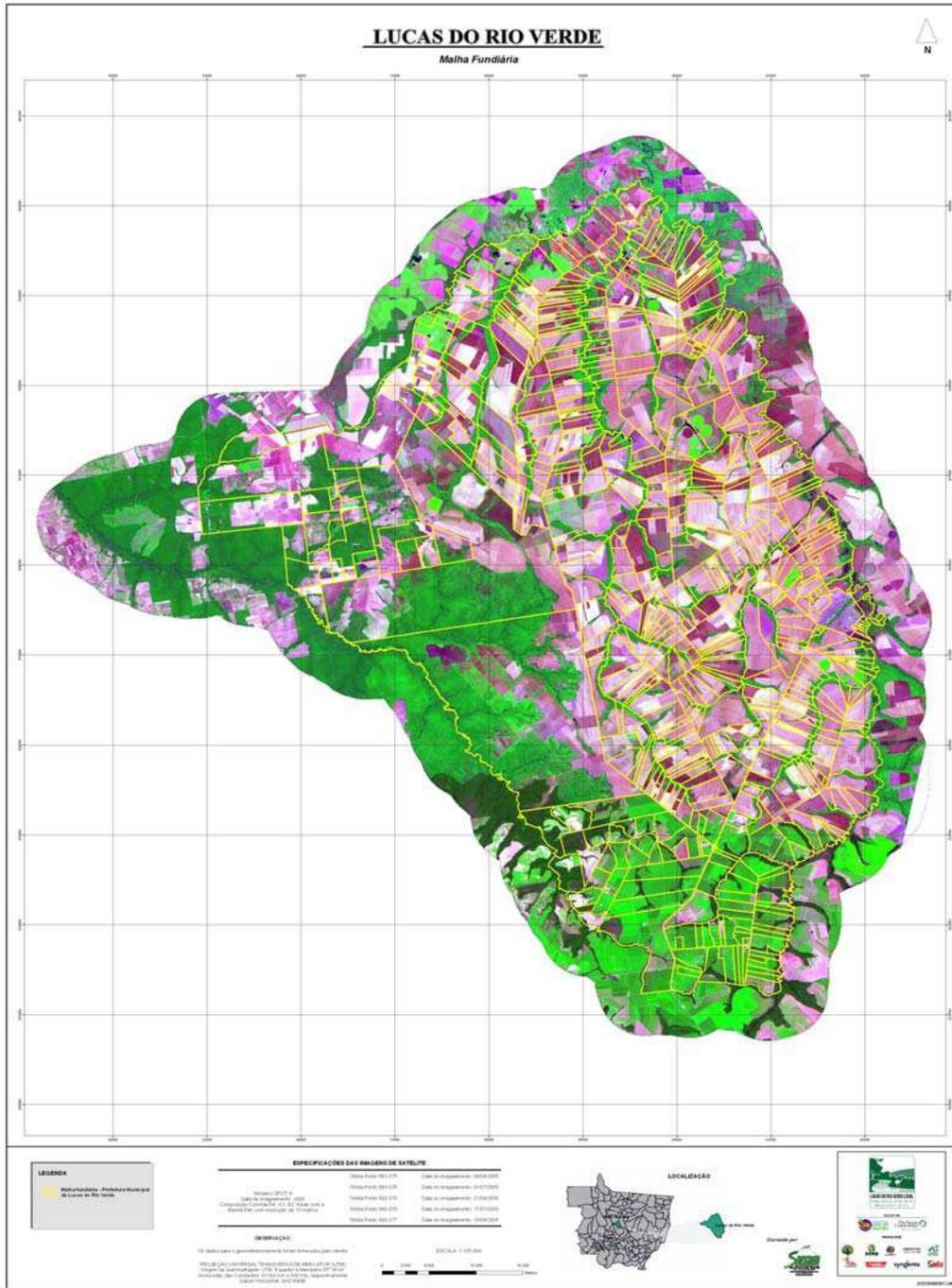
Restoration/ <i>Recomposição</i>	Restoration through the planting of exotic species geared to restoring the ecosystem, every three years, of a minimum of 1/10 of the total area necessary to be complemented, with native species, in compliance with the criteria set by the environmental entity. This may be done by temporarily planting exotic species as pioneers, seeking to restore the original ecosystem (criteria established by CONAMA).
Compensation <i>Compensação</i>	An area of equal importance in its extension and environmental aspects, provided it belongs to the same ecosystem and is located in the same micro-basin; The compensation must be approved by the state environmental authority and it may be implemented by renting the area as forest easement or legal reserve, or by purchasing quotas, as stated in article 44-B; When compensation in the same hydrographic micro-basin is not possible, the environmental agency shall apply the criterion of greater possible proximity between the property and the area chosen for compensation, provided they are located in the same hydrographic micro-basin and in the same state;
Regeneration <i>Regeneração</i>	Proof of technical feasibility; Authorization granted by the state environmental agency, including a possible demand that the area be isolated.
Donation <i>Doação</i>	The owner may be released from the obligation to recover the Legal Reserve, by donating, to the corresponding environmental agency, the area located within the public domain conservation unit, pending the regularization of the land; this area shall be of equal importance in its extension and environmental aspects, besides being within the same micro-basin.
Easement <i>Servidão</i>	In agreement with the corresponding environmental agency, the owner voluntarily renounces, on a permanent or temporary basis, to the rights of clearing or exploiting the native vegetation, located outside the legal reserve and outside the area covered with vegetation under permanent preservation; Easement must be registered in the property documents of all the landed property involved. The regime of forest easement must be, at a minimum, the same one established for the Legal Reserve.

Source: Lima,R. Instituto Ares, 2008.



Appendix 5 – Outline of the location of the Lucas do Rio Verde Municipality, with the Spot scenes in the municipality.

Source: TNC Report, Cartographic Update and Mapping of the Use of the Soil in the Municipality of Lucas de Rio Verde, 2006.



Appendix 6 – Map of the land network in Lucas do Rio Verde-MT

Source: TNC Report, Cartographic Update and Mapping of the Use of the Soil in the Municipality of Lucas do Rio Verde, 2006