ECONOMIC AND SOCIAL IMPACTS OF LOGGING AT NATIONAL FORESTS – A STUDY CASE AT BRAZIL[1]

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Abstract
Brazil has the largest tropical rainforests in the world and most of them are located in the Amazon River basin area. During the last three decades, deforestation is growing very fast in this region, and negative impacts at local and global weather are arising. In order to minimize these impacts and protect a share of the biodiversity, Brazilian government has established several national forests in this area, but just one has being exploited, the Tapajós National Forest, also known as Flona Tapajós. This paper evaluates the economic and social features of a reduced impact logging project conducted at Flona Tapajós from 1999 to 2003. It was coordinated by IBAMA (Brazilian Institute of Environment and Renewable Natural Resources), funded by ITTO (International Tropical Timber Organization) and implemented by Treviso Agropecuária Ltda (a private forest harvesting company). This project is locally known as ITTO project. Based on field interviews and through the examination of IBAMA´s and Treviso´s reports, this paper concludes that the ITTO project was highly profitable for the private company, even after attending all Brazilian working laws, what is not very common in this Brazilian region. Treviso´s internal rate of return was 35.79%, what is very high in comparison with crop and cattle projects conducted in the same region. ITTO project impacted significantly the community workers involved with the project and it was able to teach this population how to manage rainforests in order to produce timber without destroying the forest. The paper ends by suggesting some attitudes that Brazilian government can follow during its discussion about new reduced impact logging projects to be implemented at Flona Tapajós and other national forests by both private enterprises and local communities.

Key words: logging, national forests, profitability, social impacts, Brazil.

1) Introduction

In 2000, Brazil contained 527 million hectares of native tropical forest, equivalent to 29.4% of world's total (COFO, 2001). Most of these forests are located in the Amazon River basin and they are suffering an increasing process of destruction, shocking national and international communities. During the last ten years, 205 million square kilometers have been deforested, an area equivalent to ten times the size of Belgium.

Federal government has tried, and has clearly failed, to curb deforestation in Brazil, creating conservation units, banning agricultural activities in a share of private farms and

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[1] Paper prepared for the 45th Congress of the European Regional Science Association (ERSA2005), to be held at Vrije Universiteit Amsterdam, Netherlands, August 23rd to 27th, 2005.

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imposing official approval for any type of clear cuts. These measures have failed due to several reasons. Among them we can highlight the scarcity of successful experiences in exploiting native forests without destroying them, especially inside conservation units.

One of these experiences took place at the Tapajós National Forest from 1999 to 2003. This conservation unit is known as Flona Tapajós and it covers almost 600 thousand hectares in western part of the state of Pará (see Figure 1). This state is suffering a fast process of deforestation caused by agricultural production expansion and unsustainable forest exploitation. Flona Tapajós is located inside a critical area where conflicts between environmentalists, on one hand, and illegal roundwood extractors and commercial farmers, on other hand, appeal frequently in the media.

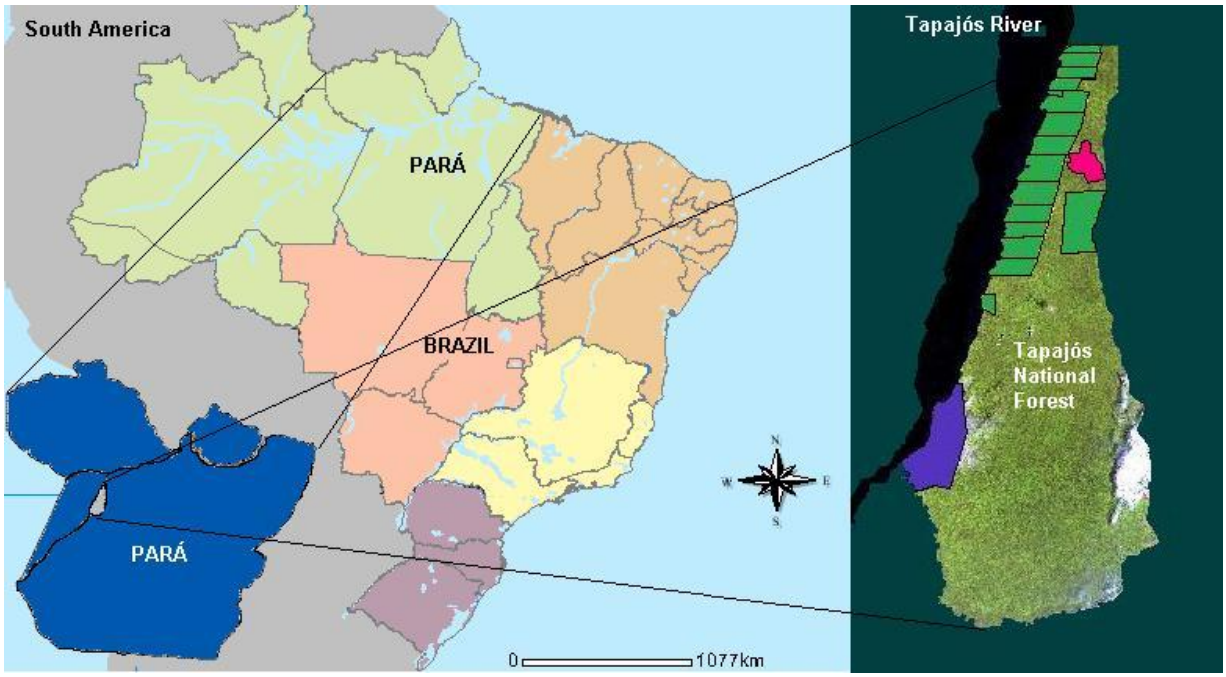

Figure 1: Brazil, the state of Pará and Tapajós National Forest location.

Flona Tapajós is edged on its western side by the Tapajós River and on its eastern side by Federal highway BR163, which interconnects the city of Santarém in state of Pará with Cuiabá (the capital of state of Mato Grosso). On both side of this partly paved highway, cattle and crops are growing rapidly, especially soybeans plantations. They are causing deforestation and the latter will increase if BR163 gets totally paved (Alencar et al, 2004). Hence, Flona Tapajós has an important role to protect biodiversity in this Amazonian area.

Flona Tapajós is one among 37 Amazon River Basin's national forests. Despite this conservation unit answers for only 3.41% of total Amazonian national forest area, it was the unique national forest that was exploited using reduced impact logging techniques. This project became locally known as ITTO project.

ITTO project is officially denominated *Project 68/89 Rev.1 (F) – Management of the Tapajos National Forest for Sustainable Production of Industrial Timber*. It was approved by the International Timber Tropical Organization (ITTO), and funded by the United Kingdom Department of International Development (DFID), in collaboration with IBAMA (Brazilian Institute of Environment and Renewable Natural Resources), to develop a realistic reduced impact logging experience in a large tropical national forest in Brazil. The concession contract was signed on December 4th 1998 and, one year later, *Empresa Agropecuária Treviso Ltda* started harvesting a 3,130 hectare track of land inside the Tapajos National Forest. That area was subdivided in 38 *working units*, most of them sizing 100 hectares each. The extracted total volume was 63,392 m^3 (averaging 6.4 m^3/tree and 20.25 m^3/ha). Harvested trees were classified into three classes: high value (I), medium value (II) and low value (III) classes.

Reduced impact logging techniques (RIL) have been prescribed to the Flona Tapajós as the alternative to conventional wood extraction operations used in areas outside the National Forest. Two experiences coordinated by Tropical Forest Foundation (FFT), a non governmental organization specialized in RIL, were initially implemented in the Tapajós National Forest. One was conducted in 1986 in 100 ha and another was developed in 1997 in 105.66 hectares, both were undertaken by FFT and *Empresa Agropecuária Treviso Ltda*. These experiences contributed with modifications to the ITTO project implemented from 1999 to 2003.

The purpose of this paper is to evaluate economic and social features of the ITTO project. By concluding this task, we hope to come up with some suggestions for other reduced impact logging projects that can be executed in the same national forest or in other Amazonian national forests.

This paper is organized in five sections, including this introduction. Section 2 describes Flona Tapajós, giving some information about its origin and actual problems. Section 3 comments briefly the scarcity literature about Flona Tapajós and reduced impact logging (RIL) at Amazonian tropical forests. Section 4 explains the methodology used in this paper to evaluate economic and social impacts of the ITTO project. Section 5 and 6 show up, respectively,

economic and social features of the ITTO project and, finally, section 7 brings out some conclusions and suggestions for other RIL projects in the Amazon River Basin.

2 – Region under study

Flona Tapajós was established on December 19th, 1974, by Federal Decree 73,684. It was created when "occupying the Amazonian Region" was one of the political objectives adopted by military governments ruling Brazil during the 1970s. The approach was two folded: colonization with road building and settlers being attracted to occupy lots on both sides of the road. A few conservation units were established close to these roads and settlement projects. It was the case of Flona Tapajós.

The opening of the BR163 road started in 1973 and finished in 1976. From kilometers 51 to 211 of BR163, there were lands, on both sides of the road, which were under the custody of the federal and state governments. Tapajós National Forest was delimited as part of these lands. The eventual existence of dwellers inside the forest or in river side banks was completely disregarded. Governmental agencies also mishandled issues and competences, simultaneously creating a conservation unit in land close to the new road and in some share allocated by INCRA (National Institute for Settlement and Agrarian Reform), another governmental agency, for settlement projects. This conduct created two big problems for Flona Tapajós since its creation: inhabitants living inside the conservation units and settlers converting forest into crops and pasture.

Until 1830, native indigenous population dwelled inside the actual Flona Tapajós area and since then new non-indigenous groups have moved into the area. These early inhabitants have occupied the margins of the Tapajós River for almost two centuries and they have now required their right over the land. Setters have multiplied on the eastern edge of Flona Tapajós and some of them have legal deeds to prove their land ownerships.

Table 1 shows the population that was living inside Flona Tapajós in 2003. Tapajós National Forest is the home for 25 communities, 20 on the western banks of the Tapajós River and 5 on the eastern shoulders of the BR163 road. In 2003, these communities congregated a minimum of 876 families (5,102 individuals). There is also the municipality of Aveiro with 5,000 residents living inside the limits of the Tapajós National Forest. The city of Aveiro sprawls over the two sides of the Tapajós River. One side is part of the National Forest and that is where 5,000

residents live in. The other 15,000 residents live in other parts of the villages located across the Tapajós River.

Table 1: Villages and inhabitants living inside Flona Tapajós in the year 2003.

	Communities	*Number of families*	*Number of inhabitants*
Western edge (near Tapajós river)	São Domingos	36	190
	Maguari	52	230
	Jamaraquá	19	76
	Acaratinga	21	78
	Jaguarari	22	110
	Pedreira	49	260
	Piquiatuba	70	370
	Marituba	n.a.	n.a.
	Bragança	n.a.	n.a.
	Marai	18	100
	Nazaré	38	200
	Tauari	57	300
	Pini	30	150
	Takuara	n.a.	n.a.
	Prainha	38	266
	Prainha II	15	112
	Itapaiúna	36	176
	Paraíso	12	72
	Jutuarana	11	47
	Itapuama	13	78
Eastern edge (edging road BR163)	São Jorge	208	1,500
	Chibé	42 a 43	350
	Nossa S^{ra} de Nazaré	24	144
	Nova Vida	26	118
	Santa Clara	39	175
	Total	876	5,102

Source: Faria *et al* (2003, p. 7 e 9) Note: n.a. data not available

From 1973 to 1993, Federal environmental agencies tried unsuccessfully to expel "intruders" from the Tapajós National Forest, causing some conflicts. These conflicts started to come to an end only in 1994, when a federal decree allowed the federal manager of the National Forests (IBAMA) to authorize traditional populations to live inside the borders of any National Forest. Since then, IBAMA has worked with communities living in the banks of the Tapajós River as traditional inhabitants. They are called "ribeirinhos" (people who live near the river) and have lived as peasants, integrated with the forest. However, communities living on the edge of BR167 road are commercial farmers (known as "colonos"), most of them originally migrants from Southern Brazil, and little integrated with the forest. As an example, "ribeirinhos" plant

rice, beans, corn, cassava and pumpkin mainly for their own consumption and sell in the market only cassava flour. Animal protein consumption comes from fishing and hunting local fauna. "Ribeirinhos" have their own code of conduct in relation to land distribution and they are supervised by IBAMA. Settlers´ farms range from 0.25 to 170 hectares, and they graze cattle and plant coffee and pepper trees, converting large tracks of native forest into agricultural plots. By doing it, settlers have had conflictive relationship with IBAMA. Easier land connection to other places provided by BR163 highway made "colonos" more market-oriented.

3) Review of Literature

Very little we know about conservation units in the Amazon River Basin. Andrioli (2003) made an overview of all conservation units created in Brazil, showing the largest share of conservation unit areas are located in the Amazon River Basin.

Among the 37 Amazonian National Forests, only Flona Tapajós has been analyzed about its population, fauna and flora. Faria (2003) and Soares (2004) describe this area, its population and problems, but they do not analyze the ITTO project.

Flona Tapajós was also divided by Federal Government in nine zones (IBAMA, 1999). One of them recognizes "ribeirinhos" and "colonos" rights over their lands and 191 thousand hectare zone 2 was allocated only for RIL projects. ITTO project took place in this zone 2, using 1.64% of total available area for RIL projects. On the right side of map 1, ITTO project area appeared in red color.

Reduced impact logging (RIL) is scarcely analyzed in the Amazon River Basin. Only two papers present evaluations of private tracks of rainforests (Barreto *et al*, 1998; and Homes *et al*, 2002). Both show RIL projects are profitable.

This paper adds some information up this knowledge, analyzing economic and social impacts of a RIL conducted at Flona Tapajós, what is ITTO project.

4) Methodology

This paper bases on primary dataset collected at ITTO project area between May 27th and June 02nd, 2004, and also relies on private and public reports about Tapajós National Forest area and ITTO project.

In order to evaluate ITTO project's profitability, internal rate of return (IRR) and total profit were calculated considering Treviso´s side. IBAMA´s fees were also estimated and they will be compared with IBAMA´s expenditure with the entire ITTO project.

IRR was calculated considering all technical operations implemented by Treviso and supposing the highest prices of inputs and wages that would be paid in the region. By doing it, we overestimate the cost and, consequently, underestimate IRR.

Five different questionnaires were elaborated to inquire about job and income generation, improvement and profits generated by the reduced impact logging (RIL) techniques, and the occurrence of illegal exploitation of roundwood inside and surrounding Flona Tapajós. These questionnaires were applied to five different groups of actors involved directly with ITTO project: four village leaders, four ITTO project's former workers, six local inhabitants not employed in the project but they would like to take part in other similar project, eight members of IBAMA local office and two Treviso´s owners. A total of 24 interviews were realized. It was not a random sample, because we selected intentionally key persons willing to collaborate with our research.

We repeated some common questions for different interviewed categories in order to be sure about the true reality. It was the case of questions related with working conditions and exploitation techniques used at ITTO project.

5) Economic evaluation

By using TREVISO´s information about operations applied at ITTO project (see Rodriguez and Bacha, 2004), we first estimate the average productivity for labor and machines for each main harvesting operation. After that, we use per unit costs for these resources to determine the specific per hectare total operation cost. Results are presented in Table 2.

The mean volume extracted from the ITTO project was 20.25 m^3/ha of commercial logs. Considering the values presented in Table 2, and adding taxes, fees and freight (11.04 US$/$m^3$), the mean total production cost amounts to 30.26 US$/$m^3$.

The internal rate of return was defined based on the following simplifying assumptions:

(i) logs were delivered to the sawmill grouped in four single loads, i.e., 38.46% of the total delivered in November 2000, 15.73% delivered in November 2001, 22.13% delivered in

November 2002, and 23.68% delivered in November 2003 (percent values reflect real production values on each one of the production phases);

(ii) each delivered load had the logs distributed in three quality classes accordingly to fixed amounts: 19.91% in class I; 37.51% in class II; and 42.59% in class III; and

(iii) Logs were valued depending on its quality as follows: 83.33 US$/$m^3$ for logs in class I; 41.67 US$/$m^3$ for logs in class II; and 20.83 US$/$m^3$ for logs in class III.

Table 2: Average cost of reduced impact logging operations

Activity	task	Productivity	Cost US$/ha
Pre-Harvesting	Trail opening and area demarcation [1]	117.21 m/HH	3.45
	100% inventory [2]	1.10 ha/h	12.31
	Liana control [3]	0.70 ha/HH	4.71
Harvesting	Roads and log landings construction [4]	591.82 m^2/HM	54.09
	Skid trails planning [5]	1.52 trees/h	4.09
	Felling [6]	1.43 trees/h	21.25
	Skidding [7]	2.93 trees/h	82.42
General Expenses	Data processing	-	1.33
	Training	-	4.26
	Mapping	-	4.02
	Roads planning	-	0.81
	Log landing operations	-	23.42
	Support, logistics and supervision	-	4.92
	Wages of permanent crews and equipment cost	-	55.83
	Lodging	-	31.95
	Depreciation of tractors, vehicles and heavy machinery	-	80.30
		Partial cost	**389.17**

[1] Average 2.68 men/crew opening 2,607.18 m/day (HH=human hour)
[2] Average 1.44 men/crew inventorying 1.10 ha/hour
[3] Average 2.31 men/crew controlling 11.12 ha/day
[4] Average 2.00 men/crew constructing 4,372.32 m^2/day (HM = machine hour)
[5] Average 3.16 men/crew marking 37.78 trees/day
[6] Average 7.28 men/crew, 3.39 crews/day felling 38.62 trees/day
[7] Skidder working an average of 8.06 h/day to move 23.47 trees/day

Table 3 presents the resulting cash flow. The internal rate of return for the cash flow of the ITTO project was 35.79%, which is a very attractive rate and proves the project was very profitable. Moreover, ITTO project was more profitable than the highest profitable cattle project already conducted in the Amazon River Basin. Mattos and Uhl (1994) founded IRR ranging from

-2% to 12% for different cattle projects conducted in Eastern Amazon. Arima and Uhl (1997) found IRR ranging from 3% to 9% and Anualpec (2003) shows IRR ranging from 4% to 11% for Amazonian cattle projects.

Table 3: Simplified cash flow

Moment	Month	Production[1] (%)	Logs volume delivered in each quality class (m^3)			Investment [2] (US$)	Income [3] (US$)
			I	II	III		
			Production (%)				
			19.91	37.51	42.58		
			Log value (US$/$m^3$)				
			83.33	41.67	20.83		
0	Nov/99	-				737,755.84	
1	Nov/00	38.46	4,854	9,145	10,381	301,739.45	1,001,817.68
2	Nov/01	15.73	1,985	3,740	4,246	424,506.94	409,739.78
3	Nov/02	22.13	2,793	5,262	5,973	454,239.69	576,448.91
4	Nov/03	23.68	2,989	5,631	6,392	-	616,823.78

[1] Total production: 63,392 m^3
[2] Considering the total mean cost of delivered logs equals to 30.26 US$/$m^3$
[3] Considering values paid for each m^3 in each quality class indicated in the table

Agropecuária Treviso Ltda sold logs extracted from the Tapajós National Forest exclusively to *Cemex* (Comercial Madeiras Exportação S.A. – Commercial Timber Exports). During the three first years of the project, *Treviso* was the unique responsible for all field operations. In 2002, *Treviso* out-sourced the operations to *Maflops* (*Manejo Florestal e Prestação de Serviços – Forest Management and Services*). A specific price was paid by *Cemex/Treviso* to *Maflops* for the services. *Cemex/Treviso* also assumed the payment of all taxes and fees to IBAMA and freight costs.

According to representatives of *Cemex/Treviso* and *Maflops*, the values paid for the services supplied by *Maflops* were the ones presented in Table 4. The average of the values paid on the last two years were very close to the estimated average of total cost (30.26 US$/m3) calculated by Rodriguez and Bacha (2004) for the roundwood extracted from the ITTO project in the Tapajós National Forest.

Table 4: Values paid for the logs transported to the Cemex sawmill

Year	Paid to *Maflops* for the logs (US$/m^3)	IBAMA fee (US$/m^3)	Freight (US$/m^3)	Total (US$/m^3)
2002	10.83	4.00	6.67	21.50
2003	15.00	5.00	8.67	28.67
2004	20.83	6.00	9.17	36.00

Exchange rate: 3.00 R$/US$

The governmental agency involved (IBAMA) obtained direct returns, in the form of cash, from the fees it charged. Concession fees were charged accordingly to three classes of trees. Log production volume ended up distributed among these three classes as follows: 19.91% in class I, 37.51% in class II, and 42.58% in class III. Considering average fee values of US$ 4.14/m^3, US$ 2.48/m^3 and US$ 1.145/m^3, for classes I, II and III, respectively. ITTO project would generate US$ 150,465 on fees to IBAMA. However, this Federal agency was not efficient to charge those fees.

Fees and taxes paid by the concessionaire (estimated in some 298 thousand dollars) represent close to 20% of the amount that IBAMA was supposed to allocate for the project. It is not unsatisfactory, because IBAMA would have the same expenditure whether or not the ITTO project took place. No direct benefits from 298 thousand IBAMA´s revenues were actually internalized by the local IBAMA office in Santarém and by the communities in the National Forest.

Therefore, the ITTO project ended up reasonably profitable to the concessionaire, but at the same time quite expensive given the small amount of direct benefits really captured by all other stake holders in the area, especially IBAMA and the local communities.

6) SOCIAL IMPACTS OF REDUCED IMPACT LOGGING

Brazilian Federal government establishes a unique minimum salary for all national territory and its real value has being increased during the last ten years. Moreover, Brazil's working rights guarantee a 44-hour maximum weekly working time period and each extra hour need to be paid 50% higher. Workers have the right of a 30-day paid vacation per year and one extra wage per year (called 13th wage). Employers pay several taxes, differing according to its activity. They add up something ranging from 49% to 102% of the payroll, depending on the economic activity.

These huge working taxes paid by employers and actual high unemployment rates motivate employers to hire illegal workers, paying less than a minimum wage and not paying working rights, such as retirement fees, for example.

Interviews with local stakeholders, from May 27th to June 2nd 2004, and the analysis of documents provided by *Treviso* and *Cemex* produced information about jobs, paid wages and destiny of income, working conditions, non-monetary benefits and negative impacts of ITTO project. In the following pages, we condensed our findings, having as background the Brazilian working rights (explained in the former two paragraphs).

6.1) Amount and quality of jobs generated

From the interviews, the following were diagnosed:

a. The ITTO project employed from 42 to 51 workers per month, an average of one job for each group of 17 families living in the Tapajós National Forest;
b. There were 43 jobs offered during the last year of the project: one forest engineer, one forest technician, one accountant, three loader operators, one tractor operator, two skidder operators, one cook, one cooking assistant, one mechanic, one tire fitter, eight chainsaw operators, eight chainsaw assistants, four skidding planners and assistants, eight log landing inventory keepers, and two security guards;
c. At the beginning, all hired workers were non-local residents, but at the end of ITTO project approximately 60% were workers hired from the local Flona Tapajós communities;
d. Local workforce occupied low and medium qualified positions, such as chainsaw operation, cooking, tree identification, mechanics, log landing accounting and other supporting roles;
e. Most of the local workers that joined to the ITTO project lived in the communities crossed by the dirt roads easily driven on non-rainy seasons (São Domingos, Maguari, Acaratinga, Pedreira, São Jorge, Santa Clara, Nossa Senhora do Nazaré e Nova Vida), creating a bias against all other communities;
f. Due to the difficulty of access to certain communities, no worker was hired from neighboring communities to the ITTO project (such as Piquiatuba, Marituba e Marai);
g. At the beginning, job stability was low and, from the 50 initially hired workers, only 17 workers were kept as crew members on the second year.

The above features were in accordance with the ITTO project intention, because local communities were involved in the project in conformity with their abilities. Unequal involvement of all forest communities reflects their different abilities and organization.

6.2) Wages and working rights

The wage officially paid was one minimum salary for less qualified workers and two minimum salaries to the mechanics, although most of them ended up receiving a little more due to extra hours worked. It is important to say, that, all workers hired by *Treviso* were legally hired. It is not common in western part of Pará, where illegally hired workers have ranged from 47.5% to 62.1% of total workforce (Sant´ana, 2005).

There were a few periods when payments had to be delayed, but all interviewers affirmed that Treviso honored all contractual working clauses.

A three category wage policy was established by Treviso to accommodate a basic wage level, paid during the first 90 days of experience to the worker, a second category of wages were paid after the experience period, and the third category of wages were paid for workers with training courses. From the first to third category was approximately 50% increase on salary for the same job.

Comparing the above situation with other local workers employed in other activities, we can affirm that Treviso´s workers were among the best paid workers surrounding Flona Tapajós area.

6.3) Working conditions

Evaluating the working conditions faced by field workers at ITTO project, the following can be affirmed:

a. Reasonably adequate lodging facilities were built by Treviso in the working area;
b. Food was prepared by one cook and one assistant to offer all daily meals by the workforce;
c. Extended working periods were very common, with workers taking twelve straight days followed by two resting days (usually a Saturday and a Sunday), or even 25 running days followed by five resting days – although Sunday afternoons were always reserved to rest on any of these two systems;

d. All hours beyond the regular and daily eight hours of work were considered extra hours and, according to the interviews, they were paid by *Treviso*;

e. Workers don't have any complaint regarding lodging, food and working journeys.

The above situation reinforces our conclusion that ITTO project workers were adequately paid and best possible working conditions in the area surrounding the project were offered to ITTO project workers.

6.4) Destiny of wages paid to the ITTO workers

Most of the interviewed workers said their welfare increased while working for the ITTO project and that their earnings were used to buy durable products (like ovens, bicycles, beds and wardrobe, for example), and non-durable consuming items such as clothes, shoes and food.

According to our interviews and local visits, the project did not alter the local level of investment, except in two cases where a small meat business and an "eco-leather" craft manufacture (producing wallets, purses, backpacks etc., made out from rubber and latex) were established by two former workers of ITTO project.

However, all interviewed ex-workers declared they would like to take again a job in similar logging operations inside the National Forest. Other interviewed local workers, with no past experience in the ITTO project, declared they would like to take a job in logging operations inside the National Forest because they perceived improvements in the welfare of those that did get involved with the ITTO project.

6.5) Non-monetary benefits produced by the ITTO project

All interviewed ITTO project ex-workers guarantee they learned new skills, specially reduced impact logging techniques. Some of them considered they learned a new profession, such as tree identifiers, felling and skidding planners, and loading site inventory controllers;

Treviso widened and improved local dirt roads that connect the BR163 highway with the Pedreira and Piquiatuba communities, what surrounding ITTO project area.

6.6) ITTO project negative direct impact

The Piquiatuba community, closest community to the ITTO project area, points out to diminishing hunting opportunities (jaguars, dears and tapirs, for example) as one of the main problems introduced by the logging operations. However, it could not be checked. Most of Piquiatuba community's claims are probably due to they were not included as workers in the ITTO project.

7) Conclusion

The reduced impact logging project coordinated by IBAMA, and co-funded by DFID/ITTO, in the Tapajos National Forest – the ITTO project – turned out to be a profitable operation for the concessionaire (Treviso), allowing it to comply with all working legal obligations. That contributed to the general welfare for all workers living in the Flona Tapajós communities who worked in the ITTO project.

Most part of favorable perceptions of the opportunities created by the ITTO project were due to good local job opportunities are actually almost inexistent.

Although ITTO project was tiny in relation to all Brazilian native forests, it proved reduced impact logging (RIL) can be applied inside and outside national forests and show forests do not need to be destroyed in order to generate jobs and income. Moreover, ITTO project shows itself more profitable than cattle projects.

Reduced impact logging projects in other Brazilian National Forests, to really involve the local communities as forest keepers, must in the future include mechanisms to transfer direct and indirect benefits to these local populations, such as (i) continuing training programs, and (ii) direct communal control of part of the revenues generated by the royalties and fees received by IBAMA.

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