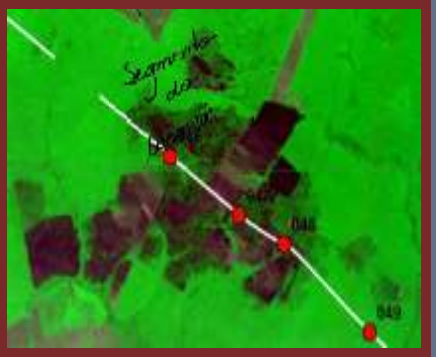

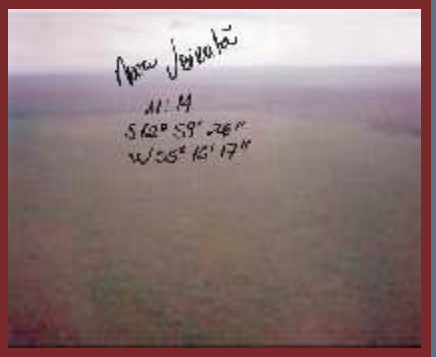

Relation between expansion of soy plantations and deforestation

UNDERSTANDING THE DYNAMICS

EXECUTIVE SUMMARY

Forests Work Group

Brazilian Forum of NGOs
and Social Mov**e**ments
for the Environment and Development

This document was prepared through the initiative of the **Forests Working Group of the Brazilian Forum of NGOs and Social Movements for Environment and Development** (FBOMS).

The FBOMS Forests WG is coordinated by Adriana Ramos, from the Socioenvironmental Institute (Instituto Socioambiental). Friends of the Earth - Brazilian Amazonia and Imaflora act as focal point on the issue soy vs. forests within the WG, being the organizations responsible for formulating and publishing this document. The following organizations and networks make up the Forests WG, representing a total of over 700 institutions:

- Friends of the Earth - Brazilian Amazonia
- Center for Alternative Agriculture in Northern Minas (CAA)
- Amazonian Workers Center - CTA/AC
- CUT Environment Commission (Trade Unions)
- Pastoral Land Commission - CPT Xingu
- Federation of Social Assistance and Educational Agencies - FASE
- CEBRAC Foundation
- Pro-Nature Foundation - Funatura
- Vitoria Amazonica Foundation - FVA
- SOS Atlantic Rainforest Foundation
- Greenpeace
- Amazon Work Group - (GTA in Portuguese) (network of 430 local organizations)
- Institute for Forest Management and Certification - IMAFLORA
- Institute of Man and the Environment of Amazonia - IMAZON
- Institute for Environmental Research of Amazonia - IPAM
- Socioenvironmental Institute - ISA
- Institute for Society, Population and Nature (ISPN)
- The Greens - Social Ecology Movement
- Atlantic Rainforest NGO Network (network of 256 local organizations)
- The Nature Conservancy - TNC
- Vitae Civilis - Institute for Development, Environment and Peace
- WWF Brazil

This document does not represent positions of the Forests WG nor of its members individually. It is a research document that seeks to offer inputs for discussion and greater understanding of the theme by public and private decision-makers, reporters and observers, as well as a basis for individual initiatives on the theme by member organizations of the Forests WG.

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Introduction

The Forests Working Group of the Brazilian Forum of NGOs and Social Movements initiated a discussion on soy and deforestation in October 2003, when the organizations Friends of the Earth - Brazilian Amazonia and Imaflora became focal points on this subject. The work moved forward in a meeting held in February 2004 in Brasilia. Minimum Criteria on Soy Cropping in Forest Areas were approved (presented in attachment to this document). The purpose of these criteria is only to act as a suggested minimum purchasing policy for commercial soybean buyers regarding the origin of their products in forest areas. They are not to be confused with other broader criteria (on sustainability, agricultural practices in general, etc.) under discussion in different national and international forums, including with participation of FBOMS. In June 2004, the Forests WG met with the Minister of Agriculture, Roberto Rodrigues, and presented the abovementioned minimum criteria. The Minister suggested that certain studies be conducted on the relation between soy cropping and deforestation, in order to provide a foundation for the proposed criteria. In September and in November 2004, the Forests WG conducted two more two-day seminars on the theme, even discussing preliminary studies that are the bases for this document. In December 2004, the WG met again with Minister Roberto Rodrigues and representatives of the private sector to share and discuss the preliminary results of this study, the purpose of which is to provide inputs for discussion and in no wise represents a position of Forests WG or of its members.

EXECUTIVE SUMMARY

This document presents the main results and conclusions of three studies conducted through the initiative of the Forests WG of the Brazilian Forum of NGOs and Social Movements for the Environment and Development (FBOMS) on the relation between expansion of soy plantations and deforestation. The studies focused only on issues related to expansion of area under cultivation, and did not analyze the relation between deforestation and the processing of soybeans (the use of charcoal, for example) or transportation infrastructure (direct impacts of road building, etc.). The first part of the document presents the context and multiple variables relating the deforestation and expansion of the agricultural frontier in Amazonia. The second part of the document presents the results of a detailed and unprecedented survey on current land use in the largest illegally deforested areas in the State of Mato Grosso in the years from 2001 to 2003. Lastly, the third part of the document presents the results from correlations analyses conducted by this project between soy expansion, deforestation and ranching in the most intense colonization regions of Brazilian Amazonia, providing inputs for the preparation of scenarios on soy expansion based on the main constraining and conditioning factors studied.

1. Context

One of the consequences of the process of expansion of the agricultural frontier in the Mid-West and North regions is concentration of land-ownership, income and productive systems - large cattle ranches and mechanized monocultures (in the case of soy) - with the subordination of cultural and productive patterns of regional and local communities to the pattern practiced by the new social actors, usually immigrants from other regions, with access to capital and technology. This process has led to an increase in the displacement of small holders, due to social conflicts or purchase of their plots, resulting in new local frontiers and increased deforestation.

In areas of soy expansion, profitability of ranching and later transformation or sale of land for intensive agriculture indicates both to the initial agents as well as to ranchers, that deforestation and forest conversion into pasture makes good business sense. If said profits did not exist, there would be no interest in appropriating or purchasing converted lands and deforestation would certainly occur at a much slower pace.

Property rights in all stages of the deforestation process are ensured by the physical occupation of the land, presence is often much more important than any deed document, encouraging the activity of speculators (grileiros) or squatters to occupy lands and ensure transfer to new actors who are adverse to relatively larger risks, even though they be low.

There is a trend to increase technology use and professionalization of ranching production, generating real perspectives of profit that encourage agents with different roles. Some tend to be speculators, with no long term interest or commitment to production per se (at most, they capitalize themselves temporarily by logging the trees), while others are capitalized and professional entrepreneurs from the consolidated frontier, with a direct relation to the formal economy. Those actors without capital, to date not only have been excluded from these processes, but also tend to be displaced to peripheral areas, where they contribute to the opening of new mobile frontiers or expand the reach of those already in existence.

2. Illegal deforestation in Mato Grosso and evolution of land use

Cropping cycles in recently-deforested areas in the State of Mato Grosso are becoming shorter. This process is most evident in regions that already have a relatively consolidated agricultural frontier, access to infrastructure and flat topography. There is evidence that the term of roughly 5 years between deforestation and mechanization - estimated by most observers - is shortening to approximately 2-3 years. The time in 20% of the cases analyzed was of only one year.

The area of Mato Grosso with soybean plantation increased 400% in the last ten years. Plantation began in central savannah forests and migrated to the north some 500 km, shifting the agricultural frontier. During the same period, the State's deforested area symmetrically and progressively increased in dimension by 133%, according to state government data.

In Mato Grosso, the FBOMS Forests WG study analyzed the areas where the greatest illegal deforestation occurred in the years 2001, 2002 and 2003, including land use evolution and frequency of conversion from one land use to another. The study analyzed 31 of the 65 largest illegal deforestations of the period (above 1,350 hectares) located along the BR-163 highway, in 20 municipalities in five micro-regions, as follows:

- **Micro-Region of Alto Teles Pires (in the municipalities of Nova Ubiratã, Nobres, Sorriso, Nova Mutum, Tapurah and Lucas do Rio Verde);**
- **Micro-Region of Arinos:** (in the municipalities of Tabaporã, Nova Maringá and Porto dos Gaúchos);
- **Micro-Region of Colider:** (in the municipality of Nova Canaã do Norte);
- **Micro-Region of Paranatinga** (in the municipalities of Paranatinga and Gaúcha do Norte)

– **Micro-Region of Sinop** (in the municipalities of Cláudia, Itaúba, União do Sul, Sinop, Marcelândia, Vera, Feliz Natal and Santa Carmem);

All of the 31 properties that underwent deforestation were initially analyzed using satellite images, then verified through overflights and in certain cases, also visited on the ground. In table 1 below, the main vegetation types observed are presented; based on frequency observed, indicating that 55% of the areas are located in dense forests and the rest in areas with mixed occurrence of dense, transition and savannah forests.

Table 1. Vegetation types on the properties studied

Vegetation types present on the properties where deforestation under analysis occurred	Number of observations
Dense Forest	17
Dense Forest and Transition Forest	2
Transition Forest	7
Savannah Forest and Transition Forest	3
Dense Forest and Savannah Forest	1
Dense Forest, Tansition Forest and Savannah Forest	1
Total	31

Table 2 below presents the evolution of land use per type of use (ranching, rice, pearl millet, soy and other uses) in October 2004, according to frequency observed.

Table 2. Land use (in October 2004) in areas analyzed of large-scale deforestations, per reference year.

Year of Deforestation	Current Use	Nº Observations
2001	Ranching	
	Rice	
	Soy	4
	Millet	
2002	Ranching	3
	Rice	3
	Soy	1
	Millet	1
2003	Ranching	5
	Rice	6
	Soy	7
	Millet	
	Not in Use	1
Total of observations		**31**

3. Soy cropping displacing ranching and scenarios of expanded cropping

The correlation analyses between expansion of soy cropping and deforestation rates on a municipal scale show that there is an indirect relation between the two phenomena, indicating that soy cropping is a deforestation factor, while not the only one. Indications exist that its expansion drives deforestation towards new pioneer areas, mainly by displacing ranching. Furthermore, future scenarios point to an increased expansion of soy cropping due to the availability of land and infrastructure.

Analyses of the evolution of the areas under soy plantation in the states of Mato Grosso, Rondônia, Pará, Tocantins and Maranhão were conducted, where the most of the soy producing regions from the center-north regions of Brazil are located. In parallel, deforestation that occurred during the period from 200-2002 was also analyzed, seeking to identify

relations between the increase of area with soy plantations and deforestation rates. An attempt was also made to analyze trends in the areas considered as susceptible to deforestation. Analyses were conducted based on official data from agencies such as EMBRAPA, CONAB, INPE, MMA, DNIT and BNDES, in addition to contextual information published by member research institutions of the Forests WG. The study also aimed at producing inputs for future preparation of soy expansion scenarios in function of elements of infrastructure already in existence and that forecast on the short-term.

Certain elements clearly indicate the fact that soy cropping displaces ranching to new areas, with a likely effect of additional deforestation. This may be seen by the phenomenon of reduced cattle herds in the main soy-producing municipalities, nonetheless, the herds increase in the peripheral regions, especially (in the case of Mato Grosso) to the municipalities in regions along the mobile frontier.

Several variables to quantify this process were analyzed, especially in the state of Mato Grosso. The area planted in the year 2000 was studied (A_soy2000), the increase in area planted for soy cropping in the municipalities (Inc_soy0102) and the deforestation rates observed for the same period (Rate_defor0102). The analyses included correlation studies between said variables, for the purpose of identifying any relation between soy expansion and the deforestation process.

Results indicate that deforestation rates are positively correlated (50%) to the increase in soy cropping and this correlation is extremely significant from the statistical point of view (>99% probability). Another element is that the increase in area planted with soybeans in the State seems to occur in municipalities that are already soy producers, with large areas already deforested, and an ongoing process of deforestation. Analyzing the relation between the rates of increase in the cattle herds during the period with the other variables, one notes that there is a negative correlation between area planted for soy cropping and herd increase, which means that the number of head of cattle has decreased in the municipalities with large soy plantations (Table 4).

Table 4. Correlation analysis among the variables: soy cropping area in 2002, increase in soy plantation between 2000 and 2002, average deforestation, total deforestation and cattle herd increase rate. Levels of significance obtained are in parentheses, the closer to zero, the more significant the results obtained.

	A_Soy_2000	Inc_Soy_01/02	Defor_Tot03	Rt_defor01/02
Inc_Soy01/02	0.511			
	(0.000)			
Defor_Tot03	0.067	0.430		
	(0.653)	(0.003)		
Rt_defor01/02	0.034	0.501	0.780	
	(0.823)	(0.000)	(0.000)	
Rt_inc_Hrd00/03	-0.271	-0.078	0.180	0.188
	(0.066)	(0.602)	(0.225)	(0.205)

The relation between the increase in area with soy planted and the decrease in ranching activities became even more evident when data on variation of the cattle herd in the state of Mato Grosso is presented spatially (Figure 2). One clearly sees on the map a reduction of ranching activities in the central section of the state (especially in the main centers of soy cropping expansion) and its expressive increase in the northern region, displaying its dislocation and explaining the pressure being placed on the dense forest.

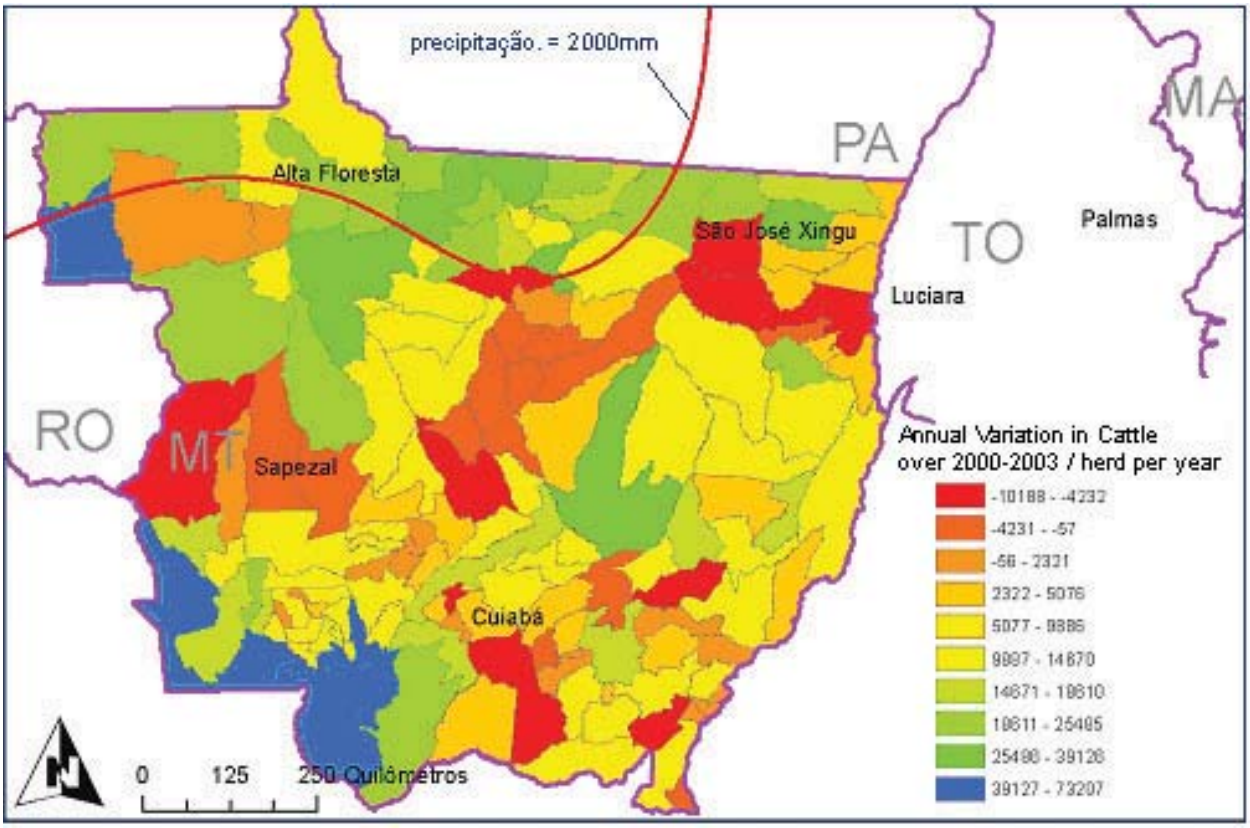

Figure 2 – Variation of cattle herd in Mato Grosso between the years 2000 and 2003. (Source: IBGE)

4. Soy cropping expansion scenarios

The partial analysis of constraining factors and stimuli to the future definition of soy cropping expansion scenarios for the region demonstrate that the main corridors available for transportation of the crop - Porto Velho-Itacoatiara and Porto de Itaqui – make large areas surrounding the highways and secondary roads susceptible to conversion to soy cropping. The zone of influence of infrastructure is defined in function of the cost/ difficulty of access ratio and the economic return of the activity.

A 100km zone around the existing roads includes the largest expanses of areas already deforested yet not currently used for soy cropping in the north of Mato Grosso, the central region of Rondonia, the eastern portion of Pará, the north of Tocantins and southern Maranhão. The forested areas most susceptible to deforestation within the same zone of influence are the transition areas of Savannah to Forest, principally located in southern Rondonia, midwest of Mato Grosso and eastern Mato Grosso (Table 5). The table below points toward some preliminary estimates of soy cropping expansion, to be validated by including other potentially important states (such as Amazonas and Roraima) and by the use of different variables in the infrastructure availability scenarios.

Table 5 – Size of areas with soy plantation and with other uses, potential area for plantation and estimated allocation of new areas of soy plantation in five states (amounts in km²).

State	Area Deforested[1]	Area Soy[2]	Other Uses	Potential State[3]	Estimated Area (2014)	Increase forecast
RO	57157	595	56562	100000	37708	37113
PA	91210	268	90942	10000	10000	9732
TO	29841	2436	27405	8000	8000	5564
MA	39293	3425	35868	10000	10000	6575
MT	156720	51488	105232	400000	105000	53512
Total	374221	58212	316009	528000	170708	112496

Source: 1 - INPE/PRODES (2004); 2 – IBGE (2004), 3 – Adapted from Bickel, U. & J.M. Dros (2003).

5. Conclusions

a) Deforestation processes are complex and involve multiple factors, in different scales of time and space. Although the spatial and temporal dimensions of the mobile deforestation frontier were thoroughly studied in the late 1980s and early 1990s, soy cropping currently adds additional complexity factors: potentializes the scale of the deforestation process, increases the speed of changes in land use from one crop to another and drives the ranching frontier, maintaining at times a direct - and at others indirect - relation with deforestation.

b) There is a clear correlation between deforestation rates and soy cropping expansion in the areas analyzed within the Amazon region. Nonetheless, the factors that affect

this correlation must be more thoroughly studied, regarding the speed (temporal dimension) and direction (spatial dimension) of deforestation.

c) The forecast for 2014 is that the area planted with soybeans in the states of Mato Grosso, Rondônia, Pará, Maranhão and Tocantins may be as much as tripled in function of existing trends, this is, however, subject to alterations, depending on other external market factors. A large part of the new areas shall most likely occur in the states of Mato Grosso and Rondônia. Nonetheless, such forecasts may also be altered in function of the expansion of areas planted in other states of Amazonia (such as Amazonas and Roraima) or in the Northeast. One must also note that the environmental and social impacts will also vary significantly according to the situation of each state or sub-region, and these must be studied on a case-by-case basis, in due detail and properly contextualized.

d) The current lack of data, surveys and research on the subject of this study leads to the conclusion that it is urgently necessary that the initial work begun by the FBOMS Forests WG be expanded and conducted in greater detail, with primary surveys in other sub-regions and trends analyses with the major variables suggested in this study. Said studies may be conducted both by members of the Forests WG as well as by government research centers, Universities and other institutions interested in these processes and problems of relevance to the country.