

COMMUNITY FIRE MANAGEMENT IN THE MARABÁ REGION,
BRAZILIAN AMAZONIA

By

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To Gustavo for our love

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The Brazilian government has increased investment in education, technology, law enforcement, and infrastructure to control fire use in Amazonia since 1998, but these campaigns have not decreased fire use. Colonist peasants, the social actors focus of this study, were the main target public of IBAMA fire campaigns in Amazonia. While colonists make use of fire every year, and are directly affected by political decisions concerning fire use, they have no voice influencing those decisions. The main groups that could hear peasant's voices-- technicians, government, academics-- generally disregard colonist's knowledge.

This study discusses government strategy for fire control, documents colonists' knowledge on fire management, and evaluates a participatory approach based on Freirian pedagogy of problem-posing, codification, and learning-cycles. Two colonist communities involved with the FATA/LASAT Fire Action were evaluated in 1998, 1999 and partially in 2000 using a combination of participant observation and systematic

interviews of a purposeful sample of families from each community. The results presented show colonists' unique history and set of values and beliefs, manifested in the communities' forms of organization, communication, and adaptation of fire management recommendations developed in the participatory Fire Action.

This study's general conclusions are that the success in fire control in the two studied communities resulted from a combination of families' willingness to avoid fire-related losses, the participatory approach adopted and coordinated by trusted leaders and institutions, and experienced technician, and families' fear of government coercive pressure for fire use. In addition, this study argues that if peasants are not seen as partners with valuable knowledge to contribute with technicians for critical reflection on better fire use, the current top-down government actions may lead to more social conflicts in the region.

CHAPTER 1 INTRODUCTION

Images of tropical rain forest burnings have been spread worldwide during the last decade, associated with forest destruction and mismanagement, raising awareness about fire as a problem for tropical forests. In Brazil, the worst event of uncontrolled fire happened in Roraima state, in 1998, when 33,000 kilometers were burned (BVRoraima 2004). The Roraima case was crucial for new Brazilian government policies on fire monitoring and control in Amazonia.

Although international concern about fire use has been relatively recent, fire has long been a part of the history of Amazonia. Charcoal from fires at least 2,000 years ago, and even older events, can be found in soil pit layers all around the Amazonian region (Pyne 1998; Meggers 1994; Negreiros personal communication). What has changed lately, however, is the higher incidence of fire associated with agricultural frontier expansion in Amazonian, particularly in regions with clear dry season¹, logging activities², concentration of farmers whose main productive tool is fire, and in years subject to El Niño-Southern Oscillation³.

¹ The sharper the contrast between dry and wet seasons, the more vigorous the fire regime (Pyne 1998:65).

² Intensive logging increases forest flammability: forest cuttings increase potential fuel loads and the amount of solar radiation reaching the forest floor (Uhl et al. 1994:295).

³ "El Niño" is part of a global configuration of atmospheric and oceanic changes resulting in droughts and inundations around the world. Amazonia has seemed vulnerable to drought during El Niño oscillations (Meggers, 1994).

Because of losses caused by fire at local, regional, and global levels, there is a common agreement that fire has to be better managed, and alternatives to its use have to be adopted, a consensus which is reflected in the growing governmental and non-governmental efforts in this direction. This common ground is a powerful step toward integrated solutions. However, there is no agreement among the several different actors on what 'better fire management' is, and how it can be reached.

Current Government Strategy

Brazilian government strategy, according to one of PREVFOGO⁴ director, is based on the "tripod of education-enforcement-monitoring, under the slogan: to educate not to burn" (Vargas 2003). Government educative actions consisted of media campaigns, educative materials, and courses, whose main goals were to inform and persuade. The government had assumed an anti-fire position, focusing on convincing farmers about the terrible effects of fire (on soil, forest, animals, water sources, people's health, transportation, carbon emissions, and the international image of Brazil), to show them how to manage and control fire, and to warn of the penalties for those who do not comply with the law. Courses were provided by PROARCO⁵ to firefighters and brigades (local disseminator agents), and to peasant representatives, showing them how to do Controlled Burnings.

⁴ PREVFOGO is the National System for the Prevention and Combat of Forest Fires, created in 1989 and ratified in 1998, administrated by the IBAMA (Brazilian Institute for Renewable Natural Resources and the Environment). For a complete list of acronyms see Appendix A.

⁵ At Amazonia level, the Brazilian government created the PROARCO (Programme for the Prevention and Control of Burning and Forest Fires in the Deforestation Arc), set up also in 1998, after the Roraima case. This program is jointly administered by IBAMA (Brazilian Institute for Renewable Natural Resources and the Environment) and by MMA (Ministry for the Environment, Water Resources and Amazonia).

Important issues like fire control cannot be effectively answered with a top-down approach, however. Such approaches assume a "domino or trickle-down effect," in which information goes in a one-way direction, reaching increasing numbers of people, without dialogue or feedback. Although local people are involved in PREVFOGO actions, the approach adopted has been top-down, since decisions about the actions "are made by a small set of powerful stakeholders, according to their own agendas, knowledge and value systems" (Ingles et al. 1999:6). In an attempt to work with social movements, in 1998-9, IBAMA (Brazilian Institute for Renewable Natural Resources and the Environment) worked as a partner with GTA⁶ (Amazonia Work Group), with economic support from PPG7 and USAID, forming an emergency program called PROTEGER, which in Portuguese means 'to protect'. In its second phase (PROTEGER II), GTA was a partner with MMA (Ministry for the Environment, Water Resources and Amazonia). PROTEGER's purpose was to reach a large and well-distributed number of Amazonian grassroots organizations in a short period. This program provided fire control and prevention training given by firefighters to community leaders, who would pass the information along to their communities. The strongest aspect of this program was considered to be its intended multiplier effect, disseminating the information to a large number of rural families. However, because of the lack of information about Amazonian realities related to fire use, the technical information given in the training sessions was based on urban/savanna firefighting knowledge and techniques (verified in the IBAMA/GTA 1998 booklet, in which many of the recommendations did not fit Amazonian conditions), and feedback from those indirectly reached by the courses.

⁶ GTA is an umbrella institution created in 1992 with support from the PPG7 program, and is composed of more than 400 Amazonian NGO's.

Evaluation of the program's effectiveness was based mainly on the number of people attending meetings.

Many questions remained unanswered. What practical fire management applications had peasants made in their productive systems? Did they adapt learned techniques? What worked well, and what did not work at all? Did peasants change their fire practices? How? Virtually no information existed to answer these questions. My study thus make a unique contribution to our understanding of the impacts of fire management programs (in this case, using a different approach from the government's) on peasants' use of fire.

The newest IBAMA/PROARCO action plan, called "Community Management of Fire" (*Gerenciamento Comunitário do Fogo*), started in 2004 in Roraima state (IBAMA 2004c), and seems to be another example of a top-down attempt by the Brazilian government to modify peasants' fire use. In this plan, 960 peasants (distributed in brigades) *appropriately trained and equipped by IBAMA* will disseminate *the right practices* for fire use and control (IBAMA op. cited). The italics were added by the author to emphasize the uneven power of *who owns the right knowledge* (and therefore decides about its content), and *decides who is qualified to manage fire* – and, by exclusion, who is not.

Beginning in 1998, IBAMA prohibited fire use in municipalities located in the "arc of deforestation" for at least 2 months: those months were satellites showing high numbers of hot pixels. In 2002, in Mato Grosso state (also located in the "arc of deforestation") a "mega-action" involving the Brazilian Environment Ministry, State Environmental Secretary, and IBAMA was organized to identify and penalize those using

fire during the prohibition. Given IBAMA's clear rationality on prohibiting fire during the driest month of the year, one of the regional IBAMA coordinators gave an interview in which he questioned farmers' and peasants' rationality: "The environment asks only two months of armistice for not using fire. There are ten more months to burn their fields. Why don't they burn when they are allowed to? We will not give them [burners] an armistice. [IBAMA] action is to repress and combat those burnings." (Benedet 2002). In addition to not understanding farmer and peasant logic on burning their fields during the last half of the dry season (after they prepare the land, and before the rains), this IBAMA coordinator's speech presented war terms in the agency's relationship with farmers, not focused on education but on repression. Changing farmers' behaviors based on this environment of war, repression, or unilateral view of right and wrong cannot be expected to be very effective.

The second foot of the IBAMA tripod is monitoring. Indeed, large-scale remote sensing has been shown to be a powerful tool for fire-occurrence monitoring (Setzer and Pereira 1991; Skole and Tucker 1993; Sanderberg et al. 1998; Nepstad et al. 1999; Souza Jr. et al. 2003; Eva and Fritz 2003). More recently, IBAMA inaugurated the CEMAN (Environmental Monitoring Center), in partnership with the SIPAM (Amazonian Protection System), equipped with the most advanced technologies to monitor Amazonian environment conditions (IBAMA 2004a). According to the IBAMA Director, CEMAN will be the "technological eye for Amazon security."

Sophisticated technological monitoring is a very important tool for controlling Amazonian fires and deforestation. However, it may not be sufficient. Despite its obvious advantages, Harwell (2000) warns about adoption of remote sensing and its

interpretations by different social actors during the Indonesia 1997-1998 fire disaster. She points out that "in addition to the silencing of local voices, remote approaches to disaster events also obscure these on-going linkages of humans with their environment" (Harwell 2000:334). Cultural understanding of environment is historically constructed, as well as social relations among different social actors, factors that have also to be considered in remote sensing interpretations. If the "technological eye" is in hands of a small set of powerful social actors only (government, international donors), participation remains passive because local people, however included in the politics and policies of conservation, remain peripheral to defining the ways in which conservation is perceived and natural resources managed (Goldman 2003:834). This thesis explores ways to involve local communities directly in monitoring.

The third foot and last of the IBAMA tripod is law enforcement. Since 1965, fire use has been ruled by an imprecise Brazilian law, called the Forest Code (*Código Florestal*). This federal law prohibited the use of fire "on forest areas and on other forms of vegetation; however, it was allowed in specific farming or forestry situations under governmental supervision" (IBAMA/GTA 1998:36). As explained above, in 1989, the Brazilian government started the PREVFOGO program within IBAMA with the objective of reducing the use of fire to "acceptable" levels (IBAMA 1998). This work was coupled with monitoring by INPE (the Brazilian Space Agency). However, Amazonia was not included among the areas to be served by this program at that time.

Only after early 1998, when fires in Roraima reached the global media, conveying international pressure on the Brazilian government, were actions taken in Amazonia. The governmental laws and actions concerning fire use then became more specific and

coercive. PREVFOGO was present in the region for the first time in 1998, supporting the creation of another program specifically for the Amazon: PROARCO (Program for Prevention and Control of Fires in the Arc of Deforestation). In 1998, IBAMA also established that community and controlled burnings were required to follow a set of procedures and rules, including obtaining an official burning permit form (authorization was required since 1965, but no practical instrument was created until 1998) and payment of fees per hectare to be deforested and burned. However, the government's recommendations were out of reach for most peasants, who often did not even have the means to prove their ownership of land (one of the documents required to obtain an official burning permit).

In 1999 and 2000, the governmental program PROARCO established firefighter groups based in the cities of the region where the fire problem is worst. The state of Pará received four new helicopters to be used by IBAMA in enforcement actions. Those actions may include high fines and jail for those who use fire without an official permit or who do not comply with the official authorization. Additionally, the official burning permit can be cancelled in special situations, such as a very high number of burnings in a municipality (based on INPE remote sensing data). When this happens, the government prohibits fire use, even for those who have burning permits. This prohibition lasts in general for two months (the driest months in the year), and it has taken place every dry season⁷ since 1998. Parallel to the IBAMA program, INCRA (National Institute for Colonization and Agrarian Reform) has organized other firefighter groups associated

⁷ The Amazonian region possesses two seasons: rainy (or winter) season and dry (summer) season, with its length varying according to micro-regions.

with people from peasant settlements, but based in cities. However, in Amazonia, the dirt roads and distant locations present serious limitations for mobilization.

Between the Roraima fires and Law of Environmental Crimes regulation in late 1999, the government's strategy was to create provisional measures to prohibit the use of fire when it is judged to be highly risky, even if official permission has been given. Although prohibitions have happened since 1998, the fees, tickets, and legal actions were based on those provisional measures, easily contested through the legal system. Powerful landowners and farmers had the resources and information to take those defensive actions, but the majority of Amazonian peasants did not. Thus peasants ended up being further punished, which created strong resentment against the government rules. The Law of Environmental Crimes (MMA 2000) defined fees for forest illegally burned: around US\$ 515 per hectare⁸ and 2 to 4 years of prison. Those penalties were widely disseminated through radio, TV, and educative material distributed around Amazonia, always associated with the bad consequences of fire use. The Brazilian government increased investment in education, technology, law enforcement, and infrastructure to control fire use since 1998. The government approach has not proven efficient yet, given that fire occurrence in Amazonia has increased⁹. In addition, higher fire occurrence has been associated with weekends and with the IBAMA staff strike in 2003 (Werneck 2003), indicating that as long as enforcement is weaker, farmers burn more. The government's top-down approach, supported by the media, is creating a scenario

⁸ R\$ 1.500,00 per ha (R\$ 1,00 = US\$ 2.91).

⁹ According to IBAMA 2004b, since the number of hot spots has been systematically monitored in the Amazon region, the higher rate was found in 2002 (160,329 hot spots). In 2003, the number of hot spots was 139,000 (IBAMA 2004b).

unfavorable for partnerships with rural producers, by labeling burners without official permits "transgressors", and depending on paid brigades to control fire in Amazonia.

This study argues that governmental actions implemented in a top-down manner, in which peasant knowledge is disregarded, and technical knowledge is "deposited" in their lives, has limitations. By contrast, studies have shown that in community-based fire management there are less occurrences of fire-related losses¹⁰ because local people share decision-making power, volunteer to maintain their natural resources (without depending on external inputs), and their empirical knowledge is embodied into practices and policies for fire management (practices culturally and environmentally better adapted). The study sought to explore these ideas through an in-depth study of two communities involved in a community-based fire management program.

Problem Statement

Colonist peasants, the social actors that are the focus of this study, were the main target public of IBAMA campaigns in Amazonia. While ranchers are recognized as the major social actors responsible for area deforested (and burned) in Brazilian Amazonia (Margulis 2003:80), peasants are also major actors because of their quantity. In Pará state alone,¹¹ 169.273 landholdings (83% of the total farms) are smaller than 100 ha (Trecanni 2000:430) (an indirect indicator of peasants representation)¹², whose main productive tool for land preparation is fire.

¹⁰ In China - Lichang et al. 2001; in India--Dalong 2001; in Thailand - Makarabhirom et al. 2001; Rakyutidharm 2001; in Indonesia - Abberger et. al 2001; in Gambia - Sonko et al. 2001; for a review, see Jackson and Moore 1998).

¹¹ Brazilian Amazon or so-called Legal Amazonia comprises eight states, representing 61% of the Brazil area.

¹² The National Forest Code (Federal Law # 4771) defines "small rural property" or "family land", as any land exploited mainly by its owner with personal or family labor, in which at least 80% of the income

While colonists make use of fire every year, and are directly affected by political decisions concerning fire use, they have no voice influencing those decisions. The main groups that could hear peasant's voices, technicians, government, academics, in general disregard peasant knowledge. This study aims to contribute to this topic by documenting colonists' knowledge on fire management, analyzing a participatory approach in which colonists and grass-roots organizations are partners to develop and implement better practices for fire management, and discussing how in those approaches in which peasants are partners with technicians, sharing decision-power, supported by action-learning cycles, fire will more likely be controlled.

Government technicians had shown that they did not believe that colonist peasants possess knowledge for natural resource management, because of peasants' lack of valuable modern "tools", such as formal education, land, infrastructure, entrepreneurial views, or money. Appropriate practices are defined *for* them but not *with* them. The Brazilian Federal Agency for Agriculture and Livestock Research (EMBRAPA), for example, explicitly identified the Amazonian peasants' three main problems, that explain their "traditional and backwards technology": lack of education, economic organization, and energy (EMBRAPA 2000:21). The rationale for not learning from colonist peasants, thus, is that they are the ones "lacking".

On the other hand, academic ethnographies tend to exclude colonist peasant from the category "traditional" because their culture is too mixed with modern societies.

While studies show indigenous tribes hold specific cultural values on fire use (Ruddle 1974; Peters and Neuenschwander 1988; Warner 1991), peasants, by comparison, are

comes from farming or extractivism, and with a maximum land size of 150 ha if located in the Legal Amazonia (Presidência da República 2002).

identified as not "genuine" or "traditional" swiddeners, but "incipient swiddeners" (Warner 1991) or "new swidden practitioners" (Peters and Neuenschwander 1988:74). Because colonists do not practice *the traditional form* of swidden, they are assumed to not be able to "understand the importance of fallow rotation" (Peters and Neuenschwander 1988:74); or to be "there only for the purpose of a crop for a year or two" (Warner 1991:9); or to be totally ignorant of the new land due to their absent cultural ecology of the region, which explains their "search for short term and predatory means of investments" (Lima and Pozzobon 2001:233).

One explanation given for this lack of "tradition" is their previous situation of being landless. Brazil is one of the countries with the highest land distribution concentration rate in the world (Trecanni 2001), and many peasants end up becoming sharecroppers. Many migrate looking for their first piece of land. This research found out that the majority of families studied were living in their first landholding. However, many had significant farming and fire management experience in their regions of origin.

The general misconception of colonist ignorance has blinded academics and technicians to their empirical knowledge. Few studies go beyond this preconception, and document in detail different uses that colonist peasants have for their natural resources. Muchagata, for example, studying five communities in the Marabá region, concluded that colonists "recognize and use a wide range of plant and animal species (respectively 142 and 39 were listed) which provide food, fuel, raw materials, and medicinal plants, and represent sources of income" (Muchagata 1996:76). Muchagata and Brown (2000) also studied colonist perceptions of soil fertility.

Regarding community fire management, Mattos et al. (2000), working with a colonist community in the Paragominas region (also located in the so-called arc of deforestation), presents how a community-conceived participatory approach developed and applied a Community Agreement on fire management, based on their practical knowledge (AMPPDR 1996). The idea of this community work for fire management was absorbed by IBAMA to officially recognize, in September of 1998, the Solidarity Controlled Burning (*Queimada Controlada Solidária*), in which one single permit would include five or more peasant burnings. Although the collective permit was better adapted to community reality, fire permits continued to require land titling, to charge for deforested and burned areas, to require firebreaks beyond peasants' capabilities, and to cancel permits during the high dry season. Therefore, some ideas from the community-based experience were adopted by decision-makers technicians, but not the participatory approach.

Why are educative campaigns ineffective in changing colonist peasants' fire practices? Do colonist peasants have empirical knowledge of fire use? Could participatory approach be more effective in finding solutions for fire management? What do colonist peasants think about fire use law enforcement? Those questions are not only academic, but also are key for those making decisions on fire management in Amazonia today. Recognizing colonist empirical knowledge does not imply that they have all the solutions for fire management. This study argues that if they are not seen as partners with valuable knowledge to contribute *with* technicians for critical reflection on better fire use (better also for peasants) the actual top-down government actions may lead to more social conflicts in the region. This study also describes a process for a participatory

approach, involving grass-roots organizations, colonist peasants, and in some stages governmental representatives, in which the philosophy and methods can contribute to show directions for collaboration between social actors for fire management.

In the Marabá region, Southeast Amazonia, the FATA (Tocantins Araguaia Agrarian and Environment Foundation) and LASAT (Social-Agrarian Tocantins Laboratory) Community Fire Action involved more than 20 colonist peasants and 3 indigenous communities. Recommendations for fire management were developed in a participatory process, coordinated by grassroots organizations, and based on colonists' empirical knowledge. The Fire Action produced positive impacts on the two communities studied, as families developed agreements to use fire, and losses caused by uncontrolled fires diminished drastically after the Fire Action. Some of the stakeholders¹³ had discussed FATA/LASAT's proposal and they had supported it as a regional substitute for the governmental strategies. Although the action is no longer carried out as a specific activity of FATA or LASAT, systematic evaluation of this experience can provide relevant insights to those interested in diminishing losses caused by fire in Amazonia.

Research Questions

This research contributes to the relevant topic of fire management in Amazonia, specifically involving colonist peasants and changes in their fire practices. This thesis aims to discuss three main questions:

- Question 1: Why aren't government fire actions and laws more effective in diminishing uncontrolled fires?

¹³ In this study, the terms "social actors" and "stakeholders" are used as synonymous, referring to any "individual, social group or institution that possesses a stake (or interest) in the management of the natural resource concerned" (Borrini-Feyerabend 1996, cited in Ingles et al. 1999).

- Question 2: Do colonist peasants have and use empirical knowledge to manage fire?
- Question 3: Is a participatory approach to fire management effective in diminishing fire losses?

Question 1 was examined by analyzing government discourse on peasants and fire use, families' discourse on government actions (historical and actual experiences), and families' evaluation of the official fire actions (fire law, its enforcement, and educative campaigns). Results are presented in Chapter 2 and 3.

Question 2 was developed through peasants' narratives about their practices and perceptions of fire and natural resources management, where had they learned them, changes over time, as well as during observation of burnings. Results are presented in Chapter 3 and 4.

Question 3 was analyzed by evaluating the participatory approach applied to a community fire management action (the FATA/LASAT Fire Action), and its impacts on fire practices of colonists families in two communities. The process regarding the fire action is described and analyzed in Chapter 2, and the evaluation of its impacts is presented in Chapter 4.

Study Site

Pará state is the second in the rank of fire occurrence in Amazonia in concentration of hot spots.¹⁴ The Marabá region, located in an Amazonian frontier region of the so-called "arc of deforestation" is one of the high concentration of hot spots (INPE 2004). The Marabá region is also known as *Bico do Papagaio*¹⁵ region, and was originally

¹⁴ The expression "hot spot" is used for heat registered on the earth's surface by the AVHRR sensor on board the NOAA satellites, which captures and records any temperature above 47 Celsius, and reads it as "hot spots" (PROARCO 1998).

¹⁵ *Bico do Papagaio* region or "Parrot Beak" region has this nickname due the shape resulted from the Tocantins and Araguaia rivers' confluence (see Figure 1-1)

occupied by indigenous groups. It comprises an area stretching across the state-lines of Pará, Maranhão and Tocantins (Figure 1-1), and includes eight municipalities: Marabá, Itupiranga, São João do Araguaia, São Domingos do Araguaia, São Geraldo do Araguaia, Nova Ipixuna, Brejo Grande do Araguaia, and Palestina do Pará (Forum das Entidades pela Reforma Agrária do Sul e Sudeste do Pará 2001:4). By the year 2000, the actions conducted by FATA and LASAT included the first six municipalities on the list and later that year extended to the remaining ones.

The importance of peasants in the state of Pará is illustrated by the high number of small plots of lands, which account for nearly 82% of the total number of plots, or 169,273 plots (Treccani 2001:430), distributed in 33% of the area (DFID1998:16). In addition, peasants in the state are estimated to produce as much as 84% of all the manioc produced, as well as 63% of the corn, 59% of the beans, and 46% of the rice (Hurtienne 1999, cited by Veiga 2000:15).

This region is located in the so-called the "Brazil-nut Polygon", an area named after the abundant Brazil-nut trees (*Bertholletia excelsa*). The average temperature is 26°C, and rainfall around 2000 mm/year (Muchagata 1996:13). It is characterized by defined rainy and dry seasons. The rainy season is concentrated from November to March, and the dry season from May to September. April and October are transition months. The vegetation is classified as *Ombrofila Densa Montana* Forest (Sestini 2002:44).

The two communities studied, São Francisco do Itacaiúnas and Cupu, were formed in much the same way. In most cases, families were landless migrants originally from Brazil's northeastern region occupying part of a large-scale farm. They faced landowners in conflicts over access to the land, and struggled to make their living by means of

extractivism, agriculture, and cattle, for which they had very little government support. They built community roads, churches, schools, and soccer fields; they harvested their own crops and marketed their own products; they founded their associations and partnered with NGOs; they obtained loans (and therefore debts) from the government for their fields. The Catholic Church and grassroots organizations were cited as their main supporters. Complaints about government absence or negligence were present in many different moments of this research, pointing to a potential resistance to future partnership agreements or collaboration with governmental guidelines laws. Some details concerning the history of each community are given in Figure 1-1.

São Francisco do Itacaiúnas Community

The São Francisco do Itacaiúnas community, in the Municipality of Marabá, is located approximately 55 km southwest of Marabá and connected to the main town center by a dirt road. To the south of the village runs the Itacaiúnas River. Nowadays, the community is divided into 64 plots, plus a village center. According to long-time resident Mr. Venâncio Dias, the community was started on July 14, 1983 when representatives of 41 families settled on the site in a non-official colonization process. Occupants were landless peasants living in local villages. More than 50% of them came from Boa Esperança, a village located 18 km from the occupied land. For safety reasons, peasants occupied temporary houses in groups. They worked together to harvest a first annual crop. Sixteen years after the village was established, the community was officially recognized by the federal government as a *Projeto de Assentament* (Settlement Project) in early 1998. The community was established as a 'new' land reform area during former President Cardoso's administration. Official recognition represents a very important step towards guaranteeing peasants' land ownership rights, and has long been

waited for. As of the time of this study, the long journey through the bureaucracy had not yet allowed authorities officially to demarcate any border lines or issue any land tenure documentation.

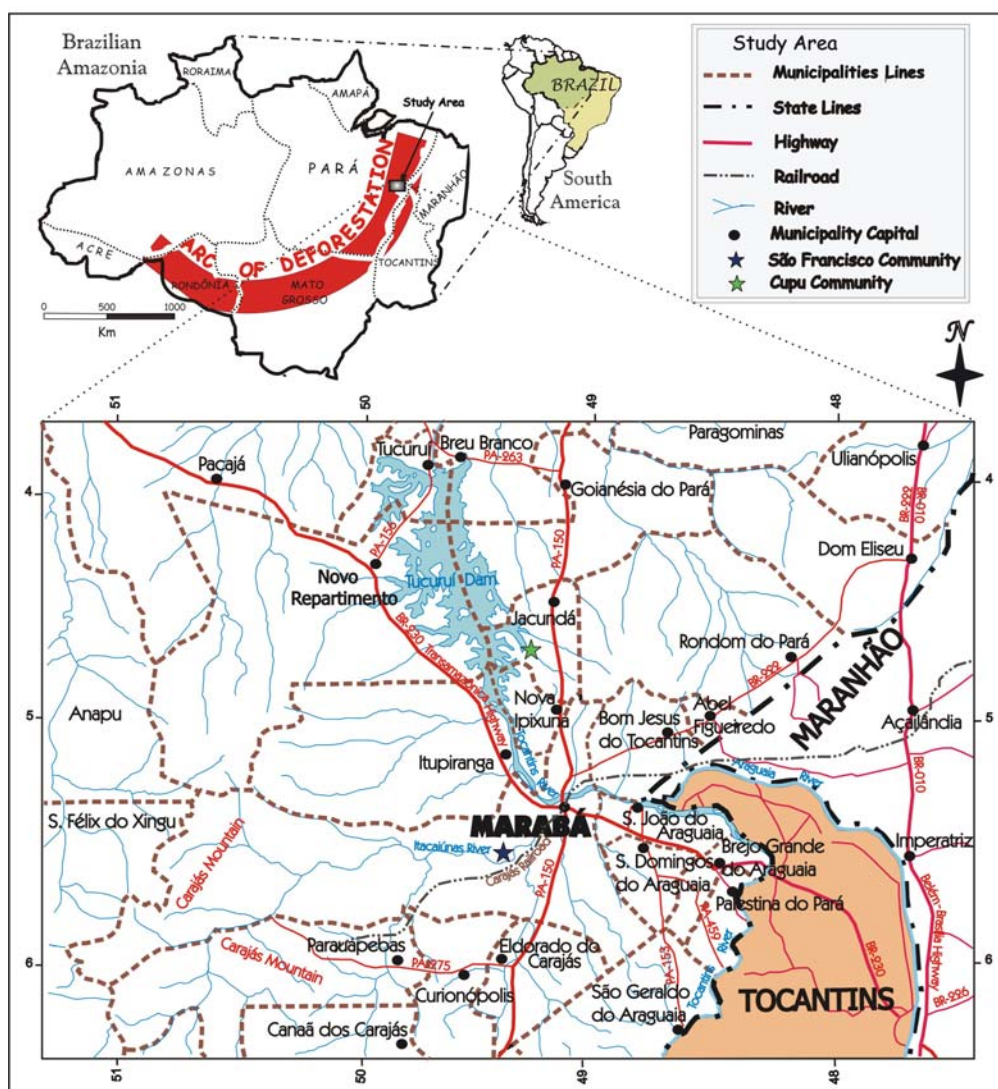


Figure 1-1. South America and Brazilian Amazonia region maps showing the study area in the so-called "arc of deforestation," the Marabá region, north of the Pará state. The map below details community locations, the "Parrot Beak" shape created by Tocantins and Araguaia Rivers, the Tucuruí Dam and the Carajás Mine, as well as highways and railroads (Bellow map adapted by author from IBGE 1998).

The history behind São Francisco do Itacaiúnas and how it was built is as typical as that of any community in the *Bico do Papagaio* region. The area was a traditional *castanhal*, or a concession of brazil-nut extractive area owned by the government. Although brazil-nut concessions theoretically could not be deforested, a first contract granted 3,500 ha to an oligarchic family which turned it into a 7,500 ha cattle ranching farm or *latifúndio*¹⁶. After that, the land was sold twice before 1983, when the peasants occupied it. Some of those interviewed said the farm owner was never a violent person, and for this main reason the conflict with the settlers has never been very violent. Nor did the farmer have land titles to prove land ownership.

During the conflict resolution with the landowner, mediated by Catholic Church leaders, representatives of INCRA and the families agreed with the farmer that the 3,500 ha of the original brazil-nut concession would become a community (Nova Canaã), and the remaining 4,000 ha would continue as a concession to the farmer. Nevertheless, by the time negotiations were concluded, the number of families had grown and 56 families were excluded from the distribution of land, among which some of those who had fought from the days of the first occupations. The excluded group received the support of "Manu" (Mr. Emmanuel Wanderberg, the Land Pastoral Commission (CPT) coordinator and later one of the FATA founders), resisting and struggling for more land. The families, which did not manage to settle in Nova Canaã, founded a new village and named it "São Francisco do Itacaiúnas". They chose Mr. Silva as their community representative, representing the community at the Rural Workers Union (STR) too. The owner eventually gave up the fight for the land. Some months later, the peasants

¹⁶ *Latifúndio* is a word of Latin origin and means a large, privately owned landholding (Macedo 1985:viii).

concluded the construction of a school, which was the first landmark of the establishment of the community. Mr. Silva volunteered to teach classes until a teacher was established, with salary paid by the municipality. Mr. Silva was an important leader, and he has been part of the Fire Action since it started.

The São Francisco do Itacaiúnas village center (Figure 1-2) occupied an area of 25 ha. This village was composed of 49 plots, four of them serving also as small grocery stores, one with a machine for processing rice, one Catholic Church, one plot for a Protestant Church (with no construction), an Afro-Brazilian Center, one small wood school built by the families just after the occupation, around 1985 (the material was donated by a politician), the soccer field, and a new school built by the federal government in 2001.

As shown in Figure 1-2, besides those occupied plots, families planned areas for new plots, roads, and whatever else the community decides (like the area chosen for the new school). From the time of the community's creation, the village was planned in such a way that all the families that possess land had the right to a plot (10 x 30 m) so they could build their houses in the village. In the São Francisco do Itacaiúnas village, there has been electric power since late 1998, as an indirect service from the electric power extended to the Tainópolis train station (part of the Vale do Rio Doce Company railroad for bauxite export) through one of the main roads that cross the village center. The access to electric power brought some new appliances and changes such as TVs, freezers, light, and rice processing machines, among others.

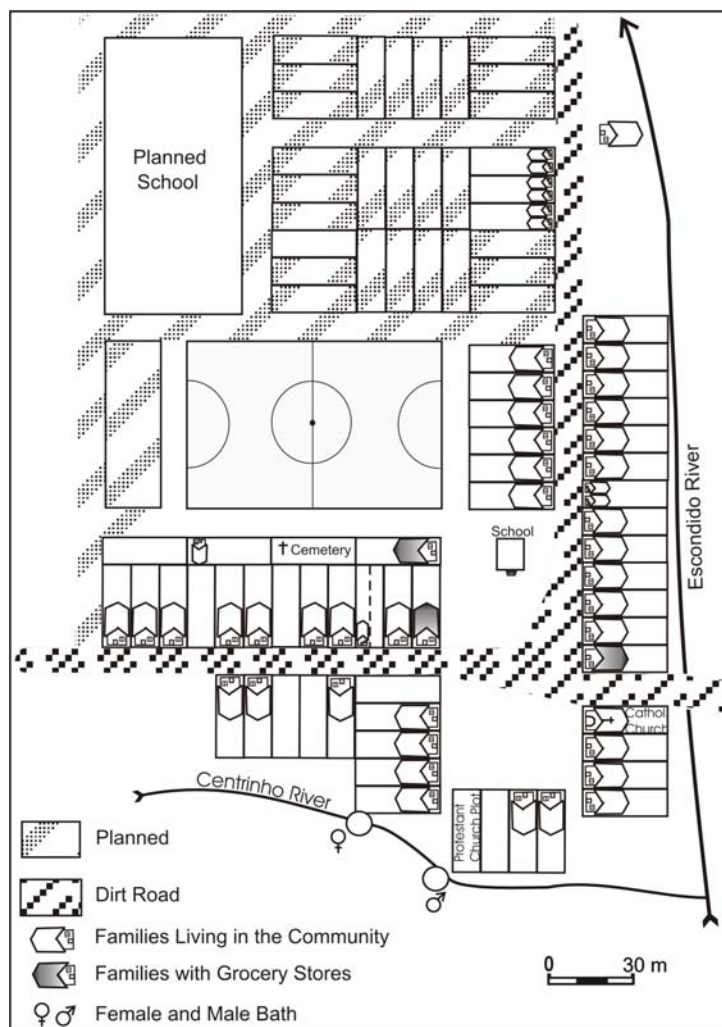


Figure 1-2. São Francisco do Itacaiúnas Community village. Representation of the individual plots for houses, school and churches, roads, rivers, and soccer field. The upper left part of the drawing represents where the village is planned to grow (Drawing by author).

Cupu Community

Located north of Marabá, Cupu is located in the municipality of Jacundá, which can be reached through a 48-km dirt road and Highway PA-150. It is located 52 km northwest of Nova Ipixuna, a city 109 km southwest of Jacundá (as shown in Figure 1-1). On its west side, the Cupu community is bordered by the Tucuruí Dam. The community was established along the Tocantins River, before the dam.

Information on community formation is not very clear, since the occupation was gradual. As in the São Francisco case, the land also was a *castanhal* or brazil-nut concession. The pioneer families got to know the area while collecting brazil-nuts. It was originally a forested region with few anthropogenic activities, and gradually families started moving to the area, building their houses, and producing subsistence crops. A key referential year for the establishment of the community was 1986, when the manager of the farm denounced the presence of peasants on the land to the owner, who lived in the neighboring Maranhão state. Despite the fact that the owner tried to expel the peasants with police support, nobody was injured. It seems that because she could not prove her rights to the land, and perhaps due to her weak political power, the owner gave up the struggle. After some time, the manager's departure was seen as a sign of the peasants' victory, and the families remained in the occupied land. They were also supported by the Catholic Church, and one of the main community leaders since the occupation, Mr. Soares, is still working as the Catholic Church coordinator¹⁷ in the community. Soares' family were involved in the Fire Action since it began in the community in 1999.

Some time after the conflict, the community received the single official visit in the history of its land tenure regulation. At that time, representatives from the GETAT, an extinct federal institute for land reform created during the military dictatorship period, visited the land once, made a list of families living there, but never returned. Since then, some families have moved out, others have arrived, and some members have died. Bureaucratically, they cannot have official permission to use fire, since they still cannot

¹⁷ Because of their distant location, peasant communities in Amazonia have priests, nuns, or ministers that visit it periodically, every few months. In their absence, there are coordinators who celebrate mass weekly, and keep the church 'alive'. These persons have a key role in influencing peasant opinions.

prove their land ownership. By 2000, the community still was not recognized as a *Projeto de Assentamento* or Settlement Project, making it very difficult for them to receive government support. The community was composed of 52 individual plots, and a small village.

The Cupu village center (Figure 1-3), located at the edge of the main road, was composed of two churches (Catholic and Protestant), one school, a soccer field, and three small grocery stores, two of them with power generators and televisions. There was another village, with land donated to the community by one of the families, free of charge, but in practice that did not work, ending around 1993, due to absence of rivers or other water sources, and its distance (around 6 km) from the lake of the Tucuruí Dam.

The current village center is located about 2 km from the Tucuruí Dam, where many families fish and raise their cattle during the dry season when the water level diminishes. Some families own land on the many artificial islands created by the Dam. The present village was not planned, and plots for houses had to be bought by residents from a peasant family, the Ribeiros. The land for the school, churches, and soccer field was donated by the Ribeiro family. The Ribeiros are one of the families that buy the peasants' milk production and sell it in the city. The head of this family was also director of the regional Association, and was engaged in the Fire Action since 1999. As of 2000, there was no electric power except for those families who owned generators. There were 27 houses in plots measuring 15 x 30 meters each, and on three of them there were small grocery stores. In two of those stores, there was a TV set in 1999. In 2000, two more families had bought TVs, the same two families that owned cars and used them to buy the milk production and transport people.

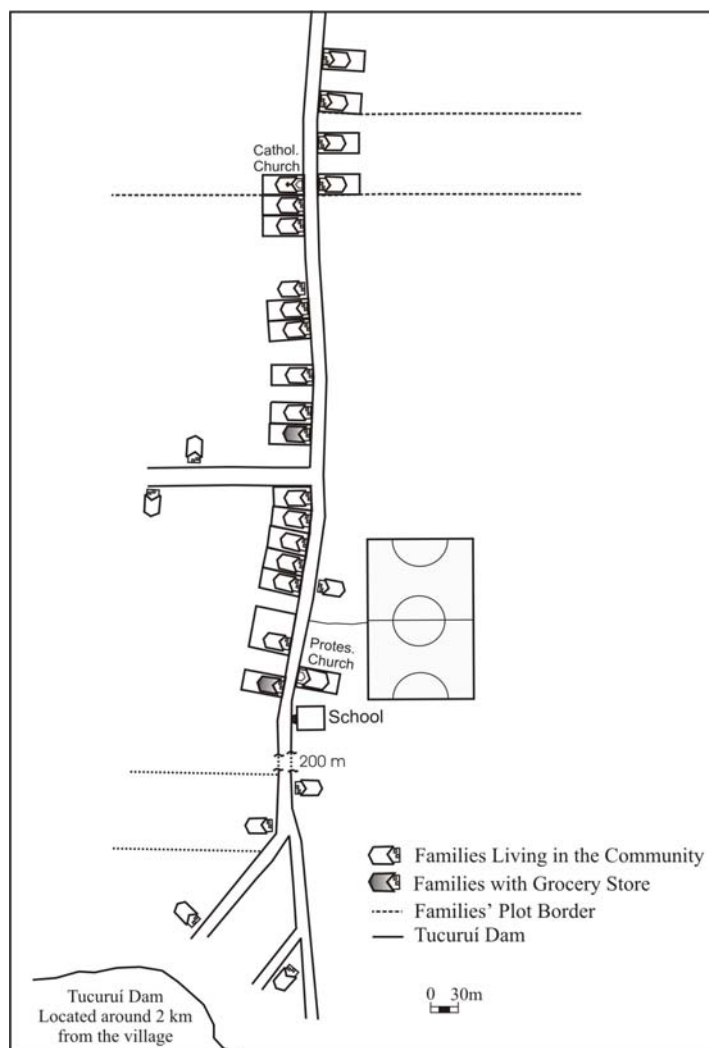


Figure 1-3. Cupu Community village. Representation of the individual plots for houses, churches, school, and soccer field. The plots were sold to families by a peasant, who donated land for school, churches, and soccer field (Drawing by author).

Research Methods

The author of this thesis was the FATA/LASAT Fire Action proponent and its first coordinator, from the 1998 dry season until the first regional seminar, held in July 1999.

The Marabá region choice was a combination of the researcher's previous experience with community fire management in other Amazonian regions, her institutional connection with grassroots institutions in the Marabá region, and those institutions'

interest in developing a community fire management action. The field research was conducted between 1999 and 2000, and focused on two peasant communities in the Marabá region. The São Francisco do Itacaiúnas community, located in the municipality of Marabá, was involved in the Fire Action since its very start, and the Cupu community, located at the municipality of Jacundá, only engaged in 1999. This choice of communities with different times and degrees of engagement in the Action was intentional, to allow comparisons between them in terms of losses caused by fires and community organization for fire management.

I had a twofold role of (a) implementing the Action during its first year and (b) evaluating it during the following years. I tried to make it clear to the families that the main goal of the study was to understand their strategy concerning fire management and their social-productive system, as well as support them with information about fire law and its impacts, other community fire experiences, and the importance of their community actions to other communities. Many families wanted to express their opinions in recorded tapes, hoping that I would help taking their voices to government representatives. In the São Francisco do Itacaiúnas community, I facilitated some of the community meetings while Fire Action coordinator.

The researcher's double role—first as facilitator and then as researcher—surely biased the research results because of people's likelihood of responding in ways favorable to the Fire Action, and because of my own commitment to helping with community fire management. On the other hand, with a subject as sensitive as fire—associated with threats of fines and imprisonment—my previous trusted relationship with the community was a key strategy in getting access to the details of their views and practices with respect

to fire management. My approach stressed listening and observing the words and actions of community members, and conveying them in this thesis in their own words. This in-depth qualitative understanding of peasant's perspectives on fire management emerged from the researcher's close relationship with the communities. To offset the potential subjective bias in the research, I combined this close familiarity with a sampling design in the communities that would encompass a wide range of types of families, in order to capture diverse perspectives in the interviews. This purposeful sample provided systematic data on social characteristics, and burning practices during two dry seasons, to complement oral histories, participant observation, and other qualitative techniques. The combination of these methods was effective in providing a unique understanding of peasant views on fire management.

The researcher's direct support received from key grassroots organizations (STR, FATA, LASAT, COOCAT, and AGRAF) was crucial in obtaining the confidence of families and their openness during the interviews conducted on fire management, on the losses caused by fire, and on fire monitoring. This was very important because families were aware of IBAMA's prohibition and penalties, and wanted to make sure that the research data collected would not be used against them. The regular visits to the field helped to build trust between researcher and families, and the academic nature of the study became clear—it definitely had nothing to do with an IBAMA inspection. In São Francisco, members of the Agro-forest group supported by FATA were always ready to lead me throughout the community for family's interviews and burnings. Their presence introducing myself as someone to be trusted (connected to FATA and STR) certainly had a strong influence on families' willingness to talk and show me their realities. Members

of the Fire Group in the São Francisco do Itacaiúnas community, in turn, claimed that my regular visits (from 1998 to 2000) supported the adoption of local rules for fire use for those families not used to participating in community actions. The Cupu community, visited in 1999 and 2000, was not as organized as São Francisco at the time of this research, and a key leader (Catholic church coordinator) was the main peasant that helped with this research, introducing me to key families. From this first contact, the majority of the families were interviewed by myself, but always referring to those leaders and to the grassroots that this study was connected with. The relatively lower level of general community organization of Cupu families may be one of the explanations for their lower degree of formal organization of fire management in particular.

As to its conceptual basis, the present study adopted the fire classification developed during the FATA/LASAT Fire Action. Accordingly, 'uncontrolled fires' were defined as fire events which break out from the planned burning area; 'accidental fires' were defined as uncontrolled fire events regardless of the use of any measure to prevent and/or combat uncontrolled fire. In this context, 'criminal fires' were defined as uncontrolled fire events in which the use of measures to prevent and/or combat uncontrolled fire was insufficient or absent (Carvalho & Aquino 1999:16-17).

Real names of communities and peasants were changed to protect them from any eventual consequence of this study.

Selection of the Communities and Families

The São Francisco do Itacaiúnas community had taken part in the Fire Action since its very beginning in 1998 and was one of the communities where FATA had developed its Perennial Crops Project. The second community studied, Cupu, was chosen because it

joined the Fire Action one year later, in 1999, and it is one of the communities where LASAT developed its Community Forest Management Project.

The families studied were chosen as a purposeful sample with the help of community leaders, and comprised more than 50% of the families of each community. Leaders and researcher discussed the main general variations among families, emphasizing that representatives of each "type" would be included in the study sample. After evaluating the differences among families, a consensus was reached regarding final criteria for selection of the families, which included variations in the following features: (a) participation in different community activities (different religions, participation in workers' associations, and *mutirão* or collective works), (b) length of residence in the community (from pioneers to newer residents), (c) location of residence (on the land, in the community village, or in the city), and (d) main source of income (agriculture, cattle, schoolteacher, grocery owner, middleman for milk market, with/without government loan).

The selection process resulted in 39 families (61%) in the São Francisco do Itacaiúnas community (the community with initial involvement in the Fire Action) and 29 families (56%) in the Cupu community (with later Fire Action influence). Sixty-seven families were interviewed during the first set of interviews, plus 5 families that wanted to participate later. Nine families from the first set of interviews were not interviewed the second time because five of them had sold their lands, three were absent during the interview period (health problems), and one had moved away to the city. The families that did not take part in both sets of interviews were not included in the sequential fire analyses. The interviews focused on heads of families, both men and women. In this

context, the heads of families were the older members, but the answers many times included other family members' opinions. Questions often generated discussions among the family members about the issues considered. In addition, 12 oral stories were narrated and recorded.

Data Collection

Information was gathered through unstructured interviews (interview guide in Appendix D), participant-observation, and oral histories (Lofland 1971; Holstein & Gubrium 1995; Rubin and Rubin 1995). Two data collection methods were used in this study: unstructured interviews sequentially conducted in two sets (at the beginning of the 1999 and 2000 dry seasons, before burning activities commenced) and participant observation during burnings (during the dry season of 2000), which provided both quantitative and qualitative information. Participant observation was also carried out in the communities during visits to the households and to families' burned and planned-to-burn fields, as well as during social events (religious celebrations, meetings held by the Association, parties, TV viewing). Oral histories were carried out with the elders and provided detailed material on their own life stories, their involvement in conquering the land and its characteristics, how the community started, its changes through time (families arriving and leaving, roads, schools, transportation, vegetation, weather), and interpretations of causes and consequences of different factors (partnerships, organization, challenges).

The information was documented in field notes (Emerson et al. 1995), recorded on tapes, and photographed. Data gathered was coded (see Appendix E for Coded Book) and organized in a database for quantitative analyses. Recorded narratives were transcribed and translated by the author for qualitative analyses (see Appendix B for

original narratives in Portuguese). Analysis and results combine both quantitative and qualitative data.

The first set of sequential interviews, conducted in 1999, covered three groups of characteristics: social, productive and fire practices (fire topic related to the previous year burnings and plans for the coming one). In order to evaluate FATA/LASAT Fire Action impacts, the second round of interviews (which occurred in 2000) repeated the same questions regarding fire practices that had been asked before, and provided the data to make year-to-year comparisons, whose results are presented in Chapter 4.

For interviews with selected families, the social characteristics included information on age, size and origin of family, number and places of migrations, length of residence in the community, level of formal education, kinship, religion (Catholic, Protestant, Afro-Brazilian etc.), association with grassroots organizations, families' plans to remain in the community or to leave, their points of view concerning community needs, and other topics considered relevant by the interviewees. Productive conditions referred to information on size of the family plot, distribution of the main ecosystems (percentage of primary and secondary forest, pasture, agricultural field, and perennial crops), quantity of cattle, labor (family, community and paid labor), equipment (chainsaw and backpack sprayer), and access to government loans. Results on social characteristics and productive conditions are presented in Chapter 3.

Sequential fire practices interviews, referring to 1998 and 1999 dry seasons, were based on FATA/LASAT Fire recommendations, and included information on accessing official law for fire use, community organization for burnings, communication between neighbors, period chosen to burn, burning after the rain, use of preventive and control

firebreaks, number of people on the burning day, use of backfires, losses caused by fire. ecosystems chosen to burn (primary or secondary forest), and burning of pasture. Results compare practices throughout the studied years. Fire topics also studied included peasant's discourse on a rich variety of concepts, such as the meaning of 'losses' in their productive systems, the importance and effectiveness of fire use (successes and losses), individual versus community labor, evaluation of the FATA/LASAT Fire Action and governmental laws, implications involving changes in fire use and alternatives to fire, as well as proposed solutions.

In addition to the sequential fire interviews and oral histories, evaluating the FATA/LASAT Fire Action included observations of burning events in the São Francisco do Itacaiúnas community in September and October of 2000. Initially, the study planned to include burnings in different situations occurring in the two communities. However, due to the frequency of rains and the scarcity of the researcher's field time, these observations were limited to the São Francisco do Itacaiúnas community.

The researcher was particularly careful not to interfere with families' decisions regarding the choice of the day on which to burn. Although it was no easy task, since the families knew that I was there to observe their burnings, and they clearly expressed their helpfulness, I managed to stress to them that my purpose was to understand what their choices were so that I could minimize the impact my presence might have on their fire management techniques. An effective way to make the families feel more comfortable with the presence of researchers was to carry out complementary interviews on qualitative information in between burning events. This way, families would not feel bad for letting the researcher 'waste her time' while they were still not ready to burn. These

complementary interviews brought more information not only on the families' evaluation of the Fire Action itself, but also on their understanding of governmental regulations and cultural strategies, as well as community organization for fire management, and formal association challenges, among other topics.

Conceptual Discussion on Participatory Approach

This study analyzes the FATA/LASAT Fire Action according to its development of a participatory approach coordinated by grassroots organizations (FATA and LASAT) with colonist peasants in the Marabá region. Due to different meanings that 'participation' can assume, this section will explore the concepts behind the Fire Action, as well as its main methods. The analysis of the Fire Action is presented in Chapter 2.

'Participation' has been a common word to those who are involved with development, and it is used by different actors (such as social groups, NGOs, government, researchers, donors), in different forms, for very broad purposes. Because it has become a vague label, different typologies were developed to specify different kinds and levels of participation, and interests of the social actors involved (Bordenave 1992; White 1996; Ingles 1999; Stone 2003). The common ground among those typologies is a differentiation in *kind* (from passive to active), and *level* of participation (decision-making power at the different activities). In general, the authors agree that the higher the power in decision-making, the higher the participation. As Schmink points out, "the degree of participation by different local groups in project decision-making and implementation is a key factor in empowering local groups to defend their own interests and to develop and adapt the institutions required to sustain natural resource management strategies over the long term" (1999:6).

The methods developed under the participatory approach were based on Paulo Freire's Pedagogy (1986), in which consciousness, the self guide, is a process "by which human beings participate critically in a transforming act" (Freire 1985:106).

Consciousness, therefore, is an active process. "Knowledge that exists today was once only a possibility, and it then became a new knowledge, relative and therefore successive to yesterday's existing knowledge" (Freire 1986:115). What Freire argues is that new knowledge, even proven scientifically to be the most suitable for a certain situation, cannot be deposited in people's minds (known as "banking education"), but has to be connected with previous knowledge, and previous understanding of the subject reality. This connection between previous and new knowledge is made via a thematic 'problem-posing' methodology, possible only through dialogue.

According to Freirian Pedagogy, in thematic problem-posing situations, the role of the educator is to propose problem situations or themes. The starting point must be the present, concrete situation of the learners, not only at the intellectual level, but also at the level of action (Freire 1986:85). Learners' ways of explaining the world involve their comprehension of their world and presence in it (Freire 1997:76). Educators should help the learners to arrive at a more critical view of their reality by, through dialogue, analyzing the dimensions of their reality, that ultimately are dimensions of total reality. This analysis involves the exercise of abstraction, through which, by means of representations of concrete realities, learners and educator seek knowledge of that reality. The instrument proposed by Freire for this abstraction is codification, or representation of the existential situations of the learners (Freire 1985:51). Codification may take the form of a photography or sketch that represents reality, or a reality constructed of a proposed

theme by the learners—a dimension of the reality. Codification, thus transforms what was a way of life in the real context into an "object" in the theoretical context. Therefore, the learners, rather than receiving information, creatively analyze aspects of their own existential experience, represented in the codification.

In the case of Fire Action, the thematic problem-posing proposed to the colonist peasants at meetings was "how to use fire better", which became synonymous with "how to reduce losses caused by escaped fires". The codification exercise was developed with colorful drawings on cardboard tags ("Burning Dynamics") representing land use types (such as primary and secondary forest, pasture, slashed vegetation, perennial crops) and elements usually present in burning situations (people, houses, firebreaks, wind, sun, buckets, fence). Those drawings were mobiles, combined to represent burning situations (real or proposed), leading to peasants' re-codification of their knowledge through critical analysis of their own situation (for more details see Chapter 2).

Freire states that one of the important points of the consciousness process is 'to provoke reactions of the world, not as a "given" world, but as a world dynamically "in the making" (1985:106). Humans are praxis—the unity of action and reflection—as reflection and action, which truly transform reality, are the source of knowledge and creation (Freire 1986:91). Neither pure action (not guided by reflection of the problematic situation) nor reflection (theoretical abstraction of reality) alone can lead to critical analysis. In this process, dialogue is the encounter in which reflection and action of the dialoguers are addressed to the world which is to be transformed.

The Fire Action was planned in a way that each dry season would be a cycle of learning by praxis (learning-cycles): reflection about the current reality would generate

actions, which in its turn would generate a new reality, again subject to reflection, in a continuous knowledge process. This means that solutions were not fixed, but had to be incessantly confronted with reality. This led to increased awareness on the part of peasants: through reflection on a given practice, ingenuous curiosity became self-conscious so as to advance to the critical stage (Freire 1998:43). Peasants, as active actors through the dialogical method, incorporated and appropriated the solutions developed by themselves. Many of the peasant narratives express that it was the first time they were using certain practices proposed by the Fire Action. Many of the peasants that were actively involved in the Action since its beginning, after only one year, referred to the Fire Action as their own action, probably because of Fire Action incentives that each community developed their own set of rules. Peasants involved in the Fire Action in a more passive manner (absent during meetings) referred to it as an IBAMA's action (see Chapter 4 for Fire Action evaluation). A key aspect of the approach was therefore to develop and support forms of communication and social organization that would support, and multiply, participation in fire management activities.

Thus, Freire's approach dictates that in order to overcome a problematic situation it is necessary to go through it, and not to stay away from it, or deny it. In this context, effective solutions involving peasant societies can be reached by a learning process, in which basic elements are: respect for local knowledge, dialogue, critical reflection, and collaboration.

The FATA and LASAT, through their history of support and collaboration with local peasantry, represented key institutions for the development of a participatory approach to fire management for peasants: trust in the institutions' intentions and

methods; open channels of communication and representation; and faith in peasants' ability to overcome the problematic situation.

The FATA and LASAT supported a technician to coordinate the Fire Action, and provided transport, food, and lodging for regional meetings, and educative materials. No peasant received any payment for fire management. Institutions and peasant leaders believed that peasants should get involved only if they believe it was worth it to them, but not as a direct economic source. Payments create dependency on outside inputs, if benefits are not linked to resource management and conservation (Schmink 1999:6). They can discourage others who receive no payment to get involved, and weaken the credibility of peasant leaders' real commitment. Especially in fire management cases, in which fire can result in fines and jail for its users, trusting in leaders was a key factor in conflict resolution situations. The Fire Action strategy was supporting each community to develop their own set of rules for fire management, including mechanisms of compensation in cases of losses caused by fire. Some peasants were not used to participating in community activities for fear that leaders were working for IBAMA, a governmental institution historically perceived as "police," acting only in enforcement, and always against peasants. Leaders' volunteer work, supported by trusted grassroots organizations, were strong arguments to convince outlying (non participant) peasants to get involved in the Action.

In sum, in presenting learners' own objective reality (how and where they are), using a problem-solving method, with a thematic investigation, peasants begin to revise their previous views of their real world through codified situations. They achieve an understanding of their previous knowledge. In so doing, they expand the limits of

knowledge. In this process, the educator exercises with the peasants a critical evaluation of their world view, resulting in their clear involvement with the real world in transformation (Freire 1985:33-34). This process promotes peasants' decision-making participation, once they get involved in creating solutions.

This study evaluated changes in fire practices in 1998 and 1999 in two communities involved with the Fire Action, and observed burning situations in 2000. Despite the short time, this study found changes in fire practices at individual (family) and collective (community) levels, and fire losses were low after the Fire Action started. In the São Francisco do Itacaiúnas, involved in the Action since its beginning, changes were stronger than in the Cupu community, involved one year later.

Organization of the Study

This introduction has discussed how the government strategy for controlling fire use in Amazonia based on a top-down approach, remote monitoring, and enforcement towards fire users is unlikely to be effective in bringing consciousness to colonist peasants. I argue that colonists possess empirical knowledge on fire management, which has been ignored by many government representatives, technicians, and academics. Another point stressed so far is that a participatory approach in which peasants share decision-making power, analyze their reality critically, are challenged using problem-posing exercises through action-learning cycles, and encouraged to develop and implement community solutions, will be more effective in managing fire. Instead of defending or attacking fire use, this study assumes that fire use is the option for the majority of colonist peasants, and they have to be seen as partners in the process of constructing better fire management strategies—including participating in the definition of "better" fire management.

In Chapter 2, I present and analyze a participatory Fire Action, coordinated by two grassroots organizations, FATA and LASAT, in the Marabá region, which involved peasants as well as other grassroots organizations, and some indigenous groups, during 1998, 1999 and early 2000. I address the participatory approach adopted, based on Paulo Freirian pedagogy, the process that originated in the proposed Fire Action, and the recommended practices for fire management. This set of recommendations developed by the peasants themselves provides the framework for the subsequent analysis of actual practices used in fire management by two communities during two successive dry seasons.

Chapter 3 presents descriptive information about the two communities and the families studied. Families' cultural interpretations of living in communities, and the importance of forest and fire are also discussed. This Chapter demonstrates some key aspects of local knowledge and situation that are typically overlooked or misunderstood, and which should provide the point of departure for fire management programs.

Chapter 4 evaluates the impacts of the FATA/LASAT Fire Action on the two peasant communities for 1998, 1999, and 2000 dry seasons. The São Francisco do Itacaiúnas community got involved in the Action since it started in 1998, while the Cupu community in 1999. The history of losses suggests the positive impacts of the Fire Action on peasants' changes regarding fire management. The assessment of implementation of the Fire Action's recommendations focused on different phases: before burning, on the burning day, after burning, and controlling accidental fires. Changing practices within and between communities, are compared in order to identify impacts of

the Action on families' fire practices. This Chapter also interprets peasants' narratives on the Fire Action government and fire Action evaluations.

The last chapter, Chapter 5, summarizes the main findings of the study, confronting the three main research questions regarding government actions, colonist empirical knowledge, and the participatory approach analyzed. Other experiences on community-based fire management in Asia and Africa are compared with this study, and suggestions are made for the management of fire in the Brazilian Amazonia.

CHAPTER 2 COMMUNITY FIRE ACTION

Introduction

An office is a small and compact setting, isn't it? And the Amazonian environment is a large, vast one. Thus I would ask the [government] agencies not to limit their actions to their own offices, but instead to make themselves present in the communities too¹⁸.

Mr. Valdir Silva, leader of the São Francisco do Itacaiúnas community, during the first regional workshop.

In the Marabá region, the history of colonists' relationships with both non-government and government institutions reflects on their present partnerships, their trust in them, as well as their willingness to engage in government policies, especially the laws which directly affect their productive practices, as the case of fire use. Conditions influencing the transformation of landless migrants into colonist peasants, specifically in the Marabá region are embedded in a long political struggle for the creation and the re-creation of their identity, a process shaped by peasants' forms of organization and resistance, as well as their strategies of permanence on the conquered piece of land. The above speech reflects the governmental history of absent support to peasants and their grassroots organizations. Government is criticized as remote and bureaucrat, creating office solutions distant from peasant realities.

In this context of fragile links between peasants and government, I argue that top-down actions are even less likely to be adopted. Complementarily, this study supports the idea that colonist communities have valuable empirical knowledge, and they should

¹⁸ Translation by the author. Original Portuguese texts are included in Appendix B.

participate actively in decision-making concerning fire use and management. It does not defend the notion that peasants' actual fire use is perfect, but on the contrary assumes that changes are needed and argues that only *with* peasants through participatory approaches can better practices and strategies be developed. The participatory approach adopted follows a problem-posing methodology, based on codification of the actual reality to develop consciousness about the reality, and learning-action cycles. This methodology is based on Paulo Freire Pedagogy (1986), and it is only possible through continuous dialogue among partners.

This Chapter is organized in two parts: The first part describes the two grassroots institutions coordinating the Fire Action: the FATA (The Tocantins Araguaia Agrarian and Environment Foundation) and the LASAT (Tocantins Social-Agrarian Laboratory). The second part presents the Community Fire Action conjointly coordinated by the FATA and the LASAT, an innovative experience of community fire management which involved peasants as well as their grassroots organizations, and some indigenous groups, during 1998, 1999 and early 2000. The text addresses the participatory approach adopted, and the process that originated the proposed Fire Action, as well as summarizing the recommended practices for fire management. Chapter 3 presents the characterization of the communities and their families. The impacts of this Action on two peasant communities will be evaluated in Chapter 4.

Peasantry Historical Construction in the Marabá Region

The Marabá region has a long history, and migrants arriving, their strategies, and their means of production, are part of this history. This region is connected to an extensive process of expansion started in the 16th century, which ran from the coastland into the inner continent. Velho (1982:29) described how this process relates to the

economic cycles of colonial Brazil. As a result of its geographical location (at the mouth of the Itacaiúnas river into the Tocantins River, and highways) and its richness in natural resources, the colonization of the Marabá region was marked by several cycles of exploitation (brazil-nuts, rubber, gold, and gems, cattle, timber, minerals and electric power dams). Those economic cycles induced and still generate different migration cycles which directly influenced the composition of its population. During the dictatorial military regime (1964 to 1985), it was considered a national security region due to the occurrence of the Araguaia Guerrilla¹⁹, when social movements were severely repressed. The Church played a key role supporting peasants and other powerless groups in a struggle for their rights. In this context, a brief review of the main economic cycles and its protagonists should yield a general picture of the colonist peasant's formation.

Exactly when Marabá village was founded is still debated—June 7 of 1898 according to Velho (1972), and 1895 according to Emmi (1999). However, authors agree that it started with the establishment of a commercial store during the rubber boom period. The merchants used a system known as *aviamento*, in which they would determine prices of rubber or nuts exchanged for goods in their store—mainly groceries and working tools—at very high prices. This led the peasants to accrue never-ending debts, carried from one season to the next one, making the worker a new type of slave (Velho 1972:41). Due to the distorted relation with the extractors based on indebtedness, merchants obtained increasing power and acted as "landlord", later becoming the "owners" of rubber and brazil-nut trees. Around 1919, following the rubber bust, the

¹⁹ The *Guerrilha do Araguaia* was a resistance movement coordinated by the *Partido Comunista do Brasil* or Communist Party of Brazil, sited in the area between Marabá and Conceição do Araguaia, in direct confrontation with the military dictatorship from 1972 to 1975 (for more information see Schmink and Wood 1992: 72-74; Alves Filho 2000).

exploitation of brazil-nuts grew stronger and used the infrastructure provided by the rubber industry, and for decades it remained the main product exported by the state of Pará (Velho 1972:45). Emmi points out that in the late 1950's the brazil-nut business (from extraction to commercialization) in the region was concentrated in the hands of brazil-nut tree 'owners' in a perpetual system of "taking" lands to themselves or *sistema de aforamento* (Emmi 1999:70-71). Those two economic cycles (rubber and brazil-nuts) consolidated two main social groups in the region: a mass of low-paid workers and an oligarchic class, where a few local families held political positions in a monopoly, as well as credit (capital), means of transportation and commercialization, natural resources, and land. Peasants were completely excluded, as were other small brazil-nut entrepreneurs, and the indigenous (Emmi 1999:151-152). Despite this system of unequal distribution of wealth, there were no land conflicts officially registered in Pará before the 1960's. Several generations of peasants lived without any official document to give legal power to their rights over their own land (Treccani 2001:307). This is explained by the fact that "ownership" was associated with the products extracted above ground and their accessibility, not with the land itself. In addition, accessing land deeds was (and still is) not a possibility for peasants that are, in practice, excluded from the legal system due to its high costs (they are required to have a lawyer representing them and to follow up on the legal suit), to a sluggish judicial structure, and to the police that generally connive with thugs (Santos 1984:457-458).

It was particularly during the military regime that the Brazilian government started to provide for the means of speeding up the occupation of the Amazonian area. The government intended to assure national sovereignty using policies that included

investments in local infrastructure (such as federal and state roads), interregional migration and economic development (Browder and Godfrey 1997:68). Those policies were organized outside the region, in the National Integration Plans or *Planos de Integração Nacional* and had as consequences deep changes in the productive structure. Since the region is strongly connected with the history of extractivism in Amazonia, the last few decades were marked by the decline of the traditional extractivism involving brazil-nuts, rubber, fur and small-scale crystal- and diamond- mining in rivers, giving place to new forms of extractivism: logging, large-scale mining (Hébette and Moreira 1997:12), and agro-cattle ranching. The so-called Large-Scale Projects carried out by manganese, bauxite, nickel, cassiterite, gold deposits, wolframite iron, copper and *caulim* mining companies were associated with hydroelectric plants, which supported them with power (Schmink and Wood 1992:66-67). Logging activities grew as the frontier advanced, along with agriculture and pasture implementation.

Through the National Plan of Integration, with government calls in the media, an example of which was the famous "land without people to people without land", the Amazonian frontier attracted people from all over Brazil and from diverse social classes. Since Brazil was facing increasing inflation rates, transferring capital to Amazonia represented an excellent option for investors, especially those investing in the cattle-ranching industry (Santos 1984:452-453). This caused a big and chaotic "land rush", where fake deeds and frauds were common, and multiple claims to a same piece of land occurred (Santos 1984:453). One of the most serious consequences was the closing of the traditionally "open" frontier to migrating landless peasants from Northeastern, who

started to face their "last frontier", "from where they have nowhere to go and nothing else to lose" (Treccani 2001:308).

In Marabá, roads made the city a strategic center for the region and brought significant changes to its social and economic structure. The brazil-nut concessions or *castanhais* were turned into large farms, and official colonization brought millions of colonists who no longer were dependent on traditional local oligarchies. Former brazil-nut extractors became *posseiros*, or squatters, making the pressure for land ownership even stronger (Treccani 2001:313). Most migrants were landless people expelled from other regions, who left in search of land and of labor opportunities in road constructions and other large construction projects, as well as small-scale mining positions (Hébette 1991:200). Frontier expansion in this scenario increased land conflicts between newcomers and old forms of land occupation, and among newcomers themselves. This increase provided the elements for the most violent land conflicts in Brazil.

The social consequences of this development model are clearly reflected in the concentration of the means of production, such as the land itself, in the hands of multinational entrepreneurs or big large-scale farmers. The ways in which these policies reflect on the state of Pará is the object of a deep analysis conducted by Girolamo Treccani in his book *Violência e Grilagem: Instrumentos de Aquisição da Propriedade da Terra no Pará* (2001). For example, Treccani shows that in 1996, 82% of the farms with areas of 100 ha or less represented 169,273 farms, corresponding to only 19.2% of the lands (totaling 4,328,158 ha). On the other hand, farms with 5,000 ha and larger represented only 0.2% of the total numbers of farms (419) but occupied 31% of the entire area of 7,138,104 ha (Treccani 2001:431). This difference in farm size is the

consequence of a historical process of political and economical favor for certain social groups in detriment of others, fostering not only the widening of the economic gap, but also and more importantly, a strong cultural distance.

In this context of land concentration and violence against peasants, the Land Reform has being made by peasants themselves. They occupy *latifundios* or large farms, and, supported by grass-roots organizations such as unions and pastoral commissions, struggle to transform the occupied land into peasant areas. Politically, peasant leaders call this land occupation process 'conquering land', while ranchers, elite, and media call it "land invasion." In the Marabá region, the historical process of peasantry consolidation is reflected in the amount of conquered lands:²⁰ from 1% in the early 1980s to more than 30% of the properties in 1998, as result of their resistance, supported by a few allies (Wambergue 2000:41). Maintaining conquered lands as peasant's communities is a bigger struggle for grassroots organizations, and one of their strategies is to support productive activities that help the family's permanence in their lands. Uncontrolled fires have become a threat to peasants' means of production due to losses caused in forested areas, crops, pasture, and goods. Therefore, managing fire in a way to avoid local losses has become a concern to grass-root organizations.

Peasant Organizations

Especially during the years of military regime in Brazil, unions and associations not connected to the government were forbidden and fought against with great violence.

Two of the tenets of the military government were undermining a movement called

²⁰ Grassroots leaders and some studies (Trecanni 2001) affirm that in Brazil there was never a Land Reform but only colonization projects. Colonist peasants' institutions use the political term "conquering" to refer to land occupation actions and their struggle for pressuring governmental agencies to recognize their rights over the occupied land. On the other side, media and elite use the term "occupation".

Peasants' Leagues or *Ligas Camponesas*, and the halt of the land reform program that started with Brazil's previous democratic president, João Goulart. Both led to the death or "disappearance" of several community leaders (Oliveira 1989:31). In this scenario, the Catholic Church experienced a constant evolution of its social concerns (Catholic Church Archdiocese of São Paulo 1998: 124), and grassroots organizations tied to the Catholic Church were often the only means for peasants to voice their needs and their opposition to events occurring in the frontier areas (Schmink and Wood 1992:180). The so-called Journey Church or *Igreja da Caminhada*, built by supporters of the Liberation Theology movement, opened its doors to peasants and, in 1975, established a committee called *Comissão Pastoral da Terra* or CPT (Land Pastoral Commission) whose goals were "to interconnect, assist, and activate the support to rural social movements" (Almeida 1991:261). The Church, together with the CPT at a community level, created ecclesial "base" communities called *Comunidades Eclesiásticas de Base* (CEB), in which local leaders would conduct religious services and facilitate community organization. From this point on, the military regime directed its violent repression not only to peasants and indigenous people, but to priests, nuns, and union leaders, who were starting to get reorganized.

After five years of military regime, a CEB was started in the region and a CPT office was set up in the city of Marabá. Several local leaders strengthened their commitment with the CEB movement and later became union directors, regional officers with the Worker's Party (PT), with the SDDH (Pará State Society for the Defense of Human Rights) with lawyers supporting peasants in judicial cases, the FETAGRI (Rural Workers Federation), and the University of Pará, among others. In these circumstances,

some of the FATA/LASAT founders (inside the CAT Program) played key roles, for example, coordinating the CPT/Marabá, heading four peasant unions, and teaching at universities. This will be discussed in the next section.

Although the Rural Workers Unions (STR's) were created under the military regime to control social movements organized in rural areas, the STR board was gradually passed on to those with a strong commitment to the rights of peasants, long before the regime fell. Nevertheless, the fall of the military government in 1985 gave place to greater violence against colonists, for the powerful landowners were responding to the new presidential decision to promote a nationwide land reform, where the region known as *Bico do Papagaio* would represent a priority. The "big" farmers set up an office to start the Rural Democratic Union (UDR), and large ranchers in the region started recruiting private militias to fight land invasion, which was likely to be carried out by peasants but also supported by government agencies attempting to expropriate the areas regarded as their own (Schmink and Wood 1992:188). Between 1989 and 1999 the average number of murders resulting from land conflicts in the Marabá region was 120 times higher than the country-wide average (Forum das Entidades pela Reforma Agrária do Sul e Sudeste do Pará 2001:4). This means that a leader or peasant living in the Marabá region and engaged in a land conflict between 1989 and 1999 had a much higher chance to be killed than any other worker living in any other Brazilian state. This history of violence against peasants and the impunity of farmers and loggers²¹, both supported by

²¹ From 1985 to 2003, the Land Pastoral Commission (CPT) registered 1,003 violent cases related to land conflicts, with 1,349 dead victims. Only 75 cases went to judgment, with few considered guilty (CPT 2004).

the legal and the executive systems, represent the main obstacle for partnership agreements to be implemented between these social groups in the Marabá region.

Peasants' history is marked by active resistance in order to guarantee their rights, in spite of harsh conditions and violence. Due to the historical distrust between government and peasants, top-down governmental actions imposed on peasants in order to control their natural resources management, especially those related to their main source of income, such as fire use, are likely to fail. This study argues that actions that see peasants as partners, with decision-making power, through a methodology that respects and supports their culture, with effective channels of communications and conflict resolution, are more likely to succeed.

FATA and LASAT

This section describes the two institutions coordinating the Fire Action, FATA and LASAT. Their history, as well as their goals and achievements are closely connected with peasantry development in the region that directly reflected on peasants' willingness to adopt the productive practices promoted by them. FATA was composed by peasant union leaders (STR's), and LASAT by researchers connected to the local university.

Both FATA and LASAT were non-governmental institutions created in 1988 under a wider agricultural and environmental program called "Tocantins Environmental Center" (CAT). At the time of its foundation, the CAT Program was a partnership agreement celebrated between four Rural Workers' Unions (STRs) and the Federal University of Pará. The main goal established by the agreement was "to assert their [peasants'] identity, to achieve full citizenship and to express their determination to live and to take their rightful place in the construction of a fair and fraternal society" (Hébette 2000:xxii). In a moment when land was being conquered by peasants through struggle, peasants'

challenges were to build good conditions to establish themselves, as well as to produce and guarantee social reproduction in their lands. From the goals set out by the CAT, it is clear that justice and fraternity were principles linked to those defended by Liberation Theology. This may be due to established partnership with the Land Pastoral Commission, also reflected in the composition of the CAT founding board: CPT's first coordinator in the Marabá region, Mr. Emmanuel "Manu" Wambergue; four peasant union directors who grew as leaders inside the CEBs; and a professor from the local university, who was assistant to the CPT, Mr. Jean Hébette. Also, STR Directors had grown up inside the church groups. The identification of the CAT Program with the peasants' struggle is well reflected in Manu Wambergue's evaluation of the role played by the CAT Program on its 10th anniversary as "one of so many fruits that flourished from the peasants' struggle in the region" (2000:41). Peasants' struggle was not violent; their form of resistance was their resilience and active search for new solutions, despite harsh conditions of exclusion from government incentives.

Communities' Social Organization

The two communities evaluated had been partners with FATA and LASAT. In the São Francisco do Itacaiúnas community, in September 1998, FATA's perennial crop group (for implementation of perennial crops) led the creation of the community association, the AGRAF, in an attempt to work more closely with families' needs than did the regional association, created in 1994 to facilitate access to federal government loans. The Association's main goal was to "carry out sustainable development activities in their community" (AGRAF 1998). They borrowed the necessary money for bureaucratic

expenses (around US\$ 512)²² from FATA and paid it back later with their labor—one week's work of ten men—at the FATA headquarters. Very often, the cost of an organization's creation is supported by local politicians, creating a certain relation of dependency on the part of the peasants and the organization. AGRAF's representatives proudly explained how they had paid off the loan with their own labor. The recognition of the São Francisco do Itacaiúnas community as a *Projeto de Assentamento* (Area for Land Reform) was a result of its leaders' organization for solutions. The community's leaders participated and supported families' participation in demonstrations organized regionally by the STR and FETAGRI when families camped out at the INCRA headquarters in Marabá, an event called *Grito da Terra*, or 'Cry of the Land'. In 1999, 77% of the families in this community had at least one member in the community association, and 95% were members of the STR. In 2000, AGRAF's members elected a new board (6 men and 1 woman), all of whom work as volunteers.

Families at the Cupu community had a close relation to the COOCAT through one of its directors who lives in the community. COOCAT has supported the marketing of açai fruits,²³ among other products. Since 2000, they have been helping with the preparation of a regional proposal for the planting of coffee, along with the Jacundá STR and Jacundá municipality representatives. The peasants' regional association was working with COOCAT and STR to achieve official recognition of their existence as a

²² In September 1998, the average conversion rate was US\$ 1.00 = R\$ 1,17 (Banco Central do Brasil 2004).

²³ Açai (*Euterpe oleracea* Mart.) is a native Brazilian palm in Amazonian region whose fruit is much appreciated in regional markets, which are growing in national interest. The palm apical bud is appreciated nationally and internationally for palm heart, but the extraction of the Atlantic Forest species (*Euterpe edulis*) requires felling the tree. This Amazonian species is very promising for sustainable harvest because of its sprouting capacity.

community (*Projeto de Assentamento*), supporting them in acquiring land title and loans. In the Cupu community, the majority of the families (62.1%) were members of a regional association created to facilitate access to federal bank loans (FNO) in 1996. Seventy-one percent were members of the STR. There was no specific community association. In the past, the community had worked in the FATA's perennial crop project. Ten families took part in LASAT's Community Timber Project. As an indicator of their hope in this Project, by 2000 none of the participants had sold any trees to middlemen since the Project started in 1997.

FATA/LASAT Community Fire Action

The FATA and LASAT direct interest in controlling fire use was to protect alternative projects for peasant productive system: FATA perennial crops implementation²⁴ and LASAT forest management.²⁵ Local peasant organizations believed that uncontrolled fires threatened alternative production systems in slash-and-burn agriculture and cattle ranching, consequently leading to new migration cycles, conflicts and suffering. The proposed Fire Action did not aim to encourage families to stop using fire in their productive systems, but rather to promote a more responsible use of fire, specifically preventing and controlling undesirable losses.

²⁴ Between 1991 and 2000, FATA implemented the PAF (Agricultural-Forest Project) to establish and to market perennial crops such as fruits and lumber. Later, activities of horticulture, honey production, and Açai palm (*Euterpe oleracea*) management have also been incorporated. In 1998, when the Fire Action started, 44 communities, including three indigenous communities (a total of 76 groups) were working with FATA in the different activities (Carvalho 2000:65).

²⁵ LASAT started a Community Forest Management project in 1996, initially involving three peasant communities from three different municipalities. The main goal of this project was to promote sustainable lumber extraction and processing by peasants, which should result in less damage to the forest and in higher profit.

Besides the grassroots institutions' and leaders' reasons to control fire, peasants in general had many questions about the new official fire regulations. The dry season of 1998 was the first after the fire disaster occurred in Roraima, and the changes introduced by IBAMA to the fire management laws were: the requirement to submit an official form to obtain a burning permit, the obligation to provide details on the type and the size of firebreaks, and for the first time, a total ban on fires in municipalities with high rates of burning (measured by the INPE - National Institute for Spatial Research). Although not all rules were new, the latest change introduced by IBAMA was to massively divulge, through the radio and TV, the requirement to obtain a license to burn, of the fire use ban, and that IBAMA staff would be enforcing the fire law in the field. In the communities, FATA/LASAT technicians were initially thought by many peasants to be IBAMA members, who were disappointed to find that the technicians could not provide them with any official burning permits, or even get them to be heard at governmental levels. They wanted to explain to IBAMA not only their reasons but also their very need to burn, which is clearly expressed in the extract below:

Many have burned, but I have not and many others have not either. We expected someone to give us explanations, because we do not understand the law, and we want to find a way to work legally. Because in a place like this, with no roads and no assistance, if a poor peasant has to pay a fine for burning his field, it would be better to bury him straight away. So, let us say a family cannot harvest their field, how would they live? This is why I want to know what we have to do in order to burn. Do we have to make firebreaks, to get a license? I want you to explain it to me so that I will understand it. If you had come earlier, I believe nobody would have burned without permission. Our group always works together to do things the right way. But we never had anybody come here to explain things to us.

Mr. João Pinheiro, Jabuti Community, Oct 14th 1998, community meeting (Carvalho 1999:18).

Despite peasants' investment in other productive systems, fire was their main productive tool for agriculture and pasture maintenance, and they wanted to know what to

do in order to produce their crops without becoming a "criminal". Peasants complained that it was hard for them to have access to information about government regulations. For example, in the whole Marabá region there was only one IBAMA agency bearing responsibility for all environmental issues in the region (from illegal logging to river pollution), whose technicians were not used to visiting colonist communities. The radio was helpful to bring general awareness. However it did not explain the official laws and regulations, and the necessary steps that should be taken in order to burn.

The Fire Action adopted a participatory approach, based on Paulo Freire's pedagogy (Freire 1986), as presented in Chapter 1. The Action adopted the problem-posing methodology, whose theme was fire use, more specifically "how to manage fire in order to keep it only where it is planned" (agricultural fields and pasture maintenance). The resulting recommendations made by the Fire Action were intended to be closely tied to their social, economic and ecological realities, and given the urgency of the problem—established perennial crops and forest areas were being burned—also to produce short-term answers. Below is presented the application of the participatory approach adopted.

Process for defining Practices for Fire Management

The Fire Action stemmed from a study proposal made in 1997 to LASAT by the author of this study, and the interest of LASAT, FATA and peasant leaders for better fire management. The diversification of peasants' productive systems with community forest management and investments in perennial crops depends on the ecosystems, which are very susceptible to fire, due both to fuel accumulation and to their proximity to the ecosystems where fire is present as an agronomic tool. The FATA/LASAT Fire Action²⁶

²⁶ For the purpose of this thesis, the Fire Action coordinated by FATA and LASAT will be referred to as FATA/LASAT Fire Action, or just Fire Action.

started during the 1998 dry season and ended at the beginning of 2000, from lack of funding. The Fire Action had economic support for the Action coming from outsiders (distant donors), was implemented by technicians from the local grassroots institutions (FATA and LASAT), and planned, developed, and evaluated with peasants at regional and community levels. Documents produced (such as reports) were shared with community leaders and unions. Educational material was developed by technicians and peasants. The author of this thesis coordinated the Fire Action from 1998 to July 1999.

The proposal was based on peasants' active participation, because they were the ones who had developed knowledge on using fire in their environment, and therefore were skilled to evaluate what was not working well, and to be important partners to improve fire management. Another reason to get peasants involved is that they are the ones who ultimately take the final decisions on fire management. If they are actively involved analyzing the situation, proposing and approving changes in their practices, those changes will be closer to their realities (infrastructure, social, and productive) and thus more likely to be incorporated into their activities.

The action-learning cycles support peasants' development of their own proposals, and recognized that changing practices is a dynamic process, and therefore has to be analyzed periodically. Peasants had a reading of their reality, and the starting point of the action-learning cycles was their actual understanding of fire. Actions of fire management were carried out at the community level, and learning (evaluation and planning) in meetings at community and regional levels. Each dry season corresponded to a full learning cycle (see Figure 2-1). Regional seminars took place in the beginning of a dry season, for evaluation of the previous and planning of the following, and at the end of

that dry season, also for evaluating and planning, closing a cycle by incorporating lessons learned. The Fire Action worked for two action-learning cycles, in 1998 and 1999.

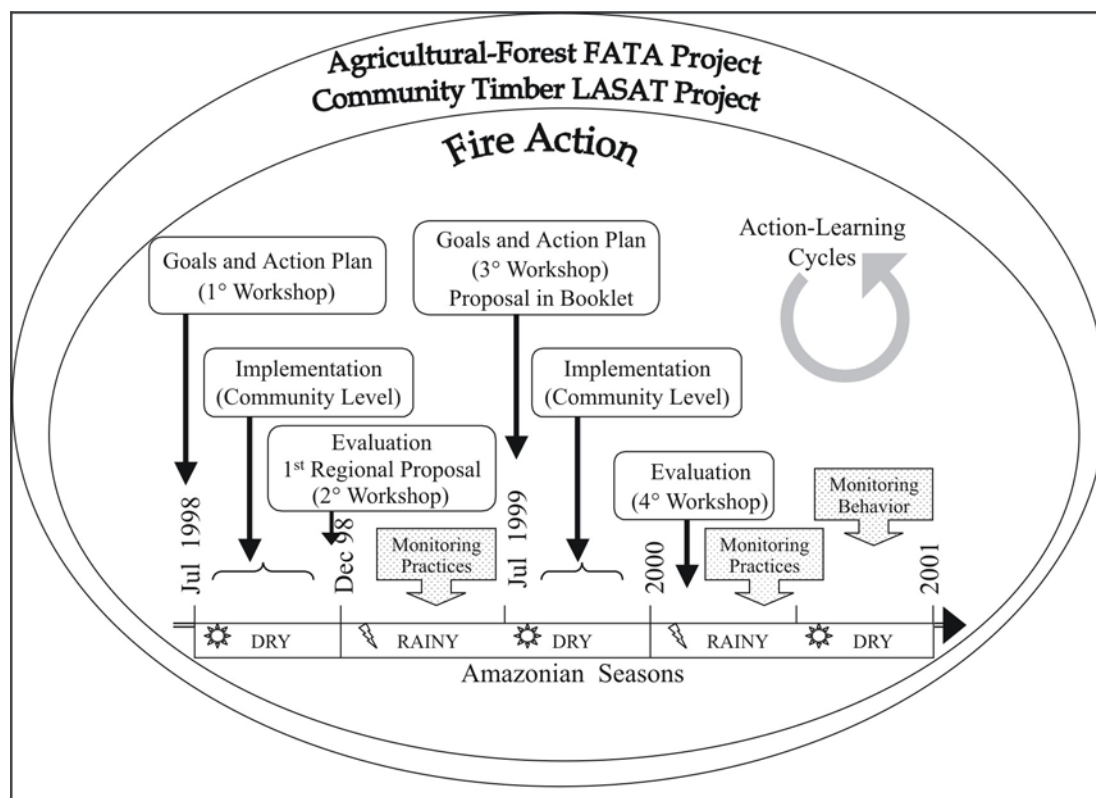


Figure 2-1. Representation of the FATA/LASAT Fire Action showing key activities of the participatory Fire Action. Action-learning cycles started in the beginning of a dry season, with activities of evaluation, planning, and dissemination at regional (workshops) and community level. Actions were taken at the community level, and evaluated in the following workshop (By author).

The Fire Action did not establish any instance of centralized decision, nor did it plan to follow any pre-defined agenda. Instead, it sought to work flexibly to reach and involve the families' realities at the community level, at same time promoting community organization. As form of incentive, grassroots institutions (FATA, LASAT and STR) declared they would support organized communities in case of conflicts with IBAMA regarding fire use, and the Fire Action's technician would visit those better organized

more communities regularly. Subsequently, regional workshops would draw general lines of action, but it was at the community level that more specific agreements and recommendations should first take place, since at this level those agreements are made and monitored.

During the dry seasons, the Fire Action technician visited some of the communities in order to monitor their actions. After the dry season was over, community representatives presented their community experiences at regional workshops. More than 40 communities were invited, with support for transportation, food, and lodging. This flexible strategy was chosen because it gave families an opportunity to play an active role at the community level, where they could change their community, shaping it to their reality, while at same time they would feel important for having played an active role and for the motivation to participate (Bunch 1994:69).

The meetings held at the community level were key to the participatory approach adopted because they created opportunities for conducting discussions, accessing information, exchanging experiences, planning, as well as for dissemination and evaluation of the proposals. In general, every family had heard something about fire management and the penalties imposed by the government for its use. However, they had always been uncertain about legal details. Many families expected that IBAMA's burning guidelines would be presented to them in 1998. Given that all families use fire in their productive systems, community meetings attracted many in search of information on fire use and of an opportunity to complain about the government's proscription of fire use. The government's prohibition of fire use²⁷ resulted in a dilemma for peasants: they

²⁷ Since 1998, the government has prohibited fire use during the dryer weeks of the dry season, in general for eight weeks. Even those who got permits are prohibited to use fire during this period.

do not want to break the law on the one hand; on the other, they depend on using fire for their social reproduction. They did not want to go against the law, but they did need to burn. After receiving no information from IBAMA by the end of the dry season, they started burning in a careless manner and without an effective plan (Carvalho, 1999:21-22). This condition allowed for deep reflections about their own situation.

The visits paid by the Fire Action coordinator to the communities reinforced the work done by community leaders because, in addition to promoting discussions, the peasants who did not attend the regional workshop could access information by asking questions directly to the technician and comparing answers to clarify some of their uncertainties. Some families are less involved in community organization and do not trust leaders or their intentions regarding fire management, suspecting that leaders would receive some form of payment from IBAMA to control the use of fire by families. This type of suspicion represented a very common conflict among communities in the Marabá region. The ban imposed by IBAMA on the use of fire represented bigger losses to peasants than uncontrolled fires usually did, because for them there is no production at all without fire. Therefore, for those with poor access to information, the regular payment of a "salary" would represent a logical justification for some peasants to go against their own class, i.e., to support fire control. The technical visits strengthened the legitimacy of the work done by the leaders, and emphasized the fact that none of the work done by peasants was done for money, since they worked as volunteers, and FATA/LASAT only assumed the cost of transportation, food and lodging for regional workshops held at the FATA Center. The fact that the leaders involved in the Fire Action were generally the same ones taking part in other actions promoted by FATA and LASAT helped to

encourage other peasants to believe in the proposals of the Fire Action, and to play an active role in it.

Regional one and three-day workshops were held at the FATA Center, and brought together peasants and technicians to discuss and evaluate their community actions and government laws, to plan strategic actions, and to present and discuss their own proposals with the representatives of both governmental and non-governmental organizations. The Fire Action coordinator also held meetings at the STR's (Rural Workers Unions) and visited governmental institutions (INCRA, IBAMA, SEMMA, EMATER, Public Defensor Office).

First Action-Learning Cycle

The first action-learning cycle started in a regional meeting, aiming to analyze the present fire use situation based on peasants' understandings, challenging their knowledge with information on fire law and fire occurrence in the region, and drawing up with the peasants a first proposal for fire management to be carried out in the coming dry season. At the community level, during the dry season, actions consisted of meetings, to inform and discuss proposals defined in the regional meeting. At the end of the dry season, the closing cycle would be an evaluation of the action carried out, and planning for the following year dry season. For the closing regional meeting of the first cycle, leaders decided to invite other grassroots institutions related to peasants, as well as governmental institutions—the presence of IBAMA would be crucial for peasants to present to them their developed proposals. Details of each step of the first action-learning cycle are presented as follows.

The first action-learning cycle started at the beginning of 1998 dry season, during the workshop on "Perennial Crop Management" held at the FATA Center, when an entire

day was dedicated to discuss fire use with peasant participants. In this first meeting, there were a total of 31 peasants (from 20 communities), and 4 indigenous (from 2 tribes), all connected to the Perennial Crops Project, and representatives of two communities also involved with the Community Forest Management project. There were also 13 technicians (8 from FATA, 4 from LASAT, and 1 from EMATER/Itupiranga).

Instead of presenting to the peasants the methodology of the coordinator's previous experience in community fire management in Paragominas (Mattos et al. 2002), and then discussing how it could be adapted to their conditions, the strategy used was exactly the opposite: first the discussions were on what participants would do in order to prevent losses caused by the fire, and only then was the other experience presented. This strategy was very positive because participants were given the opportunity to see that the results achieved by their discussions were similar to a consolidated experience carried out in other Amazonian regions, which raised their self-esteem. As discussed in Chapter 1, problem-posing methodology empowers participants by raising questions on their situations and by leading to solutions based on their own understanding of their reality, making it possible to change this reality. In addition, participants will be more likely to appropriate practices they themselves developed.

In order to theorize on peasants' knowledge, fire use was codified into three different phases: (a) before a planned burning event, (b) the burning day, and (c) after a planned burning started. The exercise resulted in the creation of a fourth category, (d) control of accidental fires. This codification constituted of discussions on each phase by a brainstorming exercise, and ideas organized in flipcharts, facilitated by the Fire Action coordinator. The problem-posing question was "What can we do before, during, and

after the use of fire in order to prevent uncontrolled fires?" The following complementary question was "What can we do in order to control fire?" Every idea was considered, even when some participants did not agree on its effectiveness. This first exercise resulted in a set of general activities (listed below), with more or less agreement on their efficiency or feasibility.

The division or codification of fire management actions into phases was key for planning during meetings because it allowed the connection of the several fire prevention and control techniques practices to the best period to use them, according to peasants' usual slash-and-burn system steps (Figure 2-2). The upper part of Figure 2 shows the approximate division in months of rainy and dry seasons; the middle part shows six basic slash-and-burn steps influenced by fire, each followed by a bar indicating the period when the step is taken; the lower part indicates the three Fire Action phases, before the burning, on the burning day, and after the burning. Following this time division during discussions, peasants were challenged to think in terms of responsible fire use during each of the slash-and-burn steps based on their own previous experience or information. Thus, this step of relating phases to local system was a major innovation that emerged from the participatory process.

This emphasis on collective action was a second major innovation. In all four phases, the overall recommendation for 'union' was consensual, meaning that the work should be done in groups of family members, friends, and neighbors. It was said that fire was "democratic," i.e., it would burn everybody's land without distinction of origin, kin, religion, etc. Acting together, families would be better able to manage fire efficiently. For instance, when choosing the burn location (sometimes during the rainy season) it is

important to analyze the fire danger to surrounding ecosystems, also taking into account neighbors' ecosystems. Neighbors should unite to organize a period to slash the vegetation, allowing fields to dry and be burned together at the same time. Burning in groups would help in the use of prevention and control techniques, such as firebreak and backfire.

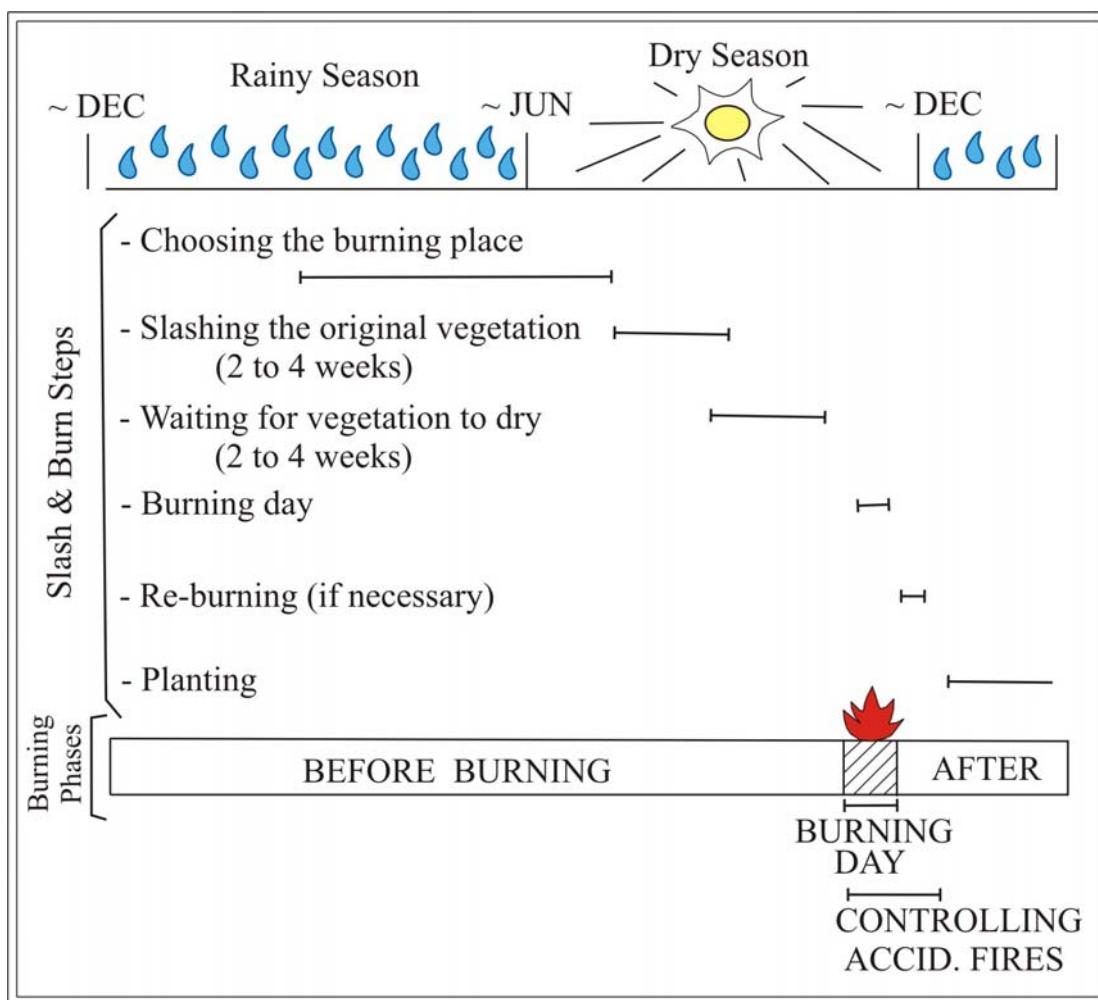


Figure 2-2. Codification of fire management actions into phases (before the burning day, at the burning day, and after burning) and its connection to the best period to use them, according to peasants' usual slash-and-burn system steps (Drawing by author).

The first systematization on Community Fire Management, developed in the first regional meeting, June 1998 (Carvalho 1999:5-6), is shown in Figure 3-3. After this brainstorming exercise, the coordinator presented an experience of fire management also developed by colonist peasants in Paragominas, through a participatory approach from 1996 to 1998 (Mattos et al. 2002). Participants concluded that their recommendations were very similar, differing only in the details about the size and type of firebreaks, and in the form of community organization for the case of accidental or criminal fire. The exercise of facilitating peasants to organize their knowledge empowered them to believe in their own capacities. The similarity between strategies from the other case and their own knowledge showed them that they already knew a lot, and that what was really missing was their organization and motivation to implement practices in a more consistent way. Another sign of their self-confidence was that they did not request copies of the Paragominas Booklet, but proceeded with their discussion. Their decision on developing their own knowledge rather than basing on other experience was a demonstration of empowerment. Peasants attending this first meeting decided not to define the details about techniques or community rules at that moment, but instead to focus on more general recommendations. They claimed that details on each family's agreement should be developed at the community level.

It was clear to the peasants attending the workshop that the recommendations defined during the meeting bore no official power to replace the IBAMA law, currently in effect. Still, peasants were motivated to develop their own rules in order to confront IBAMA's top-down rules, because of their belief that if they could manage fire well (causing no losses to the forest or to their neighbors), they would have the legitimacy to

face any eventual confrontation with IBAMA's representatives. At the end of this meeting, some agreements were reached:

- Each participant should present and promote this discussion on community fire management in their own communities;
- Each participant should support the creation of Fire Groups open to all members of their communities;
- The FATA/LASAT consultant should visit all the communities where Fire Groups were created, giving priority to those communities that could inform possible dates of burning events;
- FATA/LASAT should prepare instructional materials in the form of posters and/or flipcharts, which would include the results of the workshop; the material would be distributed and discussed during the regular technical visits conducted by the FATA;
- FATA/LASAT would support the coordinator's work for the 1998 dry season with funds provided by the DFID.

The results of these agreements were positive. Jadiel Souza (personal information), FATA director, said that more than 30 colonist communities with families involved with the FATA and LASAT projects organized Fire Groups. The Fire Action produced a poster and a serial flipchart summarizing Fire Management recommendations. The Fire Action coordinator visited nine communities, facilitated community and Fire Group meetings in five of them, and made subsequent visits to two of those five communities. Burning situations (before, during and after) were also monitored.

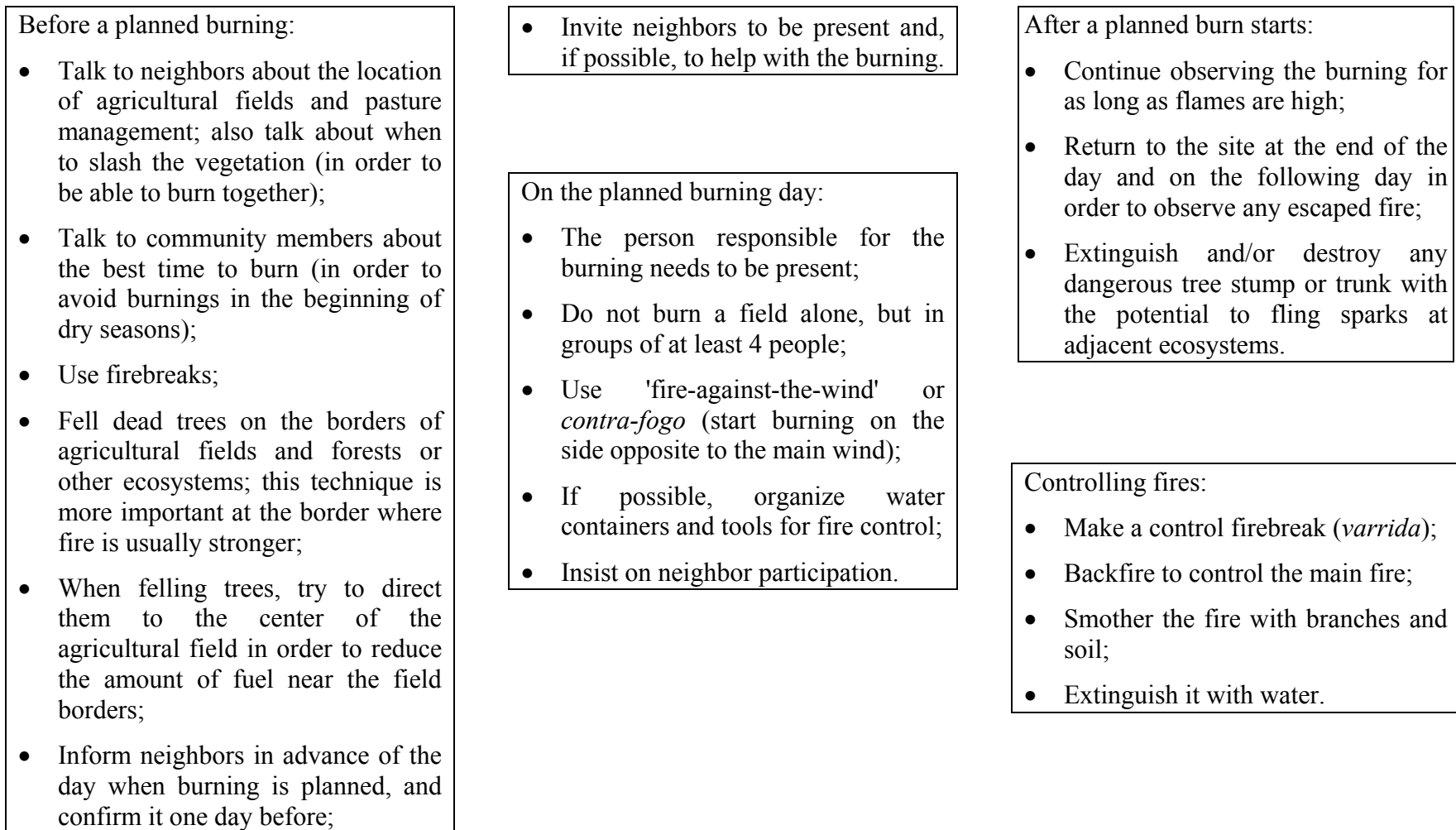


Figure 2-3. Summary of the first systematization on Community Fire Management, developed in the first regional meeting, June 1998 (Carvalho 1999:5-6).

Despite participants' initial frustration at not being able to communicate with government representatives, the meetings held at the community level led to rich discussions and to community planning. The results of the first regional workshop were presented, and their local burning situations were discussed. Each peasant's burning situation was presented to the community, which generated discussions on possible dangers and how to minimize them. In order to codify the group's visualization of the different burning situations, the FATA/LASAT technician developed an instructional kit called "Burning Dynamics" (Carvalho and Mattos, *in press*). This kit contained colorful drawings on cardboard tags representing the ecosystems (primary forest, secondary forest, perennial crops, agricultural crops, pasture) and other significant elements in a burning event, such as wind, sun, fire, rivers, firebreak, water buckets, houses, fences, equipment, and people (Figure 2-4). There were several copies of each drawing, and they could be positioned on a larger card according to different situations. The peasants would build their situation and keep moving the elements around (fire, people, water) to represent the burning dynamics, and incorporate suggestions. The kit was very helpful in promoting discussions, especially helping group understanding of a burning situation. Usually, when a peasant explains his burning situation, he or she draws in the ground with a stick, showing the agriculture field, surrounding ecosystems, wind direction, where did they started burning, etc. After a while, others in the group cannot remember what the ecosystems were around the burning, or the wind direction, or neighbors' land; the discussion does not go deeper because the person responsible for the burning has to keep explaining the burning situation again. With the burning-dynamic kit, all participants could visualize the situation, and make suggestions, adding or moving

objects, facilitating discussions of possible alternatives for the studied situation. Those meetings held at the community level attracted many people, including those not used to attending them.

As planned before, the second regional meeting called "Management Alternatives for Small Scale Production" was held in December of 1998, at the end of the dry season, during three days. It was composed of three parts, as follows:

- Community Fire Management (December 1 and December 2).
- Community Forest Management (December 3).
- Assembly open to invited institutions (December 4).

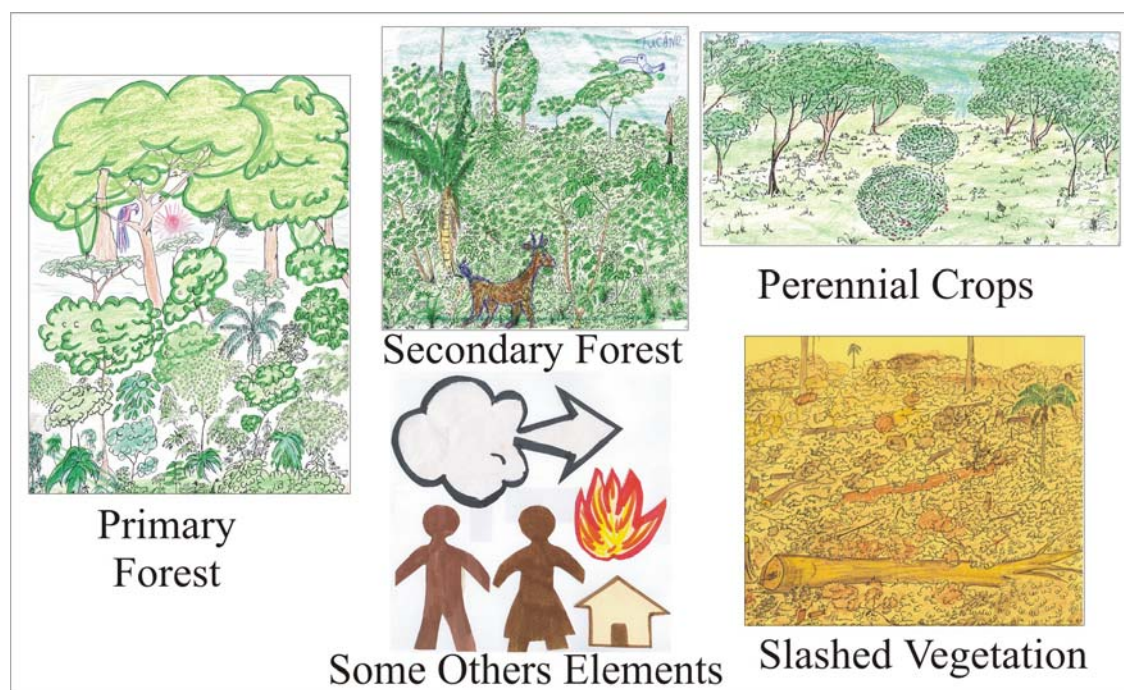


Figure 2-4. Some of the elements used in the "Burning Dynamics," which could be rearranged according to each burning situation, helping the group to visualize the burning situation and assisting in the consequent in-depth discussions (Drawings by author).

As part of the action-learning cycle methodology, the goals of the workshop were to (a) evaluate the fire Action for the 1998 dry season, (b) organize its results in a fire management proposal for the region, and (c) present and discuss this proposal with

invited institutions (IBAMA was the most hoped to attend). A total of 47 peasants representing nine communities attended the meeting (28 men, 14 women and 5 children). A stronger presence of peasants was expected, but the workshop coincided with the beginning of the rainy season, which forced families with related agricultural activities to stay in their lands. Two FATA Directors, as well as FATA technicians, the Director of a Honey Production Association, the Fire Action coordinator, and a researcher from the University of Washington were also present during the entire workshop.

The first half-day was used for theorizing the interconnections of local fire use with regional, national and international contexts. Participants discussed sustainability in Amazonia and the growing susceptibility of the forest to fires, as well as data from INPE on fire statistics, the insertion of Marabá in the Arc of Deforestation, international interests in stopping fire use in Amazonia, the fire disaster that occurred in the state of Roraima, the history of governmental fire laws and their current changes.

The most recent IBAMA booklet on fire management (IBAMA/GTA, 1998) was analyzed. Table 1 shows a summary of this analysis. Each participant received a copy of the booklet, which was read by the group, and time was allowed for discussion. As a result of this study, participants first criticized the symbol chosen by IBAMA to represent forest fire prevention and control: a humanized anteater. It was a consensus that it was not a good symbol for peasants because the anteater is an appreciated dish in Amazonia, and not at all related to fire management awareness, even to those who know that forests are their habitat. It was agreed that the representation of an experienced technician presenting practices in accordance with their reality would be more likely to be accepted

by them. During Fire Action evaluation, peasants referred to elder peasants as models for good management, as discussed in Chapter 4.

Participants also concluded that official fire permits were too hard to obtain, especially for peasants. Among other bureaucratic procedures, it required numerous documents peasants simply did not have, and which were often incompletely listed in the booklet. Although some of the participants knew that the acquisition of some of those documents cost a lot in fees they usually could not afford, the booklet did not explain any of that. Participants expressed their concern about what this money was used for.

Table 2-1. Peasant critical assessment of the IBAMA/GTA booklet on fire management (IBAMA/GTA 1998), as discussed during the second workshop in December 1998 (Carvalho 1999:21).

Summary of the critical assessment of the IBAMA Booklet on Fire Management	
WEAK POINTS	STRONG POINTS
Burning permission requires land tenure documentation	Fosters community organization
Burning permission requires payment of fee for inspection by deforestation agents	Instructs participants of different fire groups to burn on different days
Burning permission requires payment of fee	Fosters use of adequate equipment
Firebreak guidelines do not fit the reality of peasants or of the region—concerning length, distribution and format	
The Brazilian government's regulation of fire use shown at the end of the booklet is printed in small font, making it hard to read, and uses technical jargon	

Some strong points were that the booklet encouraged community organization, regarded by participants as one of the most powerful tools for fire management. Also, the instruction saying that participants of fire groups should not burn on the same day

was evaluated as positive, because the fire groups have more time to observe the burning, and to be present if any accidental fire starts. Everyone emphasized the need for adequate equipment to optimize fire control and minimize the risks involved in the activity.

Participants held that the IBAMA guidelines for burning after the first rains could not always be followed, depending on (i) the location of the agricultural field in relation to its topography (places close to swampy areas do not burn well after rain), (ii) the previously existing vegetation (burning pasture after rain events helps grass regrowth; slashed primary forest will not burn well when it receives a strong rain), and (iii) the severity of the dry season (some dry seasons are so harsh that burning without a rain event becomes highly dangerous, while in others dry seasons rain is more frequent so that it is hard to avoid burning before the rain).

The hardest criticism was placed on the length, distribution, and format of the firebreak guidelines presented in the booklet. IBAMA requires a 3-meter-wide firebreak in general, and a 6-meter-wide firebreak when the burning is adjacent to forest and neighboring areas. Three meters is a difficult target for peasants to meet because they have no access to machinery; six meters is out of the question, since this is generally a wider lane than most roads accessing their communities. Peasants also questioned the statement that the wider the firebreak, the smaller the risk of accidental fires (IBAMA/GTA 1998:14), because sparks can fly very far. Firebreaks located far away from the agriculture field were evaluated to be much more efficient (as discussed in the Fire Action recommendations). In addition, the IBAMA booklet's recommendation to make firebreaks in the middle of large agricultural fields in order to "burn in steps"

sounded like a joke, or rather like a clear sign that the people who wrote the instructions had never visited a slashed vegetation in Amazonia prepared to burn. Slashed vegetation (especially from primary forest but also from secondary forests) is composed of many fallen trunks and branches superimposed one over the others, in many layers; walking through a slashed field means walking over trunks, and in small areas over the ground. Constructing firebreaks by hand in this condition is impracticable. All this, associated to other guidelines such as building trenches inside the agricultural field when the land is steep, carrying large tree trunks located close to firebreaks to the center of the field, and the representation of slashed vegetation as pasture field, resulted in participants' total disbelief in IBAMA's real expertise and consequently in its competence to provide advice or to monitor fire management in Amazonia.

The last aspect participants criticized in the IBAMA booklet was the font size chosen to print the text content of the booklet and the language used, particularly where it presented governmental fire regulations. Besides being too small, which made it hard to read, the language was too technical and therefore difficult to understand.

On the morning of the second day of the workshop, representatives of each community presented an evaluation of the 1998 fire season in their community. They described the severity of the dry season, examples of Fire Group work, and the lack of losses in most of communities. Only one community recorded loss because of burnings, when a peasant burned a field without asking for the community Fire Group's support. Members of a community in which accidental fires were successfully prevented complained about the difficulty and danger involved in fire prevention and control, for it is done with no outside support or adequate equipment. This discussion was illustrated

using the example of a burning in which the Fire Group helped. After most of the fire had been extinguished, the group left. Later that same day, when the responsible person and his 12-year-old son returned to observe, they found that the fire had spread to the neighboring forest. There was no way to call for help, and the two of them spent many hours controlling the fire, without water or equipment. They had trouble breathing for many days after the event.

All participants then agreed on the need for equipment and expressed their concern about not being able to follow IBAMA's laws. This concern is shown in the following speech:

When people work together for a common goal, nothing is difficult. And our community is like that. We hope that from this point on, things [fire use] go right, and that IBAMA does its part too. (...) If the government is pressing us to control fire, then it [the government] has to provide us with the appropriate equipment. Nobody can control it [fire] like it is done now, using only our hands.

Antonio Pintassilgo, Tracua Community, December 3rd 1998, second regional workshop (Carvalho 1999:26)

Besides limitations with controlling fires because of absence of external support and equipment, the peasants' evaluation at the workshop closing the first action-learning cycle for the 1998 dry season showed positive reactions to the Fire Action campaign. Without discontinuing their use of fire, the families involved claimed to be better organized to prevent and control fire in their communities, and therefore reduce losses. However, they worried about uncontrolled fires that originated in large farms, and the government's outlawing of the use of fire and punishing those who use it. Those uncertainties about government actions regarding fire use are well expressed in the speech by representative Augusto Ferreira, when evaluating the work in his community:

Many people that are really interested do not want to obstruct the law; no one wants to go against it. However, we have to know how far we can go without breaking the

law, because if it [the law] does not conform to our reality, how do you follow the recommendations in the [IBAMA] booklet, for example, that do not match our reality?...

Mr. Augusto Ferreira, Nova Jerusalém community, December 2nd, 1998, regional meeting (Carvalho 1999:23).

On the afternoon of the same day, the participants were divided into groups according to their communities. Each group developed an exercise of codification using the Burning-Dynamic kit. They were asked to represent a common burning situation in their community, and to discuss in each group, fire practices for prevention and control of accidental fires. Burning-Dynamic material was provided. After that, each group presented the burning situation using cardboard visual aids, and described the practices taking place before, during and after the burning. This discussion on fire management practices was very rich, with different situations of vegetation to burn, surrounding ecosystems, practices, etc. Two of the seven examples discussed in this exercise are presented in Figure 2-5.

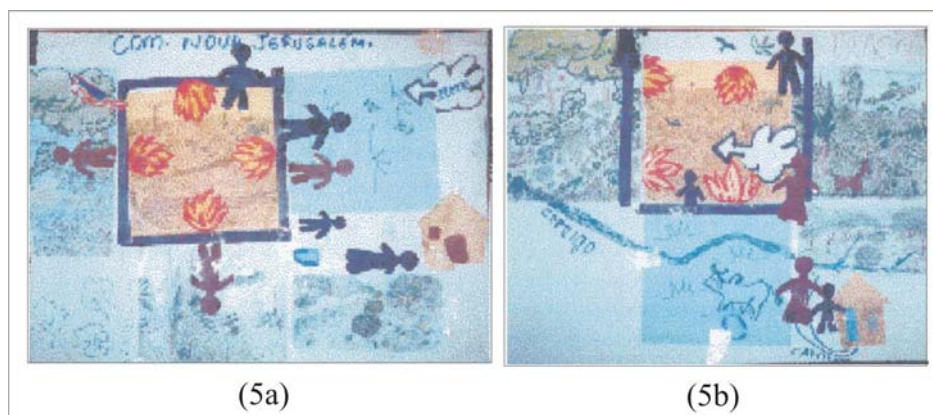


Figure 2-5. Two examples of Burning Dynamics represented by community representatives at the second Regional Seminar, held in Marabá city in December 1998. Each example represented a possible burning situation, and it was used to present and discuss this situation with seminar participants. According to Freirian Pedagogy, the codification is a visual representation of

the problem-posing situation, promoting critical reflection on peasants' reality, and their critical self-insertion into this reality (Photo by author).

Figure 2-5a shows the fire management example presented by the Nova Jerusalém and Plano Dourado communities (Carvalho 1999:27-28). They displayed a hypothetical situation of a burning where the crop field to be burned was surrounded by pasture (on the right side), neighboring forest (on the left side), forest located in the family's land on top, and secondary forest (at the bottom). The wind blows from right to left, and the family house and perennial crops are located to the right. The family organizes a group of five men to make the four firebreaks and to burn. On the day of the burning, they prepare tools (machete and scythe) and water, and start the burning from the left side, which is downwind. The woman stays close to the house and the boy remains at the firebreak, close to the fastest way out. That way, he can go and get help if necessary. The group stays and observes until the strong fire is out, checks the firebreaks for accidental fires, and observes dry wood or dry standing trees located close to the surrounding ecosystems. They return on the following days to check for any accidental fires. In case of accidental fire, they try to smother the flames with green branches and soil, also using water. If the fire gets out of control, one of them has to go for help.

The other example, Figure 2-5b, shows the situation presented by representatives from the Tracuá and Josinópolis communities (Carvalho 1999:28-29). They portrayed a burning carried out by an individual family with the help of three neighbors. A secondary forest is located to the right of the burning field, to its left there is a primary forest, at the bottom there is a pasture with animals, and the perennial crops and the family house are located at the bottom right-hand corner. The black line around the burning field represents firebreaks. They also showed a small brook crossing the

ecosystems. Firebreak width and location varied according to the neighboring vegetation: primary and secondary forest, and pasture. When the burning field was next to a pasture, the firebreak was located at the border of the burning field, and was 2 to 3 meters wide (or wider if there were fences). When the burning field was next to primary forest, the firebreak was located 8 meters from the field border, and was 1.5 meters wide. When the burning field was next to secondary forest, the firebreak was located 5 to 6 meters from the burning field border, and was 1.5 meters wide. The reason for locating the firebreak within the vegetation and not at the border of the burning field (as prescribed by IBAMA) was explained by a peasant, when he pointed out their burning situation:

(...) because when fire goes with the wind, it throws sparks, and when it goes into flame, nobody can stop it, even with a wider firebreak, because it [fire] jumps, throws sparks; when it goes inside these 8 meters of forest [between the border of the burning field and the internal firebreak], the fire runs close to the forest floor, where the forest hasn't been cut. It is easier to control the fire when the firebreak is 1.5 m wide.

José dos Santos, Tracuá Community, December 2nd, 1998, Regional Workshop (Carvalho 1999:28)

During the presentation by the representatives of the Tracuá and Josinópolis communities, they explained that this kind of firebreak works together with the contra-fogo, or preventive firebreak. In this practice, peasants are positioned on two sides of the burning field. The burning is started by those located downwind, and only then do the others start the main fire (which goes with the wind). The fire started against the wind runs slower than the main fire, but fast enough to create a strip of land without fuel. This results in the main fire going out before it reaches the field border, and consequently reduces the risk of fire reaching the neighboring vegetation. In addition, they talked about remaining in the burning field until the main fire was extinguished and returning on

the same day and on following days to check for any possible accidental fires.

Equipment was also mentioned, mainly machetes, scythes, hoes, water pumps, and if possible a chainsaw. The peasants emphasized that a chainsaw was faster and more efficient in separating the burning from the green vegetation through *varridas*, or control firebreaks (firebreaks which are made after the burning was started and are thinner than preventive firebreaks).

After the seven examples were presented, the practices and recommendations listed were classified in five categories: equipment, before the burning day, during the burning day, after the burning day, and conflict resolution. Each of those topics was discussed by the participants. The participants also defined some widely used key concepts which at many times take different meanings, and which are basic for defining responsibilities among fire users, such as "responsible", "accidental," and "criminal" fires. This discussion on fire practices and recommendations developed into the first Community Fire Management Recommendations for the Marabá Region, later organized into a booklet. The results of the peasants' discussion on concepts are listed below (Carvalho 1999:35; Carvalho & Aquino 1999:16-17):

- **Responsible Fire:** when fire is used as an agronomic tool, and its user follows all rules established in the Community Agreement.
- **Accidental Fire:** when fire is used as an agronomic tool, and although its user follows all rules established in the Community Agreement, the fire exceeds the limits of the planned burning field, causing losses.
- **Criminal Fire:** when fire is used as an agronomic tool or for any other reason and its user does not follow the rules established in the Community Agreement.

On the last day of the workshop, the first Community Fire Management Recommendations for the Marabá Region were read and approved by the peasants taking part in the workshop. After their approval, the recommendations were presented to the

invited institutions. The representative from IBAMA was anxiously expected by all, but in spite of a personal invitation two weeks earlier (IBAMA has an office in Marabá), no one from IBAMA attended the meeting. There were representatives from four STRs (Rural Workers' Union): Itupiranga, Jacundá, Marabá and São Domingos do Araguaia, as well as the Director of Marabá SEMMA (Municipal Environmental Secretariat), the Itupiranga SEMAGRI Director (Municipal Agricultural Secretariat), two technicians from INCRA, a technician from the Itupiranga EMATER branch, and the Marabá Public Defender for environmental affairs. Notwithstanding the frustration because of the absence of representatives from IBAMA, the meeting went on as planned, and the key agreements achieved were:

- To send the Community Fire Management Proposal, as well as the list of all attending institutions, to IBAMA, along with a letter explaining that they were missed and encouraging their attendance in subsequent workshops;
- Each peasant should convey the Community Fire Management discussions to his/her communities, and promote (1) the creation of a community fire management proposal, based on the discussions in the workshop (each community received the approved proposals), and (2) the development of a conflict resolution proposal;
- Institutions should work to create an Environmental Council, at the municipal level, with power to make decisions. This must be done through Municipal representatives, and be approved by the Mayor;
- To disseminate the Fire Community Management proposals in communities by means of a booklet to be prepared by FATA/LASAT before the following dry season,
- To organize another Fire Workshop at the beginning of the following dry season (second action-learning cycle).

Second Action-Learning Cycle

During the 1998-1999 rainy season, the Fire Action coordinator documented the 1998 community fire management experience, raising funds for one more year with

DFID. The coordinator and other LASAT technicians organized the Fire Action proposal into a booklet (with 750 printed copies),²⁸ which was distributed after being approved at the July 1999 regional workshop.

The third regional workshop on Community Fire Management, held at the FATA Center on July of 1999, brought together during three days representatives from 15 communities (14 peasants and 1 indigenous), comprising a total of 36 men, 13 women and 6 children. It was facilitated by the Fire Action coordinator, a LASAT technician, and two FATA directors. This time, a representative from IBAMA was present. The IBAMA state Director for Environmental Education attended the entire workshop, and the IBAMA representative at the Marabá Office was invited to-and attended - only the last day of the workshop (which was open to invited institutions). Two other IBAMA employees were also present on the last day. Additionally, representatives from the Paragominas Community Fire Management experience, a key leader and a key researcher, were present on all days.

The main goals of this workshop were to (a) review the 1998 experience, (b) evaluate 1998 agreements and achievements, (c) present the Paragominas experience represented by key social actors, (d) plan the 1999 dry season, (e) present and evaluate the FATA/LASAT Fire Action booklet, and (f) disseminate the Fire Action among new families and institutions.

The workshop was considered to be a positive experience, in which all goals were partially or totally achieved. The previous regional workshop was evaluated, and participants concluded that four of the five agreements from the second regional

²⁸ Funds for the booklet came from a field fellowship from the *Natureza e Sociedade* Program for this thesis.

workshop had been put into effect. The exception was the creation of the Environmental Council that was never formed. More families from the communities involved and from neighboring peasant communities were interested in taking part in the Fire Action, and the presence of representatives from other communities at the workshop was considered a positive sign of the Action's dissemination. The presence of the IBAMA director was the workshop's greatest achievement. For the first time, participating peasants and the representative from IBAMA were communicating face to face. Although the IBAMA representative had no decision power, and could only inform the participants of IBAMA's laws, he was respectful and listened to peasants' complaints and accounts, thus taking a step towards reducing the distance between IBAMA and peasants. It was a learning experience for all.

The Fire Action booklet was read in the assembly and after a few changes was approved by participants. The practices recommended in this booklet are presented in Appendix C.

The Paragominas leader and researcher and the peasants from the Marabá region shared experiences, exchanging information, challenges, problems, and achievements. This peasant-to-peasant information exchange tends to empower them by furnishing a wider and more profound picture of their own situation, bringing consciousness of their situation at a regional level. Horizontal communication among Amazonian peasants is very important because in general they have limited access to any means of communication and transportation.

In the previous months, the Fire Action coordinator had transferred her position to another LASAT technician, to focus on her graduate studies evaluating two of the

communities attended by the FATA/LASAT Fire Action (the present thesis). During the workshop, the participants had the opportunity to meet the new Fire Action coordinator, and five communities were selected to be monitored in the 1999 dry season. It was established that one of them should be an indigenous community, so as to involve other actors besides peasants (the Suruí tribe was chosen). Two communities were to be monitored by the author of the current thesis (one in Marabá and the other in Nova Ipixuna). The other two communities to be monitored were defined in the assembly, according to spatial distribution (regions that had not been previously involved).

Several other institutions were invited to attend the last day of the workshop, and representatives from five STRs, EMATER/Marabá, SEMMA/Marabá, a Fire Department Lieutenant, two representatives from COOCAT, the EFA Director, a representative from DFID, and an Honey Association Director were present. Several important NGOs (CPT, MST, FETAGRI and CNS) were not able to attend because they were assisting 130 families in a land conflict with police and gunmen.

After all participants introduced themselves, they received the Fire Action booklet, and it was read out loud by a peasant. The recommendations in the booklet generated several discussions. For instance, the firefighters' main comments were that the firebreaks were too thin and that the backpack sprayer proposed was not efficient to control fire. The firefighter Lieutenant suggested that peasants should use more effective equipment, such as asbestos fire swatters (*abafador de amianto*) and a large water pump (with a 20 m range), and should always call the firefighters. The peasants replied by explaining the reasons for the thin firebreaks, the lack of other kinds of equipment, the usually long distance from agricultural fields and pastures to water sources, and the

absence of public telephones for several kilometers. This face-to-face discussion among representatives from different institutions and peasants was a great learning experience. In this process, different social actors had the chance to present their realities and contrast them with government laws and peasant recommendations, making it clear to participants that many of the fire laws were actually inapplicable. Based on this discussion, the Fire Department Lieutenant proposed that a multi-institutional caravan be created, which should be composed by FATA, the Fire Department, IBAMA, the Municipal Environmental Secretariat, the army and the police. The caravan should not only inform about fire use but also punish non-conforming farmers. The FATA director agreed with the idea of a multi-institutional caravan that would educate peasants about fire use, but without inflicting punishment. He defended his position by pointing out that changing fire practices is a gradual process, and if the caravan had an educative role, it would be seen by peasants as an ally; however, if the caravan punished peasants, it would be seen by them as an enemy.

As a result of the discussions in the workshop, participants agreed that (a) they would work towards the creation of a multi institutional caravan which should play an important role in raising peasant consciousness regarding responsible fire use, but without punishments, at least at this point; (b) the Fire Action booklet should be widely distributed in the Marabá region, and its proposals should be acknowledged as official recommendations for peasants; (c) participants would raise funds to support the Fire Groups Forum, caravan expenses, and the Fire Groups; and (d) another regional workshop was scheduled for the late 1999 dry season, at the FATA Center, with the purpose of evaluating and planning the following dry season.

During the 1999 dry season, the new FATA/LASAT coordinator visited all five communities. The caravan was not created, and the workshop planned for the end of the 1999 dry season was not held until the following rainy season (in the beginning of 2000), with low attendance (many dirt roads are impassable during rainy season). In early 2000, the financial support by DFID ended, FATA faced structural changes, and thus the Fire Action was discontinued.

Nevertheless, two peasant communities continued to be monitored by the author of this thesis, who also took part in burning events in 2000. The study explores the impact of this approach on community organization, fire losses, and changes in actual practices implemented among the Fire Action recommendations during two successive dry seasons. During this period, the results show a clear positive impact in both communities of changes in fire management practices. The combination of fear of IBAMA sanctions, and the possibility of developing community-based alternative programs appropriate to their situation, worked well to reduce losses and change the timing and organization of burning events. This led to burners taking responsibility for their burns and for following community rules and practices, with support from other people in the community. These positive changes, and the practical experience of beginning to implement and evaluate them in different situations, provide an excellent basis for future fire management in the communities. The Fire Action depended upon outside technical assistance to facilitate the process of development and dissemination of the rules and practices, and meetings to discuss them at the regional level, with authorities from different agencies. How the absence of this outside technical assistance will affect future fire management practices,

and the relationship with IBAMA, is an important question for future research on the effectiveness of the Freirian approach used in the Fire Action.

Discussion

This Chapter presented the process for developing FATA/LASAT Fire Action recommendations. Based on Paulo Freirian Pedagogy, the Fire Action approach was participatory by assuming a dialogic approach in which a technician was facilitator of the problem-posing situation: of fire management, codifying colonist actual knowledge of their reality through 'burning dynamic' exercises, and challenging them to critically analyze their own situation. Other innovations were (a) relating colonist productive steps as a function of the burning day (before, on the burning day, and after) and practices for fire prevention and control; (b) working with peasant empirical knowledge; (c) leading peasants to consciousness of their own situation (codification) before presenting external solutions; (d) emphasis on collective work as the basis for the action; (e) promoting peasants to develop their own agreements at community level; and (f) technical support at the community level.

The recommendations proposed by the Fire Action, developed by means of the presented participatory process, included regional and community meetings, and innovative practices applied by some community members, as discussed above. Such recommendations were organized into a booklet (Carvalho and Aquino 1999), with the purpose of promoting community fire management by sharing the recommendations discussed and approved in the workshops. Copies of the Fire Action booklet were distributed to at least 44 communities related to FATA and LASAT, during the 1999 dry season. The impact of the Fire Action was monitored in two of these communities, one of which was involved since 1998, and the other was involved since 1999.

CHAPTER 3 COLONIST COMMUNITIES

Introduction

This Chapter presents a summary of the social-productive characteristics of 72 families in the two communities studied, São Francisco do Itacaiúnas and Cupu, both located in the Marabá region, emphasizing aspects related to fire management and social organization. Those two communities were studied in order to evaluate impacts of the Fire Action on their fire practices, and results of this evaluation are presented in Chapter 4. Knowing some of the families' characteristics is important to understand their reasons behind practices, and their decision-making, and also furnish a frame for disseminating this experience in other situations. As this Chapter will show, the history of these colonist communities, and their associated views on production, education, rural life, forest and fires constitute the important cultural context for developing fire management programs.

Age of Heads of Families

The average age of heads of families was 40 yrs (SD=12.2) for women, and 47 yrs (13.0) for men. There were, on average, 5.3 (SD=2.84) persons/house. Besides those living in the communities, some families maintain sons, daughters, or other family members living in cities, usually to continue their studies or because of health problems. In the communities, twenty-two families (31%) of the forty interviewed families maintained on average four persons (SD=3.2). This maintenance was done with products

(crops and animals), and money. Sending kids outside to study represents high economic and social costs for families, as discussed below in the education section.

Migration and Length of Residence in the Community

Data on families' origins showed that the majority of heads of families migrated from other Brazilian states, which characterizes the families as colonists. Most of the heads of families living in São Francisco do Itacaiúnas and Cupu communities (46% women and 57% of men) were born in the neighboring state of Maranhão, located in the northeast of Brazil (half of the Maranhão state is located in the Legal Amazonia region). Only 8% of the female and 3% of the male heads of families interviewed were born in the state of Pará. The other female heads of families were born in Goiás (18%), Bahia (18%), Piauí (3%), Espírito Santo (3%), Minas Gerais (3%), and Ceará (1.5%). Remaining male heads of families were born in Bahia (10%), Goiás (7%), Espírito Santo (7%), Ceará (6%), Minas Gerais (6%), Piauí (3%), and Pernambuco (1%). Figure 3-1 presents origin distributions, in percentages, for both male and female heads of families of the communities. The Figure considers the states of Tocantins and Goiás as one because of their having only recently been politically divided²⁹.

Each head of family was asked to trace his/her trajectory, listing places, villages or municipalities where he/she had lived. In order to differentiate places just visited from places where the migrant spent a "significant" time period, this study only considered places where the interviewee performed some productive activity, such as agriculture, extractivism, and/or had a job, either in rural or urban areas. In both communities,

²⁹ Goiás was politically divided in two states in 1990, with its north region becoming Tocantins state.

women had migrated an average of 4 times (SD=2.1) and men migrated an average of 5 (SD=3.0) times.

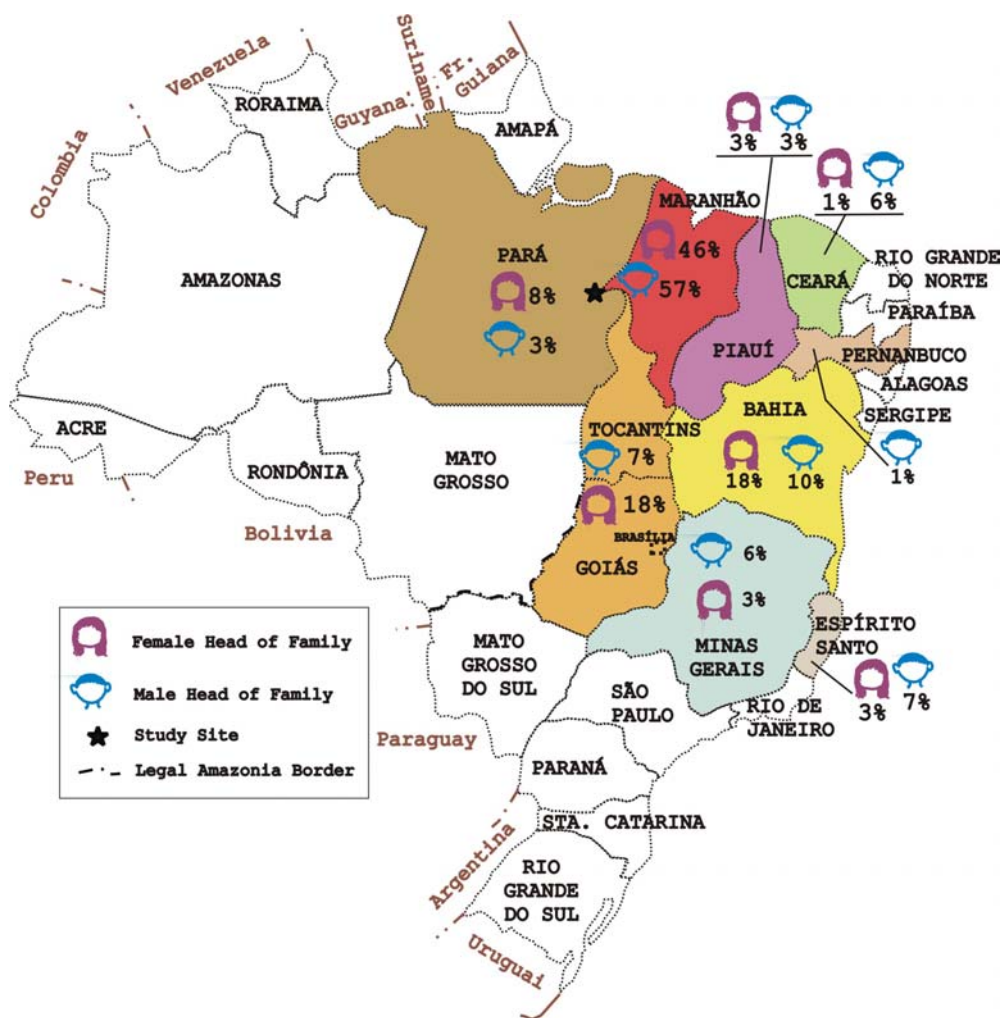


Figure 3-1. Origin distribution by state, by gender, for the heads of families of the São Francisco do Itacaiúnas and Cupu communities (n=72). The majority of men and nearly half of the women were born in Northeastern state of Maranhão, showing that few were born in Pará state (Tocantins and Goiás were considered as one because of its recent political division) (By author).

The data regarding length of families' residence and land ownership in the communities studied indicated a direct relation between length of residence and first land ownership. In 1999, the interviewed families' length of residence in both communities

averaged over 10 years, and most families were still living on their first plot of land. The average length of residence was 11 years (SD=4.2). In São Francisco do Itacaiúnas, 77.5% of the interviewed families had been landless before living in the community. Eleven families (27.5%) were living there since the creation of the community, and twenty-nine families (72.5%) were living there for ten or more years. Of those living in the community for more than 10 years, 82.8% had been landless before arriving in the community, while 57.2% out of those living there for less than five years had been landless. The same pattern was found in the Cupu community. Eleven of the thirty-one families (35.5%) were living in the community since its creation, and of those living there for ten or more years, 77.0% had been landless before arriving in the community. Of the families living in the community for less than five years, the number of those that had been landless before living in the community was only 66.7%.

For many colonist peasants, the right to cultivate land is a result of their struggle for self-esteem, for better conditions for their family. Many interviewees emphasized the harsh conditions of living as sharecroppers, or low paid employees in rural and urban areas. These difficulties associated with the unaffordability of land led people to occupy lands as squatters. Occupying land in the Marabá region was and still is very risky due to conflicts, high rates of malaria, and lack of any basic infrastructure or outside support. The importance of owning and managing their own land is a key incentive for fire management practices described in the next chapter.

Family Labor System

Family labor is the main productive force in the Marabá peasant communities, and their means to control fire. In general, they do not have access to machinery (to plow, to pick, to harvest, etc.), and a minority (28% n=69) own chainsaws. Therefore, the amount

of labor has a direct influence on the family's ability to produce. Besides family labor, the two other main ways to improve their labor force are family social organization for collective work (workday exchanges and *mutirão*, in which everyone works together), and obtaining the economic means to hire employees. For this characterization, this study considered only labor above 15 years old.

The amount of labor force, divided by gender, was similar in both communities. The average number of female and male workers per household for both communities was 1.5 (SD=1.01) and 1.9 (SD=1.32), respectively. The labor force involved in workday exchanges does not involve money. It is a verbal agreement between two or more producers to work together in each other's land for a similar number of days. The *mutirão*, on the other hand, is the collective work of a group of people on a specific project, like building a house, harvesting rice, burning, etc. In general, when the work takes several hours, the person or persons directly benefiting from the *mutirão* supplies most of the food for the meal. Hired workforce is that which implies payment of daily wages or salary. For the purpose of this study, it was divided into three frequency parameters: always hires, hires during certain time(s) of the year, and never hires. Table 3-1 shows the results for the three types of work, showing that in São Francisco do Itacaiúnas there is a tendency for higher participation in workday exchange and collective work.

Table 3-1 shows that around two thirds of families hire labor, especially during part of the year. The most common jobs were during dry seasons, for cutting weeds in pasture areas, slashing forest, and making firebreaks along fences. Data show that workday exchanges and collective work are used more in the São Francisco do Itacaiúnas

community than in the Cupu community. This may indicate more cohesive social relationships among families in the São Francisco do Itacaiúnas community. The basic proposal for fire management discussed in the Fire Action was collective work, and if in São Francisco do Itacaiúnas there is a higher willingness to work collectively, it is expected that it will reflect in their collective action for fire management.

Table 3-1. Most common kinds of workforce found in the São Francisco do Itacaiúnas (SFI) and Cupu communities, and its average distribution, in percent, for the studied families. Note that in the Cupu community, workday exchange and collective work rates are lower than in the SFI community, which may indicate weaker community cohesion.

Comm.	Hiring Workforce (%)			Workday Exchange (%)		Collective Work (%)	
	Most of Times	Sometimes	Never	Yes	No	Yes	No
SFI	12.5	50.0	37.5	59.0	41.0	55.0	45.0
Cupu	12.9	58.0	29.0	35.5	64.5	13.3	86.7

Productive System

The families' productive system is mainly based on their land, and can be broadly classified into three categories: agriculture (including annual and perennial crops), animal raising (small, medium-sized, and large), and natural resource management (forest and rivers). Fire is mainly used for annual agricultural production, as well as for pasture maintenance. A few families have other sources of income, such as selling groceries, transporting people and production, teaching, working on a daily basis for large-scale farmers, or a pension. Those that have other economic activities also work on the land (cropping, raising animals) because income from the alternative sources available is usually very meager. In addition, many affirm that they like to work the land, as a statement of their identity as peasants.

In both communities, the main activities related to the market are annual crops (rice, manioc, corn and bean), cattle (for milk production), extractive products (brazil-nut -*Bertholletia excelsa*, H.B.K.; açai fruit-*Euterpe oleracea*, Mart.; babassu coconut oil-*Orbignya speciosa*, Mart., Barb.Rodr.; cupuaçu fruit-*Theobroma grandiflorum*, Willd. Ex. Spreng., Schum), and perennial crops (mainly cupuaçu, banana, orange, lemon, coffee and coconut).

Basically, the distribution of land uses is a consequence of families' productive strategy, which may be focused on cattle, annual crops, or perennial crops. Independent of the strategies adopted, and the year of community formation (São Francisco in 1983 and Cupu in 1986), the proportion of primary forest in both communities was similar (roughly half of each plot), whereas distributions of pasture, secondary forest and perennial crops tended to show more variation (Figure 3-2). In the São Francisco do Itacaiúnas community (Figure 3-2A), the average size of family plots was 45.7 ha (SD=21.7). Primary forest occupied an average of 49% of the plot, followed by secondary forest (23%), pasture (20%), agricultural field (4%), and perennial crops (2%). In the Cupu community, the average size of family plots was larger: 77.6 ha (SD=49.7). Primary forest occupied an average of 46% of the plot, followed by larger areas of pasture (41%), smaller areas of secondary forest (8%), and similar sizes of agricultural field (4%) and perennial crops (1%) (Figure 3-2B).

Although in São Francisco the number of persons per house was, on average, 1.2 times higher than in Cupu, the average size of plots in the Cupu community was 1.6 times larger than the average plot in São Francisco do Itacaiúnas. A probable explanation for this is Cupu's focus on cattle, which, when raised extensively, require large pasture areas.

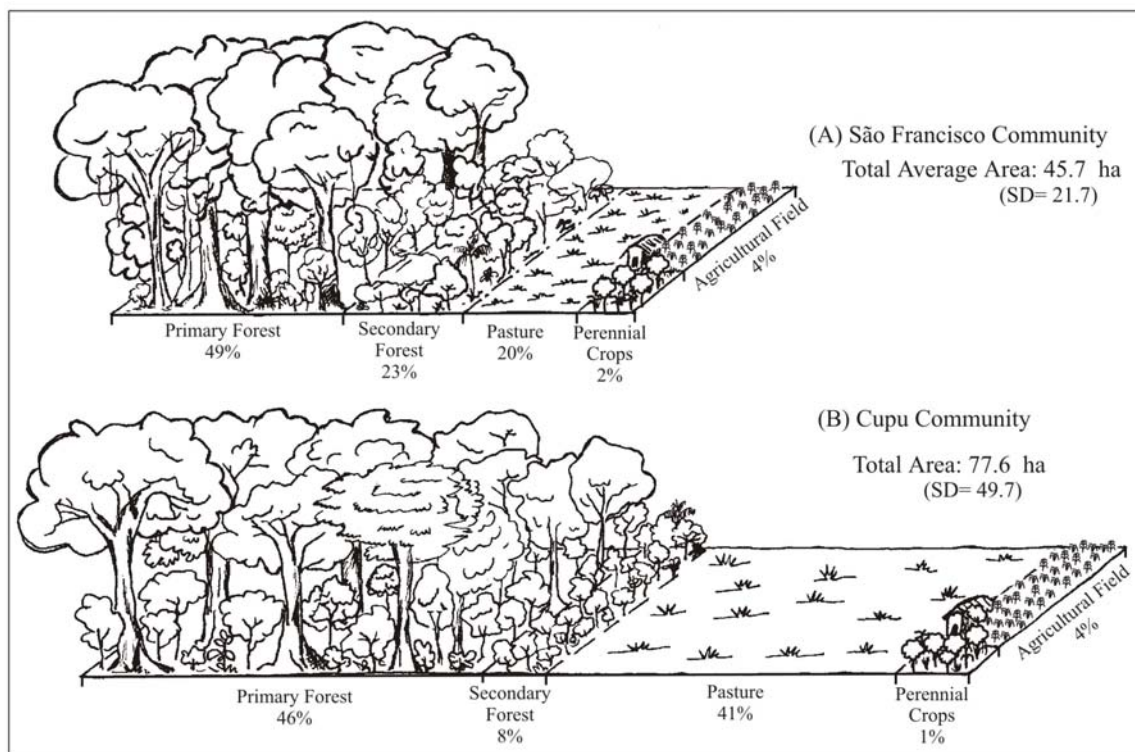


Figure 3-2. Representation of land use distribution in A) the São Francisco do Itacaiúnas community and B) Cupu community (Drawing by author).

Although in São Francisco the number of persons per house was, on average, 1.2 times higher than in Cupu, the average size of plots in the Cupu community was 1.6 times larger than the average plot in São Francisco do Itacaiúnas. A probable explanation for this is Cupu's focus on cattle, which, when raised extensively, require large pasture areas.

Another indication of the community's trend towards focusing on livestock is the type of ecosystem used for the crops: primary forest or secondary forest, since the continuous implementation of pastures tends to reduce the supply of secondary forest. Grassy species are not compatible with the locally called 'white' cultures (rice, corn, manioc) because grasses grow faster and spread profusely, and their roots pierce the manioc roots, compromising their quality. Thus, once grassy species are planted, that soil has to be plowed before it can hold any crops. So, if the supply of secondary forest

runs out, this could lead to higher pressure over primary forests. In the São Francisco community, 27% and 38% placed their crops in primary forest area in 1998 and 1999, respectively. The São Francisco community showed greater preference towards perennial crops than the Cupu community. In São Francisco, 100% of the interviewed families grew perennial crops, while in the Cupu community, that rate was only 77%. Comparatively, in the Cupu community, in 1998 and in 1999, 67% of the interviewed families placed their crops where there once was primary forest, against 32% who placed their crops where there once was secondary forest. Confirming Cupu's families tendency to invest in livestock, in 1999 approximately 80% of the families (double the families in São Francisco) planted grassy species in their agriculture field area.

As to livestock, in Cupu 93% of the families own milk cattle, while in São Francisco do Itacaiúnas only 64% do. The average number of animals per family for Cupu is 33.4 animals (SD=22.5), and in São Francisco, it is much smaller: 6.4 (SD=9.4). Data indicated that the Cupu community had relatively bigger areas of pasture, and livestock is leading to higher implementation of agriculture in primary forest. Although the percent of forest in both communities is similar, plots in Cupu are bigger, and observation in the field showed that some families tend to buy neighbors' plots containing pasture, and concentrating more land. At same time that pasture may represent to Cupu families a means of securing land tenure rights (Muchagata and Brown 2003:799), it may lead to weaker social organization if migration out of the community is high.

Another explanation for investing in cattle is its better economic return, since the financial returns obtained from cattle are higher when compared with agriculture and perennial crops. Cattle raising seems to supply some degree of security that family

agricultural production cannot offer and neither can the government (credit, health, education). The agricultural products sold achieve low market prices, compared to their production costs, and families do not have the necessary means to transport them, or even to store them to sell during the period in between harvests when prices are higher. Moreover, agriculture implies heavy and hard work, which requires lots of manual labor. Cattle, on the other hand, presents high productivity in Amazonia, allowing flexible and lower investment in labor (Muchagata and Brown 2003:800). Cattle production is not seasonal and has a year-long market. Additionally, its sub-product, milk, can also be sold, either directly or processed as cheese, as well as contribute to the nourishment of the family and of small animals.

Formal Education

This section starts with an elder peasant, illiterate, who during his whole life has worked in agriculture. Mr. Gomes was talking while he was making a fishing net, a skill learned from his father in Maranhão state, where he and his wife were born. They arrived in the Cupu community in 1986, with four of their eleven kids, always cropping and fishing. Mrs. Gomes helps as a midwife when necessary. Besides the importance that families give to education, Mr. Gomes was shown to be very upset regarding outsiders' views on the relationship between illiteracy and stupidity, or incapacity, as expressed below. He, in his class awareness, attributed this discourse on peasant "illiteracy" to mean "incapacity" to powerful people who do not share their power: "it is too much for too few."

Question (Q): Some people say that farmers are illiterate and don't understand things.

Mr. Gomes (G): They don't understand. Who is crazy around here? Nobody. Few people around here are really [intellectually] limited. But the others, if they can't

read, they can at least sign their name. Everybody has understanding. This is a movement, Mrs. Katia, from people who work under despicable conditions. These people you are talking about are a community, a strong one! People who say that are from this [elite] community. (...) That's why we are suspicious of everyone. We live under despicable conditions, but we are not aliens, we are all people and we need love and respect.

Q: People can read the stars, can read the forest, the wind, the earth...

Mr. Gomes (G): They [illiterate people] don't have that culture [formal schooling], but they are not crazy. They have other very important forms of culture. And people [outsiders] offend them like that. That's not how it really is. They deserve to be appreciated. But this contempt, contempt, contempt,... only God knows... Lots of suffering. What is lacking, Mrs. Katia, is responsibility, it's too much for too few.

Mr. Gomes, 65 yrs old, Cupu community.

When explaining their level of education, heads of families were ashamed when it was low, but proud to explain a relatively better access to school for their daughters and sons. To them, higher educational levels mean better work opportunities than for those without studies. Mr. Gomes speech finds echoes in Paulo Freire literature about illiteracy:

[Illiteracy] indices, statistically compiled by international organizations, distort the level of 'civilization' of certain societies (...). This distortion fails to acknowledge their real-life experience and all the past and ongoing knowledge acquired through their experience. (Freire 1985:7-8)

This study discusses this topic by first providing information on the education system in the communities, and years of schooling for studied heads of families. The following section addresses peasants' cultural understanding on land, forest and fire.

In both communities, schools were implemented a short time after the creation of the communities. Schools were built and maintained by families, staff salaries were paid by the local government, and some basic student materials (such as books and notebooks) and breakfast were supplied by the government. Both communities' schools, at the time

of this study, went only up to 4th grade, and in every classroom, a single teacher instructed more than one grade at a time.

An average of one third of families maintain family members living outside the community, as presented above. The majority of those living outside were students that completed the 4th grade offered at the community and went elsewhere to continue their studies. Sending kids to study in other places implies a high economic and social burden for families. It is expensive because in cities every good has to be bought, teenagers acquire new needs, and renting or buying a house, as well as maintaining it, entails monthly costs. In addition, without parental supervision teenagers may stray from their original goals and become involved with drugs or in promiscuous behavior. In many cases, the women heads of families move to the city to take care of the kids; the families end up divided between the community and the city, which brings down peasants' production, raises expenses, and contributes to migration to cities.

Heads of families, both female and male, were asked if they had attended school, and for how long. In order to determine families' ability to access written information, the study inquired what was the highest education level of any family member in the household, in general daughters and sons. The educational level of family members living outside the house was not considered.

The main consequence of communities' precarious education system is the heads of families' low formal educational level. In both communities, more than one third of the interviewed female (41%) and male (39%) heads of families had no formal schooling (n=61) (Figure 3-3a-b). The proportion of men and women whose studies were interrupted between the 1st and 4th grades is also similar, 39% of the female and 41% of

the male heads of families. Data showed that only 20% of female and male heads of families studied further than the 5th grade (for female and male, respectively, 16% and 13% interrupted their schooling between the 5th and the 8th grade, and 4% and 7% between the 9th and the 11th grade).

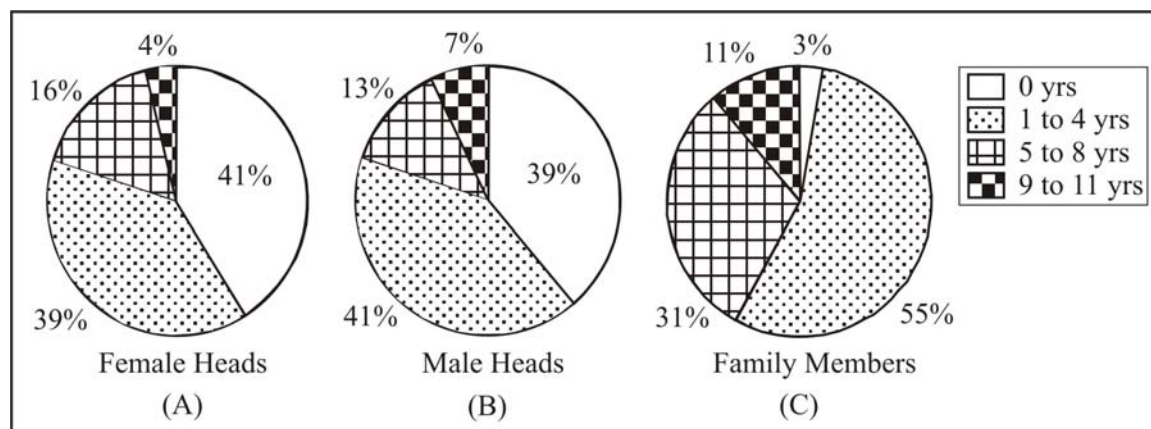


Figure 3-3. Families' formal education grades attended in the São Francisco do Itacaiúnas and Cupu communities. A) Women and B) men heads of interviewed families in both communities who had no schooling, ranged from 31% to 46%. C) The proportion with no schooling was considerably lower when the research considered education level of any household member living in the community, indicating that younger generations have been much more likely to go to school.

Because heads of families in general do not live alone, and share their skills, this study wanted to know the overall family schooling level. However the level of formal education for any family member (usually sons and daughters) in the household that was living in the São Francisco do Itacaiúnas community was quite different when compared to heads of family only (Figure 3-3c). The rate of total absence of formal education was 3%, corresponding to two families of older people who lived alone. The percentage of households whose highest level of schooling in the two communities was between the 1st and the 4th grade was 55 % of the interviewed families. The proportion of households

whose highest level of schooling was between the 5th and the 8th grade was 31%. The '9th to 11th grade' category was to 11%.

The higher level of formal education per family, compared to data on heads of family only, indicates that the new generations are having more access to schooling, and/or their parents tend to invest more in education than did the previous generation. The increase in the proportion of families whose educational level is above the 5th grade, was more than 20% in the São Francisco do Itacaiúnas community, and more than 10% in the Cupu community. This improved level of education indicates that some family members return to live in the community after going away to study. Differences in levels of schooling may also indicate that new generations in colonist communities in the Marabá region have more tools to interact with the outside world than did the previous generation.

Cultural Interpretations

During the development of this research, peasants discussed a very wide variety of topics, expressing their history, struggles, beliefs, challenges, and dreams. Some of these topics have been presented before. This section aims to deepen the discussion on peasants' knowledge through their cultural interpretations of some of the topics related to the studied theme. It is necessary to emphasize, however, that culture is a dynamic process (Freire 1988:54), and the interpretations presented refer exclusively to a specific time period.

This section will first discuss families' observations when comparing life in the communities (rural life) with life in the city (urban life). This topic is important because colonist peasants are seen by some outsiders as leading a nomadic life, moving from one place to another. In the studied communities, there was a strong consensus among

interviewed families that living in rural areas was better than living in cities, and that they wanted to continue living there. Families' level of attachment to their land is important because it can be an indicator of their interest in managing their land in a more sustainable way, and in taking into account the use of natural resources by future generations.

Another topic discussed in this section is what the forest means to the peasants. There is a widespread pre-conception that colonist peasants do not maintain a deep relationship with the forest, mainly because they come from other regions, and soon will be moving to another place. Some argue that the forest is a new environment to them, a strange environment, and in order to produce they have no other option but to deforest. This study found that most families do come from other regions. However, many of them come in search of forested areas, and most of them seeking their first piece of land. They bring with them their previous culture which comes into contact with other cultures and with the environment, creating new knowledge. As colonists, families try to improve their knowledge to overcome the new environment. For instance, Mr. Pereira, from Cupu community, born in Maranhão state, stated that they talk about these experiences or local knowledge with others, "trying to congregate others' experience, share ours, try other person's experience. Each person has a kind of experience, a system, for our own survival." People in general are shy to talk about this topic to technicians, what they call experiences (knowledge acquired with observations), as if it were nonsense. A wide range of empirical knowledge was registered, providing material for a whole new study. This section presents a brief review of this knowledge.

The other topic addressed was the meaning of fire and its uses to the peasant families. Some researchers believe that families would change their fire practices if only the negative impacts caused by fire were explained to them. However, this is an extremely naive assumption, because families have lived with the local impact of fire, from losses of goods to respiratory problems, and they unanimously affirm that if there were another way to work the land as productively as the slash-and-burn system, they would adopt it. Yet, fire is positively connected to their lives in many ways besides production, and this study describes some of them.

Communities and Towns

For the majority of the families in the communities, this was their first piece of land, since most had previously lived in other people's land as sharecroppers (*agregados*) or employees. In the São Francisco Community and in the Cupu Community 77% and 70% of the families, respectively, were living in the first plot of land they had ever owned.

All interviewed families in the São Francisco do Itacaiúnas community declared that they plan to continue living in the community, whereas in the Cupu community, 83% of the interviewed families plan to continue living there. This difference can be explained by the advanced stage of land title recognition in the São Francisco do Itacaiúnas community. While this community was officially recognized as a Settlement Project, the Cupu community was not. Recognition as a Settlement Project is merely the first step required for families to receive land rights documents, but it makes it possible for families to receive some government support for community infrastructure improvements. In early 2000, for the first time, families in the São Francisco do

Itacaiúnas community received a government grant of US\$ 1,100³⁰ to be invested in housing and agricultural tools. Leaders in this community were planning new roads the government promised to open. Families in the Cupu community had never received any support from the government, and some families mentioned they felt left aside and undervalued by the government. The lack of recognition by the government of the rights of the families living in Cupu seemed to be the main reason why some families consider leaving the community.

When asked what would be necessary to improve life in the community, nearly all those interviewed promptly mentioned a number of items and several said 'there are so many things that could be done I wouldn't know where to start'. However, when asked whether they would prefer to reside in the city or in the countryside, 100% of the interviewees opted for the country, including those families who proclaimed they had plans of moving out of the Cupu community. The main reason stated was there is the absence of hunger in the country, followed by the possibility of living in a community, their freedom, the better climate, the fewer mosquitoes and the low crime rate. Ms. Gomes, was born in 1946 in Maranhão and has lived with her family in São Francisco do Itacaiúnas since 1984. Blind since age 20, Gomes helps as a midwife when asked to, has ten children of her own and in the following words compares city and country:

Question (Q): Do you ever think of living in town?

Mrs. Gomes (Mrs G.): I never do. I like it here so much, the silence and the fact that there's nothing to bother us. Especially at my age. We have very few bugs. I hope God lets me stay.

Q: They say many people want to move from town into the forest, is that right?

³⁰ In March 2000, the average conversion rate was US\$ 1 = R\$ 1,82 (Banco Central do Brasil 2004).

Mrs G.: But there are also many who do not want to move to the country. They die in need and do not have the things we have, such as beans, broad beans, lost rice [which could not be harvested] and all, but they refuse to come. They're of a different nature, aren't they? People's natures are not alike. We can even see young women begging for change in the city!

Q.: Even women with babies, isn't it ?

Mrs G.: Yes, 'spare me some change for my child' or 'some medicine', or 'buy this', 'buy that'. We see a lot of this but thank God during all my years in blindness I have never begged for coins. I have always lived in the country, where no one refuses to give away anything they have. It is very different in the city.

Q.: Do you think there's more barter in the countryside?

Mrs G.: Sure, we raise a pig, kill it and share it. We hunt to eat, we share it and never sell a piece of it.

While Mrs. Gomes talked about quality of life (silence, less mosquitoes, plenty of food) and dignity (never had to beg despite to her special condition), a similar explanation was given by Mr. Reis, an important leader in the São Francisco do Itacaiúnas community, for whom living in the community also has to do with dignity: the male's ability to feed his family. Below is the statement made by Mr. Reis, who also lives in the São Francisco do Itacaiúnas community and is a Catholic Church coordinator, a director in the Local Association, member of the Marabá Rural Workers' Union and of the community Fire Group since July 2000:

Mr. Reis: I always say it to many people—a good place today is a place where we can make our daily bread. So, we have to stay. We cannot always run from one place to another, hunting for a nice spot. (...) If you have nothing and have many children and you sell your little property to move to the city or somewhere else to hunt for a better spot, chances are you won't even be able to make your bread anymore. You'd have to get help from others, pitching in to pay what is yours. Nowadays when someone has a family and a piece of land, and he is able to easily make his bread, he should stay there.

Mr. Reis, born in Maranhão, living in São Francisco do Itacaiúnas since one year after its occupation, Catholic Church coordinator, Association Director, Fire Group member.

Another example of living in communities and thus having access to better living conditions was presented by Mrs. Lima, 56. She was born in the state of Maranhão and lives in the São Francisco do Itacaiúnas community with seven of her eight children.

Question: Which would you say is better for your kids, the country or the city?

Ms. Lima: I wish they'd move to the city but they won't go without me. I'd like them to receive education so they would not have to work as hard as I did. But they say they won't go and I really don't know what's best, I just guess for those born to poor parents it might be better to stay in the country."

As in the São Francisco do Itacaiúnas community, families in Cupu associate living in a community with better access to food and to better living conditions. Some also expressed their concern with youths who prefer to live in cities, and with improvements that would have to be made in the communities in order to attract younger generations. The contrast between rural and urban life, as well as youth interests were expressed by Mr. Moraes, born in the state of Bahia and a resident in the community since 1989.

Question: What if peasants go to the city?

Mr.: Moraes: (...) Going to the city will mean more suffering, so a person has to hold on tight. (...) I went to the city and I realized it would not work because the salary I was on made it impossible. I came back to the country expecting to make things better. (...) The city can't offer anyone jobs, and this is why the government should provide help to those living in the country, since most things consumed in the city come from the country don't they? Listen to this: in a short time very few of these young fellows will want to live in the country because things are not easy here, it is not for everyone. And these people born these days will only stay in the country if there's something there for them, otherwise they will certainly stay in the city. I think the situation is getting worse and worse, people leave in search of education and forget the country, where most things we eat come from, don't they? A man works in a bank, or he can do anything, but his food comes from the country.

For landless peasants living in rural areas, jobs outside the community are hard work and low salaries, on a day wage basis. Job activities on ranches range from slashing forests to pulling out weeds, from taking care of cattle to felling timber and processing

wood. As many peasants have mentioned, these kinds of work are done almost on a slavery basis because it is so time-consuming and the working conditions are nearly inhuman. In addition, salaries are so low workers cannot save any money. Since they do not have any type of health benefit, they have no alternative source of income when they are ill. The difficult situation of the landless is described in the words of Mr. Reis. His family came from the state of Maranhão; they lost their first piece of land in Pará because someone 'showed up out of the blue' saying that it was his land after they had bought it, and they had to move to Pará, arriving in the São Francisco community in 1984. At that time, his father and a brother worked in the gold mines during the dry season. They made some money and invested in their current lands. Today Mr. Reis is 34 years old and married to the daughter of another colonist. They have three kids; he was one of the coordinators with the Catholic Church. He was also a director at the local association (AGRAF), an active member of the Rural Workers' Union (STR), and a member of the Community Fire Group:

Mr. Reis: (...) We see lots of people working for day wages. If someone doesn't work you can tell he's really, really sick. Here in our community there's John, who kept having more kids and I told him: 'listen man, we have to work for ourselves!' If you have a plot of land, work for yourself. It is hard in the first year but it only gets better after that, even when you don't have any money, because you will have rice and beans, the corn, the cassava, you will have it all: you have what you need to eat. Now working for others is much harder. You're making someone else rich; you're working for him.

As we can see from the statement made by Mr. Reis, many peasants show a political class awareness: they mention the peasants' union, mutual help, and critical analyses of their situation. Selling their labor for little money seems awful to many of them and they prefer to continue living as peasants. Mr. Cruz, president of the local

association, summarizes their awareness as "Here we have nothing, but at least we have our freedom."

Leaders' concern about who buys land in the community is associated with their concern about the peasants' identity and with their struggle for better living conditions in their community. They have a clear idea of what a peasant is as opposed to an average farmer or a rancher. Once road access to a rural region improves, the tendency will be that more and more ranchers will buy lands, transforming the existing peasant community into a group of ranchers. From the peasants' point of view, this transformation would represent a big loss, since ranchers do not generally reside in the lands they own and do not communicate with peasants. As a consequence, these ranchers do not get involved in community organization for improving education, health, infrastructure in the rural areas, nor practices to protect their environment such as fire management. In general, they decide about land use without consulting or informing their neighbors, and see their lands as a capital investment, especially for timber extraction and extensive cattle ranching.

For example, in the São Francisco do Itacaiúnas community, a peasant leader moved to the city in 1999 because of health problems, and sold his land to a businessman living in Marabá. His neighbors were worried because they knew from the manager that the rancher's plan was to change the entire plot (150 ha) into pasture after burning the remaining forest (around 80% of the plot). A large burning such as this one is very difficult to control, and may cause a lot of damage to the surrounding ecosystems. This farmer probably would hire outside workers because everybody in the community is busy preparing for burning too. Outside workers usually do not get involved in community agreements for land uses.

The entire community expressed concerns regarding the sale of land to large farmers, who buy so many plots of land that eventually the village may become a single large farm. Peasants rely on the government's recognition of the area as a Settlement Area, in which the average plot size is 50 ha. On October of 2000, peasants decided consensually in a general meeting held by the Community Association (AGRAF), attended by members of the Marabá Rural Workers Union (STR), that the Association would prepare an official declaration to INCRA concerning the commerce of land. In this document, the community would state that they were against the sale of plots to ranchers or large landholders, and declared their support for the policy that families that sell their plots cannot receive another piece of land from colonization projects during the following 10 years. In spite of this concern, in both communities studied, more than 70% of the families interviewed have resided in the community for over ten years.

Forest

There is a general misconception that colonist peasants only care about the forest as long it is useful to their "destructive" productive system (slash-and-burn agriculture and pasture). As discussed in Chapter 1, many academics and technicians assume that because colonists have no "environmental tradition," no historical and cultural ties to the area, they are unable to have knowledge about natural resource management, or worry about resource preservation for their descendents.

Colonists in the Marabá region, however, in general have a keen understanding of the renewal limitations of natural resources. As presented before, in both communities, which were formed more than 15 years ago, an average of almost 50% of the primary forest was left. Some families claimed that one of the reasons for their migration to Amazonia was the presence of the forest, a resource that they have seen be depleted in

their homelands, such as Bahia and Maranhão. This awareness that the health of the forest can be strongly influenced by human actions and that the forest's regeneration cycle can be broken by humans, leads to colonists' openness to more sustainable techniques. They have observed and lived with the consequences of deforested areas, dried rivers, absence of game, uncontrolled fires. Therefore, these people are the best ones to teach about the impacts of unsustainable management of natural resources on a local level, and about the high value of forested areas. The association of Amazonia with the forest was identified in statements by many families. One example is presented by Mrs. Souza, 36 years old, from the São Francisco do Itacaiúnas community. She was born in Bahia, in northeastern Brazil, and has been living in the region since 1976:

Mrs. Souza: (...) My first memories are from that farm. My father was a cowboy, manager for my uncle. There, you would look and see no green forest, just those 'small' [non valuable] fragments of woods. When it was time to plant rice, we did it in a meadow, like those over there with the açai trees. But in Bahia, açai palm isn't used, nobody eats it. We learned to eat açai after we got here. (...) When I arrived at Serra Norte [Pará state], in 1976, everything was beautiful: a lavish green forest. And in Bahia I didn't see that kind of thing. That's why I think it's pretty. (...) The only green trees we saw were the açai trees, because that's where the cattle drank. I always say the açai trees are the ones holding the water there, because there was no water in the places where there was only pasture, without trees.

Question: And when someone talks about "caring for nature," what comes into your mind?

Mrs. Souza: I think it's beautiful to leave a forest like that, all green, and not destroy it. Because God left it like that, to be left alone, and people come and mess it up. The açai trees harbor the toucans and several kinds of birds. It's a work of nature. Do you know why? There are crops people plant which are attacked by a plague of curica [a species of bird]. And there are other people who plant and the curicas don't come. The places that attract the birds are the ones where there was a tree with fruit for them to feed on. Just study that, pay attention to it. It's because you don't work with that kind of thing. In the place where there's a periquiteira [parakeet tree] where they eat every year—it's a tree like the *pitanga* tree, with tiny red berries which they eat. In the following year they [the birds] come and they don't find the tree, so they attack the crop because they have to feed. (...) This forest is pretty. Back there where we used to live there was no forest, it was ugly, nobody could see the forest, it was just those slopes fading away...

As expressed by Mrs. Souza, God is constantly associated with Nature: if an event happens, it was due to God's will. Humans possess their physical abilities and knowledge to manage nature, but in the last instance, "only God knows." Fire acts mediate nature and culture. While in forested areas some products can be extracted, who 'manages' is nature itself. In agricultural fields, the human, below God, is the manager; the higher the productivity of a field, the better peasants they are, blessed by God and socially admired by others. Fire, therefore, is part of the peasant culture that makes it possible to transform nature into agriculture, to feed God's sons and daughters through their work. This explains peasants' exasperation when the government requires intangible rules for fire use or prohibits its use, without assuring if there are alternatives to fire use. This topic will be developed more in Chapter 4, on peasants' evaluation of government actions.

When peasants were questioned about the uses and meaning of the forest in their lives, answers included as a reserve for future agriculture field; water cycle maintenance; game; wood for construction; tool handles; and medicinal plants. Many peasants also related the primary forest to beauty and to the coolness of the climate, as Mrs. Souza expressed in her speech. Mr. Lopes, 51 years old, is from São Francisco do Itacaiúnas and was born in Maranhão. He is a member of the local association and of the Fire Group, and also described the connection between the forest and the availability of water.

Question (Q.): What is the forest good for?

Mr. Lopes (Mr. L.): The cold [primary] forest? Holy Mary, it's very good!

Q.: And why is it good?

Mr. L.: Why is it good? Because if the forest isn't there everything goes dry. Without the forest everything turns into dry grasslands, the water dies out, everything is dry, it even attracts the summer [dry season]. (...) It used to rain a lot

here in Pará because of the forests. Now that everything is bare [deforested], everything is lacking. And the water [sources], the dells, everything dries out. If they are protected by the forest, they remain really beautiful (...).

The concern expressed by Mr. Lopes is that Pará state is getting drier, the dry season becoming longer and more severe than before. This verification had made peasants change their previous knowledge that primary forests do not burn, recognizing that they no longer functioned as a natural firebreak, and therefore prevention of uncontrolled fires also had to include protecting forests, as discussed in the following section.

Fire

Peasants were asked about the importance of fire in their lives. Because the value and usefulness of fire is so obvious to them, and also because they feared not giving the "right" answer, many were reluctant to talk. The question was then asked differently, somewhat like this: "if you were explaining what fire means to you, to someone who had never visited a community before, how would you explain it?" Observation and notes taken during the unstructured interviews were also considered in this discussion.

Fire was basically explained by the interviewed peasants as a special 'tool' that directly and indirectly makes it possible for them to produce most of their products. Peasants' production is consumed by the extended family³¹, and also sold. Since agriculture and cattle raising were shown to be the main sources of income in most families in the communities studied, it can be concluded that fire directly affects peasants' quality of life and dignity of being able to maintain their family through their work, as observed in many of the peasants' accounts.

³¹ Extended family includes the family nucleus (mother, father, daughters and sons) and other family members, as well as godmothers and godfathers.

In the words of Mr. Duarte, 49, born in the state of Goiás and living in the São Francisco do Itacaiúnas community since 1983:

Question: Why is fire important? What do you use it for?

Mr. Duarte: I think fire is important because we use it in burnings, for example. It is important to use fire in many places. I don't know how to explain it, I only know we use it in many ways, on tree trunks, on pastures, on crop fields. It is important to use fire on all of those. We use fire on a pan [laughs], on [manioc] flour under the oven, to burn a brick, a tile, we use it for everything. That's all I can explain [pause]. Now, about fire, the worst is when it comes in our direction. When people come and say "let's control" the fire, then it's tough. When a flame as high as this house comes, when there's some wind and this flame bends in our direction, that's when it's tough, we all risk getting roasted.

The conflictive relationship with fire presented above was found in many other statements. If, on the one hand fire is their main agricultural tool, on the other it is also very dangerous and hard to control. The following quote of the Almeida family, who were born in Maranhão and had lived in the Cupu community since 1992, suggests the use of machinery as a possible substitute to fire use.

Question: What is the importance of fire to you?

Mr. Almeida: Fire is very good, but it devours a lot, ends lives. It would be good if we could live without it.

Older son: But [fire] makes it easier for us. When we burn, less weeds come out, the land is cleaner and better to work on. Without fire, if you're going to crop a line of land you have to take out all the weeds to work, kill yourself working, throwing those weeds out. Then you have to carry the stumps. Fire burns the stumps. You have to take out all those weeds and sow the raw land, without plowing...

Mrs. Almeida: But if we could have a plow, to plow the land, we wouldn't be dealing with fire.

As did many other peasants, the Almeidas' account contrasted the use of fire with the use of machinery. Working the land with machinery is the most common alternative to fire presented by families, probably because machinery is regularly used by medium and large-scale farmers in Brazil, and frequently shown in TV programs. Almost none of

the families interviewed have ever tried any substitute to fire in their productive systems. Only two of the interviewed families have produced their main crops using the slash-and-mulch system and fertilizing with leguminous plants. Of those two families, one learned the technique from FATA workshops; the second learned from the first family (both live in the São Francisco do Itacaiúnas community). Although peasants in the Marabá region are acquainted with the slash-and-mulch system, it is used only in small areas for bean production.

Cultural weather forecasts on the length and severity of upcoming wet and dry seasons are very important in families' planning of their productive activities. In the Marabá region, as in Amazonia as a whole, only two seasons are considered: the dry season (known as summer) and the rainy season (known as winter). The end of one implies the beginning of the other. The use of fire is also associated with the rainy season. Slashed vegetation must be burned when it is dry enough for most leaves and branches to burn, and the humidity level will depend on the period of time elapsed between the moment the vegetation is cut and the moment it is burned, as well as on whether the slashed vegetation is exposed to any rain. If the vegetation is slashed long before it rains (on average more than three weeks for secondary forests, and more than five weeks for primary forests), many green leaves will sprout due to vegetation regrowth, and consequently the vegetation will not burn well. On the other hand, if the vegetation is burned long before it rains, planted seeds will take longer to sprout, birds and other animals have more time to eat the seeds, and weeds will take up the area before the planted crops have a chance to grow. In addition, if slashed vegetation is left to be burned later in the dry season, and if there is more than one strong rain event, the

vegetation may not burn well anymore. All these situations present risks for peasants, as the quality of the burning is strongly correlated to crop production.

Because fire and rain have such a strong influence on their productive systems, peasants have developed several cultural weather forecasting methods, based on which they define their productive calendar. Some of these weather forecasting methods include observing stars and the behavior of certain animals, as if they were 'reading nature'. The following piece presents examples of 'nature reading' using the stars:

Mr. Oliveira (Mr. O.): [Talking about production] You have to look at the weather.

Question (Q.): If you know how to, right?

Mr. O.: It's very simple. You know the Saint Thiago way [Milky way], don't you?

Q.: Yes, I do.

Mr. O.: Well, it is usually bright. If the night is dark, it is even brighter, right? And when it is dark and spots can be seen, it is showing next month's rains. Sometimes, if you are looking at the beginning of the month, the rains come in this same month.

Q.: Now it is not very bright; it has some spots...

Mr. O.: It has some spots on, not all over it but some spots in the middle, one here, another one there. The more spots covering it, the stronger the winter is.

Mr. Oliveira, born in Maranhão, living in the Cupu community since 1985.

Another example of weather forecasting based on reading stars was mentioned by a peasant in the São Francisco do Itacaiúnas community. Mr. Cavalcante, who was born in Ceará, predicts how dry the dry season will be by observing the Milky Way too.

However, his observation is done during Holy Week. The signs of rain are the same observed by Mr. Oliveira, born in the state of Maranhão and living in another community: dark spots on the Milky Way indicate rain, and the more often it happens, the rainier will be the dry season, and vice versa.

Peasants in the Marabá region have special folklore involving the use of fire in their productive system, for choosing the burning day. Moon phases interfered with the choice of burning date. Mr. Lopes, from São Francisco do Itacaiúnas, born in Ceará state, relies on moon phases to choose the burning day: "I burn the field when it is a full moon to a waning moon: trunks and branches are dryer, and the field will have less weeds." He said that "some people make fun of me, but I don't care, because I know it works." Other families from Maranhão state also prefer to burn during the full moon, claiming that the field will have less weeds. They said that burning during the first-quarter moon is not good, because many weeds will grow.

Other folklore about the burning day involves choosing dates that end in the number 7. Many families declare their preferences for days that end in 7. Some of the families say that "the older people" have this belief, without affirming that they use it too. Others admit it, such as Nascimento's family, living in São Francisco do Itacaiúnas. Mr. Nascimento was born in Marabá city, but always worked as a peasant. Mrs. Nascimento was born in Tocantins state. Her family migrated to Pará, and her family has been living for 11 years in this community, where she met her husband. Mr. Nascimento explained his numerological preferences, stating "I try to burn on Aug 27, or Sep 7th, or Sep 17th; those days are foggy in the morning, and from noon on through the afternoon it is hot and windy." Mr. Fonteles, born in Maranhão and living in the São Francisco do Itacaiúnas, also chooses the days ending in '7', and explained that "if in those days it continues to be cold and foggy, and does not rain, day 9 will be a great day to burn". Besides using moon phases and numerology, there was a general tradition among many families, that when the summer [dry season] is strong, you can choose the day; but if it is too rainy, the

most important factor is the vegetation dryness, considering how many days without rain, and the possibility of more rain or not.

Mr. Oliveira, from the Cupu community, talked about observing animals to predict the weather. He and his family live by the lake of the Tucuruí Dam, whose water level presents seasonal variations throughout the year. He observes the behavior of ants and alligators to foresee what the next rainy season will be like, as in his own words, below:

Mr. Oliveira: Listen, Katia, not calling us animals...Are they rational or are we?

Question: It is said that we are.

Mr. O.: We are the rational ones? And they are irrational? Well, not comparing us to irrational animals, I'll tell you something: irrational animals have more comprehension than we do. Did you know that? On the one side we are more intelligent, but we have no knowledge of what happens, only God does. And sometimes you see it in a little animal. When you see a bunch of ants moving from high areas to lower areas, they're announcing the start of summer [dry season]. When you see a bunch of ants moving all their young ones to higher areas, you can expect rain on that day or on the following one, it's certain. Here we have an understanding, we who live by the lake, that others make fun of us. I say 'today the alligator wants to get wet'. But if we are here listening to the alligator [makes a sound like an alligator croaking], then it's rain for sure. Rare is the day when the alligator croaks and there is no rain. Sometimes we have the pretense of telling what is going to happen, because an animal is showing us. Now, some pay attention, others don't.

Two families in the São Francisco do Itacaiúnas community described a ritual to "call rain," referred by them as a *brincadeira* or "play." They said it was generally coordinated by a pioneer resident, Mr. Fontes. Although Mr. Fontes was a member of one of the studied families, he had not mentioned the ritual when interviewed earlier and the description presented was given by other participants in the ritual. The main idea is to take something special from someone, and hide it until the "robbed" person gets so angry that she or he will beg for God's help. An image of a saint, for instance, or even one of three rocks employed for cooking can be used; the idea is to take something that

the "robbed" person will really miss. Generally, Mr. Fontes is the one who coordinates the play and chooses the person to be 'robbed' and the object to be taken. All other families in the community know that it is part of the play, except the "robbed" person. After some days, when the "robbed" person is very angry, begging for God's help, and cursing her/his bad luck, the whole community goes to her/his house in a procession, chanting, carrying food, and carrying the "stolen" object. The 'robbed' person's and other people's happiness, as well as the party, would make God happy as well, and He would then send the much needed rain. The ritual was not performed in 2000, probably because it was not a severe dry season.

The previous speech again refers to God as the one who has the knowledge, and the humans those with intelligence. Humans must use their intelligence to observe God's knowledge manifested in animals, or stars, to better manage their land. The ritual showed how peasants, through their faith, actively attempt to improve their production, and therefore social reproduction. Those peasants' knowledge, culturally constructed, has to be respected as an expression of their society, independent of their level of formal education.

Discussion

This Chapter described the migratory and land use histories of families in the two study communities, as well as their views on education, rural living, forests and fire.

The families in the communities studied have a history and current conditions of active effort to improve their living conditions, marked by strong partnerships with the Catholic Church and grass-roots institutions, and weak governmental support. God is frequently related to nature, and fire plays an important role in colonist peasants' culture by turning possible nature transformation into agriculture, to feed God's sons and

daughters through their work. This explains peasants' exasperation when the government imposes intangible rules for fire use or prohibits its use, without assuring if there are alternatives to fire use.

The Chapter also demonstrates that, despite their characteristics of migrants, and previously landless people, families in these colonist communities can build on their strong history of collective and individual struggle for land and living conditions upon which to build fire management efforts. They possess a significant commitment to "place" and to long-term management of forests and fires, that provide an important basis for fire management programs. The following chapter will explore, in detail, how this unique history and set of values and beliefs is manifested in the communities' forms of organization, communication, and compliance with fire management recommendations developed in the participatory Fire Action.

CHAPTER 4 COMMUNITY FIRE MANAGEMENT EVALUATION

Introduction

This chapter aims to analyze how families managed fire in their productive systems, and the potential impacts of the FATA/LASAT Fire Action in the two communities. As explained in Chapter 2, and presented in detail in Appendix C, the FATA/LASAT Fire Action's recommendations were divided into four phases, according to peasants' usual slash-and-burn system steps: before burning, on the burning day, after burning, and controlling accidental fires. For this research, systematic data were collected from a purposeful sample of members of the two communities, in order to address the research questions presented in Chapter 1:

- Question 1: Why aren't government fire actions and laws more effective in diminishing uncontrolled fires?
- Question 2: Do colonist peasants have and use empirical knowledge to manage fire?
- Question 3: Is a participatory approach to fire management effective in diminishing fire losses?

The framework used to address these questions was through in-depth interviews focused on each of the recommendations developed through the Fire Action for practices to be observed before, during, and after burnings. The interviews collected empirical information on practices used, as well as colonist statements about their motivations, and evaluations of their experiences. More details on the methods used are given in Chapter 1.

The results, presented in the next section, showed clear decreases in loss from fire in both communities from 1998-1999. The dynamics of internal community organization for fire management, the differences between the two communities, and their implications for fire management are discussed below. The majority of the chapter presents descriptions of changes in specific practices, divided into the three phases of before, during, and after burning. The discussion shows how a combination of fear of IBAMA sanctions, families' desire to control fire-related losses, and the support of the Fire Action led to a variety of positive changes in fire management practices. Another section of the Chapter conveys the complexity of putting these practices together in concrete fire strategies for specific burning experiences that require adaptation to varied conditions.

The Chapter concludes with a review of peasants' interview responses related to the government fire management programs and the Fire Action. Given their historical distrust of government agencies, and the inadequacy of many features of their programs, peasants were found to be more comfortable with the grass-roots learning approach of the Fire Action. Because of their mixed feelings about some of the results of their experiences with new practices, the long-term prospects for effective fire management will depend on the evolution of community and government actions in the future.

Results showed some similarities between communities concerning fire management. In both communities, families were aware of fire restrictions enforced by the government, and requested more information to support the continuity of their productive systems. Moreover, families claimed that community agreements would be necessary to better rule fire use, therefore avoiding losses caused by uncontrolled fires.

The main differences between communities concerned families' strategies for community actions, such as whether or not a Fire Group was formed, and whether the discussion of fire agreements was held in community assemblies or exclusively among neighbors and family. Those differences had a key influence on the organization of the community and the family with respect to fire use, as the discussion below will show, although in both communities the losses caused by fire dropped after the Fire Action.

Losses Caused by Fire

How can we live in the country and not be allowed to crop? We will control the fire in order to cause no losses to each other.

Mr. Ferreira, 62 yrs old, born in Maranhão, living in the Cupu community since 1984.

Fire makes agriculture possible for peasants in Amazonia, and they do not perceive fire use per se as a problem. The problem understood by them is associated to escapee fires, due to losses that an uncontrolled fire can cause. Defining losses caused by fire is not a simple issue. It means expressing the value of something negatively affected by fire. The complexity lies in the variations of the social construction of 'value', which varies within and among peasant families. What is valuable for one person may not be valuable for another. For example, the burning of an area of açai palm (*Euterpe oleracea* Mart.) is a loss of value for those who extract its fruits or palm heart, for their own consumption or for sale in a market. For those who do not use it, its burning is not a loss. This difference in conceptualizing value is even stronger between urban outsiders and peasants. For an urban outsider, such as a researcher, there is a tendency to relate loss with material goods. Other cultural values are less visible. In order to capture a better picture of those losses, the term 'loss' was not used directly during the interviews, unless the interviewees chose

to do it. Instead, I talked directly about occurrences of any uncontrolled fire in their lands, and their views of these fires' consequences.

For the purpose of Fire Action evaluation, this study focused on change in measurable losses throughout the years that the families had been living in the communities, up to the moment of the research. Ten different measurable kinds of losses caused by fire were considered (Table 4-1), with each community presenting eight of each. The number of losses was bigger than the number of families because a family could suffer more than one kind of loss in the same year.

In the São Francisco community (Table 4-1A), all of the households talked about fire losses. Of the 40 families studied, 95% (38 families) had had losses caused by uncontrolled fires. Seventeen of those families (42.5%) had problems in two different years, and one family (2.5%) had problems in three different years. Primary forest represented more than 44% of the total reported losses. It was followed by pasture (23% of the losses), perennial crops (14% of the losses), crop fields (6% of the losses), and secondary forest (5% of the losses). The years 1996 and 1997 were those in which more families suffered losses caused by fire, 18 and 21 families respectively. In 1998, when the Fire Action started, the number of families experiencing losses dropped to five, and continued low in 1999. Another change observed after the Fire Action started was that uncontrolled fires in forest, before the most common cause of loss, had the lowest rate in four years, and no longer were the most common type of loss. This result suggests that Fire Action's emphasis on working collectively to protect forest had positive results. Peasants also reported that large farms located near by the community diminished their

fire use, which contributed to less outside-originated fires in the forests located by the community's border.

Table 4-1. Distribution of kinds of losses caused by uncontrolled fires by year in A) São Francisco do Itacaiúnas community and B) Cupu community.

São Francisco Community (A)	Years							
	89	94	95	96	97	98	99	Total
Kinds of Losses								
Primary Forest ¹		1	3	13	14	2	2	35
Secondary Forest				1	2		1	4
Perennial Crops	1		3	2	2		3	11
Agricultural Fields ²	1			2		2		5
Açaí Palm Area				1	1			2
Pasture			2	7	5	2	2	18
Cattle								0
Fence								0
House				1			1	2
Barn				1			1	2
no. Total of losses	2	1	8	28	24	6	10	79
no. of Families	1	1	5	18	21	5	5	56
Cupu Community (B)	Years							
Kinds of Losses	89	94	95	96	97	98	99	Total
Primary Forest ¹		1		1	3	5	1	11
Secondary Forest					2	1	1	4
Perennial Crops				1	2	1		4
Crop Fields ²					3			3
Açaí Palm Area							1	1
Pasture				3	2	9		14
Cattle				1				1
Fence						1		1
House								0
Barn								0
no. Total of losses	0	1	0	6	12	17	3	39
no. of Families	0	1	0	4	8	14	2	29

¹ – 'Primary Forest' refers to all kinds of forest that had never been clear-cut, and includes timber-exploited forest and pre-burned forest.

² – 'Agricultural Fields' refers to slashed crop field that was burned before the planned time, and one case of an experimental annual crop field with leguminous plants in a 4-year-old rotation system.

In the Cupu community, as shown in Table 4-1B, men and women of 29 families talked about their losses. Among those, 79% (23 families) had had negative consequences with uncontrolled fires. Six of these families (21%) had problems in two different years. In this community, where pasture occupies almost the same area as primary forest (an average of 41% of the land, as shown at Chapter 2), pasture is the kind of loss most reported, representing 36% of the total loss. It is followed by the loss of primary forest (28% of the losses), secondary forest (10% of the losses), and perennial crops (10% of the losses). In this community, the Fire Action started in 1999, and this year presented the lowest number of families that suffered losses in four years.

The distribution of the number of families that reported any kind of losses caused by uncontrolled fire per year in the two communities studied is presented in Figure 4-1. The reduction in number of families that suffered losses caused by uncontrolled fire associated with the beginning of the FATA/LASAT Fire Action indicates a positive influence of Fire Action. This result is very important for the evaluation of Fire Action impacts because in 1998 these two communities were located in the same region, subject to the same weather conditions, and influenced by IBAMA and other initiatives to control fire use.

Community Organization for Burnings

The whole Fire Action was based on community organization, as observed in the title of the Fire Action booklet: "Community Fire Management: Stronger Bonds, Fewer Losses". (*Manejo Comunitário de Queimadas: Mais União, Menos Prejuízo*). This union should include families living in communities, peasants, and technicians Carvalheiro and Aquino 1999:1):

We believe that only with the evenly balanced association of technical knowledge (theories, research) and practical knowledge (accumulated across generations, readings of nature), will we together reach concrete and applicable solutions.

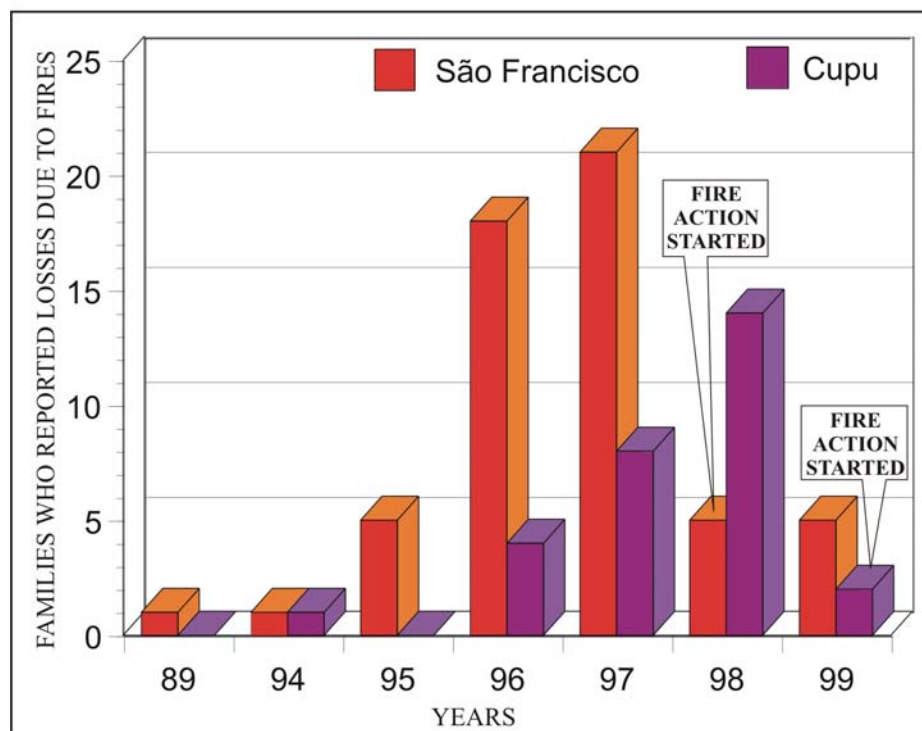


Figure 4-1. Distribution of families that reported any kind of losses caused by uncontrolled fire, in numbers per year, in São Francisco do Itacaiúnas and Cupu communities. Note the decrease in number of losses after the FATA/LASAT Fire Action started (1998 for São Francisco community and 1999 for Cupu community).

As well as pointing out the intrinsic power of union, the Fire Action also emphasized that isolated firefighting is inefficient, because of the nature of fire propagation. Once fire gets out of control, it spreads throughout surrounding ecosystems, regardless of families' willingness to work together or not. The Fire Action also stressed that preventing uncontrolled fires is more effective than fighting fire after it gets out of control. This last statement comes closer to peasants' reality, due to their scarcity of adequate tools, infrastructure, and external support to fight fires.

São Francisco do Itacaiúnas Community

Representatives of the São Francisco do Itacaiúnas community have been involved in the Fire Action since it began. Figure 4-2 (A-I) shows the FATA/LASAT Fire Action and São Francisco do Itacaiúnas community's activities from 1998 through 2000.

Until July 1998, the Agro-forestry Group was composed of 10 families working collectively in a local nursery located at the village center. They worked as volunteers on a weekly basis, producing perennial plants. In July 1998, two representatives of FATA's Agro-forestry Project Group attended the first FATA/LASAT Fire Workshop, and discussed the proposal for community fire management. These representatives returned to their communities and discussed the topic of fire and the FATA/LASAT's recommendations within the Agro-forestry group. The group then decided to work as a Fire Group too, helping all interested families. The same representatives of the Agro-forestry group led the creation of a local association, the AGRAF. At the second Fire Action workshop, held in Marabá in December 1998, community representatives shared their experience in community fire management. They reported no losses among families working with the Fire Group. In addition to reporting, they studied the IBAMA booklet and took part in the development of the Fire Action's recommendations. In May 1999, the first set of Sequential Fire Evaluation activities was carried out (field research), and the community received a copy of the complete FATA/LASAT Fire Action report. The report was received by peasants in the nine communities taking part in the second workshop, and they worked on the development of the recommendations. The act of providing a copy of the report to the communities proved to have a very positive impact on the process of building trust among the FATA/LASAT and the community leaders.

SEASON	FATA/LASAT FIRE ACTION	TIME	COMMUNITY KEY ACTIVITIES
RAINY			(A) Group Work - 10 families on the FATA's Agro-Forestry Project (weekly meetings).
DRY	1st Fire Workshop ▷	Jul 98	(B) Participation of 2 members from the FATA Agro-Forestry group; discussion of general fire management recommendations.
DRY	Community Meeting ▷	Sep 98	(C) Group discusses recommendations for fire use in community assembly; Creation of local Association(AGRAF) Agro-forestry's Group which acted as Fire Group, working in the whole community.
DRY	2nd Fire Workshop ▷	Dec 98	(D) Evaluation of Fire Group Actions in the community: no losses; Study of IBAMA's laws; More defined recommendations.
RAINY	Field research ▷ (Sequential Fire Evaluation)	May 99	(E) Fire Group receives full report on FATA/LASAT Fire Actions.
DRY	3rd Fire Workshop ▷	Jul 99	(F) Fire booklet distribution; Exchange experiences among peasants; Planning 1999's fire actions; IBAMA representative attendance.
DRY	Community Meeting ▷		(G) Assembly in the community of regional Fire Groups and fire rules; Distribution of FATA/LASAT booklets; Creation of regional Fire Groups; Group's coordinators meeting regularly.
RAINY	4th Fire Seminar ▷ FATA/LASAT's Fire ▷ Action ends	May 00	(H) Success on fire prevention & control.
DRY	Field Research ▷ (Sequential Fire Evaluation)	Jun 00	(I) Regional Fire Groups working Group's coordinators meeting regularly;
DRY	Field research ▷ (Observing Fire Strategies)	Oct 00	Success on fire prevention & control (by Oct).

Figure 4-2. The FATA/LASAT Fire Action and São Francisco do Itacaiúnas community activities, from 1998 rainy season through 2000 dry season.

Representatives of the São Francisco do Itacaiúnas Community, many of whom are members of the Fire Group, attended a third workshop, held in Marabá in July 1999. The Fire Action booklet was presented and 750 copies started to be distributed; experiences were shared among participants, and plans for the dry season were outlined. The greatest

achievement of this workshop was the presence of an IBAMA representative, with whom the peasants were able, for the first time, to directly discuss their reality, their main challenges and their most significant needs. Upon returning to the community, the AGRAF association held an assembly, where the community defined rules for fire management, distributed Fire Action booklets, and decided to divide the Fire Group into five Fire Groups. Each group would have a coordinator, who would meet regularly with coordinators. The community was successful in fire prevention and control, and presented low rates of fire-related losses. The fourth workshop was held during the rainy season, and no representatives from São Francisco or Cupu communities attended. After the workshop, the FATA/LASAT Fire Action was discontinued because of the lack of funding. In May 2000, the second field research for sequential fire management took place (field research), and in October of the same year, the field research involving the observation of fire strategies was carried out. In October, the Fire Groups were still working, even with no support from FATA or LASAT, and no losses were reported by them.

Figure 4-3 describes the relationship of the São Francisco do Itacaiúnas community with the Fire Action, focusing specifically on community organization and communication for fire management. The São Francisco do Itacaiúnas community organization for fire management can be broken up into four phases. 'Phase 1' was the phase before the Fire Action started. At this time, there was an Agro-forestry group in the community, supported by FATA, and limited to the 10 participating families, as indicated by the unidirectional arrows in the chart (Figure 4-3A). Although the group was open to community members, participants were required to follow strict rules, and

the production was divided only among those who worked in the group. An example of such strict rules is the requirement regarding attendance at weekly activities: if the member cannot attend, he/she should send someone to replace him/her at work.

Absences are only excused in cases of health problems or other really exceptional occasions. If a member does not attend, his/her absence would imply a reduction in the number of seedlings received. Thus, although the group was open to community members, its location and internal rules limited the participation of families.

Furthermore, technicians give their support exclusively to those families engaged in the project, and according to a FATA requirement, the seedlings cannot be sold because both seeds and basic materials are received as donations. Those restrictions limited the impacts of the Agro-forestry project on the community. Before the Fire Action started, around 50% of the families studied had suffered some kind of loss caused by uncontrolled fires during previous years (46% of families in 1996, and 54% in 1997).

The Fire Action, however, had a different dynamic from that of the Agro-forest project. Although the same members of the Agro-forestry Group composed the Fire Group, its proposal was to help burnings carried out by any family in the community, regardless of their social commitments (Figure 4-3, Phase 2). Shortly after returning from the FATA/LASAT workshop, they decided to work as a Fire group, under the so-called collective system (*mutirão*), helping not only each other, but also any family asking for help. This is indicated in Figure 4-3 by the bi-directional arrows (Figure 4-3B). The strong interest demonstrated by other families was in part explained by IBAMA's coercive fire laws. IBAMA began by requiring burning permits in the 1998

dry season, and prohibited burnings during the high dry season. Families felt lost and were not sure of how they should burn their fields.

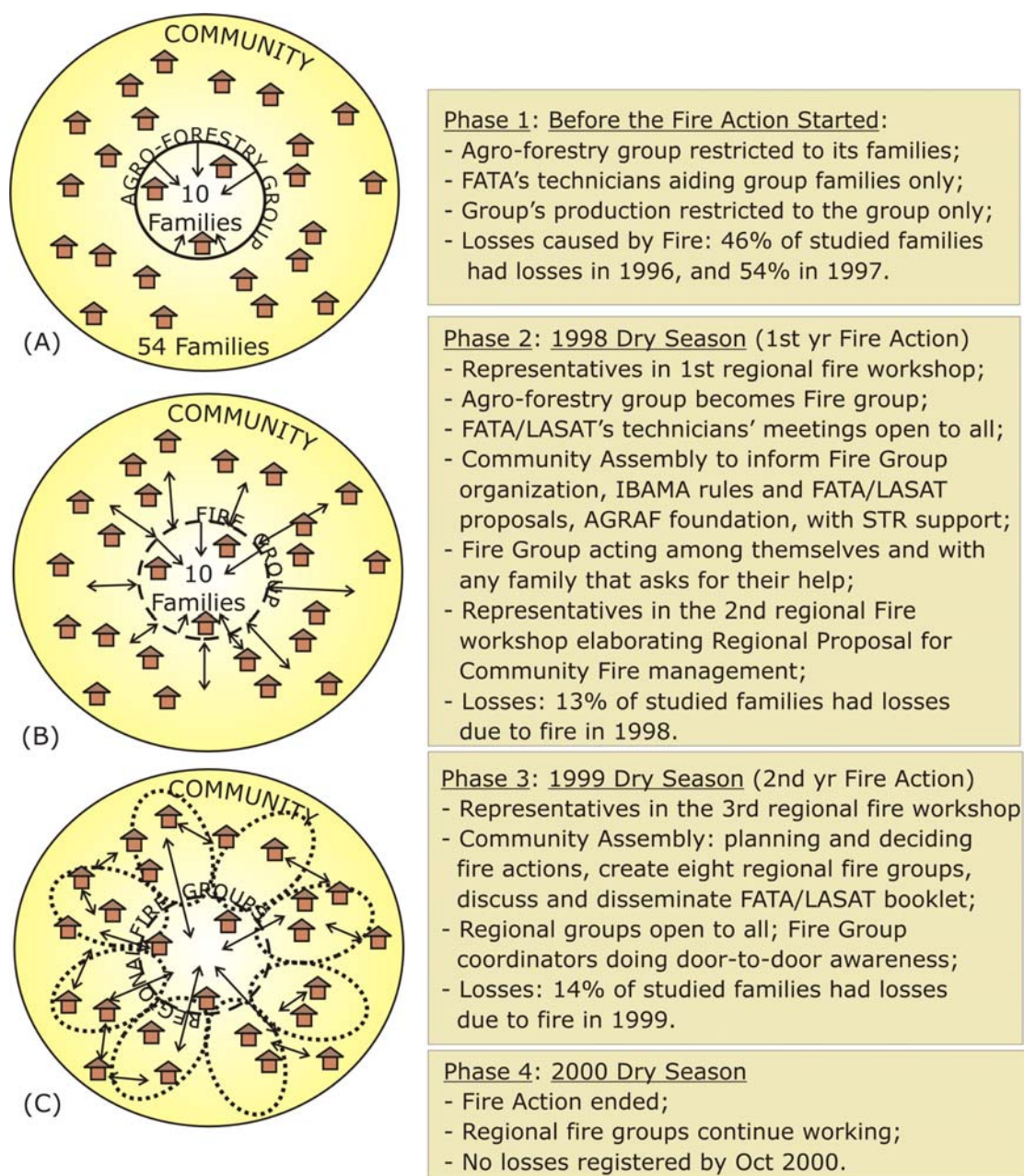


Figure 4-3. Representation of the São Francisco do Itacaiúnas community's strategy in conducting fire management, from 1998 to 2000. In this community, peasants created Fire Groups, with rules for fire use.

In September 1998, the group called a community assembly, whose main topics were fire management and the founding of the local association. Although many people were interested in fire management, only the families from the Agro-forestry Group committed themselves to the work, and to taking part in the Fire Group and in the new association, the AGRAF³² (Agro-Environmental Association for Family Agriculture Activities of the São Francisco Community). The Fire Action coordinator facilitated a meeting to discuss fire management in the community with all those who were interested, providing families with more information and reinforcing the Fire Group's importance. The Fire Group's main points were: any interested family should inform the group about the burning day in order to receive the Fire Group's help in the burning (required always burning in groups); families should make firebreaks; avoid burning in the beginning of the dry season; observe the burning; and use control practices in case of uncontrolled fires. The greatest benefit for the families was that the AGRAF, STR and FATA would support them in any fire conflict between a family and IBAMA if the burning had been carried out according to the Fire Group's guidance. Thus, the fear of IBAMA sanctions provided a strong motivation for peasants to change their burning practices, but little accessible and appropriate information or resources to support these changes. The Fire Action empowered them to develop and implement their own rules and practices for fire management, tailored to their own culture and resources, and use these to support their actions in any potential conflict with IBAMA. At the end of the season, the numbers of

³² Concurrently, the Group was in the process of founding their local association, for which purpose FATA lent the necessary money, and the families paid it back working collectively at the FATA's Center (10 days of 10 men, weeding).

losses caused by fire dropped to 13% among the interviewed families, and none of the families working in the Fire Group suffered fire-related losses.

In December 1998, the Fire Group's representatives presented the results of their actions at the 2nd Regional Fire Workshop, where participants analyzed IBAMA's fire booklet, exchanged experiences with other peasants, and took part in the development of the first Marabá regional community fire management proposal. After the burning season was over, families worked as usual in the preparation of their crops, while the members of the Fire Group also continued their activities as directors of the Agroforestry group and the AGRAF. During this time, the number of members of the AGRAF grew to reach most of the families in the São Francisco do Itacaiúnas community.

In June 1999, the first set of interviews for this study took place. In July of that same year, community representatives attended the 3rd Fire Workshop, in which they received the previously approved regional recommendations organized in the form of a booklet. They also discussed plans for the upcoming dry season and talked to an IBAMA representative for the first time without intermediation, asking questions and listening to explanations (Figure 4-3, Phase 3). Members of the São Francisco do Itacaiúnas Fire Group brought a new proposal to the workshop: working in several groups instead of in a single fire group, according to geographic distribution and to the number of families in the area. Each group should choose a coordinator, and all coordinators would meet regularly to discuss, to plan, and to share information. Fire Group members had evaluated their activities in the past dry season, and concluded that having a single group working with all the families in the community represented too much work for the

group's members, since they also have their family activities to perform. A community assembly coordinated by the AGRAF's Directors was held in the four days after the workshop. The minutes of the assembly specify that the FATA/LASAT booklet was read, and that IBAMA's laws were discussed. The minutes also recorded discussions on the fact that burning in groups was an IBAMA requirement. They emphasized that it was not fair that the Fire Group had only a few members, and stressed that "union is the foundation;" this union meaning that all the community should be actively involved. At the end of the assembly, eight Fire Group coordinators were appointed according to the community's geographical regions, and Fire Action booklets were distributed. The Fire Groups' general strategies were similar to those of 1998, with coordinators meeting weekly; the difference was that each coordinator would be responsible for his/her region, but not limited to it. This responsibility included raising families' fire awareness by means of door-to-door work. The number of losses caused by fire was low again.

In 2000, AGRAF called another assembly at the beginning of the dry season, and families agreed to continue working as regional fire groups, even after the Fire Action had ended. Rules regarding fire management were stressed again. No losses were registered by October of that year (Figure 4-3, Phase 4).

Cupu Community

The Cupu community engaged in the FATA/LASAT Action in 1999, one year later than did the São Francisco Itacaiúnas community. Methodologically, choosing a second community, located in the same region that did not participate since the Fire Action started, was designed to compare the two communities in different stages of the Action's development. Figure 4-4 shows related activities of the Fire Action and the Cupu community.

In terms of formal social organization before the FATA/LASAT Action started (Figure 4-4A), the Cupu community had had a FATA Agro-forest group in 1995, whose nursery was located on the land of group member Mr. Souza, near the place where the first Village Center was implemented. The Agro-forestry group, formed by members of 10 families, ended about one year later. Mr. Souza Jr. (son to Mr. Souza) became a Director at the COOCAT and organized courses, such as the course on açaí management, as an attempt to draw the community to the Coop. The LASAT Community Forest Project started in 1997 and involved representatives of 10 families. By 2000, this group no longer held regular meetings in the community but met for the LASAT technician's visits. There was also a group of 9 or 10 families which called itself the Cattle Association. In addition to the organizations described above, there was the Regional Association, created by reason of a bank loan and whose members occasionally met in order to solve specific issues related to the loan. Almost half of the families interviewed reported losses caused by uncontrolled fires.

The first set of Sequential Fire Evaluation activities were carried out in June 1999, aiming to evaluate the previous dry season, to collect data on the social-productive conditions of the families, and to understand their views regarding governmental laws on fire management. In July 1999, the Cupu community was invited to the 3rd FATA/LASAT Fire workshop, held in Marabá. Three families attended, including Mr. Souza Jr. representing the COOCAT (Figure 4-4B). They received the Fire Action booklet, discussed fire proposals, exchanged experiences, and planned to support the creation of the Fire Group in their community.

After the regional meeting, community representatives discussed the fire proposal with the other members of the community. Because the leaders involved with LASAT and COOCAT were Catholics, they were used to having weekly meetings in church. The local Protestant Pastor was interviewed, and he expressly said that fire management was not discussed during their meetings. The Protestant church was established in the previous year, and its members (10% of the male heads of families interviewed, and 38% of the female heads of families) had been Catholic in the past. Due to families' historical relationships, this study assumes that differences concerning religions was not a barrier. Booklets were handed out to most of the families. In the community, the Fire Action coordinator facilitated a meeting in which she emphasized the importance of burning in groups, discussed the laws by IBAMA, and distributed more booklets. There was no official formation of "Fire Groups", but they organized burnings with their relatives and neighbors. Losses caused by fire dropped to less than 10% in 1999, for the families studied.

In the 2000 dry season, the FATA/LASAT Fire Action ended as a result of financial limitations. Its last activities were the 4th workshop and a community meeting. The workshop was held during the rainy season, and very few peasants (from communities located closer to the city) attended. The second set of Sequential Fire Evaluation activities was carried out in June 2000. Families were planning to continue with fire management among kin and neighbors (Figure 4-4C). This study intended to observe fire management during this season, but this was made impossible due to the unusually long rainy season and to the researcher's limited time in the field. Therefore,

fire management data for the Cupu community solely considered their plans, not their actions.

SEASON	FATA/LASAT FIRE ACTION	TIME	COMMUNITY KEY ACTIVITIES
RAINY			(A) Fata Agro-forestry group in 1995; One COOCAT director; 10 families in the LASAT Community Forestry project, irregular meetings; 'Cattle Group' with regular activities; Regional Association; No participation in Fire Action in 1998.
DRY	1st Fire Workshop ▷	Jul 98	
	2nd Fire Workshop ▷	Dec 98	(B) Receive Fire booklets; Exchange experiences with other peasants; Planning 1999 fire actions. Discussions in the community during Catholic meetings; Distribution of FATA/LASAT booklets to all interested; FATA/LASAT technician facilitates community meeting; Neighbors and kin organizations for fire management; Fire losses drop.
RAINY	Field research ▷	Jun 98	
	3rd Fire Workshop ▷	Jul 99	
DRY	Community Meeting ▷		
RAINY	4th Fire Seminar ▷	May 00	(C) Plan to organize among neighbors and kin for fire management.
	FATA/LASAT's Fire Action ends		
DRY	Field research ▷	Jun 00	

Figure 4-4. Related FATA/LASAT Fire Action and the Cupu community activities, from 1998 through 2000 dry season.

Figure 4-5 relates the Fire Action and the Cupu community, focusing on internal community organization for fire management. The Cupu community's organization regarding the Fire Action can be divided into three phases. Phase 1 corresponds to the period before the Fire Action started. As described in Figure 4-4, there had been a

previous experience in community organization with the FATA Agro-forestry project; a regional association devoted especially to a governmental loan administration; a COOCAT Director; a Cattle Group for meat commercialization among members who met regularly; and the LASAT Community-forest Project, whose technician provided support only to group members (Figure 4-5, Phase 1). The Catholic Church coordinator was a member of the LASAT Community-forest group. The closed circle in the drawing (Figure 4-5A) points to the fact that the LASAT Community-forest Group was a closed group, and the unidirectional arrows indicate that the action focused on group members only. In the 1998 dry season, with no interference from the Fire Action, 45% of the families studied had suffered losses caused by uncontrolled fires (against 26% in 1997).

In July 1999, community representatives attended the Fire Action's regional workshop (Figure 4-5, Phase 2). In this meeting, they were informed of the Fire Action's goals, received booklets with the Fire Action's main recommendations, discussed their situation with the IBAMA representative, and exchanged experiences with other peasants. Returning to the Cupu community, the Fire Action was presented and discussed mainly during the Catholic Church meetings, and Fire Action booklets were handed out. The Fire Action coordinator facilitated a community meeting on fire management, open to all interested persons. Although no specific Fire Group was created in the Cupu community, families and neighbors worked together for fire management, as represented in Figure 4-5B. The house in the center represents the Catholic Church coordinator, the main Fire Action disseminator in the community. The unidirectional arrows indicate him or other peasants talking about fire management, but

with no cooperation from the listener. The bi-directional arrows indicate teamwork among peasants. The number of losses due to uncontrolled fires dropped to 7%.

The Fire Action ended in 2000. The second set of Sequential Fire Evaluation activities was carried out in June of the same year. Families evaluated the previous dry season as successful in preventing fire losses. They were planning to work again together with kin and neighbors, claiming that many families that once were not involved wanted to participate because of the success achieved by their fire management practices, and also because they feared IBAMA's repressive actions.

The analysis of changes in patterns of communication and organization within the two communities shows how the Fire Action was able to build and expand outward, based on existing community groups, especially among those of the Catholic faith who were used to church-sponsored collective actions and supported by church leadership. Improved communication and mobilization of peasants was a key strategy in the Fire Action approach. People in both communities were concerned about IBAMA regulations, and motivated to seek alternatives for compliance, which the Fire Action helped to organize. In the São Francisco de Itacaiúnas community, stronger initial organization helped to support a broader organizational structure and more participation in community definition of rules, which suggests greater potential for long-term fire management in that community.

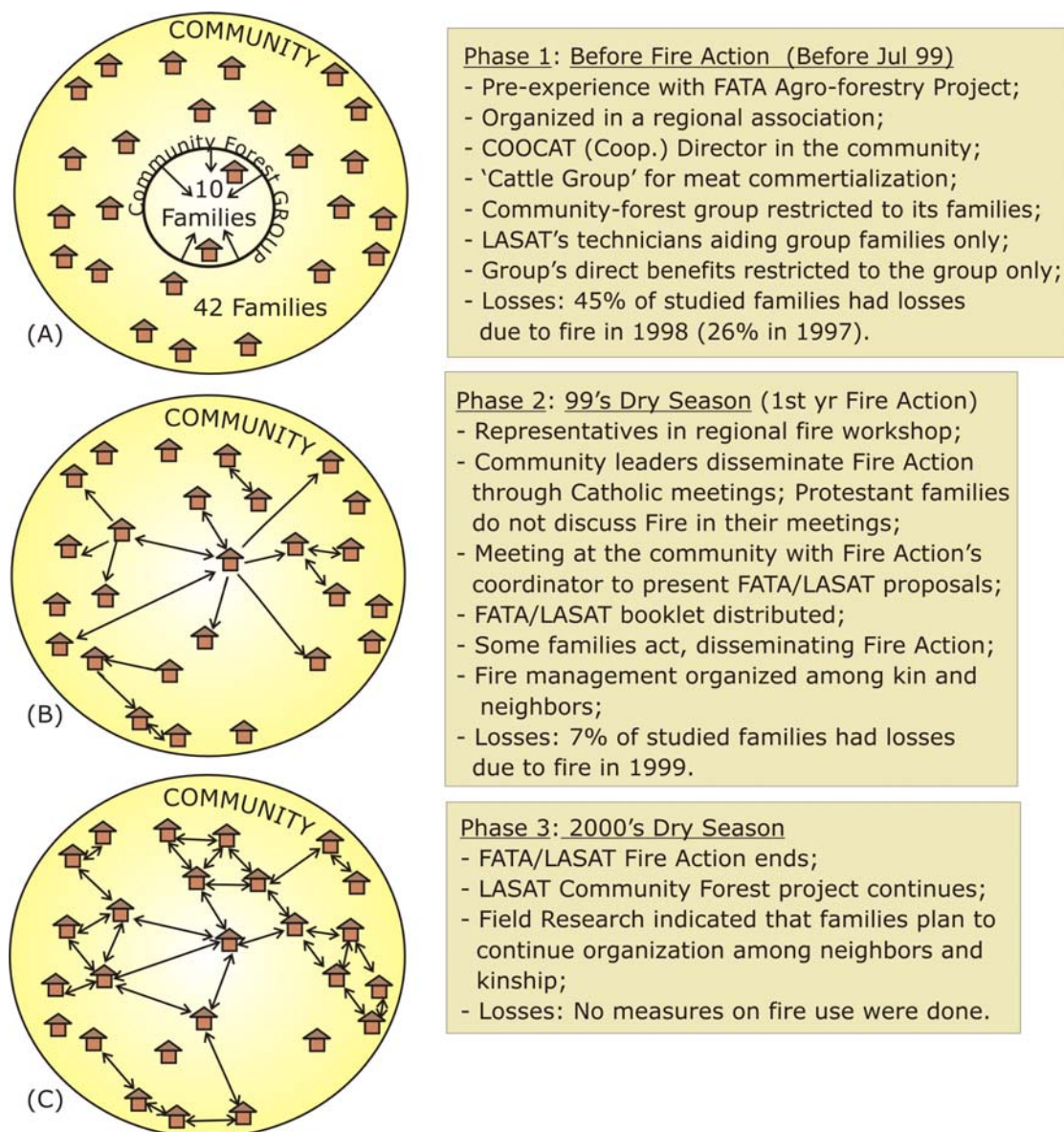


Figure 4-5. Representation of Cupu community organization for fire management, from 1999 to 2000. In this community, peasants worked among families and kin, encouraged by local leaders.

Before Burning

The "before" burning' recommendations were organized into four sections in the FATA/LASAT booklet: official burning license, planning, preventive firebreaks, and communication between neighbors. Those recommendations were analyzed by

evaluating questionnaire responses regarding the interviewee's knowledge of official fire use regulations, community organization for burnings, the period chosen to burn, burning after rain or not, use of preventive firebreaks, and communication between neighbors.

Responding to Official Fire Use Regulations

This study wanted to evaluate how government rules were reaching families at the community level. Information about governmental regulations is of difficult access by peasants. For example, in the entire Marabá region there is one single office representing IBAMA, which is responsible for all environmental issues pertaining the region, from illegal logging to river pollution. The best means for farmers to obtain information from outside the rural areas is the radio, where programs are an effective way to explain dangers associated with fire and to suggest the use of preventive techniques. However, programs do not explain government laws and regulations, or present the steps required to carry out legal burnings.

The studied communities had not been visited a single time by any IBAMA representative. When asked in 1999 about the IBAMA Fire booklet³³, only 16% of the families in São Francisco and 13% and of the families in the Cupu Community, reported they had ever seen a copy. The families which were familiar with the booklet published by IBAMA were those in which one or more members had a more active participation in the STRs, the FATA or the LASAT. But only those who had attended the Fire Action's regional workshops could offer straightforward explanations of the issues addressed in the booklet. Possible reasons for that might lie in the in-depth analyses of the IBAMA Fire booklet conducted in the second regional workshop (described in Chapter 2).

³³ IBAMA's Fire booklet was one of the most important informative sources of official fire law for peasants.

Despite having access to the booklet, most of the interviewees were not able to explain details of official regulations concerning fire use, such as the steps that are necessary to follow in order to obtain a permit from IBAMA, or the need for firebreaks and their specific sizes, or the criteria for fire prohibition.

Despite not being able to explain the fire legislation in detail, all the families knew that IBAMA has been applying more restrictive rules for fire use, including requirement of official permits, prohibition, fines and even physical arrest for those who do not comply with such fire laws. Also, families were aware of the fee charged per area planned to burn in order to receive IBAMA permit. Families learned about IBAMA's new rules on the radio (100% of the total for São Francisco; 97% for Cupu), on television (49% of the total for São Francisco; 33% for Cupu), and/or through the STR or Association representatives (100% for São Francisco; 70 % for Cupu).

This study found that official information regarding fire use was poorly received by peasants at community level, raising general topics such as "fire is bad for the environment" or "do not burn without IBAMA permit." From the 72 families interviewed, only two leaders from the São Francisco were able give deeper explanations on government rules.

Peasant's fears of IBAMA sanctions were a strong motivating factor in their willingness to change fire management practices, especially for those peasants not used to participating in community organizations. However, the information on the regulations was inaccessible, hard to understand, and not appropriate to their situation. Many recommendations were simply beyond their means. The Fire Action was successful, in part, because of the fear of IBAMA sanctions, which resonated with and

reinforced a history of government neglect and coercion. This motivated people to participate in a program designed to develop their own community-based program for fire management, and set their own rules for avoiding fire-related losses.

Communication between Neighbors.

The Fire Action stressed, at several different moments, the importance of communication between neighbors, as part of the Fire Action's bottom-line recommendation on collective work. The FATA/LASAT booklet stated that "Good communication is the foundation for union." The emphasis on union can be explained not only by peasants' history of struggle, but by their social organization as a "community" (the term used by people in the two communities, mainly those sharing the same principles of the Catholic church), and by the empowering aspect of working together for a common goal. The same message was discussed in regional and community meetings.

This study attempted to evaluate the practice of informing neighbors of burning, by asking the family if they had informed their neighbors about the burning day and invited their participation. This turned out to be difficult because there was no formal invitation, and it was hard to standardize the meaning of "inform." The way in which one was to inform his neighbors was too subjective, since no specific rules were set. Therefore, it was difficult to consider the validity of the 'informing neighbors' practice. An ethnographic study would bring valuable information on this topic.

Still, the results show a very high incidence of informing neighbors, especially those close by. In 1998, in São Francisco do Itacaiúnas (n=36), only one family stated they had not informed neighbors of a burning, because they were located far from neighboring lands. In 1999, five families did not inform their neighbors, arguing that the

burning did not present any danger to them, either because it was far from their lands, or because only a small plot was to be burned, after it rained. In the same year, all the families interviewed in the Cupu community (n=27) declared that they had informed their neighbors of the burning day. In the following year, after the Fire Action started, two families declared that they had not informed their neighbors because the area to be burned was distant from the neighbors' land.

The practice of "inviting neighbors" proved to be more measurable than was 'informing neighbors', although the invitation was also informal (which meant no written proof of the invitation). Burning collectively was the main point made by the Fire Action, and families were informed that the Fire Action (represented by the local association, FATA, LASAT and STR) would only support those families that burned collectively. This support was not restricted to preventing and fighting uncontrolled fires; the Fire Action would also help families in case of conflicts with IBAMA due to fire use. Families were aware, through radio and TV broadcasts, of IBAMA's new procedures on fire use prohibition, fines, or even jail for those who did not comply. As seen in Chapter 1, since Roraima's large uncontrolled fires in early 1998, burnings could only be performed with a permit issued by IBAMA, and during the weeks of the high dry season, even those that had licenses were forbidden to burn their fields. If neighbors were invited to participate in a burning event and did not come, they would have no support from the Fire Group or community leaders in seeking compensation for losses caused by uncontrolled fire reaching their land.

The methodology used in order to determine neighbors' presence at burnings was to ask interviewees to describe their burning situations, including proximity to lands

belonging to neighbors who were present on the burning day, and their connections with those persons (kin, neighbor, friend, and/or member of Fire Group). If the neighbors were not present at the burning, the interviewee was asked if they had been invited. Crossing data from interviews of different neighbors also helped to check people's participation during burnings.

In the São Francisco community, in which the Fire Action started in 1998, the number of families inviting neighbors was high and stable in 1998 and 1999, and always higher than in the Cupu community: 81% and 80%, respectively for the two years. The number of families that invited their neighbors to burning events in the Cupu community (n=29) increased from 34% in 1998 to 64% of the families in 1999. The difference regarding this practice in the two communities might be due to the Fire Action. In the Cupu community, the percentage of families inviting neighbors almost doubled from one year to the other, while in São Francisco, the percentage of families inviting neighbors continued to be high. The higher number of families inviting neighbors in the São Francisco do Itacaiúnas community was probably due to their commitment to fire management since 1998, represented by the Fire Groups' work and by the local association support, which also discussed fire management in assemblies.

The importance of communication between neighbors can be illustrated by the following example, in which losses were caused by lack of communication and planning among neighbors. In 1999, in the Cupu community, a slashed 1.5-hectare plot of old secondary forest (*juquirão*), owned by the Pereira family, was ready to be burned, while the contiguous neighbor's pasture was not (Figure 4-6). To avoid causing the neighbor any losses, the field's owner waited for either his neighbor to burn the pasture or for it to

rain, so as to reduce the risk of uncontrolled fire. However, it rained twice and the field, which was located by the dam, was too wet to catch fire when the Pereiras tried to burn it later. Mr. Pereira claimed that his loss would have been even greater if an uncontrolled fire had escaped from his field and burned his neighbor's pasture. He was afraid the neighbor would protest and he would have had to feed the neighbor's animals, but his pasture was not large enough for that. Mr. Pereira and his neighbor do not get along very well. Nevertheless, he said that in the coming year it would not happen again, because the neighbor had sold his land to his godfather, and they will plan burning events together. It was the first time that Mr. Pereira did not burn his slashed field, and this may reflect a higher awareness that losses caused by fire are the responsibility of the owner of the burning event. Mr. Pereira's family ended up cropping 0.15 ha in the slash and mulch system. They harvested 200 kg of beans, but did not produce rice and had to buy it from neighbors.

Thus, this study found a surprisingly high frequency of informing and inviting others regarding a planned burning, albeit much of it informal and unrecorded. Communication and cooperation among community members is probably the most important factor in fire management, and the Fire Action build on this social foundation to prescribe adequate numbers of people required, and specific practices they should follow, and to promote and support collective action.

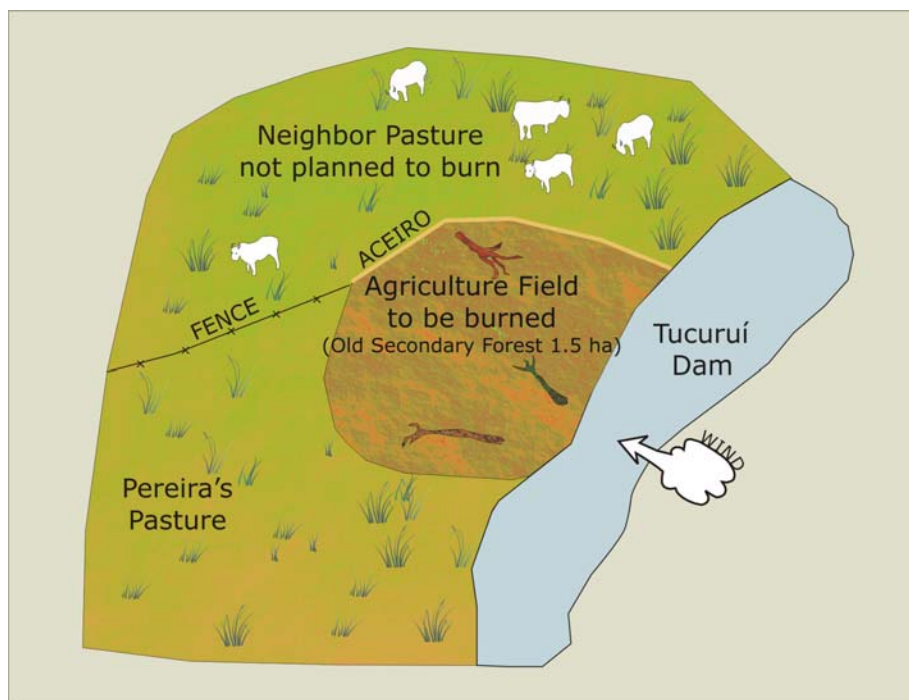


Figure 4-6. Representation of a burning situation in the Cupu community, in 1999, in which the lack of communication caused loss to one family. Pereira's family slashed a plot of 1.5 ha in an old secondary forest (*juquirão*), and when it was ready to be burned, they feared that fire would reach the contiguous neighbor's pasture, and decided to wait for a rain to wet the pasture and, consequently, diminish the risk of fire to spread. Their neighbor did not plan to burn the pasture that year. The two families do not get along very well. However, it rained twice, and the Pereira field, located by the dam, did not catch fire when he tried to burn it later. The Pereira family did not plant on that field that year, losing all the investment in labor and other services that the old secondary forest would provide, and had to buy rice.

Period Chosen to Burn: Month Choices

One of the Fire Action's recommendations was to avoid burning in the beginning of the dry season. The reason for this recommendation was that an uncontrolled fire starting in the beginning of a dry season is much more dangerous than a fire starting later in the dry season, since when it gets out of control, it may take weeks or even months before a rain can turn ecosystems wetter. Changes in this practice (burning later) were measured through interviewees, asking peasants burning dates and number of days before or after the rain that they burned their fields.

Results indicated that peasants in both communities were burning slightly later than customary practice, after the Fire Action (Figure 4-7). Evaluation of this practice was not easy because only average precipitation data were available for the Marabá region as a whole, and no inter-annual variations were specified on the frequency of rains in the literature.

Figure 4-7A shows the monthly precipitation in the Marabá region (average of 20 yrs according to SECTAM 2004), against the total of hot pixels obtained for the state of Pará (average hot pixels obtained by NOAA-12 satellite from 1998 to 2003, according to INPE 2004). Although the Marabá region is located in an equatorial super-wet climatic region (IBGE 2002), with average annual precipitation of 2043 mm, the region presents a clear four-month-long dry season (May through September) during which the average precipitation rate stays below 100 mm. However, the distribution of hot pixels in the state of Pará shows clear concentrations of burnings events occurring in August and September: 53% of all the hot pixels. Nonetheless, is still a risky month to start a fire in the Marabá region, because ecosystems have been drying since late April or May, and strong rains are expected to arrive only in October.

Therefore, controlling fires is hard under these circumstances, and likely to be ineffective and pose risks to the lives of those taking part. As local peasants say: "August-dry vegetation feeds fire like gasoline." Although peasants have reached a consensus on the fact that burning early in the dry season increases the chances of fire losses, families in both communities stated they usually conducted burnings in August, before the rains. Some of the peasants justified this practice by explaining that fire did not normally get out of control 10 or 15 years ago as it does nowadays. In the words of

Mr. Ambrosio, a Fire Group member in the São Francisco do Itacaiúnas community, "back in 1983 when we arrived here in the community, burning an agricultural field well was difficult because of the constant rain. It is different now: the dry season has been very strong in the last few years." In those days, he explained, "the forest worked as a firebreak."

The data from interviews indicated changes in the choice of month for burning in both communities studied: families tended to burn later in the year, and to concentrate burnings in certain months. Although the communities engaged in the Fire Action at different moments, data showed no differences between them in terms of choice of month for burning. Changes were noticed, however, in the reasons given by families for burning late in the season, in 1998 and 1999. The families in São Francisco relate changes to the need to prevent uncontrolled burnings, while in Cupu, families explained that in 1998 they burned late because of IBAMA changes in rules for fire use, and they were waiting for more explanations on this topic. They claimed they had burned in a hurry, after receiving no information, and many families suffered fire-related losses in this year (see section on fire losses).

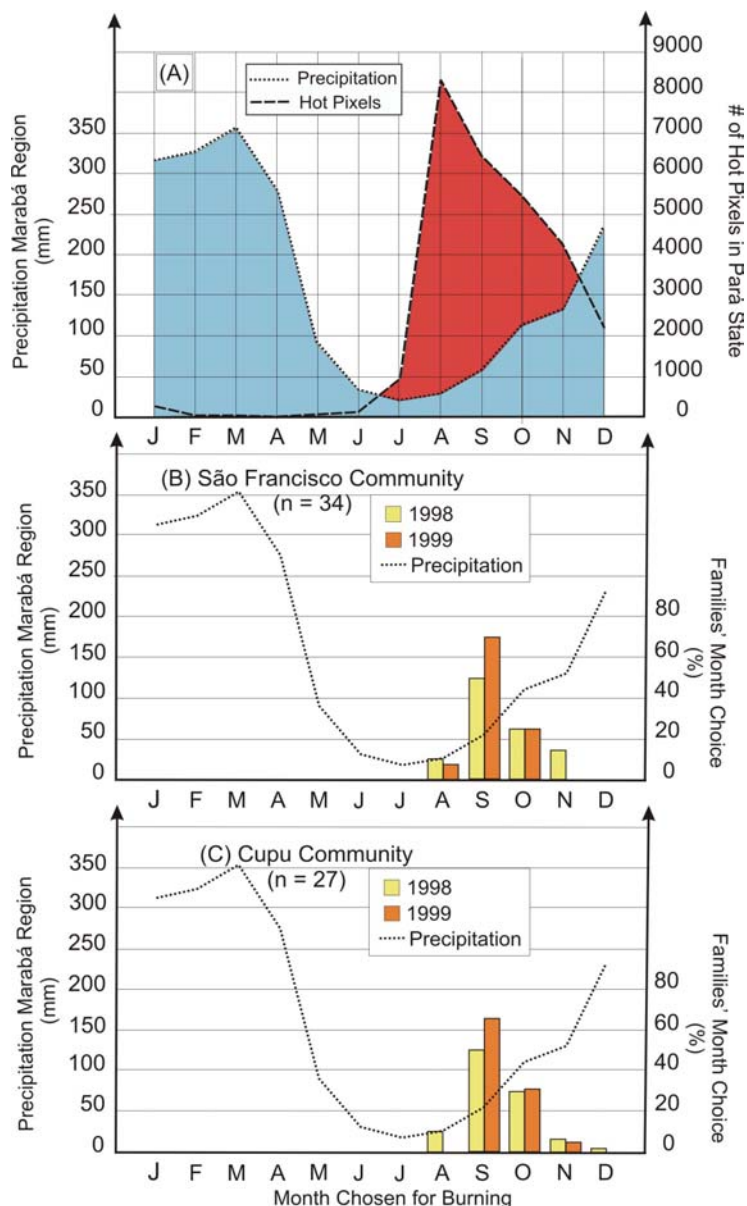


Figure 4-7. Rainfall distribution and months chosen for burning. The upper graph A) shows the average precipitation in the Marabá region (SECTAM 2004) in relation to the average number of hot pixels in the Pará state (INPE 2004). It shows a clear dry season, and high concentration of burnings on August and September. The following two graphs relate the Marabá rainfall distribution with months chosen for burning by families studied in São Francisco do Itacaiúnas community and B) Cupu community C), for 1998 and 1999.

Figure 4-7 shows the average precipitation distribution in Marabá (SECTAM 2004) associating it with families' choice of month for burning in the two communities studied, (B) São Francisco and (C) Cupu, for 1998 and 1999. The average rainfall distribution

explains families' rationality for burning in August and September. As rainfall decreases in May, they are ready to start preparing their agricultural fields, which means slashing the vegetation in June (2 to 4 weeks), waiting for it to dry in the month of July (3 to 4 weeks), and burning before the rain starts, in August or early September. In the São Francisco community, where the FATA/LASAT Action started in 1998, Figure 4-7B shows that, from 1998 to 1999, there was a small decrease in the number of burning events in August (from 12% to 9%), and an increase in the number of burning events in September (from 50% to 68%). No changes were seen in October, and a decrease was noted in November (from 15% to 0). This result shows a higher concentration of burning events (from 4 to 3 months), which may reflect the collective burning events supported by the Fire Action. Additionally, the higher concentration of burning events in September may be related to families' decision to wait for the first rain. Burning events late in November 1998 might correlate to families' insecurity concerning how to burn in accordance with IBAMA's laws, since it was the first year of IBAMA's massive media dissemination of fire-use prohibitions.

The same pattern was observed in the Cupu community (Figure 4-7C): a higher concentration of burning events (from four to three months), reduced number of burning events in August (from 11% to 0), increase in the number of burning events in September (from 48% to 64%), unchanged figures for October (30% and 32%), and a decrease in November (from 14% to 5%) and December (from 4% to zero). Despite the fact that no formal fire groups were created in the Cupu community, families claimed to burn with neighbors and family more often than they used to before the Fire Action started.

Given the limitation on local microclimate data for a more accurate evaluation on families choice of month for burning, it appears that peasants in the two communities studied in the Marabá region concentrated their burning in September and October. This was a shift of several weeks later than their traditional time of burning in August and September, before the rains began. This shift to later burning reflected a combination of fear of IBAMA sanctions, and compliance to Fire Action rules.

Burning after the First Rain

The practice of burning after the first rains is indirectly connected with the choice of certain months for burning, since the rainy season generally starts in late September in the Marabá region. The Fire Action stressed the importance of burning after the first rain, both in its booklet and in meetings. Unlike the evaluation of impact on families' choice of month to burn, which was limited due to lack of local climatologic data, the 'burning after rain' practice allowed more precise measuring. Families were very precise when remembering rain events and burning date and answering if the burning event was before or after the rain. If the burning event was carried out after rain, they were able to say how many rainfalls there had been before burning, and how many days after the last rain they burned their agricultural fields. Evaluation of this practice focused on burning before or after rain, and on understanding the reasons for each choice.

The general Fire Action recommendation was to burn plots for agricultural fields after a first rain whenever possible, and to always burn *after* rain when burning pasture. Pasture fields are divided by fences, and burned every 3 to 4 years following a rotation system, aiming to reduce the amount of weeds and favor pasture sprout. After burning the plot, grass seeds are sown where weeds had prevailed prior to the burning. Families claim that in addition to renewing pasture fields, burning is important to reduce the

amount of weeds which are not suitable for cattle grazing, to scare away snakes and also to exterminate ticks.

Results showed that all of the peasants who burned pasture fields after the rains were unanimous in affirming that it was a very good practice for pasture maintenance. They claimed that only a few days of sun were enough to dry the pasture and for its slashed weed to burn effectively. The experience also showed that because the soil was wet, the fire spread faster over the vegetation, and the soil temperature was not as high as when the pasture is burned before the rains. Therefore, burning after the rain rains did not burn grass roots. In addition, grasses sprouted faster when compared to earlier burnings. If a pasture is burned long before a rain, other dryness-tolerant species start growing and therefore competing with the grass. Another great advantage, emphasized by the Fire Action, is that the rain wets surrounding vegetations, therefore reducing the risk of fire spreading.

In São Francisco do Itacaiúnas, all of the families that burned pasture fields in 1998 (24% of families) and in 1999 (40% of the families) claimed that they had waited for it to rain before they burned. In the Cupu community, 66% of the families in 1998 and 39% in 1999 burned their pasture fields, respectively. Also, all the families claimed they had waited for rain before burning their pasture fields, in both years, but that they had not always done this before 1998. As mentioned before, some families explained that they burned late in the dry season of 1998 because they were waiting for IBAMA's guidance regarding fire use. This guidance did not take place. Families' lack of information on IBAMA's fire laws and the fear of not being allowed to burn may explain the high

number of families (66%) burning their pasture fields in 1998, since in usual years families burn their field each 3 or 4 years.

Burning pasture fields after the rain was not a controversial topic to peasants because pasture fields burn well after only a few days of sun following a rainfall. Scientists had reached the same conclusion in the Paragominas region, also located in the Amazonian 'arc of deforestation' (Uhl and Kauffman 1990).

With regard to agricultural fields, however, waiting for it to rain before burning is a more complex topic. Too much rain results in the sprouting of weeds, and the slashed field may not be dry enough again for a good burning. Moreover, burning after rain does not work on slashed *palhada*, or one-year-old fallow fields: there is too much straw left from the previous harvested plants, and if it rains, the straw 'sticks' to the ground, and fire will not spread to it. Another critical situation is when slashed fields are located on lowland wet soils, where a single rain might leave the slashed vegetation too wet to dry properly, favoring weed sprouting, or, even worse, not allowing it to become dry enough to burn. Figure 4-8 exemplifies a slashed primary forest burned after heavy rain, at the end of the dry season (Oct 10, 2000). The peasant was afraid that it would rain again, and burned the field before it was dry enough. However, the large number and size of trunks left unburned made it impossible to reburn, and rendered the plot unsuitable for planting. Living in the São Francisco do Itacaiúnas community since 1994, he had always cropped secondary forest and for the first time he slashed a primary forest. His concern with the primary forest can be seen by the uncut plot left between the pasture and the slashed field, in which there were cupuaçu plants (*Teobroma grandiflorum* [Willd. ex Spreng] Schum.) and brazil-nut trees (*Bertholletia excelsia* H.B.K.), among others. He

expressed his sorrow about the situation, stating "Agriculture (*roça*) is a lot of work already; if the field does not burn, we are facing a huge loss".



Figure 4-8. A slashed primary forest burned after heavy rain, at the end of the dry season, resulting in a bad quality burning for cropping (Photo by author).

The reburning technique, locally called *encoivara*, is a practice in which the unburned vegetal material, resulted from a not very good burning, is manually piled up, using scythes and machetes for bigger trunks, and then ignited. Smaller pieces are piled by the bigger ones. It is a difficult and time-consuming activity. In spite of such difficulties, peasants generally claimed it was better to burn after a rainfall because it did not affect their production, and it really helped in the prevention and control of

undesirable fires. Some peasants, however, stated that burning agricultural fields after the rain was good for preventing uncontrolled fires, but bad for production because the slashed field did not burn well, which negatively affected their crops.

When the vegetation is too dry, before the rains, fire quickly gets out of control if it escapes from the planned burning area, and it is very difficult for peasants to control it. In 1997, for instance, the Duarte family from the São Francisco do Itacaiúnas community, lost 90 coconut trees he had acquired with government loans, plus forested and pasture areas that they did not want to burn. Mr. and Mrs. Duarte were born in the north state of Goiás (now Tocantins), and have been living in the community since its occupation in 1983. Below is one of their comments on trying to combat uncontrolled fires started before the rain:

Mr. Duarte (D.): I was at the barn, around 3 km from here, almost past the field. When I arrived home, we could hear this high crackling noise in the coconut fields. The fire had jumped to a year-old fallow field with pasture and rice. There was fire everywhere; and there was no way to control it. Ninety coconut trees were burned. This happened prior the rains in 1997. Back then we used to burn before the rain because since we arrived [in the state of Pará], the fire did not escape from the planned burning field to the forest. I think that at that time leaves in the forest were wet 'by life', you know? But nowadays if we do not wait for the rain, fire spreads into the forest just as if we had put dry branches under the fire. In the past, however, we could burn one alqueire [5 ha] or 2 [10 ha] of slashed vegetation, and the fire would surround the neighboring forest, burning only the slashed vegetation. Now it is not like that anymore.

Question: What do you believe has changed from that time, so that in the past the fire would not spread into the forest, but now it does?

Mr. D.: I believe that it changed due to rain [frequency]. Before [20 yrs ago], it would rain almost every month in the state of Pará. It used to rain very often. Then, the forest was wet, you would walk inside it and it was cold. And nowadays you see how it is, sometimes we have 2, 3, or even 4 months without rain; then the forest gets dry. When fire reaches the forest, it gets stronger and spreads all over, because everything is dry! In the past it was not like that. You would scratch the leaves on the floor, and they were wet.

Mr. Duarte lives in the São Francisco do Itacaiúnas community. He was born in the state of Goiás, and has been living in the community since its occupation (1983).

Fifty-seven percent of the families studied in the São Francisco do Itacaiúnas community, where the Fire Action started in 1998, waited for the rain to come before they set out to burn their agricultural fields in 1998. This percentage went up to 86% in 1999 ("n" total for this variable was 35 families). In 1998, peasant families were more resistant to change their behavior because they feared that their agricultural fields would not burn well after the rain, perhaps reducing their production. Some of those families who burned after the rain admitted that they burned late in the season fearing IBAMA reprimands, but not because they believed it was a good practice. In 1998, three of the ten Fire Group members burned before the rain, one did not crop, and the other six burned after the rain. All of the peasants that burned after the rain said it was the first time they planned to do so. Before the Fire Action, they would only burn after the rain by accident. In 1999, there was an increase in the number of families burning after the rain. Some families and most Fire Group members associated this increase with the positive results obtained in the prevention and control of fires.

In spite of the apparent success of this practice, one Fire Group member stated that his agricultural field did not burn well, and his family would have to work hard doing the reburn (*encoivara*). Another peasant credited his adoption of the practice 'burning after the rain' to social pressure towards not causing losses to anyone, and not because he believed it was the best practice. Changing behavior was a process, as the Fire Group in the São Francisco do Itacaiúnas community explained. Even for those who lead new fire practices, such as the Fire Group members, changing behavior was challenging. The whole year's production of the agricultural field depended on the burning quality. In June

of 1999, for instance, the Fire Group was evaluating the past dry season, and planning the next one. Mr. Carvalho, then Director of the AGRAF, explained how he understood the reluctance on the part of some families to change their behavior, especially those who did not participate in the meetings held to discuss the fire issue. He stressed the role of Fire Group members in bring consciousness to those that usually do not get involved in community organization. In the following segment there is a discussion of this reluctance:

Mr. Carvalho: I think that, in order to bring consciousness to the people, we should organize a [community] meeting, as soon as we arrive [from the Fire Action regional seminar] (...). I can say this for me: when it was August, I used to burn my agricultural field; the agriculture field was then clean, just ready for the rain and plantation. And the worse is that: people are used to burning early. He [peasant] is apart from the 'movement' [organization for fire use], he does not know what is going on, and he gets worried, I agree with him. When a person is used to burning early, when it rains, and his agricultural field is not burned yet, he gets worried. I am one of those. When it rained [in 1998] and the slashed vegetation was getting ready to sprout, I said: 'this year I will not have agriculture!' People are used to burning their fields before the rains. There are many people with this habit (...). When it rains at night, he thinks: 'my God, it seems that this year I won't have agriculture.' I don't know, it is our habit. But sometimes it works like that: we burn early, and suddenly a uncontrolled fire starts, burning forest, or neighbors' land. Then, besides burning their forests, one can even go to jail...(...) If we are conscious that we have to change, we have to bring consciousness to others. If one is resistant to change, we have to understand his behavior, and try to communicate to him what we know.

Mr. Carvalho, São Francisco community, then the AGRAF Director.

The discussion presented in the speech above touches the very essence of the Freirian pedagogy that was the basis for the Fire Action: the peasants critically analyzing their situation, challenged by the complex situation, in a process of consciousness development. In this process of how to disseminate awareness inside the community, fire group members, mediated by dialogue, plan their next steps. Their solutions are different from the coercive government strategy; they have empathy with other peasants in their

reluctance to change their behavior (burning after the rain) because they 'have been there', i.e., before their present awareness they used to behave like that too. And they conclude that only through communication will they continue as partners, likely to develop a more critical understanding of their reality.

In 1998, 64% of the studied families in the Cupu community reported that they had waited for rain before burning their agricultural fields (n=28). Families stated that they never used to intentionally wait for the rain to burn. All of the families interviewed in this community credited the high number of families adopting this practice to the lack of information about IBAMA's laws and fear that IBAMA might engage in repressive action. None said they had changed because of their belief in it as a better practice. After the Fire Action started in 1999, the number of families saying they had waited to burn after rain increased to 74% (n=23). Among those saying they waited for the rain to burn, 41% said they planned to burn after the rain from then on. The remaining 59% said they had unintentionally burned their fields after the rain.

The overall higher number of families burning their agriculture fields after the rain in the São Francisco community, as well as the higher level of consciousness in adopting this practice, is probably due to the higher level of community organization for fire management in the community. This organization was reflected in local rules discussed in assemblies and in the implementation of fire groups, resulting in more appropriation of the Fire Action discourse.

Preventive Firebreaks

Question: People used to say that the forest itself was the firebreak. Did it really work as a barrier to fire?

Mr. Duarte: Yes, the forest used to be a real firebreak. Nowadays, if you do not make one, the forest will not prevent the fire from spreading because the fire will

burn it, there's no doubt about that. Putting it out will be a very difficult task because you kill the fire here, a small spark starts a fire again over there. No one alone can control a forest fire, it will take a lot of men.

Mr. Duarte, São Francisco do Itacaiúnas community, born in Tocantins state, living in the community since 1983.

There was a cultural belief, based on experience, that the forest itself was a natural firebreak, but peasants have found out that this is no longer true, as shown in the narrative above. This critical evaluation of their knowledge-weather had changed, and peasants' practices should then change too - was key for peasants changing their practices. The Fire Action's recommendation about preventive firebreaks (called locally *aceiro*) was clear, especially concerning agricultural fields, as discussed in Chapter 2. The Action stresses the fact that preventive firebreaks, i.e., firebreaks made before the burning day, were mandatory (despite not being official). Several possible definitions of "firebreak" were discussed during the meetings, from "border between the slashed vegetation and the contiguous ecosystems" to "clean and contiguous line on the ground surrounding the area to be burned." After a great deal of debating, the latter definition was always the final choice. Every head of family interviewed said they knew about firebreaks, usually made to protect material goods such as houses, silos, and fences, and also to protect other direct investments such as perennial crops, slashed fields to be burned later, and pasture fields not planned for burning.

Firebreaks made along fences in pasture fields were not new to peasants. They usually make firebreaks to protect what represents direct high investments to them. When a fence was located at the border between two properties, families would take on conjoint responsibility for making the firebreak, with each family responsible for the firebreak side of their land. All the families said they protected their fences from fires,

both before and after the Fire Action was implemented. Observations in the field found that the firebreaks protecting fences are normally between 1 and 2 meters wide. Peasants said that all families have always used this kind of preventive firebreaks in fences located along pasture fields, regardless of any recommendation proposed by any authority or NGO. Therefore, the present evaluation of the Fire Action was based mainly on the firebreaks used for implementation of agricultural fields.

The new aspect concerning firebreak practices in both communities was the use of firebreaks as a means to protect forests, as recommended by the Fire Action. In the two communities studied, preventive firebreaks located far away from the burning border and in the forest are usually familiar to the elderly in Northeastern states of Maranhão and Ceará. Although they had never used this kind of preventive firebreak in Pará before, they claimed that their families used it back in their home states when they were children. Figure 4-9 (above) shows a photograph of a typical borderline between the slashed vegetation and the remaining forest, where Brazilian laws require 6-meter wide firebreaks. Figure 4-9 (below) shows the Fire Action's representation of a firebreak located far away from the burning border.

The "far-away" firebreak proposed by the Fire Action is located inside the forest (8 to 15 meters away from and along the area to be burned). In this way, the standing trees work as a barrier, reducing the fire speed (wind barrier) and intensity of the fire (due to the colder and wetter microclimate), and the fire goes down, spreading on the ground. After a few meters a firebreak, which is only 1.5 to 2 meters wide, may hold back this ground fire that has become too weak to cross the firebreak. Even when a tree in flames falls, crossing the firebreak, this accident is easily verified and controlled because

peasants can walk through the firebreak faster and safer, and combat it while uncontrolled fire is still beginning. This technique was observed to be considerably more efficient and safer than a firebreak located by the burning border, as recommended by IBAMA.

Similar practices using firebreaks inside the forest were observed in another colonist community located in Paragominas, in the state of Pará (Mattos et al. 2002).

Brazilian law's minimal requirement for firebreaks is 3 meters wide, and twice this width when the burning field is adjacent to a forested area or a neighboring property. In the case of protecting forested areas, peasants claim that firebreaks proposed by the law have two main limitations. First, they own neither machinery nor the resources to rent any to make a firebreak this wide. In their communities, 6-meters-wide firebreaks are only comparable to their main roads, such as the one crossing the community. Second, firebreaks located near the border of the burning area are not very effective in preventing fires from escaping, for three main reasons: (a) the fire often crosses it anyway. Six meters is not enough to separate the standing forest and the burning vegetation, and the heat will dry the green leaves and thin branches, which is easily seen after a burning (brown leaves) along the forest line; (b) no one can observe the burning after it starts because it is too dangerous (heat, smoke, falling trees and branches); and (c) it is comparatively harder to control escaped fires through firebreaks located near the border of the burning area, since one cannot walk through it, and people and equipment transit from inside the forest is less effective (takes longer; is more dangerous).

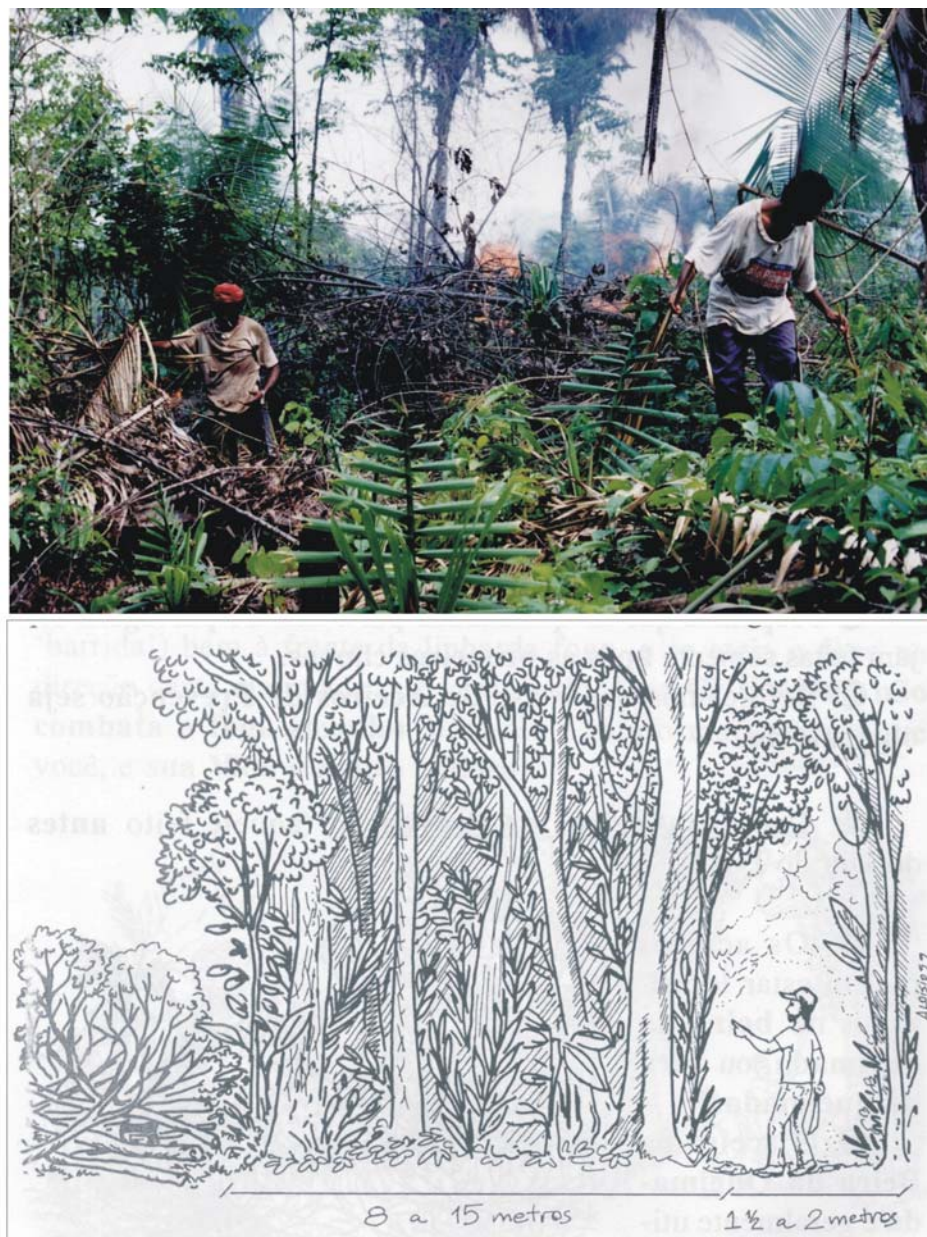


Figure 4-9. Firebreak bordering forests. The above figure shows a typical border between agricultural field and forested area, where fire law recommend a 6 m wide firebreak. The below figure shows the firebreak recommendation for forest near by the burning field, located away from the burning border, developed by peasants.

In 1998, all of the interviewed families in the São Francisco community reported having used some kind of firebreak for agriculture fields. Five families (12.5%) reported fire-related losses. These families had not worked with the Fire Group. In 1999, the one

family which did not use a firebreak was the family of a Fire Group member, and they had no losses. He said the firebreak was not necessary because it was "just a small field of slashed secondary forest" (0.9 ha); besides, "it had rained well and there were five people working on the burning day"—he burned in early October, and they were able to prevent uncontrolled fires. This adaptation of practices was seen in other situations, when Fire Group opted by not to use important practices due to their understanding that the other practices used for that specific condition would be effective in preventing an uncontrolled fire occurrence.

In 1998, 75% of the families interviewed in the Cupu community who had performed burnings in their agriculture fields (21 families) reported having used firebreaks. Only one of them incurred losses due to their fire. Of the 7 families that had not used firebreaks, one suffered fire-related losses from their burning. In 1999, fifteen families said that they had used firebreaks (65% of the families burning in that year), and one family reported losses. Of the eight families which had not used a firebreak, one reported losses. In the Cupu community, in which the Fire Action started in 1999, there is a slight decrease between the years in the percent of families that used firebreaks. This difference may, in part, result from a discrepancy regarding the firebreak concept. As we have discussed above, many peasants refer to a simple border between the slashed vegetation and the standing forest as a "firebreak," not considering whether or not the vegetation spread along this area has been removed. None of such firebreaks in the Cupu community in 1998 were made inside the forest (far-away firebreak); all were located by the burning border. On the other side, in 1998, more families may have used firebreaks due to fear of IBAMA's new rules. The high number of losses reported in this

community in 1998 (48% of the 27 families reported losses that year) indicated that firebreaks used were not efficient in preventing uncontrolled fires. In 1999, only two families reported fire-related losses, against fourteen in the year before.

The data above do not point to a positive correlation between the use of firebreaks and prevention of losses, nor to an increased rate of firebreak use from one year to the other. Despite discrepancies concerning their different types, firebreaks per se represent no guarantee against escaped fires. As will be presented in the section on Fire Strategies, different sets of practices applied in each situation determinate the success of a burning event (considering both cropping quality, and fire control).

On the burning day

The Fire Action booklet was composed of ten recommendations for the burning day, as described in Appendix C. The first four recommendations discussed the importance of the presence of the families responsible for the burning, of communication among neighbors, and an adequate number of people participating on the burning. The fifth recommendation concerned the use of backfires. The sixth and seventh recommendations covered water and fire control equipment. The eighth recommendation concerned the time to start a burning event. The ninth provided more details on avoiding the driest days, as well as windy periods. The last recommendation was about the importance of monitoring the burning. This study evaluated these practices by asking about the number of people participating in the burning, the use of backfires, and the time the burnings are started. In addition, control practices such as water and equipment, and monitoring of the burnings, were evaluated. Results for control practices are presented in the section After the Burning.

Number of People at the Burning Event

Using fire in groups was the main issue emphasized by the Fire Action, and it is reflected on the booklet title "Stronger Bonds, Fewer Losses." On the burning day, the Fire Action recommendation was that fields should not to be burned by one single person alone, but rather by a group formed by at least four people. Interviewees were asked to list the names of the persons participating during the burning. The following evaluation focused on number of people during burnings of agricultural fields in 1998 and 1999.

The results showed clear changes in the pattern of "number of people present on the burning day". In the São Francisco community, where the Fire Action started in 1998, none of the interviewed family members conducted burning events only on their own. In this community, the average number of people present at the burnings was 6.0 (SD=4.01; n=36) in 1998, and 8.3 (SD=4.90; n=33) in 1999. In the Cupu community, where the Fire Action started in 1999, the average number of people present at the burnings was 3.3 (SD=1.56; n=26) in 1998, and 4.5 (SD=2.75; n=24) in 1999. The maximum number of people present also increased in 1999: up to 20 from 14 in 1998 (São Francisco do Itacaiúnas), and up to 15 from 7 in 1998 (Cupu).

In order to obtain a clear understanding of the changes in the number of people attending the burnings, while simultaneously allowing a comparison between inter-annual and inter-community patterns, a ratio was calculated dividing the number of people present at the burning by the area burned (people/ha). Figure 4-10 shows how this ratio was distributed against the percentage of families interviewed, in (A) São Francisco do Itacaiúnas community and (B) Cupu community.

Comparing the two communities regarding the Number of People by Area Burned ratio (people/ha), São Francisco do Itacaiúnas presented a wider distribution, while Cupu

presented a higher concentration of lower ratios. One other common pattern found between the two communities was the displacement of Frequency of Families from the lower to the higher ratios between 1998 and 1999, which points to an increasingly higher number of people attending the burnings from one year to the next.

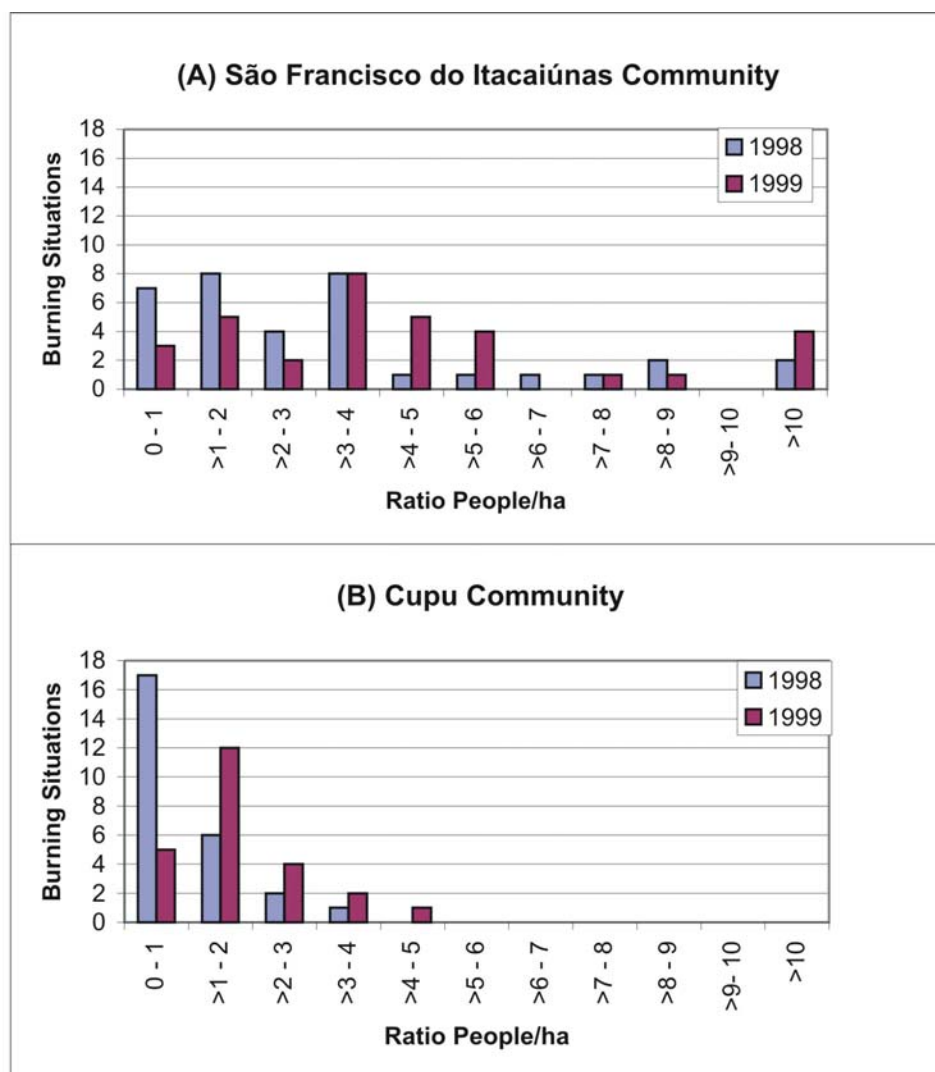


Figure 4-10. Distribution of ratio of people to size of area burned, for percentage of families interviewed, in (A) São Francisco do Itacaiúnas (n=35 in 1998; n=33 in 1999), and (B) Cupu (n= 26 in 1998; n=24 in 1999). The ratio was calculated by dividing the Number of People present at the burning by the Area Burned.

In São Francisco do Itacaiúnas, the ratio was higher than 2 people/ha in 20 burning events (57%) in 1998. In 1999, this ratio was found in 25 burning situations (76%). The ratio above 4 people/ha rose from 8 burning situations (23%) to 15 burning situations (46%). Comparatively, in the Cupu community, only three burning situations (12%) reached a people/ha ratio above 2 in 1998; this ratio was found in 7 burning situations (29%) in 1999. The ratio above 4 people/ha only was found in one burning situation in 1999. In the Cupu community, the ratio was one or less person/ha in 17 burning situations (65%) in 1998, and in 5 burning situations (21%) in 1999. In 1999, burnings were concentrated at around 1.1 to 2.0 persons/ha, with a frequency of 12 burnings (50%).

The Cupu community's low patterns regarding people/ha in 1998, together with the changes to a higher number of people/ha point to the positive impacts of the Fire Action in this community. Many families in São Francisco do Itacaiúnas reported that they used to conduct burnings in their fields by themselves before the Fire Action, as this study observed in the Cupu community in 1998. This shift toward a higher number of people attending the burnings is directly connected with the lower number of losses caused by fire, as we discussed in the section Losses Caused by Fire.

Time to Start Burnings

This study founded that the time to start a burning is a complex topic for peasants, who discuss a series of factors that influence the time chosen for burnings. The FATA/LASAT booklet provides specific recommendations regarding the time to start a fire: after 3 p.m. in agricultural fields, and after 4 p.m. in pasture fields. Many variations on this practice were observed. During the Fire Action meetings, technicians presented the official recommendations for burnings events, both at the beginning and at the end of

the day. However, the vegetation is generally cold in the early morning, and the wind is too light. At the end of the day, wind is normally light too. Peasants claimed that this factor results in bad burnings because fire does not spread easily. Slow fires represent a problem because they burn the soil for too long, which peasants say is not good for agriculture. In fact, one study of the effects of swidden fires on soil temperature showed that heating the ground to 200°C increases soil nutrient availability, but temperatures above 400°C lead to a complete destruction of organic matter, to the fusion of clay particles into sand-sized aggregates, and to a reduction in the cation exchange capacity (Sertsu and Sanchez 1976). Peasants argued that the best time to burn depends on where the agricultural field is located: wind is faster during a burning on a hill or highland plot, compared to fires in lowland plots. Furthermore, plot size also has its influence: the bigger the plot, the faster the winds. The type of vegetation to be burned plays a role, too: winds are faster in slashed primary forests than in secondary forests. The number of days elapsed after the last rain is also a factor to consider when defining the time to start a fire, since it influences the humidity of slashed materials. For pasture management, peasants do not want the fire to spread slowly, because slow fires kill the grasses.

Figure 11 shows the distribution of times in which fires were started in agricultural fields in 1998 and 1999, by families in the two communities studied. For both communities, a common pattern of later burning times was observed in the two years studied. In 1998, in the São Francisco community, the burnings were concentrated mainly at 1 pm (41% of the families) and at 2:00 p.m. (37%) (n=32). Nineteen percent of the families burned their fields at 3:00 p.m., and 3% at 4:00 p.m. In that year, the Fire

Group worked mainly helping each other and those asking for support, which may explain the minority of families burning after 2:00 p.m. (22%).

In 1999, after an assembly meeting held in the community voted to maintain eight Fire Groups (instead of only one) and reinforced community rules for burnings after 3 p.m. only, the result on this practice became more effective.

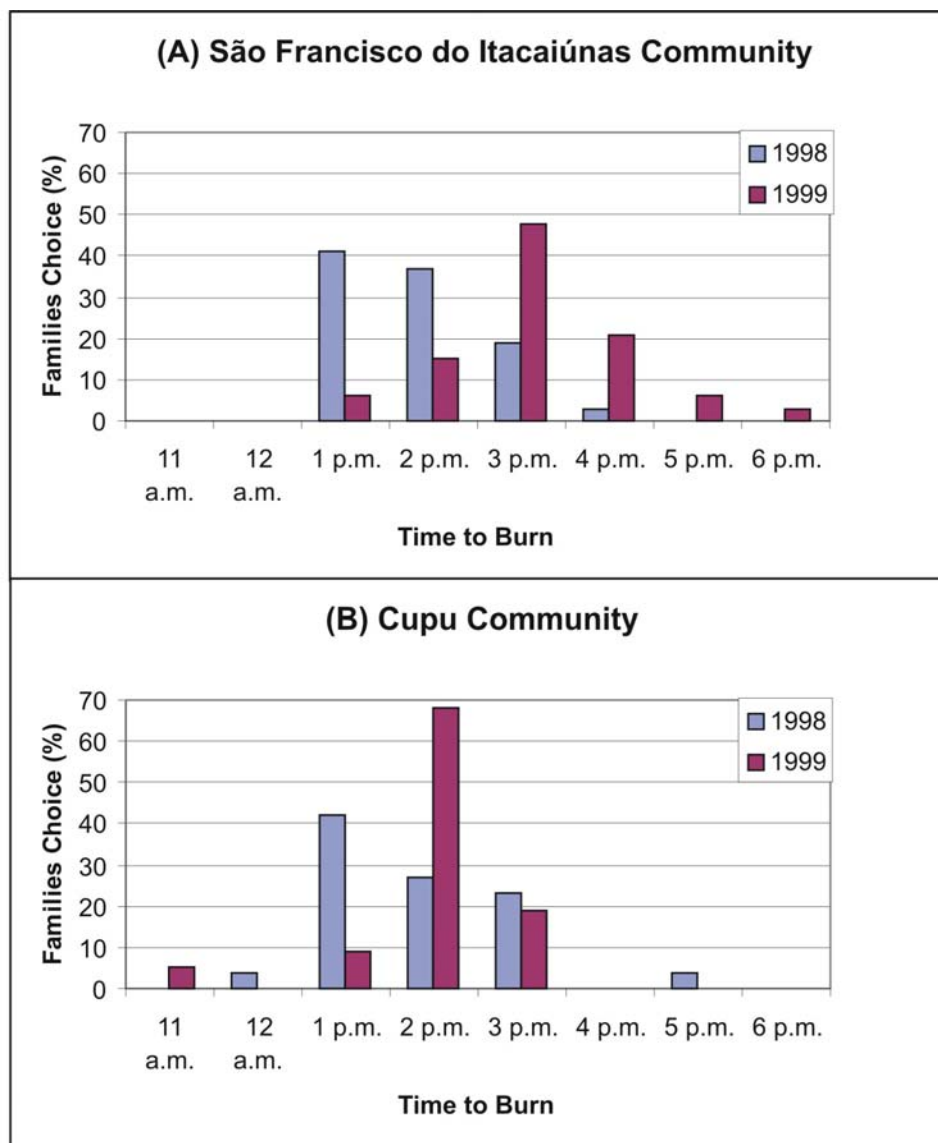


Figure 4-11. Distribution of studied families' 1998 and 1999 choices of burning time for their agricultural fields, for A) São Francisco do Itacaiúnas community and B) Cupu community.

After Fire Groups were distributed by region and a defined rule for later burnings was defined in assembly, 78% of the families studied in this community followed this recommendation. Only 6% of the burnings started at 1 p.m., followed by 15% starting at 2 p.m., 48% at 3 p.m., 21% at 4 p.m., 6% at 5 p.m., and 3% at 6 p.m. (n=34). The three ground-breaking individuals who burned after 4:00 p.m. were Fire Group members: Mr. Valdinei Cruz, (major Fire Group coordinator and director of local association AGRAF) burned at 6 p.m. Cruz burned a 1 ha. of uphill agricultural field from the primary forest, and he said his field burned well. Mr. Dionisio burned late (5 p.m.) because he had helped with two other burnings earlier that day. He complained that his field did not burn well because it was flat land and he had waited for the rain. If this happens again in the future, he plans to burn earlier in the day. Mr. Raimundo burned a 1.5 ha, one-year fallow secondary forest (palhada) at 5:00 p.m. and his field burned well.

In the Cupu community, due to the absence of a local community association, no assembly was held in 1999 to set the community rules for fire management. The Catholic church's local leader seem to be the main coordinator of the Fire Action, by reading the Fire Action booklet and discussing fire management during weekly meetings at the Church. Others organized among families and neighbors. Some peasants explained that many burned their fields late in 1998 because they had heard about changes introduced by IBAMA and were waiting for guidance on fire use. But once the dry season was nearly over and no guidance had been provided, they burned later in the dry season and later in the day, fearing repression from IBAMA. They explained that the usual burning time was somewhere around noon, when winds are stronger. In 1998 (n=26) and prior to the Fire Action, 46% of the studied families concentrated their burnings between noon

and 1 p.m., 27% of the families burned at 2:00 p.m. and 23% of families burned their fields at 3:00 p.m. A single family (4%) burning at 5 p.m. reported they had burned late for fear of IBAMA, but not because they believed it was a good practice. In 1999 (n=22), when the Fire Action had been implemented but not the Fire Group, burnings were concentrated at 2:00 p.m. in 68% of the cases. One family burned at 11 p.m. in September, therefore before the rains came. They said it was the first time they were burning so early in the day, and that they had liked it because it caused no losses to anyone involved and, in addition, the field had burned well. Two of the families burned at 1 p.m. (9%) and 19% burned at 3 p.m.

Whereas traditionally peasants had burned their fields at midday when the sun was hottest and the wind the strongest, results of the interviews in 1998 and 1999 showed people in both communities tending to burn later in the day, some approximately an hour later than before and others in the late afternoon, which was previously unheard of. This change in practice was partly due to fear of discovery by IBAMA, and partly through the recommendations of the Fire Action.

Use of Backfire

Backfires, locally called contra-fogo, are a practice that can be used in preventing and controlling fires. Its use as a control technique will be discussed in After Burning section. This practice when used for prevention consists in starting the burning at the border in opposition to the main wind direction. For example, if the main wind direction is from east to west, the burning should be started on the west side. After the fire has spread slowly some meters against the wind, the main fire (pro wind) is lighted too. It is not desirable that fire should spread against the wind for a long distance because, as explained before, slow fires stay too long in the soil, harming the soil and consequently

the agricultural production. Since fires have to be started in different positions, at least two persons are needed, one starting the backfire and the other starting the main fire.

This backfire works, at the end, as a firebreak, eliminating fuel near the border where the main fire comes stronger, as peasants say, *na batida do fogo*, or the side where main fire "hits."

Peasants in the two studied communities were used to using preventive backfires when some border of the field to be burned was located by something that they wanted to protect from fires, such as houses, barns, perennial crops, or pasture fields. In general, preventive firebreaks were not used to protect forests. The Fire Action recommended that preventive firebreaks would be required for any burning (agriculture or pasture).

Peasants argued that backfires' width (i.e. how long the fire has to go against the wind before starting the main fire) varies in accordance with the level of danger of each situation. Backfire width, therefore, varies according to the vegetal material to be burned. For example, slashed primary forest needs wider backfires than a young secondary forest. The kind of surrounding ecosystem is also important: if the adjacent ecosystem is very flammable or valuable, backfires need to be wider. The humidity of slashed material is also a factor: when burning after rain, or fields located in lowlands or close to rivers, backfires can be shorter. Peasants said they had learned about backfires in their homelands, from their parents, as explained by Mr. Fontes, born in Maranhão state, Northeast Brazil. As shown by the Mr. Fontes' speech below, firebreaks were known by him. The newness was applying it in Pará state:

Question (Q.): Where had you seen or learned it [fire management]?

Mr. Fontes (Mr. F.): There where I grown up; there it [fire management] was like that. My father was poor as I am too, and every of his agricultural fields was surrounded by firebreaks.

Q.: Where did it happen?

Mr. F.: In Maranhão. Every agricultural field was surrounded by firebreaks (...). On the burning day, he would start the burning in the firebreak located by the border with the forest: the firebreak. Then when the main fire [pro-wind] was coming from there, before it could reach this side, the firebreak had burned this side. They [firebreak and main fire] would reach each other far from the border. Thus, this I learned when I was a boy, working with my father.

Mr. Fontes, São Francisco do Itacaiúnas community, born in Maranhão state, living in the community since 1983.

In the São Francisco community, in 1998, 79% (n=34) of the families studied used backfires. All the eight families that did not use backfires were not involved with the Fire Group, living far from the village. Among them, one had losses caused by his fire, and half of them used backfires in the following year. In 1999, the number of families that used backfires increased to 88% (n=34). Of the four families that did not use firebreaks, one had losses caused by their own fire. This family did not invite neighbors, and only two persons burned the field. Those examples of losses due to not following community rules were used by Fire Group members to convince others to participate in the community fire management, as discussed on section of Peasants' Evaluation. In the Cupu community, in 1998, 82% (n=28) of the families interviewed said that they used firebreaks. In 1999, this percent dropped to 61% (n=23). As in the firebreak case, it seems that the high rate of families that reported they had used backfire in 1998 might be connected with their fear of the Fire Action's connection with IBAMA. After one year working building trust in the community, the rate reported might be closer to the families' reality. Another indication of not very efficient fire management in 1998 was the high rate of losses caused by fire in this community, as discussed before in 'Losses Caused by Fire' section.

After Burning

The Fire Action recommendation for fire management after the burning was to returning to the burned field to observe if any fire had escaped or had the potential to escape (like burning trunks, stumps, or palm). It was suggested to return at the end of the same day, and each of the three following days. The recommendation was to call for support (if needed), and to use control practices. Evaluation of this practice was related to questions about control of fires, since people were more likely to remember when an accidental fire happened, and control techniques used.

The main control techniques measured through interviews involved the use of water, access to equipment, and *varrida* or backfire for control. Families have many limitations on equipment for fire prevention and control, no safety protection at all, and no external support on fire fighting actions. Peasants usually control a fire with their agricultural tools (*terçado* or long knife, scythe and ax), backpack-sprayers, and buckets. The absence of external help was due to communities' distant location, bad quality of roads and bridges, no means of communication, and limited firefighter actions. In these conditions, the Fire Action stressed, in its booklet and meetings, controlling fire when it is beginning, since small fires control is more feasible and less dangerous.

Regarding equipment, no family possessed any safety equipment for those who go to burnings. Nor did they have equipment to control fires, besides their agricultural tools. There were some backpack-sprayers used to spray chemicals on plants, which could be used with water (mainly on localized fire in trunks). Families involved with loans from the FNO (Federal loan) usually possess this equipment: 47% and 42% of the families in the São Francisco do Itacaiúnas and Cupu communities, respectively. A chainsaw is another very useful type of equipment to control fires, when quick actions are needed,

helping to make control firebreaks, and to cut burning trees and trunks. In the São Francisco, nine families (24%) reported having chainsaws, and in the Cupu community, 10 families (32%).

Families' first control technique used was control backfires, used in all controlling situations. A detailed description of this technique is presented in the section on Fire Strategies. Water is harder to use due to distance from water sources, lack of adequate containers and sources of transport. In the São Francisco community, seven families (29%) used water to control fires in 1998: two of them had losses caused by those fires, and five controlled fires efficiently (two of those five were from the Fire Group). In 1999, eleven families (32%) used water to control fires, and two of them had losses. In the Cupu community, four of the interviewed families (15%) used water to control fires in 1998, and all of them suffered losses because they were not able to control the fire. In 1999, only two families (9%) needed to use water and none of them suffered losses.

Mr. Duarte, from the São Francisco do Itacaiúnas community, described an experience trying to control a fire during the early dry season, and how fast fire spreads and gets strong and dangerous.

Mr. Duarte: Once we went to extinguish a fire at Jose's. They had started the fire in an agricultural field—we were around ten people—and the fire jumped to the pasture. It happened before the rain. The grass was high, very dry, and the fire grew fast; we beat on the fire with branches. And I ran to the other side, and the fire where I was had grown again. Using water, extinguishing, but our control did not work. We gave up because we were almost being burned. I lost my eyebrow; it burned due to the high heat. (...) But if the fire is small, it is easy to control.

Mr. Duarte, São Francisco do Itacaiúnas community.

Before the Fire Action, there was a general belief that nobody could control fire, that fire was uncontrollable. The awareness that the burner is also responsible for its consequences (that it was not "fire's fault") brought a new scenario for community

organization. Families were encouraged to help each other, especially if a Fire Group was created. Examples of success in controlling fire, or at least trying to, brought awareness of fire prevention and control and new behavior to families: those that became used to being more careful with fire use felt an incentive to do so, and those not used to caring about their fire consequences felt pressure to do so. For the latter, usually not involved with community organizations, the possibility of being charged by neighbors for losses caused by their fire, and even to be reported to IBAMA, were their main incentive. Those engaged in community organization linked responsible fire management with living in community: helping each other, and being careful not to cause losses to others.

Summary of Practices Evaluated

Table 4-2 summarizes some of the main practices discussed, and points out changes related to the FATA/LASAT Fire Action. Table 4-2 shows that seven of the practices used during fire management were familiar from use in peasants' productive system, for agriculture implementation as well as for pasture maintenance. Those practices were discussed during meetings, workshops, and Fire Action booklet. The first column categorizes the practices before, during, and after burning. The second column presents the practices, the third explains how the practice was generally used before the Fire Action, then the fourth column summarizes changes in that practice after the Fire Action, and finally the last column discusses if the practice was known by peasants as a concept for fire management, or if it was an innovation.

In the phase "before the burning day," the practice "communication for fire use" was known as a concept, but mainly associated to kin and to neighbors (if they got along well). The Fire Action promoted communication and collective work for fire management, and its results were observed in a higher number of people during burnings.

In São Francisco do Itacaiúnas, the number of people during burnings was higher than in Cupu, probably due to earlier engagement to the Fire Action, organized Fire Groups, discussion of fire management in community assemblies, and definition of local rules. The second practice presented in the Table, 'use of preventive firebreak', prior to the Fire Action was used to protect material goods and direct investments mainly. After the Fire Action, forested areas were also protected by this practice, resulting in less forested areas burned. Another newness relating to this practice was the use of far-away firebreaks (located inside forests), known by some families but never applied in Pará state.

In the second burning phase (on the burning day), the practice "burning in groups" was promoted as the ground-line by the Fire Action, and supported by the STR (Rural Workers Union) in case of conflicts with IBAMA regarding fire use. Number of people during burnings, fire group's organization, and success in fire control were signs of better community organization for fire management. Peasants worked collectively for different activities, but the Fire Action's motivation, associated with the fear of IBAMA's repressive actions, encouraged people that were not used to working collectively to get involved with community fire management. The practices "burning after the rain, later in the dry season, on less windy times", were more sensitive than others. While collective work would imply changes in social behavior, and use of firebreaks in extra work, they do not affect directly the burning quality, as much as rain, and time affect it. Therefore, changes in those practices were observed, but their acceptance over the long term will depend on burning qualities obtained and consequent final crop production. If families experience bad production due to bad burning quality, they are less likely to incorporate those practices in their management.

Table 4-2. Main practices evaluated, and possible changes due in part to the FATA/LASAT Fire Action, in the two studied communities in Marabá region, Brazilian Amazonia.

	PRACTICE	Before FATA/LASAT Fire Action	Changes After Fire Action	Known as a Concept for Fire Management?
B E F O R E	Communication for Fire Use	✓ General discussion over fire use and weather forecasting among kin and neighbors.	✓ Majority of families communicating fire plans; ✓ Common invitation to neighbors and/or Fire Group.	✓ In part. Kin and close friends used to communicate in special situations, such as protecting houses or other goods.
	Use of Preventive Firebreak	✓ Used to protect material goods and direct investments (such as houses, silos, fences, perennial crops, and pasture with animals)	✓ Used always, to protect material goods, direct investments and forested areas; ✓ Increased discussion on kinds and effectiveness of firebreaks; innovative firebreak for forest protection.	✓ In part. The newness was using it to protect forest, and forest firebreak located far from the border of the burning; this kind of firebreak was known by some families but never applied in Pará.
B U R N I N G	Burning in Groups (<i>Mutirão do Fogo</i>)	✓ Burnings organized among kin mainly; ✓ Commonly one single person burning fields.	✓ Increased number of people in the burnings; ✓ In the São Francisco community, peasants organized Fire Groups, made clear rules for burnings, and encouraged family and neighbors to burn together.	✓ In part. There was kinship collective work for especific situations; the newness was always organizing groups (kinship and neighbors), and STR support to burners organized in groups.
	Burning After the Rain, later in dry season, on less windy times	✓ Better if burning is done before rain, at the beginning of dry season, close to noon, in order to maximize burning quality (for better crop production per area).	✓ Waiting for the rain to humidify surrounding ecosystems and land use (exception for crops in wet lowlands and on one year old fallow, or <i>palhada</i>); ✓ Burning after 2 or 3 p.m.	✓ In part. Before the Action, the main goal was to burn before the rain; burning after the rain only in unplanned situations. The newness was planning to wait for the rain before burning.
	Use of Preventive Backfires (<i>Contra-fogo</i>)	✓ Used for control, to protect material goods and direct investments.	✓ Used for prevention, at the beginning of a burning;	✓ In part. The newness was using it for prevention.
D A Y	Use of Control Backfires (<i>Varrida</i>)	✓ Used for control, to protect material goods and direct investments.	✓ Used as before, but also to protect forested areas.	✓ In part. The novelty was using it to protect forested areas, and with more people and more often than before.
	Observing the Burning during and after Main Fire	✓ Usually neither continued to observe the fire until main slashed vegetation burned, nor returned during the following days to observe possible escaped fires.	✓ At least burning owner continues to observe until main fire finishes; owner returns late on the same day and following days.	✓ No, it was an innovation. Nobody claimed to observe fires before.

The "use of preventive backfire" also affects crop production, but on a limited strip of the burned field that is burned against the wind. Before the Fire Action, it was used to mainly for control, aiming to protect material goods and direct investments. The newness was using backfires for prevention, and to protect forested areas. The practice "use of control backfire" remained very similar to before the Fire Action, but it began to be used for forest protection too, besides goods and direct investments. "Observing the burning during and after the main fire" was the only practice that all families studied said that they did not practice before the Fire Action. Before, escaped fires were detected only after they had caused damage, and their conditions were difficult to control. Observation improved initial escaped fire detection, and efficiency in its control.

Fire Strategies

So far, practices for fire management had been analyzed. Although practices used are key for fire management, peasant adaptive variations on practices used seemed to be determinant for successful fire prevention and control. Peasants' use of practices varied according to each situation, after analysis, and discussion among participants, always balancing burning quality and prevention of uncontrolled fires—a process which here is called "fire strategy." This discussion is, primarily, based on participant observation of burning events, a method that allowed the researcher to witness all the practices used and adapted in practice.

During October of 2000, six burning situations and two control actions were observed. The peasants' strategies for fire management were monitored during the 2000 dry season. As explained before, it was planned to monitor the two communities but, due to rain frequency and limited time in the field, only the São Francisco community was visited. Monitoring burnings implied observing the fire group's planning, and doing the

burning, at same time recording, taking pictures and notes. The researcher's previous experience monitoring burnings helped in following the peasants' velocity, trying not to delay or perturb their practices. Peasants' comments about how fast the researcher operated indicated minimal impacts of researcher presence. The results presented in this section are based on this monitoring but also on some described burning situations, where observations were done at posteriori, and on interviews.

Each burning situation was analyzed, varying as a function of physical characteristics: field size, dryness, kind of slashed vegetation, relief, weather, availability of labor and equipment, access to water, surrounding ecosystems, distance from houses, and others. In addition, cultural values were considered, such as: choices on burning quality, previous experience, social relation with neighbors, cultural variations for practices used (such as kind of firebreaks), and level of family awareness. The final decision on strategy chosen was taken by the fire responsible (or fire 'owner'). Preventive firebreak was also the duty of the owner.

In order to present more information on fire strategies, this section presents three examples of fire management. The first situation describes a planned burning, with Fire Group coordination (monitored), the second without the Fire Group planning it (from interviews), and the third a fire control situation (monitored).

In the first situation (Figure 4-12), a good example, two neighbors planned to burn together, Mr. Machado, one of the Fire Group coordinators, and Mr. Fontes. The Figure 4-12A (upper figure) represents the burning situation when it was starting. From Machado's side, the field was composed of slashed secondary forest, surrounded by secondary forest on two sides, pasture another, and his neighbor's land on the other. He

decided firebreaks were not needed, because the slashed vegetation was secondary forest, it had rained, and the main wind power was in the opposite direction. From the Fontes' side, they prepared two far-away firebreaks in the primary forest, around 10 meters from the field border, around 1 m width. One firebreak was made by the field border and the secondary forest, with around 2 m width. They invited two other neighbors to help, plus a member of Mr. Fontes' family, putting together five men. They prepared some containers with water. They divided the group in three: two from the Fontes' side, and three from Machado's side. They started burning at 2 p.m., from the opposite side from the main wind direction (preventive backfire), two men taking different directions. When the other three saw the smoke, they started the fire from the two extremes of the field, starting a flame each 1 to 2 meters, until they reached the other fire. They explained that the fire has to go together, as a big flame, so it can spread faster, burning better. After all the borders were in flames, three stayed observing from the Machado's side, and two walking through the far-away firebreaks (Figure 4-12B). While starting the burning, and observing the main fire, peasants keep yelling. They explained that yelling was their custom for calling the wind. I stayed observing by the border between the field and pasture until the main fire was set, and walked through the far-away firebreaks. Around 4 p.m., they dispersed. Mr. Fontes returned with a family member one hour later, and detected the beginning of an accidental fire. The two prepared backfires, and were able to control the fire. They returned to observe the following day, but no more accidental fire happened. They believe that waiting for the rain was key for controlling the accidental fire. The far-away firebreak also prevented accidental fires in one place.

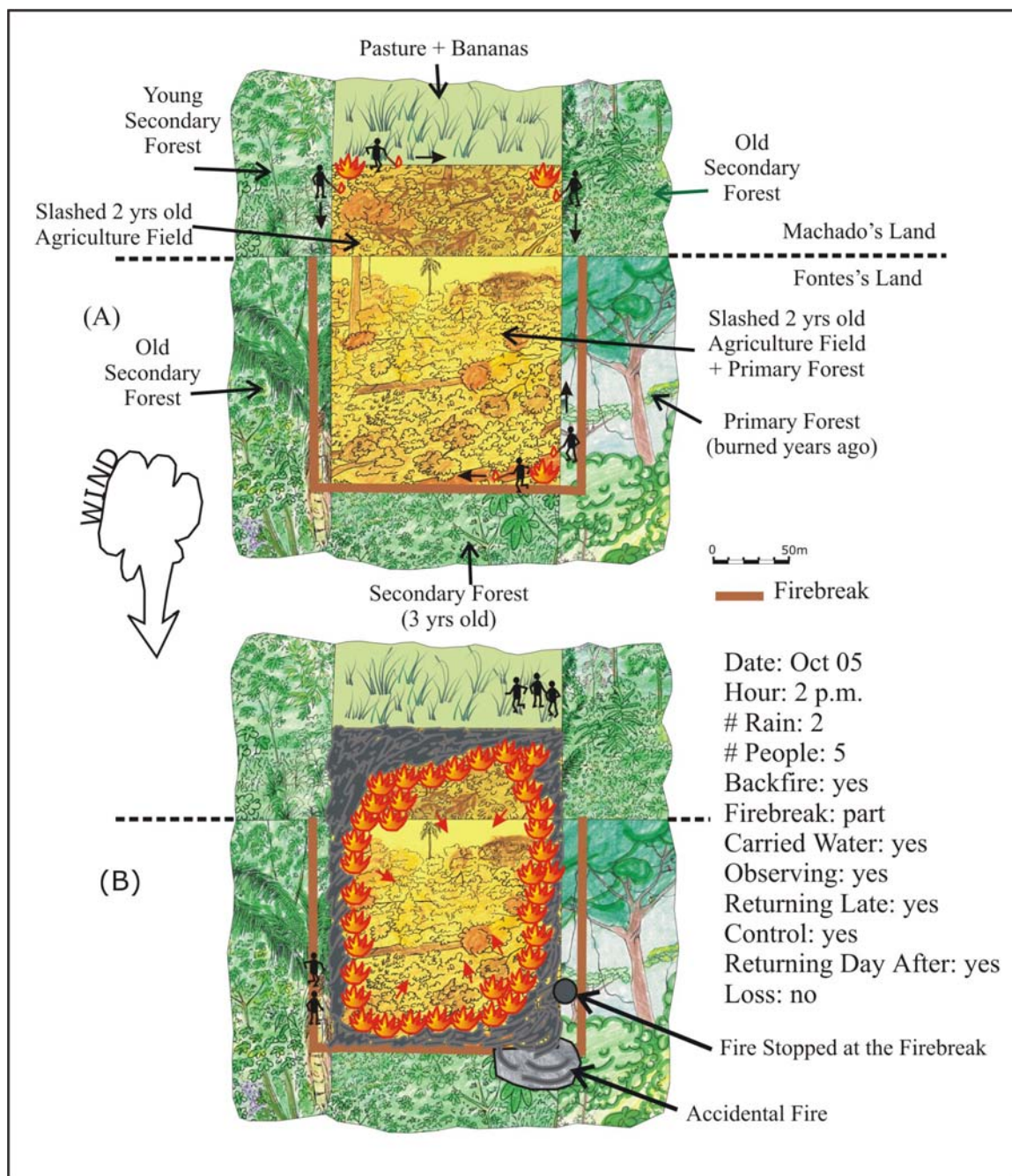


Figure 4-12. Conjoint burning situation of two neighbors, Mr. Machado regional Fire Group's coordinator, and Mr. Fontes. Although an accidental fire started, they were able to control it, and the burning was successful (Drawing by author).

The second example was Onorio's family, one of the two who suffered losses in 1999, and was cited as a bad example for the Fire Group, and a lesson for families about how planning and collective work is needed for fire management. He was the first to

burn in 1999, in September 5th, together with his neighbor Mr. Leao. Mr. Leao lives in the city, and hired a landless family to take care of his lands. The two neighbors agreed to burn together, and invited a third neighbor, but did not invite the Fire Group.

Although not living in the community, Mr. Leao oriented his employee, Mrs. Joao, to follow community rules for fire management. Both fields were composed of slashed secondary forest. Four people started the burning, after a small rain only, because part of the slashed vegetation was located on lowland. They started the burning at 2 p.m. The area to burn was relatively big, 3.5 ha of Onorio's, contiguous to 4.5 ha of Mr. Leao. They did not use preventive backfire, starting with the main wind power, and the fire escaped to another neighbor's land, burning banana trees, and a slashed secondary forest not ready to burn. Mr. Onorio used control backfire, but the fire spread too fast, getting out of control. When fire started to get uncontrolled, someone called the Fire Group, and at the end a total of 15 people helped to combat the fire, using control backfires, water, branches, and a chainsaw. Although they tried to control the fire, it burned Onorio's house, barn, and some fruit trees located by the house. This burning was used by Fire Group members as a bad example to alert other peasants about better planning for fire management.

The third example referred to a fire control situation. A Fire Group member, Mr. Ambrosio and his neighbor, Mr. Celestino were crossing Mr. Celestino's land to talk with another neighbor, when they saw an uncontrolled fire spreading in his pasture, in the direction of his slashed secondary forest, not ready to burn yet. Using their scythes, in 30 minutes they prepared a control firebreak (varrida), and set a backfire. They stayed 30 minutes monitoring, but no more fire spread (Figure 4-13).



Figure 4-13. Example of a successful use of control firebreak. The above left picture shows the accidental fire coming from left to right, in direction to a slashed field not ready to burn, and the two peasants making a firebreak. The middle left picture shows the peasant 'brooming' the firebreak with branches, in order to take off any fuel from the firebreak. The below left picture and the above left show the peasants starting the backfire. The below right shows how the fire stopped at the firebreak, marking the success of the control technique.

Observing burnings was a very rich experience. There are things that cannot be detected by interviews, and experiencing their reality is key for technicians that want to be partners with peasants, so peasants' rationality can become clearer to them. The burning process requires a series of judgments and choices depending on the biophysical

and social conditions of the moment, personnel involved and the burning process itself. Experiencing it from the peasant's point of view would help technical people to appreciate their knowledge, experience, and ability to adapt and innovate in fire management.

Besides rationality, there are customs, folklore, yelling "to call" the wind, or moon phases, numerology, among others, that should be respected. Soares, an anthropologist who worked with Nambiquara indigenous in Central Brazil (Mato Grosso) found the recorded colonists 'calling the wind' to be very similar to the way indigenous people yell during burnings, also to call the wind (Neila Soares 2002, personal communication).

Peasants' Evaluation of Government and Community Fire programs

IT IS *FOGO* (means "fire" but also "awful" or "out of control")

Poetry written by Mr. Adaildo during one of the FATA/LASAT Fire Action workshops, in December 1998.

If the citizens do not participate in decisions, it is *fogo*.

When the poor live under oppression, it is *fogo*.

To live together in a community nowadays is *fogo*.

If it is hard to achieve a more dignified life, that is also *fogo*.

Bank credit for planting often never comes, and when it does come, the timing is wrong. That is *fogo*.

The negligence of those that govern in terms of health care, education and community infrastructure, this is *fogo*.

When over and over again peasants work to produce but cannot sell their crops because the roads are poor, it is also *fogo*.

When IBAMA applies the law only to peasants, and only they are punished, it is *fogo*.

To be an active participant in popular movements, that is SO *fogo*.

If burnings are disorganized and uncontrolled and lead to losses, it is *fogo*.

When the workshop is for discussing fire, yet other things are discussed instead, that is *fogo*.

If politicians lie, mislead, and cheat those with less information, this is really *fogo*.

When experts do not deal with the practical and instead focus on theory, oh how this is *fogo*.

When a burning is started and it gets out of control, we have to find a way to extinguish this fire, and it will need lots of water or a huge extinguisher, but it can also be extinguished with a little bit of love, or who knows, perhaps when the poor are valued.

The poetry above summarized many of the peasants' evaluations reported in this research. It was written by a peasant during a Fire Action seminar, and read out loud for all. This poetry is another example of peasants' creativity, when their voice can be heard. This section aims to present the peasants' main evaluations of the government and FATA/LASAT actions.

Government enforcement of fire control was generally seen as a positive thing, because of the losses peasants had suffered in the past from accidental fires, whose perpetrators had not previously been blamed because it was considered to be the "fire's fault." The study found peasants to be motivated to change their fire management practices due to fear of IBAMA sanctions, a negative incentive that clearly affected behavior. The disagreement with the government was the way actions had been taken, especially: government periodical prohibitions on fire use, difficulties in getting a fire permit, recommendations out of touch with peasants' realities (firebreaks, time to burn), the fee charged to deforest and burn, the absence of adequate equipment and support for peasants, the absence of government representatives in the communities, the big emphasis on enforcement, and so little meaningful education.

Those government actions end up causing disgust, like in the Cupu community, in 2000, when a peasant said "Because of my labor nobody takes me into jail! I already have more than 50% deforested, and I make my living from agriculture. Who will give me food? It is the agriculture!" (Mr. Gomes 2000). In addition, some peasants distrust the government's real intentions, seeing laws as class discrimination: "those governmental fire laws are only for peasants; larger farmers start their fires and say it was accidental. Who really follows the law are the peasants, because they are afraid of punishments" (Mr. Reis 2000). This mistrust is promoted by the behavior of IBAMA's representatives, rarely present to dialogue, and to clarify doubts. Helicopters flying away are the closer presence, from which people hide fearing repression.

Fire is a sensitive topic since it directly affects families' production, and work against fire use ultimately would mean work against peasants. Peasants were more positive about the Fire Action with the FATA, LASAT and STRs, grass-roots organizations that have historical relations of trust with peasants in the region. Families saw the meetings at the community level to be essential, in order to directly confront the technician with things, helping to build trust about the Fire Action and leaders' intentions. As a peasant at the Cupu community expressed it, when asked about the difference between technicians' presence in the communities, and messages disseminated through the radio: "For sure meetings are better than radio; in a meeting, messages are clear, challenging, stronger. I respect you. I do not respect my radio, if it says what I do not want to hear, I turn it off." (Mr. Ribeiro 1999) Another pertinent issue was receiving a salary for working with fire management. Many thought that leaders were receiving payment for working 'against' them, and convincing them that it was not true was an

awareness raising process. The interest was not in finding a job with the government, but controlling fire use in order to prevent losses caused by uncontrolled fires.

Regrets about the Fire Action were expressed by some families whose burning field did not burn well due to rains. In addition, many said that they wished the Action had started ten years ago, so their forested areas would be in much better shape. Good consequences listed were that more people working together made it easier to control fire (higher efficiency and safety), and to protect forests, with less losses to all.

Discussion

The Fire Action introduced important changes in Marabá colonist peasants' strategies on fire management. Still, the number of families that suffered losses decreased considerably in both communities after the Fire Action. These data suggest that the Fire Action was a positive influence on fire management, although longer time studies are necessary to capture families' lasting appropriation of Fire Action recommendations and approach.

The main practices developed with the Fire Action and adopted by the families were community organization for burning, a higher number of people working together to prevent and control fires, waiting for the rain before burning, and timing to burn. Data showed that those practices were key for prevention and control, and improved from one year to the next, within both communities. Other key practices adapted and used were firebreaks, backfires, observing the burning, returning to the burning after the main fire was over, and control techniques. Beyond these isolated practices, peasants showed themselves to be capable of implementing complex fire management strategies that were adapted to the particulars of each situation.

Many families reported that before the Fire Action, burnings usually took place in August and around 12 o'clock noon. The weather then is usually hot and windy, and by burning during that period, families maximized their production and ignored any recommendations aimed at the prevention of uncontrolled fires. After the Fire Action, they were more likely to burn in September or October, after the rain, and somewhat later in the day when the wind might be lower. Precautions were aimed at preventing uncontrolled fires to protect forests, as well as agricultural fields and pastures. Many families wished the Action had started ten years ago, so their forested areas would be in much better shape.

The practices, in general, were known by peasants, but used in different ways. The Fire Action's big achievement was to give confidence to peasants for them to organize and adapt their known practices, and discuss among them ways to improve fire management in the community. By doing this, peasants that were progressively involved in the Fire Action become part of the action too. This methodology supported peasants to appropriate the Action, and empowered local organizations.

Data revealed a generally higher level of consciousness favoring change in practices of fire management in the São Francisco community. This was reflected in local rules discussed in assemblies, fire groups implementation, and appropriation of the Fire Action discourse when referring to local leaders as the main coordinators of the Action. Due to the higher level of community organization for fire management observed in São Francisco do Itacaiúnas community (Fire Groups, local rules), it is more likely that the fire management strategies adopted by families will persist.

Local leaders played a key role in the Fire Action in both communities. In the São Francisco do Itacaiúnas, Mr. Valdir Silva, a Fire Group member, was one of the key community members present in all FATA's workshops, and was also the community association's director. He was one of the most cited among interviewees' families as a reference for information on community fire management. He had been a representative at the STR (Rural Worker Union), one of the local association founders, and had a history of commitment, struggling for community well-being (such as schools, teachers' wage, roads, electric power, health). In Cupu, Mr. Soares, also had a history of commitment to the community, was the church coordinator, and was a key peasant leading the Fire Action in the community.

Fire management was connected with individual family strategies of natural resources management. What and how to produce takes place inside the family context of individual choice. One should not go to a family's house and tell them how they should work. It is offensive to family dignity, insinuating that they are not smart enough to do their job. At this point, however, government laws helped the community unite for a common goal: to burn their field without causing losses to others. IBAMA's coercive laws were sometimes used as a threat to convince those who usually did not participate in community work. Local associations (São Francisco community), FATA and STRs would only support peasants against IBAMA penalties if the family were organized in their communities, burning according to community rules. At the beginning, their fear promoted a higher degree of community organization, involving all the community. The positive results of community fire management encouraged families to continue and to improve their fire strategies.

In order for the government to be seen as a partner, some barriers constructed throughout peasants' history should be broken down. As discussed throughout this study, peasants complained at different times about government absence in peasant communities: "we are forgotten here", said a peasant. Colonists, through their labor, have made their land reform, built their houses, cropped their lands, built roads, schools, churches, soccer fields and formal associations, and faced health difficulties. Without changing this image of neglect, the same government implemented top-down actions to control and prohibit fire use, and charged fees for burning. This evaluation showed that colonist families are ready to change their fire practices, if supported by trusted organizations, through an approach that respects and promotes their local knowledge.

CHAPTER 5 CONCLUSIONS

This study discussed fire use by colonist peasants in the Marabá region, Pará state, Brazilian Amazonia. It aimed to answer three main questions: 1) Why aren't government fire actions and laws more effective in diminishing uncontrolled fires? 2) Do colonist peasants have and use empirical knowledge to manage fire? and 3) Is a participatory approach to fire management effective in diminishing fire losses? Those questions were developed by analyzing government fire laws and narratives, discussing a participatory fire action coordinated by grass-roots institutions, and evaluating impacts of this action in two colonist peasants communities.

This Chapter presents this study's main conclusions directly related to the above questions, discusses contributions and limitations of the study, and presents some suggestions for future fire actions in Amazonia.

Government Approach

The study found that the government's top-down approach to controlling fire use in Amazonia is not likely to succeed, and potentially might lead to peasants' revolt against government measures, weakening possibilities for partnerships. This is because:

- a) The government has a long history of neglect and mistrust with colonist peasants, especially at community level;
- b) Government educative programs, supported by the media, are based on anti-fire messages, in a unilateral approach ('banking' education) developed for peasants, but not with them, in general resulting on fire use recommendations not appropriate for

Amazonian peasants' conditions -- ecological (e.g., amount of forest biomass), economic (e.g., absence of adequate safety and combat equipment), and cultural (fire use not perceived as a crime); and

c) Government bureaucratic requirements for fire permits, recommendation of inappropriated practices, and periodical fire use prohibition, based on enforcement, exclude peasants from being able to burn in accordance with fire laws. Peasants therefore "became" transgressors by virtue of working on their productive systems, work which is a strong basis for cultural pride.

Colonist Empirical Knowledge

This study showed that colonist peasants in the Marabá region want better natural resource management in their lands. In their historical struggle for land and living conditions (individual and collective), they have always made decisions on their natural resources management, and assumed responsibility for those choices, supported by grass-roots institutions. Due to their previous experience as landless, and the struggle for their land and for social reproduction, in general colonist peasants have a high level of awareness of their current resources' depletion, as well as the implications for future generations.

At the community level, families suffer from fire-related losses caused by uncontrolled fires, and they want to manage fire better. Some peasants' perceptions that the weather is getting hotter, dry seasons getting stronger, and that the forest is not as wet as it was ten years ago, contribute to their consciousness for better fire use. Better fire management in the peasants' context means using fire only where it is necessary in their productive system, and preventing and controlling escaped fires.

Colonist peasants have valuable empirical knowledge for fire management, developed through its use as their main agricultural tool for crop production and pasture maintenance. They learned how to use fire in their homelands, and adapted their knowledge to their actual conditions. For peasants, fire management includes both assuring good burning quality and avoiding losses caused by uncontrolled fires. At the same time that fire is useful, originated by peasants, they are also susceptible to fire hazards. Therefore, peasants' empirical knowledge on fire management intrinsically associates fire for production, with prevention and control of escaped fires.

This study found that in peasant culture, God is often associated with Nature. Peasants believed that 'only God knows', but that humans possess their physical abilities and knowledge to manage nature, and they are expected to use their knowledge to manage natural resources. Fire acts mediate nature and culture, making it possible to transform nature into agriculture, to feed God's sons and daughters through their work. Colonist peasants' knowledge is expressed by their cultural understandings on weather foreseeing, where families interpret stars and observe animals' behavior; their beliefs for choosing the burning day, based on moon phases, numerology, and the daily weather conditions; and their ritual for calling the rain.

Colonists' knowledge is also present in their fire practices and strategies for prevention and combat of uncontrolled fires, as described in detail in Chapter 4. Adapted firebreaks when a burning field neighbors forest (firebreak located far away, inside the forest), burning after the rain, and use of control firebreaks, are some of their practices, that became more effective with community organization.

Participatory Approach

The community fire management action presented was coordinated by trusted grass-roots institutions (FATA, STR, LASAT, COOCAT, and local association) and an experienced technician, with regional (several communities) and local (community) meetings and burning monitoring. The emphasis was on learning-cycles at the regional level, and collective work and local agreement at the local level, and peasants got involved voluntarily. The number of families that suffered losses decreased considerably in both communities after the Fire Action. The Fire Action adopted the Freirian Pedagogy, based on a dialogic approach in which a technician was facilitator of the problem-posing situation of fire management. Peasants' empirical knowledge was codified through relating colonist productive steps as a function of the burning day (before, on the burning day, and after), and 'burning dynamic' exercises. In this approach, peasants were challenged to critically analyze their own situation, and to find their own solutions to identify problems, and set their local rules and strategies.

The Fire Action empowered colonist peasants to develop and implement their own rules and practices for fire management, tailored to their own culture and resources, and use these to support their actions in any potential conflict with IBAMA.

General Conclusions

Peasants' motivation for better fire management was mainly a combination of three factors: a) local willingness to avoid fire-related losses, b) influence of a participatory Fire Action coordinated by trusted leaders and institutions, and an experienced technician, and c) government coercive pressure for control fire use.

This thesis discussed that families' local willingness to avoid fire-related losses, associated with their need for fire in their productive systems, motivated families to

engage to the Fire Action, led by local trusted leaders who worked on a voluntary basis, supported by grass-roots institutions. The Fire Action encouraged and supported more active peasants to develop their own rules, empowering them. The success of fire management motivated more passive peasants to engage in the action too, taking active roles and appropriating the changes in fire management into their practices. The government pressure for fire use control and prohibition induced those families not used to engage in collective actions to get involved, since in cases of conflicts with IBAMA, the Fire Action institutions would support only families involved with the Action.

While the fear of IBAMA repressive actions provided a strong motivation for peasants to change their burning practices, there was little accessible and appropriate information or resources to support changes. People in both communities wanted to know what to do in order to use fire in the official way, and the lack of support generated strong critiques to government actions.

The Fire Action brought information and motivated peasants to seek more efficient fire management strategies, encouraging families to seek their own solutions, resulting in fewer losses caused by uncontrolled fire in the two communities evaluated.

Contributions of this Study

This study aimed to present the unique and precious history and set of values, beliefs, and practices of colonist families in Amazonia, by analyzing their voices, through incorporated narratives, and by showing that they do have a clear culture that deserves respect. In addition, they are the ones who ultimately take the final decision on natural resources management, and have to be actively involved in collaborative actions (implying decision-making power).

By evaluating families' forms of organization, communication, and compliance with fire management recommendations developed in the participatory Fire Action, this thesis also makes a unique contribution to our understanding of the impacts of fire management programs on colonist peasants' use of fire.

Despite the richness of unique information on colonist peasants' knowledge, and evaluation on fire management, this study is based on short-term evaluation, carried out in two communities only. There is no information on how dependent the Fire Action results were on external technical support, since no evaluation was done after the Fire Action was over. This study can formulate stronger conclusions if future monitoring on the communities impacted by the FATA/LASAT Fire Action is carried out. The Fire Action focused on the community level, and was not successful in developing partnership with government agencies, or policy makers, which limited the actions' impacts.

Future actions for community fire management should include other key social actors, such as environmental agencies, in order to reach regional changes on fire policies, contributing to more adapted and effective recommendations.

Technicians aiming to work with peasants should be prepared to communicate with them, in a dialogic approach, in order to combine together theory with practice, and technical with empirical knowledge.

APPENDIX A
GLOSSARY OF ACRONYMS

AGRAF	Associação Agro-Ambiental de Atividades de Agricultura Familiar da Vila São Francisco do Itacaiúnas (Agronomic-Environmental Association for Peasant Activities at the São Francisco do Itacaiúnas Village)
CEB	Comunidade Eclesial de Base (Christian Base Community)
CEMAN	Centro de Monitoramento Ambiental (Environmental Monitoring Center)
COOCAT	Cooperativa Camponesa do Araguaia Tocantins (Peasants Co-operative of Tocantins Araguaia)
CPT	Comissão pastoral da Terra (Land Pastoral Commission)
DFID	UK Department for International Development
EMATER	Empresa de Assistência Técnica e Extensão Rural (Agency for Technical Support and Rural Extension)
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária (The Brazilian Federal Agency for Agriculture and Livestock Research)
FNO	Fundo Nacional do Norte (National Fund for the North)
FATA	Fundação Agro-Ambiental do Tocantins Araguaia (Tocantins Araguaia Agrarian and Environment Foundation)
FETAGRI	Federação dos Trabalhadores na Agricultura (Rural Workers Federation)
FNO	Fundo Constitucional do Norte (Constitutional Fund of the North)
GETAT	Grupo Executivo de Terras do Araguaia Tocantins (Executive Group for the Araguaia Tocantins Lands)
GTA	Grupo de Trabalho da Amazônia (Amazonia Work Group)
IBAMA	Instituto Brasileiro de Recursos Naturais Renováveis e do Meio Ambiente (Brazilian Institute for Renewable Natural Resources and the Environment)

IBGE	Instituto Brasileiro de Geografia e Estatística (the Government Agency for Geography and Statistics)
INCRA	Instituto Nacional de Colonização e Reforma Agrária (National Institute for Colonization and Agrarian Reform)
INPE	Instituto Nacional de Pesquisas Espaciais (Brazilian Space Agency)
LASAT	Laboratório Sócio-Agrônomo do Tocantins (Social-Agrarian Tocantins Laboratory)
MMA	Ministério do Meio Ambiente, Recursos Hídricos e Amazônia (Ministry for the Environment, Water Resources and Amazonia)
SEMAGRI	Secretaria Municipal de Agricultura (Agriculture Municipal Secretary)
SEMMA	Secretaria Municipal de Meio Ambiente (Environment Municipal Secretary)
SDDH	Sociedade de Defesa dos Direitos Humanos do Pará (Pará State Society for the Defense of Human Rights)
PPG7	Programa Piloto para a Proteção das Florestas Tropicais do Brasil (Pilot Program for Protection of the Brazilian Rainforests)
PREVFOGO	Sistema Nacional de Prevenção e Combate aos Incêndios Florestais (National System for the Prevention and Combat of Forest Fires)
PROARCO	Programa de Prevenção e Combate aos Incêndios Florestais no Arco do Desflorestamento (Program for Prevention and Control of Fires in the Arc of Deforestation)
PT	Partido dos Trabalhadores (Workers Party)
PAF	Projeto Agro-Florestal (Perennial Crop Project)
SIPAM	Sistema de Proteção da Amazônia (Amazonian Protection System)
STR	Sindicato dos Trabalhadores Rurais (Rural Workers Union)
USAID	United States Agency for International Development

APPENDIX B
PEASANT'S NARRATIVES

Translations were made by the author.

1. Translated narrative from Chapter 2, page 39: "O meio ambiente de um gabinete é muito pequeno, muito reduzido, né? E o meio ambiente da Amazônia, ele é grande, ele é extenso. Então eu pediria a essas instâncias, a estes órgãos [do governo] que não se extendam só nos seus gabinetes, mas que façam as suas presença também nas comunidades."

2. Translated narrative from Chapter 2, page 52: "Hoje muitos já queimaram, mas eu pelo menos não queimei e outros por aí não queimaram ainda. Mas a gente estava sempre esperando, por exemplo, uma pessoa assim que viesse para explicar, por que a gente é mesmo que não entende da lei, mas a gente quer é ver o assunto que a gente possa trabalhar certo, né. Por que, numa região dessa daqui, que não tem estrada, não tem um socorro de nada, um pobre dum colono desse aqui se queimar uma roça e tiver que pagar uma multa, é melhor pegar ele e enterrar logo de vez. (...) Então, vamos supor, se não botar uma rocinha para fazer, como é que se pode passar? O que eu quero saber é o seguinte: o que que nós tem que fazer pra queimar? Se nós tem que fazer aceiro, tirar licença? Aí eu quero que você passe isso pra mim, pra eu ficar sabendo, né, por que se tivesse, por exemplo, vindo antes, acho que ninguém aqui teria queimado sem ordem. Por que o grupo da gente aqui sempre combina um com o outro, né, pra fazer as coisas mais ou menos certa. Só que nós não tivemos essa pessoa que viesse aqui antes".

3. Translated narrative from Chapter 2, page 71: "Quando as pessoas trabalham tudo num só sentido, não tem coisa difícil. E na nossa comunidade é isso. A gente espera que daí pra frente as coisas se encaminhem desde quando o IBAMA também faça a papel que ele tem que fazer. (...) Se o governo está cobrando de nós que é pra combater o fogo, então ele tem de mandar um equipamento bem adequado pra gente trabalhar. Da maneira que vai indo não vai poder defender lá só com as mãos."

4. Translated narrative from Chapter 2, page 74: "...porque esse fogo quando vai mesmo daqui do vento que ele joga faísca lá, ou quando ele vai labareda, não tem quem atalhe, nem que seja um aceiro largo, mas ele pula, joga faísca, e ele entra nessa ponta de mata aqui de 8 metros, ele vai pegando aquela folhinha já no chão, na mata sem derrubada, aí já num metro e meio de largura já fica fácil para a gente controlar."

5. Translated narrative from Chapter 3, page 92: Pergunta: "Algumas pessoas falam que os agricultores são analfabetos, e que não entendem as coisas."

Sr. Gomes (G.): "Não entendem. Quem é que é doido por aqui neste interior? Não tem nenhum. Povo deficiente que tem aqui é pouco. Alguns. Mas os outros, se não têm o

saber da leitura, mas ele assina o nome. Todos têm entendimento. Isso já é movimento, dona Katia, de quem já é de dentro daquela comunidade que só trabalha no desprezo. Esse povo que a senhora falou é uma comunidade, e forte! Esse povo que diz isso são dessa comunidade (...). Por isso que a gente desconfia de todos. A gente vive no desprezo. A gente não é coisa do outro mundo não, nós somos tudo gente. Precisamos de amor e de respeito."

P.: "O pessoal sabe ler as estrelas, sabem ler as florestas, o vento, a terra..."

Sr. G.: "Ele [analfabeto] não tem essa cultura [educação formal], mas doido ele não é. Outras [culturas] de muita importância ele tem. E aí com essas desfeitas. Não é assim não. Merece ser acolhido. É brincadeira essa coisa, desprezo, desprezo (...). Só Deus... É sofrido. Pois é, dona Katia, falta muito é responsabilidade, é muito para poucos."

6. Translated narrative from Chapter 3, page 100: Pergunta (P): "A senhora já pensou em morar na rua ?"

Sra. Gomes (G.): "Não, nunca pensei não. Acho tão bom prá cá, silêncio, não tem tormento de nada. Ainda mais na idade que a gente já está. Aqui em casa não tem muriçoca. Sair, Deus o livre, nem pensar."

P.: "Tem muito que querem sair da rua e vir prá roça, não é?"

Sra. G.: "Mas tem muitos que não querem vir para a roça. Morrem de precisão, e não tem como a gente, feijão, fava, arroz perdido [por não conseguir colher] e tudo, mas não vêm. têm muitas naturezas, não é? As naturezas não são iguais. A gente vê mulher nova pedindo [na cidade]."

P.: "Mulher até com neném, não é?"

Sra. G.: "Não é? 'Dá uma ajudinha aqui, prá dar comida prá criança', ou 'um remédio', ou 'compre isso'. A gente vê muito. Graças a Deus, durante todo esse tempo que sou cega, num pedi esmola. Deus tem me ajudado. Sempre só moro na roça mesmo. Na roça ninguém não tem pena de dar nada a ninguém, não é? Na rua não."

P.: "Na roça é uma troca, não é?"

Sra. G.: "É, porque a gente cria um porco, mata, divide. Pega [caça], mata só prá comer, divide, não vende nenhum pedaço."

7. Translated narrative from Chapter 3, page 101: Sr. Reis: " Então hoje o lugar - sempre falo aí para um bocado [de gente] - o lugar bom hoje é aquele onde você está arrumando seu pãozinho de cada dia. Então você tem que ficar. Você não pode mais ficar correndo de um lugar para outro, caçando lugar bom não (...). A pessoa não tem nada, não é? É pobrezinho, com muito menino - que é o que aparece. Aí você pega sua terra, vende, vai para a cidade, ou vai caçar lugar bom. Aí muitas vezes você não arruma mais nem um pão. É obrigado os outros estarem ajudando, fazendo vaquinha para a pessoa. Então hoje onde a pessoa tem a família, e terrinha, e está arrumando seu pão direto, com facilidade."

8. Translated narrative from Chapter 3, page 101: Pergunta: "E se vai para a cidade?"

Sr.: Moraes: "(...) Se ele partir para a capital, ele vai sofrer mais, então o cara tem que segurar (...). Sai para a cidade e vi que não dava. Porque o salário não dava para continuar. Aí eu voltei para a roça, para melhorar a situação(...). A cidade não está tendo emprego para ninguém, é por isso que o governo tem que dar ajuda ao pessoal que mora

na roça, que da roça é onde sai de tudo para todo mundo, não é? Olha, eu vou falar: daqui mais uns tempos dessa mocidade serão poucos os que vão querer roça, porque a roça é duro, não é fácil, não é todo mundo. E esse povinho que de hoje em diante vai nascer, para ir para a roça só se tiver uma coisa muito boa para eles, se não tiver eles não vão. Eu acho que a situação vai ficando pior toda vida. Porque cada um quer procurar o estudo, aí vai esquecendo da roça, e é onde sai de tudo pro cara comer, não é? O cara trabalha no banco, ele trabalha em qualquer serviço, mas tem que vir da roça o de comer."

9. Translated narrative from Chapter 3, page 102: Sr. Reis: "(...) A gente vê muita gente trabalhando aí mais em diária, em diária. O dia que ele não trabalha em diária é por que ele já está ruim demais. Aqui mesmo na nossa comunidade tem o João. Trabalhava mais só de diária. E menino aumentando cada vez mais. Aí a pessoa chega trabalhando assim, o dia que não trabalha fica mal [sem alimento]. É o que eu digo 'rapaz, a pessoa tem que trabalhar para a gente mesmo!' Se a pessoa tem uma terrinha, então vamos trabalhar para a gente. Quando a pessoa trabalha um ano [primeiro ano], é aperreado [difícil], passando mal. Mas de um ano para frente, mesmo que você não tenha dinheiro, mas você tem muito arroz, tem muito feijão, tem o milho, tem a fava, tem mandioca, tem tudo; o que comer tem. Agora trabalhando para os outros, aí fica difícil. Você está enricando só o outro, direto, está trabalhando para ele."

10. Translated narrative from Chapter 3, page 105: Sra. Souza: "(...) Eu me entendi por gente nessa fazenda. Meu pai era vaqueiro, gerente do meu tio. Lá tu olhavas assim, tu nem vias mata verde, só aquelas matinhas velhas. O arroz, quando era no tempo de plantar, a gente plantava num varjão, tipo esse aí de açazal. Mas só que o açai lá na Bahia não tem serventia para nada, ninguém come. Nós viemos aprender a comer o açai aqui. (...) Quando cheguei na Serra Norte, em 76 [Pará], tudo era bonito: uma mata verde fechada. E lá na Bahia eu não via isso não, por isso acho bonito. (...) Só o mato verde que a gente via era um açazal, por que lá era bebedouro do
Pergunta: "E quando se fala 'cuidado com a natureza', o que vocês pensam?"
Sra. Souza: "É por que eu acho bonito deixar uma mata assim, tão verdinha, não destruir. Porque Deus deixou foi tudinho, para viver sossegado, aí a pessoa vai e desmancha. O açazal cria os tucanos, cria vários tipos de passarinhos. Já é uma obra da natureza. Sabe porquê? Tem roça que o pessoal bota que dá uma praga de curica [tipo de pássaro], uma praga. Já tem outros que botam [a roça], e não dá. Aquele lugar que a curica atenta muito é porque ali tinha uma árvore que dava o fruto para eles se alimentarem. Pode estudar, pode prestar atenção. É por que tu não trabalhas com este tipo de coisa. Aonde tem um pé de piriquiteira [árvore], que todo ano eles comem ali - é uma árvore tipo pitanga, das frutinhas vermelhas bem miudinhas, aí eles comem. No outro ano eles [os pássaros] vêm, não a acham, eles vão atentar na roça, por que é um jeito de eles se alimentarem. (...) Fica bonito essa mata. Logo para lá onde nós morávamos não tinha [mata], era feio, ninguém via mata. Era só aquelas rampas, sumindo...."

11. Translated narrative from Chapter 3, page 107: Pergunta (P.): "No caso, a mata é bom para quê?"
Sr. Lopes (L.): "A mata fria [primária]? Ave Maria, é bom demais!"

P.: "Para que é bom?"

Sr. L.: "Por que é Bom? Por que a gente não tendo a mata, seca tudo, sem a mata vira só o agreste de capim, a água se acaba, fica tudo seco, chama [atrai] até o verão. (...) Aqui no Pará chovia demais, devido às matas. Agora tudo pelado [desmatado], fica faltando tudo. E assim as [fontes de] águas, as grotas, secam tudo. se é a vida toda guarneçada [protegida] de mata, ela fica a grota de um jeito só, bonita (...)."

12. Translated narrative from Chapter 3, page 108: Pergunta: "Para que o fogo é importante? Para que usa o fogo?"

Sr. Duarte: "Acho que o fogo é importante por que a gente usa ele em tocação [queimada] de roça, por exemplo. Em muitas partes o fogo é importante a gente o usar. Ai, não sei nem como explicar, só sei que a gente o usa de muitos jeitos, num munturo [toco], num pasto, numa roça. Tudo isso é importante a gente usar o fogo. A gente toca fogo numa panela [risos], na farinha [de mandioca] debaixo do forno; para caudar um tijolo, uma telha, em tudo a gente o usa. O que sei explicar é só isso. De todos os jeitos a gente o usa. [pausa] Agora [sobre] o fogo, o mais ruim é quando ele vem do lado da gente. Quando chegam [dizendo] 'vamos atalhar [controlar] o fogo', aí é dose. Quando vem uma linguona de fogo da altura dessa casa, quando dá um vento que ele deita rumo da gente, aí que é dose; está arriscado a se assar todinho."

13. Translated narrative from Chapter 3, page 108: Pergunta: "Qual a importância do fogo para vocês?"

Sr. Almeida: "O fogo é muito bom, só que ele devora muito, acaba com as vidas. Se a gente pudesse viver sem ele era bom."

Filho mais velho: "Mas [o fogo] dá mais facilidade para a gente. Quando a gente queima vem menos mato, a terra fica mais limpa, melhor para trabalhar. Sem o fogo, só se for fazer uma linha de terra, tem que jogar o mato todinho fora para trabalhar, se arrebentar de jogar aquele mato fora. Depois tem que carregar os tocos. O toco, o fogo queima. Tem que tirar aquele mato todinho, e plantar naquela terra crua, sem ser arada..."

Sra. Almeida: "Mas se a gente pudesse ter o arado, para aradar a terra, a gente não mexia com ele [fogo] não."

14. Translated narrative from Chapter 3, page 112: Sr. Oliveira: "Olha, Kátia, não chamando a nós de animalzinho... Ele é racional, ou racional somos nós?"

Pergunta: "Diz-se que os racionais somos nós."

Sr. O.: "O racional somos nós? E o outro é o irracional? Pois bem, não comparando a nós com o animal irracional, mas eu lhe digo: os animais irracionais têm mais compreensão do que nós. Você sabia disso? Por um lado! Nós temos muita inteligência, mas conhecimento do que se passa, nós não temos nenhum, só Deus tem. E às vezes se vê num animalzinho. Quando você vê um bocado de formiga se mudando do alto para o baixo, é verão. Quando você vê um bocado de formiga no baixo se mudando com todos os seus filhotes para o alto, pode esperar chuva naquele dia ou no outro, que é certa. Nós aqui temos uma experiência, nós que moramos na beira da água, que o baiano às vezes pega corda com a gente. Eu digo 'hoje o jacaré está querendo se molhar. Mas se nós estamos aqui, escutando o jacaré [faz o som do jacaré] esturrando dentro da água, é chuva na certa. É raro demais o dia que o jacaré esturra dentro da água e não chove, é difícil. Às

vezes nós temos a pretensão de dizer o que vai acontecer, por que o animalzinho está mostrando para a gente. Agora, uns prestam atenção, outros não."

15. Translated narrative from Chapter 4, page 117: "Como a gente pode viver na roça, e não poder fazer uma roça?
Nós vamos controlar o fogo, para não dar prejuízos uns aos outros."

16. Translated narrative from Chapter 4, page 152: Sr. Duarte (D.): "Eu estava lá no paiol, lá para acolá, uns 3 km, quase para lá da roça. Quando eu cheguei em casa estava o maior estalo nos cocos, pois o fogo pegou numa palhada [roça do ano anterior], que tinha plantado arroz e grama. Era meio mundo de fogo, não dava conta de apagar, queimou uns 90 cocos em [19]97. Ainda não tinha chovido. Nesse tempo o povo estava naquele esquema de queimar antes de chuva. Por que no Pará, de primeiro [quando a família chegou], a gente tocava fogo numa roça bem aqui, o fogo não entrava uma braça na mata. Por que acho que as folhas parecem que eram molhadas por vida, não é? Mas agora, se você não deixar chover, o fogo entra na mata igual botando galho por debaixo do fogo. Mas de primeiro botava 1 alqueire, 2 alqueires de roça, o fogo só fazia rodear, queimar só o que estava brocado. Hoje em dia não está mais assim não."

Question: "O que o senhor acha que mudou daquele tempo para cá, que antes o fogo não andava [na mata]e agora anda?"

Sr. D.: "Mas eu acho que mudou por causa das chuvas. O Pará, de primeiro, era difícil passar um mês sem chover; era 15 dias, no máximo um mês. A chuva aqui era direto. Aí a mata toda era molhada, você andava [dentro dela] era frio. E hoje em dia você vê como é, passa às vezes de 2, 3 meses, até 4 meses sem chover; aí resseca o mato. Na hora que chegar qualquer fogueiro ali, [o fogo se] altera, pega fogo em tudo, por que está tudo seco! De primeiro não era assim não, você ciscava a folha, era molhado."

17. Translated narrative from Chapter 4, page 154: Sr. Carvalho: "Eu acho que, para poder estar conscientizando mais o pessoal, tem que fazer a reunião [na comunidade] assim que a gente chegar [do seminário da Ação do Fogo] (...). Eu vou dizer por mim: quando dava um tanto de agosto, eu tocava fogo; deixava a roça limpinha, só esperando o tempo de chuva para eu plantar. E o pior é o seguinte: muitas pessoas estão acostumadas a queimar cedo. Ele está fora do movimento [organização para o uso do fogo], não sabe o que está se passando, e ele fica preocupado, eu concordo com ele. Porque a pessoa que é acostumada a queimar cedo, quando dá a primeira chuva e ele está com a roça sem queimar, fica preocupado. Eu mesmo sou um. Quando deu as primeiras chuvas [in 1998] que a roça estava querendo ficar em tempo de nascer o broque para todo lado, eu disse: 'esse ano a roça eu não tenho!' Camarada está acostumado a quando dar a primeira chuva a roça já estar queimada. Então é muita gente que tem esse hábito (...) Quando dá a chuva de noite, ele pensa 'meu Deus do céu, parece que este ano não vou ter roça.' Não sei, é um hábito nosso. Mas às vezes funciona assim: a gente queimar cedo, de repente pode ter um fogo desabado, entrar na mata, ou então passar para o lote do vizinho e destruir. Aí quando o camarada, além de destruir a mata própria, ele ainda pode ser preso... (...) Se a gente tem consciência que tem que se conformar, é conscientizar os outros. Mesmo que o camarada esteja meio duro, é a gente compreender por que ele está meio duro, e tentar repassar aquilo que a gente sabe."

18. Translated narrative from Chapter 4, page 156: Pergunta: "O pessoal falava que antes a mata era o aceiro, não era?"

Sr. Duarte: " Era, a mata era um aceiro. E hoje em dia, se você não fizer o aceiro, a mata não serve mais de aceiro não, que o fogo invade mesmo, não tem jeito. E olha lá para você apagar, atalhar ele... Por que você apaga bem aqui, pensa que não, ficou um olho bem acolá, uma faisquinha. Sozinho a pessoa não dá conta não, [tem que ser] uma turma; se não for, é difícil de atalhar."

19. Translated narrative from Chapter 4, page 170: Pergunta (P.): "E onde o senhor via fazer ou aprendeu isso [manejo do fogo]?"

Sr. Fontes: "Lá onde eu me criei, lá era assim. Meu pai era pobre, como eu também sou, e toda roça dele era aceirada."

P.: "E isso era aonde?"

Sr. F.: Era no Maranhão, todas as roças eram aceiradinhas (...). No dia do fogo, ele ia botar [o fogo] logo naquele aceiro na beira do mato: o contra-fogo. Que aí quando o fogo da roça vinha sapecando delá, antes de chegar até aqui no aceiro, aquele contra-fogo já ia bem por lá. Já se encontravam [contra-fogo com o fogo principal] fora do aceiro. Então isso eu aprendi de quando eu era menino, trabalhando com o meu pai."

20. Translated narrative from Chapter 4, page 173: "Uma vez fomos apagar um fogo no José, num capim. Tocaram fogo na roça, nós íamos bem uns dez, e o fogo saltou para o pasto. Ainda não tinha chovido. O capim estava alto, bem seco, logo o fogo vinha e crescia; nós batíamos o galho no fogo, pá! E ia acolá, corria, e esse [fogo] daqui já tinha ganho o mundo. Junto com água, apagando, mas não deu jeito; nós largamos que nós estávamos para se queimar. Fiquei sem sobrelha, caiu, queimou tudo, da queimadura. O fogo invadiu o pasto dele, queimou tudo. (...) Mas sendo um fogo leve é fácil apagar."

21. Translated narrative from Chapter 4, page 184: É Fogo

Se o povo não participa das decisões, é fogo.

Quando a classe mais baixa vive oprimida, é fogo.

Para viver hoje em comunidade, é fogo.

Se está difícil para conseguir uma vida mais digna, isso também é fogo.

Muitas vezes o financiamento não vem para aumentar a produção, e quando vem é fora de hora, isso é que é fogo.

O descaso dos governantes com assistência médica, educação e infraestrutura das comunidades, isso é fogo.

Quando muitas vezes os agricultores produzem e não conseguem escoar a produção por falta de estrada, isso também é fogo.

Quando o IBAMA muitas vezes aplica as leis e só os pequenos é que são punidos, é fogo.

Ser um participante ativo dos movimentos populares, como é fogo.

Se as queimadas muitas vezes são desorganizadas e descontroladas e causam muitos prejuízos, é fogo.

Quando o seminário é para falar de fogo, e se fala de outros assuntos, é fogo.

Se os políticos mentem, enganam e iludem os menos desinformados, isso é que é fogo.

Quando os técnicos não fazem na prática e ficam só na teoria, ah, como isso é fogo.

Quando se bota o fogo, e não se pode controlar, temos que achar um jeito para esse fogo apagar, e vai precisar muita água, ou um grande extintor, mas também pode apagar com um pouco de amor, ou quem sabe quando o povo tiver valor.

APPENDIX C
FATA/LASAT COMMUNITY FIRE ACTION BOOKLET

The FATA/LASAT Fire Action's recommendations were organized in a booklet (Carvalho and Aquino 1999), distributed to at least 44 communities related to FATA and LASAT, during the 1999 dry season. Below are the fire use recommendations, and their main illustrations as presented in the FATA/LASAT Fire Action booklet (Figure C-1).



Figure C-1. Cover of the FATA/LASAT Fire Action booklet.

1. General Guidance

The booklet starts by explaining that it was developed as part of a process of seeking more responsible fire management practices, and that it contains proposals by peasants and has no official legitimacy. It is composed of three parts, (a) Proposed Recommendations by the Fire Action, (b) Community Agreement regarding Fire Use, and (c) Brazilian Laws concerning Fire Use. As general guidance, it was recommended that an agricultural field (based on the slash-and-burn system) should not be larger than 5 ha per family. The size of a pasture to be burned, on the other hand, was said to be a family decision because fire management for pastures varies greatly (fire for pasture management is used for diminishing weeds).

2 Before Burning

2.1 Official Burning Permit

The STR agreed to support community organization for fire management. Because of the INCRA's limitations in recognizing land rights for peasant communities, the STR would also issue a document acknowledging that the family is a peasant family, in much the same way as it already does for peasants applying for government loans. In addition, the STR would give families a written authorization to burn, provided that the families were organized into community groups, and IBAMA would charge no fees to issue the permit (Figure C-2).

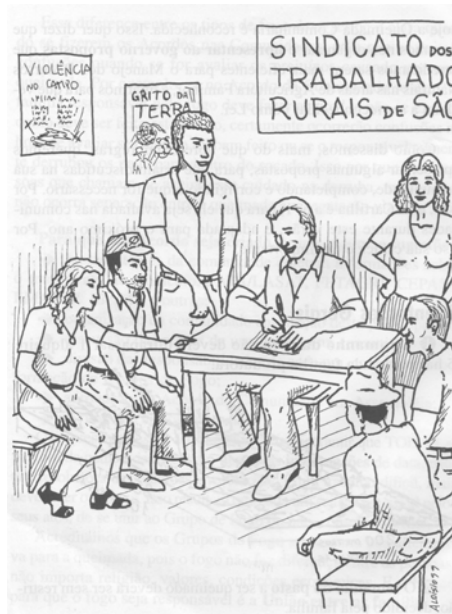


Figure C-2. The STR's (Rural Worker Union) support regarding burning activities, in the FATA/LASAT Fire Action booklet.

2.2 Planning

The booklet emphasized the importance of planning, based on the premise that "it is always easier to prevent than to control." When confronting fire prevention versus control, prevention presents great advantages to peasants that generally live in communities far away from any Fire Department or other outside support, with no means of communication, and difficult access. Moreover, the peasants in the Marabá region generally have no access to fire control equipment, such as machinery, water pump and appropriate asbestos fire swatter, and few possess chainsaws. The peasants also lack adequate safety equipment. Consequently, fire control is a very dangerous activity for them and every effort should be made to prevent instead of controlling escaped fires.

Because of its importance, this section of the booklet includes ten recommendations, as follows:

(a) "Discuss in your community what would be the best way to manage fires." It emphasizes community organization, because working collectively enhances peasants' ability to implement fire preventive practices and control, such as firebreaks, fire against fire, *varridas*, or control firebreaks, and carrying water.

(b) "When choosing the location of agricultural fields, keep fire management in mind. Many times a buffer zone might be very helpful in preventing accidents related to fire." Decisions on field location are sometimes made during the rainy season, and

peasants do not always take fire management into account then. Thinking ahead about fire management can help in the implementation of buffer zones. It is also important to consult neighbors about ecosystems or goods to be protected from fire, and to be prepared to change field location, if necessary.

(c) "When burning up or downhill, it is necessary to be more careful, due to faster winds and longer flames." Peasants and firefighters agree that burning on hills is more dangerous than on flat areas, and requires more caution. Fire propagates faster uphill because (1) the fuel located on top of a hill or mound is usually drier and is more intensively heated by fire, and burns faster causing more intense fire diffusion, and (2) hot air currents move uphill, drawing oxygen-rich fresh air to the combustion zone (Soares 1985:36).

(d) "The quality of the slashing has direct consequences for the quality of the burning, and better slashed vegetation will allow burnings after a first rain, at a time of day when winds are slower." This recommendation (as well as items 'e' and 'f') are related to slash-and-burn activities. Well-slashed vegetation is that in which the upper part of plants are totally separated from their base. This practice allows vegetation to dry better. If the vegetation is not totally separated from its base, the plant's sap will keep its leaves and trunk green, and the field will not burn well after rain.

(e) "When felling the bigger trees, try to direct their fall to center of the slashed area." As the previous one, this recommendation is related to slash-and-burn activities, and aims to diminish the amount of fuel around the border of the agricultural field, so as to minimize the risk of fire spreading to the neighboring ecosystems.

(f) "Try to fell dry big trees and palms located at the borders of the slashed area" (Figure C-3). This recommendation calls attention to the need to felling dry trees and palms before the burning day, because of their high flammability and consequent high risk of fire spreading to neighboring ecosystems through sparks or falling branches, twigs or leaves. Peasants tend to not fell the dry trees, for safety (high risk of dead branch fall over peasant during felling), and economic (fire in general knocks down dry trees) reasons (Mattos and Carvalheiro 2002:290).

(g) "Avoid burnings during the first half of the dry season; each community should define the less dangerous months for burning." Controlling fire once it gets out of control is very difficult, especially for peasants without adequate equipment and outside support. Therefore, this recommendation gives emphasis to the appropriate periods for burning, in the late dry season, for if uncontrolled fire achieves large proportions, rain will help control it.

(h) "Burn agricultural fields after a first rain. "This recommendation is connected with the previous ones (preparing the vegetation to be burned, burning late in the season, etc). If the vegetation is dry enough, it will be able to receive rain and be dry enough again after a few days of sun. This suggestion takes into account the fact that the rainy season does not start at once, but with some early rain events alternating with sunny days. Peasants agreed, however, that this recommendation could not be applied when the field is located in a swamp, nor if the vegetation is a *palhada*, the remains of crop, and other regrowth vegetation in a field that is going through a one-year fallow period.

(i) "Burn pasture only after the first rains. "Preventing uncontrolled fires from pasture burnings is usually harder than preventing uncontrolled fires from agricultural field burnings. This is caused by the pastures' larger extensions, the difficulty involved in

making manual firebreaks in pasture areas, and the inefficiency of firebreaks due to the long distance reached by sparks and the high speed of fire during the burning. The rain helps by wetting surrounding ecosystems (making it easier to control fires), and by improving grass regrowth.

(j) "The use of preventive firebreaks is mandatory. "The use of firebreaks was the only obligatory recommendation for the 'before the burning day' phase. Besides preventing fire from spreading to neighboring ecosystems, firebreaks also allow people to move about in neighboring ecosystems to spot and control fire. The booklet contains a special section on firebreak use, as follows.



Figure C-3. One of the Fire Action booklet's recommendations, before the burning day, on avoiding sources of sparks: 'try to fell the large dry trees (*pau-seco*) and palms located at the borders of the slashed area' (Carvalho & Aquino 1999:6).

2.3 Use of Preventive Firebreaks

Due to the many different ways in which peasants understand and use firebreaks, the two main kinds of firebreaks were addressed: preventive firebreaks and control firebreaks. Preventive firebreaks are made before the burning, and are either located next to the border of the burning, or far away from the border of the burning. The firebreak located by the border of the burning is generally used when the vegetation to be burned is a pasture, when it is an agricultural field located right next to a pasture, a one-year-old agricultural field, or a lower secondary forest (*capoeira fina*). The booklet recommends that when the firebreak is located next to the border of the burning its width be 2.00 meters and, if there is a fence, it has to be protected on both sides" (Figure C-4).

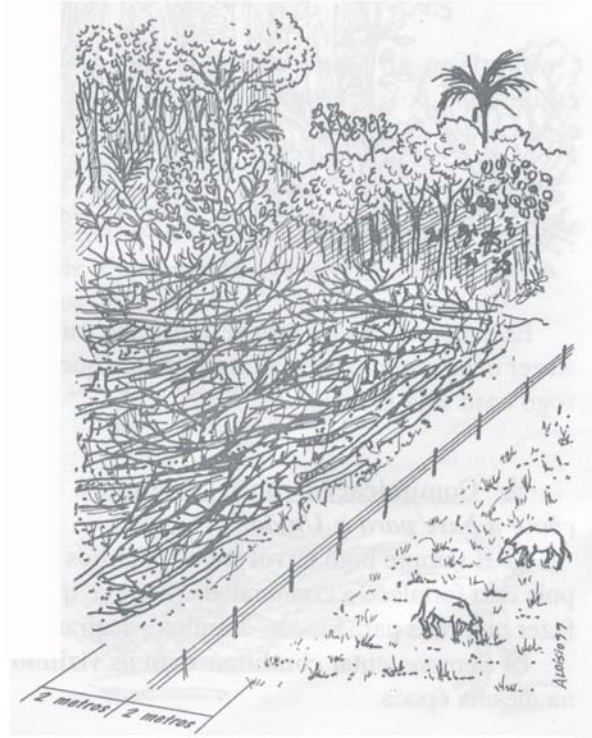


Figure C-4. Recommendation in the Fire Action booklet regarding mandatory preventive firebreak use, located by the border of the burning. The left side of the fence represents slashed vegetation being prepared for agriculture; on the right side there is a pasture with animals, meaning that it has to be protected from fire. In this situation, the firebreak is 2.0 m wide and is located next to the border of a slashed field. If there is a fence, both of its sides have to be protected.

The other type of preventive firebreak is far away from the border of the burning. "This kind of firebreak is used when the border of the burning is contiguous to a forest (either primary or old secondary forest) It is located approximately 8 to 15 meters from the border of the burning, and is 1.5 to 2.0 meters wide (Figure C-5)." There are different reasons for the use of this kind of firebreak. The first one is its high efficiency. During the burning, the hot air dries leaves and thin trunks close to the border of the burning, and fire flames and sparks easily reach surrounding tree crowns. Firebreaks located next to the border of the burning are not efficient, because sparks often fly more than 50 m away (personal observation). When the firebreak is located inside the forest, as shown in Figure C-4, the forest works as a green barrier for the fire. The fire starts burning the upper dry leaves by the border of the burning, and as it goes forward into the forest, finding more green leaves, the fire moves to the forest ground, where dry fuel can be found. Inside the forest, the wind loses its power, and fire moves slowly, tending to be extinguished. If the fire reaches the far-away firebreak, it usually does not have enough energy to cross it, due to weak winds and absence of fuel for 1.5 to 2 meters. If a burning tree falls across the far-away firebreak, peasants can control it more easily because the forest microclimate is wetter and the wind is slower when compared to the microclimate near the border of the burning. Better fire control, therefore, is the second advantage of

this kind of firebreak. The third reason, also connected with the two previous ones, is peasant safety. Firebreaks located far from the burning area allow peasants to stay at the firebreak during the burning, walking through it and looking for accidental fires. Water and available equipment can be transported easily, if necessary. Controlling fire is a dangerous activity, and by being relatively far from heat and smoke, the danger is minimized.

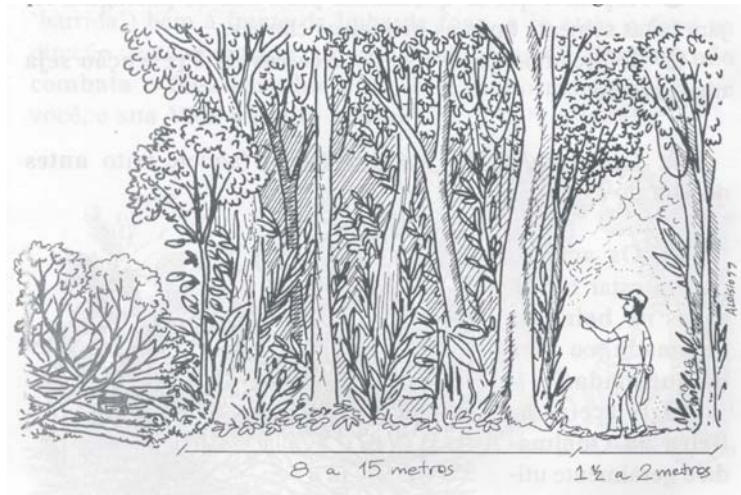


Figure C-5. FATA/LASAT Fire Action booklet's recommendation on obligatory preventive firebreak use, located far from the border of the burning. To the left is the slashed vegetation to be burned, then there is a buffer zone of standing forest, the firebreak and, on the right, the forest to be protected.

The fourth reason that justifies this kind of firebreak is its feasibility. Peasants that in general do not possess machinery and even chainsaws can build far-away firebreaks inside forests without felling any large trees. Instead of being made in a straight line, this kind of firebreak can be made around big trees, and be located further or closer to the burning border, depending on the composition of the standing vegetation (lianas, palms, dead trees). The fifth reason to use a far-away firebreak is the smaller amount of damage caused to the forest. Less adult trees are felled, compared to a 6.0 meter-wide firebreak, and if fire burns the standing forest between the border of the burning and the far-away firebreak, its recovery is faster when compared to a firebreak in a soil that has been cleared due to re-sprouting (85 % of forest recovery comes from re-sprouting: Moira Adams).

Some of the families studied used this kind of firebreak during the 1998, 1999 and 2000 dry seasons, others have just heard about it, and others learned about it from their colleagues. Firebreaks located far from the burning border are also known by colonists at the Paragominas region (Mattos and Carvalheiro 2002). This kind of firebreak is not officially recommended by IBAMA, which instead requires firebreaks in neighboring forests to be located by the burning border, and to be about 6.0 meters wide. A firebreak located far away from the area of the burning has to be associated with the fire against fire technique, as well as with the practice of burning after the first rain, and should be done by a group of people, so that fire can be observed and controlled if necessary.

2.4 Communication Between Neighbors

The booklet emphasizes the importance of communication, "Good communication is the basis for unity", and focuses on four points: (a) always try to work collectively, (b) always try to agree among neighbors to burn at the same period, (c) anyone who will burn a field must officially communicate the planned burning date, at least 8 days in advance to contiguous neighbors; the STR may help with an official information form, (d) the more people in the burning event, the better; specifically invite your contiguous neighbors and insist on their participation.

This section concentrates its recommendations on collective work among neighbors. In colonist communities, where families have different origins, religions, life histories, etc., the newer the community, the fewer the family ties. Therefore, communication and willingness to work collectively may not be a simple task. Fire, on the other hand, can draw people to work together because once it gets out of control in communities, the fire spreads regardless of family, kinship, religion, possessions or land ownership. This indiscriminate behavior at the community level tends to make families work together. The minimum recommendation is communicating to neighbors the chosen burning day, so neighbors can plan to observe or participate at the burning. Working collectively is advantageous for peasants because together they can use better practices, such as preventive fire against fire and firebreaks, and having more people using the control practices increases the possibility of success.

3 On the Day of the Burning

The booklet contains ten recommendations in this section:

(a) "The family responsible for the burning must be present at the burning event. Any loss caused by an uncontrolled/escaped fire will be the responsibility of the 'owner' of the burning. "This recommendation calls attention to peasants' responsibility regarding fire use and its consequences.

(b) "It is necessary to confirm the date of the burning again with the contiguous neighbors. "Before the burning day, it is recommended that the peasants notify their neighbors about the day in which the family plans to burn. The burning date can change due to several reasons, or neighbors may have forgotten about the burning date, and notifying them again reinforces the importance of neighbors' presence.

(c) "Never burn a field alone, even if it is not considered a dangerous situation; always burn with a Fire Group, family, and friends. "This recommendation again emphasizes the importance of group work for prevention and control of accidental fires.

(d) "Organize a group of at least 4 people, and discuss how the fire will be started, the role of each participant, codes of communication during the burning, and what to do in case of accidental fire" (Figure C-6). Here, the booklet also emphasizes group work in planning, in discussing prevention and in control practices.

(e) "Required use of preventive fire against fire, or contra-fogo". As discussed in the section on firebreak, fire against fire is a fire started from the side opposite the wind, which makes the fire spread against the wind. Almost at the same time, the main fire runs with the wind. Before the main fire reaches the other side where the contra-fogo started, a strip of land without fuel will be formed, and the main fire will finish before it reaches the burning field border, minimizing risks of accidental fires in the neighboring ecosystem.



Figure C-6. FATA/LASAT Fire Action's booklet Recommendation on community organization for burnings.

(f) "If possible, arrange containers with water near firebreaks". Many times agricultural fields are located far from roads or trails, and from water sources. That is the reason for the conditional recommendation, using "if possible."

(g) "Equipment (boots, gloves, helmet, scythe, ax, fire swatter, water pump and chainsaw) is essential but not always available; when accessible, leave them within reach." This section calls attention to the necessary safety equipment, as well as to fire control.

(h) "Start a burning later in the day, varying according to its being in an agricultural field (recommended after 3 p.m.), or in a pasture (recommended after 4 p.m.)". This recommendation tries to change a regional practice of burning field around midday, when the wind is stronger and the sun is hotter. Peasants argued that a few hours later, the field to be burned is still hot and the wind strong enough for a good burning. The advantage is that the microclimate of surrounded ecosystems will not be as hot as it is at midday, which consequently makes it easier to control accidental fires.

(i) "Avoid the season's drier days, and periods in which wind is too strong". The reason for this recommendation is directly related to the previous one. Burning on days which are not so hot and dry minimizes the risk of accidental fires and, in the event of any accidental fire, makes it easier to control.

(j) "Keep on observing the burned field until the end of the day. This will allow you to control any accidental fires more easily." Continuous observation of the burning allows early detection of accidental fires, and it is easier to control an accidental fire in the beginning, when its flames are small and its sparks are few.

4 After Burning

"Return to the burned field during the following three days, to monitor and, if necessary, ask for help in controlling any accidental fires." This recommendation has the same purpose as the recommendation to remain at the burning field until the end of the

day, which is to allow early detection and control of any accidental fires. Many trunks continue to burn for many days after the burning day, and may fall over surrounding ecosystems or hurl sparks at them. The time during which trees can continue burning varies according to tree species and age. For instance, a *copaíba* tree was observed to go on burning for more than two weeks after the burning day, even after rain. Older trees burn longer due their to amount of fuel, some burning even their roots, as was observed with an *angelim vermelho*.

5 Controlling Accidental Fires

Control practices are used on the burning day or after, depending on causes of uncontrolled fires. The Fire Action booklet divided this section into four parts:

(a) "The Fire Group must always be alert, in order to help in case of any accidental fires." This recommendation emphasizes Fire Group organization and responsibilities for the entire dry season.

(b) "Pay special attention to burning stumps, trunks or roots due to the risk of sparks; it is recommended to extinguish or destroy them." This recommendation complements the one about observing the burning field until late on the burning day and for three days after that, in order to prevent accidental fires.

(c) "Combine the use of *varridas*, or control firebreaks, and backfires so as to protect forests, perennial crops or houses from any uncontrolled fires. But be careful: never try to control fire alone, because it is faster than you, and your life is too precious!" Peasants of the Marabá region in general control fire with fire, preparing a *varrida*, or thin control firebreak, to separate the vegetation to be burned from the one that will not be burned. This control firebreak creates a strip of vegetation between the uncontrolled fire and the ecosystem or goods to be protected from the fire. When the *varrida* is ready, the peasant sets fire to the vegetation strip that tends to propagate to the uncontrolled fire direction. Thus the name of this practice: *contra-fogo*, or fire against fire. The goal of this fire is to remove any fuel that may be close to the area to be protected, so that when the uncontrolled fire reaches it, it will be extinguished due to lack of fuel to continue the combustion. The booklet also calls attention to the fact that this practice should not be used when you are alone, because fire is very fast, and building the *varrida* is very time consuming. The Fire Action booklet in general emphasizes that fire management should never to be done by a single person, but by a group (Figure C-7).

(d) "Pay attention to smoke and hot air: smoke and hot air can kill a person. In general, smoke is composed of toxic gases that act slowly, while the heat can kill a person in few minutes if she/he inhales hot air, burning her/his lung (...)." This part gives some safety and first aid for information people working close to a burning. It is common for peasants to try to control fire while wearing rubber sandals, and without any safety or fire control equipment. Therefore, items 'c' and 'd' call attention to safety risks while controlling fires.

6 Conflict Resolution

The Fire Action booklet puts emphasis on community organization as an essential key to minimize losses caused by fire. In order to promote discussions on the importance of fire management, it addresses topics such as 'why did burnings increase so much in the last few years?', because of global warming and changes in forest flammability due to

logging activities. It also emphasizes what peasants have noticed: 'nowadays fire use is more dangerous than years ago'. This section discusses the Brazilian government's fears of fire in the Amazon, and IBAMA's coercive laws as an attempt at fire control solutions.

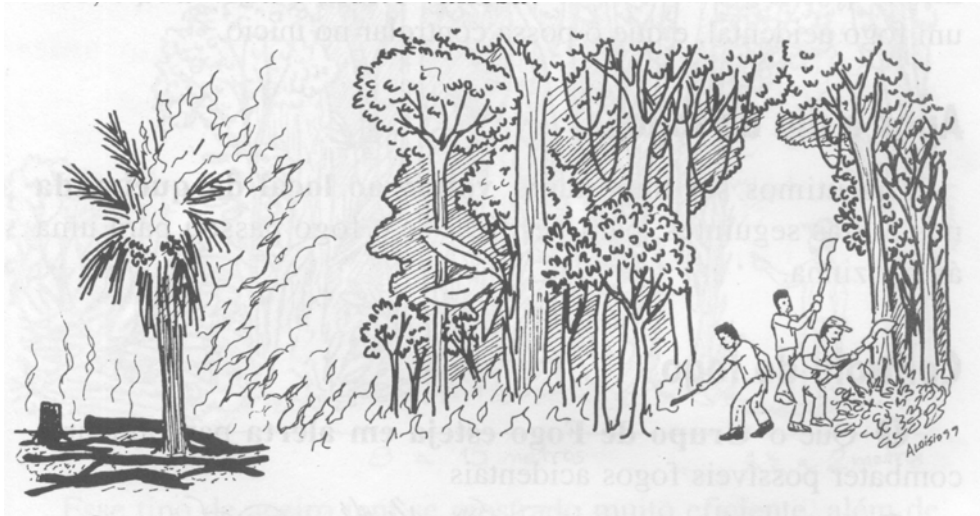


Figure C-7. FATA/LASAT Fire Action's recommendation regarding the use of control firebreaks and backfire, in order to control the fire.

The booklet presents concepts discussed during the regional workshop for responsible, accidental, and criminal fires. These concepts, based on community agreements, can be used to evaluate losses caused by uncontrolled fires, contrasting accidental fires with criminal ones. In case of criminal fires, the concepts help in attributing responsibility to the fire 'owner'.

The booklet's proposed steps for community agreements regarding fire were:

(a) "Community members should gather information at the STRs, and key NGOs and GOs." This recommendation aims to empower community representatives by suggesting that they be responsible for actively seeking information on fire use. When the representatives have relevant information, they are recognized by other peasants at the community level as credible resources for fire management, reinforcing their local organization.

(b) "Organize the community for fire management." This recommendation implies that, besides getting information, the whole community should be motivated to discuss and organize fire use. This suggestion aims to stimulate community agreements on fire use, involving most families in the community.

(c) "Discuss community fire use recommendations." It is expected that recommendations will result from community discussions. It is important to discuss those agreements in depth, in order to establish the recommendations that have to be followed by everyone in the community. If rules vary according to individual interests, recommendations will lose their reliability.

(d) "Share responsibilities, and support the creation of a fire group." This suggestion aims to support the decentralization of community fire management, which is important to motivate families' responsibilities for their own acts. In order to be

responsible, families have to be active in obtaining information, to communicate with neighbors, to plan fire use, to get organized and check their neighbors' activities during fire use, and to take responsibility for any losses caused by their fires. Besides family responsibility, the booklet encourages the creation of Fire Groups, established in assembly. Depending on community decisions, Fire Groups can motivate family planning, disseminate information, and act as a third party in conflicts involving fire losses.

(e) "Approve community agreements in assembly or official meetings." It is essential that the Community Assembly (the highest decision forum at the community level) approve the discussed recommendations, in order to render the recommendations and the Fire Group's work legitimate. Some peasants suspected that Fire Group members would receive payment from IBAMA for monitoring and punishing families, working on behalf of individual interests, and this generated conflicts among peasants. Official recognition of Fire Groups' work reduces this kind of conflict, and generates a sense of justice and fairness for all.

(f) "Disseminate agreements inside the community." This suggestion reinforces that only when all families in the community have access to the agreed recommendations, will they be able to use fire consciously. In addition, only if all families know the community recommendations, can they be responsible for their use of fire, and therefore take responsibility for consequences in case of losses resulting from fire.

The last part of the booklet presents some basic points on fire laws, and information that is not presented in IBAMA's booklet, such as deforestation and burning costs. It was included in the Fire Action booklet to complement the IBAMA booklet. Some peasants were confused by this section because they understood the FATA/LASAT Fire Action to be defending IBAMA's fees. The FATA/LASAT booklet would have had a better reception if this section had not been included, but furnished as an appendix for the IBAMA booklet.

APPENDIX D INTERVIEW GUIDE

Interview guide for unstructured interviews carried out in 1998. The fire questions were repeated in 1999.

- Age (male and female heads of families)
- Length of residence in the community
- State of Origin
- Migration of heads of families
- Plans of continue living in the community
- Number of people that live in the community
- Number of family members living outside that depend on the family's production
- Formal education
- Possess land before this one
- Work force (male and female)
- Hiring workers
- Collective activities
- Possess equipments
- Plan of continuing in the community
- Participation in formal social activities
- Size of the land
- Land use distribution
- Livestock
- Losses caused by fire
- Accessing IBAMA fire laws
- Ecosystem slashed for agriculture
- People during the burning
- Inviting neighbors to the burning event
- Informing neighbors of the burning event date
- Month and hour chosen for burning
- Firebreak
- Backfire
- Control practices (water, control backfire)
- Burning of pasture
- Participation in Fire Groups

APPENDIX E
CODED BOOK

Res	Tempo de Residência na comunidade, em anos.
Pos Terra	Possuiu terra antes de chegar na comunidade (1=sim; 2=não)
Cont Com	Planos de Continuar na Comunidade (1=sim; 2=não)
Vila	Possue casa na Vila (1=sim; 2=não)
Pessoas	Número de pessoas que vivem no lote e:
Res.	Residem no lote
Dep.	Não residem mas dependem economicamente
Idade	Idade, em anos,
H	do homem
M	da mulher
Orig	Estado de origem (1=MA; 2=GO+TO; 3=PA; 4=PI; 5=CE; 6=MG; 7=ES; 8=BA; 9=PE)
Migração	Número de migrações até chegar na comunidade (onde exerceu atividades produtivas)
M.O.adult	Quantos trabalham
M.O.\$	Contrata mão de obra (1= maior parte do ano; 2= parte do ano; 3=nunca)
M.O.troca	Realiza troca de dia (1=sim; 2=não)
Muti	Participação em mutirão (1=sim; 2=não)
CAT	Participa Grupo do Viveiro (1=sim; 2=não)
PDA	Participa Projeto de Manejo Florestal (1=sim; 2=não)
STR	Sócio STR (1=sim; 2=não)
Ass	Sócio Associação (local ou regional) (1=sim; 2=não)
Reli	Religião frequentada (1=católica; 2= evangélica; 3= Batista; 4=não participa)

H	Homem
M	Mulher
Tam	Tamanho (em hectares)
Lote	do lote
Mat	da área de mata
Cap	da área de capoeira
Pas	da área de Pastagem
Roc	da área de roça
Fru	da área de fruteiras e perenes
Mat sape	Quantidade da mata sapecada
Gad	Quantidade de Gado
Ani	Quantidade de Animais de Carga
Equipam	Equipamentos
Mot	Motosserra (1=sim; 2=não)
Bom	Bomba Costal (1=sim; 2=não)
Contro Roc98	Necessidade de Técnica de Controle na queima da roça (1=sim; 2=não)
Ecos	Ecosistema usado na roça (1=mata; 2=capoeira; 3=roça anterior)
Prej	Ocorrência de Prejuízo neste ano (1=sim; 2=não)
Tipo de Prej	Tipo de ecossistema/bem perdido (1=mata; 2=roça; 3=cap; 4=past; 5=fruteiras; 6=casa; 7=cerca; 8=açazal; 9=gado)
No. Pess	Número de pessoas que participaram no dia da queimada
Viz Avis	Avisou Vizinho (1=sim; 2=não)
Viz Con	Convidou Vizinho (1=sim; 2=não)
Acei	Aceiro (1=sim; 2=não)
Cont	Contra-fogo (1=sim; 2=não)
Mes	Mês do ano que queimou (1=jul; 2=ago; 3=set; 4=out; 5=nov; 6=dez)
Hor	Hora do dia para queima de roça
Chuva	Queima após um evento chuvoso (1=sim; 2=não)
Água	Uso de Água (1=sim; 2=não)

Past 98	Queima de Pasto em 98 (1=sim; 2=não)
Prej Past	Ocorrência de Prejuízo desta queimada (1=sim; 2=não)
Past 99	Planeja queimar Pasto 99 (1=sim; 2=não)
IBAMA:	
Cart	Leitura da Cartilha do IBAMA (1=sim; 2=não)
Rad	Conhecimento de normas do Ibama via Radio (1=sim; 2=não)
TV	Conhecimento de normas do Ibama via TV (1=sim; 2=não)
STR	Conhecimento de normas do Ibama via STR/Assoc.
Roc99	Tamanho da Roça em 1999
Ecos99	Ecosistema que se planeja usar para roça (1=mata; 2=capoeira; 3=roça anterior)
Prej:	Prejuízo
Hist	Se teve história de prejuízo (1=sim; 2=nao)
Ano	Ano de ocorrência do Prejuízo
Tipo	Tipo de ecossistema/bem perdido (1=mata; 2=roca; 3=cap; 4=past; 5=fruteiras; 6=casa; 7=cerca; 8=açaizal; 9=gado)

LIST OF REFERENCES

- Abberger, Hatmut M., Bradford M. Sanders, and Helmut Dotzauer
2001 The Development of a Community-based Approach for an Integrated Forest Fire Management System in East Kalimantan, Indonesia. Paper presented at *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*. Balikpapan, Indonesia. Electronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.
- AGRAF
1998 *Estatuto da Associação Agro-Ambiental de Atividades de Agricultura Familiar da Vila São João do Itacaiúnas*. AGRAF. Unpublished document, Marabá, Jun 1998. 3 p.
- Almeida, Alfredo Wagner Berno de
1991 O Intransitivo do Transitivo: O Estado, os Conflitos Agrários e a Violência na Amazônia (1965-1989). In *Amazônia: A Fronteira Agrícola 20 anos Depois*, edited by Philippe Léna and Adélia Engrácia de Oliveira, pp. 259-290. Museu Paraense Emílio Goeldi MPEG, Belém.
- Alves, Filho. Armando dos Santos
2000 A Guerrilha do Araguaia. In *Pontos da História na Amazônia Vol 2*, edited by Filho. Armando Alves, José Alves Jr., and José Maia Neto, pp. 71-99. Editora Paka-Tatu, Belém.
- AMPPDR
1996 *Regulamento de Queimadas na Colônia Del Rey*. Associação dos Mini e Pequenos Produtores da Colônia Del Rey/Comissão do Fogo/STR de Paragominas/IPAM. IPAM, Paragominas. 20 p.
- Banco Central do Brasil
2004 *Cotações e Boletins*. BCB Ministério da Fazenda. Electronic document, <http://www.bcb.gov.br/?TXCOTACAO>, accessed May 2004.
- Benedet, Maria Helena
2002 *Ibama Realiza Mega Operação no MT para Combater as Queimadas*. Electronic document, <http://www.amazonia.org.br/noticias/noticia.cfm?id=20347>, accessed August 2002.
- Bordenave, Juan E. Diaz
1985 *O Que é Participação*. Editora Brasiliense, São Paulo. 85 p.

Browder, J. O., and B. J. Godfrey

1997 Geopolitics, Regional Development, and Urbanization: Historical Dynamics of Amazon Frontier Expansion. In *Rainforest Cities*, pp. 55-82. Columbia university Press, New York.

Bunch, Roland

1994 *Duas Espigas de Milho: uma Proposta de Desenvolvimento Agrícola Participativo*. AS-PTA/PESACRE, Rio de Janeiro. 221 p.

BVRoraima

2004 *O Fogo que Entrou de Vez para a História de Roraima e do Brasil*. Electronic document, http://www.bvroraima.com.br/roraima_chamas.htm, accessed April 2004.

Carvalho, Katia

1999 *Manejo Comunitário de Queimadas*. LASAT/FATA, unpublished report, Marabá, January 1999. 49 p.

Carvalho, Katia, and Heloísa Aquino

1999 *Manejo Comunitário de Queimadas: Mais União, Menos Prejuízos*. LASAT/FATA/SUNY/DFID, Marabá. 20 p.

Carvalho, Antônio de Souza

2000 O CAT na Perspectiva do Movimento Camponês. In *CAT-Ano Décimo: Etnografia de uma Utopia*, edited by Jean Hébette and Raul da Silva Navegantes, pp. 65-76. Editora Universitária UFPA, Belém.

CAT

1994 *Documentação sobre a Sistematização de Dados e Análise Preliminar das Atividades do Projeto Agroflorestal (PAF)*. CAT/FATA, unpublished report, Marabá, August 1994. 19 p.

Catholic Church Archdiocese of São Paulo

1998 *Torture in Brazil: a Shoking Report on the Pervasive Use of Torture by Brazilian Military Governments, 1964-1979*. University of Texas Press, Austin. 238 p.

CPT

2004 *A Impunidade Permanece*. Comissão Pastoral da Terra. Electronic document, <http://www.cptnac.com.br/?system=news&action=read&id=1159&eid=8>, accessed April 2004.

Darlong, V. T.

2001 Traditional Community-based Fire Management Among the Mizo Shifting Cultivators of Mizoram in Northeast India. Paper presented at *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*, Balikpapan, Indonesia. Eletronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.

DFID

1998 *Projeto de Desenvolvimento Rural e Conservação Florestal no Tocantins-Fase II: Avaliação, Resultados/Objetivos*. Projeto DFID/FATA, unpublished report, Marabá, December 1998. 49 p.

EMBRAPA

2000 *Alternativas para a Prática de Queimadas na Agricultura*. Ministério de Agricultura e Abastecimento MAA/EMBRAPA, Brasília. 42 p. Electronic document, <http://www.cptnac.com.br/?system=news&action=read&id=1159&eid=8>, accessed January 2004.

Emerson, Robert M., Rachel I. Fretz, and Linda L. Shaw

1995 *Writing Ethnographic Fieldnotes*. The University of Chicago Press, Chicago. 254 p.

Emmi, Marília

1999 *A Oligarquia do Tocantins e o Domínio dos Castanhais*. UFPA/NAEA, Belém. 174 p.

Eva, Hugh, and Steffen Fritz

2003 Examining the Potential of Using Remotely Sensed Fire Data to Predict Areas of Rapid Forest Change in South America. *Applied Geography* **23**:189-204.

Forum das Entidades pela Reforma Agrária do Sul e Sudeste do Pará

2001 *A Violência Contra Trabalhadores Rurais no Estado do Pará*. FETAGRI MST/CPT/SPDDH/STR's Sul e Sudeste do Pará/FASE/CEPASP. 18 p.

Freire, Paulo

1985 *The Politics of Education: Culture, Power and Liberation*. Bergin & Garvey Publishers, South Hadley. 209 p.

1986 *Pedagogy of the Oppressed*. The Continuum Publishing Corporation, New York. 186 p.

1998 *Pedagogy of Freedom: Ethics, Democracy, and Civil Courage*. Rowman & Littlefield Publishers, Boston. 138 p.

Goldman, Mara

2003 Partitioned Nature, Privileged Knowledge: Community-based Conservation in Tanzania. *Development and Change* **35**:833-862.

Harwell, Emily E.

2000 Remote Sensibilities: Discourses of Technology and the Making of Indonesia's Natural Disaster. *Development and Change* **31**:307-340.

Hébette, Jean

2000 O CAT em Cronologia. In *CAT-Ano Décimo: Etnografia de uma Utopia*, edited by Jean Hébette and Raul da Silva Navegante, pp. 287-299. Editora Universitária UFPA, Belém.

Hébette, Jean, and Edna Silva Moreira

1991 Situação Social das Áreas Rurais Amazônicas. :CAT unpublished report, Belém, 1991. 22 p.

1997 Situação Social das Áreas Rurais Amazônicas. CAT, unpublished report, Belém, 1997. 22 p.

Holstein, James A., and Jaber F. Gubrium

1995 *The Active Interview*. Sage Publications, Thousand Oaks. 85 p.

IBAMA

1998 *Prevfogo: Áreas de Atuação*. IBAMA/PREVFOGO. Electronic document, <http://www.ibama.gov.br/~prevfogo/atua.html>, accessed September 2000.

2004a *Roraima Terá Plano de Prevenção a Incêndios Florestais*. Electronic document, <http://ibama.gov.br>, accessed January 2004.

2004b *Inaugurado o Centro de Monitoramento Ambiental do IBAMA*. Electronic document, <http://ibama.gov.br>, accessed April 2004.

2004c *Focos de Calor na Amazônia*. MMA/IBAMA/PROARCO - MCT/INPE. Electronic document, http://www2.ibama.gov.br/proarco/relatorio/Amaz_legal.htm, accessed April 2004.

IBAMA/GTA

1998 *Queimada Controlada: Verde é a Cor do Brasil*. IBAMA, Brasília. 36 p.

IBGE

1998 São Luís. IBGE-Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro. Map scale 1:1,000,000.

2002 Mapa de Clima do Brasil. Ministério do Planejamento, Orçamento e Gestão/ IBGE/ Diretoria de Geociências, Rio de Janeiro. Map scale 1:5,000,000.

Ingles, Andrew W., Arne Musch, and Helle Qwist-Hoffmann

1999 *The Participatory Process for Supporting Collaborative Management of Natural Resources: An Overview*. FAO, Rome. 84 p.

INPE

2004 *Histograma dos Focos de Calor-Noaa-12*. INPE/IBAMA/CPTEC/DPI. Electronic document, <http://www.doi.inpe.br/proarco/bdqueimadas/>, accessed March 2004

Jackson, W. T., and P. F. Moore

1998 The Role of Indigenous Use of Fire in Forest Management and Conservation. Paper presented at International Seminar on *Cultivating Forests: Alternative Forest Management Practices and Techniques for Community Forestry*. Bangkok, Thailand, September 1998.

Lichang, Zhang, Wu Long, Zhao Ya qiao, and lu Caizhen

2001 Community -based Forest Fire Management in Wenyime Village, Sancheahe Township, Dayao County, Chuxiong Yi Autonomous Prefecture, Yunnan Province, China. In *Communities in Flames*. FAO/Project FireFight South East Asia. Electronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.

Lima, Deborah, and Jorge Pozzobon

2001 Amazônia Socioambiental - Sustentabilidade Ecológica e Diversidade Social. In *Diversidade Biológica e Cultural da Amazônia*, edited by Ima Célia Guimarães Vieira, José Maria Cardoso da Silva, David Conway Oren, and Maria ângelo D'Incao, pp. 196-251. Museu Paraense Emílio Goeldi, Belém.

Lofland, John

1971 *Analyzing Social Settings: a Guide to Qualitative Observation and Analysis*. Wadsworth Publishing Company, Belmont. 136 p.

Makarabhirom, Pearmsak, David Ganz, and Surin Onprom

2001 Community Involvement in Fire Management: Cases and Recommendations for Community-based Fire Management in Thailand. Paper presented at *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*, Balikpapan, Indonesia. Electronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.

Margulis, Sergio

2003 *Causas do Desmatamento da Amazônia Brasileira*. Banco Mundial, Brasília. 100 p.

Mattos, Marli M., Katia O. Carvalheiro, and Renata A. Alves

2002 Regulamento Comunitário de Queimadas como Resposta aos Fogos Descontrolados. In *Simpósio Internacional IUFRO Manejo Integrado de Florestas Úmidas Neotropicais por Indústrias e Comunidades: Aplicando Resultados de Pesquisa, Envolvendo Atores e Definindo Políticas Públicas*, edited by César Sabogal and José Natalino Macedo Silva, pp. 281-297. CIFOR/EMBRAPA Amazônia Oriental, Belém.

Meggers, Betty J.

1994 Archeological Evidence for the Impact of Mega-Niño Events on Amazonia During the Past Two Millenia. *Climate Change* 28:321-338.

MMA

2000 *Lei da Vida: a Lei dos Crimes Ambientais*. Ministério do Meio Ambiente, Brasília. 39 p.

- Muchagata, Marcia, and Katrina Brown
2000 Colonist Farmers' Perceptions of Fertility and the Frontier Environment in Eastern Amazonia. *Agriculture and Human Values* 17:371-384.
- Muchagata, Marcia, and Katrina Brown
2003 Cows, Colonists and Trees: Rethinking Cattle and Environmental Degradation in Brazilian Amazonia. *Agricultural Systems* 76:798-816.
- Muchagata, Marcia, and R. Gonçalves
1996 Forest and People: The Role of Forest Production in Frontier Farming Systems in Eastern Amazonia. Master of Science, University of East Anglia. 89 p.
- Negreiros, Gustavo Hees de, Daniel Nepstad, David Sandberg, Ernesto Alvarado, Tom Hinckley, and Marcos Pereira
1996 Fire Along the Transition Between the Amazon Forest and the Cerrado Ecosystems. Paper presented at Proceedings of the *13th Conference on Fire and Forest Meteorology*, Lorne Australia.
- Nelson, Bruce W.
1997 O Índio e El Niño: Florestas Alteradas pelo Fogo Natural na Amazônia. Paper presented at *Congresso Nacional de Botânica*, Crato, Ceará.
- Nepstad, Daniel, Adalberto Veríssimo, Ane Alencar, Carlos Nobre, Eirivelthon Lima, Paul Lefebvre, Peter Schlesinger, Christopher Potter, Paulo Moutinho, Elsa Mendonça, Mark Cochrane, and Vanessa Brooks
1999 Large-Scale Impoverishment of Amazonian Forests by Logging and Fire. *Nature* 398:505-508.
- Oliveira, Arioaldo U. de
1989 *A Geografia das Lutas no Campo*. Editora Contexto, São Paulo. 101 p.
- Peters, William J., and Leon F. Neuenschwander
1988 *Slash and Burn: Farming in the Third World Forest*. University of Idaho Press, Idaho. 113 p.
- Presidência da República
2002 Lei no. 4.771, de 15 de Setembro de 1965: Institui o Novo Código Florestal. Medida Provisória no. 2.166-67, de 24 de Agosto de 2001. Presidência da República. Eletronic document, <http://www.planalto.gov.br>, accessed October 2002.
- PROARCO
1998 Programa de Prevenção e Controle às Queimadas e aos Incêndios Florestais no Arco do Desflorestamento. IBAMA/PROARCO, Brasília. Eletronic document, <http://www2.ibama.gov.br/proarco/apresentacao.htm>, accessed September 2003.

Pyne, Stephen J.

1998 Forged in Fire: History, Land, and Anthropogenesis Fire. In *Advances on Historical Ecology*, edited by William Balée, pp. 64-103. Columbia University Press, New York.

Rakyutidharm, Atchara

2001 Forest Fire in the Context of Territorial Rights in Northern Thailand. Paper presented at *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*, Balikpapan, Indonesia. Electronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.

Rubin, Herbert J., and Irene S. Rubin

1995 *Qualitative Interviewing: The Art of Hearing Data*. Sage Publications, Thousand Oaks. 302 p.

Ruddle, Kenneth

1974 *The Yukpa Autosubsistence System: a Study of Shifting Cultivation and Ancillary Activities in Columbia and Venezuela*. Ph.D., University of California, Berkeley. 368 p.

Sanderberg, David V., Ernesto Alvarado, Gustavo H. de Negreiros, João A. de Carvalho, Sue A. Ferguson, and Guido Ranzani

1998 *Modeling the Role of Fire in the Forest-Savanna Ecotone in the Brazilian Amazon: Fire Severity Under Present and Future Land Use and Climate Scenarios*. USDA Forest Service. 53 p.

Santos, Roberto

1984 Law and Social Change: The Problem of Land in the Brazilian Amazon. In *Frontier Expansion in Amazonia*, edited by Marianne Schmink and Charles H. Wood, pp. 439-462. University Presses of Florida, Gainesville.

Schmink, Marianne

1999 Conceptual Framework for Gender and Community-Based Conservation. *Gender, Community Participation and Natural Resource Management* :1-14.

Schmink, Marianne, and Charles Wood

1992 *Contested Frontier in Amazonia*. Columbia University Press, New York. 387 p.

SECTAM

2004 Meteorologia Marabá. SECTAM Secretaria Executiva de Ciência, Tecnologia e Meio Ambiente. Electronic document, <http://www.para30graus.pa.gov.br/meteorolo3c.htm>, accessed April 2003.

Sertsu, S. M., and P. A. Sanchez

1978 Effects of Heating on Some Changes in Soil Properties in Relation to an Ethiopian Land Management Practice. *Soil Science Society of America Journal* :940-944.

- Sestini, Marcelo Francisco, Regina Célia dos Santos Alvala, Eliana Maria Kalil Mello, Dalton de Morisson Valeriano, Chou Sin Chan, Carlos Afonso Nobre, João Argemiro de Carvalho Paiva, and Erica da Silva Reimer
2002 *Elaboração de Mapas de Vegetação para Utilização em modelos Meteorológicos e Hidrológicos*. MCT/INPE/CPTEC. 72 p.
- Setzer, Alberto W., and Marcos C. Pereira
1991 Amazonian Biomass Burning in 1987 and an Estimate of Their Tropospheric Emissions. *Ambio* 20:19-22.
- Skole, David, and Compton Tucker
1993 Tropical Deforestation and Habitat Fragmentation in the Amazon: Satellite Data from 1978 to 1988. *Science* 260:1905-1910.
- Soares, Ronaldo Viana
1985 *Prevenção e Controle de Incêndios Florestais*. MEC/CAPES/ABEAS, Brasília. 148 p.
- Sonko, Kebba, Saikou Samateh, Kanimang Camara, and Clemens Beck
2001 Why Don't They Come and Discuss Together? Community-initiated Stakeholder Co-ordination on Forest Fire Management in Rural Gambia. Paper presented at *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*, Balikpapan, Indonesia. Electronic document, <http://www.fao.org/DOCREP/006/AD348E/ad348e07.htm>, accessed April 2004.
- Souza Jr, Carlos, Laurel Firestone, Luciano Moreira Silva, and Dar Roberts
2003 Mapping Forest Degradation in the Eastern Amazon from SPOT 4 Through Spectral Mixture Models. *Remote Sensing of Environment* 87:494-506.
- Stone, Samantha Sara
2003 *From Tapping to Cutting Trees: Participation and Agency in two Community-Based Timber Management Projects in Acre, Brazil*. Doctor of Philosophy, University of Florida, Gainesville. 414 p.
- Sunderlin, Willima D.
1997 *Shifting Cultivation and Deforestation in Indonesia: Steps Toward Overcoming Confusion in the Debate*. Overseas Development Institute, London.
- Treccani, Girolamo Domenico
2001 *Violência e Grilagem: Instrumentos de Aquisição da Propriedade da Terra no Pará*. UFPA/ITERPA, Belém. 600 p.
- Uhl, Christopher, and J. Boone Kauffman
1990 Deforestation, Fire Susceptibility, and Potential Tree Responses to Fire in the Eastern Amazon. *Ecology* 71:437-449.

- Uhl, Christopher, Adalberto Veríssimo, Paulo Barreto, Marli Maria Mattos, and Ricardo Tarifa
 1994 Lessons from the Aging Amazon Frontier: Opportunities for Genuine Development. In *Biodiversity and Landscapes: a Paradox of Humanity*, edited by Ke Chung Kim and Robert D. Weaver, pp. 287-303. Cambridge University Press.
- Vargas, Rodrigo
 2003 *Queimadas: Cronograma de Combate Está Atrasado*. Diário de Cuiabá. Eletronic document, <http://www.diariodecuiaba.com.br/>, accessed June 2003.
- Veiga, Jr. Iran P.
 2000 *Plano de Desenvolvimento Integrado do Programa de Pesquisa-Formação-Desenvolvimento do NEAF Centro Agropecuário da UFPA: 2000-2004*. NEAF/CA/UFPA. Unpublished report, Belém.
- Velho, Otávio Guilherme
 1972 *Frentes de Expansão e Estrutura Agrária: Estudo do Processo de Penetração numa Área da Transamazônica*. Zahar Editores, Rio de Janeiro. 178 p.
- Velho, Otávio Guilherme
 1982 *Sociedade e Agricultura*. Zahar Editores, Rio de Janeiro. 145 p.
- Wanbergue, Emmanuel
 2000 O Programa CAT: Memórias de um Protagonista. In *CAT-Ano Décimo: Etnografia de uma Utopia*, edited by Jean Hébette and Raul da Silva Navegante, pp. 37-41. Editora Universitária UFPA, Belém.
- Warner, Katherine
 1991 Local Technical Knowledge and Natural Resources Management in the Humid Tropics. *Forestry Note 8*. FAO, Rome.
- Werneck, Keka
 2003 *Proibição não Impede o Aumento das Queimadas*. Gazeta Digital. Eletronic document, <http://www.amazonia.org.br/noticias/print.cfm?id=75749>, accessed July 2003.
- White, Sarah C.
 1996 Depoliticising Development: the Uses and Abuses of Participation. *Development in Practice* 6:6-15.

BIOGRAPHICAL SKETCH

Katia Carvalheiro was born in September 1st, 1966, in São Paulo, Brazil. In 1986, she started her undergraduate program in Forestry at the Escola Superior de Agricultura 'Luiz de Queiroz', University of São Paulo (ESALQ/USP). Before finishing her program, she developed her first work in Amazonia, studying deep-roots distribution in the Paragominas region, Pará state. In 1991, after finishing her undergraduate program, she moved to Pará state. In 1992, she took a one-year graduate program in Peasantry and Amazonian Natural Resources Management, in the University of Pará state. From 1994 to 1996, she developed a community fire management project with Ms. Marli Mattos, in Paragominas, Pará. In 1996, she coordinated a Community Forest Management project in the Marabá region, Pará, with the LASAT. In 1998 she was awarded a Inter-American Foundation and Programa Nature e Sociedade fellowships for masters-level studies, with concentration in Tropical Conservation and Development, at the University of Florida. After graduating, she returned to Pará state, Brazil, to continue working with peasants.