



## Sustainable development policies and the spread of land-sharing practices – A statistical assessment in a frontier region of the Brazilian Amazon



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### ARTICLE INFO

#### Article history:

Received 27 January 2013

Received in revised form

29 October 2014

Accepted 21 September 2016

Available online 6 October 2016

#### Keywords:

Pioneer front

Amazonia

Agrarian reform

Family farming

Inter-class analyses

Land sharing/land sparing

### ABSTRACT

Agrarian reform has become a highly topical issue in Brazil and is proceeding mainly along the Amazonian pioneer fronts, thus jeopardising the continuity of forest cover. Although it is sometimes accompanied by highly proactive policies for sustainable development, the results of these policies are extremely variable. In this article, we compare four sites where agrarian reforms have been applied; they are located along the boundary between eastern Amazonia (deforestation arc) and central Amazonia (along a pioneer front) and are variously covered by sustainable development policies. In each of these sites, we surveyed plant cover, existing production systems, the characteristics of the local populations and their quality of life in the sites themselves. We bring out discrepancies between sustainable development policies applied in the sites and their environmental preservation status. These discrepancies cannot be accounted for by the characteristics of the populations and do not bear any relation to people's quality of life in the different sites. While effects of context and of local levels of acceptance account for the success or failure of sustainable development projects, the agrarian reform policies we investigated are characterized by impacts that are negative for the environment but positive for the quality of life of local populations. By proposing a series of multivariate analyses and their combination through a scalar analysis, this article also puts forward an original methodology for studies of relationships between people and their environment.

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### 1. Introduction

The “land-sharing” versus “land-sparing” debate is useful for conceptualizing the choices made by policy makers in the agricultural sector to satisfy demand for food at the least cost to the environment (Green et al., 2005; Phalan et al., 2011). While “land-sparing” seeks to develop agriculture in areas most suited to this purpose, with specific areas set aside exclusively for conservation purposes, the aim of “land-sharing” is to develop agricultural

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systems where conservation and production coexist.

Many studies have shown that the opposition between conservation and development (represented in the land-sparing strategy) will become counter-productive in the long term, and that new forms of governance and action must be found to ensure that Amazonia can continue to deliver a range of environmental services in the future (Davidson et al., 2012) while also fulfilling various social and economic functions (Rodrigues et al., 2009). Even in areas mostly dedicated to food production, alternative agricultural systems are needed.

The situation in the Brazilian Amazon illustrates this necessity. From the 1990s to mid-2010, the Amazonian landscape came under conflicting management practices: on the one hand, conservation-gearred projects seeking to create more protected areas (Soares Filho et al., 2006), and on the other hand, policies looking to integrate the Amazon into the dynamics of capitalism, which are characterized by severe impacts on the Amazonian forest (Laurance et al., 2001). In the Brazilian Amazon, the conflict was partially resolved by partitioning the region into areas of different types: areas dedicated to conservation, areas dedicated to production (“land-sparing” strategy) and areas for sustainable use (geared to “land-sharing”). In the strategy of dividing the Amazonian region into areas managed for different purposes, family farmers in particular were considered as key players for establishing projects within the areas earmarked for sustainable development.

Furthermore, family farmers are also considered as key stakeholders in developing alternative, more environmentally sound agricultural systems. Land-sharing holds out greater potential for sustaining agricultural production because its core principle is the development of alternative agricultural systems, sometimes based on traditional forms of agriculture. The land-sharing strategy could therefore represent an opportunity for family farmers, who depend directly on the fertility of their immediate environment. They are better placed to invent and disseminate forms of development that can reconcile production and conservation objectives.

However, 20 years of sustainable development in the Brazilian Amazon have shown how difficult it is to create and disseminate such innovations (Albaladejo et al., 2005; Le Tourneau and Droulers, 2011). Although this is theoretically more relevant to family farmers than to other players who are less vulnerable to environmental degradation, the relevance is not immediately obvious to them (Brown and Purcell, 2005). Furthermore, it does not necessarily apply to all family farmers, since this social group is made up of people with very different patterns of activity (Arnauld De Sartre, 2006). Family farmers are in a situation that greatly reduces their capacity for defining alternative strategies (De Reynal, Muchagata, Topall and Hébette, 1997) and are very diversely linked to social and political organizations: depending on the location of their farm, the locality where they live and the social network they belong to, the reality they experience can be very different. This results in farming systems that are more diverse than expected from the literature (Castellanet et al., 1998; Pacheco, 2009a,b).

To understand how this diversity affects the dissemination of sustainable farming practices in rural areas, we propose to compare one “regular” and three “sustainable” settlement projects in the Eastern Brazilian Amazon (Fig. 2). The sustainable development projects were chosen for their characteristics and their main objectives in terms of the issues addressed: social issues, such as land reform, productive issues, such as incentives for extractive production, or socio-environmental issues. In this paper, these projects are characterized through an environmental assessment (land use) and a social assessment (quality of life). The diversity of situations is taken into account through the family profiles characterized, farm characteristics and the sociopolitical history of each project.

In this paper, we first present the context of settlements in the Amazon in general and in the study region in particular (section 1). We then describe the four projects studied and the methodology we applied (section 2). Next, we present the main results of the variables measured (land use dynamics, quality of life, farming systems and family profiles) for each area studied (section 3), which differ from the objectives of the policies applied in the sites. Using statistical methodologies, we then identify the main factors that could explain variations in project outcomes. This leads to a discussion, in section 4, of the main scales and technical and social issues that arise when disseminating sustainable development projects in situations as diverse as those encountered on the Amazon pioneer front.

## 2. Sustainable development, family farmers and productive areas in the Amazon

The presence of unproductive areas of land in the Brazilian Amazon attracts both farmers looking for (more) land and the Brazilian Federal State as it seeks ways of supporting its economic growth and honouring its commitments to agrarian reform. However these “unproductive areas” are also tropical rainforests - ecosystems that are of great importance for their biodiversity, as carbon traps and as the home of traditional populations such as native Amazonian people. The contradictory issues that arise result in numerous conflicts between the different Amazonian projects.

The division of the Amazon into different sub-regions, some dedicated to production, others to conservation, is one way to resolve such conflicts. In its *Amazônia Sustentável* program (Governo Federal do Brasil, 2007), the Brazilian Federal State divided Amazonia into zones of five main categories in order to rationalize its management and colonization: zones with a productive structure, either defined or to be defined, zones to be rehabilitated or reorganised, fragile zones, zones for sustainable uses, and protected areas (Fig. 1). The productive zones are either zones with a large number of agrarian reform beneficiaries (as in eastern Amazonia), or zones dominated by large cereal or cattle ranching farms.

In areas dedicated to development through agrarian reform, the social category generally described as “family farmers” is supposed to reconcile development (agrarian reform and food production) and conservation objectives. These migrant families, who live and work along the pioneer fronts, are among those responsible for deforestation since their livelihoods depend on farming the lands they have cleared. This is particularly the case in the Eastern Amazon where, since the 1970s, colonization has been organised along federal or state roads (mainly the Transamazonian and the Belém-Brasília roads) and the many secondary roads that branch off the main roads into the forest. After an initial period (1972–76) when family farmer settlements were encouraged and supported by the Federal State, large landowners were given many incentives in the late 1970s and 1980s. This did not discourage family farmers from extending their settlements along the secondary roads; they colonized the forested areas mostly by themselves. This situation led to numerous conflicts that have created a culture of violence in the region (Simmons et al., 2007). The return of democracy in the 1980s, spread of sustainable development objectives and the increasing demand for agrarian reform account for the renewed interest in family farmers since the 1990s. Sustainable farming practices were developed and disseminated within this region as a strategy to establish, stabilize and strengthen family farming. Large landowners have nevertheless increased their power with the establishment of large development projects in the region, and land conflicts have continued. State sovereignty has been reinforced since mid 2000, and the division of the Amazon into different sub-

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