



3° CONGRESO NACIONAL DE SISTEMAS SILVOPASTORILES



VIII CONGRESO INTERNACIONAL SISTEMAS AGROFORESTALES

Editor Dr. Pablo Luis Peri

**7 , 8 y 9 de Mayo 2015
Iguazú, Misiones - Argentina**



Restauración de paisajes y producción de alimentos orgánicos en sistema agroforestal

C. E. SEOANE¹; J. AMARAL; S. RÉDUA; L.C. FROUFE; W. STEENBOCK.

Resumen

El futuro de los paisajes de florestas tropicales depende si tenderemos o no la visión para guiarnos para la sostenibilidad. En este aspecto las agroflorestas - sistemas agroecológicos y agroforestales - son importantes. Nosotros realizamos un estudio de paisaje a través de técnicas de GPS en trece familias de campesinos asociados a Cooperafloresta, en el sudeste de Brasil, haciendo mapas de uso de la tierra. Desde 1994 hasta 2011 Capoeiras (Florestas en regeneración) e agroflorestas reemplazaron en el paisaje la creación extensiva de ganado e agricultura de tala y quema. Las agroflorestas son un ejemplo de sabia domesticación de la paisaje, pues sus dos métodos, parcelas de agroflorestas y capoeiras, rotacionando en tiempo y espacio, resultan en un paisaje productiva sobre un intenso proceso de restauración.

Palabras clave: agroecología, sostenibilidad, campesinos, floresta tropical.

Landscape restoration and organic food production on agroforestry system

Abstract

The future of tropical rainforest landscapes depends on our vision to guide ourselves towards sustainability. In this aspect Agroflorestas, agroecology-based production on agroforestry systems have a important role. We realized a GIS land use study on thirteen family production unities, from the peasant association Cooperafloresta, Southeast Brazil, building land use maps. From 1994 to 2011 Capoeiras (secondary succession forests) and agroflorestas substituted both extensive cattle grazing and slash- and-burn agriculture systems. These results show that the agrofloresta is an example of wise nature domestication, as it's two methods, capoeiras and agroflorestas plots, rotating in space and time, results on the scale of family production unity in a productive landscape undergoing an intense restoration process.

Key words: agroecology, sustainability, peasants, rainforest.

¹ Embrapa Florestas. Estrada da Ribeira km 111 cx Postal 319 Colombo_PR, Brazil. Eduardo.seoane@embrapa.br.

Introduction

There are already many evidences that the planet and its landscapes are undergoing a unsustainable trajectory, specially the tropical rainforest landscapes which have massively been converted to rural areas at an alarming rate. At a regional level, South America suffered the largest net loss of forests between 2000 and 2010 – about 4.0 hectares per year (FAO, 2010). Not only the future of tropical rainforest landscapes but also of the humanity as a whole depends on if we have or not the vision to guide the human activities towards sustainability (NRC, 1999; Wu, 2013). Both agroecology-based production systems and agroforestry systems have a important role on meeting the ongoing necessity of developing more sustainable food production systems. Agroecology-based production systems are meant to be biodiverse, resilient, energetically efficient, socially just and comprise the basis of an energy, productive and food sovereignty strategy. One type of agroforestry system, successional agroforestry systems, mix crops and several tree species progressively through time-increasing income, biodiversity, and ecosystem structure and function. During the successional process in both natural systems and analog crop systems, short-lived species are gradually replaced by long-lived species over a period of months to years to decades, as species requirements for soil fertility and light change, and vertical stratification increases (Vieira et al, 2009).

One example of a system that combines both agroecological and agroforestry principles is the Agrofloresta developed on Brazil by Ernst Gotsch and fellow associates. Agrofloresta is an agroecological food production agroforestry system designed from ground zero on which succession is accelerated with selective pruning to increase light levels in the understory strata, nutrients input and soil formation. It provides continuous food production and ultimately becomes an multilayer food production forest system (Vieira et al., 2009; Froufe & Seoane, 2011).

Agroflorestas are being developed at several localities. One is the Ribeira River Valley where a local peasant association – Cooperafloresta – is using Agroflorestas since 1994 (Figure 1). Steenbock et al. (2013) compared Cooperafloresta's peasants gains before and after they adopted Agroflorestas and showed that during this period they considerably bettered their life quality and the quality and variety of their food consumption. Before adopting Agroflorestas the peasants survived mainly from the production of beans in slash-and-burn agriculture and obtained yearly gains of US\$ 703. In 2011 the peasant's gains reached an average of US\$ 2160. The current markets include institutional

markets (government purchase), open-air markets and retails. Cooperafloresta sells a variety of approximately 130 raw products, among fruits, vegetables, leguminous plants and tubercles, and processed products. The principal product commercialized is banana.

Aiming to support local and worldwide political programs directed to the development of sustainable food production systems, we evaluated the outset of the adoption of agroecological food production agroforestry systems on the livelihoods of smallholder farmers and on the landscape transformation at their producing unities.



Figura 1. 17 years old Agrofloresta. Barra do Turvo, São Paulo State, Brazil. Photography: Soraya Rédua.

Methodology

This work was realized from 2010 through 2011 on the municipalities of Barra do Turvo, Adrianópolis and Bocaiúva do Sul, on the portion of Ribeira river Valley situated at the border between the States of São Paulo and Paraná, Brazil. The region has a steep landscape, with heights ranging from 200 to 1000 meters above sea level. The climate is classified as wet mesothermal subtropical, having a rainy and hot season from september to march, annual rainfall varying from 1.500

to 2.000 mm and annual average temperature at 21,5 °C. The predominant land uses are primary and secondary atlantic rainforest (45%) and a mosaic of slash-and-burn agriculture and extensive cattle grazing systems (60%) (figure 2)(SOS Mata Atlantica, 2013).

We realized a GIS land use study on thirteen family production unities, randomly selected from Cooperafloresta's total of 110 families. Data was collected at each family unity by walking

around each use land situation using a portable GPS accompanied by one of the families peasants, that was also asked to appoint the past land use of each land use situation. Using the program Arc View GIS 3.3., with the data gathered for each family production unity we build land use maps from 1994 to 2011. Land uses were classified on four types: 1- Atlantic Rainforest, areas covered by primary and mature secondary Forests,

2- Capoeira, areas where traditional slash and burn agriculture and cattle grazing practices were ceased and natural forest succession regeneration was allowed to begin and go on, 3- Agroflorestas, areas under agroecological production on agroforestry systems, 4- Slash-and-burn agriculture, an modified and more destructive form of swidden agriculture and 5 – Extensive cattle grazing systems, using rudimentary technology.



Figure 2. Typical Landscape of Barra do Turvo, São Paulo, Brazil, showing a mosaic of slash-and-burn agriculture, extensive cattle pastures and rainforest patches. Photography: Eduardo Seoane.

Results and discussion

The study of the land use shows that the average area of the thirteen families production unities is 24 hectares, ranging from 2 to 47 hectares. From 1994 to 2011 the area percentage covered by Atlantic Rain forest patches did not change, staying constant at 12% of the total area. Capoeira land use varied from 2% in 1994 to 43% in 2011. Agroflorestas were nonexistent in 1994 but occupied 30% of the total area in 2011. Capoeiras and agroflorestas substituted both extensive cattle grazing systems that diminished from 63% to only 4%, and slash-and-burn agriculture, that retrieved from 23% to 11% (Figure 3).

In 1994 a mosaic composed of slash and burn agriculture and extensive cattle grazing systems dominated the landscape of the 13 families unities surveyed, occupying 85% of their total area of these families. As occurring on many places with tropical and subtropical forest, the slash-and-burn agriculture practiced by this peasants differs from traditional slash-and burn shifting cultivation where production plots shifted from place to place over the years and the surrounding forests were allowed to regenerate unless it became the next production plot. Instead, as reported for another tropical forests, due to factors that include a biased government perception that traditional slash-and-burn agriculture is unproductive and harmful to forest conservation, the regional slash-and-burn agriculture is on an transitional state to more a intensive slash-and-burn agricultural land use, one that

deliberately prevents forest succession processes to occur trough setting the total area on fire. Fire is used also to maintain the natural successional forest process from occurring at the extended cattle grazing land use. Thus the capoeiras did not last more than two years and the natural succession processes occurred only at 12% of the total area, on the Atlantic rain forest patches.

The landscape use transformation that agroflorestas adoption brought resulted in 2011 in 85% of the total area undergoing forest succession processes, on Atlantic rain forest patches and capoeiras - natural processes at 55% of the total area - and on agroflorestas - induced forest succession - at 30 % of the total area. Thus during the 17 years surveyed the landscape matrix changed from fire using and forest succession suppression food production methods to an no fire using and forest succession inducer agroecological food production Agroforestry system.

In 2011, although the agroflorestas plots are the basis of food security and income production of the peasant families, the most common land use are the capoeiras. The capoeiras are the natural regeneration that grows after the abandonment of both slash and burn and extensive extensive cattle grazing systems. Similar as its use on traditional Slash-and burn agriculture, on the agrofloresta system the natural regeneration capoeiras are left untouched on the landscape for along time unless it is cut down to become an agrofloresta plot, because the peasant identify the capoeiras as

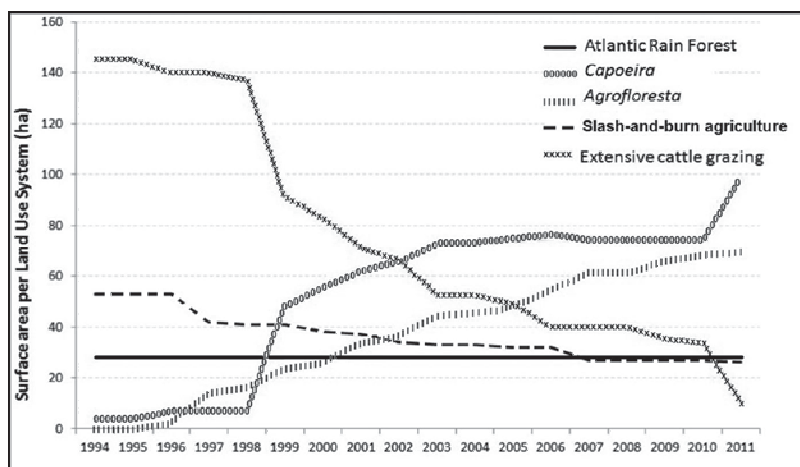


Figure 3. Changes on land use area (ha) on 13 family production unities associated to Cooperafloresta, from 1994 to 2011.

areas for soil improvement, habitat for seed and pollen dispersers and other factors that will on one hand contribute to the production of surrounding agroflorestas plots and on the other serve as optimized starting points for future agrofloresta plots (Steenbock et al., 2013; Seoane et al., 2012).

Vieira et al (2009) investigated Ernst Gotsch's agroflorestas plots in Bahia State, Northeast Brazil, and proposed that those should be considered a method of forest restoration, which they called agro-successional restoration, that could be used as a transition phase early in forest restoration to overcome socioeconomic and ecological obstacles to restoring these lands by extending the management period of restoration, offsetting some management costs, providing food security for small landholders, and

involving small landholders in the restoration process. We agree with the authors on their view about the agroflorestas plots, but consider that in terms of landscape restoration all the agrofloresta system, including the agroflorestas plots and the capoeiras, must be considered, because it enables the restoration of a fire destructed landscape matrix.

The areas of Cooperafloresta represent less than 1% of the territory of the local municipalities (SOS Mata Atlântica, 2013). Thus, although the Cooperafloresta agroforestry is an very interesting agriculture, it has not changed significantly the landscape of the region. But the transformation on the landscape matrix occurring at these family production unities is highly significant as an example to be followed, spread and adopted on tropical landscapes.

Conclusion

The agrofloresta practiced by these peasant families is an example of wise nature domestication, as it's two methods, capoeiras and agroflorestas plots, rotating in space and time, results on the scale of family production unity in a producti-

ve landscape undergoing an intense restoration process. Thus these agricultural technics are recommended to be diffused trough public politics that aim the sustainability of food production.

Aknowledgements

The research was generated through Projeto Agroflorestas, part of EMBRAPA's Macroprograma 06, and Projeto Agroflorestar, coordinated by Cooperafloresta and sponsored by Petrobrás.

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