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Linking Agrobiodiversity and Culture: The Dissemination of Agroforestry Practices by Indigenous Agents in Brazil

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Abstract

Agroforestry is the result of a dialectical relationship between humans and the environment, capable of increasing agrobiodiversity. However, the lack of technical assistance is considered to be one of the major obstacles to its implementation. In the Brazilian Amazon region, Agroforestry Indigenous Agents, attached to Acre State Pro Indigenous Commission (CPI-Acre), have been disseminating these practices through participatory processes that combine traditional knowledge with new techniques in order to ensure food security, improve environmental conservation and guarantee a good quality of life. They promote behavioral change towards more sustainable land management practices through knowledge-sharing.

Keywords

agrobiodiversity, agroforestry, indigenous agroforestry agents, sustainable land management

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Introduction

Agrobiodiversity cannot be dissociated from cultural diversity. Agriculture is a means of social affirmation, the result of a relationship of integration and exchange between humans and the environment. The protection of agrobiodiversity implies not only the protection of the environment, but also the protection of traditional knowledge and customs, which are part of the lifeways of indigenous peoples and small farmers. Agrobiodiversity and cultural diversity are interdependent and, according to Klaus Töpfer (UNESCO and UNEP, 2003), there is a strong correlation between areas of maximum biodiversity and areas of cultural diversity. Agrobiodiversity is the result of the complex and dynamic management of agricultural crops, wild crops and livestock by farmers.

The management of agrobiodiversity by farmers has multiple benefits, such as the balance of diverse crops in different agroecosystems, the sustaining of cultural and traditional values, and the conservation of local varieties, which is an important element of stress resistance and adaptation to different climates and environments (Machado, Santilli and Magalhães, 2008). Nevertheless, at global scale, the agricultural sector is one of the largest contributors to greenhouse gas emissions and biodiversity loss through conventional practices based on monoculture and pesticide use.

The aim of this paper is to demonstrate that agroforestry, an agroecological practice,[2] can enhance agriculture's positive outcomes through sustainable land management. However, agroforestry systems encompass complex practices and, if not managed correctly, they may not turn out to be sustainable. Amongst the obstacles to its implementation are the lack of information and lack of technical assistance, such as capacity-building, extension and research

[2] Beyond a set of techniques, agroecology can be considered as a branch of science that studies the application of ecological principals to agricultural systems and practices. And, over the years, it has become a social movement.

programmes. In order to overcome these obstacles, Agroforestry Indigenous Agents are generating behavioral change and promoting environmental protection through culturally founded participatory and educational processes. These agents belong to different indigenous ethnicity from Acre State, and are chosen from each village to help implement agroforestry practices based on their own traditional practices.

This paper is divided into three sections. The first section considers agroforestry systems generally as the result of a dialectical relationship between man and nature; the second section examines the role of the Agroforestry Indigenous Agents in knowledge-sharing in the Brazilian Amazon region; and the third section analyzes the important contribution of the Agroforestry Indigenous Agents to the socio-environmental management of indigenous territories in this region.

I. Agroforestry systems as the result of a dialectical relationship between man and nature

According to the general definition given by the World Agroforestry Center, agroforestry is ‘a collective name for all land-use systems and practices in which woody perennials are deliberately grown at the same land management unit as crops and/or animals. This can be either in some form of spatial arrangement or in a time sequence. To qualify as agroforestry, a given land-use system or practice must permit significant economic and ecological interactions between the woody and non woody components ‘ (Clarke and Thaman, 1993, 9). King and Chandler (1978, 2) complement this definition, stating that agroforestry is ‘a sustainable land management system which increases the overall yield of the land: combines the production of crops (including tree crops) and forest plants and/or animals, simultaneously or sequentially, on the same unit of land; and applies management practices that are compatible with the cultural practices of the local population’.

Agroforestry practices are based on a relationship of continuity, integration and support between humans and nature. Rather than manipulating technology to reach maximum output, as seen in conventional agriculture, the farmer tries to reproduce the dynamics of nature, in order to

optimize production and meet a wide range of economic and social needs (Ewert, 2014). This makes sustainability an intrinsic characteristic of the agroforestry system. The alternation of production during different periods throughout the year ensures greater profits per acreage unit and greater economic stability, since the earnings of certain seasonal products are balanced by others, reducing market risks for the farmer (Müller, 2006). Moreover, agroforestry plays an important ecological role, since agroforestry systems provide a range of ecosystem and environmental services, such as erosion control; retention of organic matter and improvement of the physical and chemical structure of the soil; increased nitrogen fixation and the promotion of efficient nutrient cycling; maintenance of biodiversity at levels similar, in some cases, to natural ecosystems; increased agrobiodiversity; and the capacity to recover and rehabilitate degraded land (Müller, 2006).

Agroforestry systems tend to sequester much greater quantities of carbon than agricultural systems without trees, since they store carbon in vegetation, as well as in soils. Agroforestry can contribute to climate change mitigation by enhancing carbon sequestration, as well as by improving micro climate and macro-climate conditions It also contributes to climate change adaptation, since the presence of trees in agricultural fields improves resilience to natural hazards, reduces vulnerability, diversifies production and income sources, and improves livelihoods, thereby building the capacity of smallholders to adapt to climate change (Uthappa, et al. 2017). Thus, it is considered to be a 'climate-smart' agricultural technique.[3]

From a social point of view, agroforestry systems can be seen as the result of a dialectical relationship between man and the environment. Agroforestry has emerged from traditional and cultural practices that bind humans and nature. New techniques and practices of environmental management have been created through cross generation cultural transmission of knowledge of ecosystems and plants. The transformation of the farmer's relationship with natural resources

[3] The climate smart agriculture approach (CSA) was developed at the 2010 FAO Conference on Agriculture, Food Security and Climate Change in Hague. It is an approach that seeks synergy between mitigation and adaptation to climate change, aimed at redirecting agricultural production systems towards sustainable development.

through agroecological practices such as agroforestry generates a behavior change towards more sustainable practices (Vivan, 2011). Agroforestry practices offer the potential to maintain stable populations in rural areas, as it requires a constant workforce throughout the year, promoting sustainable diversification of production, food security and good quality of life (Paludo and Costabeber, 2012).

Clarke and Thaman (1993) explain that there are two different approaches to agroforestry: the institutional approach, which relies on modern agronomic science and field experimentation; and the traditional or indigenous approach, which emerged from 'cultural geography and ecological anthropology'. In Brazil, within this traditional approach, the Agroforestry Indigenous Agents are important agroforestry disseminators in the Amazon region. Belonging to a different indigenous ethnicity from Acre State, they have been chosen from each village to help implement agroforestry practices within indigenous territories based on their own traditional practices (Gavazzi, 2012, 32).

According to Bianchini, the indigenous agroforestry practices of this region are based on three types of systems, each of which support a wide range of types of agrobiodiversity:

1. Agroforestry home gardens – involving the cultivation of fruit trees and other useful plants;
2. Agroforestry in *capoeira*[4] -- agroforestry practices implemented by the Indigenous Agroforestry Agents in secondary vegetation composed of sparse grasses and shrubs;
3. Swidden (fallow agroforestry) -- a year-long, rotating management system on communal farmlands, involving slash-and-burn of capoeira for farming, with subsequent enrichment with useful plants, such as fruit trees (Bianchini, 2006).

[4] Term originated from the Tupi language.

Miller and Ramachandran Nair affirm that indigenous agroforestry systems in the Amazon generate extensive knowledge on the interactions between plants and their environment, and among agricultural, social, and cosmological systems (2006, 158).

In the Brazilian Amazon region agroforestry is attracting increasing attention of local communities and governmental institutions. Nevertheless, Miller and Ramachandran Nair argue that " the current configuration of extension services has, however, been unable to meet the demand for technical assistance" (2006, 162). Given such a scenario, the Agroforestry Indigenous Agents can represent important actors in the agroforestry knowledge-sharing, as will be analyzed by the next section.

II. Indigenous agroforestry agents as knowledge sharers

Indigenous scholar education projects started to appear in the Brazilian Amazon region in the 1970s. The first indigenous teachers were trained, through a process of appropriation and re-signification of regular school education, by other indigenous people. Concerning government actions, the education department of Acre's State has been implementing indigenous teacher training programs since the 1980s (Bianchini, 2006).

Acre State Pro Indigenous Commission (CPI-Acre) was created in 1979 to support Acre's indigenous peoples in the fight for land, education, health and environmental protection through information and participation processes. It also promotes the professionalization of indigenous adults based on the principle of self-determination, in which the teaching material is elaborated by the indigenous peoples themselves (Bianchini, 2006). In 1983 the first teacher training course for indigenous health agents was completed (Bianchini, 2006).

In 1996, facing growing environmental and territorial concerns, and building on the success of indigenous health agents programs, the agricultural and environmental sector of CPI-Acre established the Territorial and Environmental Management Program. The program focuses on educational activities for the training of indigenous youth and adults regarding territorial and

environmental management of the indigenous territories. Within this program, natural resources, sustainable management and agroforestry practices are particularly important. Since 1996, the training of Agroforestry Indigenous Agents (AAFIs) has been developed as part of CPI-Acre's strategic actions. In the first year of the program, 15 agents were trained; subsequently, mobile workshops extended the training to other community members. Between 2000 and 2003, 38 agents were trained through the intensive courses and a further 87 were reached by the mobile workshops (Bianchini, 2006, 41). In 2012, there were 143 Agroforestry Indigenous Agents representing 13 ethnicities and 28 indigenous territories in Acre State (Gavazzi, 2012, 32). The agents are mostly men from 18 to 45 years, chosen for this function by the indigenous leaders of their communities (Gavazzi, 2012).

The program combines environmental conservation and management with the systematization of indigenous traditional knowledge (Gavazzi, 2012). It aims to enable a growing number of indigenous actors to identify, systematize, appreciate and use environmental knowledge and technology to manage land through culturally based participatory and educational processes. The program ensures support for indigenous peoples in order to increase their quality of life through sustainable land management (Bianchini, 2006, 42).

Currently, there are four types of training provided by the program (Bianchini, 2006, 42-49). These are:

1) Intensive courses at the Forest Peoples Training Center that happen once a year. This center was recognized in 1997 by Acre State government as the Indigenous Teacher Training School.
2) Mobile workshops conducted at the indigenous territories, which normally have a pre-defined theme, and focus on a problem in the territory’s socio-environmental context. These workshops enable the co-management of the project within the community.

3) Distance training programs that are promoted by technical advisors from the agricultural and environmental sector of CPI-Acre. An analysis of the indigenous agents' work is done in order to propose solutions to the existing problems through a participatory process.
4) Internships in which the agents visit other regions and receive visitors to extend their knowledge. This type of training enables learning though the peer-to-peer exchange of experience and contact with other realities.

Besides knowledge of agroforestry practices, the agents receive basic training in skills such as reading and writing, geography, ecology, mapping, math, political organization and representation, professional orientation and principles, surveillance, and environmental law (MMA, 2002. The material produced by the agents in the courses goes to the CPI Acre headquarters in Rio Branco. There it is cataloged and archived, for consultation and the preparation of didactic materials, as well as for the evaluation activities promoted to improve the training of agents. (MMA, 2002).

In view of their valuable environmental and technical services, the agroforestry agents were formally recognized by the Acre State government as « forest workers » and from 2001 a small amount of financial aid was granted. In 2002, the Association of Indigenous Agroforestry Agents was established. The association is responsible for ensuring the necessary financial resources for the viability of the agents' work (Gavazzi, 2012).

In 2009, the Acre State Education Council approved the political-pedagogical curricular proposal concerning the technical and professional training integrated with the basic education assessment of Agroforestry Indigenous Agents of Acre (EEC Resolution No. 236/2009 and EEC Council Resolution AC No. 101/2009). In 2017, aiming to encourage the training of new Agroforestry Indigenous Agents, the government of Acre State established a scholarship program to support the professional training of Agroforestry Indigenous Agents through Act 3.357/2017.

The agents are considered to be messengers who bring perspectives and experiences from within the indigenous territories out to the broader world and back to their territories. These messages are the new techniques and technologies learned at the training courses, which they share broadly in order to enable other community members to implement their projects (Bianchini, 2006, 82). They also articulate practice and theory by bringing to the training situations their personal knowledge and collective knowledge, cultural knowledge, intercultural and traditional knowledge accumulated in the experience of their daily lives as well as new technologies (MMA, 2002). This combination is called hybrid knowledge (Bianchini, 2006, 82). Alongside this knowledge-sharing, the agents also promote the environmental management of the indigenous territories through community engagement.

III. The important contribution of the Agroforestry Indigenous Agents to the environmental land management

The agents' activities are not only about planting, but also about guiding the community concerning environmental protection and sustainable natural resource management. As expressed in their official manifest in 2001 (Bianchini, 2006, 78), they consider themselves environmental indigenous agents. Each activity is discussed with the interested actors, and agroforestry implementation is undertaken only after a discussion within the community about the area of implementation and the species to be cultivated. Their main form of action is through community work, aiming for the common good (Bianchini, 2006, 78). The agents act in partnership with the communities within the indigenous territories in order to develop sound environmental land management, provide environmental education, ensure food security, and support cultural revitalization (Bianchini, 2006, 78).

During the training courses, the agents are invited to reflect on natural resources management plans that ensure sustainable use. In this context, the agents help with the systematization of environmental and land management plans for the indigenous territories of Acre State. These management plans are collective agreements on land and natural resource use, and their

development is undertaken through a participatory process that involves several indigenous representatives (Gavazzi, 2012).

The environmental and territorial management plans are important tools to assure socio-environmental sustainability of indigenous territories. These are undertaken with the aim of obtaining community support for improved natural resource use, management and conservation, and include objectives related to implementing community development projects, influencing public policy, and strengthening local land management (Gavazzi, 2012, 261-262).

Agroforestry Indigenous Agents play a crucial role within the process of environmental and territorial management: they communicate with the communities. As described previously, the agents are considered messengers who bring new information to other community members and spread information to other communities. They are capable of encouraging community members towards more sustainable land practices and of influencing public policies concerning land management. Furthermore, they help to find sustainable development options that foster climate change resilience and produce food while conserving the environment. Currently, Agroforestry Indigenous Agents are among the main protagonists of forest conservation, food security and quality of life improvement. However, an ongoing struggle is the lack of governmental recognition (Gavazzi, 2012).

Conclusion

Besides promoting climate change adaptation and mitigation, agroforestry has great potential to provide several ecosystem services essential to both man and nature. However, in order to be sustainable, mastery of advanced cultivation methods and technical and financial support are required to ensure adoption. In this sense, the agents act as disseminators of agroforestry practices. They mobilize the communities for reflection and the development of sustainable land use strategies. The success of this program is based on participation and the constant dialogue between new and traditional knowledge. The agents help to promote an intercultural dialogue. They help bring together traditional indigenous knowledge on the one hand, and new techniques

and technologies on the other, so that these can jointly contribute to the establishment of new production models better adapted to the socio-environmental local conditions. Thus, they should be professionally recognized as environmental managers by the State of Acre in order to establish a permanent contracting and remuneration mechanism for the socio-environmental services they provide to society (Gavazzi, 2012).

The indigenous agroforestry models generate better environmental, social, cultural and economic conditions. The Indigenous Agroforestry Agents play an important leadership role regarding the socio-political organization of indigenous territories and the establishment of natural resources sustainable use practices. They promote environmental awareness, and are respected as true environmental managers. They represent the communication link between communities and governmental and non-governmental institutions.

Besides the implementation of agroecological practices, the agents enhance the transmission of knowledge and cultural strengthening -- aspects that go beyond environmental and technical ones. The integration of new knowledge and traditional knowledge ensures the autonomy and rights of indigenous peoples. The work being done by the indigenous agroforestry agents provides an example of sustainable land and environmental management within indigenous territories: a perfect integration of culture and nature that improves environmental conservation and a training program that should be expanded to other indigenous territories.

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