

Agroforestry in the western Amazon – opportunities for new markets and threats from expanding natural resource extraction.

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Deforestation in the western Amazon – A global problem

Providing sufficient food for a growing world population and achieving more sustainable development is one of today's global challenges (Pretty et al. 2010, Foley et al. 2011, Sayer et al. 2013). But the expanding agricultural land and increasing agricultural intensification leads to ecosystem degradation, deforestation and biodiversity loss in many parts of the world, particularly in tropical areas (Geist and Lambin 2002, DeFries et al. 2010, Harris et al. 2012, Hansen et al. 2013). The western Amazon region is an area of astounding diversity, both in biodiversity, but also in cultural diversity. The region's ecosystems are of particular global conservation importance and recognized as an area of great animal and plant species diversity and richness (Mittermeier et al. 1998, Myers et al. 2000, Mora et al. 2013).

However, the region undergoes dramatic changes and forests are cleared for conversion to large scale agriculture, forests are fragmented by roads, and at risk from oil production and mining. Despite forest laws on paper, control and enforcement of forest protection is relatively weak. A large proportion (up to 98%) of the timber used in urban centers in the Amazon region is sourced through illegal logging and due to the outdated and inefficient technologies used a large amount of timber is wasted in the process (Palacios, 2009).

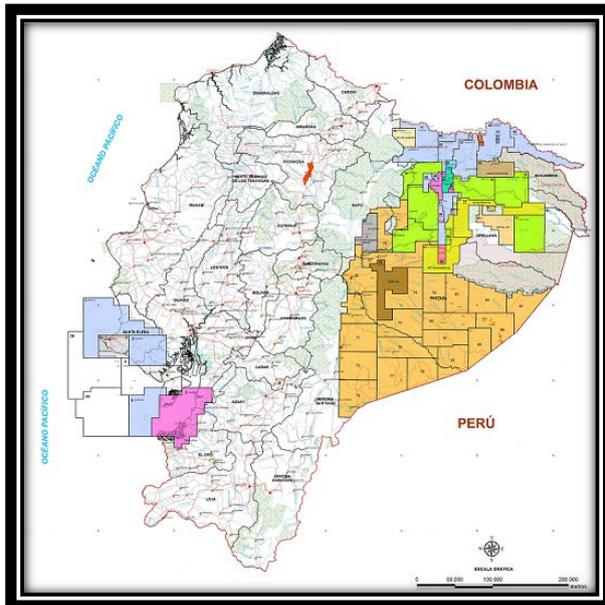
From a political perspective, the governments of Ecuador and Colombia are both pushing for extractive industries, foremost oil exploitation and mining, thus further signing the fate of the forest and their inhabitants.



On the way to Quito - Truck with Timber from the Amazon; Photo: Torsten Krause, Jan. 2014



Deforestation hotspots in Southern Colombia; IDEAM 2014



A map of Ecuador showing the currently exploited oil blocks in Ecuador (Blue, Purple, Green) and the designated blocks in the Amazon Region (Orange). (IGM, 2012)



Photo showing oil pipelines next to a gravel road in the Orellana province. (Photo: Torsten Krause, July 2011)

Oil exploration and production in the Amazon show no signs of slowing down or ceasing in the near future, particularly in the light of a planned construction of a new refinery (Martin, 2011a, Martin, 2011b). Indigenous groups and organizations in Ecuador and beyond strongly oppose oil development on their territories (CONAIE et al., 2012)

The role of agroforestry

Complex multistrata agroforestry systems, also referred to as home or forest gardens, are characterized by multistory combinations of trees and crops; where livestock may or may not be present (Kumar and Nair 2004) (see Figure 1). These complex systems store more carbon in aboveground biomass than plantations (e.g., coffee or cacao), monocultures (e.g., cassava, maize, plantain), or open pastures (Montagnini and Nair 2004, Porro et al. 2012) and provide significantly more biodiversity habitat than plantations and monocultures (McNeely and Schroth 2006, Bhagwat et al. 2008). For small scale farmers agroforestry means a diversification of cash and subsistence crops, which is a buffer against market price fluctuations, a balanced diet, the potential for new markets (i.e., for carbon sequestration) and less vulnerability to climatic changes and pests (Leakey 2007, Anderson and Zerriffi 2012, Nair and Garrity 2012, Porro et al. 2012). Many studies depict multistrata agroforestry systems as a potential and more sustainable forest land-use option, compared to intensive agriculture, with long term environmental and social benefits (Torquebiau 1992, Leakey et al. 2005, Mosquera-Losada et al. 2008, Schroth et al. 2011, Nair and Garrity 2012, Porro et al. 2012, Kull et al. 2013).

In the past years the scientific and political interest in agroforestry systems has increased, since these systems represent a source of income under a more sustainable land-use while possibly helping to curb tropical deforestation (Follis and Nair 1994, Mosquera-Losada et al. 2008, Nair and Garrity 2012, Porro et al. 2012). But despite its social and environmental benefits many current conservation and development initiatives fail to acknowledge the importance of maintaining agroforestry systems. Thus, there is a gap between strict environmental protection policies on one hand and the support of sustainable natural resource management for local food production on the other hand (Porro et al. 2012). While environmental policies aim to halt environmental degradation, traditional agricultural and economic policies promote agricultural intensification for food production and socio-economic development. Among small-scale farmers at the local level, these policies have contradictory effects, as their strategies and experiences are often not considered. Therefore, there is a need to understand how contradictory effects between policies impact farmer's agroforestry practices. The overall objective of this 3 year project is to understand why farmers decide to either continue multistrata agroforestry practices or switch to intensive agriculture. I aim to find out how and what influences farmers in their decisions regarding agroforestry practices. Thus, I aim to identify and understand what mechanisms can support agroforestry practices among farmers.

The Amazon region of Ecuador and Colombia

Multistrata agroforestry systems are representative of the relation between forests and Indigenous people living in the region and certain areas of Amazonian ecosystems have been used by generations (Clement and Junqueira 2010). Tropical multistrata agroforestry is the result of human adaptation to the characteristics of tropical forest ecosystems, which in general are not favorable to intensive or monoculture agriculture, for reasons such as rapid soil degradation and vulnerability to pests (Cochrane et al. 1985). However, in the agricultural frontier regions, the maximization of economic gains incentivized farmers to deforest for establishing monocultures or cattle ranching (Denevan 1973, Pichón 1997). Similar developments and policies in other Amazonian countries led to large-scale deforestation (Nepstad et al. 2002). While Ecuador has a high rate of deforestation compared to Colombia (FAO 2009, MAE 2011), deforestation in the Colombian Amazon is increasing due to the expansion of intensive agriculture, Indigenous farmers conversion of agroforestry to monocultures, mining and infrastructure development in the forest frontier (Armenteras et al. 2013).

Therefore, although both countries have different institutional set-ups, the current situation in each country offers sufficient reasons for comparison.

The region is threatened by climate change, such as increased droughts and fire risks (Malhi et al. 2008, Phillips et al. 2009, Jiménez-Muñoz et al. 2013), high rates of deforestation and land-use change driven by oil and mining activities, illegal logging and the expansion of intensive agriculture (Finer et al. 2008, DeFries et al. 2010, Armenteras et al. 2011, Armenteras et al. 2013). Agroforestry as a traditional land use is changing in light of land scarcity, increasing population and new sources of income from the government's conservation incentives that facilitate a transition to intensive agriculture, or from the increasing development of petrol industry and mining in the region. These changes will lead to pressures on agroforestry practices and people's livelihoods.

New Ideas for improving local livelihoods – Emerging Agroforestry Tree Products

To study an existing and emerging practical mechanism that has the potential to support agroforestry practices among farmers, the emerging Agroforestry Tree Product (AFTP) guayusa (*Ilex guayusa*). The Runa foundation supports farmers to expand guayusa growing in multistrata agroforestry systems, combined with already existing cash and subsistence crops. Guayusa is a native tree of the western Amazon region and has been grown by Indigenous groups in agroforestry systems for centuries. Guayusa leaves are harvested and traditionally used as tea and in ceremonies and, of the cultivated medicinal plants in the region; it is the most frequently used (Innerhofer and Bernhardt 2011). Recently, guayusa has been commercialized and marketed outside of the region, diversifying small-scale agroforestry systems beyond the conventional subsistence crops (plantain, cassava, maize, etc.) and cash crops (primarily coffee and cocoa). The commercialization of guayusa has the potential to support income diversification for farmers, who so far depend mostly on cash crops such as coffee (*Coffea Arabica*) and cocoa (*Theobroma cacao*). One advantage for farmers is that they receive a stable and pre-defined price for guayusa, reducing their vulnerability towards volatile prices for coffee and cocoa (Mejia 2013). However, the growing and commercialization of guayusa, as well as its effects on farmer's income and the environment, is little understood until now and this particular part of my research will provide a better understanding into the dynamics of this emerging AFTP.



Harvested guayusa leaves and the final product



Planting guayusa in a nursery before the plants are given to farmers

What the future holds?

The international pressure to preserve the remaining rainforests in the Amazon is increasing. But trade-offs between environmental protection, local livelihoods and macro-economic objectives are decisive and increasingly apparent. Both Colombia and Ecuador are pushing for more natural resources extraction in areas with ecosystems and forests that so far were relatively undisturbed. This is a trend we see all over the Amazon region and we have to keep in mind that while there might be some macro-economic benefits in the short run, the costs and benefits of natural resource exploitation are borne unevenly by different sections of the population. Indigenous people often bear most of the social and environmental cost, without receiving fair economic benefits in return.

In the face of a governmental drive towards auctioning off concessions for new oil blocks and mining operations in the Ecuadorian Amazon, deforestation, forest degradation, pollution and conflicts with Indigenous groups are expected to continue. Although Indigenous communities have strong land rights, the mineral rights remain with the Ecuadorian government. In light of this, many communities who largely rely on traditional agroforestry for their subsistence and livelihoods are faced with an uncertain environment. Their land rights are being undermined and their traditional livelihoods jeopardized.

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