SUSTAINABLE LANDSCAPES:

RECONCILIATING RURAL DEVELOPMENT AND ENVIRONMENTAL CONSERVATION

Picture: Luisa Lemgruber

Workshop

March 25 -26, 2015
International Institute for Sustainability (IIS)
Estrada Dona Castorina, 124 – Horto
Rio de Janeiro / RJ – Brazil

Realização **Parceiros** **Apoio**

LIST OF CONTENTS

EXECUTIVE SUMMARY

On March 25 and 26 of 2015, the International Institute for Sustainability (IIS) organized a workshop titled “Sustainable landscapes: Reconciliating rural development and environmental conservation”, where academics, government officials, members of research institutes and non-governmental organizations joined to present research projects and public and/or private initiatives to promote sustainable landscapes on different performance ranges. The experience exchange between participants promoted important and necessary debates regarding reconciliation of rural development and environmental conservation, and public policies that contemplates this relation. This workshop sought to bring multidisciplinary case studies, aiming to share knowledge, instruments and strategies when thinking about sustainable landscapes, challenges, potentialities and practical solutions.

Potential tools were presented such as biochar; restoration projects; innovative initiatives to incorporate sustainable development indicators; actions that are present throughout the state of Rio de Janeiro via Rio Rural's actuation; strategies for soil management in organic agriculture performed by Embrapa, ecosystem services and their valuation, financial strategies for sustainable landscapes among other topics.

A total of 42 participants, 25 lectures and 17 participating institutions were present (with representatives from several countries):

- International Institute for Sustainability (IIS)
- Norwegian Geotechnical Institute (NGI) - Norway
- Brazilian Agricultural Research Corporation (Embrapa)
- Botanic Garden of Rio de Janeiro (JBRJ)
- Conservation Strategy Fund (CSF)
- Instituto Centro de Vida (ICV)
- University of Leipzig - Germany
- University of Humboldt - Germany
- Agrosuisse
- State Department of Agriculture and Livestock (SEAPEC)/ Rio Rural
- Pontifical Catholic University of Rio de Janeiro (PUC-Rio)
- Instituto de Manejo e Certificação Florestal e Agrícola (Imaflora)
- Mais Água
- Postgraduate Program in Ecology and Evolution / University of the State of Rio de Janeiro (PPGCE/UERJ)
- Center for International Forestry Research (CIFOR)
- Associação Mico-Leão-Dourado
- University of Wageningen - Netherlands

Complementing to this meeting, the seminar “Biochar: a potential technique to improve the Environment” was held at Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), on March 23, 2015, with lectures of Agnieszka Latawiec (IIS) and Sarah Hale (NGI). Approximately 35 students from different courses, such as Geography and Environmental Engineering, as well as the Professors of the Department of Geography and Environmental Engineering attended to this event.

Due to the success of the meeting, the relevance of the discussions and the interest of the large public in participating in the discussions about sustainable landscapes this was the first of a series of conferences. The next workshop will be in 2016 and open to the public, held in the Rio de Janeiro’s Botanic Garden.

AGENDA

Wednesday, March 25

Session 1: Potential of Biochar

Moderator: Agnieszka Latawiec (IIS)

Agnieszka Latawiec (IIS) - *Welcome*

Agnieszka Latawiec (IIS) – *The use of biochar to sustainably increase agricultural productivity and to aid reforestation projects.*

Sarah Hale (NGI) – Biochar effect on nutrients and soil agronomy: laboratory tests and field trials in Indonesia and Malaysia.

Gerard Cornelissen (NGI) – Biochar implementation in Zambia and Nepal: technology, environmental impacts and socio-economics.

Carlos Alho (Embrapa) - *Studying the Indian black earth: Developing soil management techniques from systems.*

General discussion

Session 2: Valuation of the ecosystem services of landscapes and public policies

Moderator: Helena Alves Pinto (IIS)

Sven Wunder (CIFOR) – *When conditional payments meet integrated conservation: Early lessons from the Bolsa Floresta program (Amazonas).*

Mariella Uzêda (Embrapa) - Ecological *intensification in the productive process and biodiversity conservation.*

Marina Piatto (Imaflora) - *The trajectory of GHG emissions in the Brazilian agriculture and cattle ranching and the impact of agricultural policies.*

Alvaro Iribarrem (IIS) - *Valuation of the ecosystem services fit in it. 'Unlocking Forest Finance'.*

Francisco Beduschi (ICV) - *Program Novo Campo: Practicing Sustainable Cattle Ranching in the Amazon.*

General discussion

Session 3: Analyses and financial strategies for sustainable landscapes

Moderator: Kemel Kalif (IIS)

Fernanda Resende (CSF) e Camila Jericó-Daminello (CSF) - *Economic viability and financing sustainable biodiversity business.*

Márcio Rangel (IIS) e Daniel Silva (IIS) - *Economic analysis of a more sustainable cattle ranching.*

Ronaldo Seroa (UERJ/PPGCE) – *Bonus territory and sustainable cattle ranching and agriculture.*

Bernardo Strassburg (IIS) – *The national strategy for large-scale restoration and its implications for Archer project.*

General discussion

Thursday, March 26

Session 1: Restoration projects

Moderator: Ana Hardman de Castro (IIS)

Agnieszka Latawiec (IIS) e Maiara Mendes (IIS) – *Soil - forest feedbacks: indicators and implications for ARCHER.*

Renato Crouzeilles (IIS) - *The drivers of forest restoration success: a global meta-analysis of biodiversity and vegetation structure.*

Jerônimo Sansevero (IIS) – *Ecological restoration in the Atlantic Forest: from practice to theory.*

Felipe Barros (IIS) e Helena Alves Pinto (IIS) - *Spatial analysis: from data acquisition to the scenarios creation.*

Luisa Lemgruber (IIS) e Ana Hardman de Castro (IIS) - *Assessment of restoration success through sustainability indicators: the case of the city of Rio de Janeiro.*

Pablo Rodrigues (JBRJ) - *Biodiversity and restoration: the ideal and the impossible.*

General discussion

Session 2: Advancements in rural development research

Moderator: Márcio Rangel (IIS)

Ednaldo Araújo (Embrapa) e José Antônio Espíndola (Embrapa) – *Strategies for soil management in organic agriculture.*

Luiz Fernando de Moraes (Embrapa) - *The potential role of innovative agriculture and cattle ranching practices in the environmental adjustment of rural properties.*

Ricardo Novaes (SEMEA/PMSJC - Mais Água) - *The potential role of innovative agriculture and cattle ranching practices in the environmental adjustment of rural properties.*

Helga Hissa (Rio Rural) - *Rio Rural Program Experience: Building sustainable landscapes in micro-watersheds of Rio de Janeiro State.*

Rachel Prado (Embrapa) - *Research Networks on Enviromental Services in Rural Landscapes: challenges and opportunities along with public policies.*

Rafael Feltran-Barbieri (IIS) - *Beyond the Amazon: agricultural expansion and land-use change across Brazil 2000-2012.*

General discussion

INTRODUCTION

Landscapes are constituted by interrelations of urban-anthropogenic and environmental elements and, therefore, they are subject to constant changes and dynamic processes, making them vulnerable to such interventions.

On October 20, 2000 the "European Landscape Convention" was signed, in which was considered essential to achieve sustainable development by setting a balanced relationship between social, economic and environmental means, using the landscape to perform public interest functions in favor of a better protection, management and ordering in cultural, ecological, environmental, social and economic fields. It was clear to the convention the landscape role on improving welfare and quality of life.

This way, sustainable landscapes appears as modern conceptions of the landscape concept. Sustainable landscapes need to conciliate social, economic and ecological interests, integrating them to the territorial planning processes on different performance scales, whether on urban or rural, degraded or non-degraded areas. These landscapes seek to maximize the socio-economic and environmental benefits and, at the same time, minimize possible conflicts of space and resource management.

When it comes to rural areas, a lot has been said about “Sustainable Productive Landscapes”, resulting from combinations of important areas for biodiversity conservation and protection of natural resources with suitable areas for the execution of rural activities.

Therefore, the landscape needs to be understood ever more as a place with strong potential to reach sustainable planning, where all spheres (environmental, social and economic) are benefited. However, achieve this goal is not an easy task, many are the challenges to integrate all components in landscapes and intersectoral partnerships towards sustainable development. Is that possible? If so, what are the best ways to achieve the conciliation of all interests considering such complexity?

This way, the workshop “Sustainable landscapes: Reconciliating rural development and environmental conservation” sought to bring multidisciplinary discussions and case studies, aiming to share knowledge, instruments and strategies when thinking about sustainable landscapes, their practical applications, challenges, potentialities and practical solutions.

SUMMARY OF PRESENTATIONS

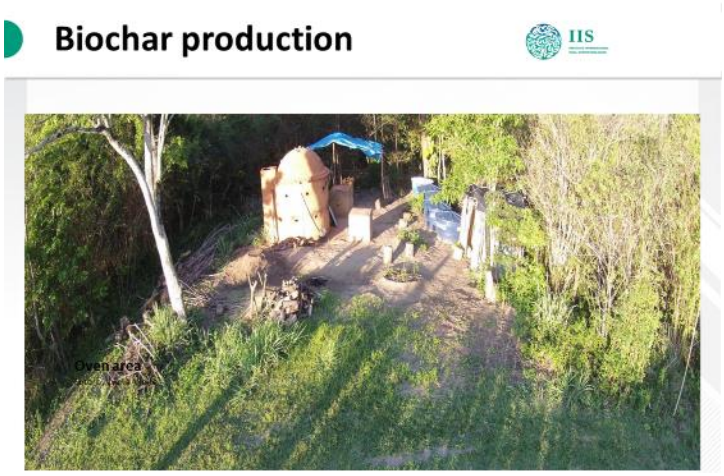
First day of workshop, March 25

Session 1: Potential of Biochar

Moderator: Agnieszka Latawiec (IIS)

This session was dedicated to present studies regarding the biochar tool, explaining its source (related to the Indian black earth) and characteristics, beyond the limitations and potentialities of its use. As a relatively new tool for the researches, much has been developed to find out better uses of biochar on distinct soils and local conditions.

Agnieszka Latawiec (IIS) – *The use of biochar to sustainably increase agricultural productivity and to aid reforestation projects.*



Biochar is a potential tool to increase soil quality and, thereby, boost agricultural productivity or the reforestation success. The International Institute for Sustainability, along with partners, started in 2014 the project seeing biochar as an enhancer of pasture soils and organic agriculture of maize and beans. In addition, the survival and other indicators associated to reforestation of three Atlantic Forest native species are tested in collaboration with Embrapa Agrobiologia. This research focuses not only on environmental aspects of the potential to increase agricultural productivity in the long term, but also analyzes social and economic aspects related to the viability of biochar use in practice.

Sarah Hale (NGI) – *Biochar effect on nutrients and soil agronomy: laboratory tests and field trials in Indonesia and Malaysia.*

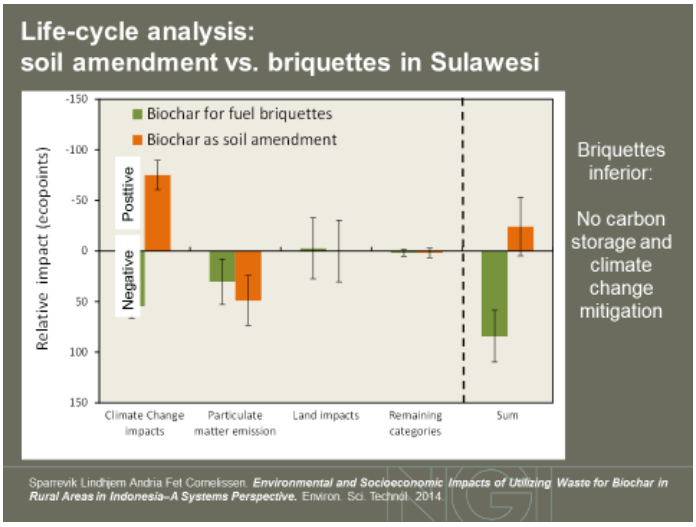
Biochar has been mentioned as a tool to improve the quality of agricultural soils and its nutrient content. We are focused on both macro and micronutrients and investigated both biochar alone and in the presence of soil.

Two biochars were selected, one from corncob and made in Zambia and one from cacao shell made in Indonesia. The experiments carried out with biochar alone were done so to investigate the behavior of ammonium, phosphate and nitrate. Biochar was found to release phosphate, weakly bind ammonium and had no influence on nitrate. The biochar likely acts as a sponge for ammonium, first sorbing it and then releasing it. This in combination with the release of phosphate means that biochar can improve the quality of certain agricultural soils that have a lack of essential nutrients. Biochar should be used in combination with fertilizers to achieve the best effect.

In the presence of soil, the picture was slightly different. Soils from Indonesia and Zambia were used on the experiment and represented peaty, sandy and loamy soils. Biochar produced from corncob was added at two doses (5 and 10 % by weight). Ammonium concentrations were not affected when biochar was added to soil, however nitrate concentrations increased. The concentration of aluminum, which can often be present at levels high enough to be toxic to plants, decreased in the presence of biochar.

Field trials have been carried out in Indonesia to investigate whether these trends are present in real world situations. Biochar from cacao shell was added to soil on upland and lowland rice and maize was plantings. Biochar increased the pH of the soil, increased the cation exchange capacity of the soil, altered the nutrient composition and resulted in an increase in plant yield in some cases.

Gerard Cornelissen (NGI) – *Biochar implementation in Zambia and Nepal: technology, environmental impacts and socio-economics.*



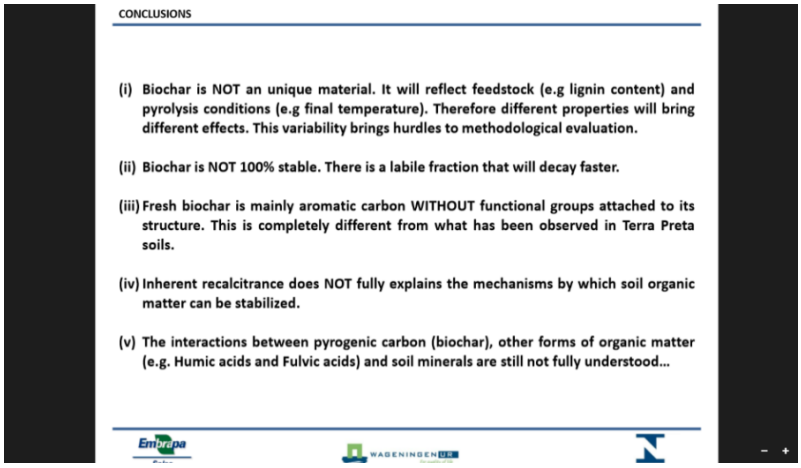
A suite of multidimensional biochar projects in tropical countries was presented. Experiments on soil dynamics showed several factors that contribute to agronomic effects of biochar: water retention in Zambia and sandy Malaysian soil, pH effects on Sumatra and acid sulphate soil in Malaysia, and water drainage effects on West-Timor. Biochar on Sumatra was shown to decrease strongly N2O emissions, and a pH increase was probably part of the reason.

Technology: improper technology will result in emissions of CO, CH4 and smoke. Gas emission data have been obtained for several type of retort and traditional technologies in all four countries, and show that retort technology is about a factor of four cleaner than traditional technology.

A life-cycle analysis for the Zambian situation showed that biochar implementation is optimal when done with proper technology, but that non-improved technology still is favorable in a life-cycle perspective if crop yield responses are big enough. A life cycle and cost-benefit analysis for Indonesia showed that soil amendment

is better than biochar briquetting, mainly because of carbon sequestration effects and the high labor required to make briquettes.

Carlos Alho (Embrapa / Universidade de Wageningen) - *Studying the Indian black earth: Developing soil management techniques from systems.*



The quantity and quality of organic matter play an important part in the chemical, physical and biological properties of soils. Pyrogenic carbon - a fraction of the organic matter - is highly resistant to thermal and chemical degradation, and to photo oxidation, which has been claimed as the responsible for its long stability against microbial degradation and for ensuring soil fertility in a sustainable way.

The Indian Black Earth is an anthropic soil highly fertile, which superficial horizons are rich in pyrogenic carbon with a graphitic core and surface oxidized. Compared to adjacent soils, the Indian Black Earth also presents a higher theor of organic matter, nutrient content, and higher cation exchange capacity. Compared to adjacent soils, the Indian Black Earth also presents a higher theor of organic matter, nutrient content, and higher cation exchange capacity.

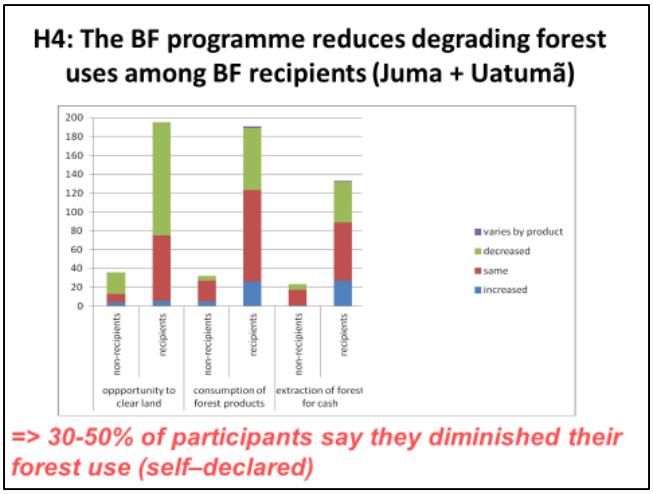
The single contribution of organic matter to the cation exchange capacity is difficult to determine since the minerals and organic matter are usually aggregated. Although the pyrogenic carbon occurs within micro aggregates, it is still unclear how the particles interact with each other. It was suggested that the phosphate adsorption reduces the solubility of mineral particles, which results in a smaller particle size, hence in a larger surface area, allowing the stabilization of high amounts of organic matter.

Therefore, the purpose of this study is to investigate the roles and the interactions between metal oxides, pyrogenic carbon and phosphorus on the organic-mineral interactions related to the organic matter stabilization on Indian Black Earth, as a breakthrough in understanding these as a model for sustainable land use.

Session 2: Valuation of the ecosystem services of landscapes and public policy
Moderator: Helena Alves Pinto (IIS)

Only by understanding the ecological and socioeconomic conditions of landscapes, it is possible to suggest an assessment of ecosystem services and its benefits. This approach, which connects the investigation of ecosystems to economic parameters, is innovative, promising and aims at the development of biodiversity conservation and the need to improve the life quality of the population living in the landscapes. This way, this session sought to present different proposals of successful valuations at national level such as Bolsa Floresta Program, the agro-ecological management as an approximation between the productive efforts and the biodiversity conservation, the trajectory and estimation of greenhouse gases (GEEs), "Unlocking Forest Finance (UFF)" and the Program Novo Campo.

Sven Wunder (CIFOR) – *When conditional payments meet integrated conservation: Early lessons from the Bolsa Floresta program (Amazonas).*



A lot of interest continuously surrounds Reduced Emissions form Deforestation and forest Degradation (REDD), yet still we know little about how the early REDD movers have fared. The Bolsa Floresta Program was launched in 2007 in 15 Sustainable Development Reserves (SDR) of the State of Amazonas (Brazil). The one in the SDR Juma became Brazil's first certified REDD project. Bolsa Floresta combines in a market-remote, forest-rich setting the use of household-level payments for environmental services (PES) with community-level integrated conservation and development projects (ICDPs), and the enforcement of protected area regulations.

This study was implemented by a CIFOR-led consortium of researchers, in collaboration with project implementers. It characterizes the intervention context, based on a detailed socio-economic survey in SDRs Juma and Uatumã (incl. Respective control Groups), and complemented by analyses based on remote sensing. We find it likely that Bolsa Floresta has generally improved the livelihoods of program participants, and also at the margin further reduced forest threats, although from an already low-threat baseline.

We recommend steps for improved program monitoring, allowing for further customization of the applied intervention mix. An early lesson for REDD is that forest incentives in remote forest-rich, low-deforestation environments can help building locally supported conservation alliances early on, but these alliances will only stand their test of resilience once stronger environmental threats materialize.

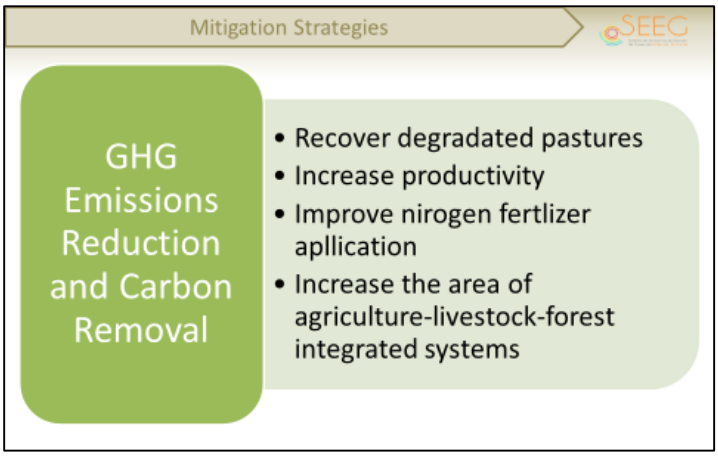
Mariella Uzêda (Embrapa) - *Ecological intensification in the productive process and biodiversity conservation.*

In agricultural landscapes, the presence of natural habitats associated with adopting agro ecological practices are factors known to increase the resilience of production systems, facilitating the adaptation to climate changes and other anthropic or natural pressure vectors. Several studies state that the conversion of potential benefits of biodiversity allows translating conservation in actual goods and services for society, especially for the local community, by providing several alternatives to the new species, productive systems adapted to local conditions and able to fit themselves to changes over time.

However, despite being recognized as a "hotspot" of global biodiversity, the Atlantic Forest still has numerous knowledge gaps, especially in studies of potential of local biodiversity on direct use, as income-generating species, or indirect use, in providing environmental services. In this sense, the agro ecological management focused on the family farm has been the object of work of the proponent team, seeking an approach between the productive efforts and the biodiversity conservation.

The works being performed are complementary, involving multi-scale studies, considering from the diversification of systems using native species (arboreal and herbaceous), suitability of handling techniques that promote biodiversity, to the exchanges with the surrounding ecosystems. The agriculturist's knowledge about local biodiversity and his daily experiences associated with technical knowledge have guided the actions of the project.

Marina Piatto (Imaflora) - *The trajectory of GHG emissions in the Brazilian agriculture and cattle ranching and the impact of agricultural policies*

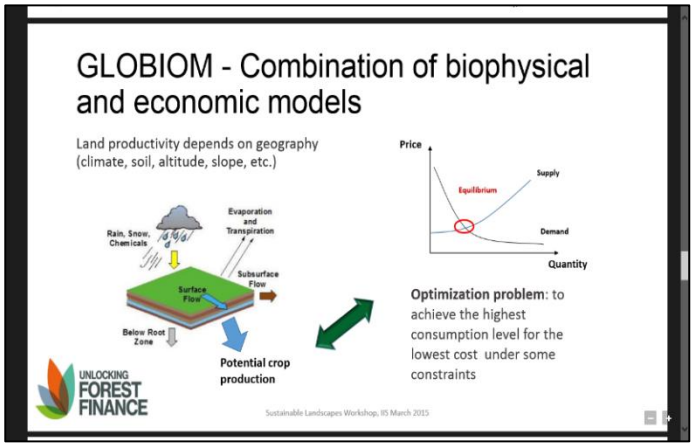


Based on civil society initiative to annually update the emission of greenhouse gases in Brazil, this lecture seeks to promote a debate on GHG emissions in agriculture and cattle ranching and the impact of public policies on climate change.

The SEEG (System of Greenhouse Gas Emissions

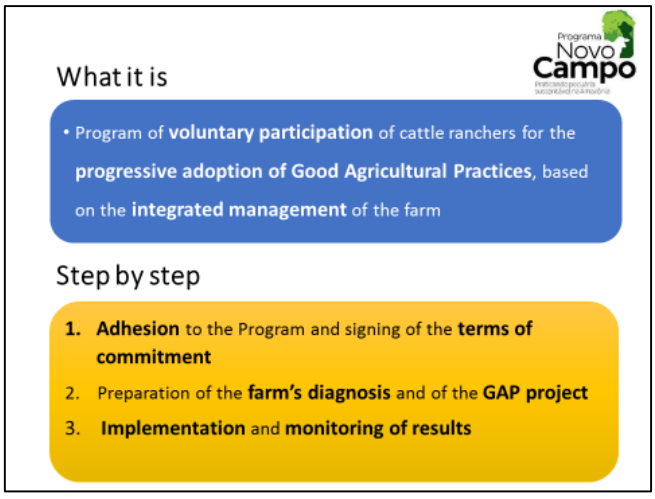
Estimates) is a Climate Observatory initiative (Observatório do Clima in Portuguese) to perform the annual estimate of GHG emissions in Brazil. Using the IPCC methodology, the SEEG estimates emissions in the following areas: agriculture, land use change, energy, industry and waste.

Alvaro Iribarrem (IIS) - *Valuation of the ecosystem services fit in it. 'Unlocking Forest Finance'.*



This talk included a brief introduction of the project "Unlocking Forest Finance (UFF)", its goals and how the valuation of the ecosystem services fit in it. It was discussed the approaches to three regions around the Amazon forest and land-use models, its inputs, outputs, and main assumptions.

Francisco Beduschi (ICV) - *Program Novo Campo: Practicing Sustainable Cattle Ranching in the Amazon.*



The lecture presented a brief history and the results of the Program Novo Campo, which pilot phase was conducted with 14 producers in the municipality of Alta Floresta/MT and had the adoption of Good Agricultural Practices (GPA) recommended by Embrapa. The implementation of livestock areas intensive and the recovery of riparian vegetation, beyond the model viability with the pilot phase results. The lecture also presented the Program Novo Campo through: 1) components and expected results; 2) criteria and commitments for participants; 3) governance; 4) status and next steps.

Session 3: Analyses and financial strategies for sustainable landscapes
Moderator: Kemel Kalif (IIS)

Session 3 consisted of lectures presenting strategic and financial studies that combines the increase of producer income and biodiversity conservation.

Briefly, it was presented: a study on profitability and financial attractiveness of the business community based on the sustainable use of biodiversity; the evaluation of the risks of intensification to the financial return of cattle ranching; the discussion on tax incentives offered to rural producers to adopt good sustainable practices; and the Archer project presentation as a national strategy for large-scale restoration.

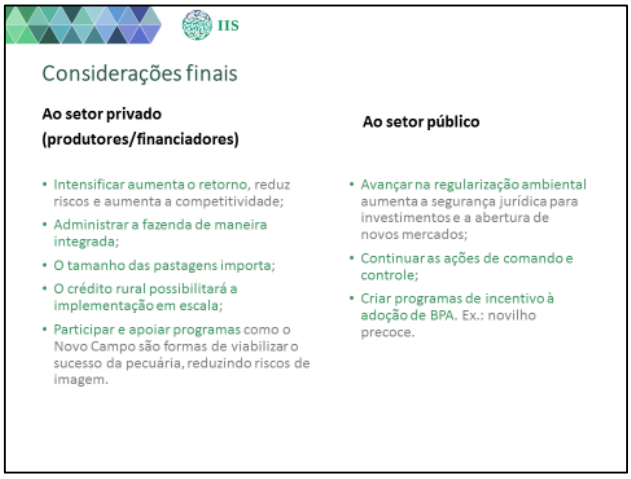
Fernanda Resende (CSF) e Camila Jericó-Daminello (CSF) - *Economic viability and financing sustainable biodiversity business.*

This lecture presents and launches a study by Conservation Strategy (CSF) about the rentability and financial attractiveness of communitarian business based on sustainable use of biodiversity. This study was based on CSF´s support to experiments in strengthening sustainable production chains in protected areas, such as the Brazil nut, artisanal fishing, wood and tourism.

It compares investment viability indicators Net Present Value (NPV), Internal Rate of Return (IRR) and Discounted Payback, and gross and net income estimative found in six business plans and through an income monitoring performed between 2010 and 2013. Moreover, it provides guidance to communities, governments and non-governmental organizations on how resources can be applied to overcome bottlenecks and have higher profitability of these activities.

The profitability expansion of this business was considered a challenge and a priority for the current phase of the Action Plan for Prevention and Control of the Legal Amazon Deforestation (PPCDAm). The continuous reduction of deforestation rates depends on the economic valuation of environmentally sustainable productive activities that promotes life quality and social progress of the Amazon population.

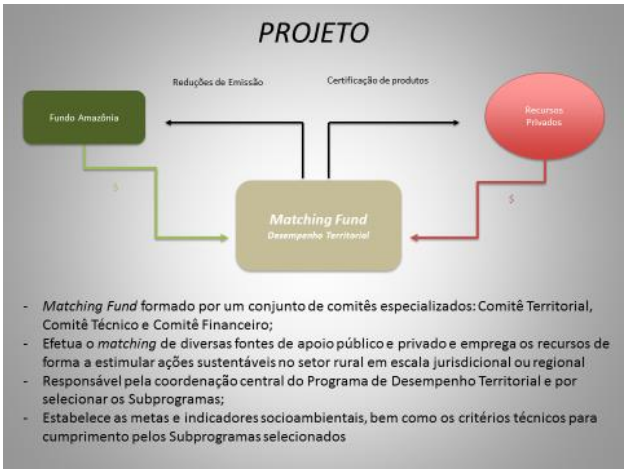
Márcio Rangel (IIS) e Daniel Silva (IIS) - *Economic analysis of a more sustainable cattle ranching.*



In this work, the economic performance of the intensified and traditional cattle ranching was modeled, in the micro-region of Alta Floresta, in the Brazilian Amazon. Parallel to the increase of meat demand, the Brazilian cattle ranching has suffered market pressures and legal actions to enforce labor laws, environmental regulation and zero deforestation. As a way to increase the production without new deforestation, some producers have been investing in increasing productivity, in other words, the higher production in smaller area.

The bio-economic model developed by IIS evaluates the impacts of intensification technologies and the financial return of cattle ranching. Beyond the traditional financial indicators (NPV and IRR), we calculate the risk of viability cattle ranching in different technologies. The results indicate that the intensified cattle ranching is more profitable than the traditional one and the rural credit may be the mechanism to put this intensification at scale. Furthermore, the government needs to continue the command and control actions in order to avoid the rebound effect of the financial return of intensification.

Ronaldo Seroa (UERJ/PPGCE) - *Bonus territory and sustainable agriculture and cattle ranching.*

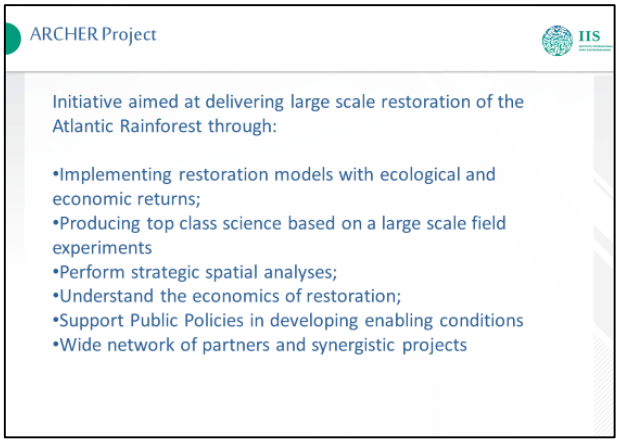


Tax and credit incentives offered individually to each producer for the adoption of sustainable practices, in particular for the deforestation control, lacks a territorial approach to promote an increase in scale of its results.

In this sense, incentives based on territorial performance have been discussed as a mechanism that induces the cooperation of local authorities and producers. This is because such incentives make additional payments to producers based on territorial performance and thus stimulate the continuity of the actions, which were initially carried out through individual incentives. This dynamically attracts the adherence increasing from other

producers and expand the commitment of public environmental management to achieve territorial scale for continuous capture of territorial incentives.

Bernardo Strassburg (IIS) – *The national strategy for large-scale restoration and its implications for Archer project.*



The Brazilian Atlantic Rainforest is considered a global hotspot (Mittermeier et al., 2004), often referred to as "the hottest of the hotspots" (Laurance, 2009) due to its high diversity, endemism and species richness. Its importance for people living in the region has been recognized for over 150 years when, for example, the Tijuca National Park in Rio de Janeiro was founded in 1861 to safeguard clean drinking water supply for the city's then rapidly growing population. Today, the Atlantic Forest provides clean drinking water to 70% of Brazil's population. The maintenance of this and other vital ecosystem services, including protection from landslides (which killed over 900 people in 2011), carbon storage and the protection of its globally unique biota, are threatened by widespread deforestation and degradation: the Atlantic Forest now encompasses less than 15% of its original extent, mostly in small fragments. The urgent need for widespread forest restoration is now well recognized, as highlighted recently by a Supreme Court battle over water rights between the states of Rio de Janeiro and São Paulo following droughts in 2014 and extreme drought events in 2015.

Reforestation is currently supported by political will and popular support, such as the New Forest Code (National Law No 12.651/2012) that requires restoration of millions of hectares of forest across Brazil. While there is currently a great opportunity, delivering large-scale reforestation is complex and requires a deep understanding of mechanisms for equitable and effective reforestation that requires an interdisciplinary approach and involves a range of stakeholders including researchers, policy, business and civil society. This project aims to i) diminish existing gaps in understanding of restoration success and investigate restoration impacts on soil and water, and apply these lessons learned to places with relatively less reforestation (synthesis of lessons learned and recommendations from older reforestation sites to new sites); ii) critically assess the opportunities and trade-offs for food, water and biodiversity associated with large-scale restoration and agricultural development in the Brazilian Atlantic Forest; iii) spatially indicate priority areas for restoration that include environmental and socio-economic factors; iv) perform reforestation on at least 200 hectares of priority restoration area; iv) propose tailor made policy recommendations.

Second day of workshop, March 26

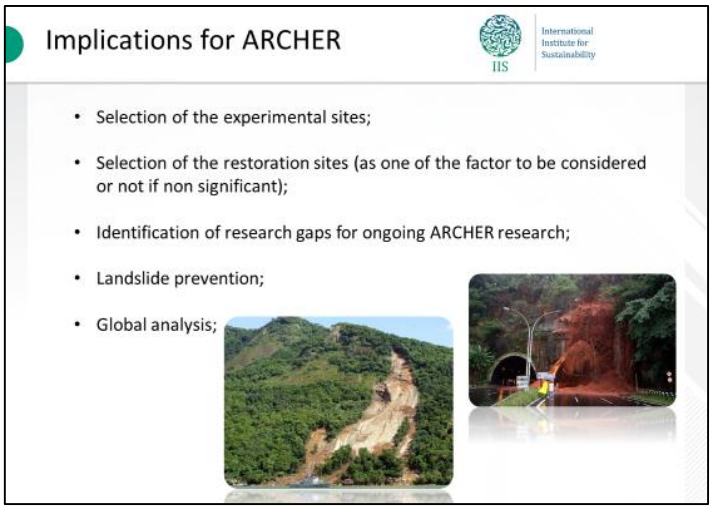
Session 1: Restoration projects

Moderator: Ana Hardman de Castro (IIS)

The first session of the second day focused on enhancing the importance of biodiversity in sustaining life on the planet through reforestation projects to preserve and expand biodiversity and forest cover.

The lectures had as main objective to describe the advancement of knowledge on ecological restoration; offer a better understanding of the importance of ecosystem services in order to provide guidelines for restoration policies; outline recommendations for the landscape restoration with purpose of increasing biodiversity and vegetation structure; present tools to contribute to sustainable rural development; as well as bring indicators (social, environmental and economic) to evaluate the success of reforestation projects.

Agnieszka Latawiec (IIS) e Maiara Mendes (IIS) – *Soil - forest feedbacks: indicators and implications for ARCHER.*



The Atlantic Rainforest had a reduction of its original area (around 90% is deforested). The AF is a mosaic of small fragments and secondary forest with distinct degree of perturbation. Two-thirds of the country's population lives in this biome, and this high population density depends on the services provide by the forest remnants.

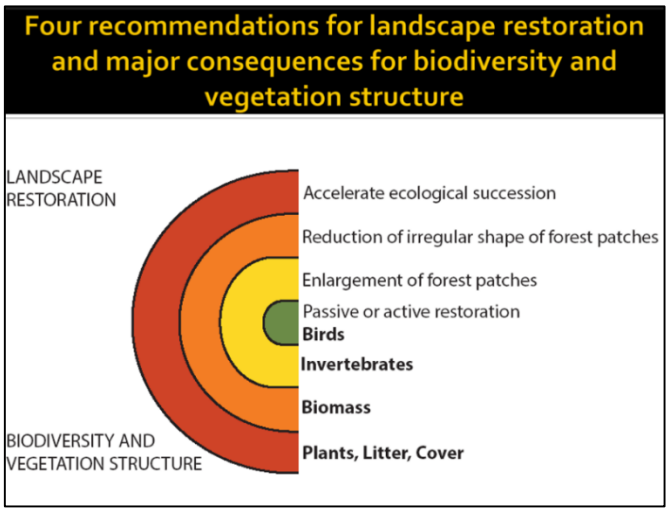
Due to habitat degradation and reduction, the maintenance of ecosystem services and biodiversity in the Atlantic Rainforest region is threatened.

The new Brazilian Forest Code obliges landowners to reforest 21 million hectares throughout the country (to reforest their properties). The Atlantic Rainforest is a priority area for restoration due to its endemism, high diversity, high carbon and reduction of its original area.

Soil-restoration feedbacks of Atlantic Rainforest: implications for restoration and special priorization of conservation of ecosystem services is a different way to look at the selection of the best type of restoration. The soil, still under-researched, is critical for success of restoration.

This project aims to deliver a step-change in understanding on how different types of restoration impact on services supplied by the Atlantic Rainforest, to provide policy-tailored recommendations on the best restoration model.

Renato Crouzeilles (IIS) - *The drivers of forest restoration success: a global meta-analysis of biodiversity and vegetation structure.*

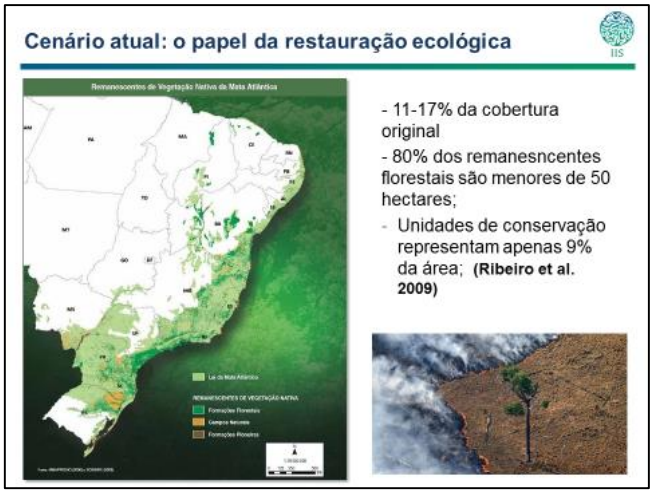


Two billion ha have been globally identified as potential opportunities for forest restoration. Our global meta-analysis encompassing 224 study landscapes revealed that median effect sizes of biodiversity and vegetation structure were >15% higher in restored than in degraded systems.

For the first time, we identified five main determinants for successful forest restoration, i.e. return to the reference condition: on a local scale i) the time that the system has been disturbed or since the restoration has begun, ii) the restoration activity (active / passive) or soil use (planting / agriculture); at the landscape scale, iii) isolation of forest remnants, iv) average size of forest remnants and v) ratio perimeter area of forest remnants.

We outline key recommendations for landscape restoration at scale to enhance biodiversity and vegetation structure, such as restoring land, enlarging and reducing the irregular shape of forest patches, thus accelerating ecological succession.

Jerônimo Sansevero (IIS) – *Ecological restoration in the Atlantic Forest: from practice to theory.*



The Atlantic Forest, classified as a biodiversity hotspot, has only 11-17% of its original cover, and much of the forest remnants consists of small fragments. These changes have a significant impact on the biodiversity maintenance and ecological processes of ecosystems. This way, the increase of forest cover through restoration projects is a key activity for the biodiversity conservation of this biome. In this scenario, ambitious targets for ecological restoration have been proposed (ex. PACT for the Atlantic Forest Restoration – 15 million hectares by the year 2050; environmental suitability of rural properties - Forest Code).

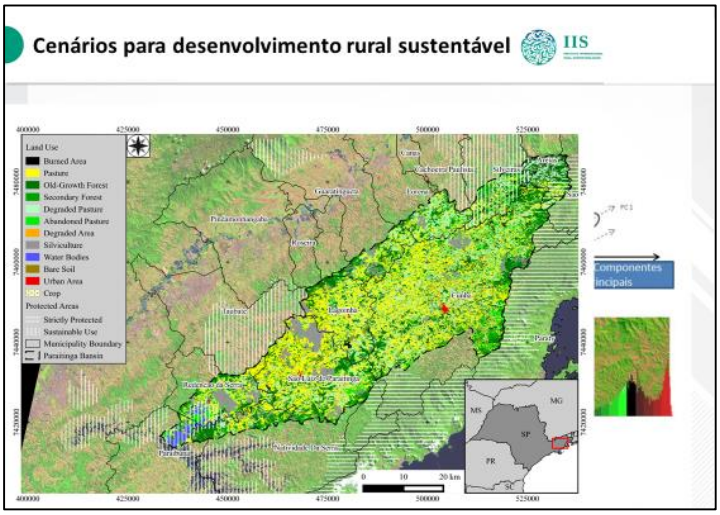
Therefore, the presentation aimed to describe the advancement of knowledge on ecological restoration in the Atlantic Forest over time, as well as the ecological theories

in which the initiatives were based on. Five periods were identified: i) Protection plantations (until 1982); ii) Ecological groups (1982 - 1985); iii) Reference ecosystems – phytosociological studies (1985 – 2000); iv) Ecological processes – How many species (2000 – 2012); v) Forest Code / How much will it cost? / Landscape restoration (2013 - present).

Different ecological theories provided important contributions to the development of restoration (ecological niche, dynamic glades, community assembly rules, Biodiversity and Ecosystem Function – BEF, etc.).

Currently, restoration projects also offer a great opportunity to test theories. The article entitled "Identification of 100 fundamental ecological questions" (Journal of Ecology, 101, 2013) gives us a good starting point.

Felipe Barros (IIS) e Helena Alves Pinto (IIS) - *Spatial analysis: from data acquisition to the scenarios creation.*

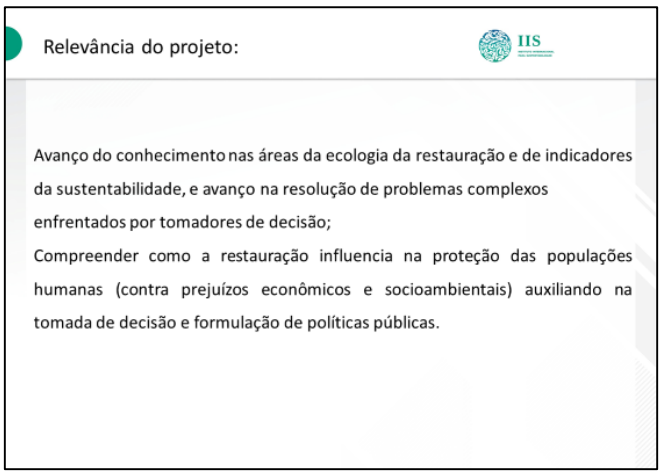


The elaboration of scenarios for sustainable development requires the ability to spatialize environmental, social and economic phenomena to understand them better. Therefore, the process of acquisition and production of spatial data is a key element, as well as the Geographic Information System and Remote Sensing.

This work shows how such tools can be used to contribute to the development of strategies for sustainable rural development in Paraitinga River Basin. It was developed the diagnosis of land use and intensification scenarios based on the potential increase of sustainable productivity of cattle ranching in the region.

Beyond the spatial analyzes, other contextual factors were taken into account, as the region's potential and the obstacles to the development of more sustainable activities. Thus, it is possible to avoid risks of cattle ranching intensification as rebound effect and leakage. Above all, it is important that strategies are developed in synergy, promoting a better-integrated handling of land use, reducing the competition for its use, and conciliating agriculture and conservation of natural resources.

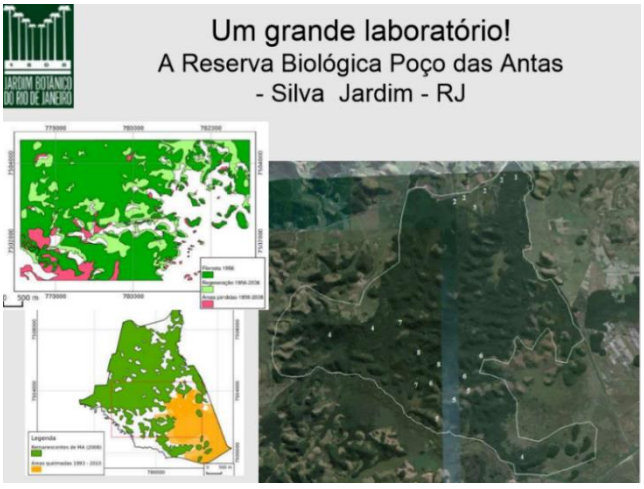
Luisa Lemgruber (IIS) e Ana Castro (IIS) - *Assessment of restoration success through sustainability indicators: the case of the city of Rio de Janeiro.*



Despite the increase in restoration initiatives in the last decade, the assessment of restoration success projects is still an open question for science, and currently review has just been held from environmental variables. However, it is important to emphasize that the benefits of deploying restoration projects go beyond ecological issues, since they contribute to the creation of jobs and increase the income of workers involved, the provision of ecosystem services and risk reduction of natural disasters.

The purpose of this study is to evaluate the success of restoration projects conducted in the city of Rio de Janeiro through a set of sustainability indicators (ecological, economic and social). The study will be conducted in three stages: i) Selection of the study areas; ii) Measurement of sustainability indicators (ecological, economic and social) considering the complexity of the socio-ecological system. The ecological indicators are related to the restoration of vegetation structure, diversity and ecological processes. Economic indicators are linked to the cost of implementation, creation of jobs and poverty reduction. The social indicators are related to the involvement with the local community, perception of improvement in quality of life and provision of ecosystem services; iii) Development of a sustainability index from multivariate analysis.

Pablo Rodrigues (JBRJ) - *Biodiversity and restoration: the ideal and the impossible.*



Biodiversity can be seen as an important property of natural systems and is closely linked to life-sustaining processes on the planet. Among the many factors that have altered its properties are fragmentation and extinction of habitats. In this sense, the remaining forests act as true "stem cells", since they keep vital information to restore the natural patterns and processes. Therefore, to understand the current scenario some questions become essential, such as:

What do we know about the "biodiversity"?
What do we know about natural processes and standards?
Why are we the most predatory species of natural resources?
Why do we keep repeating the pattern of inconsequent exploitation, which has already led to extinction thousands of other living beings? What can we do to review this path of destruction?
Using as an example the Atlantic Forest, it was intended to show their great diversity of faces and ways of life along with the degradation history that reduced it to only about 10%. One of the examples used is the Biological Reserve of Tinguá, that is a relatively well-preserved remaining, which shelters thousands of life forms. Another example used is the Poço das Antas Biological Reserve where we concentrate our efforts to Ecological Restoration. Lastly, it is concluded that we need to review our relation with nature and understand that we are the result of "interactions", and thus the elimination of other forms of life jeopardize our own existence.

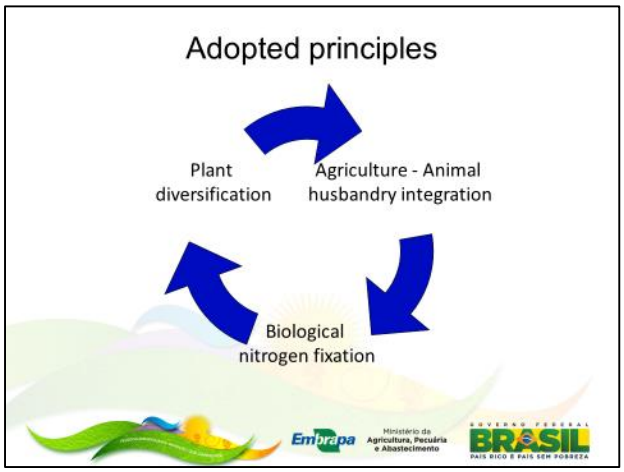
Session 2: Advancements in rural development research

Moderator: Márcio Rangel (IIS)

Session 2 consisted of several studies, in different regions of Brazil, that include strategies to achieve rural development that is able to give priority to environmental conservation, biodiversity, biological cycles and quality of life.

The lectures covered topics such as: strategies for the expansion of organic agriculture; techniques for developing the restoration of natural ecosystems and for the construction of more sustainable production systems; presentation of the PMDRS construction process and of the programs to promote sustainable rural landscapes, such as Rio Rural; analysis of research ecosystem and environmental services related to Brazilian agriculture and finally, spatial analysis of land use change in Brazil due to the expansion of sugarcane, soybeans and cattle.

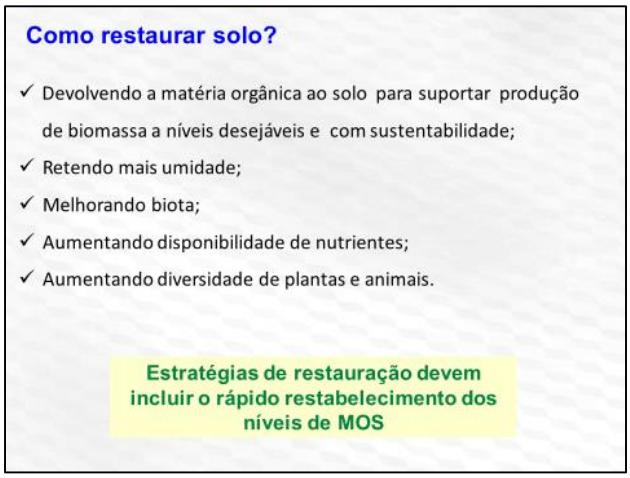
Ednaldo Araujo (Embrapa) e José Antônio Espíndola (Embrapa) – *Strategies for soil handling in organic agriculture.*



Organic agriculture is characterized by production systems that privilege environmental conservation, biodiversity, biological cycles and quality of life. These systems are supported by the growing need of society for the supply of agricultural products obtained with greater sustainability, reducing problems related to soil degradation, contamination of water resources,

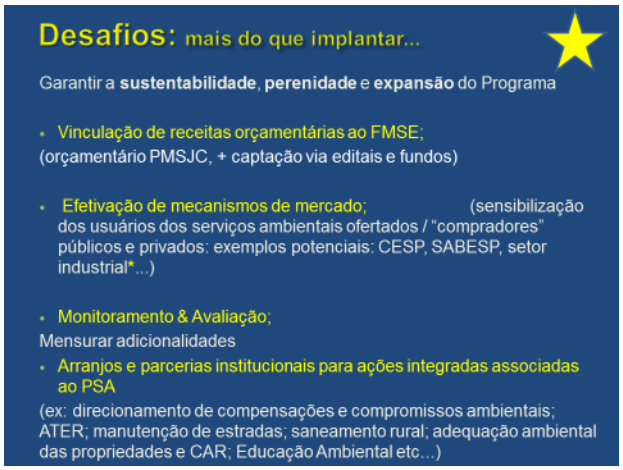
dependence on external inputs to the production units and genetic erosion. However, in order to enhance these benefits, efforts of educational institutions, technical assistance and extension become necessary, associated with rural producers, to develop appropriate technological bases to organic agriculture to the different national biomes In this sense, we highlight strategies that include green manure, composting, vermicomposting, substrates produced from locally available raw material, agroforestry systems, direct planting and organic fertilizer.

Luiz Fernando Moraes (Embrapa) - *The potential role of innovative agriculture and cattle ranching practices in the environmental adjustment of rural properties.*



The rural landscape inserted in the Atlantic Forest Biome is characterized by the predominance of fragmentation of forest ecosystems, especially in South and Southeast regions of Brazil. In a very expressive way, natural ecosystems in these regions have been replaced by unsustainable land uses, resulting in the degradation of natural resources. The presence of erosion processes in low productivity pastures, located in hilly landscapes, illustrates this problem. Likewise, the deforestation areas around springs and along rivers and streams affects negatively the water supply for the maintenance of ecosystems and for cattle ranching and agriculture production as well as urban centers. Since the whole society is favored by environmental suitability of rural properties, by the maintenance or restoration of environmental preservation areas and legal reserve, and by the reestablishment of environmental services, there is an increasing demand for production systems, practices and processes more sustainable.
Several studies have been made to develop techniques that allow the restoration of natural ecosystems and to build more sustainable production systems, but there is much more to advance regarding the knowledge of practices and inputs that can make the most effective techniques or even increase the resilience of the areas in restoration. The low quality of the soil in large areas of the rural landscape of the Atlantic Forest in the south and southeast of the country, resulting from the degradation history by unsustainable land use, is the main motivation for the development of these practices.

Ricardo Novaes (SEMEA/PMSJC - Mais Água) - *Prospects and challenges in the articulation of public policies and the construction experience of "Mais Água" Program in São José dos Campos, SP.*



The presentation is based on the process - in progress – of constructing the Plano Municipal de Desenvolvimento Rural Sustentável de São José dos Campos (Municipal Plan for Sustainable Rural Development of Sao Jose dos Campos) or PMDRS, providing a reflection on the challenges and opportunities of joint agendas, actors and public policies related to the theme, having as background the emergency of "new rurality" concept.

The report explores the redefinition process of rural – a dynamic not necessarily consensual and free from conflicts – along the construction of the Plan. This is because that territory, before easily identified as the "non-urban" and devoted almost exclusively to the provision of food, fiber and labor, started to receive – over the past decades – other additional attributes, material and symbolic, such as environmental services provider, "Second home" and tourist attraction for the urban population, in addition to "living space and sociability" to their populations (traditional and/or in "renovation") living there. After a short presentation and contextualization of the territory, the presentation reports the steps of social construction of PMDRS, exploring the exercise of building a shared design scenarios and guidelines.

The presentation explores the key interfaces of the Plan with public policies focused on the environmental agenda, as 2/3 of the rural territory of the municipality is set in Environmental Protection Areas, APA's, in the municipal, state and federal levels. Among these policies, it is given special emphasis to the Municipal Program of Payment for Environmental Services, "Programa Mais Água", focused on financial compensation, APP's restoration and environmental suitability of rural properties located in Rio do Peixe Basin, main contributor to the Jaguari dam, strategic reservoir for the hydraulic system of the Paraiba do Sul River, with imminent interconnection with the Cantareira System, responsible for a significant portion of the supply in the Greater São Paulo.

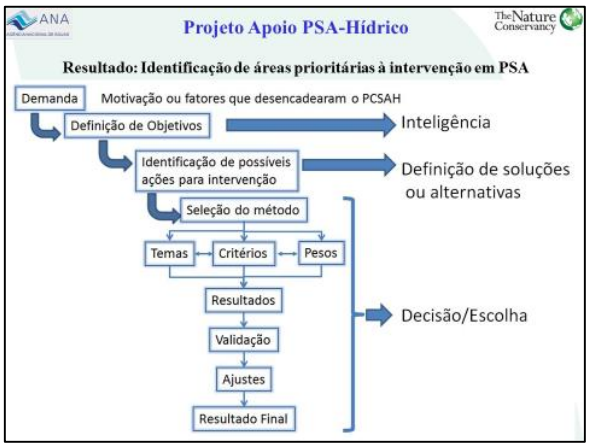
Helga Hissa (Rio Rural) - *Rio Rural Program Experience: Building sustainable landscapes in micro-watersheds of Rio de Janeiro State.*

The Sustainable Rural Development in Small Watersheds Program – Rio Rural (Programa de Desenvolvimento Rural Sustentável em Microbacias Hidrográficas, in Portuguese), of the Secretary of Agriculture and Cattle Ranching of the State of Rio de Janeiro - is developed in 72 municipalities in all regions of the state, with funding from the World Bank and FAO support.

Using the small watersheds as the basic unit for diagnosis, planning, implementation and monitoring, the program covers 366 small watersheds, with total area near 1,580,000 m², involving about 78,000 farmers, women and young rural people in participative processes of community self-management and engagement with actions aimed at the transition to sustainable productive systems, balanced with the conservation of natural resources.

By 2018, Rio Rural will have invested about R$ 600 million to promote sustainable landscapes in rural areas of the state. Among the activities developed, it stands out the conservationist handling and rational use of soil and water in small watersheds, the recovery of degraded areas, biodiversity conservation and the restoration of APPs, also enabling the increase of carbon stocks in the rural landscapes, where there are critical and unique remnants of the Atlantic Forest biome. The program's strategy is to contribute with technology to ensure the production of healthy food and income generation through sustainable increase in productivity and in return, committing to the conservation of natural resources and environmental suitability of production units.

Rachel Prado (Embrapa) - *Research Networks on Enviromental Services in Rural Landscapes: challenges and opportunities along with public policies.*

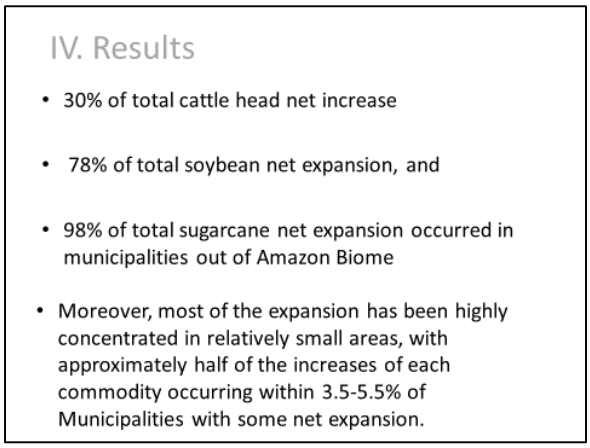


Anthropic pressures on ecosystems cause degradation of natural resources and biodiversity reduction, with consequences to human welfare, which demands increasingly water, air, fibers, food, energy and raw materials. In a scenario of climate change, therefore, the concern about this issue points to the compatibility of economic, social and environmental components.

Many were the research data obtained by research institutions, educational, governmental and non-governmental about the natural resources in the last decades in the Brazilian biomes, but without a conceptual and methodological focus turned to ecosystem services. Since the Millennium Ecosystem Assessment, there are rising researches around the world directed to the understanding of ecosystem and environmental services, as in Brazil. Embrapa has also followed this trend and since 2014 has headed a research network entitled Arranjo em Serviços Ambientais na Paisagem Rural (Arrangement of Environmental Services in Rural Landscape), with over 60 projects.

The purpose of the lecture is to present the state of the art research on ecosystem and environmental services related to agriculture and cattle ranching in Brazil, highlighting the work of this network; identify their main opportunities and challenges to support the related public policies and to expand the environmental services in rural areas.

Rafael Feltran-Barbieri (IIS) – *Beyond the Amazon: agricultural expansion and land-use change across Brazil 2000-2012.*



Brazil has risen to become one of the world´s leading exporters of agricultural commodities whilst also being widely lauded across the world for dramatic reductions in deforestation in the Amazon. Yet, this picture only tells part of the story as 41% of Brazil is outside the Amazon. We present the first spatial analysis of land-use change across all of Brazil´s six major biomes, showing that between 2000 and 2012 Brazil expansion of sugar cane and soybeans, as well as increases in the size of the national cattle herd, have all played a significant role in driving national-scale deforestation.

PARTICIPANTS

Speakers and participants on the first day of debates (03/25)

Member group on the second day of the workshop (03/26)

WORKSHOP PARTICIPANTS LIST

Name	Institution	Email
Agnieszka Latawiec	IIS	a.latawiec@iis-rio.org
Alvaro Iribarrem	IIS	a.iribarrem@iis-rio.org
Ana Hardman de Castro	IIS	a.castro@iis-rio.org
Ana Elena Muler	JBRJ	aemuler@gmail.com
Bernardo Strassburg	IIS	b.strassburg@iis-rio.org
Camila Jericó-Daminello	CSF	camila@conservation-strategy.org
Carlos Alho	Embrapa / University of Wageningen	carlos.brazaovieiraalho@wur.nl
Daniel Silva	IIS	d.silva@iis-rio.org
Dietmar Sattler	University of Liepzig	sattler@uni-leipzig.de
Ednaldo Araújo	Embrapa	ednaldo.araujo@embrapa.br
Felipe Barros	IIS	f.barros@iis-rio.org
Fernanda Resende	IIS	ascom@iis-rio.org
Francisco Beduschi	ICV	francisco.beduschi@icv.org.br
Gabriel Galvão	Embrapa	gabrielgalvao@gmail.com
Gerard Cornelissen	NGI	gco@ngi.no
Helena Alves Pinto	IIS	h.alves-pinto@iis-rio.org
Helga Hissa	SEAPEC / Rio Rural	microbacias@agricultura.rj.gov.br
Isaura Lago	CSF	isaura@conservation-strategy.org
Ivana Vieira	Embrapa	ivana.vieira@embrapa.br
Jerônimo Sansevero	IIS	j.boelsums@iis-rio.org
José Antônio Espíndola	Embrapa	jose.espindola@embrapa.br
Kemel Kalif	IIS	k.kalif@iis-rio.org
Luis Paulo Ferraz	Associação Mico-Leão-Dourado	luispaulo@micoleao.org.br
Luisa Lemgruber	IIS	l.lemgruber@iis-rio.org
Luiz Fernando de Moraes	Embrapa	luiz.moraes@embrapa.br
Luiza Manzatto	PUC-Rio	luiza.manzatto@gmail.com
Maiara Mendes	IIS	m.mendes@iis-rio.org
Márcio Rangel	IIS	m.rangel@iis-rio.org
Mariela Figueredo	IIS	m.figueredo@iis-rio.org
Mariella Uzêda	Embrapa	mariela.uzeda@embrapa.br
Marina Piatto	Imaflora	marina@imaflora.org
Pablo Rodrigues	JBRJ	pablojfpr@hotmail.com
Rachel Prado	Embrapa	rachel.prado@embrapa.br
Rafael Feltran-Barbieri	IIS	r.feltran@iis-rio.org
Reginaldo Oliveira	Embrapa	ivana.vieira@embrapa.br
Renato Crouzeilles	IIS	renatocrouzeilles@gmail.com
Ricardo Novaes	MAIS ÁGUA	ricardo.novaes@sjc.sp.gov.br
Ronaldo Seroa	UERJ / PPGCE	seroadamotta.ronaldo@gmail.com
Sarah Hale	NGI	sah@ngi.no
Sven Wunder	CIFOR	swunder@cgiar.org
Tatiana Levinstein	PUC-Rio	tatilevinstein@gmail.com
Wolfram Lange	University of Humboldt	w.lange@gmx.net

BRIEF PROFESSIONAL HISTORY OF SPEAKERS

Agnieszka Latawiec

Co-founder of International Institute for Sustainability and Research Director at the Institute. She is also Post-Doctoral Student in PUC-Rio. She holds BSc in Environmental Engineering, MSc in Environmental Protection and PhD in Environmental Sciences. Develops research associated with soil chemistry and plant (PhD focused on the evaluation of the bioavailability of pollutants in soils with subcritical water extraction). She recently took part in creating the Sustainability Science course at PUC-Rio and she is interested in a number of topics related to sustainability (She edited the book "Sustainability Indicators in Practice"). She seeks collaborative interdisciplinary research in a range of topics including soil science, decision-making and socioeconomic aspects of land-use change. She collaborates with researchers involved in working with biochar and participates in projects focused on sustainable land-use both in Europe and in Brazil.

Contact: **a.latawiec@iis-rio.org**

Alvaro Iribarrem

Physical from the Federal University of Rio de Janeiro, he worked as a doctoral student at the headquarters of the European Southern Observatory (ESO) in Garching bei München, in the years 2011 and 2012. He defended his doctorate in 2013 in the field of Extragalactic Astrophysics. He worked from 2005 to 2009 as a professor of Physics Laboratory in Colégio Santo Agostinho, Leblon. At IIS, he works with mathematical modeling, numerical simulation and data analysis. Currently he is also in IIASA.

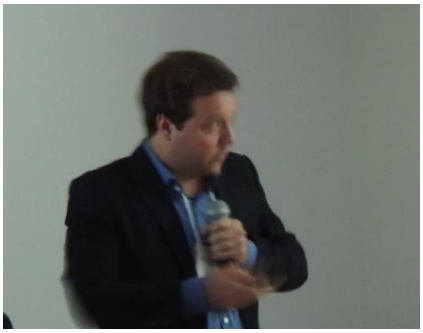
Contact: **a.iribarrem@iis-rio.org**

Ana Hardman de Castro

Ana has bachelor's degree in Geography and Environment at PUC-Rio, and Master in Geography from the same university. She works with Sustainability, Land Planning and Management, Territorial Development and Social and Environmental Issues. It has interest in public policy area. Currently, works as research assistant at IIS.

Contact: **a.castro@iis-rio.org**

Bernardo Strassburg



Founder and Executive Director of the International Institute for Sustainability in Rio de Janeiro, and Assistant Professor at the Pontific Catholic University of Rio de Janeiro. Bernardo is an economist with a M.Sc. in environmental planning (focused on land-use change and ecosystem services in the Amazon), and Ph.D. in Environmental Sciences, focused on issues related to reducing emissions from deforestation and forest degradation (REDD+).

He is dedicated to the transition to sustainability, with focus in the sustainable use of land and its resources, conciliating production needs, environmental services and social development, by developing interdisciplinary research, providing assistance to governments, NGO's and private companies in the pursue of solutions to sustainability challenges and implementation of projects.

Contact: **b.strassburg@iis-rio.org**

Carlos Alho

PhD student in Production Ecology & Resource Management at the University of Wageningen (Netherlands) as a member of Terra Preta Program (Black Earth Program) with project developed in partnership with Embrapa Solos (Brazil). He has a degree in Forestry from the Federal Rural University of Rio de Janeiro and a Masters in Environmental and Forestry Sciences from the same university, with project developed in partnership with the units of Embrapa Solos and Embrapa Florestas (Brazil) and the United Kingdom Biochar Research Centre in University of Edinburgh (Scotland) through support of the International Humic Substances Society for Training Award. He currently conducts research in Soil Science, with emphasis on the role of pyrogenic carbon in organic-mineral interactions in Dark Earth soils.

Contact: **carlos.brazaovieiraalho@wur.nl**

Camila Jericó - Daminello

Bachelor in Biological Science and Master in Environmental Science from the University of São Paulo. She works in the area of economic instruments for conservation, particularly with approach to ecosystem services and their valuation.

Contact: **camila@conservation-strategy.org**

Daniel Silva

Daniel Silva has a bachelor's degree in Economics at the University of Amazon (UNAMA), in Belém. He works with analysis and researches deforestation factors (rural credit and scenarios analysis), and studies of economic and financial performance at cattle ranches in the Amazon.

Contact: **d.silva@iis-rio.org**

Ednaldo da Silva

Agricultural engineer, PhD in Soil Science from the Federal Rural University of Rio de Janeiro - UFRRJ. Researcher at Embrapa Agrobiology, Graduate Program Professor in Organic Agriculture UFRRJ / Embrapa - PPGAO and Member of the Agro-ecological Fazendinha Management Committee of Km 47. He has experience in organic agriculture with emphasis on soil fertility and fertilization, biological fixation nitrogen, green manure and nutrient cycling.

Contact: **ednaldo.araujo@embrapa.br**

Felipe Barros

Bachelor in Geography at Pontifical Catholic University of Rio de Janeiro, Felipe works in the spatial analysis area through GIS and Remote Sensing tools. Specialized in Environmental Analysis and Territorial Management at the National School of Statistical Science/Brazilian Institute of Geography and Statistics, Felipe is currently a Masters student in Biodiversity at Rio de Janeiro's Botanic Garden conducting research in Ecology, Biodiversity Conservation and Spatial Modeling area.

Felipe has worked as a GIS coordinator at the Brazilian National Centre for Plant Conservation (CNCFlora).

Contact: **f.barros@iis-rio.org**

Fernanda Alvarenga

Degree in Administration at PUC Minas and Master in Sustainable Development by the Institute of Geography of Paris-Sorbonne University, she has been working for nearly five years in Strategic Conservation for strengthening sustainable business in protected areas, through studies and economic and management analysis.

Contact: **fernanda@conservation-strategy.org**

Francisco Beduschi

He has a BS in Agronomy from ESALQ / USP and MBA in Agribusiness from ESALQ / USP. He acts as Project Manager at Instituto Centro de Vida (UCV) since 2013.
Contact: **francisco.beduschi@icv.org.br**

Gerard Cornelissen

Gerard Cornelissen is a technical expert at the Norwegian Geotechnical Institute and professor at the Norwegian University of Life Sciences. He is currently leading projects on the agronomic and climate aspects of biochar in Zambia, Indonesia, and Nepal. In Norway, he is mainly working on passive samplers and the use of activated carbon for in situ sediment remediation. He has published 91 peer-reviewed papers with 4000 citations.
Contact: **gco@ngi.no**

Helena Alves Pinto

Helena has a degree in Biology from São Paulo University and holds a Master's degree in Applied Ecology and Conservation from the University of East Anglia (UK). During her Masters, Helena's studies focused on the impacts of a Payment for Ecosystem Services program on traditional communities in the Brazilian Amazon. Complementing her research, Helena has experience working as an environmental consultant, focusing on economic incentives for tropical forest conservation and land use change. At the International Institute for Sustainability, Helena works as an Environmental Analyst, participates in research development, project implementation, and collaborates in the development of Public Policies.
Contact: **h.alves-pinto@iis-rio.org**

Jerônimo Sansevero

Forestry engineer with master's and doctorate in plant ecology from the National School of Tropical Botany - Rio de Janeiro's Botanic Garden. During the master worked with evaluation of different models of ecological restoration. At doctorate conducted research on the classification of functional groups and modeling successional trajectories in degraded areas in the Atlantic Forest. He is currently a researcher at the International Institute for Sustainability working on the development of research on restoration models, the restoration planning on large-scale and ecosystem services.
Contact: **j.boelsums@iis-rio.org**

José Antônio Espíndola

He has master's degree in Agronomy (concentration area in Soil Science) from the Federal Rural University of Rio de Janeiro (1996) and doctorate in agronomy (concentration area in Soil Science) from the Federal Rural University of Rio de Janeiro (2001). He is currently a researcher at the Brazilian Agricultural Research Corporation (Embrapa). He has experience in the Agroecology area, acting on the following topics: organic farming, green manure and live ground cover.
Contact: **jose.espindola@embrapa.br**

Helga Hissa

Agronomy Engineer with a Masters in Soil Science. Researcher at Embrapa Solos, she is technical coordinator of the Rio Rural program, at the Department of Agriculture and Cattle Raising of the State of Rio de Janeiro, taking part in the idealization of the Sustainable Rural Development Project in small watersheds, developed in partnership with the state government, the World Bank and the Food and Agriculture Organization. She is at Rio Rural since 2000, supporting the institutional coordination and integration partnerships and co-investments for sustainable rural development actions.
Contact: **microbacias@agricultura.rj.gov.br**

Kemel Kalif

Agronomist, M.Sc. in Zoology/Ecology, Ph.D. in Sustainable Development and Postdoc in Economics and Ecological Economics Environmental. Currently he is Coordinator of IIS Livestock Projects.
Contact: **k.kalif@iis-rio.org**

Luisa Lemgruber

Degree in Geography and Environment at PUC-Rio and currently attending a Master´s degree at the National School of Tropical Botany (ENBT-RJ), beginning her interest in management of urban and rural areas and a deeper contact with environmental issues. Currently works as a research assistant in IIS.
Contact: **l.lemgruber@iis-rio.org**

Luiz Fernando de Moraes

Graduated in Agronomic Engineering from the College of Agriculture Luiz de Queiroz (1985), master's degree in Animal Science and Pastures by the College of Agriculture Luiz de Queiroz (1992) and PhD in Agronomy (Soil Science) from the Federal Rural University of Rio de January (2005). He currently works as a researcher at Embrapa Agrobiology with Systems of Sustainable Production and Restoration of Degraded Areas, as well as acting as a collaborator researcher at the Research Institute Botanical Garden of Rio de Janeiro. He has experience in Ecology, with an emphasis on Ecological Restoration of Degraded Areas, working mainly with restoration of degraded areas in the Atlantic Forest, seedling production and planting of native tree species, and use of indicators for ecological restoration. He coordinates a project arrangement with several units of Embrapa aiming Restoration and Environmental Adequacy of Rural Landscape in the Atlantic Forest of southern and southeastern regions. He is moderator of the Brazilian Network of Ecological Restoration (REBRE) since 2011.
Contact: **luiz.moraes@embrapa.br**

Maiara Mendes

Student of the 8th period in Geography and Environment at PUC-RIO. Maiara has experience as PIBIC studentship at Embrapa Solos, making the analysis of water retention in the soil by different methods of soil samples in the main soil classes of coffee trees regions in the state of Rio de Janeiro. Is currently involved in IIS with literature review, data collection and tabulation of a project that seeks to understand how soils influence the process of regeneration / reforestation of the Atlantic Forests.

Contact: **m.mendes@iis-rio.org**

Márcio Rangel

Degree in Agronomic Engineering from Escola Superior de Agricultura Luiz de Queiroz - University of São Paulo, with experience in sustainable rural development. Masters from the Graduate Program in Sustainable Development Practices in the UFRRJ that integrates international network of professional Master's degrees in sustainability (Global Master's in Development Practice), coordinated by the Earth Institute at Columbia University (USA). Marcio has been working as a consultant on environmental projects, with an emphasis on sustainable rural development, preparation and implementation of projects aimed at supporting public policies and the development of family farming, with actions aimed at rural training, technology transfer, strengthening and expansion of production chains entrepreneurial vision. Including experiences related to wildlife conservation, watershed management and land development projects. He is a specialist in livestock and Rural Development at the International Institute for Sustainability (IIS).
Contact: **m.rangel@iis-rio.org**

Mariella Uzêda

Graduated in agronomy from the Agronomy School of the Bahia Federal University, master's degree from the State University of Campinas and doctorate from the State University of Campinas / University of Paris (Paris 6) _ Institut de Recherche pour le Développement (IRD) in Renewable Natural Resource Management. She worked at Amazon NGOs (Belém / PA) and BioAtlântica Institute (Rio de Janeiro / RJ) as a researcher and project manager. She also worked as professor of Agroecology at the State University of Santa Cruz (Ilheus / BA). She is currently a researcher at Embrapa Agrobiology and associated researcher at the Institute for Social and Environmental Studies of Southern Bahia. Operates in the areas of ecology in agricultural landscapes, agro-ecology and management of agro-biodiversity and accumulated experiences at Amazon and Atlantic Forest.
Contact: **mariella.uzeda@embrapa.br**

Marina Piatto

Since 2005, Ms. Piatto has been working at Imaflora, a Brazilian NGO, in the field of Agriculture and Climate Projects. Her work involves initiatives connected with good agriculture practices, environmental conservation and human rights. She is also involved in projects related to low carbon agriculture and REDD+ safeguards in Amazon rainforest. Marina has a degree in Agronomic Engineering from São Paulo State University in Brazil and she holds a Master degree in Tropical Agriculture from Bonn University in Germany. At University of California, she spent a year as a Humphrey fellow from the Fulbright Program.
Contact: **marina@imaflora.org**

Pablo Rodrigues

Graduated in Biological Sciences at the Federal University of Rio de Janeiro (1995), master's degree in Ecology from Federal University of Rio de Janeiro (1998) and PhD in Biosciences and Biotechnology at the State University of North Fluminense (2004). He is currently a Research Associate of the Institute of Botanical Garden Research of Rio de Janeiro and has served as a visiting professor and / or supervisor in graduate courses at the National School of Tropical Botany and PPGBot National Museum / UFRJ. His focus area is Ecology, with an emphasis on tropical forests ecology and particularly interested in issues such as fragmentation and habitat extinction, human impacts and ecological restoration

Contact: **pablojfpr@hotmail.com**

Rachel Prado

Graduated in Biological Sciences at the Federal University of São Carlos (1996), Master of Science in Environmental Engineering at the University of São Paulo (1999), specializing in Planning and Water Management at the Federal University of Amazon (2003) and PhD in Sciences Environmental Engineering at the School of Engineering of São Carlos (2004). Conducted training in 2010 on the theme Ecosystem Services Evaluation in Spanish institutions, with scholarship from Carolina Foundation. She is currently a researcher level A at Embrapa Soils and has been working in the area of monitoring and planning of environmental services, especially water resources, using geoprocessing tools. The researcher has participated in several projects, including as coordinator in interdisciplinary partnership and national and international scope. Currently leads the Embrapa project entitled: Strengthening of knowledge, information organization and developing support tools for Watershed Environmental Services Payment Program in rural areas and the Embrapa Project Arrangement entitled Environmental Services in Rural Landscape. Participates in the Research Network AGROHIDRO-Embrapa. Member of the State Council for Water Resources-RJ

Contact: **rachel.prado@embrapa.br**

Rafael Feltran Barbieri

He has bachelor's degree in Biology and Economics from PUC/SP, Ph.D. in Economics from USP, a master's degree in Environmental Sciences, a PhD in Science and Ph.D. in Economics from USP, and Ph.D. in Economics from UNICAMP.

Contact: **r.feltran@iis-rio.org**

Renato Crouzeilles

He has MSc and PhD in Ecology. His work focus on reconcile environmental management with public policies on different spatial scales, to be applied into actions related to biodiversity conservation, ecological restoration and adaptive management. He is currently a Post-Doc at the International Institute for Sustainable acting on the development of scientific research focused on the spatial prioritization of restoration on a large scale and global meta-analyzes on the success of forest restoration.
Contact: **renatocrouzeilles@gmail.com**

Ricardo Novaes

Responsible, since 2013 for the Planning Board of the Municipal Environment of São José dos Campos, SP; which has, among other things, supported the design and implementation of the Municipal Plan for Sustainable Rural Development. Agronomy Engineering (ESALQ / USP), with Post graduating in Development and Public Policies (IPEA), Master in Sociology (IFCH-Unicamp), PhD in Environmental Science (PROCAM-USP) and Post-Doctorate in Education (FE-USP) he has allied to that solid and comprehensive academic education over 25 years of professional experience in the environmental field.

Between 2011 and 2013, he worked at WWF-Brazil with the program Agriculture and Environment. In WWF accounted for Coordination of the "Axis Water and Agriculture" Water Program Brazil, focused on the development of sustainable models of agricultural production and based on the dissemination of "best practices" of management, validation of efficient models of forest restoration, and disseminating economic and financial instruments and environmental certification systems that would stimulate agricultural production associated with the conservation of natural resources. Throughout 2010 was Advisor to the Inter-American Institute for Cooperation on Agriculture (IICA / OAS), with the Ministry of Environment - MMA, having the opportunity to coordinate the construction process of the National Program for Environmental Education and Family Farming, PEAAF. In addition, next to the structured agribusiness chains, deserves its operations between 2001 and 2007, as a consultant for Votorantim Celulose e Papel (now Fibria), contributing to the development and implementation of strategies and actions in the field of environmental responsibility in the area of influence "Forest Unit South" (Capão Bonito region, SP).

Throughout 2008 was Visiting Researcher at the ENGREF AgroParisTech in Montpellier, France; participating in the research activities of the Group “Eaux continentales : ressources, usages et services de l’eau, gestion des territoires de l’eau”. Parallel to this career path he led, on integrated and coordinated manner, an intense academic experience, participating in research groups, production of articles and teaching activities focused primarily on institutional dynamics related to the themes "Sustainable Territorial Development", "Shared Management of Natural Resources "," Water Governance "and" Social and Environmental Conflicts ".
Contact: **ricardo.novaes@sjc.sp.gov.br**

Ronaldo Seroa

Professor of Economics and Program Coordinator of Post Graduate Studies in Economics (PPGCE) and the Center for Development Strategies Studies (CEDES) of the State University of Rio de Janeiro (UERJ). PhD in Economics from University College London. Former Coordinator for Environmental Studies at IPEA / Rio de Janeiro and Former Director of the Ministry of Environment of Brazil. Review Editor of the IPCC / AR5 / WGIIII / Chapter 15 - National and Sub-National Policies and Institutions. He has several books and scientific articles published, including Environmental Economics from FGV, Rio de Janeiro.

Contact: **seroadamotta.ronaldo@gmail.com**

Sarah Hale

Project leader in collaboration Norway-Denmark-Indonesia in order to investigate the implementation and use of biochar production in Indonesia scenario. Experiments in the laboratory and field are related to carbon sequestration and the suitability of biochar in Indonesia. Life cycle analysis and cost-benefit will relate to the implementation of green aspects of biochar technology. Previously, Sarah worked with several other biochar project implementation in Malaysia, Nepal and Zambia. Her doctorate focused on the absorption of organic pollutants by activated carbon that was added to the sediments contaminated as a repair strategy.

Contact: **sah@ngi.no**

Sven Wunder

He has a master's degree in economics (cand.polit.), Doctorate in macroeconomics (PhD) and post-doctorate in forest economics (DSc, habil.), all from the University of Copenhagen (Denmark). He worked with the Danish Technical Cooperation (Danida), the World Conservation Union (IUCN, Ecuador), and the Center for Development Research (CDR, Denmark). Since 2000 works for CIFOR, first based in Indonesia, then in Brazil (Belém do Pará, Rio de Janeiro). Sven has experience in the management area of natural resources, with emphasis on payments for ecosystem services, deforestation, climate change, ecotourism, and socioeconomics facing the countryside.

Contact: **swunder@cgiar.org**