BOOK OF ABSTRACT

I. SESSION DESCRIPTION

ID: S1a

Title of session:

Multiple Ecosystem Services in Agriculture

Hosts:

	Title	Name	Organisation	E-mail
Host:	DSc	Azeneth Schuler	Empresa Brasileira de Pesquisa Agropecuária – Embrapa Solos	azeneth.schuler@embrapa.br
Co-host (s):	DSc DSc DSc Dsc DSc PhD PhD	Elaine Fidalgo, Ana Paula Turetta, Rachel Bardy, Joyce Monteiro, Mariella Uzeda, Abdon Schmitt Filho, Joshua Farley.	Embrapa, Embrapa, Embrapa, Embrapa, Embrapa, Universidade Federal de Santa Catarina, University of Vermont.	elaine.fidalgo@embrapa.br, ana.turetta@embrapa.br, rachel.prado@embrapa.br, joyce.monteiro@embrapa.br, mariella.uzeda@embrapa.br, abdonfilho@hotmail.com, jfarley.uvm@gmail.com

Abstract:

Considering the role of agriculture for the production of food, fibre and energy as well as its negative impact on ecosystem services and functions, the development of disruptive farming systems is deeply needed for the health of environment and society. In Latin America, several farmers have faced the challenge of experiencing innovative systems to provide or recover ecosystem services. These farmers are mainly small family producers that are developing ecosystem-based farming systems often working together with research groups of Ecology

and Agriculture areas.
This Session aims at gathering different experiences and discussing approaches for assessment of multiple ecosystem services by integrating social, environmental and economic dimensions of sustainability.

Goals and objectives of the session:

1. Discussing approaches for multiple ES assessment in agriculture, mainly in ecosystem-based farming systems;
2. Integrating Brazilian ES network in Latin America initiatives in agriculture and multiple ES provision.

Planned output / Deliverables:

Ten oral presentations of experiences and approaches to assess multiple ecosystem services provision by agriculture and the role of ecosystem-based farming systems;
A final report of discussions on the perspectives for collaborative research in this theme.

Related to ESP Working Group/National Network:

Sectoral Working Groups: S1 - ES in Agricultural production systems

II. SESSION PROGRAM

Date of session: Tuesday, 23 October 2018
Time of session: 13:30-15:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
13:30-13:40	Ana Azeneth	Turetta Schuler	Embrapa Embrapa	Presentation of the Session
13:40-13:50	Carolina	Montealegre-Talero	Universidade de São Paulo	Landscape structure affects pollinator and natural enemy spillover
13:50-14:00	Mônica	Matoso Campanha	Embrapa (Milho e Sorgo)	Greenhouse gases mitigation in a crop-livestock-forest integration system
14:00-14:10	Ricardo	Figueiredo	Embrapa (Meio Ambiente)	Stream Water Quality Monitoring as a Tool to Evaluate a Payment for Environmental Service Program in Extrema (Minas Gerais), Brazil
14:10-14:20	Anderson	Latini	Univ. Federal de São João del Rey (UFSJ)	Birds, dragonflies and weeds increasing rice yield in a paddy field
14:20-14:30	Anderson	Latini	Univ. Federal de São João del Rey (UFSJ)	Pollinators and effective fructifying in cherry plants
14:30-14:40	Mariella	Uzeda	Embrapa	Forest fragments and trees: contribution to the generation of ecosystem services, livelihoods and production income in Atlantic Forest

Time	First name	Surname	Organization	Title of presentation
14:40–15:00	Rachel Joshua	Prado Farley	Embrapa University of Vermont.	Questions and Recommendations

Date of session: Wednesday, 24 October 2018
Time of session: 10:30–12:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
10:30–10:40	Gabriela Teixeira	Duarte	Universidade Federal de Minas Gerais.	Landscape Services and Agroecosystems: using current knowledge to build a framework and tool for landscape restoration planning
10:40–10:50	Mónica Ribeiro	Palacios	Universidad Autónoma de Querétaro, Mexico.	The role of livelihoods and ecosystem services bundles in the multifunctionality of an agroecosystem.
10:50–11:00	Rafaela Aparecida da	Silva	Universidade Estadual Paulista.	Ecosystem services perception by landowners in a region under high agricultural pressure
11:00–11:10	Ana Gabriela	Morim de Lima	Universidade de São Paulo (PPGAS/ USP)	A contribuição dos povos indígenas para a agrobiodiversidade: o estudo de caso Krahô (TO)
11:10–11:20	Luísa	Leal	Pontifícia Universidade Católica do Rio de Janeiro (PUC–Rio)	Potential for implementation of Agroecological Backyards in urban spaces

Time	First name	Surname	Organization	Title of presentation
11:20-12:00	Elaine Joyce Abdon	Fidalgo Monteiro Schmitt	Embrapa Univ. Federal de Santa Catarina (UFSC)	Questions and Recommendations

III. ABSTRACTS

The abstracts appear in alphabetic order based on the last name of the first author. The first author is the presenting author unless indicated otherwise.

1. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Greenhouse gases mitigation in a crop-livestock-forest integration system

First authors(s): Mônica Matoso Campanha, Thomaz Correa e Castro Costa
Other author(s): Thomaz Correa e Castro da Costa, Miguel Marques Gontijo Neto
Affiliation, Country: Brazilian Agricultural Research Corporation, Brazil
Contact: monica.matoso@embrapa.br

Agriculture depends on numerous ecosystem services (ES) for its operation. Besides being a consumer, agricultural activities can also be suppliers of ES, through the management of agroecosystems. Integrated systems are more efficient in the exploitation of natural resources and are alternatives for sustainable agricultural production. The crop-livestock-forest integration system (CLFI), in addition to the provision of plant food, animal food and wood, improved soil fertility, nutrient cycling, crop diversification and carbon sequestration. Carbon sequestration is a currently valued ES by mitigating the effects of climate change. In a CLFI system implanted in the Brazilian Savana region, state of Minas Gerais, the 333 eucalyptus trees per hectare planted in 15 x 2 rows, after 60 months of planting produced the average volume of 82.75 m3 per hectare. This wood production was responsible for sequestering from the atmosphere 14.90 Mg of C ha-1, estimating the amount of 54.63 Mg ha-1 of CO2 equivalent sequestered. This carbon retention was able to neutralize the emission of methane from 5.81 animal units (AU) ha year-1, equivalent of 29 adult bovines per hectare (29 AU) in five years. Considering the average stocking rate of Brazilian pastures near 1.0 AU ha-1 year-

1, and 1 AU equivalent to 450 kg of live weight for an adult bovine, the great capacity of CLFI to mitigate emissions of greenhouse gases from livestock production in these systems.

Keywords: carbono sequestration, climate changes, eucalyptus, CLFI

2. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Ecosystem services perception by landowners in a region under high agricultural pressure

First authors(s): Rafaela Aa da Silva, Marina Corrêa Côrtes

Other author(s): Laury Cullen Junior

Affiliation, Country: Universidade Federal de Goiás Universidade Estadual Paulista, Universidade Estadual Paulista, Brazil

Contact: rafaaps832@gmail.com

The Pontal do Paranapanema region, located in the extreme west of the São Paulo state (Brazil), is characterized by conflicts over land tenure, great loss of native vegetation cover, presence of rural settlements and lands with high agricultural potential. Therefore, landowners are key parties in decisions related to the conservation of biodiversity and the provision of ecosystem services (ES) in the region. Including their perception about the environment enables the establishment of more successful participatory actions for the sustainable management of landscapes. In this study, we identified, through interviews, the perception of the environment and ES by two groups of social-actors in the region: landowners of agrarian reform settlements (n=18) and owners of large farms (n=16).We verified that, in general, owners of large farms have higher educational levels, have owned properties for a longer time and often live in urban areas, while all settlers reside in the rural area and have been living in the property for less than 30 years. Although they recognize benefits from nature, these stakeholders do not act to intensify such benefits, neither have proactive attitudes to restore natural environments or to approach green areas. Agroforestry systems were only present in the settlements. The environments with the highest frequencies and quantities of ES perceived by landowners were forests and water bodies. ES were more frequently perceived by owners of large farms, reflecting their higher educational levels, higher frequency of visitation to the green areas and tenure time. This study has improved the understanding of attitudes and factors that affect

behaviors for conservation in the region. With this information,decision-makers can plan their action in a more a participatory manner, in order to avoid conflicts of interest that could jeopardize conservation projects.

Keywords: Stakeholders, Agrarian reform, Environmental behavior, Land tenure, Natural capital

3. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Landscape Services and Agroecosystems: using current knowledge to build a framework and tool for landscape restoration planning

First authors(s): Gabriela Teixeira Duarte

Other author(s): Milton Cezar Ribeiro, Adriano Pereira Paglia

Affiliation, Country: Federal University of Minas Gerais Federal University of Minas Gerais, Brazil

Contact: gabitduarte@gmail.com

The Brazilian Congress has established a new law for the protection of native vegetation in private properties, which determines that every landowner in rural regions must maintain a certain minimum percentage of natural areas, called Legal Reserves (LRs). The minimum percentage varies according to biomes and regions where properties are located, but it is at least 20%. As Brazil has suffered from intense deforestation due to land cover/use change mainly for the production of commodities, currently, many areas throughout the country must be restored or compensated to reach the minimum percentage of LRs. Neither the national government guidelines nor the state programs for restoration take into account landscapes patterns necessary to sustain ecosystem services and biodiversity in rural regions. Brazilians have the opportunity to make better environmental, social and economic decisions, but they do not have a tool for that. Here, we present the results of a recent review and meta-analyses regarding the effects of landscape patterns on multiple ecosystem services(ESs). Building on this review, we also present a spatially explicit modeling framework, with a rapid assessment tool, that uses simple, readily available data to identify locations for restoration across landscapes that have the greatest potential to increase or maintain the provision of multiple ESs. The framework states the main characteristics of the ESs of concern that need to be identified to know which landscape pattern to pursue restoration actions. Based on these

findings, the tool models and prioritizes areas for restoration throughout the landscape. Our model outputs indicate potential areas for restoration regarding specific ecosystem services or bundles of services and the landscape patterns necessary to maintain or increase them. We believe our framework and tool have a great potential to support landscape planning and management decisions that aim to increase landscape multifunctionality, especially in agroecosystems.

Keywords: Ecosystem services; Restoration planning; Rural landscapes; Spatial patterns; LSRestoration

4. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Stream Water Quality Monitoring as a Tool to Evaluate a Payment for Environmental Service Program in Extrema (Minas Gerais), Brazil

First authors(s): Ricardo de Oliveira Figueiredo
Other author(s): Matheus Martins Simioli, Patrícia Porta Nova da Cruz, Timothy Richard Green
Affiliation, Country: EMBRAPA, Brazil
Contact: ricardo.figueiredo@embrapa.br

Posses and Salto de Cima small catchments (1,200 ha and 1,500 ha, respectively) are situated in the municipality of Extrema (MG), southeast Brazil. Their stream outlets enter into the Jaguari River, an important tributary to the Cantareira Reservoir, which supplies part of the water demand of the São Paulo metropolitan area. These catchments, with pastures as the dominant land use, have been targets of a payment for environmental service program that aims to face successive water deficit that has occurred in the region. Possible improvement of water resources has been investigated by this present hydrobiogeochemical study. Evaluations included the temporal variation of water quality parameters as well as a comparison of two monitored streams in relation to these variables, since their catchments are at different stages in the environmental recovery process. From January to December 2017 sample collections and field measurements were conducted every two weeks, continuous physical-chemical measurements were taken each 10 minutes, and automatic samples were collected each 72 hours. Additional automatic samples were collected when extreme rain events occurred. The evaluated parameters were: flow, temperature, pH, electrical conductivity, dissolved oxygen, carbon, nitrogen and major dissolved ionic elements as well as suspended particulate matter.

Some signals of pollution point sources were detected on some random days and times at the Posses stream. Despite the confirmed improvement of the streamwater quality in response to the forest vegetation recovering at riparian zones and hilltops, it was observed that other watershed management practices regarding anthropic effluents must be elaborated in the public policies. Consequently we recommend that monitoring of streams and rivers be done using equipment that can get continuous data throughout the days as a means to detected eventual signals of point pollution.

Keywords: hydrobiogeochemistry, pastures, reforestation, small catchments, watershed management

5. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Birds, dragonflies and weeds increasing rice yield in a paddy field

First authors(s): Anderson LATINI

Other author(s): Jaciara de Andrade França, Mauri Aparecido BARBOSA, Gabriela Soares Santos Araújo, Ana Clara Pimenta Pereira

Affiliation, Country: Universidade Federal de São João del-Rei UFSJ, , Brazil

Contact: aolatini@ufsj.edu.br

Conservation techniques are important to improve the rice (Oriza sativa) production without damaging the environment. This research, developed in Jequitibá, Minas Gerais, Brazil, evaluated the hypotheses that weeds, birds, and dragonflies presence may improve the yield of flooded rice. An experiment controlling weeds maintenance and another controlling bird and dragonflies access to rice plants were doing to test differences on rice productivity. Eight experimental plots with 0.43m2 received a nylon net (20mm) to avoiding birds and dragonflies access but allowing access of the pests small rice stink bug, the aquatic beetle, the fall armyworm and the rice stalk stink bug. Other eight plots allowed access to all organisms, birds, dragonflies and pests. T-tests were used to test hypotheses. There were no differences in number ($t=0.297$; $d.f.=198$; $p=0.195$) and weight ($t=1.667$; $d.f.=198$; $p=0.096$) of good grains within or without the second weeding, suggesting that weeds can be left in the crops without productivity loss. In areas where the birds and dragonflies accessed the plants there was a higher number (34%; $tvar.sep.=9.979$; $d.f.=358$; $p<0.001$) and weight (64%; $tvar.sep.=16.425$; $d.f.=358$; $p<0.001$) of good grains and in areas where the species did not

access the plants, the number of damaged grains was larger (23%; t=-4.673; d.f.=358; p<0.001). Considering number of grains, was estimated an increase of about 37% when all organisms had access to rice plants (13.08 ton.ha-1 vs 9.50 ton.ha-1). This research enabled to understand the benefits of weed maintenance, which results in economy with herbicides and workforce, beyond increasing the agroecosystem heterogeneity by providing several environmental services. Besides it, the presence of birds and dragonflies suggest they worked as natural predators of the rice pests, what reduces insecticides use and improving grains quality. Those results represent economic and sustainable alternatives for the flooded rice culture, favoring, mostly, the small producers.

Keywords: Agroecosystem, birds, dragonflies, weeds, Oryza sativa, productivity

6. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Pollinators and effective fructifying in cherry plants

First authors(s): Anderson Latini
Other author(s): Natália Ferreira Suárez, Pedro Guedes Chagas
Affiliation, Country: Universidade Federal de São João del-Rei UFSJ, Brazil
Contact: aolatini@ufsj.edu.br

Cherry plants are considered self-incompatible and may become dependent on the cross-pollination carried out by insects to obtain a satisfactory fruit production. The objective of this study was to quantify the effective fruiting, to identify the primary pollinators of this plant and to test the hypothesis that the output of acerola fruit is higher when the flowers are pollinated by insects. The study was performed in an acerola orchard without a genetic pattern in the municipality of Jequitibá, MG, from August to September 2014. In twenty trees were marked two branches, being one with free access of pollinators branch and another with restricted access to pollinators. Each branch had marked the number of flower buds accounted for comparison with the fruiting data and to collect the main pollinators; pan traps were used throughout bloom. As potential pollinators, species were collected from Anthophoridae (Hymenoptera) and Syrphidae and Sarcophagidae (Diptera) families. When the flowers had free access of pollinators, 24% became fruit, whereas restricted access did not produce fruits (t(sep.var.)=-5.588; df=19; p<0.001). Therefore, it is evidence that this fruit production of acerola fruit is highly dependent on pollination by insects, a common and very important

ecosystem service, and probably, incorporation of resources in the landscape may optimize the conservation of natural pollinators and help producers' incoming in that culture.

Keywords: Malpighia ermaginata, Ecosystem services, Pollination

7. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Potential for implementation of Agroecological Backyards in urban spaces

First authors(s): Luísa Leal
Other author(s): Ana Paula Dias Turetta, Luiz Felipe Rego Guanaes
Affiliation, Country: PUC- Rio PUC-Rio, Brazil
Contact: luisa.lima.leal@gmail.com

The urbanization process has impacted the natural landscape and exerting pressure on natural resources, which leads to a decrease in the provision of environmental services. Thus, the cities become vulnerable to climatic varieties which impact the social well being. In this scenario, it is necessary to adopt strategies to minimize these effects for society. One of the strategies is the creation of green areas in the cities, such as urban and peri-urban agriculture (UPA), which have the capacity to generate environmental services (support, regulation, provision and culture) and minimize the effects caused by climate change. Agroecological backyards (areas with agricultural potential in the family plot) are a form of urban agriculture that becomes a strategy for personal and community empowerment. The study area delimited for the work is called Colônia Juliano Moreira in the city of Rio de Janeiro, Brazil, and was selected for being inserted in an urban context of expansion. The area has some successful experiences regarding UPA and is assisted by AS-PTA, a non-profit civil organization, and FIOCRUZ Mata Atlântica, which promote projects for the development of agriculture, human health and the environment in the area. Our main goal is to identify possible areas for the implementation and expansion of Agroecological backyards, to evaluate and investigate the potential of this implementation in the provision of environmental services in urban areas. Thus, it will be possible to propose a methodology capable to evaluate the potential of UPA to provide ecosystem services and increase the resilience of cities to climate change.

Keywords: Ecosystem services, urbanization, climate changes, urban forests, food security

8. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

LANDSCAPE STRUCTURE AFFECTS POLLINATOR AND NATURAL ENEMY SPILLOVER

First authors(s): Carolina Montealegre-Talero

Other author(s): Andrea Larissa Boesing, Jean Paul Metzger

Affiliation, Country: Universidade de São Paulo PhD student, Departamento de Ecologia, Instituto de Biociências, USP, Brazil

Contact: biocaro@gmail.com

Cross-habitat spillover, defined as the movement of individuals between distinct habitat types, is an important connectivity process that can at the same time allow species to survive in fragmented landscapes and contribute in ecosystem services provision. However, the links between landscape structure characteristics and spillover movements are still poorly understood. Here we performed a systematic review of the existing literature focused on this topic, considering natural enemy and pollinator spillover movements. We found 25 studies, mostly published in the last 4 years, and most of them focused on crops from temperate regions. Multiple landscape features were found to affect the spillover of pollinators and natural enemies. Particularly, crop cover and habitat type were key features modulating pollinator movements into crop fields, while habitat and matrix types were important for natural enemy spillover. Those results suggest that landscape complementation processes and edge effects are relevant to explain species spillover movements. Particularly complex landscapes, with soft edges, and higher abundance of natural habitats are more favorable for spillover movements. Yet there is urgent need to develop this research topic in tropical and subtropical regions, where spillover movements can be particularly important to integrate biodiversity conservation with the provision of ecosystem services.

Keywords: agricultural landscape, ecosystem services, pest control, pollination, spillover

9. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

A contribuição dos povos indígenas para a agrobiodiversidade: o estudo de caso Krahô (TO)

First authors(s): Ana Gabriela Morim de Lima, Terezinha Dias

Affiliation, Country: Universidade de São Paulo PPGAS / USP, Embrapa Recursos Genéticos e Biotecnologia - CENARGEN, Brazil

Contact: morimdelima@gmail.com

O trabalho tematiza a contribuição dos povos indígenas para a produção e a conservação da agrobiodiversidade, a partir do estudo de caso do povo indígena Krahô (bioma Cerrado, TO). Ressalta-se a importância dos saberes locais para a resiliência e a inovação dos sistemas agrícolas tradicionais, sendo as principais questões abordadas: (i) manejo tradicional da roça (técnicas de cultivo, manejo com fogo, seleção e conservação de sementes, incorporação de novas variedades); (ii) esquemas conceituais e cosmológicos (mitos, rituais, calendários sazonal e agrícola); (iii) redes de troca de sementes e transmissão dos conhecimentos associados. Diante dos desafios socioambientais atuais, diversas iniciativas desenvolvem experiências inovadoras visando fortalecer ou recuperar serviços ecossistêmicos, em especiais os culturais, através do reconhecimento das comunidades e dando visibilidade aos processos locais. As pesquisadoras proponentes estiveram envolvidas em diferentes atividades e projetos entre os Krahô que, de forma ampliada, compuseram um conjunto de ações de fortalecimento da segurança alimentar, embasadas na agrobiodiversidade e nos saberes associados. Além das atividades de pesquisa, realizadas com pesquisadores, professores e mestres krahô, foram realizadas a reintrodução de variedades tradicionais perdidas e a introdução de novos cultivares por meio da articulação entre estratégias de conservação ex situ e on farm, apoio às feiras de trocas de sementes e valorização dos guardiões da agrobiodiversidade. Essas experiências trazem para o centro da reflexão uma série de processos sociais envolvendo a articulação de interesses globais e locais, assim como uma rede de atores diversos que, entretanto, não compartilham necessariamente as mesmas visões de mundo, ideias e valores. O pioneirismo dessas ações carecem de reflexões no contexto das dinâmicas socioculturais locais, da contribuição efetiva para a promoção da segurança alimentar e sustentabilidade, sendo necessário avaliar seus efeitos nas aldeias Krahô, nas instituições envolvidas, bem como em políticas públicas, aprofundando a análise de suas convergências e contradições, consensos e conflitos.

Keywords: Krahô, Agrobiodiversidade, Sistemas Agrícolas Tradicionais, Regimes de conhecimentos, Políticas públicas

10. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

The role of livelihoods and ecosystem services bundles in the multifunctionality of an agroecosystem.

First authors(s): Mónica Ribeiro Palacios

Other author(s): Elisabeth Huber-Sannwald, Mónica Figueroa Cabañas, Claudia Morales Gomez

Affiliation, Country: Universidad Autónoma de Querétaro Universidad Autónoma de Querétaro, Mexico

Contact: ribeiro.palacios@gmail.com

Agroecosystems deliver provisioning, cultural, regulating, and supporting ecosystem services (ES) simultaneously, emphasizing the multifunctional character of these multi-purpose production systems. In many regions of the global South, management policies and market tendencies have been leading to livelihoods targeted towards maximizing the production of market provisioning services, at the cost of unintended and undesired effects on cultural, supporting and regulating ES. Multiple ES can respond similarly to social-ecological factors, own of a particular livelihood, to form bundles. The study of these bundles elicits how management practices may enhance (synergies) or impair (trade-offs) other ES types. We explore how three indigenous types of livelihood, coupled to distinct land use types have influenced both, the supply condition and interactions (synergies and tradeoffs) of multiple ES types and the supply of ES bundles in a mountainous rural landscape in the tropical region of San Luis Potosi, Mexico. We assessed the production of 13 ES in citrus orchards, sugarcane plantings, milpa systems and secondary forests that form the basic life support systems for local livelihood. For provisioning and cultural services, we applied 90 interviews, to analyze supporting services, we use soil properties and for regulating services, soil and hydrological properties. We determine the interaction between ES with a non-parametric Spearman´s rank correlation test and identified the condition of the ES bundles associated with livelihoods using a cluster analysis. We found that currently, three livelihood types coexist in this tropical landscape and each has distinct impacts on the supply and condition of the bundles of ES of their current production systems. Local livelihoods focus almost exclusively on provisioning

ecosystem services or sometimes in cultural services, while they ignore and/or omit management actions targeted towards the conservation of supporting and regulating services. Identifying bundles of ES associated with livelihoods can bring numerous benefits for managing complex landscapes.

Keywords: ecosystem services, Trade-offs, land use management, agriculture livelihoods.

11. *Type of submission:* ***Abstract***

S. Sectoral Working Group sessions: S1a Multiple Ecosystem Services in Agriculture

Forest fragments and trees: contribution to the generation of ecosystem services, livelihoods and production income in Atlantic Forest

First authors(s): Mariella Uzêda, Elaine Fidalgo
Other author(s): Elaine Fidalgo, Julian Wilmer, Rodrigo Condé Alves
Affiliation, Country: Embrapa Embrapa Agrobiologia, Embrapa Solos, Brazil
Contact: mariella.uzeda@embrapa.br

Despite growing interest in ecosystem services research over the past three decades, poorly understood of the contribution of forests and trees to conserving ecological processes that ensure food production remains limited. Our work in the community of São José da Boa Morte synthesizes evidence of the contribution of native and forest trees to ecosystem services, agricultural production and livelihoods for family farmers, where intensive production often occurs in mosaic complexes subjected to strong anthropic pressures. We investigated the abundance of birds and bees as potential pest controllers, and the increase in the income considering the existance of forest remnants or trees, in 20 production systems. Our results suggest that by incorporating forests and trees into an appropriate and contextualized management strategy for natural resources, there is a potential to maintain and, in some cases, to increase the resilience of productive systems when compared to exclusively monoculture systems. The results illustrate the potential benefits and food security through integrating trees into farms, providing rural farmers with additional income sources linked to new markets. In addition, we identified that significant gaps in current knowledge about native biodiversity can be filled through local knowledge. Our results demonstrate the need for long-term and large-scale research to better understand the contribution of forest and trees to the landscape and their associated impacts on livelihoods and food production systems, linking scientific and local knowledge .

Keywords: lanscape ecology, ecological intensification, food sovereignty