BOOK OF ABSTRACT

I. SESSION DESCRIPTION

ID: T14a

Title of session:

Land Use Changes, Supporting and Regulating Ecossystem Services

Hosts:

	Title	Name	Organisation	E-mail
Host:	Ms.	Margareth Simões	Embrapa Solos and UERJ	margareth.simoes@embrapa.br
Co-host (s):		Rodrigo Ferraz	Embrapa Solos	rodrigo.demonte@embrapa.br

Abstract:

Changes in land use and cover are a spatial and transverse phenomenon, intrinsically correlated to most of the environmental processes and its impacts, consequently decreasing the provision of relevant ecosystem services, which are fundamental for the sustainability of agricultural production activities. Interactions between land use changes and degradation processes have been extensively reported, with emphasis on: deforestation; ecosystems fragmentation; loss of biodiversity; soil degradation and erosive processes; hydro sedimentological dynamics changes in watersheds; Scarcity of water resources; and others. A number of important environmental services for the establishment of a sustainable agricultural production model, such as sequestration of CO2 from the atmosphere, mitigation of greenhouse gas emissions (GHGs), accumulation of carbon (C) in biomass and soil, regulation of the hydrological cycle, minimization of soil degradation and erosion process stability are directly or indirectly related to land use.

Goals and objectives of the session:

The objective of this section is to discuss all aspects related to the subject – Land Use Changes and Ecosystem Services – as methodologies for: monitoring, modeling, ES indicators/ tipping point, among others in a multiscale perspective.

Planned output / Deliverables:

Discussion (still to be planned afterwards with the organisers)

Related to ESP Working Group/National Network:

Thematic Working Groups– TWG 5 – Modeling ES

II. SESSION PROGRAM

Date of session: Thursday, 25 October 2018
Time of session: 10:30–15:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
10:30–10:45	Margareth	Simões	Embrapa	Session introduction: Land Use Changes and Ecosystem Services
10:45–11:15	Tasso	Azevedo	MapBiomas Program	Land Use Monitoring – MapBiomas Program
11:15–11:45	Celso	Manzatto	Embrapa	Low Carbon Agriculture – ABC Platform
11:45–12:00	–	–	–	Questions session: For the first and second speaker
13:30–13:55	Luciana	Soler	CCST/INPE	Land use scenarios linked to beef consumption, conservation polices and more nutritious diet in Brazil

Time	First name	Surname	Organization	Title of presentation
11:55-14:00	-	-	-	Questions session: For the third speaker
14:00-14:15	Viviane	Dib	International Institute for Sustainability (IIS)	Valuation of water quality services in different landscape restoration scenarios: ecological and socioeconomic trade-offs
14:15-14:30	Yara	Cruz	CCST/INPE	Smart conservation and land regulation policies combination to map potential areas for REDD+ mechanisms as Payment for Ecosystem Services (PES) in Cerrado
14:30-14:45	Clarita	Zamudio	Humboldt Institute	¿Pueden los análisis de Servicios Ecosistémicos contribuir a la comprensión de la Sostenibilidad en Paisajes Rurales?
14:45-14:55	-	-	-	Questions session: For the three speakers of presented works
14:55-15:00	Margareth	Simões	Embrapa	Session Finalization: Comments 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***

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Effects of landscape structure on the scavenger insect community and the provision of the carcass removal ecosystem service

First authors(s): Sebastián Alvarado-Montero

Other author(s): Andrea Larissa Boesing, Rodolfo Jaffé

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Agriculture expansion is one of the main drivers of deforestation and species loss worldwide. The intensity of this phenomenon depends on the crop type and its structural contrast with the native ecosystems. Scavenger insects are very sensitive to changes in their environment and provide important ecosystem services, such as removal of carcasses and disease prevention. We determine how landscape structure affects the community of scavenger insects and the supply of carrion removal service in the Southeastern Brazilian Atlantic Forest. We sampled forest remnants and its adjacent agricultural matrix (cattle pastures or coffee plantations) along three focal landscapes with 13%, 28% and 48% of remaining native habitat (an overall of 18 sampling sites; six sampling sites per focal landscape). We placed five vertebrate exclusion cages containing meat baits in each fragment-matrix interface, along a distance gradient of 200m from inside the forest into the matrix interior. Scavenger insects were sampled during six days after placing the bait and carrion mass loss was measured at the end of this period to determine the amount removed by insects. Carrion removal was substantially higher within forest remnants (82%) compared to the adjacent matrices, although carrion removal was higher within coffee plantations (65%) compared to pastures (24%). Even though remaining forest cover did not affect the overall carrion removal, the least forested landscape presented lower removal at forest edge (54%) than those focal landscapes with higher forest cover (84%). Data of the composition of scavenger insects community is still in progress, but our preliminary results suggest that matrix composition plays a key role structuring these communities and influencing the carrion removal service. This way, our investigation can be used to landscape management aiming to improve both the scavenger insects community and the carrion removal ecosystem services in agricultural landscapes.

Keywords: Brazilian Atlantic Forest, matrix type, forest cover, edge effect, regulation services

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

A multi-scalar approach to identify priority areas

First authors(s): Mariana Beauclair

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The Conexão Mata Atlântica Project aims to protect and restore ecosystem services related to climate and biodiversity in the Brazilian Atlantic Forest Southeastern Corridor. The approach to meet this end in Rio de Janeiro State is through conservation of forests, ecological restoration of low productivity pastures and sustainable farming practices. Farmers who implement actions on their properties will receive a payment for environmental services in the form of investments in sustainable production technologies with potential for income improvement. In a project with such a broad area of action, it is fundamental to establish a prioritization process that favors concentration and coordination of actions to obtain perceptible and measurable results. As the successful implementation and the achievement of environmental outcomes depends on several environmental, social, economic and political factors that are distributed differently through geographic space, the prioritization was built on three complementary scales. First, areas of action were defined in the State of Rio de Janeiro. The selection of small catchments was based on habitat availability, occurrence and threats to native plants, importance of forest patches for connectivity and the existence of partnerships already established with local actors. The selected catchments should combine satisfactory environmental and social conditions to the development of the project. The small catchments were subdivided into even smaller areas ("nano catchments"), which were analyzed for their importance as a local source of water supply for people and farming activities and for their potential to have a positive biodiversity-related response to action. This analysis generated a score that will contribute to the selection of submitted proposals. To coordinate action at the local scale, landscape elements – river margins, hilltops, slopes and the surroundings of forest patches – were defined as priority areas to the implementation of sustainable farming, conservation and restoration practices.

Keywords: priority areas, GIS, multi-scalar, biodiversity, ecosystem services

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

¿Pueden los análisis de Servicios Ecosistémicos contribuir a la comprensión de la Sostenibilidad en Paisajes Rurales?

First authors(s): Clarita Bustamante, Johan Manuel Redondo

Presenting author: Clarita Bustamante Zamudio

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Esta propuesta de investigación aborda el asunto del análisis de la sostenibilidad de paisajes, asumiendo que la sostenibilidad es una expresión emergente de los paisajes rurales (o socioecosistemas en el esquema de paisaje), que son sistemas complejos caracterizados por una amplia gama de relaciones que incluyen procesos ecológicos, dinámicas económicas y sociales y representaciones icónicas de las sociedades rurales.

La metodología aplicada para este análisis se desarrolló bajo la denominación de análisis de expresiones emergentes del paisaje y básicamente considera la manera en la que se encuentran entretejidos indicadores del paisaje relacionados con la oferta de servicios ecosistémicos, así como el acceso a estos y su riesgo de pérdida, con otros indicadores como la heterogeneidad, la sinergia, la apertura, la integridad, la eficiencia, la redundancia, la carga, la modulación, el control, la confianza, el acceso a oportunidades, a recursos y a información, la legitimidad, el bienestar social y de la biodiversidad, con el fin de analizar la manera en la que su interacción satisface tres principios de sostenibilidad: multifuncionalidad, productividad y bienestar.

En la metodología de expresiones emergentes, un indicador es una variable de estado del paisaje en relación sistémica con los demás indicadores, considerando los datos disponibles del paisaje para ser definida. Un principio, por su parte, considera un conjunto de indicadores y las condiciones o criterios que estos deberían cumplir para satisfacer el principio. Este criterio, dado que el concepto de sostenibilidad puede alcanzar ideales diferentes tanto

actores y relaciones hay en el paisaje, debe definirse, o al menos acordarse con dichos actores a través de la construcción de nuevos referentes que expliquen la expresión emergente deseada.

La metodología se aplicó en la Orinoquia colombiana, tomando como unidad de análisis las cuencas hidrográficas, obteniéndose una representación espacio-analítica de la sostenibilidad centrada en la relación con los servicios ecosistémicos.

Keywords: Servicios Ecosistémicos, Sostenibilidad, Expresiones Emergentes, Paisaje, Referentes sociales

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Valuation of water quality services in different landscape restoration scenarios: ecological and socioeconomic trade-offs

First authors(s): Viviane Dib

Other author(s): Agnieszka Latawiec, Alvaro Iribarrem, André Braga Junqueira, Catarina Jakovac, Ellen Fonte, Fernanda Tubenchlak, Helena Alves-Pinto, Isabelle Soares Pepe, Juliana Silveira dos Santos, Luisa Lemgruber, Renato Crouzeilles, Veronica Maioli, Bernardo Strassburg

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Despite the development of ecosystem services (ES) science in recent decades, integrating ES in landscape management is still a challenge. Water-related ES are less explored and particularly interesting to incorporate into governmental decisions. The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative that aims to integrate the values of biodiversity and ecosystem services into decision making at all levels. This work integrates a TEEB initiative focused on the Paraiba do Sul River basin (São Paulo State, Brazil), which is responsible for the water supply of the two largest urban centers in the country. We used InVEST models to estimate soil loss and exportation to water bodies. The economic valuation was based on avoided costs of water treatment and sediment dreading. We also estimated

habitat availability for diversity conservation and carbon sequestration. To valuate ES provision, three scenarios were modelled: business-as-usual (BAU, no restoration); legal compliance (LC, restoration required by law); and sustainable scenario (SS, sustainable practices and restoration planned to minimize costs and maximize landscape connectivity). As expected, soil loss and exportation were lower in scenarios with restoration practices. LC and SS showed similar soil loss, but LC was more efficient in avoiding soil exportation to water, which meant R$ 5 million per year in avoided costs. In SS restoration was allocated mostly on the basin's outskirts, where opportunity costs are lower and connectivity is higher. This scenario was less efficient for soil retention, but provided more habitat for biodiversity conservation. The sustainable productive systems adopted in SS also resulted in higher carbon sequestration. This understanding of the trade-offs among multiple ecosystem services must be considered in complex landscape management. Our results highlight the importance of spatial planning in landscape restoration initiatives and help decision makers to define sustainable development pathways.

Keywords: ecosystem services, water quality, biodiversity, carbon sequestration, TEEB

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Ecosystem Services of most common trees species in subtropical urban environments.

First authors(s): Julia Rodrigues Leite

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This abstract is part of the post doctoral research "Ecosystem services in urban areas: the tree evapotranspiration influence for the São Paulo city urban microclimate " that is developed at the Laboratory of Environmental Comfort and Energy Efficiency, FAUUSP Department of Technology. Seeks to advance in the knowledge of ecosystem services performed by trees within urban areas, and on the possibilities of their application in the process of planning urban green areas.

Ecosystem services are benefits that we can get from nature (Sukhdev et al, 2014, Hassan et al, 2005). The need to conserve natural resources is not recent. It is not a new knowledge, but a different perspective of approach to the conservation, implantation and maintenance of natural resources, where nature is considered as a precious element, endowed with great value, not only as something that is apart from human life, and in our context from built cities.

The theme is related to the promotion of urban green infrastructure, which is a process of urban planning and landscape that integrates to its development ecological and socio-economic knowledge in a holistic perspective (Pellegrino & Moura, 2017, Mell, 2016 and Madureira, 2012).

In order to counterbalance the impacts of urban heating, mitigation and adaptation technologies are proposed based on materials that keep the surfaces cooler and in green infrastructure (urban parks, road trees, roofs and green walls and permeable pavements) as they promote the increase of evapotranspiration in the environment. (Yenneti, K. et al., S/D, (Akbari & Kolokotsa, 2016).

We intend with this abstract contribute with the session presenting a part of the review of the current knowledge on ecosystem services of most common trees species in subtropical urban environments such as water absorption, carbon retention and the cooling potential.

Keywords: Ecosystem services, Urban Microclimate regulation, Trees evapotranspiration, Green infrastructure.

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Identification of potential areas for food production in Cerrado that meet land regulation requirements of the Brazilian New Forestry Code

First authors(s): Rafael Melo Rodiani, Luciana Soler

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Recent deforestation in Cerrado region has been determined by grain production and livestock aimed for external and internal markets of animal protein and animal feeding. Despite the economic contribution to national GDP, such land use systems do not guarantee food security to Brazilian population. Introducing sustainable agricultural practices that promote the protection of Cerrado biome and at the same time increase nutritious food availability are crucial to human and ecosystems health. In this context, this work aims to identify potential areas for food production inside properties in Cerrado smaller than four fiscal modules. Such properties are usually linked to small scale or family farming considered a key component in the nutritional diversification of food production. Following the Brazilian Forestry Code (FC) and related land regulation, we adopt the concept of fiscal module to set groups of farm sizes allowed to partially recover eventual deforested areas of permanent preservation (PPAs) and legal reserves (LRs) throughout agroforestry systems. Recently approved FC and related environmental legislation are analyzed to define data preparation procedures regarding: 1) definitions of groups of farm sizes prone to adopt agroforestry systems in PPAs and LRs recovery; 2) compliance evaluation of article 61-A, as part of the new FC, to evaluate impacts on permissive removal of native vegetation. A spatial geodatabase was built using limits of rural properties, PPAs, LRs, native vegetation and consolidated land use (SICAR / MMA); agrarian project limits (INCRA); as well as census survey data of population and agricultural production (IBGE). Results indicate that family farms occupy 16.53% of the rural areas in Cerrado and present an environmental deficit of ~ 2.2Mha (i.e., deforested PPAs and LRs). Undergoing result analysis are expected to deliver figures and maps that will contribute to ecosystem services related to food production and biodiversity conservation, while sustaining family farming.

Keywords: Forestry Code, Cerrado, family farming, agroforestry, food production.

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Forest restoration to improve hydrologic ecosystem services in Cantareira system headwaters

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The modeling of hydrological ecosystem services is an auxiliary tool in decision making for financial investment in land use practices and in forest restoration projects. Due to the need for improvement in the provision of these services at the lowest investment cost for the Cantareira System, this work aimed to evaluate scenarios for two methods of forest restauration to increase hydrologic ecosystem services yield. The study area comprises the Jaguari watershed, located in the head of water suplly Cantareira System, which has the purpose of supplying water to the metropolitan region of São Paulo, Brazil. This study uses RIOS model to find optimal places for forest restoration, both assisted and unassisted regeneration, and then evaluate export sediment and base flow changes using the InVEST tool. The scenarios with increased forest cover in priority places were evaluated in terms of reduction of sediment exports from sheet erosion and sediments capture by riparian areas and also for the impact in baseflow derived from having a more forested labdscape. In this analisys, RIOS selected about 50,730 ha to transition by assisted and 50,237 ha to unassisted forest restoration. The principal land use located in riparian legal protected areas found was pasture. Considering the restoration of all priority areas indicated by modelling it will be possible to reduce 68.24% and 36.85% of sediment exported in the watershed from sheet erosion due to enhanced riparian areas retention capacity, applying assisted and unassisted forest restoration, respectively. The smallest effect in base flow was the unassisted method with 2.75% of reduction in base flow while the assisted restoration could result in a reduction of 21.73%. The unassisted forest restoration was the most efficient activity to implement in order to improve hydrologic ecosystem services yield in the headwaters of Cantareira System.

Keywords: Modelling; Water management; Sediment export; Base flow

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Prioritization of areas for Crop-Livestock-Forest Integration technology transfer.

First authors(s): Sandro Pereira

Other author(s): Celso Vainer Manzatto, Ladislau Araújo Skorupa, Maria Isabel de Oliveira Penteado, Margareth Simões, Renan Milagres Lage Novaes, Priscila de Oliveira

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This paper will explore the implications of using multi-criteria analysis (MCA) and geographical information systems (GIS) along with strategic planning forecasting tools to map priority areas for crop-livestock-forest integration (CLFI) transferring technology actions (TT). Although it is usual works with MCA in GIS, there is no established approach to the definition of objectives, guidelines and criteria. Thus, we chose to use the strategic planning for it. The steps of this work were developed with TT and CLFI professionals of whole country. Which allowed us to identify and validate the guidelines and the criteria and drawing the thematic integration model of the evaluation with participatory approach. Thus, the guidelines were defined focused in strategic TT questions. And each criterion was conceived having its spatial representation in mind. After being validated, criteria were weighted through Analytic Hierarchy Process (AHP). Thus, the integration model was developed for representing how experts would use these criteria to select areas for TT. The use of strategic tools allowed the core of the problem and the goal to be clearly and objectively identified. Additionally, it enabled us to elaborate the strategic review of CLFI TT context and guiding the expert panel focused in the issue itself. Furthermore, reducing the subjectivity in the guidelines and criteria definition. Additionally, we conclude that the use of strategic planning tools allow for conflict resolution between research goals and experts' ideologies. Finally, this study gives an alternative methodology for spatial evaluation that allows the participation of non-experts in GIS. As a result of the spatial analysis, we identified that 82% of the agricultural area in Brazil are in accordance to CLFI TT criteria. From which, it offers the following areas of priority classes for TT in the CLFI: 41.5% with high; 28,8% with average; 18,7% with low and 13,8% with very low.

Keywords: Spatial Evaluation, Spatial Decision support system – SDSS, Analytic Hierarchy Process – AHP, multi-criteria analysis –MCA

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Riparian vegetation cover and valuation of ecosystem services for water quality provision in the Guarapiranga Reservoir (São Paulo, Brazil): future scenario (2030) versus ideal scenario from land use changes

First authors(s): Mariana Amélia Arantes Adas, Décio Semensatto
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The provision and maintenance of water quality for water supply are some of the ecosystem services that produce significant economic and social impact. We estimated the economic value of these ecosystem services provided by the riparian vegetation of the permanent preservation areas (PPA) located on the streams and the Guarapiranga Reservoir (São Paulo, Brazil). For this purpose, we used as references previous studies on the evolution of land use and occupation in the hydrographic basin and estimates of the vegetation cover loss over time with their respective impacts on the cost of treatment of raw water for public supply. We delimited the PPA and verified the land use classes present for the association between the area of riparian vegetation and its respective valuation. The valuation considered two scenarios: (i) a projection for the year 2030, maintaining the trend of losing vegetation in the hydrographic basin observed between 1986 and 2010; and (ii) an ideal scenario projection, that is, with the PPA conserved according to the incident legislation. For the future scenario, we estimate that riparian vegetation will cover 81270 ha (77% of the total area of PPA), which represents deforesting 3589 ha from the year 2010. This change will rises annual expense with water treatment reagents from around USD 6.6 million in 2010 to USD 101.8 million in 2030 as a consequence of losing ecosystem services provided by vegetation. Accomplishing the ideal scenario will require to reforest 3664 ha in the PPA, which would dramatically reduce the water treatment annual expense and save around USD 104 million per year. Even considering a possible underestimation, these projections indicate the strategic importance of recovering and preserving the riparian vegetation and the economic valuation of the

environmental resources, having as a consequence significant social and economic impact in the hydrographic basin.

Keywords: Water quality, water supply, riparian vegetation, natural resources valuation, deforestation

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Microplastics in sediment from Guarapiranga Reservoir (São Paulo, Brazil): effects on ecosystem services

First authors(s): Marina Landim da Cruz, Décio Semensatto

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Microplastics are plastic particles <5 mm that represent a residue whose detection has been growing in quantity and variety in several ecosystems. However, there are still few conclusive studies on their adverse effects on the environment and human health. We aimed to detect the presence of microplastics in Guarapiranga Reservoir (São Paulo, Brazil) sediment from a drilling core collected in 2010 that covers the whole sedimentary history of the reservoir. Therefore, we sought to relate the impacts on ecosystem services resulting from the presence of microplastics. We examined sediment samples from layers representing five and ten years of sedimentation (from the early 1990s to 2010 and from the 1920s to the 1980s, respectively). The samples were dried at 60°C for 48 hours and sieved in 63 µm metal mesh. Then, microplastics were picked under a stereomicroscope, photographed and measured using Zeiss AxioVision software. Microplastics composition was identified using Raman spectroscopy. The predominant material in the last two decades is filaments and fibers, usually 2 to 5 mm in length. Probably, its primary pathway is domestic sewage discarded in the reservoir about 1.5 km from the sampling point. The shape and composition (polystyrene, polypropylene, polyethylene terephthalate and others) suggest that this residue may come from plastic garbage. The presence of microplastics in the reservoir can potentially impact the ecosystem services of food production, recreation, waste treatment, biological refugee and disturbance

regulation. These results indicate the importance of expanding the monitoring of microplastics in aquatic ecosystems and of greater attention for the adoption of public policies associated with microplastics control.

Keywords: water pollution, sediment pollution, water quality, environmental degradation, aquatic ecosystem services

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

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Land use scenarios linked to beef consumption, conservation policies and more nutritious diet in Brazil

First authors(s): Luciana Soler, Luciana Soler
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In 2011, Brazil more than halved undernourishment prevalence (UnP) and the number of starving people as a response of political agenda on income distribution, food production and access. However, a parallel timeline on land use/cover changes (LUCC) Brazil can be hardly attached to food security policies, but instead to neoliberal policies to supply national food markets and international demand for agricultural/livestock commodities. Thus, in this work we make opposite scenarios where local land systems can be able or fail to sustain internal food supplies, which is linked to beef consumption, Forestry Code compliance and pasture recovery, but can guarantee somehow commodities production and/or ecosystem services (ESS). Due to recent land use concentration for food, energy and feeding crops and relevance on continental water and carbon cycles ESS on climate regulation, LUCC scenarios were focused on Cerrado. Scenarios are based on storylines supported by diagnostic maps of food acquisition, projected food/feeding commodities for export or internal consumption, goals of environmental and health policies; and land demand to 2050 under pre-defined climate change scenarios using FEEDME model that provide UnP for a certain population and estimated figures to be used as land use intensification proxies according to food consumption. As it allows inferring required cropland to avoid high UnP, results indicate that Brazil must tackle increasing gaps between the amount of food produced regionally and the share actually

available to low income population under high food insecurity. Implications on land availability indicate reasonable pathways to meet balance between crops/livestock production and conservation, but law enforcement, health and environmental education, participative governance and land tenure issues can hinder sustainable pathways for Cerrado region.

Keywords: food security, land use scenarios, domestic consumption, diet, Cerrado

12. *Type of submission:* ***Abstract***

T. Thematic Working Group sessions: T14a Land Use Changes, Supporting and Regulating Ecosystem Services

Smart conservation and land regulation policies combination to map potential areas for REDD+ mechanisms as Payment for Ecosystem Services (PES) in Cerrado

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In Brazil land use changes in Cerrado are major threats to ecosystem services that guarantee essential provisions of food and water to human survival. In Tocantins state, recent intensified land systems have increased human vulnerability to global changes. This paper aims to identify potential areas prone to receive REDD+ subsidies as PES in the Tocantins state. A first perspective is focused at the property level, being original vegetation remnants quantified inside properties´ limits given SICAR data (MMA). A second one is focused at the regional level, where potential forested areas are analyzed according to carbon stocks within watersheds in the study area. Beyond SICAR data we adopted updated land use/cover map from MAPBIOMAS project, hydrographic basins limits based on Ottobasins level (ANA) and Brazilian National Inventory data of carbon stocks per vegetation type (MMA). Early results indicate that out of 35.107 properties in Tocantins, 85% of them have forested areas varying between 10 to 35% of their total limits, including their legal reserves (LRs) and permanent preservation areas (PPAs). At the regional level, it was possible to compute that at least 90% of area from all hydrographic basins in Tocantins have a carbon stock ranging from 0 to 87.55 tC/ha. Spatial and scoring analyses are being done to quantify potential areas for REDD+ initiatives under conservation and climate change mitigation policies inside PPAs and LRs of properties, considering remaining carbon stocks inside hydrographic basins where they are located.

Adopted policies stand for the Brazilian Forestry Code and the Forest Reference Emissions Level (FREL) in Cerrado biome, recently approved to be implemented as part of Brazilian INDC under UNFCC/UN scope. Forthcoming results aim to contribute to a broad understanding of the spatial distribution of LRs and PPAs suitable for REDD+ incentives according to carbon stocks in their hydrographic regions.

Keywords: REDD+ subsides, property level, regional level, carbon stocks, REDD+ initiatives