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I. SESSION DESCRIPTION

ID: S2

Title of session:

Enhancing sustainable aquaculture in freshwater ecosystems of Latin America

Hosts:

	Title	Name	Organisation	E-mail
Host:	Prof.	Livia Madureira	UTAD (University of Trás-os-Montes e Alto Douro)	lmadurei@utad.pt
Co-host (s):		Marcos C. Santos, Marcos Brabo,	UNIR (Federal University of Rondonia), UNFP (Universidade Federal do Pará) e IECOS	marcoscesar@unir.br, marcos.brabo@hotmail.com,

Abstract:

Aquaculture in freshwater ecosystems is a growing activity in Latin America in tune with the sector dynamics across the world. This is envisaged as key activity to supply animal protein to an increasing global and regional food demand. Hence it's an attractive business for small entrepreneurs in many regions of Latin America that integrate large value chains involving input suppliers, growers and whole and retail sellers. The structure of this value chains tends to allow limited added value retention by the small and medium growers who are pressured to intensify the activity in order to increase their production and productivity. As a result freshwater ecosystems are being deteriorated due to aquaculture farms implementation which change the hydrological flows pattern and affect the whole freshwater ecosystems balance. The situation is aggravated by the farm fishing operation that causes freshwater ecosystem eutrophication as a consequence of a large rate of organic waste which includes non-



consumed feed, lixiviation of aquaculture feedstuffs, decomposition of died organisms, and over fertilization. Other ecosystem disservices of aquaculture are well documented by the scientific literature, including losses in soil ecosystems services and water quality, as well food safety issues due to overuse of antibiotics and other pharmaceutical substances to prevent and control diseases outbreaks that are inflated due to production intensity.

Given the sector importance as a supplier of important provisioning services if the activity respects the ecosystems carrying capacity it's fundamental to develop smart legislation along with effective tools for regulating the planning and the implementation of the activity. However, self-regulation is a major drive for enhancing sustainable aquaculture in freshwater ecosystems of Latin America. To accomplish the later incentives are need to lead to changes in aquaculture growers decision-making. These might include tools to increase grower's added-value such as ecological certification and branding or the development of responsible collective action at value chain level and/or at the watershed territorial and community level. Sustainable demand tools are also needed, by increasing consumer's awareness of environmental and food safety costs of unsustainable aquaculture.

To support the development of smart legislation, planning and regulation tools for policy-makers along with the development of market-based tools to help growers and aquaculture value chains and the initiatives of collective action towards sustainability, the ecosystem services framework an related tools can be of major usefulness. Hence the aim of this session is to bring together researchers, policy-makers and business representatives enabling to exchange experiences and practical solutions to enhance sustainability of aquaculture in freshwater ecosystems and to present and discuss how ecosystem services framework and related tools can be used to get and share knowledge to inform public policies, researchers and private decision-makers.

Goals and objectives of the session:

- To share knowledge and experiences of practical examples and solutions for enhancing sustainability of freshwater ecosystems aquaculture in Latin America
- To present and demonstrate added-value of ecosystem services framework and related tools, including mapping, modelling, trade-off assessing, valuing and value capture of ecosystem services, to support the development of effective policies, planning and managing tools for freshwater ecosystems aquaculture
- Develop ecosystem approach guidelines with a business and socio-territorial development perspective for fresh water aquaculture



Planned output / Deliverables:

- To establish a working multi-actor group to produce business guidelines to promote sustainable freshwater aquaculture based on the ecosystems services framework
- Develop a special issue proposal by inviting papers on the topic of ecosystem services approach for sustainable freshwater aquaculture
- To deliver contributions to the Sustainable agendas under discussion in this ESP regional conference.

Related to ESP Working Group/National Network:

[Sectoral Working Groups: S2 – ES in Fishery & Aquaculture](#)

II. SESSION PROGRAM (S2)

Date of session: Tuesday, 23 October 2018

Time of session: 13:30– 15:00

Timetable speakers

Time	First name	Surname	Organization	Title of presentation
13:30–13:45	Tamara	Fonseca	São Paulo State University, Brazil	Emergy synthesis of the ecosystem services from lambari aquaculture
13:45–14:00	Marcelo Gomes	Silva	Embrapa, Brazil	Climate change and fish farming
14:00–14:15	Marcos Cesar	Santos	Universidade Federal de Rondônia (UNIR), Brazil	Is sustainability decision-making influenced by participation in online social networks? The case of the WhatsApp group "Peixe de Rondônia"
14:15–15:00			Discussion	



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: S2 Enhancing sustainable aquaculture in freshwater ecosystems of Latin America

Emergy synthesis of the ecosystem services from lambari aquaculture

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Lambari aquaculture is a fast-growing activity in Southeast Brazil. As a native low-trophic-level fish, lambari has a potential to be produced in a sustainable way. Lambari aquaculture could provide several non-market-traded ecosystems goods and services (EGS). Thus, the identification and measurement of the systems' weakens and strengths are necessary steps for improving its efficiency and reach sustainability. Therefore, the present study aimed to identify and quantify the EGS provided by lambari aquaculture farms using the emergy synthesis method. We studied 9 lambari farms located in São Paulo State, Brazil, operating at different management strategies: low, medium and high production control. The positive externalities were identified based on the Indicators of Sustainability previously applied to the farms. A system diagram was set focusing on the emergy flows from the ecosystem services. The main services identified in the systems were greenhouse gases absorption, nitrogen and phosphorous retention, climate regulation, habitat provision, hydrological regulation, recreational activities and maintenance of rural communities' livelihoods. The next steps include quantifying these emergy flows into the lambari aquaculture system. The valuation of the EGS provided by lambari aquaculture could guide decision makers to promote changes towards sustainability. In addition, the internalization of these positive externalities could directly benefit producers that choose for better management practices.

Keywords: emergy synthesis, sustainability, ecosystem services, lambari aquaculture.



2. *Type of submission: Abstract*

S. Sectoral Working Group sessions: S2 Enhancing sustainable aquaculture in freshwater ecosystems of Latin America

Is sustainability decision-making influenced by participation in online social networks? The case of the WhatsApp group "Peixe de Rondônia"

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Aquaculture is a worldwide expanding activity which growth aims at responding to an increasing demand for fish. This paper focus on the Southern region of the Brazilian Amazonia. In the region, more than 90 thousand tons of native fish were produced in 2016, mainly in systems of confinement in excavated tanks. Aquaculture is experiencing continuous growth in the region for the last 10 years. Its expansion created several sustainability challenges, which might compromise the activity in the long run and endangered the local ecosystems sustainability. Fish growers along with other sector stakeholders are discussing solutions to overcome sustainability challenges both at the environmental and economic front. This paper analyses how effective can be multi-actors online social networks (OSN) acting as digital communities of practice. The conversations held in the WhatsApp group "Peixe de Rondônia" during a period of 15 months (from August 2016 to October 2017) by 239 actors, comprising: Input and equipment suppliers, Upstream industry and trade, fish growers (with 155 participants covering a diversity of growers in terms of its size and production system), the institutional sector, scientific community, and others, including the media and the community. The conversations held in the network were analyzed with content analysis technique. The analysis was supported by statistical analysis and lexical interpretations of lemmatization with the software Iramuteq. The results suggest that fish growers have a business view of sustainability, with a focus on aspects influencing fish productivity such as water quality, fish health and welfare, the introduction (pros and cos) of exotic species and the sector competitiveness, comprising the ecologic certification under a collective territorial brand. Hence, in spite of conflictual aspects some convergence can be found between economic and ecologic sustainability if fish growers were able to embrace the ecologic certification.

Keywords: Amazonia; Aquaculture; Content analysis; Sustainability; WhatsApp Group.



3. Type of submission: **Abstract**

S. Sectoral Working Group sessions: S2 Enhancing sustainable aquaculture in freshwater ecosystems of Latin America

Climate change and fish farming

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The knowledge of the environmental impact of an activity can be seen as a market differential. Agricultural activities such as cattle raising have been heavily taxed because they are considered high greenhouse gases (GHG) emissions, forcing the market to adopt mitigating measures. Little is known about its emission and its real impact of aquaculture on climate change. The increase of GHG in the atmosphere results in alterations like the increase of the temperature and changes in the precipitation with direct effects in the aquaculture as alterations in the growth, reproduction and fish mortality. A pioneer work was done to quantify methane (CH₄) and carbon dioxide (CO₂) fluxes of fish farming areas with Nile tilapia (*Oreochromis niloticus*) in net cages. The GHG fluxes were measured in fish farms at the tropical reservoirs Furnas (FHR), Castanhão (CAS) and Chavantes (CHV). The CH₄ was classified by the mechanism for gas transport through the water column as diffusive flux or bubble flux. The comparison between the points with fish net cages and control (without net cages) in FHR and CHV suggest that fish farming did not impact the emission of CH₄ by diffusive transport. In the CAS, high CH₄ diffusive fluxes were observed in sites with fish net cages. The mean CH₄ bubble flux in CAS and CHV was higher in areas with fish net cages when compared to areas free of fish production suggesting the influence of fish farming on the CH₄ bubble fluxes. In the FHR, the decrease in depth during the drought period was associated as the factor with the greatest impact on the CH₄ bubbles emission. The CO₂ sink in CAS and emission in CHV suggest that characteristics of the reservoir, as chlorophyll-a and turbidity have a greater impact factor to CO₂ emission than the fish farming.

Keywords: Greenhouse gases, fish farming, tropical reservoirs, climate change