CLIMATE SMART LAND USE: THE AGRICULTURE – FOREST NEXUS

Session programme
Increasing agricultural production is key in reaching the zero hunger SDG target. In past decades, forest loss has been driven primarily by the expansion of agriculture in the tropics (Carter et al. 2018). In addition, in many tropical developing countries, land use (agriculture) and land use change (deforestation) are the major contributors of greenhouse gas emissions. This calls for climate-smart land use supported by evidence-based decision making. In this session we will explore recent research that gives insight in this forest-agriculture nexus. Our specific focus is on the potential for new data sources to present opportunities to better understand this forest-agriculture nexus. We discuss the use of ground measurements, satellite imagery and the use of drones.

14.00-14.20 Using data to understand the forest-agriculture nexus and to achieve climate-smart land use

14.20-15.15 Rotating session: Each presentation (approx. 15 minutes) is delivered three times to small groups of 1/3rd of the audience, so all participants have the opportunity to interact with all the speakers:

- Greenhouse gas emissions for different scenarios of agricultural intensification or expansion for sub-Saharan Africa (Renske Hijbeek)
- The role of new data sources in land monitoring: the case of Drones (Lammert Kooistra)
- New data and big data analysis for forest and land monitoring: A practical demonstration (Sabina Rosca)

15.15-15.30 Plenary discussion on what is needed to achieve climate smart land use. The audience are invited to comment on the speakers' proposals for achieving a transformative change in this theme.

Detailed descriptions of presentations:

Using data to understand the forest-agriculture nexus and to achieve climate-smart land use Sarah Carter[1], M. Herold[1], N. de Sy[1], P. Brandt[1], and A. Pratihast[1]
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This presentation will discuss how climate-smart land-use might be achieved, considering the potentially conflicting goals of other agreements such as the Paris Climate agreement (promoting forest protection), and the SDGs. We will discuss local case studies (for example Brandt et al. 2018) on the interaction between agriculture and forest, as well as the broader issue of large-scale land acquisitions driven by food demand in tropical areas (Carter et al. 2017). We will also highlight how lessons learned from forest sector initiatives, such as REDD+ can feed into agriculture related policies. Finally, the scale of actions needed to achieve climate-smart land use, which will avoid competition for land for both agriculture and also forest protection will be discussed (Carter et al. 2018b). The use of new spatial data and novel methods to identify/map land use (change) and emissions, at different spatial scales and timeframes using remote sensing can contribute to more insight in this nexus. Examples will be discussed ranging from a pantropical study on the identification of hotspots for emissions from the land sector (agriculture as well as deforestation) (Rosa-Roman et al. 2016) to the use of citizen science (for example Pratihast et al. 2013).

Greenhouse gas emissions for different scenarios of agricultural intensification or expansion for sub-Saharan Africa Renske Hijbeek[1], M. van Loon[1], H. ten Berge[2], N. de Sy[3] and M.K. van Ittersum[1]

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Current greenhouse gas emissions associated with maize production are relatively low in SSA. This will change in the future when demands for food will increase with increasing population growth. One manner to increase food production is by increasing nutrient inputs to attain higher crop yields (agricultural intensification), with associated increase in greenhouse gas emissions. An alternative route is for maize cultivation to continue with limited external inputs and low yields (i.e. current extensive agricultural practices), increasing agricultural expansion into forests or grassland areas. Besides their biodiversity values, forests and grassland are important stocks of carbon which will then be converted into CO_2 emissions. In this study we explore the associated greenhouse gas emissions from either agricultural intensification or expansion of maize production in nine countries in sub-Saharan Africa using four different scenarios for 2050.

The results show that under the assumption of balanced crop nutrition, intensification of maize production will cause less greenhouse gas emissions than continuing current extensive agricultural practices with land expansion, but only with yield levels up to a certain percentage of the potential yield and with high nitrogen use efficiency. Preliminary farm level analyses show that an increased use of NPK inputs might be beneficial for farmers' income, but not under all conditions. Successful intensification of maize production (with limited greenhouse gas emissions and benefits for farmers' income) will require strong efforts in promoting market access to farmers, prudent use of external inputs and good agronomy.

The role of new data sources in land monitoring: the case of Drones Lammert Kooistra[1]

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Intensification in agricultural systems can be achieved by altering management practices. In order to understand better what changes need to be made, biophysical information on both crops and the forest canopy is required. Drones can potentially deliver a wealth of information and this presentation will describe the benefits of using drones in terms of independent and flexible data acquisition, customization of data types and spatial detail. Informing decisions based on this data however is not straightforward, as data must be processed, validated, and of good quality. On top of this, data must be accessible to the decision makers who must be able to identify issues and apply interventions based on the information provided. Examples of integrated systems using multiple data sources will be discussed, and implications for the design of future agricultural systems and for research in this field will be discussed.

New data and big data analysis for forest and land monitoring: A practical demonstration Sabina Rosca[1]

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System for Earth Observation Data Access, Processing and Analysis for Land Monitoring (SEPAL) is an innovative FAO digital platform that helps countries measure, monitor and report on their forests and land use. This session will demonstrate this easy-to-use platform, and will cover access to granular satellite data, land use change analysis, and accessing the super computing power required to scale analyses. SEPAL is at the forefront of Open Foris, a suite of innovative open-source technical tools, leveraging technical partnerships with Google. Open Foris software helps FAO support countries in their development of robust National Forest Monitoring Systems through survey design, data collection, analysis and reporting. This helps countries to improve the accuracy and transparency of national plans to mitigate the effects of climate change and fine-tune land-use policies and implementation.

References / some relevant papers:

P Brandt et al. 2018. The contribution of sectoral climate change mitigation options to national targets: a quantitative assessment of dairy production in Kenya. Environmental Research Letters, 13 (3).

S Carter et al. 2015. Mitigation of agriculture emissions in the tropics: comparing forest land-sparing options at the national level. Biogeosciences, 12, 4809–4825.

S Carter et al. 2017. Large scale land acquisitions and REDD+: a synthesis of conflicts and opportunities. Environmental Research Letters, 12 (3), 035010.

S Carter et al. 2018. Agriculture-driven deforestation in the tropics from 1990 to 2015: emissions, trends, and uncertainties. Environmental Research Letters 13 (1), 014002

S Carter, et al. 2018b. Climate-smart land use requires local solutions, transdisciplinary research, policy coherence, and transparency. Carbon Management, ISSN 1758-3004 - 11 p

V De Sy et al. 2015. Land use patterns and related carbon losses following deforestation in South America. Environmental Research Letters, 10(12), p.124004

A Pratihast et al. 2013. Mobile devices for community-based REDD+ monitoring: A case study for Central Vietnam. Sensors, 8220, 21-38.

R M Roman-Cuesta et al. 2016. Hotspots of gross emissions from the land use sector: patterns, uncertainties, and leading emission sources for the period 2000–2005 in the tropics. Biogeosciences, 13 4253-4269.

E Wollenberg et al. 2016. Reducing emissions from agriculture to meet the 2 °C target. Global Change Biology, 22, 3859–3864.

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